p-ISSN: 2338-5324
e-ISSN: 2442-7276

JKP

JURNAL KEPERAWATAN PADJADJARAN

OPEN ACCESS

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Jurnal Keperawatan Padjadjaran

Volume 13 Issue 1: April 2025

OPEN ACCESS

All articles published in Jurnal Keperawatan Padjadjaran are fully open access under the terms of a Creative Commons Attribution-NonCommercial CC BY-NC 4.0, which allows others to share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material). JKP provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

© The Author(s) 2025

Jurnal Keperawatan Padjadjaran Volume 13 Issue 1
E-ISSN: 2442-7276; P-ISSN: 2338-5324
http://jkp.fkep.unpad.ac.id

Faculty of Nursing Universitas Padjadjaran, Building Academic 2 Floor 1
Jl Ir. Soekarno KM. 21, Hegarmanah, Jatinangor District, Sumedang Regency,
West Java Province, Indonesia, 45363
Mobile: 085317736810; Phone: 022-7796647; Fax: 022-7796647

p-ISSN : 2338-5324 e-ISSN: 2442-7276
Jurnal Keperawatan Padjadjaran

Editorial Boards

Editor in Chief

Titis Kurniawan, S.Kep., Ners., MNS, PhD
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

International Editorial Advisory Board

Professor Alison Hutton
School of Nursing and Midwifery, University of Newcastle, Australia

Professor Akiko Kondo
Graduate School of Health Care Sciences, Tokyo Medical and Dental University, Japan

Associate Professor Young Mi Ryu
Baekseok University, South Korea

Professor Che An Binti Ahmad
Faculty of Nursing, Mahsa University, Malaysia

Ernesto R Gregorio
College of Public Health, University of the Philippines, Manila, Philippines

Editorial Board Members

Professor Suryani Suryani
Faculty of Nursing, Universitas Padjadjaran, Indonesia

Professor Kusman Ibrahim
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Professor Dr. Siti Yuyun Rahayu Fitri
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Jerico Pardosi, Ph.D
Faculty of Health at Queensland University of Technology, Australia

Eva Suarthana, Ph.D
McGill University Montreal, Canada

Professor Ferry Efendi, Ph.D
Faculty of Nursing, Universitas Airlangga, Indonesia

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Hidayat Arifin, M.Kep
Faculty of Nursing, Universitas Padjadjaran, Indonesia

Production Editor

Sri Hendrawati, M.Kep
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Journal Manager

Professor Laili Rahayuwati, Dr.PH
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Marketing and Promotion

Irman Somantri
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Novita Kamaruddin
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

Technical Administration

Endah Rahayu
Faculty of Nursing, Universitas Padjadjaran, Bandung, Indonesia

About Jurnal Keperawatan Padjadjaran

Jurnal Keperawatan Padjadjaran (JKP) is an international journal that provides a forum for nurses to promote excellence in nursing sciences and practice through the dissemination of the latest, evidence-based, peer-reviewed clinical information and original research. JKP is a scientific peer-reviewed nursing journal that is published three times a year (April, August, and December) by the Faculty of Nursing, Universitas Padjadjaran, Indonesia, in collaboration with the Association of Indonesian Nurses Educational Institutions (AINEC).

JKP welcomes studies from various study designs (original research, review article, case study, editorial, perspective, and letter to editor) to accommodate nursing research with rigorous methods for international readers. This journal has been publishing peer-review journals since 2013. This journal offers benefits for authors (1) A nursing journal with a high reputation; (2) indexed in major databases such as Science and Technology Index (SINTA) rank 2, and Directory of Open Access Journal (DOAJ); (3) and rapid decision for sustainability editorial process.

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Jurnal Keperawatan Padjadjaran

JKP

Research Article
Volume 13 Issue 1
https://doi.org/10.24198/jkp.v13i1

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Jurnal Keperawatan Padjadjaran

JKP

Research Article
Volume 13 Issue 1
https://doi.org/10.24198/jkp.v13i1

Roles of agro-nursing in bringing health services in rural and remote areas of Indonesia

Tantut Susanto[1*], **Daniel Joseph E. Berdida**[2]

[1] Department of Community, Family & Geriatric Nursing, Faculty of Nursing, Universitas Jember, Jember, Indonesia
[2] North Private College of Nursing, Arar City, Northern Border, Saudi Arabia.

Abstract

Agro-nursing is an innovative approach to health care that integrates nursing science with a contextual understanding of agricultural conditions and rural life. Rural and remote areas in Indonesia often face challenges in accessing adequate health care. This article discusses the role of agro-nursing in addressing these challenges, highlighting how nurses can act as agents of change who provide health care and empower communities through approaches appropriate to local characteristics. By utilizing local potential, community culture, and agricultural systems as an integral part of rural life, agro-nursing strengthens health care promotive, preventive, curative, and rehabilitative efforts. This study also highlights the importance of specialized training, cross-sector collaboration, and policy support to optimize the role of agro-nursing in improving the health of communities in remote and disadvantaged areas. It is hoped that agro-nursing can be a sustainable strategy for narrowing the gap in health services between urban and rural areas in Indonesia.

Keywords: agro-nursing, health services, rural areas, remote areas, community nursing

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 1-6
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2784

Article Info

Received : March 30, 2025
Revised : April 14, 2025
Accepted : April 23, 2025
Published : April 25, 2025

Corresponding author

Tantut Susanto*
Department of Community, Family & Geriatric Nursing, Faculty of Nursing, Universitas Jember, Jember, Indonesia; Address: Jl. Kalimantan No.37, Krajan Timur, Sumbersari, Kec. Sumbersari, Kabupaten Jember, Jawa Timur; Telp/fax : (0331) 323450; Postal Code: 68121, Phone: (0331) 323450; Email: tantut_s.psik@unej.ac.id

Citation

Susanto, T & Berdida, D.J.E. (2025). Roles of agro-nursing in bringing health services in rural and remote areas of Indonesia . *Jurnal Keperawatan Padjadjaran, 13*(1), 1-6. http://dx.doi.org/10.24198/jkp.v13i1.2784

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Challenges of healthcare services in rural – remote areas in Indonesia

Nursing services in rural and remote areas face various challenges, including limited health infrastructure, lack of medical personnel, and limited access to healthcare facilities. Healthcare facilities are entities that deal directly with the community. Community health centers are still the primary healthcare facility that provides basic health services and referrals. In 2023, the number of community health centers in Indonesia is 10,180, consisting of 4,210 with inpatient facilities and 5,970 without inpatient facilities. The ratio of community health centers to sub-districts in 2023 is 1.4, indicating at least one community health center in each sub-district in Indonesia (Ministry of Health of Indonesia, 2023).

Rural and remote are concepts used to identify areas based on their level of accessibility, population density, and infrastructure. While both share similarities in terms of resource constraints, there are fundamental differences that influence approaches to health care. Rural refers to rural areas with relatively small populations, limited access to health facilities, and reliance on agriculture or local natural resources (Christie et al., 2022). Rural areas usually have connections to small towns or service centers, although access often takes time and effort. Key challenges in rural areas include limited health workers, minimal medical facilities, and social stigma related to health problems, including mental health.

Meanwhile, remote refers to isolated areas with a higher level of isolation than rural areas (Watters et al., 2025). These areas include mountains, small islands, or remote forests that are difficult to reach both physically and digitally. Access to health services in remote areas often relies on long-distance referral systems or telemedicine technology due to transportation and communication limitations. Geographic factors, extreme weather, and lack of infrastructure further complicate the provision of health services in

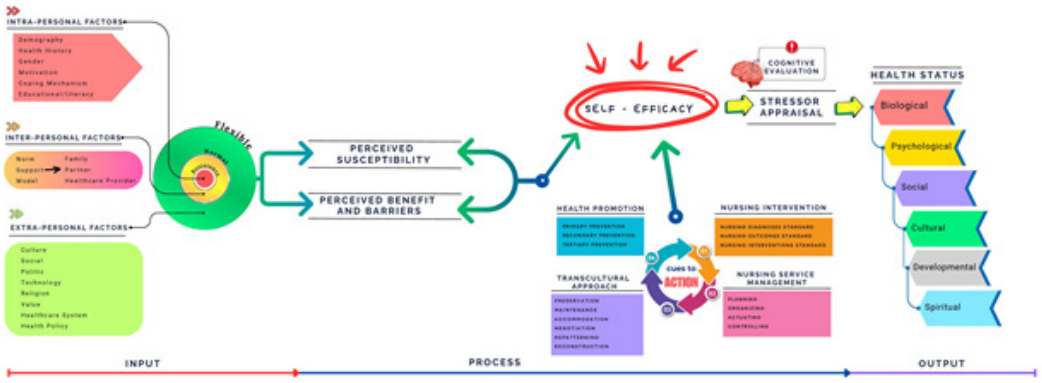


Figure 1. Conceptualized Framework of Agronursing

these areas.

Rural areas generally have low populations, limited infrastructure, and are far from urban centers (Asghari et al., 2024). Meanwhile, remote areas refer to isolated areas with limited access to basic health services. They are often difficult to reach due to geographic factors such as mountains, forests, or isolated islands (Franco et al., 2021). Both of these areas have unique challenges that affect how health services are delivered. In rural areas, people generally rely on local resources and have limited access to information, technology, and health services (Christie et al., 2022). Infrastructure such as roads, communications, and electricity may be inadequate, slowing the response in an emergency. These conditions make health services more difficult to reach and require health workers to be more creative in providing nursing care.

Meanwhile, remote areas are often more extreme than rural areas due to their profound isolation (Buse et al., 2022). These areas may not have health facilities, so health workers must travel long distances or use telemedicine to provide medical consultations. Challenging geographic conditions also delay the medical evacuation process in an emergency (Rossiter et al., 2023).

In the context of health, the concepts of rural and remote influence how services are designed and implemented. In rural areas, health services are often community-based, with nurses and health workers actively providing health promotion and early intervention (Hayes et al., 2025). Meanwhile, in remote areas, innovative approaches such as using health information technology (e-health) and telemedicine are crucial to bridging the gap in access to services (Tsou et al., 2021). The remote-rural concept can be understood through five rurality dimensions: geography, demography, economy, infrastructure, and socio-culture (Christie et al., 2022). This approach helps provide a more transparent framework for policymakers to improve access and quality of services, including health services, in remote areas. Rural areas usually depend highly on the agricultural sector and local natural resources (Rossiter et al., 2023).

Meanwhile, remote refers to remote areas that are geographically difficult to reach, such as mountains, islands, or forest areas. Therefore, agricultural health nursing services are very much needed for people living in rural and remote areas. Nurses are needed in rural and remote health service environments because they carry out various roles that are very important for the health and well-being of these communities.

Health problems experienced by farmers are malnutrition (28.5%), anemia (62.6%), and joint and bone pain (50.3%) (Susanto et al., 2017). Health problems in farmers are caused by age factors, drinking habits, breaks in work less than 30 minutes while working, and workloads exceeding five working hours per week (Aji et al., 2023; Susanto et al., 2017, 2023; Susanto & Widayati, 2018). The unhealthy lifestyle of farmers is the primary trigger for health problems such as hypertension (Rhosani et al., 2023; Susanto et al., 2020; Susanto et al., 2022; Yunanto et al., 2023). Agricultural health nursing (in this case, called agro-nursing in Indonesia) can be a form of nursing service in agricultural areas to prevent and improve health levels through a community nursing care approach and family nursing care in rural and remote areas.

Nurses' role in providing care in rural – remote areas

Nurses play a critical role in providing health services in rural and remote areas as they are often the sole primary healthcare providers in rural and remote areas (Jennings et al., 2021; Muirhead & Birks, 2020), providing a range of services, including emergency care, chronic disease management, and mental health support (Kgatla et al., 2021). In addition, due to shortages of physicians and specialists, nurses in rural and remote areas often work in advanced

generalist roles, performing tasks that would typically be performed by medical practitioners (Muirhead & Birks, 2020), such as providing critical care, palliative care and managing cardiovascular disease (Holland et al., 2024; Kgatla et al., 2021). To provide effective services, nurses in rural and remote areas must engage directly and deeply with communities, building trust and understanding of cultural, historical, and family contexts (Malley et al., 2024). The number of health human resources in health facilities in Indonesia in 2023 is 2,077,473, consisting of 183,694 medical personnel (8.8%), 1,317,589 health workers (63.4%), and 576,190 health support personnel (27.7%). In 2023, there were 11.5% of health centers with a shortage of doctors, 59.1% of health centers with an excess of doctors, and 29.4% of health centers with a status of having enough doctors (Ministry of Health of Indonesia, 2023).

Agro-nursing development and implementation

Health services in rural and remote areas face various challenges, especially for agrarian communities that rely on the agricultural and livestock sectors as their primary source of livelihood. One innovative approach in nursing that aims to improve access and quality of health services in these areas is Agro-nursing, which integrates nursing science with an understanding of specific health challenges in the agricultural and livestock sectors (McCallum et al., 2023). Agronursing aims to provide health services that are more relevant to the working environment of farmers and ranchers and to increase awareness of occupational health in agrarian communities.

In the Indonesian context, the implementation of agro-nursing still faces structural challenges, including the lack of nursing staff with specific expertise in agro-nursing, limited policies that support the integration of health and agriculture, and the lack of incentives for medical personnel working in rural areas (Anggraini, 2023). The Ministry of Agriculture (2023) shows that only 5% of health workers in rural areas have special training related to farmer occupational health, so many cases of work-related diseases are not properly handled yet. Based on these challenges, the agro-nursing approach is becoming increasingly relevant as a solution to improving the quality of health services for agrarian communities. By strengthening agro-nursing education, developing more supportive policies, and integrating health technology into rural services and remote health nursing, health services in agrarian areas are hoped to be more optimal and sustainable.

Agronursing is developed based on the application of community nursing and public health with an emphasis on occupational health nursing, so that it becomes a service, namely agricultural health nursing (AHN). AHN, in the context of nursing services in agricultural and plantation areas in Indonesia, was created cognizant of agro-nursing services. Agro-nursing is a nursing care service for the farmer population with various health problems. Furthermore, agro-nursing is a method of nursing care and nursing service management focusing on clients, individuals, families, groups, and communities. Agronursing services are provided in the form of holistic nursing care services, covering aspects of biological, psychological, social, spiritual, cultural, and developmental services.

Additionally, agro-nursing services in nursing care are provided comprehensively, which include promotive, preventive, curative, and rehabilitative services. Agronursing services are provided in the agricultural scope, which includes agriculture, plantations, fisheries, animal husbandry, and agro-industry (Susanto, 2022; Susanto et al., 2022). Therefore, agro-nursing is a form of nursing care management and nursing service management for both healthy and sick clients that is holistic and comprehensive throughout the human life cycle in the agricultural context.

As a field of nursing services, agro-nursing is developed based on a study of four components of the nursing paradigm, namely humans, health, nursing, and the environment. The first agro-nursing paradigm pattern is related to humans. Humans in the context of agro-nursing services are viewed as clients who will receive nursing care in the fields of agriculture and plantations. Humans are described as a complete and complex individual system, which includes humans as biological, psychological, social, spiritual, and developmental beings (Susanto, 2022; Susanto et al., 2022). In providing agro-nursing services to humans, ethical and cultural aspects that are unique and universal in the agricultural scope are considered.

The second nursing paradigm in agro-nursing is related to nursing. The view of agro-nursing related to nursing is recognized as a form of service that is part of health services that can be provided to improve health status and improve health levels in agricultural and plantation community groups (Susanto, 2022; Susanto et al., 2022). Therefore, nursing in the context of agro-nursing is seen as an effort to provide health services, both promotive, preventive, curative, and rehabilitative, to clients, both as individuals, families, groups, and communities, throughout the human life cycle in the agricultural scope. Meanwhile, the environment, as the third component in agro-nursing, is all things, both physical and non-physical environments around human life, that can affect health and illness in agricultural and plantation areas. Furthermore, the environment in the context of agro-nursing is seen as all aspects that can affect basic human needs both internally and externally in the agricultural scope (agriculture, fisheries, livestock, and agro-industry) (Susanto, 2022; Susanto et al., 2022). Furthermore, the agro-nursing view regarding the fourth paradigm component related to health is the optimal state of an individual physically, socially, psychologically, and spiritually. In addition, health

also indicates a state where an individual is free from dependency and disability. Therefore, health in the context of agro-nursing is defined as the state of an individual's system in the range of healthy or sick in the agricultural scope.

As a form of health and nursing services, agro-nursing is based on nursing theories. Agro-nursing theory is based on three nursing theories and models, namely Neuman's System Model, Pender Model, and Leininger's Sunrise Model (Transcultural Approach) (Susanto et al., 2024), which are developed into a model with a unique essence, namely the provision of nursing services in agricultural areas. Figure 1 below illustrates the visualization of the agro-nursing model theory. Based on Figure 1, there are three factors that are closely related to improving health holistically in agricultural areas, namely (1) Intrapersonal factors, such as demographics, health history, gender, motivation, coping mechanisms, and education; (2) Interpersonal factors, such as appropriate norms between family or partners and health workers, health support between family or partners and health workers, and role models, namely health workers with family or partners; and (3) Extra-personal factors, such as culture, social, politics, technology, religion, values, health service systems, health policies. These related factors are health indicators that need to be improved with the Neuman System Model, consisting of flexible, normal, and resistant lines of defense. Accordingly, in agricultural areas, farmers are the core of the community, family, or individuals who are vulnerable or at risk of contracting infectious or non-infectious diseases.

Furthermore, Figure 1 describes the perception of the farming community in implementing actions that improve health and also the obstacles that can occur from various health problems that are threats or challenges that can trigger the farming community in making decisions to take action to improve the form of prevention in accordance with the Pender Model on health promotion related to primary, secondary and tertiary prevention in collaboration and assisted by health workers, especially nurses. The role of nurses is as educators in providing health education to the community in the agricultural environment, both communities, families, and individuals, with a transcultural approach adapted from Leininger's Sunrise Model. Through a transcultural approach, nurses can facilitate and support farming communities in improving and maintaining health, including facilitating and supporting farming communities in making and taking mutual health-related decisions. Additionally, it may help farmer communities to reshape their healthier behaviors while maintaining their local cultural values and beliefs. After participating in the collaborative health programs, the farmer communities' self-efficacy may improve and potentially succeed and retain the future developed programs. Community health behavior improvement will enhance the community's health status in six aspects: biological, psychological, social, cultural, developmental, and spiritual.

In practice, agro-nursing adapts nursing methods to the specific challenges faced by agricultural workers and rural communities. Farmers and agricultural workers are at high risk of experiencing various health problems, such as exposure to pesticides, work injuries due to the use of heavy equipment, zoonotic diseases from livestock, and respiratory disorders due to inhalation of dust particles and agricultural chemicals (Byrne et al., 2024). Therefore, the agro-nursing health approach focuses on curative aspects and is preventive and promotive by educating the community about occupational health and safety. Agro-nursing has a different approach than the conventional nursing model. If urban nursing focuses more on treating acute diseases and specialist services, agro-nursing emphasizes community-based health services, health education, and disease prevention relevant to agriculture (McCallum et al., 2023). Finally, it can be concluded that agro-nursing has a strategic role in improving health services for agricultural communities in rural and remote areas. Integrating nursing science with an understanding of the agricultural sector allows for a more contextual approach to addressing the various health challenges that farmers and agricultural workers face. In its application, agro-nursing not only emphasizes the curative aspect but also prioritizes promotive and preventive efforts, such as occupational health education, early detection of occupational diseases, and the use of telehealth technology to expand access to medical services. With the increasing complexity of health problems in the agricultural environment, agro-nursing has become a relevant solution in addressing the health needs of rural communities, which often experience limited medical resources and health infrastructure.

Implementing agro-nursing in rural and remote areas faces various challenges, ranging from limited medical personnel and geographical constraints to minimal awareness of occupational health in agricultural communities. However, various strategies have been developed to overcome these obstacles, including implementing mobile agro-nursing clinics, telemedicine, and community empowerment to improve the quality of health services, reduce the number of occupational diseases, and encourage active community involvement in maintaining their health. Therefore, the agro-nursing approach is becoming increasingly relevant in strengthening health systems in rural and remote areas.

Furthermore, the sustainability of agro-nursing in supporting rural and remote health requires support from various parties, including the government, academics, and health workers. Regulations that support incentives for rural health workers, investment in health infrastructure, and integration of telehealth into the national service system are crucial steps to ensure the effectiveness and efficiency of agro-nursing in the long term. With

the right strategy and community-based approach, agro-nursing can continue to grow as an integral part of health services in rural and remote areas in Indonesia and may be applicable in other countries with vast agricultural communities, ensuring that agrarian communities have access to quality and sustainable health care.

Conclusion

Finally, it can be concluded that agro-nursing has a strategic role in improving health services for agricultural communities in rural and remote areas. Integrating nursing science with an understanding of the agricultural sector, including technology integration, allows for a more contextual approach to addressing the various health challenges that farmers and agricultural workers face. In its application, agro-nursing emphasizes the curative aspect and prioritizes promotive and preventive efforts, such as occupational health education, early detection of occupational diseases, and the use of telehealth technology to expand access to medical services. Thus, agro-nursing is one of the relevant and potential solutions to manage the health needs of rural communities that are increasingly challenging and often experience medical resources and health infrastructure shortages.

Declaration of Interest
None to declare

Acknowledgment
None

Funding
None

Data Availability
None

References

Aji, R. R., Susanto, T., Susumaningrum, L. A., Kholidi, M., & Yunanto, R. A. (2023). The relationship between basal metabolism index and blood sugar levels among farmers: A secondary data analysis of non-communicable disease in public health center of Pakusari, Jember Regency, Indonesia. *Journal of Rural Community Nursing Practice, 1*(1), 43–51. https://doi.org/10.58545/jrcnp.v1i1.76

Anggraini, S. (2023). Challenges and opportunities in providing equitable healthcare access in rural Indonesia. *Indonesian Journal of Public Health, 10(*2), 89–105. https://doi.org/10.19184/ijph.v10i2.2023

Asghari, S., Bent, J., Modir, A., MacDonald, A., Farrell, A., Bethune, C., & Graham, W. (2024). Building a learning health care community in rural and remote areas: A systematic review. *BMC Health Services Research, 24*(1): 1013. https://doi.org/10.1186/s12913-024-11194-7

Buse, C. G., Allison, S., Cole, D. C., Fumerton, R., Parkes, M. W., & Woollard, R. F. (2022). Patient- and community-oriented primary care approaches for health in rural, remote and resource-dependent places: Insights for eco-social praxis. *Frontiers in Public Health, 26*(10) :867397. https://doi.org/10.3389/fpubh.2022.867397

Byrne, J., McCallum, T., & Wang, P. (2024). The role of agronursing in occupational health: A comprehensive review. *Journal of Rural Health Research, 15*(2), 102–118. https://doi.org/10.1093/jrhr/2024.014

Christie, V., Amin, J., Skinner, J., Green, D., Littlejohn, K., & Gwynne, K. (2022). Comparison of study quality as determined by standard research and community engagement metrics: A pilot study on breast cancer research in urban, rural, and remote indigenous communities. *International Journal of Environmental Research and Public Health, 19*(9):5008. https://doi.org/10.3390/ijerph19095008

Franco, C. M., Lima, J. G., & Giovanella, L. (2021). Primary healthcare in rural areas: Access, organization, and health workforce in an integrative literature review. *Cadernos de Saude Publica, 37*(7):e00310520. https://doi.org/10.1590/0102-311X00310520

Hayes, K., Coxon, K., & Bye, R. A. (2025). Rural and remote health care: the case for spatial justice. *Rural and Remote Health, 25*(1), 8580. https://doi.org/10.22605/RRH8580

Holland, C., Malatzky, C., & Pardosi, J. (2024). What do nurses practising in rural, remote and isolated locations consider important for attraction and retention? A scoping review. *Rural and Remote Health, 24*(3):8696. https://doi.org/10.22605/rrh8696

Jennings, N., Lowe, G., & Tori, K. (2021). Nurse practitioner locums: A plausible solution for augmenting health care access for rural communities. *Australian Journal of Primary Health, 2016, 27*(1):1–5. https://doi.org/10.1071/PY20103

Kgatla, M. N., Mothiba, T. M., Sodi, T., & Makgahlela, M. (2021). Nurses ' experiences in managing cardiovascular disease in selected rural and peri-urban clinics in Limpopo Province , South Africa. *International Journal Of Enviromental Research and Public Health, 2017. 18*(5):2570. https://doi.org/10.3390/ijerph18052570

Malley, L. O., Kellett, U., & Forster, E. M. (2024). Australian rural emergency nurses ' care of paediatric patients : A qualitative study. *Journal of Pediatric Nursing, 79,* 42–51. https://doi.org/10.1016/j.pedn.2024.08.018

McCallum, T., Byrne, J., & Hughes, R. (2023). Rural and remote nursing: Challenges and innovations for the future. *Global Health Perspectives, 18*(1), 45–60. https://doi.org/10.1016/j.ghp.2023.045

Ministry of Health of Indonesia Indonesia. (2023). Profile of Indonesian Health 2023. Accessed on https://kemkes.go.id/id/profil-kesehatan-indonesia-2023

Muirhead, S., & Birks, M. (2020). Roles of rural and remote registered nurses in Australia : An integrative review. *Australian Journal of Advanced Nursing, 37*(1), 21–33. https://doi.org/10.37464/2020.371.5

Rhosani, N. O., Susanto, T., Rasni, H., Ma'fuah, S., & Kurdi, F. (2023). Vegetable and fruits consumption and body mass index among farmers in rural areas of Indonesia: A Secondary data analysis. *Journal of Rural Community Nursing Practice, 1*(1), 20–31. https://doi.org/10.58545/jrcnp.v1i1.74

Rossiter, R., Phillips, R., Blanchard, D., van Wissen, K., & Robinson, T. (2023). Exploring nurse practitioner practice in Australian rural primary health care settings: A scoping review. *In Australian Journal of Rural Health, 31*(4), 617–630. John Wiley and Sons Inc. https://doi.org/10.1111/ajr.13010

Susanto, T. (2022). AGRONURSING: Aplication community and family health nursing in the agronursing context. Jakarta: Trans Info Media.

Susanto, T., Kusuma, I. F., Purwandhono, A., & Sahar, J. (2022). Community-based intervention of chronic disease management program in rural areas of Indonesia. *Frontiers of Nursing, 9*(2), 187–195. https://doi.org/10.2478/fon-2022-0021

Susanto, T., Purwandari, R., & Wuryaningsih, E. W. (2017). Prevalence and associated factors of health problems among Indonesian farmers. *Chinese Nursing Research, 4(*1), 31–37. https://doi.org/10.1016/j.cnre.2017.03.008

Susanto, T., Rahmawati, I., & Wantiyah. (2020). Community-based occupational health promotion programme: An initiative project for Indonesian agricultural farmers. *Health Education, 120*(1), 73–85. https://doi.org/10.1108/HE-12-2018-0065

Susanto, T., Rasni, H., Susumaningrum, L. A., & Kurdi, F. (2022). Family care in meeting toddler nutritional needs: Application of family nursing in the context of agronursing. Jakarta: Trans Info Media.

Susanto, T., Rasny, H., Kurdi, F., Yunanto, R. A., & Rahmawati, I. (2023). Management of hypertension using a plant-based diet among farmers: Protocol for a mixed methods study. *JMIR Research Protocols, 12*(1), e41146. https://doi.org/10.2196/41146

Susanto, T., Waluyo, A., & Saleh, A. (2024). Model theory and innovation in nursing, the great ideas of Indonesian nursing professors (1st ed.). Jakarta: Nuansa Fajar Cemerlang.

Susanto, T., & Widayati, N. (2018). Quality of life of elderly tobacco farmers in the perspective of agricultural nursing: A qualitative study. *Working with Older People, 22*(3), 166–177. https://doi.org/10.1108/WWOP-01-2018-0002

Tsou, C., Robinson, S., Boyd, J., Jamieson, A., Blakeman, R., Yeung, J., McDonnell, J., Waters, S., Bosich, K., & Hendrie, D. (2021). Effectiveness of telehealth in rural and remote emergency departments: Systematic review. *Journal of Medical Internet Research, 23*(11). https://doi.org/10.2196/30632

Watters, T. K., Glass, B. D., Scholes-Robertson, N. J., & Mallett, A. J. (2025). Health professional experiences of kidney transplantation in regional, rural, and remote Australia. *BMC Nephrology, 26*(1), 88. https://doi.org/10.1186/s12882-025-04015-4

Yunanto, R., Susanto, T., Hairrudin, H., Indriana, T., Rahmawati, I., & Nistiandani, A. (2023). A community-based program for promoting a healthy lifestyle among farmers in Indonesia: A randomized controlled trial. *Health Education and Health Promotion, 11*(3), 447–454. https://doi.org/10.58209/hehp.11.3.447

Caring behavior and its impact on patient safety activities: Investigating the role of safety competency

Lusianah Lusianah[1*], Muliyadi Muliyadi[2], Any Kurniawati[3], Mira Asmirajanti[4]

[1] Institut Kesehatan dan Teknologi Pondok Karya Pembangunan DKI Jakarta, Daerah Khusus Ibukota Jakarta, Indonesia
[2] Politeknik Kesehatan Kemenkes Palembang, Palembang, Indonesia
[3] Rumah Sakit Umum Bhakti Asih Ciledug, Tangerang, Indonesia
[4] Universitas Esa Unggul Jakarta, Indonesia

Abstract

Background: Patient safety is a critical component of healthcare. Caring behavior among nurses is hypothesized to enhance patient safety activities. However, the relationship between caring behavior and patient safety activities, particularly the moderating role of patient safety competency, remains underexplored.
Purpose: This study aims to examine the influence of caring behavior on patient safety activities, while assessing the moderating role of patient safety competency.
Methods: This study employed Structural Equation Modeling (SEM) to analyze the relationship between caring behavior and patient safety activities. A total of 154 nurses from a private hospital in Tangerang participated. The caring behavior inventory (CBI) was used to assess the nurses' caring behaviors across four subscales: respectful communication, ensuring human presence, communication with a positive disposition, and professional knowledge and skills. The safety nursing activities scale evaluated comprehensive patient safety activities across eight subcategories, such as communication, operations, and risk management. The Patient Safety in Nursing Education Questionnaire (PaSNEQ) was employed to assess patient safety competency, comprising three subdomains: basic patient safety competency, clinical analysis and action effectiveness, and error prevention strategies and additional training.
Results: The analysis showed that caring behaviour significantly influenced patient safety activities (T-value = 7.70, $p < 0.05$). Patient safety competency did not significantly moderate this relationship (T-value = 1.21).
Conclusion: Caring behavior significantly improves patient safety, although increased patient safety competency does not show significant moderation effects. Future research should explore alternative moderators and emphasize interventions that foster caring behaviour to strengthen patient safety outcomes.

Keywords: caring behavior, patient safety, safety activities, safety competency, SEM model

Introduction

Patient safety is a critical component of healthcare delivery, focusing on error prevention, harm reduction and high-quality care. Patient safety activities in hospitals, such as medication reconciliation and communication protocols, are vital for minimizing errors and improving care quality. The implementation of patient safety improvement programs that focus on error analysis and prevention through structured methods and a culture of continuous enhancement is a critical initiative. Initiatives like surgical safety checklists and communication protocols have shown substantial improvements in patient outcomes (Dicuccio, 2015; Lee & Quinn, 2020).

Research indicates that the patient safety activities conducted among

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 7-16
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2631

Article Info

Received : October 28, 2024
Revised : January 17, 2025
Accepted : February 11, 2025
Published : April 25, 2025

Corresponding author

Lusianah Lusianah*
Faculty of Health and Nursing Institut Kesehatan dan Teknologi Pondok Karya Pembangunan DKI Jakarta, Indonesia; Address: Jalan Raya PKP, Kelapa Dua Wetan, Ciracas, RT.1/RW.8, Klp. Dua Wetan, Kec. Ciracas, Kota Jakarta Timur, Daerah Khusus Ibukota Jakarta 13730; Phone:087878884252; E-mail: lusianah@iktj.ac.id

Citation

Lusianah, L., Muliyadi, M., Kurniawati, A., & Asmirajanti, M. (2025). Caring behavior and its impact on patient safety activities: Investigating the role of safety competency. *Jurnal Keperawatan Padjadjaran, 13*(1), 7-16. http://dx.doi.org/10.24198/jkp.v13i1.2631

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

nurses generally have a positive trend with an average score of 4.19 out of 5 (Ha & Lee, 2019). The factors influencing these activities include patient safety education, the hospital environment, and the attitudes of supervisor/managers. The perceived patient safety culture scores are moderate, ranging from 3.26 to 3.34 out of 5 (Jangland et al., 2018). Nurses report high scores for supervisor/manager expectations and event reporting frequency but lower scores for staffing and non-punitive error response (World Health Organization, 2020). Additionally, incident reporting knowledge and attitudes significantly impact safety care activities (Ha & Lee, 2019). The average importance of patient safety activities was 3.51±0.41, while the average performance was 3.37±0.43, indicating that the importance of these activities exceeds their performance. According to the Importance-Performance Analysis, components in the second quadrant, characterized by high importance but low performance, included three medication-related items and one test/procedure/surgery-related item (Baek & Shin, 2024). Consistent with the existing literature, this study finds that the nurses' caring behaviors significantly enhance patient safety activities. Caring nurses are more attuned to patient needs and potential risks, fostering enhanced communication and reducing medication and procedural errors. Their behaviors also promote adherence to safety protocols and the effective reporting of medical errors, thereby improving patient safety (Ambarika & Anggraini, 2021). Despite establishing a positive correlation between caring behaviors and patient safety outcomes, the existing studies often lack a comprehensive framework to capture the complexities of this relationship. Predominantly cross-sectional in nature, these studies provide a static view of the association, failing to explore the dynamic interactions and longitudinal effects of caring behaviors on patient safety activities.

Patient safety competencies encompass the nurses' ability to understand and apply safety principles in clinical practice (Sari et al., 2024). These competencies underpin patient safety activities, including standard procedures, infection control, and clinical risk management, which is aimed at minimizing adverse events. A combination of knowledge, skills, and a positive attitude is essential for aligning actions with patient safety goals. Enhancing patient safety competency among healthcare professionals significantly improves patient safety activities. Research demonstrates a strong link between safety competencies and effective safety management. For example, the critical reflection and person-centered care practices of clinical nurses are positively associated with improved patient safety outcomes (Zaitoun et al., 2023). In intensive care units, patient safety competency significantly influences nursing activities (β = .58), underscoring its pivotal role in ensuring safe practices (Shin & Jang, 2023).

Caring behavior, patient safety competence, and patient safety activities are interdependent and mutually reinforcing elements. Caring behavior enhances communication, patient safety competencies equip nurses with the necessary skills, and patient safety activities ensure the effective implementation of protocols (Mårtensson et al., 2024; Rezende et al., 2024). The synergy among these elements is essential for achieving optimal safety and quality in healthcare services. This study addresses these gaps by employing Structural Equation Modeling (SEM), a robust analytical technique that enables a nuanced exploration of the relationships between caring behaviors, patient safety competencies, and patient safety activities. Unlike previous cross-sectional studies, this research adopts a longitudinal approach to examine the correlation between these variables, including specific patient safety activities such as patient identification, medication safety, and infection prevention. The study seeks to elucidate how caring behaviors influence patient safety activities and how patient safety competencies mediate these relationships.

Theoretical Framework and Relevant Research

This study integrates Jean Watson's Theory of Human Caring, which emphasizes the moral, spiritual, and interpersonal aspects of nursing care, particularly relational care, trust, and empathy, as vital to improving the patient adherence to safety protocols and reducing errors (Hunt, 2022; Wang et al., 2024; Watson, 2018). Caring behaviors, which are foundational to safety practices, enhance patient outcomes and satisfaction by fostering trust and understanding. Key behaviors such as knowing the patient, patient monitoring, and forming trusting relationships align with Watson's Caritas Processes, promoting both emotional and physical well-being, reducing stress, and facilitating healing (Almukhaini et al., 2020; Hunt, 2022).

Caring behaviors in nursing—respectful communication (CR), human presence (HP), positive attitude (CPA), and professional knowledge and skills (PKS)—are integral to fostering effective nurse-patient relationships (Ghafouri et al., 2021). Respectful communication builds trust and enhances patient satisfaction (Sirera et al., 2024; Vujanić et al., 2022). Human presence, signified by attentive care, is perceived as therapeutic by patients (Wu, 2021). Positive attitudes improve care experiences, linking directly to patient satisfaction (Iwanow et al., 2021). Competence in professional skills ensures effective care delivery, which is a core component of caring behavior (Vujanić et al., 2020, 2022). Systemic challenges such as staffing shortages and high patient loads can limit the demonstration of these behaviors, potentially impacting care quality. Generational differences further complicate patient advocacy, especially for millennial nurses who must navigate traditional cultural norms while promoting

Table 1. Demographic sample characteristics (N=154)

Variables	Frequency	Percent
Age		
≤ 25 years old	26	16,89
> 25 years old	128	83,11
Education Degree		
Vocational	110	71,4
Bachelor	44	28,6
Gender		
Woman	135	87,7
Men	19	12,3
Workplace Unit		
Inpatient care	93	60,4
Outpatient care	14	9,1
Intensive Unit	25	16,2
Operating room	22	14,3
Employment Status		
Temporary	25	16,2
Permanent	129	83,8

safety and quality care (Kramer et al., 2018; Kuntarti et al., 2018).

Patient safety encompasses practices to prevent harm, including secure access, precise identification, safe operations, medication administration, blood transfusion protocols, infection control, fall and sore management, and fire safety (Ha & Lee, 2019; Yang, 2021). Competency frameworks such as Building Patient Safety Competence (BPSC), Competence to Act After an Error (CAAE), and Ensuring Safety Standards (EST) empower healthcare professionals to foresee risks, prevent incidents, and ensure adherence to safety guidelines (Langari et al., 2017). Evidence-based interventions like medication reconciliation, surgical safety checklists, and hand hygiene programs reduce errors and improve outcomes (Falade et al., 2024). Positive patient experiences also correlate with clinical safety, treatment adherence, and resource efficiency, underscoring the importance of integrating safety activities into care delivery (Lungu, 2023).

The current study seeks to address this gap by employing Structural Equation Modeling (SEM), a more advanced analytical technique that allows for a nuanced exploration of these relationships. This study addresses this gap by proposing a hypothetical model using a sample of 154 nurses and the Structural Equation Modeling (SEM) method to investigate these relationships. This study aims to explore how caring behavior influences patient safety activities and how these relationships are mediated by patient safety competencies. The proposed hypotheses are:

Caring behaviors (CR, HP, CPA, PKS) has a direct, positive effect on patient safety activities (SC, PI, SO, MA, BTS, IC, MFS and FM)

Patient Safety Competency (BPSC, CAAE, EST) moderates the relationship between Caring Behavior and Patient Safety Activities, enhancing the positive effect of Caring Behavior on Patient Safety Activities.

Materials and Methods

Design

This research is an observational study with a quantitative cross-sectional design that sought to analyze the relationship between caring behavior (respectful communication, human presence, positive attitude, and professional skills) and patient safety activities (patient identification, medication management, invasive procedures, blood transfusion, infection control, fall prevention, pressure sore management, and firefighting preparedness). In particular, the addition of fire management and blood transfusion demonstrates a more comprehensive approach to addressing patient safety risks in healthcare settings. Ethical approval for this study was obtained on June 8, 2024, under registration number KEPK/UMP/79/VI/2024. Data collection was conducted from July 3, 2024, to August 3, 2024.

Sample and Setting

The population in this study included all nurses actively engaged in patient care across departments such as outpatient services, intensive care units, inpatient wards, and operating rooms within private inpatient hospitals in Tangerang. A sample size of 154 participants was determined using the Finite

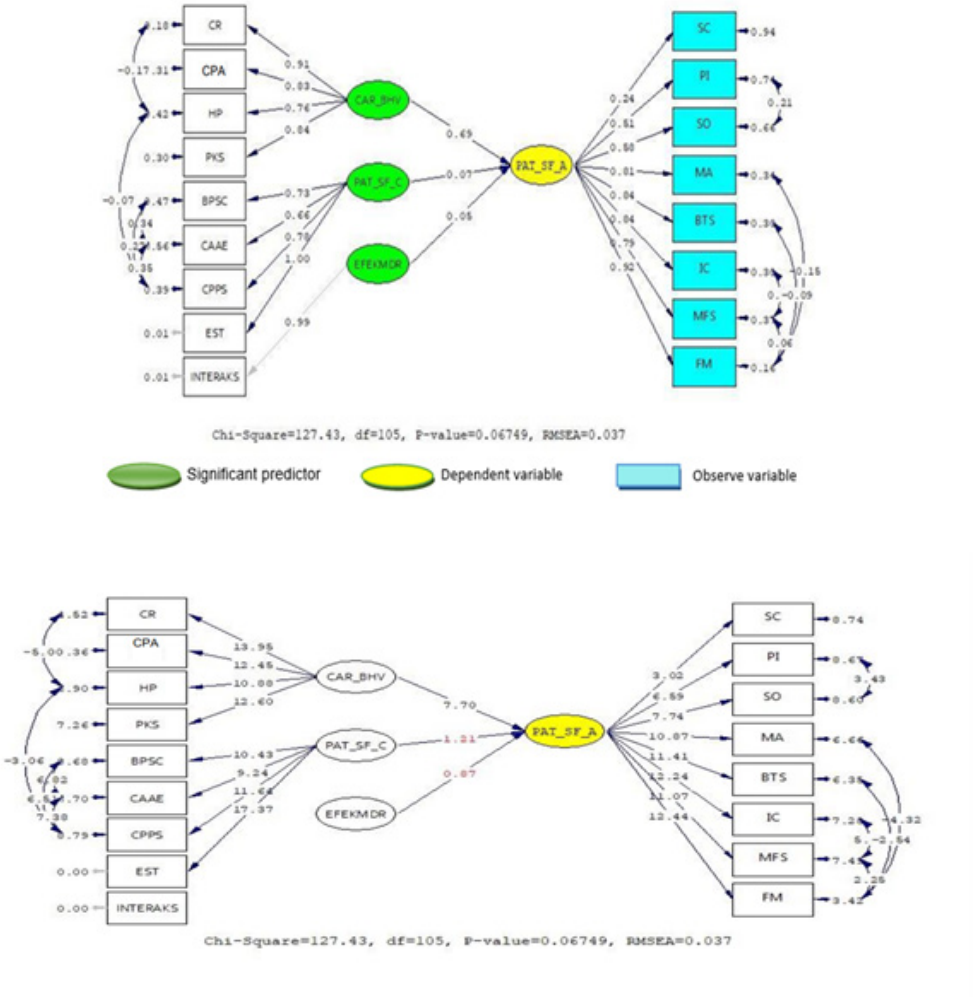


Figure 1. Fitted structural equation model on Patient Safety Activities

Population Correction (FPC) adjusted Cochran's formula. This calculation ensured a 95% confidence level and a 5% margin of error for a population of 256. The formula was applied considering a maximum variability (p = 0.5) and a Z-score of 1.96 for the desired confidence level.

The sampling technique used to select the nurse respondents was systematic random sampling, with the inclusion criteria specifying that the nurse respondents must not be on leave, sick, or on study assignment. This process involved organizing all eligible nurses from the nursing staffing database and systematically selecting every fourth nurse from the compiled list, thereby guaranteeing that each registered nurse possessed an equal probability of being included in the study. A total of 154 nurses successfully completed the online survey. We sent polite reminders to those who hadn't. The participants were invited to complete the online survey through an email which included the information letter, and a validated questionnaire.

Variables

Independent Variable: The independent variable in this study is caring behavior operationalized through the dimensions of CR, HP, CPA, and PKS. Caring behavior is proposed to have a direct positive impact on patient safety activities.

Dependent Variable: Patient safety activities serve as the dependent variable, encompassing subcategories that include SC, PI, SO, MA, BTS, IC, MFS, and FM. These dimensions reflect the comprehensive safety actions taken by nurses to uphold patient safety standards.

Moderating Variable: The moderating variable, Patient Safety Competency, is expected to enhance the relationship between caring behavior and patient safety activities. This competency is assessed via three key dimensions: BPSC, CAAE, and EST. By moderating the impact of caring behavior on patient safety activities, patient safety competency is hypothesized to strengthen the positive effect of caring behavior.

Instruments

The instruments employed in this research encompass the Caring Behavior Inventory (CBI) (Ghafouri et al., 2021) and the Safety Nursing Activities Scale, which was developed by Yang (2021). The CBI comprises 16 items categorized into four subscales: respectful communication (items 1, 2, 3, 4, 7, 8, and 10), ensuring human presence (item 11), communication coupled with a positive disposition (items 5, 6, 9, 12, and 15), and professional knowledge alongside skills (items 13, 14, and 16). The responses are evaluated utilizing a 6-point Likert scale, with response options extending from 1 (never) to 6 (almost always). This instrument has exhibited significant validity and reliability, as evidenced by a Cronbach's alpha of 0.99.

The Safety Nursing Activities Scale comprises 44 inquiries distributed across 8 subcategories: security, precise patient identification, operations (invasive procedures), medication administration, blood transfusion, management of infections, management of falls and sores, and firefighting management (Yang, 2021). Responses are assessed on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). This scale has similarly undergone validation for reliability, attaining a Cronbach's alpha of 0.96. Contemporary instruments that evaluate safety care activities generally address only select aspects of the healthcare accreditation standards, concentrating on five subscales, which include precise patient identification, effective communication, operations (invasive procedures), medication administration, and the management of falls.

The patient safety competency scale was developed using the Patient Safety in Nursing Education Questionnaire (PaSNEQ), a modified instrument based on the work of Langari et al. (2017). The modified PaSNEQ consists of 20 items, which were adapted from the original scales of the Basic Patient Safety Competency (BPSC), Clinical Assessment of Adverse Events (CAAE), and Educational Safety Training (EST). The questionnaire employs a 4-point Likert scale, ranging from "fully disagree" to "fully agree." Rigorous validation and reliability testing were conducted, and the total Cronbach's alpha for the patient safety competency items was calculated to be 0.89, indicating strong internal consistency and reliability.

Data collection

The data for this research was obtained via a structured questionnaire administered to 154 nurses at a private hospital in Tangerang, utilizing validated instruments such as the Caring Behavior Inventory (CBI) and the Nursing Safety Activity Scale to assess caring behaviors and patient safety activities, with participants responding anonymously and voluntarily to uphold data integrity and confidentialityduring a designated timeframe while strictly adhering to ethical standards.

Data analysis

Descriptive statistics alongside the reliability of the scales were meticulously examined utilizing the Statistical Package for the Social Sciences (SPSS) software, specifically version 22. Prior to the assessment of the proposed model, preliminary confirmatory factor analysis (CFA) was performed to investigate the factor structure of all measures, employing structural equation modeling (SEM) via Lisrel version 8.8. The SEM analysis incorporated maximum likelihood estimation to evaluate the alignment between the empirical data and the proposed model (Wang & Wang, 2019).

In order to assess the significance of the indirect effects present within the model, a bias-corrected bootstrapping technique consisting of 1,000 iterations was implemented due to its superior statistical power when applied to small sample sizes and its capacity to effectively regulate the type I error rate (Wang & Rhemtulla, 2021). This investigation employed SEM to scrutinize the interrelations between the observed and latent variables, specifically focusing on how elements such as CR, EHP, CPA, and PKS impact the principal dependent variable (DV). Gaining insights into these relationships is crucial for the formulation of effective interventions and policies designed to address these variables. In accordance with Hoyle's (1995) recommendations, model fit was evaluated through the application of various criteria: Chi-square (χ^2), the Chi-square to degrees of freedom ratio, incremental fit index (IFI), comparative fit index (CFI), Tucker–Lewis index (TLI) and the root mean square error of approximation (RMSEA). A threshold value of 0.90 or above is typically regarded as acceptable for both IFI and CFI, while an RMSEA value below 0.06 suggests an excellent model fit (Wang & Rhemtulla, 2021).

Ethical consideration

The ethical considerations for this study have been thoroughly addressed. Ethical approval for this study was obtained from the Research Ethics Committee of Universitas Muhammadiyah Purwokerto (UMP), as stated in approval letter No. KEPK/UMP/79/VI/2024. The participants received a cover letter outlining the study's purpose and providing the names and contact details of the researchers. They were informed of their right to participate voluntarily, assured of their anonymity and confidentiality, and reminded of their ability to withdraw from the study at any time without any consequences. The collected data was securely stored and accessible exclusively to the research team. The study adhered to the principles of beneficence, ensuring that participants were not exposed to any harm, guaranteeing justice, equal treatment and opportunity for all participants. The research complied with the Helsinki Declaration and other relevant international ethical guidelines, ensuring that the integrity of the process and the rights of participants were fully respected (Al-Durra et al., 2020).

Results

The data reveals the key demographic and employment trends among the respondents. Most are aged over 25 (83.11%) and have vocational education (71.4%), indicating a mature, technically skilled workforce. Women dominate the sample, representing 87.7%, suggesting a gender imbalance typical in certain sectors like healthcare. In terms of employment distribution, the majority work in inpatient care (60.4%), followed by smaller proportions in outpatient care (9.1%), intensive care (16.2%), and operating rooms (14.3%). Employment status shows that 83.8% are in permanent roles, while 16.2% hold temporary positions, reflecting job stability for the majority. These insights suggest a predominantly older, female, and vocationally educated workforce concentrated in inpatient care, with a stable employment status. Based on the results from the uploaded SEM analysis document, here's a breakdown of the findings with the inclusion of relevant statistical values:

Caring Behavior (CAR_BHV) and Patient Safety Activities (PAT_SF_A):

The analysis reveals a significant path between CAR_BHV and PAT_SF_A with a path coefficient of 0.69. This shows that caring behavior among healthcare professionals has a strong and direct positive impact on patient safety activities. The t-value for this relationship is substantial (T > 1.96), indicating a statistically significant relationship. A low p-value (<0.05) confirms that the effect of caring behavior on patient safety is not due to random chance.

Patient Safety Competency (PAT_SF_C) and Patient Safety Activities (PAT_SF_A):

Despite the theoretical expectation that competency in patient safety protocols influences safety activities, the model does not show a significant effect (path coefficient = 0.05). This path's t-value is below 1.96, suggesting no significant direct influence. This might indicate that competency training, while important, needs to be supplemented with practical applications to translate into actual safety practices.

Moderating Effect (EFEKMDR):

The moderating effect (EFEKMDR) does not have a significant impact on the relationship between CAR_BHV and PAT_SF_A, with a low path coefficient (0.05). The t-value for the moderation effect is also insignificant, indicating that EFEKMDR does not play a strong moderating role in this model. The insignificant moderation effect suggests that broader systemic factors—such as workload, organizational culture, and leadership support—may have a more substantial impact on safety outcomes than patient safety competency alone (Mazumder et al., 2023).

The results of the analysis show that the proposed model is generally in accordance with the data, supported by the value of Chi-square = 127.43 and degree of freedom (df) = 105, where a Chi-square that is not excessively large relative to the degrees of freedom suggests a reasonable model fit. P-value = 0.06749 (a p-value slightly above 0.05 indicates that the model fits the data well, although it is not perfect). RMSEA = 0.037. Here, the RMSEA value is below the 0.05 threshold, indicating a good fit of the model to the data. This confirms that the overall model is robust and reliable. In summary, while caring behaviors have a significant and positive effect on patient safety, the role of patient safety competency and moderating factors (EFEKMDR) is less clear.

Discussion

The results of this study show that caring behavior has a significant influence on patient safety activities. These findings underscore the importance of caring behavior in improving patient safety. Caring behaviors not only help build a better relationship between nurses and patients, but also improve the adherence to safety procedures and the implementation of safer clinical practices. These discussions align closely with Watson's Theory of Human Caring, which emphasizes the importance of caring behaviors in creating a healing and supportive environment for patients. Watson's theory integrates the concepts of empathy, compassion, and holistic care, proposing that caring relationships are central to achieving positive patient outcomes (Norman et al., 2016; Watson, 2018; Wei et al., 2021). The instruments used in this study were carefully selected to capture the essence of caring behaviors as defined by Watson's theoretical framework. These instruments measured not only the technical aspects of caring behaviors but also the emotional and interpersonal dimensions that are integral to Watson's vision of patient-centered care (Ghafouri et al., 2021; Oktaviana & Dwiantoro, 2018). By highlighting the impact of empathy and caring communication, this study validates Watson's theory, demonstrating that caring practices directly contribute to the improved safety and well-being of patients. While these strategies are effective, some argue that the inherent challenges of emotional labor in nursing can lead to burnout, potentially undermining the very empathy these strategies aim to cultivate. Balancing emotional demands with self-care is essential for sustaining caring communication in nursing practice.

Recent research confirms that the caring behavior of healthcare workers can reduce the risk of medical errors and increase patient involvement in the treatment process which, in turn, contributes to patient safety (Ahmed et al., 2024; Wang et al., 2024). Developing empathetic and caring communication skills in nurses is crucial for enhancing patient safety and overall care quality. Effective strategies include targeted training programs, fostering a supportive environment, and utilizing technology to enhance empathetic interactions. Research has proven that higher levels of empathy correlate with emotional support and better quality of care (Atta et al., 2024).

Structured empathy training can significantly

improve the nurses' caring communication skills, leading to better patient outcomes. Simulation-based learning allows nurses to practice empathetic communication in realistic scenarios, enhancing their emotional intelligence and responsiveness (Cho & Kim, 2024). It is important to create a culture that prioritizes empathy within healthcare teams and encourages nurses to engage in caring communication, which is linked to improved patient safety (Haribhai-Thompson et al., 2022). Peer support and mentorship programs can reinforce empathetic practices among nursing staff (Kramer et al., 2018). Using digital health platforms designed with empathetic interfaces can facilitate better caring communication between nurses and patients, ensuring that emotional needs are met during care (van Lotringen et al., 2023).

Patient Safety Competency (PAT_SF_C) in this study did not have a significant influence on patient safety activities. This indicates that safety competencies may not play a strong role as a mediator in this model. Although safety competencies are conceptually important, these results suggest that having safety competencies alone is not enough to significantly affect patient safety. Studies show that structural empowerment and systems thinking correlate positively with safety competency (Lusianah & Kurniawati, 2023; Mazumder et al., 2023). A systematic review has highlighted that basic safety competencies, such as teamwork and communication, are vital for maintaining a sustainable safety climate (Rahman et al., 2022).

The Moderation Effect (EFEKMDR) was also not significant, which showed that moderation in the relationship between caring behavior and patient safety activities did not occur. The contemporary study by Macphee et al. (2017) supports these findings by showing that systemic factors such as high workloads and less frequent management support play a greater role in influencing these relationships. This means that safety training and competency development programs may not be effective enough if they are not accompanied by efforts to address the systemic factors that affect the performance of health workers. The overall success of patient safety requires a more holistic approach. This approach must include strong management support, an organizational culture that supports safety, and a work environment that is conducive to the optimal implementation of safety competencies.

Conclusion

This research identified that caring behaviors (CR, HP, CPA, PKS) directly and positively influence patient safety activities (SC, PI, SO, MA, BTS, IC, MFS, FM). The expected moderating effect of patient safety competencies (BPSC, CAAE, EST) on this relationship was insignificant. These outcomes emphasize the importance of caring behaviors in bolstering patient safety while also indicating that current approaches to implementing patient safety competencies may need revision to produce meaningful results. This study highlights the need for further exploration into approaches that can strengthen both caring behaviors and patient safety. Simulation-based training programs that replicate real-life scenarios are highly recommended, particularly when combined with randomized controlled trials (RCTs). RCTs can provide robust evidence regarding the efficacy of such simulations in improving patient outcomes and enhancing safety practices among healthcare professionals. Additionally, longitudinal and qualitative studies are essential to evaluate the sustained impacts of these interventions on clinical outcomes and patient safety.

Understanding systemic factors like workload, burnout, and supportive organizational environments is crucial in determining their influence on caring behaviors and patient safety practices. Comparative studies across diverse healthcare settings can reveal how organizational culture and systemic factors interact to shape patient safety outcomes. This study's single-site design limits the generalizability of its findings, as the private healthcare institutions' unique characteristics—such as organizational structure, patient demographics, and resource availability—may lead to different approaches to compassionate care and patient safety compared to public facilities. Future research should explore a broader range of healthcare settings, encompassing both private and public sectors, to validate these findings and identify more comprehensive patterns.

In summary, this study underscores the crucial role of caring behaviors in fostering patient safety; however, the moderating function of patient safety competencies warrants further investigation. Future research should prioritize simulation-based RCTs, examining systemic factors, the role of organizational culture, and the integration of emotional intelligence into patient safety initiatives as fundamental components to improve both caring behaviors and patient safety practices within healthcare environments.

Declaration of Interest

The authors declare no conflicts of interest related to this study. All research, authorship, and publication processes were conducted with impartiality and without any competing interests.

Acknowledgment

The authors express their gratitude to the management and nursing staff of Private Hospital, Tangerang for their support and collaboration during data collection. Special thanks are extended to IKTJ staff for their invaluable assistance in facilitating access to participants and resources essential for this study.

Funding

This research was funded by a grant from LPPM

Institut Kesehatan dan Teknologi PKP DKI Jakarta. No additional funding was received from public, commercial, or other not-for-profit sectors.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and ethical guidelines.

References

Ahmed, Z., Ellahham, S., Soomro, M., Shams, S., & Latif, K. (2024). Exploring the impact of compassion and leadership on patient safety and quality in healthcare systems: A narrative review. *BMJ Open Quality, 13*, 1–8. https://doi.org/10.1136/bmjoq-2023-002651

Al-Durra, M., Nolan, R. P., Seto, E., & Cafazzo, J. A. (2020). Prospective registration and reporting of trial number in randomised clinical trials: Global cross sectional study of the adoption of ICMJE and Declaration Of Helsinki recommendations. *The BMJ, 369*. https://doi.org/10.1136/bmj.m982

Almukhaini, S. J., Goldberg, L., & Watson, J. (2020). Embodying caring science as islamic philosophy of care: Implications for nursing practice. *Advances in Nursing Science, 43*(1), 62–74. https://doi.org/10.1097/ANS.0000000000000300

Ambarika, R., & Anggraini, N. A. (2021). Patient safety analysis review of nurse caring behavior in patients with risk of fall. *Indonesian Journal of Nutritional Epidemiology and Reproductive, 5*(1), 114–122.

Atta, M. H. R., Hammad, H. A. H., & Elzohairy, N. W. (2024). The role of empathy in the relationship between emotional support and caring behavior towards patients among intern nursing students. *BMC Nursing, 23*(1), 1–13. https://doi.org/10.1186/s12912-024-02074-w

Baek, O.-J., & Shin, Sun-Hwa. (2024). An importance-performance analysis of patient safety activities for inpatients in small and medium-sized hospitals. *The Journal of Korean Academic Society of Nursing Education, 30*(2), 170–181. https://doi.org/doi.org/10.5977/jkasne.2024.30.2.170

Cho, M. K., & Kim, M. Y. (2024). Effectiveness of simulation-based interventions on empathy enhancement among nursing students: A systematic literature review and meta-analysis. *BMC Nursing, 23*(1), 1–12. https://doi.org/10.1186/s12912-024-01944-7

Dicuccio, M. H. (2015). The relationship between patient safety culture and patient outcomes: A systematic review. *Journal of Patient Safety, 11*(3), 135–142. https://doi.org/10.1097/PTS.0000000000000058

Doyle, C., Lennox, L., & Bell, D. (2013). A systematic review of evidence on the links between patient experience and clinical safety and effectiveness. *BMJ Open, 3*(1). https://doi.org/10.1136/bmjopen-2012-001570

Falade, I., Gyampoh, G., Akpamgbo, E., Chika, O., Obodo, O., Okobi, O., Aguguo, J., & Chukwu, V. (2024). A comprehensive review of effective patient safety and quality improvement programs in healthcare facilities. *Medical Research Archives, 12*(8). https://doi.org/10.18103/mra.v12i7.5649

Ghafouri, R., Nasiri, M., Atashzadeh-Shoorideh, F., Tayyar-Iravanlou, F., & Rahmaty, Z. (2021). Translation and validation of caring behaviors inventory among nurses in Iran. *PLoS ONE, 16*(7 July), 1–11. https://doi.org/10.1371/journal.pone.0254317

Ha, S., & Lee, M. (2019). A study on patient safety culture, incident reporting and safety care activities of clinical nurses in a university-affiliated hospital. *Journal of Muscle and Joint Health, 26*(1), 35–45.

Haribhai-Thompson, J., McBride-Henry, K., Hales, C., & Rook, H. (2022). Understanding of empathetic communication in acute hospital settings: A scoping review. *BMJ Open, 12*(9). https://doi.org/10.1136/bmjopen-2022-063375

Hunt, D. D. (2022). A Holistic Approach for Nurses: Putting the pieces together for safe, effective care. *Fast Facts for Patient Safety in Nursing,* 137–152. https://doi.org/10.1891/9780826151568.0008

Iwanow, L., Jaworski, M., Gotlib, J., & Panczyk, M. (2021). A model of factors determining nurses' attitudes towards learning communicative competences. *International Journal of Environmental Research and Public Health, 18*(4), 1–15. https://doi.org/10.3390/ijerph18041544

Jang, H., Lee, M., & Lee, N. J. (2022). Communication education regarding patient safety for registered nurses in acute hospital settings: A scoping review protocol. *BMJ Open, 12*(2), 1–6. https://doi.org/10.1136/bmjopen-2021-053217

Jangland, E., Teodorsson, T., Molander, K., & Muntlin Athlin, Å. (2018). Inadequate environment, resources and values lead to missed nursing care: A focused ethnographic study on the surgical ward using the fundamentals of care framework. *Journal of Clinical Nursing, 27*(11–12), 2311–2321. https://doi.org/10.1111/jocn.14095

Kramer, D., Hillman, S. M., & Zavala, M. (2018). Developing a culture of caring and support through a peer mentorship program. *Journal of Nursing Education, 57*(7), 430–435. https://doi.org/10.3928/01484834-20180618-09

Kuntarti, K., Yetti, K., & Novieastari, E. (2018). The contributing individuals in developing caring behaviors of nursing students: The focus group finding. *International Journal for Human Caring, 22*(4), 169–178. https://doi.

org/10.20467/1091-5710.22.4.169

Langari, M. N. M., Tella, S., Smith, N.-J., & Turunen, H. (2017). Self-assessment of patient safety competence: A questionnaire survey of final year British and Finnish pre-registration nursing students. *International Journal of Caring, 10*(3), 1212–1223. https://www.proquest.com/scholarly-journals/self-assessment-patient-safety-competence/docview/1988004119/se-2

Lee, S. E., & Quinn, B. L. (2020). Safety culture and patient safety outcomes in East Asia: A literature review. *Western Journal of Nursing Research, 42*(3), 220–230. https://doi.org/10.1177/0193945919848755

Lungu, D. (2023). Patient safety: A systematic review of the literature with evidence based measures to improve patient safety in healthcare settings. *Texila International Journal of Academic Research, 10*(2), 27–35. https://doi.org/10.21522/tijar.2014.10.02.art003

Lusianah, L., & Kurniawati, A. (2023). The relationship between patient safety competency and safety behavior in nurses at RSU X Tangerang. *Dunia Keperawatan: Jurnal Keperawatan dan Kesehatan, 11*(2), 176–183. https://doi.org/10.20527/jdk.v11i2.530

Macphee, M., Dahinten, V. S., & Havaei, F. (2017). The impact of heavy perceived nurse workloads on patient and nurse outcomes. *Administrative Sciences, 7*(1), 1–17. https://doi.org/10.3390/admsci7010007

Mårtensson, S., Knutsson, S., Hodges, E. A., Sherwood, G., Broström, A., & Björk, M. (2024). Development of caring behaviour in undergraduate nursing students participating in a caring behaviour course. *Scandinavian Journal of Caring Sciences, 38*(1), 47–56. https://doi.org/10.1111/scs.13189

Mazumder, B., Sultana, S., Sharma, S., Akhter, S., & Nessa, Z. (2023). Structural empowerment and clinical competency among the nurses in Bangladesh. *IOSR Journal of Nursing and Health Science (IOSR-JNHS), 12*(6), 1–10. https://doi.org/10.9790/1959-1206010110

Norman, V., Rossillo, K., & Skelton, K. (2016). Creating healing environments through the theory of caring. *AORN Journal, 104*(5), 401–409. https://doi.org/10.1016/j.aorn.2016.09.006

Oktaviana, Y., & Dwiantoro, L. (2018). Development of nurses' empathy attitudes in patient center care through transformational leadership: A literature review. *Jurnal Kepemimpinan Dan Manajemen Keperawatan, 1*(2), 9–14. https://doi.org/http://dx.doi.org/10.32584/jkmk.v1i2.62

Rahman, F. A., Arifin, K., Abas, A., Mahfudz, M., Cyio, M. B., Khairil, M., Ali, M. N., Lampe, I., & Samad, M. A. (2022). Sustainable safety management: A safety competencies systematic literature review. *Sustainability (Switzerland), 14*(11), 1–17. https://doi.org/10.3390/su14116885

Rezende, H. De, Morais, A. S., Vitorio, A. M. F., Quadrado, E. R. S., Garzin, A. C. A., Martins, M. S., Lourenção, D. C. de A., Modesto, R. C., & Nicole, A. G. (2024). Effectiveness of educational interventions to develop patient safety competencies in undergraduate nursing students: A systematic review. *Nurse Educator, 50*(1), 37–42. https://doi.org/10.1097/NNE.0000000000001750

Sari, D. W. P., Arief, Y. S., Ahsan, A., & Abdurrouf, M. (2024). The development of clinical education model based on community of practice for the patient safety competency achievement in nursing students: A pls-sem approach. *Journal of Law and Sustainable Development, 12*(1), e2712. https://doi.org/10.55908/sdgs.v12i1.2712

Shin, J. Y., & Jang, E. H. (2023). Influence of person-centered perioperative nursing and patient safety competency on patient safety management activities among operating room nurses: A descriptive survey study. *Korean Journal of Adult Nursing, 35*(2), 97–106. https://doi.org/10.7475/kjan.2023.35.2.97

Sirera, B., Naanyu, V., Kussin, P., & Lagat, D. (2024). Impact of patient-centered communication on patient satisfaction scores in patients with chronic life-limiting illnesses: An experience from Kenya. *Frontiers in Medicine, 11*(March). https://doi.org/10.3389/fmed.2024.1290907

van Lotringen, C., Lusi, B., Westerhof, G. J., Ludden, G. D. S., Kip, H., Kelders, S. M., & Noordzij, M. L. (2023). The role of compassionate technology in blended and digital mental health interventions: Systematic scoping review. *JMIR Mental Health, 10*(April). https://doi.org/10.2196/42403

Vujanić, J., Mikšić, Š., Barać, I., Včev, A., & Lovrić, R. (2022). Patients' and nurses' perceptions of importance of caring nurse–patient interactions: Do they differ? *Healthcare (Switzerland), 10*(3), 1–16. https://doi.org/10.3390/healthcare10030554

Vujanić, J., Prlić, N., & Lovrić, R. (2020). Nurses' self-assessment of caring behaviors in nurse–patient interactions: A cross-sectional study. *International Journal of Environmental Research and Public Health, 17*(14), 1–15. https://doi.org/10.3390/ijerph17145255

Wang, J., & Wang, X. (2019). Structural equation modeling: Applications using mplus (Second edition). John Wiley & Sons, Incorporated.

Wang, K. L., de Montemas, W., Dey, S., Johnson, A., Nguyen, H., Tuqiri, K., Crawford, B., & Murray, S. (2024). Not just a 'nice to have': Team compassionate care behaviours and patient safety. *Australian Journal of Management, June*. https://doi.org/10.1177/03128962241270743

Wang, Y. A., & Rhemtulla, M. (2021). Power analysis for parameter estimation in structural equation modeling: A discussion and tutorial. *Advances in Methods and Practices in Psychological Science, 4*(1). https://doi.

org/10.1177/2515245920918253

Watson, J. (2018). Unitary caring science: Philosophy and praxis of nursing. University Press of Colorado.

Wei, H., Hardin, S. R., & Watson, J. (2021). A unitary caring science resilience-building model: Unifying the human caring theory and research-informed psychology and neuroscience evidence. *International Journal of Nursing Sciences, 8*(1), 130–135. https://doi.org/10.1016/j.ijnss.2020.11.003

World Health Organization. (2020). Patient safety incident reporting and learning systems: Technical report and guidance. World Health Organization. https://iris.who.int/handle/10665/334323ance

Wu, Y. (2021). Empathy in nurse-patient interaction: A conversation analysis. *BMC Nursing, 20*(1), 1–6. https://doi.org/10.1186/s12912-021-00535-0

Yang, Y. K. (2021). Development of a patient safety care activity scale for clinical nurses in Korea. *Archives of Public Health, 79*(1), 1–13. https://doi.org/10.1186/s13690-021-00596-2

Zaitoun, R. A., Said, N. B., & de Tantillo, L. (2023). Clinical nurse competence and its effect on patient safety culture: A systematic review. *BMC Nursing, 22(*1), 1–10. https://doi.org/10.1186/s12912-023-01305-w

The self–directed learning readiness and self–efficacy of nursing students in synchronous learning: A cross–sectional study

Totok Harjanto[1*], Made Satya Nugraha Gautama[2], Dimas Septian Eko Wahyu Sumunar[3]

[1] Basic and Emergency Nursing Department, School of Nursing Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada, Yogyakarta, Indonesia;
[2] Department of Nursing, Faculty of Medicine, Universitas Pendidikan Ganesha, Singaraja, Indonesia
[3] Department of Health Policy and Management, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia

Abstract

Background: Beyond the pandemic, synchronous online learning was found to be a reliable approach in undergraduate nursing education. The students' self-directed learning readiness and online self-efficacy are key to the successful implementation of this approach. Readiness determines the learner's needs based on contextual education, while efficacy refers to the students' confidence when completing online learning tasks.
Purpose: The current study aims to investigate the relationship between self-directed learning readiness and self-efficacy among undergraduate nursing students.
Methods: A descriptive correlational study was carried out to measure the undergraduate nursing students' readiness and efficacy using the Self-Directed Learning Readiness (SDLR) Scale and the Online Learning Self-Efficacy Scale. Upon completing data collection using a web-based survey, univariate descriptive and bivariate analysis with Pearson correlation were conducted.
Results: A total of 188 undergraduate nursing students participated in this study with an average age of 20.12 years old. The majority of nursing students (72.9%) within the program had a moderate SDLR level, while the mean (SD) SDLR was 149.95 (±12.24). Similarly, moderate self-efficacy was reported by the present study participants. The self-efficacy subscale of strength was categorized as high, while moderate levels of generality and magnitude were interpreted from the findings. The bivariate statistical analysis indicated a significant correlation between SDLRS and online self-efficacy ($r=0.298$, $p<0.001$). SDLR had significant correlations with each online self-efficacy subscale, including strength ($r=0.259$, $p<0.001$), generality ($r=0.259$, $p<0.001$), and magnitude ($r=0.259$, $p<0.001$).
Conclusion: In synchronous learning, the undergraduate nursing student's SDLR was found to have a positive relationship with self-efficacy. Provisioning the students' individual learning skills is necessary to enhance their readiness and consequently improve their acquisition of the educational outcomes.

Keywords: nursing students, self-directed learning readiness, self-efficacy, synchronous learning

Introduction

The COVID-19 pandemic has disrupted traditional modes of education and forced many countries to adopt online or hybrid learning models (Harjanto et al., 2023). This has posed many challenges and opportunities for synchronous learning in different contexts and settings. Synchronous learning refers to a method of learning where instruction and interactions occur in real-time, allowing for live communication between instructors and learners. This can take place through various technologies, such as video conferencing,

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 17-25
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2445

Article Info

Received : November 30, 2023
Revised : January 09, 2025
Accepted : February 04, 2025
Published : April 25, 2025

Corresponding author

Totok Harjanto*
Basic and Emergency Nursing Department, School of Nursing Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada, Yogyakarta, Indonesia; Senolowo, Jl. Farmako, Sekip Utara, Kec. Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281; Phone: (0274) 560300;
E-mail: toharjanto506@ugm.ac.id

Citation

Harjanto, T., Gautama, M. S. N., & Sumunar, D. S. E. W. (2025). The self–directed learning readiness and self–efficacy of nursing students in synchronous learning: A cross–sectional study. *Jurnal Keperawatan Padjadjaran, 13*(1), 17-25. http://dx.doi.org/10.24198/jkp.v13i1.2445

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

webinars, and instant messaging platforms, enabling participants to engage simultaneously (Warden et al., 2013). While often facilitated in an online format, synchronous learning can also occur in classroom settings where immediate interaction is possible. This contrasts with asynchronous learning, where interactions do not happen in real-time, and students learn on their own schedule using tools like emails and recorded lectures (Zeng & Luo, 2023).

In the context of nursing education, synchronous online learning has become increasingly prevalent because it accommodates learners who are geographically dispersed or have other commitments, offering flexibility and accessibility (Meng et al., 2019). Additionally, it fosters opportunities for social presence, immediate feedback, and collaboration, which can lead to higher levels of engagement and satisfaction among learners (Noh & Kim, 2019). Despite its advantages, synchronous learning poses challenges such as managing technical issues, maintaining effective communication, and requiring learners to exhibit strong time-management and self-regulation skills.

Self-directed learning and self-efficacy are important factors in successful synchronous learning (Stephen & Rockinson-Szapkiw, 2021). Self-directed learning (SDL) is a process in which learners take the initiative and responsibility for their own learning by setting goals, selecting strategies, monitoring progress, and evaluating outcomes (Hwang & Oh, 2021). It is considered to be an essential competency for lifelong learning and professional development in nursing where the healthcare environment is constantly evolving (Soliman & Al-Shaikh, 2015). SE, the belief in one's ability to perform specific tasks or achieve certain goals, influences motivation, effort, persistence, and coping skills when facing challenges (Meng et al., 2019).

However, nursing students may have varying levels of self-directed learning readiness (SDLR) and SE for different subjects or topics, potentially affecting their engagement and achievement in synchronous learning environments (Hwang & Oh, 2021). This variability can be particularly problematic if students are not given sufficient flexibility to tailor their learning experience (Warden et al., 2013). Moreover, the relationship between SDLR and SE in the context of synchronous learning for nursing students remains understudied, representing a significant gap in the current knowledge.

Synchronous learning, while offering benefits such as real-time interaction and immediate feedback, also presents challenges for nursing students (Edelbring et al., 2020). These may include the need for high levels of SE to maintain motivation during live sessions, the requirement for effective time management skills, and the potential for technical difficulties that can disrupt the learning process (Al-Abyadh & Abdel Azeem, 2022). Understanding how SDLR and SE interact within this learning format is crucial for developing effective educational strategies (Wong et al., 2021).

Given these considerations, there is a clear need to investigate the relationship between SDLR and SE among undergraduate nursing students, particularly in the context of synchronous learning. This study aims to address this knowledge gap by examining how these factors are related to and potentially influenced by different modes of learning. The findings could inform the development of more effective synchronous learning experiences that cater to the diverse SDLR and SE levels of nursing students, ultimately enhancing their educational outcomes and preparing them for the demands of the nursing profession.

Materials and Methods

Design

A correlational descriptive research design was used in this study.

Sample and setting

This study included all eligible undergraduate nursing students from the School of Nursing, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia, using the total sampling method. The study was conducted from May to November 2022. To determine the appropriate sample size, we used the G*Power 3.1.9.7 software for correlation analysis. Assuming a small effect size ($r = 0.25$), $\alpha = 0.05$, and power $(1-\beta) = 0.80$, the calculated minimum sample size was 123 participants. To account for potential non-responses or incomplete data, we aimed to recruit all eligible students. A total of 188 students participated, comprising first-year (n=67), second-year (n=62), and third-year students (n=59). The inclusion criteria were undergraduate nursing students who participated in online lectures and were willing to be research respondents. The exclusion criteria were students who were unable to attend due to illness, working class students, students on leave, and students who participated in the instrument's reliability testing. Students who participated in the reliability testing were assigned unique codes and subsequently excluded from the main study to prevent potential bias. All remaining eligible students were invited to participate in the main study.

Variables

In this study, the variables examined include self-directed learning (SDL) as the dependent variable and self-efficacy as the independent variable. SDL refers to the process in which students take the initiative, with or without the help of others, to diagnose their learning needs, formulate objectives, identify learning resources, select and implement appropriate learning strategies, and evaluate their learning outcomes. SDL is assessed using the Self-Directed Learning Readiness Scale questionnaire (SDLRS). Self-efficacy, the independent variable,

Table 1. Frequency distribution of students' demographic characteristics during synchronized learning (n=188)

Demographic characteristics	N	%
Gender		
Male	12	6.4
Female	176	93.6
Study Years		
First year	67	35.6
Second year	62	33.0
Third year	59	31.4
Age (Mean ± SD)	20.12 ± 0.91	
Video conference frequency		
≤ 3 times	96	51.1
>3 times	92	48.9
Video conference duration		
≤ 60 minutes	19	10.1
> 60 minutes	169	89.9
Type of devices used		
Smartphone/Tablet/iPad	17	9.0
Computer/laptop	169	89.9
Both	2	1.1
Turn on/off camera		
On	183	97.3
Off	5	2.7

Table 2. Frequency and Percentage Distribution of Students' Self - Directed Learning Readiness

SLD Readiness categories based on mean (149.95±12.24)	No	%
Low level SDL readiness	28	14.9
Moderate level SDL readiness	137	72.9
High level SDL readiness	23	12.2

Low: < Mean – SD; Moderate: Mean – SD < x < Mean + SD; High: > Mean + SD

Table 3. Mean score of nursing students' self – efficacy during synchronized learning

Student Self – Efficacy	Mean	SD	Interpretation
Student Self – Efficacy	39.13	6.88	Moderate
Domain 1: Strength	15.05	2.98	High
Domain 2: Generality	14.13	2.31	Moderate
Domain 3: Magnitude	9.96	3.04	Moderate

Student self – efficacy: low (9 – 26); moderate (28 – 45); high (46 – 63)
Domain: low (3 – 8); moderate (9 – 14); high (15 – 21)

is defined as an individual's belief in their capability to successfully engage in and complete the synchronous learning activities. It is measured using the Online Learning Self-Efficacy Scale (OSES).

Instruments

The Self-Directed Learning Readiness Scale (SDLRS) questionnaire consists of 40 items divided into three subscales: self-management, desire to learn, and self-control. The questionnaire items are assessed using a 5-point Likert scale, ranging from 1 for "strongly disagree" to 5 for "strongly agree." The students' SDL readiness is determined based on their total score on the questionnaire, with higher scores indicating greater SDL readiness. According to a previous study, the validity (r value) and reliability

Table 4. Correlation between self – directed learning readiness and self – efficacy during synchronized learning

Student Self – Efficacy		SDL readiness
Student Self – Efficacy	r	0.298**
	p	0.000*
Domain 1: Strength	r	0.259**
	p	0.000*
Domain 2: Generality	r	0.259**
	p	0.000*
Domain 3: Magnitude	r	0.259**
	p	0.000*

** r Pearson correlation is significant at the 0.01 level (2-tailed)
*P is significant at P < 0.05

(Cronbach's alpha) of this instrument is 0.268 and 0.90, respectively (Suryani et al., 2022).

The Online Learning Self-Efficacy Scale (OSES) instrument was adapted from the Online Learning Value and Self-Efficacy Scale developed by Artino in 2008. The instrument underwent cross-cultural adaptation before use. The main instrument consists of 27 items, including 18 items that measure the value of online learning and 9 items that measure the students' self-efficacy level in online learning. For this study, only the 9 items measuring the students' self-efficacy level were used to develop the 'self-efficacy scale on online learning' questionnaire. This scale used a 7-point Likert scale, where 1 represents "strongly disagree" and 7 represents "strongly agree." The scale is divided into three dimensions — strength, generality, and magnitude — each consisting of 3 items. To determine the overall self-efficacy score, the scores from all 9 items are summed, resulting in a total score ranging from 9 to 63. This total score is categorized into levels of self-efficacy: scores from 9 to 27 indicate low self-efficacy, 28 to 45 signify moderate self-efficacy, and 46 to 63 reflect high self-efficacy. Each dimension is scored by summing the 3 items associated with a given domain, with the scores then categorized into low, moderate, and high based on dividing the possible range into three equal parts (low: 3 – 8; moderate: 9 – 14; high: 15 – 21). The interpretation of the score is that higher scores indicate higher self-efficacy. A validity test was conducted involving six experts, selected based on their expertise in developing the learning processes in nursing and technology and e-learning programs (Yusoff, 2019). The results of the validity test showed an index value of 0.93. A reliability test was also conducted on the research instrument with 33 professional students (Wahyuningrum et al., 2021). The results of the analysis showed a Cronbach's alpha value of 0.72, indicating that the instrument was valid and reliable for use in research.

Data collection

The data collection technique used by the researcher was a questionnaire made using a Google Form. The Google Form contained questions related to the respondent's characteristics, such as their full name, class year, age, gender, and attitude towards participating in synchronous online learning, as well as core questions from the SDLRS and OSES instruments. After all respondents had completed the questionnaire and confirmed receipt of the completed questionnaire via email, the researcher closed the survey. During the data collection, the researcher monitored the Google Form database to ensure that the number of respondents met expectations, that all answers from the respondents were complete, and that each respondent's answer to each question was valid.

Data analysis

The data collected in this study was analyzed using the IBM SPSS software package, version 26 (IBM, 2019). To verify the normality of the data, the Kolmogorov-Smirnov test was employed. The categorical data was presented using numbers and percentages, while the quantitative data was described using means and standard deviations. In this study, categorical data included the demographic variables including gender and year of study. Numerical data comprised the primary outcomes of the research, specifically self-directed learning readiness (SDLR) and self-efficacy (SE). Both SDLR and SE were measured as continuous scores. The level of significance for the results obtained was set at ≤0.05. Additionally, the Pearson correlation coefficient was used to determine the relationship between the two normally distributed quantitative variables. This statistical method measures the strength and direction of a linear relationship between two variables, providing valuable insights into the associations between them.

Ethical consideration

In this study, the researchers adhered to research ethics with the primary goal of protecting the rights and well-being of the research subjects. As an ethical requirement, the data collection was only conducted after receiving approval from the ethics committee of the Faculty of Medicine, Public Health,

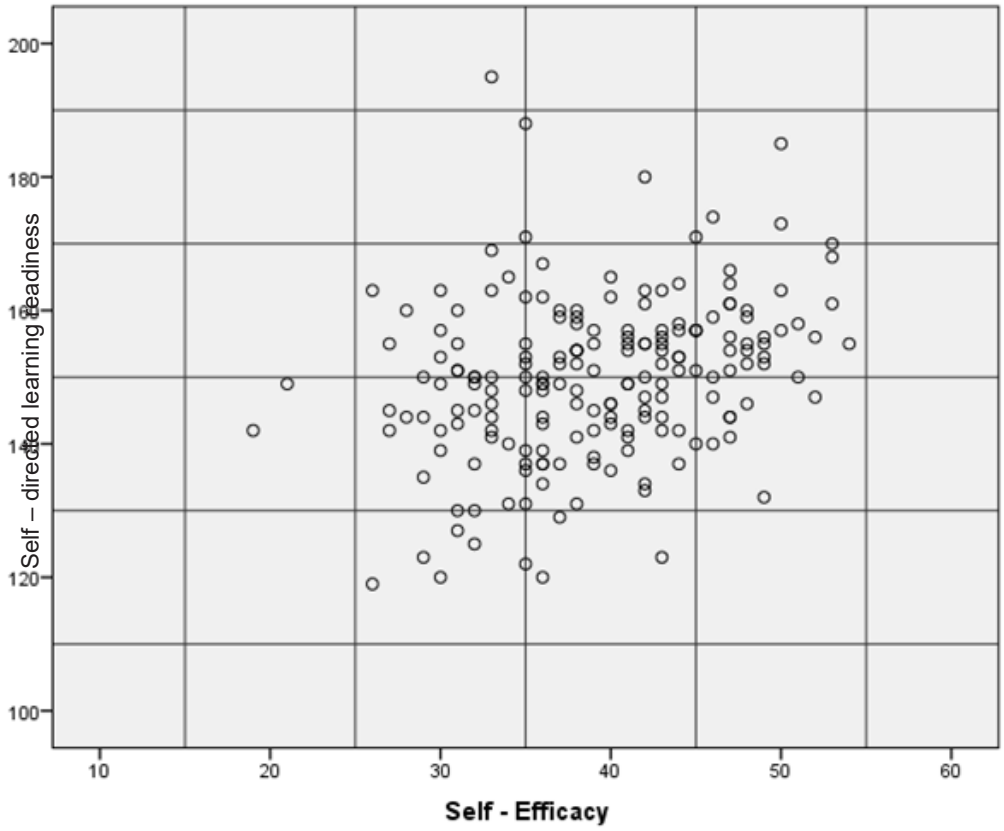


Figure 1. Correlation between self – directed learning readiness and self – efficacy during synchronized learning

and Nursing at Universitas Gadjah Mada – Dr. Sardjito General Hospital Yogyakarta. This research received ethical clearance from the Medical and Health Research Ethics Committee (MHREC) of FMPHN UGM, as indicated by clearance number KE/FK/1041/EC/2022.

Results

Characteristics of the respondents

According to Table 1, this study had a total of 188 respondents. The respondents were from three different grade years: 59 students (31.4%) from third year, 62 students (33%) from second year, and 67 students (35.6%) from first year. The majority of the respondents were aged between 20-22 years (72.3%), with a mean age of 20.12 (0.91) years old. The majority were female, coming to a total of 176 students (93.6%).

Self – directed Learning Readiness

According to Table 2, the majority of nursing students (72.9%) exhibited a moderate level of self-directed learning (SDL) readiness, with 137 respondents falling into this category. In contrast, 23 nursing students (12.2%) demonstrated a high level of SDLR, while 28 nursing students (14.9%) exhibited a low level of SDL readiness. The data suggests that the distribution of SDLR among the nursing students is skewed towards the moderate level.

Nursing students' self – efficacy during synchronous learning

Table 3 presents the mean score of self–efficacy among nursing students during synchronous learning, categorized by domain. The strength domain exhibited the highest mean score (15.05 ± 2.98), indicating a high level of self-efficacy in this domain. The generality and magnitude domains demonstrated moderate levels of self-efficacy, with mean scores of 14.13 ± 2.31 and 9.96 ± 3.04, respectively. Overall, the mean score for self-efficacy among nursing students was 39.13 ± 6.88, indicating a moderate level of self-efficacy across all domains.

The correlation between self–directed learning readiness and self–efficacy during synchronous learning

As shown in Table 4, a significant positive correlation was observed between SDLR and self-efficacy among nursing students during synchronous learning ($r = 0.298$, $p < 0.001$), highlighting that students who are more prepared for self-directed learning tend to also possess higher self-efficacy. This correlation, while statistically significant, is considered weak to moderate in strength based on the common

interpretations of correlation coefficients. The r-value of 0.298 indicates a modest positive relationship between SDLR and self-efficacy. This suggests that while there is a connection between these two variables, other factors likely contribute to both SDLR and self-efficacy. Furthermore, weak positive correlations were found between each domain (strength, generality, and magnitude) of self-efficacy and SDLR, with all domains exhibiting a correlation value of 0.259 ($p < 0.001$). These r-values also indicate weak relationships, suggesting that while strengthening both SDLR and self-efficacy could be beneficial for the students' learning success, other factors likely play significant roles in determining these outcomes.

Discussion

The present study aimed to investigate the SDLR and self-efficacy among nursing students during synchronous learning. The results revealed that the majority of nursing students exhibited a moderate level of SDLR, with a smaller proportion demonstrating high or low levels of readiness. In terms of self-efficacy, the nursing students demonstrated moderate levels across all domains, with the strength domain exhibiting the highest mean score. A significant positive correlation was observed between SDLR and self-efficacy, suggesting that higher levels of SDLR are associated with higher levels of self-efficacy among this population.

The majority of nursing students exhibited a moderate level of SDLR, indicating that they possess some degree of autonomy and motivation to engage in self-directed learning. However, there is still room for improvement, as a smaller proportion of students demonstrated high levels of SDLR. In terms of self-efficacy, nursing students demonstrated moderate levels across all domains, with the strength domain exhibiting the highest mean score. This suggests that nursing students have a moderate level of confidence in their ability to perform tasks and achieve their goals during synchronous learning. The significant positive correlation observed between SDLR and self-efficacy further supports the importance of these factors in the success of nursing students during synchronous learning. This is in line with a previous study that examined the relationship between self-directed learning readiness and online learning self-efficacy among undergraduate nursing students in Saudi Arabia. The findings of this study can be used to develop interventions to improve the students' self-directed learning readiness and online learning self-efficacy, which can ultimately lead to better academic performance, self–confidence and success in online learning environments (Broadbent & Poon, 2015; Harjanto et al., 2023; Idrizi et al., 2021).

A recent study investigated the efficacy of online-synchronous clinical simulation in relation to the learning and performance of medical students and the management of patients with COVID-19 in simulation centers in three Latin American countries (Díaz-Guio et al., 2021). The study found that online-synchronous clinical simulations improved the students' knowledge, skills, and attitudes regarding the care of patients with COVID-19. Another study explored the implementation of active learning methods by nurse educators in undergraduate nursing students' programs (Pivač et al., 2021). The study revealed that the use of various active learning methods in simulation settings improved the nursing students' critical thinking and communication skills. These studies suggest that synchronous learning and active learning methods can be beneficial for nursing education, as they can foster the development of SDLR and self-efficacy among nursing students (Geng et al., 2019). However, these studies also have some limitations, such as the small sample size, the cross-sectional design, and the reliance on self-reporting measures. More research is needed to examine the effectiveness and best practices of synchronous learning and active learning methods in nursing education, as well as other disciplines that require high levels of SDLR and self-efficacy.

Self-directed learning and self-efficacy can foster learner engagement, motivation, and satisfaction in synchronous learning, which are crucial for achieving positive learning outcomes. Engaged learners are more likely to participate actively and interactively in synchronous learning activities, such as lectures, discussions, and assignments. Motivated learners are more likely to persist and complete their synchronous learning courses. Satisfied learners are more likely to enjoy and appreciate their synchronous learning experiences.

Nursing educators can promote self-efficacy and self-directed learning readiness among students in several ways. One effective method is through the use of blended learning, which combines face-to-face instruction with online learning (Geng et al., 2019). This approach has been shown to improve the students' social involvement in the class and enhance their teaching presence. Prior training in learning technologies can also help to enhance student self-efficacy and self-directed learning readiness (Geng et al., 2019; Jowsey et al., 2020). Another way to promote self-efficacy and self-directed learning readiness among nursing students is by providing them with opportunities to engage in self-directed learning activities. This can be achieved by teaching self-directed learning skills to the students via training courses (Nazarianpirdosti et al., 2021). Self-directed learners control their learning experiences using a variety of cognitive or metacognitive strategies that lead to active participation in the learning process (Helen & Lorraine, 2012). In addition, nursing educators can promote self-efficacy among students by providing positive reinforcement and encouragement (Aras & Çiftçi, 2021). Verbal persuasion from teachers is an important source of self-efficacy in nursing education, and can help to boost the students'

confidence in their abilities and motivate them to achieve their goals (Harjanto et al., 2023; Robb, 2012).

Implications for practice

The implications of these findings are that synchronous learning could be a beneficial mode of delivery for nursing education as it could foster the development of SDLR and self-efficacy among nursing students. SDLR and self-efficacy are important competencies for nursing professionals, as they enable them to cope with the changing demands and challenges of the healthcare environment, and to pursue lifelong learning and career development. By enhancing these competencies, synchronous learning could improve the quality and outcomes of nursing education and practice. The findings also suggest that instructors should consider the individual differences in SDLR and self-efficacy, and provide appropriate feedback and support to facilitate learning.

Our study findings indicate that synchronous online learning is a highly effective modality for nursing education, particularly when fostering SDLR and self-efficacy among students. This approach allows for real-time interactions and immediate feedback, creating an environment that closely mirrors the collaborative and interactive nature of clinical practice. Synchronous learning promotes active engagement and helps nursing students develop confidence in their ability to participate in discussions, solve problems collaboratively, and apply theoretical knowledge to practice. These findings align with the prior research demonstrating that synchronous online sessions enhance interpersonal communication and engagement, both of which are critical for nursing competencies (Fabriz et al., 2021; Nwamu & Ni, 2023).

Additionally, our study supports the notion that synchronous learning, when implemented with appropriate instructional strategies and technological support, is comparable to and even more effective than traditional face-to-face learning in certain areas. This is particularly true when synchronous sessions are structured to include active learning components, such as live case studies or simulations. The combination of immediacy and interaction in synchronous learning provides a unique advantage for nursing students, enabling them to develop critical skills in a controlled yet dynamic, environment (Fabriz et al., 2021). Based on these findings, synchronous learning can be considered one of the best methods for nursing education, although its success relies on effective design, instructor preparedness, and institutional support (Nwamu & Ni, 2023).

Furthermore, the findings could inform future research on the effectiveness and best practices for synchronous learning in nursing education, as well as other disciplines that require high levels of SDLR and self-efficacy. Future studies should be also considered to explore the impact of other factors, such as motivation and learning styles, and to conduct longitudinal studies to examine the changes in self-directed learning readiness and online learning self-efficacy over time among nursing students.

Conclusion

In conclusion, this study found that the sample of nursing students exhibited moderate levels of self-directed learning SDLR and self-efficacy during synchronous learning. A smaller proportion of students demonstrated high and low levels of SDLR. The strength domain had the highest mean score among all domains of self-efficacy. A significant positive correlation was observed between SDLR and self-efficacy, indicating that higher levels of SDLR are associated with higher levels of self-efficacy. These findings suggest that promoting SDLR may enhance the self-efficacy found among nursing students in synchronous learning environments.

Declaration of Interest

None

Acknowledgment

None

Funding

None

Data Availability

All data underlying the results are available as part of the article and no additional source data are provided.

References

Al-Abyadh, M. H., & Abdel Azeem, H. A. (2022). Academic achievement: influences of university students' self-management and perceived self-efficacy. *In Journal of Intelligence, 10*(3). https://doi.org/10.3390/jintelligence10030055

Aras, G. N., & Çiftçi, B. (2021). Comparison of the effect of reinforcement with question-answer and kahoot method on the success and motivation levels of nursing students: A quasi-experimental review. *Nurse Education Today, 102*, 104930. https://doi.org/10.1016/j.nedt.2021.104930

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27,* 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007

Díaz-Guio, D. A., Ríos-Barrientos, E., Santillán-Roldan, P. A., Mora-Martinez, S., Díaz-Gómez, A. S., Martínez-Elizondo, J. A., Barrientos-Aguiñaga, A., Arroyo-Romero, M. N., Ricardo-Zapata, A., & Rodríguez-Morales, A. J. (2021).

Online-synchronized clinical simulation: An efficient teaching-learning option for the COVID-19 pandemic time and beyond. *Advances in Simulation, 6*(1), 30. https://doi.org/10.1186/s41077-021-00183-z

Edelbring, S., Alehagen, S., Mörelius, E., Johansson, A., & Rytterström, P. (2020). Should the PBL tutor be present? A cross-sectional study of group effectiveness in synchronous and asynchronous settings. *BMC Medical Education, 20*(1), 103. https://doi.org/10.1186/s12909-020-02018-3

Fabriz, S., Mendzheritskaya, J., & Stehle, S. (2021). Impact of synchronous and asynchronous settings of online teaching and learning in higher education on students' learning experience during COVID-19. *In Frontiers in Psychology, 12*. https://www.frontiersin.org/articles/10.3389/fpsyg.2021.733554

Geng, S., Law, K. M. Y., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education, 16*(1), 17. https://doi.org/10.1186/s41239-019-0147-0

Harjanto, T., Gautama, M. S. N., & Sumunar, D. (2023). Effect of online case-based learning on nursing students' self-confidence amid COVID-19 pandemic. *Bali Medical Journal, 12*(1), 519–523. https://doi.org/10.15562/bmj.v12i1.3702

Helen, B., & Lorraine, M. (2012). Social cognitive theory, metacognition, and simulation learning in nursing education. *Journal of Nursing Education, 51*(10), 543–548. https://doi.org/10.3928/01484834-20120820-02

Hwang, Y., & Oh, J. (2021). The relationship between self-directed learning and problem-solving ability: The mediating role of academic self-efficacy and self-regulated learning among nursing students. *In International Journal of Environmental Research and Public Health, 18*(4). https://doi.org/10.3390/ijerph18041738

IBM. (2019). IBM SPSS Statistics for Windows (No. 26). IBM Corp.

Idrizi, E., Filiposka, S., & Trajkovijk, V. (2021). Analysis of Success Indicators in Online Learning. *International Review of Research in Open and Distributed Learning, 22*(2), 205–223. https://doi.org/10.19173/irrodl.v22i2.5243

Jowsey, T., Foster, G., Cooper-Ioelu, P., & Jacobs, S. (2020). Blended learning via distance in pre-registration nursing education: A scoping review. *Nurse Education in Practice, 44,* 102775. https://doi.org/10.1016/j.nepr.2020.102775

Meng, L.-N., Zhang, X.-H., Lei, M.-J., Liu, Y.-Q., Liu, T.-T., & Jin, C.-D. (2019). Relationship between self-directed learning readiness, learning attitude, and self-efficacy of nursing undergraduates. *Frontiers of Nursing, 6*(4), 341–348. https://doi.org/doi:10.2478/FON-2019-0043

Nazarianpirdosti, M., Janatolmakan, M., Andayeshgar, B., & Khatony, A. (2021). Evaluation of self-directed learning in nursing students: A systematic review and meta-analysis. *Education Research International, 2021,* 2112108. https://doi.org/10.1155/2021/2112108

Noh, G.-O., & Kim, D. H. (2019). Effectiveness of a self-directed learning program using blended coaching among nursing students in clinical practice: A quasi-experimental research design. *BMC Medical Education, 19*(1), 225. https://doi.org/10.1186/s12909-019-1672-1

Nwamu, H., & Ni, A. Y. (2023). Nursing students' evolving perceptions of online learning: A hierarchy of curricula. *In Education Sciences, 13*(6). https://doi.org/10.3390/educsci13060574

Pivač, S., Skela-Savič, B., Jović, D., Avdić, M., & Kalender-Smajlović, S. (2021). Implementation of active learning methods by nurse educators in undergraduate nursing students' programs – a group interview. *BMC Nursing, 20*(1), 173. https://doi.org/10.1186/s12912-021-00688-y

Robb, M. (2012). Self-efficacy with application to nursing education: A concept analysis. *Nursing Forum, 47*(3), 166–172. https://doi.org/10.1111/j.1744-6198.2012.00267.x

Salah Dogham, R., Elcokany, N. M., Saber Ghaly, A., Dawood, T. M. A., Aldakheel, F. M., Llaguno, M. B. B., & Mohsen, D. M. (2022). Self-directed learning readiness and online learning self-efficacy among undergraduate nursing students. *International Journal of Africa Nursing Sciences, 17,* 100490. https://doi.org/10.1016/j.ijans.2022.100490

Soliman, M., & Al-Shaikh, G. (2015). Readiness for self-directed learning among first year saudi medical students: A descriptive study. *Pakistan Journal of Medical Sciences, 31*(4), 799–802. https://doi.org/10.12669/pjms.314.7057

Stephen, J. S., & Rockinson-Szapkiw, A. J. (2021). A high-impact practice for online students: The use of a first-semester seminar course to promote self-regulation, self-direction, online learning self-efficacy. *Smart Learning Environments, 8*(1), 6. https://doi.org/10.1186/s40561-021-00151-0

Suryani, K. E., Gautama, M. S. N., Sunaryo, E. Y. B. A., & Harjanto, T. (2022). Self-directed learning of nursing students in the implementation of e-learning in nursing professional practice learning. *Jurnal Keperawatan Klinis Dan Komunitas (Clinical and Community Nursing Journal), 6*(1), 59–68.

Wahyuningrum, D., Pertiwi, A. A. P., & Harjanto, T. (2021). Description of self-efficacy of nursing professional students towards e-learning. *Jurnal Persatuan Perawat Nasional Indonesia (JPPNI), 6*(2), 64–72.

Warden, C. A., Stanworth, J. O., Ren, J. B., &

Warden, A. R. (2013). Synchronous learning best practices: An action research study. *Computers & Education, 63,* 197–207. https://doi.org/10.1016/j.compedu.2012.11.010

Wong, F. M. F., Tang, A. C. Y., & Cheng, W. L. S. (2021). Factors associated with self-directed learning among undergraduate nursing students: A systematic review. *Nurse Education Today, 104*, 104998. https://doi.org/10.1016/j.nedt.2021.104998

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal, 11*(2).

Zeng, H., & Luo, J. (2023). Effectiveness of synchronous and asynchronous online learning: A meta-analysis. *Interactive Learning Environments,* 1–17. https://doi.org/10.1080/10494820.2023.2197953

Effect of combined lateral and supine positioning on oxygen saturation in ICU patients during the mechanical ventilator weaning process: A randomized controlled trial

Iwan Purnawan[1*], Putut Anggara Susetya[2], Arif Imam Hidayat[1], Galih Noor Alivian[1], Sidik Awaludin[1], Ikit Netra Wirakhmi[3], Sawinee Chanshintop[4]

[1] Faculty of Health Sciences, Jenderal Soedirman University, Indonesia
[2] Prof Margono Soekarjo Hospital, Indonesia.
[3] Faculty of Health Sciences, Harapan Bangsa University, Indonesia.
[4] Faculty of Nursing, Princess of Naradhiwass University, Thailand

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 26-34
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2431

Article Info

Received : November 09, 2023
Revised : April 07, 2025
Accepted : April 09, 2025
Published : April 25, 2025

Corresponding author

Iwan Purnawan*
Faculty of Health Sciences, Jenderal Soedirman University, Indonesia; Jl.. Dr. Soeparno, Karangwangkal, Karang Bawang, Grendeng, Kec. Purwokerto Utara, Purwokerto, Jawa Tengah, Indonesia; Postal address: 53122, Phone: (0281) 6572772, E-mail: purnawan08@gmail.com

Citation

Purnawan, I., Susetya, P. A., Hidayat, A. I., Alivian, G. N., Awaludin, S., Wirakhmi, I. N., & Chanshintop, S. (2025). Effect of combined lateral and supine positioning on oxygen saturation in ICU patients during the mechanical ventilator weaning process: A randomized controlled trial . *Jurnal Keperawatan Padjadjaran, 13*(1), 26-34. http://dx.doi.org/10.24198/jkp.v13i1.2431

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Abstract

Background: Prolonged mechanical ventilation in ICU patients increases mortality risk and length of stay. Ineffective weaning can exacerbate the patient's condition and further elevate mortality risk due to hypoxemia-induced cellular damage, contributing to ICU overcrowding.
Purpose: This study investigates the effect of lateral positioning on oxygen saturation in ICU patients undergoing mechanical ventilator weaning.
Methods: A randomized controlled trial (RCT) with block randomization was conducted, enrolling 60 participants assigned to either the intervention group (n = 30) or the control group (n = 30). The intervention group received 5% FiO_2 and was repositioned every two hours (right lateral, supine, left lateral), whereas the control group remained supine with 5% FiO_2. Oxygen saturation (SaO_2) was measured using pulse oximetry before and after the intervention. As the data were not normally distributed, the Mann-Whitney U test was used to compare SaO_2 changes between groups, with statistical significance set at $p < 0.05$.
Results: Baseline characteristics, including age, gender, and ventilator duration, were comparable between groups ($p > 0.05$). The median increase in SaO_2 was 6% (IQR: 1–8%) in the intervention group and 1% (IQR: 0–3%) in the control group, with a significant between-group difference of 5% ($p < 0.001$). A large effect size ($\eta^2 = 0.68$) indicated a substantial impact of lateral positioning on SaO_2.
Conclusions: Lateral positioning significantly improves oxygen saturation in ICU patients undergoing ventilator weaning, potentially reducing complications associated with prolonged mechanical ventilation.

Keywords: critical patients; lateral position; mechanical ventilation; oxygen saturation

Introduction

Most intensive care unit (ICU) patients require mechanical ventilation (MV) due to their inability to breathe independently (Adamski, 2015). However, prolonged MV use increases the risk of mortality, extended hospital stays, therapy-related complications, and a decline in post-treatment functional activity (Marik, 2015). Weaning from MV is essential for restoring spontaneous breathing and can be performed gradually or abruptly. Successful weaning is sustaining spontaneous breathing without MV support for at least 48 hours while maintaining normal oxygen saturation levels (Morton et al., 2016; Othman, 2017).

Oxygen saturation (SaO_2), the percentage of oxygen-bound hemoglobin, typically ranges from 95% to 100% (Hafen & Sharma, 2022). Various factors influence SaO_2 levels during weaning, including age, gender, Glasgow

Coma Scale (GCS) score, oxygen therapy, fraction of inspired oxygen (FiO_2), positive end-expiratory pressure (PEEP), airway clearance, circulatory status, and activity level (Annesi et al., 2017; Kozier et al., 2012). Weaning failure is often associated with hypoxemia, which can lead to cellular injury, organ dysfunction, and an increased burden on ICU resources (Marik, 2015). One of the primary contributors to weaning failure is an imbalance between the respiratory muscle workload and weakness (Adamski, 2015).

Positioning plays a crucial role in enhancing respiratory muscle function and improving oxygenation. Studies suggest that lateral positioning can reduce the work of breathing and optimize diaphragmatic movement (Pujiati, 2019; Mezidi & Guérin, 2018; Patel et al., 2022). Additionally, it enhances pulmonary circulation, facilitating better oxygen binding to hemoglobin (Clarissa, 2019; Banasik, 2010). However, previous studies on lateral positioning and oxygenation have yielded inconsistent findings, potentially due to sample characteristics, underlying health conditions, and intervention duration variations. Some studies reported no significant changes in oxygen saturation (Agustina et al., 2021; Ferrando et al., 2020) others observed improved arterial oxygenation (PaO_2) in patients with acute respiratory distress syndrome (ARDS) (Hartanto, 2021).

To address these inconsistencies, this study investigates the effect of lateral positioning on oxygen saturation in ICU patients undergoing ventilator weaning. Unlike previous research, this study continuously monitors patients for 24 hours while implementing positional changes every two hours (right lateral, supine, and left lateral). Recent studies have highlighted the role of lateral positioning in improving oxygenation in critically ill patients (Hassan & Baraka, 2021; Sunaina et al., 2022). Supporting the rationale for this investigation. Furthermore, a preliminary study conducted in the ICU of Margono Soekarjo Hospital found that 74.34% of 1,085 patients required MV; however, the impact of lateral positioning on oxygen saturation remains unclear. Therefore, this study aims to provide stronger clinical evidence regarding the role of lateral positioning in optimizing oxygenation during the weaning process.

Materials and Methods

Design

This study utilized a randomized controlled trial (RCT) with a pre-test and post-test control group design. This approach directly compared the intervention and control groups by measuring key variables before and after the intervention. Including pre- and post-test assessments enhanced the study's ability to evaluate the intervention's effectiveness while reducing potential confounding factors.

Sample and Setting

Data was collected from April to May 2021 in the Intensive Care Unit (ICU) of Prof. Dr. Margono Soekarjo Hospital, Purwokerto, Central Java, Indonesia. The inclusion criteria for participants were as follows: ICU treatment for more than 48 hours, undergoing the weaning process, aged 20–60 years, stable hemodynamic status, Glasgow Coma Scale (GCS) score above 8, and a positive end-expiratory pressure (PEEP) value between 6 and 10 cm H_2O. Patients were excluded if they were terminally ill or had spinal disorders, pulmonary diseases, or anemia. Participants were withdrawn from the study if they experienced hemodynamic instability, cardiac electrical disturbances, or chose to discontinue participation.

Sample Size Calculation

The sample size was determined using the formula for an unpaired comparative analytical study with two groups, which is commonly used in experimental research to ensure sufficient statistical power for detecting significant differences (Dahlan, 2017). The formula used was:

$$n_1 = n_2 = 2x\left(\frac{[z_\alpha + z_\beta] \times S}{x_1 - x_2}\right)^2$$

$$n_1 = n_2 = 2x\left(\frac{[1.96 + 1.28] \times 3.14}{3}\right)^2$$

$$n_1 = n_2 = 2x\left(\frac{10.2}{3}\right)^2$$

$$n_1 = n_2 = 23$$

Description

n1 = n2 : Minimum sample size
Zα : Type I error (1.96)
Zβ : Type II error (1.28)
S : Pooled standard deviation from related studies (3.14) (Apriliawati, 2017)
x1-x2 : Minimum clinically significant change in SaO_2 (3) (Kristiani et al., 2020)

Based on this calculation, the minimum required sample size per group was 23 participants. To account for an estimated 10% dropout rate, the sample size was adjusted to 26 participants per group. However, due to the availability of eligible patients during recruitment, an additional four participants were included in each group, resulting in a final total of 30 participants per group.

Increasing the sample size beyond the initially calculated minimum is a common practice in experimental research. This enhances the robustness and generalizability of findings, reduces the risk of Type II errors, and increases the precision of effect estimates. A larger sample size strengthens statistical power, ensuring more reliable and valid conclusions (Heriansyah et al., 2022; Kristiani et al., 2020; Syahran et al., 2019).

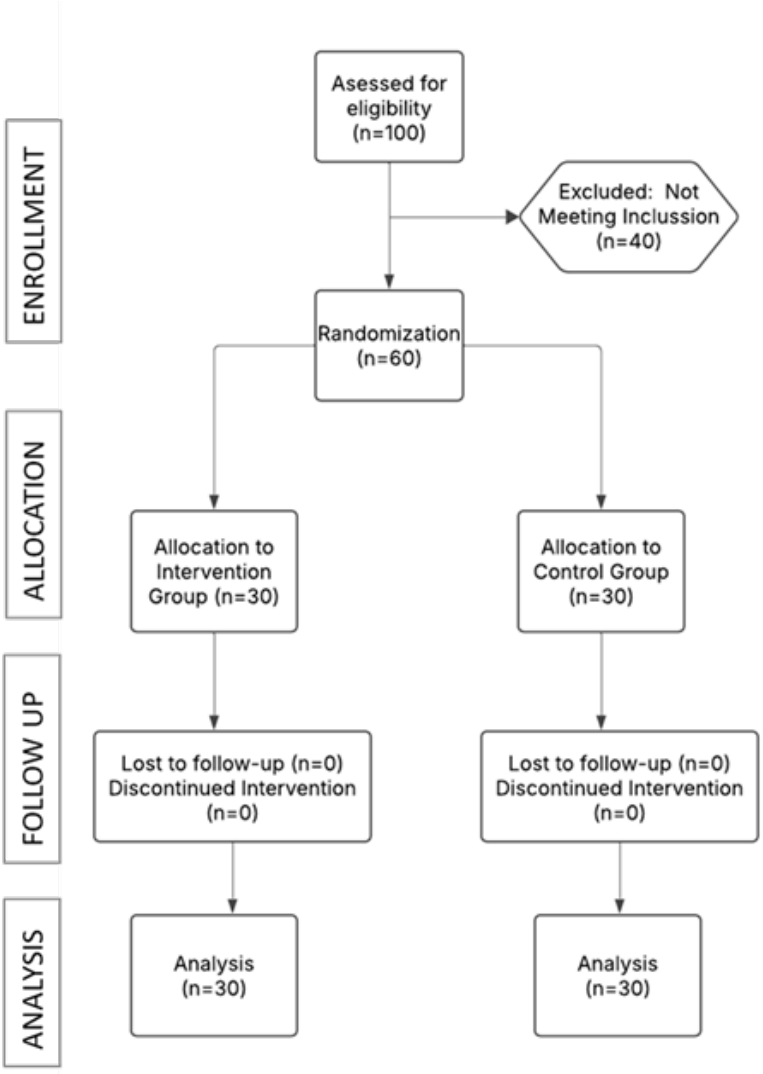


Figure 1. Respondent Selection Chart (CONSORT DIAGRAM)

Participant Selection and Randomization

Out of 100 ICU patients screened, only 60 met the inclusion and exclusion criteria. These patients were randomly assigned to either the intervention or control group, with 30 participants in each group. The selection process is illustrated in Figure 1.

Eligible ICU patients were selected based on the inclusion and exclusion criteria. Informed consent was obtained from their families, and if consent was given, patients were assigned a label number based on their admission sequence (1 to 60).

Participants were allocated using a block randomization system to ensure equal distribution and maintain balance across groups. A computer-generated randomization list was used for unbiased allocation. To minimize selection bias, an independent research assistant who was not involved in intervention administration or outcome assessment conducted the randomization.

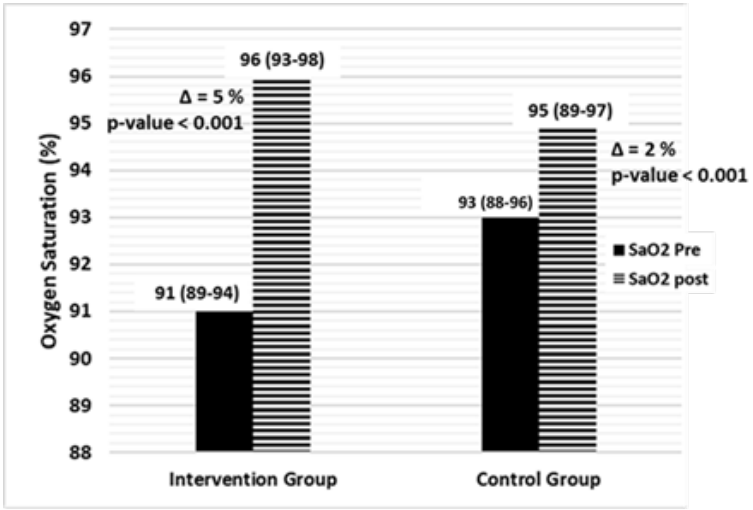
Due to the nature of the intervention (patient positioning), blinding participants and intervention providers was not feasible. However, single blinding was implemented, ensuring that data analysts remained blinded to group assignments to minimize bias in outcome analysis. This methodological approach enhances the internal validity and reliability of the study's findings (Purnawan et al., 2022).

Intervention

The study was conducted with the support of six trained research assistants, all ICU nurses holding basic ICU training certifications. These assistants were assigned across three shifts—morning, afternoon, and night—with two assistants per shift. Their primary responsibilities included repositioning patients every two hours and recording pre- and post-intervention oxygen saturation levels.

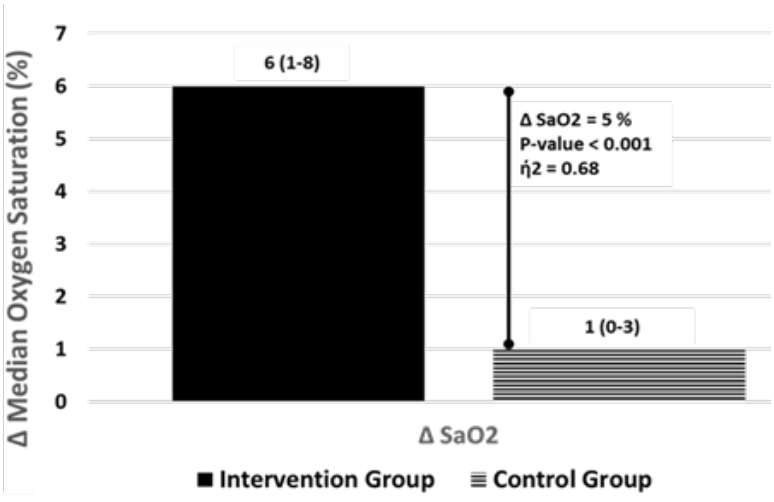
Lateral positioning was adjusted between 30° and 45°, depending on each patient's response and tolerance. The positioning sequence consisted of right lateral, supine, and left lateral positions, each maintained for two hours and systematically rotated over 24 hours.

To ensure consistency in oxygen saturation



Wilcoxon test
Δ : Oxygen saturation difference

Figure 2. Difference between pre and post SaO2



Mann-whitney test ; ή2: effect size; Δ: difference/increase

Figure 3. The difference in SaO2 Increase between the Two Groups

measurements across shifts, the Intraclass Correlation Coefficient (ICC) was calculated, yielding a reliability score of 0.80. This result indicates a high level of agreement among research assistants conducting measurements during morning, afternoon, and night shifts. A single designated researcher measured each patient's oxygen saturation to standardize data collection further and minimize inter-observer variability.

Oxygen saturation was measured using pulse oximetry devices connected to bedside monitors. All ICU equipment, including pulse oximeters, underwent routine calibration every six months as part of a validity and quality control protocol. These measures ensured data collection accuracy, precision, and consistency throughout the study.

The intervention and control groups received the same fraction of inspired oxygen (FiO_2) at 5% throughout the study. Each participant in the intervention group underwent systematic repositioning every two hours over 24 hours, totaling eight positional changes (alternating between left lateral, supine, and correct lateral positions)—this structured intervention aimed to optimize respiratory muscle function and improve oxygenation through consistent mechanical stimulation. The total intervention period spanned six weeks, allowing for the sequential enrollment of eligible patients.

In contrast, the control group received standard ICU care alongside 5% FiO_2 oxygen administration. Standard therapy included routine pharmacological and non-pharmacological treatments, with positional changes occurring only as part of routine nursing care, such as during hygiene procedures (e.g., bathing). This approach ensured uniformity in standard care while maintaining a clear distinction

between the control and intervention groups.

Both groups underwent hemodynamic monitoring every two hours, including assessments of heart rate (HR), respiratory rate (RR), blood pressure (BP), mean arterial pressure (MAP), and oxygen saturation (SaO_2). Suctioning was performed when necessary, based on clinical indicators such as audible secretions, declining oxygen saturation, or increased respiratory effort.

Throughout the study, no participants dropped out due to adverse events such as hemodynamic instability, vomiting, hypoxia, or a decline in Glasgow Coma Scale (GCS) score. This ensured the uninterrupted completion of the study protocol as planned.

Variables

This study examined two primary variables: the independent variable—lateral positioning—and the dependent variable—oxygen saturation (SaO_2). The primary objective was to evaluate the effect of positional changes on ICU patients' oxygen saturation levels.

Oxygen saturation was measured using a calibrated pulse oximeter (CMS50N Contec, Omron) to ensure accuracy and reliability. Measurements were taken every two hours throughout the 24-hour intervention period, with the highest recorded value in each session used for analysis. The pulse oximeter was recalibrated before each use according to the manufacturer's guidelines to maintain measurement precision.

Participants in the intervention group underwent systematic repositioning every two hours, alternating between left lateral, supine, and correct lateral positions. In contrast, the control group remained in the supine position. This intervention aimed to enhance respiratory function and optimize oxygenation. The dependent variable, oxygen saturation, was analyzed to assess the impact of these positional changes, providing insights into the relationship between patient positioning and oxygenation levels.

Data Collection

Oxygen saturation was measured at two key time points: before (pre-intervention) and after 24 hours (post-intervention). This measurement strategy was chosen to evaluate the cumulative effect of lateral positioning on oxygen saturation over 24 hours, rather than capturing short-term fluctuations that might occur with each position change.

Frequent measurements every two hours were deemed unnecessary, as previous studies suggest that oxygen saturation changes induced by positional adjustments do not significantly fluctuate within short intervals, particularly when assessing cumulative effects over an extended period. After the post-intervention measurement, patients in the control group were repositioned every two hours as part of standard ICU care.

A senior ICU nurse, who also served as an assistant researcher at Prof. Dr. Margono Soekarjo Hospital in Purwokerto, conducted data collection, ensuring consistency and reliability in data acquisition.

Data Analysis

Non-parametric data, such as age and duration of mechanical ventilator use, were reported as median and interquartile range (IQR). In contrast, categorical data, such as sex, were presented as frequency distributions. A chi-square test was used to assess the homogeneity of age and sex between groups, whereas the Levene test was applied to compare variance in mechanical ventilator duration. Since all 60 randomized participants completed the study without dropouts, statistical analyses were conducted using a per-protocol approach. Differences in oxygen saturation before and after the intervention within each group were analyzed using the Wilcoxon test. At the same time, between-group comparisons were performed using the Mann-Whitney test due to non-normally distributed data (Dahlan, 2019).

The effect size of oxygen saturation improvement was calculated using eta squared (η^2) to determine the magnitude of the intervention effect. The eta squared value was computed using the formula available at https://www.psychometrica.de/effect_size.html. All statistical analyses were conducted using SPSS version 26.

Ethical Clearance

This study was approved by the Health Research Ethics Committee of a government-based hospital in Central Java, Indonesia, in 2022 (No: 420/15533). It was conducted using the principles outlined in the Helsinki Declaration. Participants were selected based on well-defined inclusion and exclusion criteria, and informed consent was obtained to ensure that participants and their families fully understood the study's objectives, procedures, and potential risks.

Patient safety was a priority, and ICU protocols for patient positioning were strictly adhered to. Continuous monitoring and necessary adjustments were made to minimize potential risks associated with repositioning. Research assistants, who were thoroughly trained in the study protocol, worked under supervision, and scheduled breaks were provided to ensure their well-being during the 24-hour observation period. These measures ensured compliance with ethical standards and safeguarded study participants and research personnel.

Results

The demographic and clinical characteristics analysis, including age, duration of mechanical ventilator use, and sex distribution, revealed no significant differences between the intervention and control groups. The statistical results demonstrated p-values of 0.77 for age, 0.06 for ventilator duration,

and 0.17 for sex distribution, confirming the homogeneity of both groups in these variables.

The pre- and post-intervention SaO_2 levels in both groups were analyzed using the Mann-Whitney test, with the results presented in Figure 2. The analysis indicated a significant increase in the median SaO_2 levels in both the intervention and control groups ($p < 0.001$). The intervention group exhibited a 5% increase in SaO_2, while the control group demonstrated a 2% increase. Although both groups showed statistically significant improvements, a clinically meaningful change in SaO_2 was observed only in the intervention group. A change in SaO_2 is considered clinically significant in critically ill patients if it exceeds 3% (Kristiani et al., 2020).

The between-group comparison of SaO_2 improvements was also conducted using the Mann-Whitney test, as shown in Figure 3. The results revealed a statistically significant difference in the increase in SaO_2 between the two groups ($p < 0.001$). The median SaO_2 increase in the intervention group was 5% higher than in the control group. Furthermore, the effect size, indicated by $\eta^2 = 0.68$, suggests that lateral positioning substantially improved SaO_2 levels among ICU patients undergoing ventilator weaning. This 5% increase is clinically significant, as previous studies have established that a minimal change of 3–5% in SaO_2 is clinically meaningful (Kristiani et al., 2020).

Discussion

This study's findings indicate that the intervention and control groups had comparable characteristics in terms of age, gender, and duration of mechanical ventilator use. These factors are known to influence oxygen saturation and the success of ventilator weaning in ICU patients. Age, for example, affects pulmonary capacity, alveolar surface area, and diffusion capacity, all of which tend to decline with aging, impacting oxygenation and the likelihood of successful weaning (Yuswandi et al., 2020; Hakim et al., 2022). The influence of age on oxygen saturation is particularly pronounced in individuals with systemic disorders (Colodny, 2001). Additionally, gender differences play a role, as critically ill female patients tend to exhibit a leftward shift in the oxygen dissociation curve (ODC), allowing for better oxygen saturation at lower partial pressures of oxygen (Annesi et al., 2017; Yasseen et al., 2023). The duration of mechanical ventilation is another critical factor, as prolonged ventilator use increases the risk of complications that may hinder successful weaning (Elbaradey et al., 2015). However, homogeneity testing confirmed that these variables were evenly distributed across both groups, ensuring they did not introduce bias into the study results.

Effect of Lateral Positioning on Oxygen Saturation

The Wilcoxon test results indicated a significant increase in SaO_2 in both groups, likely due to the administration of 5% FiO_2, which was provided to prevent hypoxia during the weaning process. The additional oxygen supply enhanced hemoglobin oxygen binding and facilitated systemic oxygen distribution (Morton et al., 2016).

However, the Mann-Whitney test revealed a significantly more significant increase in SaO_2 in the intervention group compared to the control group. This difference can be attributed to the combined effects of FiO_2 supplementation and the lateral positioning intervention. The lateral position has been shown to enhance respiratory muscle strength, improve lung capacity, and facilitate adequate oxygenation in patients on mechanical ventilation (Yuswandi et al., 2020).

Lung capacity plays a crucial role in oxygenation, as increased lung volume allows for greater hemoglobin binding capacity, ultimately improving oxygen saturation (Kozier et al., 2012; Yuswandi et al., 2020). This study's findings align with previous research demonstrating that lateral positioning significantly increases PaO_2 compared to the supine and semi-Fowler positions (Mahvar, 2012; Tongyoo et al., 2006). Furthermore, lateral positioning has been associated with improved respiratory function and reduced respiratory muscle workload, potentially shortening the duration of mechanical ventilation in critically ill patients (Pujiati, 2019; Lai et al., 2016; Lin & Lin, 2012). Experimental studies have also reported that lateral positioning significantly enhances animal models' partial oxygen pressure (PaO_2) (Tongyoo et al., 2006).

Physiological Mechanisms Underlying Lateral Positioning

Lateral positioning improves oxygenation by preventing airway collapse, a common issue in supine patients due to gravitational effects (Stanchina et al., 2003). Additionally, studies have shown that functional residual capacity (FRC) is significantly greater in the lateral than the supine position, providing a better opportunity for gas exchange (Pinna et al., 2015). The lateral position also enhances pulmonary perfusion, optimizing oxygen transport in the alveoli and improving overall oxygenation (Hewitt et al., 2016).

Beyond respiratory benefits, lateral positioning positively influences cardiovascular function by optimizing cardiac output and reducing cardiac workload (Hewitt et al., 2016). This effect is crucial, as optimal cardiac performance supports efficient oxygen delivery to tissues (Aries et al., 2012). Previous studies have confirmed lateral positioning significantly increases PaO_2 in mechanically ventilated patients (Karmiza et al., 2014). This improvement is likely due to an increased cardiac index, which enhances oxygen distribution to body cells (Thomas et al., 2007).

Study Limitations

This study has several limitations that should be acknowledged. First, the randomized controlled trial (RCT) protocol was not registered, which

may impact transparency and reproducibility. Future research should prioritize trial registration to enhance study credibility. Second, hemoglobin (Hb) levels, influencing SaO_2, were not analyzed as a potential confounding factor. However, anemia was included as an exclusion criterion to mitigate this limitation, ensuring that all participants had adequate Hb levels for effective oxygen transport. Third, while designed to optimize lung recruitment and oxygenation, the two-hourly repositioning protocol increased nursing workload and may have impacted patient comfort, particularly during night shifts. Frequent repositioning could disrupt sleep, which is essential for ICU recovery. Future studies should explore alternative repositioning schedules that balance oxygenation benefits with patient comfort and sleep preservation, ensuring a more patient-centered approach to ICU care.

Conclusions

This study demonstrates that a structured two-hourly lateral repositioning protocol significantly improves oxygen saturation (SaO_2) in ICU patients undergoing weaning from mechanical ventilation. The intervention group experienced a clinically meaningful increase in SaO_2 compared to the control group, highlighting the beneficial effects of lateral positioning on oxygenation. These findings support the integration of systematic repositioning into ICU care protocols to optimize oxygenation and facilitate the weaning process.

Declaration of Interest

The authors declared no conflicts of interest.

Acknowledgment

The authors would like to express their gratitude to the Institute for Research and Community Service, Jenderal Soedirman University; the Department of Nursing, Faculty of Health Sciences, Jenderal Soedirman University; and the ICU nursing staff of Margono Soekarjo Hospital, Purwokerto, for their invaluable support throughout this research.

Funding

None

References

Adamski. (2015). The differences between two selected intensive care units located in central and northern europe – preliminary observation. *Anaesthesiology Intensive Therapy, 47*(2).

Agustina, N., Nurhaeni, N., & Hayati, H. (2021). Right lateral position can improving oxygen saturation and respiratory rate on under-five children with pneumonia. *La Pediatria Medica E Chirurgica.* https://doi.org/10.4081/pmc.2021.262

Annesi, S. M., Brooks-brunn, J. A., Byers, J. F., Casey, P. E., Cash, J., & Corbin, J. (2017). Brunner and suddarth's textbook of medical-surgical nursing 14th edition. Lippincott Williams & Wilkins (Vol. 79). https://doi.org/10.1111/mono.12088

Apriliawati, A. (2017). The effect of prone position to oxygen aturations'level and respiratory rate among infants who being installed mechanical ventilation in nicu koja hospital'. *IMC 2016 Proceedings, 1*(1).

Aries, M. J. H., Aslan, A., Elting, J. W. J., Stewart, R. E., Zijlstra, J. G., Keyser, J. D., & Vroomen, P. C. A. J. (2012). Intra-arterial blood pressure reading in intensive care unit patients in the lateral position'. *Journal of Clinical Nursing, 21*(18).

Banasik, J. L. (2010). Effect of lateral positions on tissue oxygenation in the critically ill. *Heart & Lung, The Journal of Acute and Critical Care, 30,* 4.

Clarissa. (2019). Early mobilisation in mechanically ventilated patiens: a systematic integrative review of definition and activities'. *Journal Of Intensive Care, 7*(3).

Colodny, N. (2001). Effects of age, gender, disease, and multisystem involvement on oxygen saturation levels in dysphagic persons. *Dysphagia, 16*(1), 48–57. https://doi.org/10.1007/s004550000042

Dahlan, M. S. (2017). Determining sample size in medical and health research. Epdiemiologi Indonesia.

Dahlan, M. S. (2019). Statistics for medical and health sciences (6th ed.). Epdiemiologi Indonesia.

Elbaradey, G. F., Elshmaa, N. S., & Ganna, S. A. (2015). Can integrative weaning index be a routine predictor for weaning success? *Indian Journal of Critical Care Medicine*. https://doi.org/10.4103/0972-5229.171352

Ferrando, C., Artigas, R. M., Arruti, E., Tamayo, G., Hernández-Sanz, M. L., Martín-Grande, A., Kacmarek, R. M., Villar, J., Suárez-Sipmann, F., Vendrell, M., Sánchez□Etayo, G., Alcón, A., Belda, I., Agustí, M., Carramiñana, A., Gracia, I., Panzeri, M., León, I., Balust, J., … Vidal, A. M. A. (2020). Awake prone positioning does not reduce the risk of intubation in COVID-19 treated with high-flow nasal oxygen therapy: A multicenter, adjusted cohort study. *Critical Care.* https://doi.org/10.1186/s13054-020-03314-6

Hafen, B. B., & Sharma, S. (2022). Oxygen saturation. StatPearls Publishing, Treasure Island (FL). http://europepmc.org/books/NBK525974

Hakim, R. I., Hadisaputro, S., Suhartono, S., & Runjati, R. (2022). Efect of hypnopressure on anxiety in pregnant women with preeclampsia. *Jurnal Kebidanan.* https://doi.org/10.26714/jk.11.2.2022.121-132

Hartanto, D. (2021). Acute respiratory distress syndrome: Pathophysiology and management.

Cermin Dunia Kedokteran. https://doi.org/10.55175/cdk.v48i5.1374

Hassan, E. A., & Baraka, A. (2021). The effect of reverse trendelenburg position versus semi-recumbent position on respiratory parameters of obese critically ill patients: A randomised controlled trial. *Journal of Clinical Nursing*. https://doi.org/10.1111/jocn.15645

Heriansyah, H., Yakub, A. S., Harmiady, R., Junaidi, J., & Yulianto, M. (2022). Suctioning and its impact on oxygen saturation in ventilated patients with endotracheal tubes. *Media Keperawatan Politeknik Kesehatan Makassar.* https://doi.org/10.32382/jmk.v13i2.3077

Hewitt, N., Bucknall, T., & Faraone, N. M. (2016). Lateral positioning for critically ill adult patients. *The Cochrane Database of Systematic Reviews, 2016*(5), CD007205. https://doi.org/10.1002/14651858.CD007205.pub2

Karmiza, M., Emil, & Huriani. (2014). The effect of left lateral position with 30-degree head elevation on partial oxygen pressure in mechanically ventilated patients. *Jurnal Ners, 9*(1).

Kozier, B., Erb, G., Berman, A., & Snyder, S. (2012). Kozier and Erb's fundamentals of nursing: concepts, process and practice. *Nurse Education in Practice, 12*(2), e12. https://doi.org/10.1016/j.nepr.2011.09.002

Kristiani, A. H., Riani, S., & Supriyono, M. (2020). Analysis of changes in oxygen saturation and respiratory rate in ventilated patients undergoing suctioning in the ICU of Mardi Rahayu hospital, Kudus. *Jurnal Perawat Indonesia.* https://doi.org/10.32584/jpi.v4i3.811

Lai, C., Chou, W., Chan, K., Cheng, K., Yuan, K., Chao, C., & Chen, C. (2016). Early mobilization reduces duration of mechanical ventilation and intensive care unit stay in patients with acute respiratory failure. *Archives Of Physical Medicine And Rehabilitation, 11*(7).

Lin, C. K., & Lin, C. C. (2012). Work of breathing and respiratory drive in obesity. *Respirology, 17*(3), 402–411. https://doi.org/10.1111/j.1440-1843.2011.02124.x

Mahvar, T. (2012). The effect of positioning after coronary artery bypass graff'. *Life Science Journal, 9*(3).

Marik, P. E. (2015). Evidence-Based Critical Care Third Edition. Admission Discharge Criteria' (3rd ed., Vol. 4, Issue 4). Springer International Publishing.

Mezidi, M., & Guérin, C. (2018). Effects of patient positioning on respiratory mechanics in mechanically ventilated ICU patients. *Annals of Translational Medicine, 6*(19), 384. https://doi.org/10.21037/atm.2018.05.50

Morton, P. G., Fontain, D., Hudak, C., M., Gallo, B., & M. (2016). Critical Care (P. A. Holistik & Eds.; Vol. 1). EGC.

Othman, H. A. (2017). Ventilator-associated pneumonia, incidence and risk factors in the emergency intensive care unit of Zagazig University Hospital. *Egyptian Journal of Chest Diseases and Tuberculosis, 6*(7).

Patel, N., Chong, K., & Baydur, A. (2022). Methods and applications in respiratory physiology: Respiratory mechanics, drive, and muscle function in neuromuscular and chest wall disorders. *Frontiers in Physiology, 13*(June), 1–17. https://doi.org/10.3389/fphys.2022.838414

Pinna, G. D., Robbi, E., La Rovere, M. T., Taurino, A. E., Bruschi, C., Guazzotti, G., & Maestri, R. (2015). Differential impact of body position on the severity of disordered breathing in heart failure patients with obstructive vs. central sleep apnoea. *European Journal of Heart Failure, 17*(12), 1302–1309. https://doi.org/10.1002/ejhf.410

Pujiati, L. (2019). The effect of right lateral positioning on hemodynamic parameters in patients with congestive heart failure during the circadian cycle in Medan. Tesis, Faculty of Nursing, Universitas Sumatera Utara.

Purnawan, I., Setiyarini, S., Probosuseno, P., & Widyastuti, Y. (2022). The effect of the dreamer spiritual therapies on saliva cortisol hormone and pain score patients in the intensive care unit : a true-experimental study. *Macedonian Journal of Medical Sciences, 9,* 281–287.

Stanchina, M. L., Malhotra, A., Fogel, R. B., Trinder, J., Edwards, J. K., Schory, K., & White, D. P. (2003). The influence of lung volume on pharyngeal mechanics, collapsibility, and genioglossus muscle activation during sleep. *Sleep, 26*(7), 851–856. https://doi.org/10.1093/sleep/26.7.851

Sunaina, N. P., Shweta, A. P., & Andrews, M. (2022). Impact of lateral positioning on oxygenation in noninvasively ventilated COVID-19 patients. *International Journal of Health Sciences.* https://doi.org/10.53730/ijhs.v6ns2.8078

Syahran, Y., Romadoni, S., & Imardiani, I. (2019). The effect of endotracheal tube suctioning on oxygen saturation levels in patients with respiratory failure in the icu and emergency department of Prabumulih Regional General Hospital in 2017. *Jurnal Berita Ilmu Keperawatan.* https://doi.org/10.23917/bik.v12i2.4551

Thomas, P. J., Paratz, J. D., Lipman, J., & Stanton, W. R. (2007). Lateral positioning of ventilated intensive care patients: A study of oxygenation, respiratory mechanics, hemodynamics, and adverse events. *Heart and Lung: Journal of Acute and Critical Care, 36*(4), 277–286. https://doi.org/10.1016/j.hrtlng.2006.10.008

Tongyoo, S., Vilaichone, W., Ratanarat, R., & Permpikul, C. (2006). The effect of lateral position on oxygenation in ARDS patients: A pilot study. *Journal of the Medical Association of Thailand, 89(SUPPL. 5)*, 55–61.

Yasseen, B. A., Elkhodiry, A. A., El-sayed, H., Zidan,

M., Kamel, A. G., Hamdy, R., El-Shqnqery, H. E., Samir, O., Sayed, A. A., Badawy, M. A., Saber, A., Hamza, M., El-Messiery, R. M., Ansary, M. El, Abdel-Rahman, E. A., & Ali, S. S. (2023). Evidence associating neutrophilia, lung damage, hyperlactatemia, blood acidosis, impaired oxygen transport, and mortality in critically ill covid-19 patients. *bioRxiv.* https://doi.org/10.1101/2023.09.17.558185

Yuswandi, Y., Warongan, A. W., & Rayasari, F. (2020). Hemodynamic status of patients under mechanical ventilation in the left lateral position with a 30-degree head elevation. *Journal of Islamic Nursing, 5*(2).

Milk-sharing experiences: Perspective among Malaysian donors and recipient mothers

Lee Khuan[1], Nurul Akma Jamil[1,3*], Cheong Ai Theng2[2], Siti Mariam Muda[3]

[1] Department of Nursing, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[2] Department of Family Medicine, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia
[3] Department of Special Care Nursing, Kulliyyah of Nursing, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

Abstract

Background: Shared breastmilk has been a longstanding tradition in many cultures throughout history through wet nursing, cross nursing, and the donation of expressed breastmilk to a milk bank. However, social media has introduced some new dynamics to this practice, making it more visible and accessible; and it is known as milk-sharing. Research on milk sharing is still in its infancy and focused on western perspectives. Therefore, the sociocultural dimensions of milk sharing have not been adequately explored across different settings and cultures.
Purpose: This qualitative study aims at understanding the milk-sharing experiences among donor and recipient mothers in Malaysia.
Methods: We conducted a social media analysis on milk-sharing postings from four Facebook Groups Pages. This was followed by a detailed exploration of individual experiences throughout the milk-sharing journey using a semi-structured, online interview with thirty mothers. Thematic analysis was applied in the data analysis process using ATLAS.ti 9 software.
Results: A total of 252 postings were retrieved from four Facebook Groups Pages. Of these, 151 postings referred to donating milk, 70 referred to requesting milk, and 31 focused on issues related to milk-sharing. Thirty mothers with various milk-sharing experiences were involved in this study. Fifteen donors, six recipients, and nine fell into both categories. The mothers in the study had an average age of 32.9 years and the majority were Malay. In terms of their relationship with the infants, 93.3% were biological mothers with the majority having two to five children. Thematic analysis identified four themes: 1) point of reference, 2) altruism for mutual benefit, 3) faith and 4) challenges and problem-solving methods.
Conclusion: Milk sharing is a personal and sociocultural-bounded practice where mothers negotiate their understanding of the need to breastfeed and the use of donated breastmilk. Despite its specific focus on the Malaysian context, this research offers a complementary understanding of milk sharing within a non-Western framework and transferable to similar sociocultural backgrounds. The findings are important for intercultural nursing and midwifery practice, where nurses can incorporate sociocultural perspectives into breastmilk donation initiatives to increase public acceptance.

Keywords: altruism; Asia; breastfeeding; human milk; social media

Introduction

Technological advances have greatly transformed the traditional practice of wet nursing into modern milk sharing. While wet nursing was commonly practiced among family members or close friends and involved direct breastfeeding, modern milk sharing often takes place between donors and recipients who do not know each other personally. With the widespread use of smartphones and the growing influence of social networking sites such as Facebook, this practice has become more accessible and publicly visible. This evolution challenges earlier understandings that viewed wet nursing

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 35-43
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2571

Article Info

Received : July 10, 2024
Revised : April 17, 2025
Accepted : April 24, 2025
Published : April 25, 2025

Corresponding author

Nurul Akma Jamil*
Department of Special Care Nursing, International Islamic University Malaysia, 25150 Kuantan, Pahang, Malaysia; Address: Jln Gombak, 53100 Kuala Lumpur, Selangor, Malaysia; Postal code: 25150: Mobile phone: +6095707348, E-mail: nurulakmaj@iium.edu.my

Citation

Jamil, N. A., Khuan, L., Theng, C. A., & Muda, S. M. (2025). Milk-sharing experiences: Perspective among Malaysian donors and rexipient mothers. *Jurnal Keperawatan Padjadjaran, 13*(1), 35-43. http://dx.doi.org/10.24198/jkp.v13i1.2571

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

as a private arrangement limited to family and close friends (Thorley, 2011).

Although milk sharing has sparked debates over safety, quality, and ethics, demand for donor breastmilk continues to rise globally (Vogel, 2011). The limited access to human milk banks in many countries, compounded by strict operational procedures, has led some mothers to seek alternatives such as peer-to-peer milk sharing (Gribble, 2014; McCloskey & Karandikar, 2018; Perrin et al., 2016). Additionally, the existence of active online support groups can significantly influence maternal decision-making and increase participation in milk-sharing activities (Akre et al., 2011).

Despite growing global interest in milk sharing, the literature remains dominated by research rooted in Western perspectives—mainly from the United States, Canada, Australia, and parts of Europe and Turkey (Jamil et al., 2021). These studies provide valuable insights but often overlook the rich cultural, religious, and social complexities that may shape milk-sharing experiences in other settings. This presents a significant gap in the literature and highlights an urgent need for more culturally specific research; especially in Southeast Asian countries like Malaysia, where breastfeeding and infant feeding practices are deeply intertwined with spiritual and sociocultural values.

Malaysia offers a unique context with its multi-ethnic population and diverse religious traditions, especially Islam, which introduces important religious implications to the practice of using donated milk. For example, the Islamic concept of milk kinship establishes familial bonds between donor and recipient families, thereby affecting issues such as marriage permissibility and legal guardianship (Bensaid, 2021). These religious considerations, alongside traditional customs and evolving maternal norms, make milk-sharing in Malaysia a culturally sensitive and complex practice.

To date, empirical research on milk sharing in Malaysia remains scarce. While historical accounts highlight the normative use of donated breastmilk prior to the introduction of formula (Mohamad et al., 2013), contemporary experiences—particularly those influenced by digital platforms—remain underexplored. Without a clear understanding of how Malaysian mothers navigate milk-sharing in the context of cultural expectations and religious beliefs, healthcare providers and policymakers may struggle to offer appropriate guidance or support.

This qualitative study addresses that gap by examining the milk-sharing experiences among donor and recipient mothers in Malaysia, with a focus on how sociocultural and religious values influence their decisions. The findings contribute to a more inclusive and localized understanding of milk-sharing practices, and they are essential for developing culturally sensitive guidelines and interventions that align with Malaysian mothers' lived experiences and beliefs. Lessons learned from this practice can also be transferred to the context of breastmilk donation. Understanding how mothers negotiate cultural, religious, and emotional aspects of milk sharing can inform the design of culturally appropriate breastmilk donation systems, improve public acceptance, and support policy development for human milk banking in Malaysia and similar settings.

Materials and Methods

Design

This research used constructivist approach, focusing on mothers in Malaysia who have either donated or received breastmilk through social media. A multiple case study design was chosen to explore diverse milk-sharing experiences among donor and recipient mothers on Facebook, enabling in-depth, contextual comparisons across individual cases. There were two main phases to this study: (1) Phase 1: Analyzed posts from four Facebook Groups Pages related to breastfeeding and milk-sharing. (2)Phase 2: Conducted online interviews with 30 mothers to explore their personal experiences.

Sample and setting

Facebook was selected as the primary platform for this study because modern milk-sharing practices often emerge and operate through online social networks, rather than traditional, face-to-face arrangements. With the limited availability of formal milk banks and growing demand for donor milk, many mothers turn to the internet to find, connect, and communicate with other mothers. In Malaysia, Facebook is the most widely used platform among women of childbearing age.

The researchers decided to target communities of shared interest or Facebook Groups Pages as it corresponded to the research topic as recommended Marks et al. (2017). These support groups were identified using predetermined keywords; "breastfeeding" and "breastmilk donation" in both Malay and English, using the Facebook search engine (See supplementary material 1). These processes resulted in four Facebook Groups Pages that then included as data sources.

For phase two, participants were purposively selected to ensure they had relevant experiences. The inclusion criteria for the mothers were; (1) Malaysian woman, (2) aged more than 18 years old, (3) experience as either a donor mother or a recipient mother, and (4) the donated breastmilk was used for feeding purposes. The exclusion criteria were; (1) unable to speak Malay or English, (2) unreachable via online methods, and (3) the mother had an existing family relationship with the donor/recipient or knew each other before milk sharing took place. Finally, this study recruited 30 informants for data collection.

Ethical consideration

This study was guided by the guideline and protocol given by the Ethics Committee for Research Involving Human Subject, Universiti Putra Malaysia (Ref. no: JKEUPM 2019-283). The recruitment and administration were approved by the administrators of selected Facebook Groups Pages. All the ethical aspects have been considered prior to carrying out the research project to preserve privacy and confidentiality.

Data collection

In phase one, a total of 204 breastfeeding and 4 breastmilk donations support groups were identified. These Facebook Groups Pages were then screened based on the criteria; a) breastfeeding and breastmilk donation Facebook Groups Pages, b) play a role as support groups and c) milk-sharing activities exist. As a result, only four Facebook Groups Pages were included in this study. From these, the researchers collected 252 public posts between January and June 2020. These posts were sorted into three categories; offers to donate expressed breastmilk (EBM), requests for EBM and discussions or concerns about milk-sharing.

A total of 32 mothers who met the inclusion criteria were interviewed; however, two were excluded from the final analysis due to poor audio quality. The interviews were conducted via various online platform such as Zoom, Google Meet and WhatsApp video call apps. Each interview lasted between 40 to 90 minutes. A semi-structured interview guide was used to facilitate the interview process (See supplementary material 2). The duration of each actual interview ranged from 40 to 90 minutes. All the interviews were recorded using a digital voice recorder. The saturation point was achieved at the 25th interview when new data was forming into patterns similar to those of the existing codes. The remaining scheduled interviews were conducted to compare and validate the findings.

Data analysis

In this study, data analysis was carried out in two main stages, based on the two types of information collected: Facebook posts and interviews with mothers. The researchers identified common words and phrases related to milk-sharing, such as “donate,” “milk,” “eczema,” and “location.” They were then grouped into categories that represented shared topics. Phase 1 served as a foundation, offering a broad overview of how milk-sharing was discussed and practiced. For the interviews, each conversation with the mothers was recorded and transcribed verbatim. The transcripts were then returned to the participants for checking to ensure everything was accurate.

The data were then analysed using thematic analysis. Analysis started as soon as the data were collected from the first interview to data saturation. The thematic analysis procedure is based on the work of Braun & Clarke (2006). Initial coding was developed by Researcher 1 and revised based on input from Researcher 2. The coding was further revised based on discussion and consensus within the research team. The postings, interview transcripts, field notes, and reflective journals were used together during data analysis to elucidate how they might connect to answer the research questions.

All the codes identified were collated into subthemes, whereby codes with similar concepts were categorised as subtheme. The initial themes were identified after developing and reviewing the initial codes and subthemes. It was a rigorous process, with researchers moving back and forth between themes and databases until a comprehensive set of themes was created. Finally, we performed a cross-case analysis to compare the themes, sub-themes, and code that emerged from the Facebook page posts with the transcripts of the interviews to explore the similarities, differences, and patterns between the datasets. Results are reported collectively as each dataset complements each other to provide a holistic understanding of milk-sharing experiences. All data was transferred to Atlas.ti software to facilitate data management and provide an auditable data trail.

The purpose of starting with social media data was to gain an initial understanding of the milk-sharing landscape in a natural, unprompted environment, where mothers expressed themselves voluntarily and publicly. By identifying the most frequently discussed issues in Phase 1, the researchers were able to craft a more focused and relevant interview guide for the interviews. For example, if posts commonly mentioned food allergies, transportation difficulties, or religious concerns, these topics were included as prompts during interviews. In this way, Phase 1 acted as a preliminary scoping exercise that highlighted real-world, context-specific issues and allowed Phase 2 to dive deeper into personal experiences with those same themes. The transition from broad, public conversations in Phase 1 to personal, detailed storytelling in Phase 2 ensured that the study captured both the general patterns and individual perspectives of milk-sharing.

Trustworthiness

Several strategies recommended by Lincoln & Guba (1986) were adopted to enhance the trustworthiness of the study findings. First, data triangulation through the adoption of multiple methods; social media analysis using text mining and semi-structured interviews, and participant mothers with various milk-sharing experiences. Second, the transcription was done by the same researcher who conducted the interviews. This allowed the researcher to become more immersed in the data and achieve better clarity of the context of the interviews. Third, prolonged engagement through serial follow-ups with participant mothers in phase 2 provided the opportunity to build rapport and enhanced their openness to share stories.

Results

In phase one, a total of 252 postings were retrieved from four Facebook Groups Pages in phase 1. Of these, 151 referred to donating milk, 70 referred to requesting milk, and 31 focused on issues related to milk-sharing. Phase two involved a total of 30 mothers were classified according to their experiences with milk sharing. Fifteen donors, six recipients, and nine fell into both categories. Among donors, the number of recipients ranged from one to twenty-four, and among recipients, the number ranged from one to five donors. The majority of the mothers were Malay and of Islamic faith which is generally representative of Malaysian society. Table 1 shows the sociodemographic profiles of the mothers in this study. Through thematic analysis, four major themes were identified that reflect the multifaceted nature of milk-sharing: (1) point of reference, (2) altruism for mutual benefit, (3) faith, and (4) challenges and problem-solving methods.

Theme 1: Point of Reference

This theme captures how Facebook Groups Pages served as initial contact points and informal learning hubs for mothers. Two sub-themes were identified: 1) sources of information about milk sharing and 2) a point for meeting demand and supply.

Sources of information about milk-sharing

Mothers relied on Facebook Groups Pages to gain knowledge about breastfeeding, safe handling of EBM, religious implications of milk-sharing, and ethical considerations. Data from phase 1 identified the codes 'centre' and 'bank', referring to human milk banks which categorised into availability of the milk bank. The codes 'mufti,' and 'fatwa' were then categorised into Islamic legal views on milk sharing practice. Meanwhile 'kinship' and 'mahram' refer to consanguineous relationship is established by feeding a baby with non-biological mothers' milk; from an Islamic perspective. In addition, 'radhaah,' and 'kad' refers to an official record of milk mothers and milk children. The Facebook Groups Pages also contained risk-mitigation recommendations for donors and recipient mothers. The phrase 'health screening' and 'EBM handling' found from phase one were categorised into quality and safety of donated milk where the Facebook Groups Pages also provide a guideline for donor and recipient mothers.

Data from the semi-structured interviews with mothers who had experienced milk sharing revealed that they shared the view that Facebook Groups Pages were highly informative and supportive:

[There are] specific files on milk sharing such as a database, EBM handling, religious views on using non-biological mothers' milk, advice while considering to use donated EBM, and [the] religious implications of milk sharing. It gave me an idea how it works. (Donor, P3)

A point for meeting demand and supply.

This sub-theme elucidates how the process of milk sharing on the Facebook Groups Pages occurred. An in-depth analysis of social media content revealed that the milk-sharing process could be initiated in four ways: using a milk-sharing database, uploading one's own post, referring to existing posts, and seeking help from the administrators of Facebook Groups Pages. Therefore, this platform helped facilitate connections between donors and recipients, especially in urgent or unplanned situations.

The process of finding milk donors or recipient infants was detailed in the mothers' stories. The majority of the mothers in this study explained that for them, the process started by looking at existing posts on the Facebook Group Pages about finding milk donors or recipient babies.

I saw several posts looking for milk mothers and requesting EBM on the Facebook Page. So, I commented on one of the posts. Then another mother replied to my comment, asking if there was any milk. Then we communicated via FB messenger. (Donor, P3)

I saw her [donor's] post looking for a milk child on the Facebook Group Page. So, then I commented on the post. (Donor and recipient, P6)

Theme 2: Altruism for Mutual Benefit

This theme refers to the underlying situations that connect the donor and recipient in milk sharing. The sub-themes include 1) the need for milk sharing and 2) awareness of the importance of breastmilk. This theme reflects the motivations behind milk-sharing, highlighting its mutually beneficial nature.

The need for milk sharing

Donors often had an oversupply of milk and viewed milk-sharing as a way to help others while avoiding waste. Some were motivated by gratitude or empathy toward struggling mothers. Meanwhile, recipients often faced low milk supply, premature births, or medical complications.

In phase one, the codes compiled from text mining included 'full', 'hyperlactation', 'oversupply', and 'reject', indicating donor's perspectives on sharing EBM. On the other hand, the codes 'insufficient', 'enough', 'low', and 'struggle' indicated that the recipients were experiencing a low milk supply while 'premature' and 'NICU' indicated the infant's health condition that needs donated breastmilk. Meanwhile 'engorgement', and 'blocked ducts' were categorised as breastfeeding difficulties.

In phase two, the interview data provided a better understanding from both the donors' and recipients' perspectives of how their situations create reciprocal relationships for mutual benefits.

My child refused direct feed; he rejected the expressed breastmilk too so I kept on pumping until I was pregnant with my second child. I tried giving him again but he rejected so I did not know what to do with all the frozen expressed milk. (Donor, P4)

It began when I gave birth to a premature baby. I gave birth to my son at 28 weeks of gestation. I decided to exclusively breastfeed when he experienced poor weight gain and complications due to [the] long stay in [the] NICU. (Donor and recipient, 16)

Awareness of the importance of breastmilk

Donors and recipient mothers expressed strong awareness of the health benefits of breastmilk and a shared belief in its importance for infant well-being, regardless of biological connection. In phase one, the codes derived from the milk providers' posts constituting the codes includes 'sayang' and 'tak sanggup', which implied disappointment about the inevitability of having to discard EBM stock. On the other hand, the codes generated from the milk requesters' post constitutes the codes includes 'immunity', 'benefit', and 'nutritious', indicating the importance of breastmilk. The word 'best' in the codes refers to breastmilk being regarded as the best nutritional choice for infants; emerged from both types of user-generated content.

The data analysis from phase two provided evidence, whereby mothers reported making their decision while aware of the nutritional value of breastmilk.

I realise the importance of mother's milk and its benefits compared to formula milk. Breastmilk is a better option because it is natural. So why [don't] we donate to other people? The baby also gets the benefits of breastmilk even though [it is] from another mother. (Donor, P6)

A mother's instinct is to want the best. [With] babies, we don't know [if] they might be allergic to cow's milk. So, we choose the natural option, which is breastmilk. (Recipient, P1)

Theme 3: Faith

This theme refers how mothers navigated their understanding of religious teachings while milk sharing. The sub-themes include 1) religious views on the need to breastfeed and 2) religious concerns due to milk sharing. In theme 1 (points of reference), it was reported that Facebook Pages helped mothers to obtain breastfeeding and milk sharing information. This information equipped them with knowledge about breastfeeding from a religious point of view. Thus, all the Muslim mothers in this study were aware of some important religious aspects of milk sharing, including the knowledge that milk sharing is permissible, a consanguineous relationship is established when certain conditions are fulfilled, and this relationship causes the prohibition of marriage between those related through milk kinship.

Religious views on the need to breastfeed

Mothers who had donated their milk supported this practice as they felt it followed religious recommendations, fulfilled the child's rights, and symbolised human kindness. On the other hand, the recipient mothers tended to feel that breastmilk is a child's right and that a mother must breastfeed her child. All the mothers in this study, including the non-Muslims, emphasised the religious principle concerning the need to breastfeed. Mothers who had donated their milk supported this practice as they felt it followed religious recommendations, fulfilled the child's rights, and symbolised human kindness.

I am aware of the importance of breastfeeding for the health of the child and also the demands in religion. It is a satisfaction to fulfil the responsibility of breastfeeding a child and to help mothers in need to fulfil their responsibilities. (Donor, P19)

In addition, two mothers explained the commandment to find a milk nurse if the mother is unable to breastfeed as also outlined in the Quran.

The child's right to receive breastmilk is for two years, only. The child's mother's sustenance [may] not [be] long enough to breastfeed the child for two years. After all, the rights of these children are already written in the Quran. (Donor, P3)

This study unravels to some extent about the views of other religions on the use of non-biological mothers' milk. P25, a Buddhist who had experienced donating and using donated EBM reported:

I believe all religions teach us to do good to others. In Buddhism, we have been taught about the concepts of loving and kindness. I started my journey as a recipient [and] then I became a donor. It is like doing good in return. I donate my milk because that's one of the ways to do good. I share what we have with others in need. I help mothers who are unable to breastfeed their own children and help babies get the benefits of breastmilk, even if the milk is produced by other mothers. It is still breastmilk and [it] is not the same as formula milk. (Donor and recipient, P25)

Similarly, P13, a Hindu, expressed her views as follows;

In my religion, we are allowed to use milk from other people but the person must not be our own family member. It is associated with helping each other. In this case, we help the baby to get the benefits of breastmilk. (Donor and recipient, P13)

Religious concerns due to milk sharing

Although milk sharing was highly regarded from a religious point of view, mothers also expressed concern about the religious issues surrounding milk sharing. The main concern among Muslim mothers was the concept of milk kinship, which prohibits marriage between children nursed by the same woman. Many took steps to document and inform family members to prevent future complications.

What worries me is I have a milk son and five milk daughters. I worry that they will marry each other. So, as their milk mother, it is my responsibility to ensure that the problem does not occur. (Donor, P15)

What worries me is the milk kinship status. There is a risk [that] milk siblings [will] marry each other. (Recipient, P2)

P25, a non-Muslim, also recognised the religious implications of using milk from a non-biological mother from an Islamic point of view. This awareness made her cautious about donating and receiving milk from Muslim mothers. She expressed her concern as follows:

I was quite surprised when the Malay lady agreed to give her milk. For Chinese, we can donate to anyone regardless of religion. She gave less than five packets so that it [would not] establish a legitimate relationship. (Donor and recipient, P25)

Theme 4: Challenges and Problem-Solving Methods

This theme outlines the difficulties mothers faced and the strategies they used to overcome them. Two sub-themes emerged from the data were 1) logistical issues, and 2) sociocultural perspectives.

Logistical issues

The logistical issues encountered were closely related to the costs incurred when transporting EBM and providing equipment to preserve the quality of EBM during transportation. While conducting phase two of this study, Malaysia was struck by the COVID-19 pandemic, which restricted people's activities. In Malaysia, the federal government implemented a law that anyone in Malaysia could only travel within a maximum radius of 10 kilometres for essential activities, which significantly affected milk-sharing activities. In phase one, the codes compiled from text mining included 'MCO' and 'PKP' which refers to movement control order. In addition, the codes compiled also included 'delivery', 'courier', and 'transport' to indicate methods of transporting the EBM during pandemic. In phase two, mothers reported that they had to either stop milk sharing or find another solution.

We only got EBM supply until my baby was eight months old because I could not return to my home town due to [the] MCO. (Donor and recipient, P26)

Some mothers in this study, needed to use delivery services to transport the EBM during the MCO. Therefore, they incurred the additional costs of the service charge and the equipment to prevent the EBM from thawing.

I usually used the express bus, but its operations were put on hold during the MCO. [During the MCO] the milk mother sends the EBM by lorry. To be honest, we use any lorry from Nilai to Bangi. We don't care about it, as long as the drivers agree. We bought durable cooler boxes and ice. She [the milk mother] then sprinkles coarse salt to maintain the temperature. (Donor and recipient, P29)

Sociocultural perspective

The sociocultural perspective refers to other people's perceptions, as perceived by the mothers. This included the bottle-feeding culture and any lack of understanding of the use of non-biological mothers' milk from a religious perspective. In phase one, the codes compiled from text mining included 'sceptical,' and 'condemn' which refer to negative perceptions towards milk-sharing. Despite the views that the use of non-biological mothers' milk was noble and recommended in some spiritual belief systems, this practice was considered to be different from societal norms because bottle feeding remains a cultural norm in Malaysian society. The codes compiled from text mining included 'alternatif' (alternative) 'tukar susu' (infant formula replacement), 'susu soya' (soy milk), and 'susu kambing' (goat milk). These codes were classified as preferable to milk sharing.

Mothers in this study reported encountering negative views about the use of non-biological mothers' milk, particularly from a religious perspective. One-third of the Muslim mothers in this study said that the scepticism about using non-biological mothers' milk arose from a lack of understanding from the perspective of religious beliefs.

People always ask me, 'why should we choose breastmilk over formula milk?' So, I share a lot about these things in breastfeeding and parenting class. From there, we can get feedback from parents, especially new parents and new parents that are expecting. It can be seen from there that there are some people that will be like, 'I'm not going to give the milk or receive the milk from someone I don't know'. They are afraid of them [milk children] getting married unknowingly. So, we can see that people are still afraid of the implications of milk kinship. (Donor, P5)

I cannot force them to accept my decision. I only provide information and assurance. I keep telling them that it [milk kinship] can be managed. I showed them all documents. I want them to know that I don't take this issue for granted. (Donor and recipient, P6)

Discussion

The findings of this study bridge the empirical gap in milk-sharing practices in the Malaysian context. These findings could help healthcare practitioners understand more about the emerging trend of infant feeding practices in Malaysia, while they might also be useful in empowering mothers to make informed decisions that align with their needs and preferences. The research team initially scoped this study through social media analysis of breastfeeding and breastmilk donation via Facebook Pages to gain a preliminary understanding of the mechanism and process of milk sharing. This was followed by a detailed exploration of individual experiences during the milk-sharing journey. The findings of this study provide valuable insights into the motivations, beliefs, needs, and experiences that shape the practice of milk sharing and its role in supporting infants' health and well-being.

Participant mothers in this study were predominantly young (age range 25 to 42 years), well-educated and not surprisingly enthusiastic about breastfeeding. These findings are not dissimilar to those of Banu & Khanom (2012) who

propose that maternal age and educational level indirectly influence perceptions and knowledge of breastfeeding. Similar findings from Gribble (2014) and Perrin et al. (2016) that show mothers are fully aware of the value of breastmilk for infants. These results were expected, given the need for expectant mothers to be informed about breastfeeding during perinatal care. The study found that mothers strongly recognised the importance of breastmilk and can relate to religious and scientific recommendations, regardless of their personal religious beliefs.

Today, many people tend to seek information through social media due to its accessibility factor. It is believed that social media has the potential to change people's perceptions of breastfeeding and its practices. Social media platforms can empower breastfeeding mothers by sharing knowledge and experiences (Wagg et al., 2022). However, the increasing number of social media sites and ever-expanding access to the internet may pose challenges as conflicting, unmoderated, and misleading information is easily disseminated. In the context of milk-sharing practice, mothers need to emphasize on the importance of reliable information from reputable sources. This includes the active involvement of healthcare providers in the discussion and available clear guidelines on milk sharing.

Mothers' awareness of the importance of breastfeeding, coupled with empathy, creates a spirit of altruism. The findings resonated with those from the studies by Carter et al. (2015) and Perrin et al. (2016), where breastmilk was regarded as the gold standard for infant feeding. The strong belief in the value of breastmilk may have resulted from the continuous promotion of breastfeeding. This value also influenced mothers who chose milk sharing instead of donating to a milk bank. Despite the safety measures taken to maintain the quality of donated EBM, some donors believe the pasteurisation process destroys its nutritive contents (Gribble, 2014; Perrin et al., 2016). This finding was not evident in the present study since Malaysian mothers may be unaware of this because their knowledge appears to be limited to their own reading. In the western countries, there are different views on the quality of breastmilk obtained from milk sharing and human milk banks. Reyes-Foster and Carter (2018) reported how milk sharing has been often misunderstood as breastmilk selling. Thus, breastmilk obtained from milk sharing may be regarded as dangerous and as not meeting the quality requirements compared to milk from a milk bank. Meanwhile, the quality of EBM donated to a milk bank may also be viewed negatively. Such beliefs influenced mothers who chose milk sharing instead of donating to a milk bank. Mothers' awareness could be channelled to breastmilk donation to a human milk bank. This may lead to a supportive environment for milk donation programs in Malaysia, whereby those with milk-sharing experience could become facilitators, using their observations and knowledge to disseminate information and inculcate awareness.

The current findings suggest that religious views could be both facilitating factors and barriers towards the use of non-biological mothers' milk. It was clear that the spiritual implications of milk sharing were of major concern. Thus, the strategies adopted by the mothers in this study to address religious-related issues demonstrate how they navigated their understanding of spiritual teachings while milk sharing. This indicates that spiritual beliefs regarding the kinship status of milk are still highly respected and taken seriously by mothers. This study provided further evidence of how spiritual understanding can help resolve issues arising from the use of donated breastmilk. Similar sentiments were shared by mothers in another Muslim country, suggesting that a good understanding of spiritual beliefs and certainty is key to acceptance of using donated breastmilk. This is interesting as it may be contrary to previous findings from western research.

In this study, the religious implications of milk sharing were clearly a major concern. This is interesting, as it contrasts with the findings from research conducted in the west. The current findings correlate with those of Bressler et al. (2020), who undertook a study in another faith-based community in the US, and those of Onat and Karakoc (2019), who conducted a study among a Muslim community in Turkey. Similarly, previous research involving a small number of Muslim mothers – the studies by Gribble (2013) and Thorley (2011)-produced the same outcomes. The current findings support previous evidence that religious beliefs could be both a driving factor and a hindrance to the implementation of milk banking and milk donation in Malaysia. However, a deeper understanding and appropriate strategies could address this issue.

Although efforts were made to ensure diversity across ethnicity and religion, the final sample comprised primarily Malay Muslim mothers. This imbalance reflects the demographic composition of the Facebook Groups Pages in Malaysia, where the majority of active participants are Malay and Muslim. Given that Islam places significant emphasis on breastfeeding and milk kinship, Malay Muslim mothers are often more engaged in discussions and practices related to milk-sharing. In addition, cultural norms and religious teachings in the Malay Muslim community tend to position breastmilk donation as both a spiritual and maternal responsibility, which may further contribute to their higher visibility and participation in such spaces. While this distribution limits the ability to generalize findings across all ethnic and religious groups in Malaysia, it provides a deeply contextualized understanding of milk-sharing within the predominant sociocultural group. The inclusion of Indian and Chinese mothers, though limited in number, still offered valuable perspectives that highlighted both shared and unique concerns. Future studies may benefit from targeted recruitment strategies to better capture the experiences of minority groups in this context.

Strength and limitation

This study has several limitations that should be acknowledged. Firstly, most participants were Malay and adhered to Islam, which limits the findings to those from similar cultural and religious backgrounds. Recruiting non-Malay participants was challenging due to the reliance on Facebook, which reflected the researcher's social network. Secondly, data were collected only from mothers, excluding other's significant perspectives; particularly those of husbands, who often play a crucial role in decision-making within families. Including their views could have offered deeper insights. Lastly, the use of online platforms posed technological challenges, such as poor internet connections and unfamiliarity with digital tools. Nonetheless, online interviews allowed access to participants across various locations, which was especially advantageous during pandemic restrictions. Despite these limitations, the study had several strengths. The qualitative approach was appropriate for exploring the research questions and was enhanced by the use of multiple data sources; including social media content and semi-structured interviews with mothers-adding to the trustworthiness of the findings. The researcher's identity as a Malay Muslim mother, nurse, and breastfeeding peer counselor provided a unique insider perspective, facilitating empathetic engagement and culturally nuanced understanding within the study context.

Nursing implication

The findings highlight the importance of considering these cultural elements when promoting breastfeeding and breastmilk donation in Malaysia's diverse communities. For healthcare providers, understanding these cultural nuances is key to offering care and support that truly respects mothers' beliefs and preferences. This study also points out the need for clear guidelines and recommendations on milk sharing. While safety issues like donor screening and proper milk handling are important, religious concerns must also be taken into account. Addressing these issues would help ensure that mothers receive informed, respectful, and culturally appropriate feeding support from healthcare providers. Implications for nursing research include the need to further explore culturally specific beliefs and practices surrounding breastfeeding and milk sharing in various communities. Nursing research can also focus on evaluating the effectiveness of culturally sensitive interventions and education strategies in promoting safe milk-sharing and breastmilk donation practices. Additionally, future studies could investigate the role of nurses in supporting informed decision-making and how guidelines can be integrated into nursing practice to provide holistic, respectful care.

Conclusion

This study has shown how mothers come together through social media platforms like Facebook, navigating both modern challenges and timeless values to ensure that babies receive the best start in life. What stands out most is the powerful sense of empathy and responsibility that drives these mothers. Whether they're donating their milk or seeking it for their children, their decisions are shaped not just by practical needs, but also by spiritual beliefs, cultural expectations, and a strong sense of doing what's right. One important lesson from these experiences is the potential to extend this spirit of giving into more formal systems, like milk banks. By building on mothers' existing awareness and motivations, and by providing clear, culturally respectful guidance, we can encourage more mothers to contribute to milk banks; ensuring that even more babies, especially the most vulnerable, have access to the life-saving benefits of breastmilk.

Declaration of Interest

The authors declare that they have no conflict of interest.

Acknowledgment

We would like to express our sincere gratitude to all authors for their help in the process of writing this article. A special gratitude to all gatekeepers (administrators of Happy Breastfeeding Malaysia, the Breastfeeding Advocates Network, Human Milk 4 Human Babies-Malaysia and the Breastmilk Donation Malaysia) and participants for providing us with the precious data collection experiences and giving full cooperation thorughout the data collection process.

Funding

This research received no specific grant from any funding agency, commercial or non-profit sector.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

References

Akre, J. E., Gribble, K. D., & Minchin, M. (2011). Milk sharing: From private practice to public pursuit. *International Breastfeeding Journal, 6*. https://doi.org/10.1186/1746-4358-6-8

Banu, B., & Khanom, K. (2012). Effects of education level of father. *Journal of Enam Medical College , 2*(2), 67–73.

Bensaid, B. (2021). Breastfeeding as a fundamental islamic human right. *Journal of Religion and Health, 60*(1), 362–373. https://doi.org/10.1007/s10943-019-00835-5

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Carter, S. K., Reyes-Foster, B., & Rogers, T. L.

(2015). Liquid gold or Russian roulette? Risk and human milk sharing in the US news media. *Health, Risk and Society, 17*(1), 30–45. https://doi.org/10.1080/13698575.2014.1000269

Gribble. (2014). "I'm happy to be able to help:" Why women donate milk to a peer via internet-based milk sharing networks. *Breastfeeding Medicine, 9*(5), 251–256. https://doi.org/10.1089/bfm.2014.0009

Gribble, K. D. (2013). Peer-to-Peer Milk Donors' and Recipients' experiences and perceptions of donor milk banks. *JOGNN - Journal of Obstetric, Gynecologic, and Neonatal Nursing, 42*(4), 451–461. https://doi.org/10.1111/1552-6909.12220

Guluz Onat and Hediye Karakoc. (2019). Informal breast milk sharing in a muslim country : *Breastfeeding Medicine, 14*(8), 597–602. https://doi.org/10.1089/bfm.2019.0027

Jamil, N. A., Khuan, L., Cheong, A. T., & Muda, S. M. (2021). An emerging trend in infant feeding practice: A scoping review on breastmilk sharing. *In Central European Journal of Nursing and Midwifery, 12*(4), 555–568. University of Ostrava. https://doi.org/10.15452/CEJNM.2020.11.0036

Lincoln, Y. S., & Guba, E. G. (1986). But Is It Rigorous? Trustworthiness and Authenticity in Naturalistic Evaluation. 73–84.

Marks, A., Wilkes, L., Blythe, S., & Griffiths, R. (2017). A novice researcher's reflection on recruiting participants for qualitative research. *Nurse Researcher, 25*(2), 34–38. https://doi.org/10.7748/nr.2017.e1510

McCloskey, R. J., & Karandikar, S. (2018). A liberation health approach to examining challenges and facilitators of peer-to-peer human milk sharing. *Journal of Human Lactation, 34*(3), 438–447. https://doi.org/10.1177/0890334418771301

Mohamad, E., Ahmad, A. L., Rahim, S. A., & Pawanteh, L. (2013). Understanding religion and social expectations in contemporary Muslim society when promoting breastfeeding. *Asian Social Science, 9*(10), 264–273. https://doi.org/10.5539/ass.v9n10p264

Perrin, M. T., Goodell, L. S., Fogleman, A., Pettus, H., Bodenheimer, A. L., & Palmquist, A. E. L. (2016). Expanding the supply of pasteurized donor milk: Understanding why peer-to-peer milk sharers in the united states do not donate to milk banks. *Journal of Human Lactation, 32*(2), 229–237. https://doi.org/10.1177/0890334415627024

Reyes-Foster, B. M., & Carter, S. K. (2018). "That's not the milk sharing I'm doing": Responses to a pediatrics article from women who milk share. *Human Organization, 77*(3), 262–272. https://doi.org/10.17730/0018-7259.77.3.262

Thorley, V. (2011). Mothers' experiences of sharing breastfeeding or breastmilk, part 2: The early 21st century. *Nursing Reports, 2*(1), 2. https://doi.org/10.4081/nursrep.2012.e2

Vogel, L. (2011). Milk sharing: Boon or biohazard? In CMAJ : *Canadian Medical Association journal = journal de l'Association medicale canadienne, 183*(3). https://doi.org/10.1503/cmaj.109-3767

Wagg, A. J., Hassett, A., & Callanan, M. M. (2022). "It's more than milk, it's mental health": A case of online human milk sharing. *International Breastfeeding Journal, 17*(1). https://doi.org/10.1186/s13006-021-00445-6

The effect of awake prone position in non-intubated patients with COVID-19: A feasibility randomized controlled trial

Eli Indawati*, Achmad Fauzi, Siti Ida Farida

STIKES Abdi Nusantara, Kota Bekasi, Jawa Barat, Indonesia

Abstract

Background: The duration of discomfort and clinical benefits of lying prone in Indonesian clinical settings remain unknown, with the accumulation of prone hours potentially impacting results.
Purpose: The study aimed to test the effect of awake prone position in non-intubated patients with covid-19.
Methods: This study used a feasibility randomized control trial. The research was conducted at two general hospitals in Jakarta, Indonesia. This study used a computerized random number generator was used to assign patients to intervention and control groups. The sample is adult patients who admitted to the hospital with hypoxic respiratory failure due to a positive COVID-19 test. A total of 70 patients were randomly assigned to each group, with 35 individuals being included in the analysis. The intervention involved bedside nurses encouraging patients to lie prone for at least 6 hours daily, with additional pillows provided for comfort. Significant prone position sessions were recorded if they lasted more than 30 minutes in both arms, lasting for 7 days.
Results: The intervention group of patients achieved 65.7% adherence to the intervention protocol. After 2 hours, the P/F ratio was significantly different across the groups, but no significant different between intervention and control group, in term of respiratory escalation, length of stay, or mortality. However, 5.7% of patients in intervention group and 11.4% of patients in control group died due to respiratory failure.
Conclusion: Clinical trial conditions have shown that non-intubated patients can be placed in an awake prone position without harm, and this information could be used to help design protocols for future large randomized controlled trials.

Keywords: COVID-19; prone position; oxygen saturation

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 44-50
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2450

Article Info

Received : December 05, 2023
Revised : April 14, 2025
Accepted : April 18, 2025
Published : April 25, 2025

Corresponding author

Eli Indawati*
STIKes Abdi Nusantara Bekasi, Jawa Barat, Indonesia; Address: Jl. Swadaya No.7, RT.001/RW.014, Jatibening, Kec. Pd. Gede, Kota Bks, Jawa Barat Indonesia; Postal address: 17412 Phone: (021) 86901352, E-mail: eliindawati956@gmail.com

Citation

Indawati, E., Fauzi, A., & Farida, S. I. (2025). The effect of awake prone position in non-intubated patients with COVID-19: A feasibility randomized controlled trial. *Jurnal Keperawatan Padjadjaran, 13*(1), 44-50. http://dx.doi.org/10.24198/jkp.v13i1.2450

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-Non-Commercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Introduction

COVID-19 infections have led to an increase in admissions for hypoxemic and breathing problems requiring non-invasive ventilation (Franco et al., 2020; Grasselli, Tonetti, et al., 2020). The high demand for ventilatory assistance has had a negative influence on the ICU's ability to respond to surge capacity (Grasselli, Pesenti, et al., 2020; Winck & Ambrosino, 2020). Acute respiratory distress syndrome (ARDS) is a common complication of COVID-19 with prevalence rate of 20%–41% (Cammarota et al., 2020; Grasselli, Pesenti, et al., 2020). Prone positioning has been proven to increase oxygenation and reduce mortality among ARDS patients (Guérin et al., 2013). Prone positioning considered as a cornerstone of treatment for COVID-19-related ARDS (Scaravilli et al., 2015; Valter et al., 2003; Yang et al., 2020). There are many types of prone positioning, including awake prone positioning (APP) aimed to decrease the need for invasive mechanical ventilation and enhance patient outcomes (Cammarota et al., 2016). The APP ensures uniform lung perfusion, shifts ventilation to well-perfused lung segments, and recruits dependent atelectatic regions of the lung (Guérin et al., 2013, 2020; Sartini et al., 2020). More gas-exchange effective regions can be recruited in the dorsal areas because the abdominal cavity and mediastinum are no longer constricting them (Jagan et al., 2020;

Sartini et al., 2020) APP is workable and associated with better oxygenation in non-incubated individuals (Broccard et al., 1997; Cornejo et al., 2013; Valenza et al., 2005; Yang et al., 2020).

A few researchers have documented the practice of putting a patient in a prone position while they are receiving routine oxygen therapy, CPAP, or noninvasive ventilation (Ding et al., 2020; Scaravilli et al., 2015; Valter et al., 2003). Prone positionings appear to promote oxygenation and reduce breathing effort, which may be advantageous to patients at risk of self-induced lung injury. As a result, this position may allow for the deferral or avoidance of tracheal intubation and its associated dangers. In resource-constrained settings, a reduction in the requirement for intubation and subsequent admission to the intensive care unit (ICU) may also be helpful. At the same time, this approach may introduce various risks associated with position change (e.g., vomiting, thrombosis) or delayed intubation. Later studies have reported prone positioning in awake COVID-19 patients (Coppo et al., 2020; Guérin et al., 2020; Ng et al., 2020; Sartini et al., 2020). The use of APP in non-intubated or hypoxemic patients with COVID-19 is now commonplace in overburdened health care systems (Grasselli, Tonetti, et al., 2020; Raoof et al., 2020; Winck & Ambrosino, 2020). A cohort of ten patients reported that the prone position resulted in a significant improvement in oxygen saturation within one hour (Elharrar et al., 2020). Another study indicated that compared to supine position, APP was related to decreased fatality (20.0%) and intubation rate (23.6%) (Guérin et al., 2020).

The question of whether APP is beneficial for non-incubated hypoxic COVID-19 patients has increased interest in the conduct of randomized controlled trials (RCTs) (Bouadma et al., 2020; Elharrar et al., 2020; Valter et al., 2003). Moreover, in Indonesian clinical contexts, many questions remain unanswered, such as how long can a patient comfortably lie prone for, how long is clinically beneficial, and whether the accumulation of prone hours affects results. Therefore, we conducted a feasibility study of prone positioning in non-intubated COVID-19 patients requiring additional oxygen.

Materials and Methods

Design

This study followed the guidelines of the 1964 Helsinki Declaration, Good Clinical Practice, and the Consolidated Standards of Reporting Trials (CONSORT) for conducting a feasibility randomized control trial. The study was conducted at two general hospitals in Jakarta, Indonesia, from January to March 2021, with a 7-day follow-up completed on April 10. COVID-19 patients were treated in designated areas of the hospital. Those requiring more than 4 liters of oxygen a minute were administered in areas capable of providing a high level of intensive care. The Affiliated University Ethical Review Authority (STIKes Abdi Nusantara) granted ethical approval (2020-02743) on November 10, 2020. All subjects provided written informed consent.

Randomization

Patients randomized to either intervention and control group. A computerized random number generator was used to assign patients in groups of two randomly. The allocation was hidden by utilizing sealed opaque envelopes. Block sizes were unknown to the sites. The participants and treating professionals were not blinded because of the nature of the intervention.

Sample

Adults admitted to the hospital with hypoxic respiratory failure due to a positive COVID-19 test were assessed for study eligibility. Patients over the age of 18 who require more than four LPM of supplemental oxygen to maintain a SpO2 of 92 percent were considered for inclusion in the study. It was decided that the study would not be conducted on pregnant women, patients in hemodynamic shock who required norepinephrine 0.1 mcg/kg/min, GCS of 15 or less, emergency intubation patients, or those who were unable to lie prone due to absolute or relative contraindications.

The feasibility study involved enrolling 70 patients due to limited event rate data, as the results will aid in determining sample sizes for a definitive trial, as the trial was designed with limited data (Jayakumar et al., 2021).

Intervention procedure

Intervention was done by nurse who have experienced working in Intensive Care Unit for more than 5 years and have taking care for COVID-19 patients at least 6 months. The duration of the interevntion was 7 days. The nurses advised the study group to maintain a supine position for a minimum of six hours each day (in total). The inclusion of more cushions facilitated assuming the prone posture and enhanced overall comfort. In the control group, patients were permitted to make postural modifications as necessary. If they preferred assuming a prone position, they were free to do so. The nurses and healthcare providers in this group will not support or endorse the use of prone positioning. Extended periods of lying face down for over 30 minutes were observed and documented in both groups. Patients received timed intervals for eating and resting while in a recumbent position. The oxygen flow and fraction of inspired oxygen (FiO2) were adjusted to ensure a consistent saturation level of 92% in both arms.

Outcome Measurements

The primary outcome was the proportion of patients in each group who completed their treatment regimen as intended. Secondarily, we looked at the percentage of patients who needed escalation of respiratory assistance and how long patients could spend in the prone position in 24 hours.

Table 1. Baseline characteristics between intervention and control group (n=70)

Characteristics	Intervention group (n=35)	Control group (n=35)	p-value
Age in years	43.3 ± 11.9	44.8 ± 11.6	0.345
Sex			
Men	13 (37.1%)	17 (48.6)	0.198
Women	22 (61.9%)	18 (51.4)	
BMI	25.9 ± 3.4	26.1 ± 4.1	0.076
APACHE II Score	9.2 ± 3.7	9.8 ± 3.3	0.515
Comorbidity (yes)	16 (45.7%)	15 (42.9%)	0.113
Initial oxygen delivery device			0.275
Face Mask	18 (51.4%)	17 (48.6)	
Non-Rebreather Mask	17 (48.6)	18 (51.4%)	
Initiation oxygen saturation	92.45± 1.3	93.12± 2.5	0.164
Initial FiO2	50.2 ± 20.8	48.2 ± 18.6	0.214
Initial P/F ratio	185.6 ± 126.1	201.4 ± 118.8	0.387

Table 2. The effect of awake prone position on primary and secondary outcome

	Intervention group (n = 35)	Control group (n = 35)	P value
Average Hours Awake Prone^			
0 hours	0	30 (85.7%)	
1-3 hours	0	5 (14.3%)	
4-6 hours	12 (34.3%)	0	
≥ 6 hours	23 (65.7%)	0	
P/F ratio after 2 hours	175.1 ± 87.2	198.7 ± 96.4	0.023a
Respiratory escalation	3 (8.6%)	4 (11.4%)	0.352b
Oxygen saturation	94.0± 3.7	93.5± 4.3	0.131a
Adverse events	0	0	–
Length of stay	13.21 ± 2.44	16.40 ± 5.11	0.046a
Dead	2 (5.7%)	4 (11.4%)	0.561b

a Independent t-test; bChi Square Test; ^over 7 days or duration of stay whichever is shorter; – No statistical test applicable due to zero variation or not relevant.

Data collection

In addition to the patient's demographics and APACHE II scores, comorbidities data were obtained. The position chart also recorded the total number of hours spent in the prone position during the day (cumulative), the number of prone sessions, and the length of each one. We followed this approach for seven days. This information was noted if the patient was unable to lie prone due to any of the issues listed above, as well as any adverse events such as pressure ulcers, vomit, or nerve compression that may have happened.

Data analysis

Means and standard deviations are used to report continuous variables and frequency for categorical data. Comparing demographic characteristics between intervention and control group was done using independent t test and Chi-Square test. The student t-test was used for comparing means and the chi-square was used for comparing proportions of studies outcome between intervention and control group. All two-tailed tests had a significance level of $p<0.05$. The analysis was done using Statistical Package for the Social Sciences (SPSS) version 23 (Chicago, SPSS In).

Results

Over five months, 110 patients were screened for eligibility, 70 of whom agreed to participate (Figure 1). Seventy patients were randomly assigned to each group, with 35 individuals being included in the analysis.

Table 1 shows the baseline characteristics that were comparable between the two groups. There were no significant different between intervention and control group in term of age, sex, BMI, APACHE

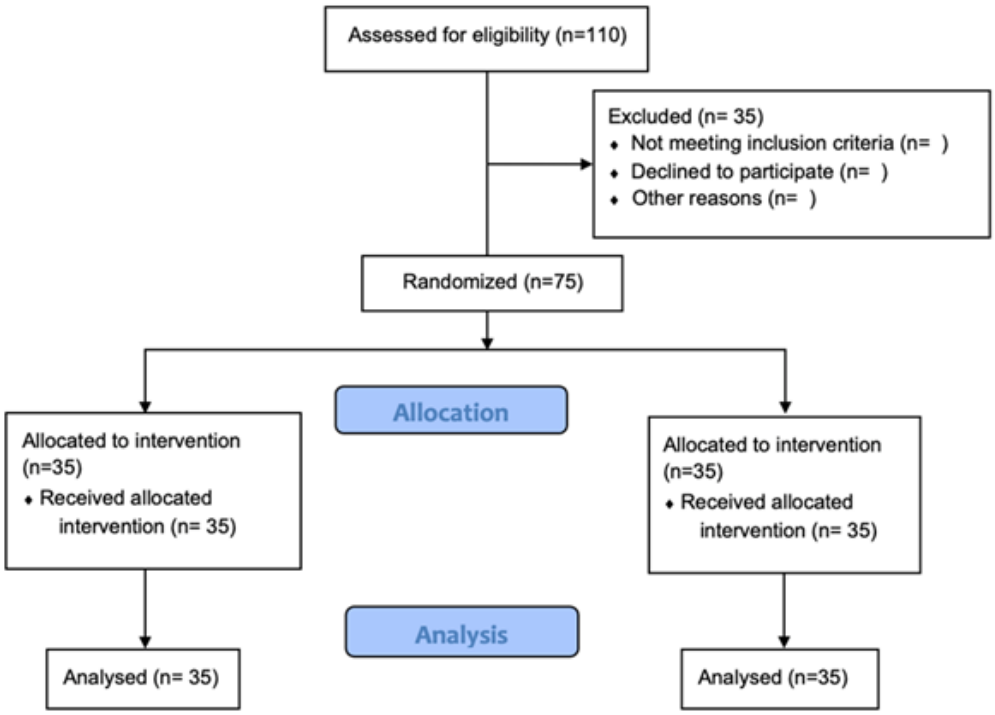


Figure 1. CONSORT 2010 Flow Diagram

II score, comorbidity, initial oxygen delivery device, initiation oxygen saturation, initial FiO2, and initial P/F ratio (p>0.05).

Patients who participated in the intervention group were found to be 65.7% adherent to the protocol (23 patients completed an average of 6 hours a day in prone position), and 24.3% of the patients were able to lie prone for 4 to 6 hours per day (Table 2). In the control group, 85.7% (30 of 35) of participants were supine, and 14.3% spent around 1 to 3 hours per day in the prone position.

After 2 hours, the P/F ratio was significantly different across the groups, but not respiratory escalation, length of stay, or mortality (Table 2). About 5.7% (n=2) patients in intervention and 11.4% (n=4) in control group were dead due to respiratory failure. All patients assigned to the intervention group were able to lie prone with no difficulty. There were no negative side effects associated with the positional treatment.

Discussion

This study indicated that prone positioning was safe and practical in most patients and increased P/F ratio after two hours showed a significant difference between groups. Valter and colleagues reported that who awake prone position enhanced oxygenation immediately and prevented the need for intubation. Feltracco and colleagues reported five successful awake prone positioning with noninvasive breathing for refractory hypoxemia. Munshi and colleagues suggest that numerous factors influence acceptance of a pandemic intervention, including the perception of therapeutic benefits and risks, situational factors including the convenience of use, and physician characteristics (early or late adopters). Although prone positioning may seem like a mild method, it's likely that the temporary improvements in oxygenation give a false sense of security and postpone the need for an increase in respiratory support. As a result, even in the face of pandemic desperation, the threshold for considering experimental interventions must remain high.

The majority of patients in the treatment group met or exceeded the six-hour daily APP target. In a previous study, the prone group spent 10.54 hours per day compared to 1.54 hours in the supine group. According to a prior study (Longhini et al., 2020), treatment adherence is one of the most significant limitations of APP. When participants were placed in a prone position, researchers expected to see a decrease in static adherence because of the lack of lung recruitment, but they did not. We know that being in the prone position has a negative effect on chest wall compliance (Guérin et al., 2020), this must imply that lung compliance increased during prone stance. While this is not a typical outcome, it is seen in "classic" ARDS when total compliance does not improve (Guérin et al., 2020). Two of three prone

patients were found to have recruited dorsal lung areas via serial electrical impedance tomography (EIT) measurements.

Following a period of two hours, there was no significant difference in respiratory escalation, duration of stay, or mortality between the intervention group (which was getting APP) and the control group. Due to the fact that APP in non-intubated patients failed to enhance oxygenation, the degree of respiratory escalation did not considerably improve. This was notably true in patients who were experiencing hypoxemic respiratory failure as a result of COVID-19 pneumonia. However, the translation of physiological improvement into clinically meaningful results has not been confirmed by studies conducted on ARDS (Ferrando et al., 2020). Furthermore, there is still a vacuum in the existing understanding about the use of APP (Albert et al., 2014; Padrão et al., 2020; Coopersmith et al., 2021). A randomized clinical study has not yet been conducted to investigate the impact that APP has on the percentage of patients who do not need intubation while they are suffering from hypoxemic respiratory failure. The APP did not substantially lower the duration of stay or the mortality rate, which is another point of interest. According to the findings of a multicenter observational research that investigated a cohort of 199 patients with COVID-19, there was no difference in the frequencies of intubation between patients who had administered APP for more than 16 hours per day and those who had administered APP for a shorter length (Hallifax et al., 2020). When compared with our inquiry, they showed comparable baseline characteristics, levels of respiratory failure, and death rates; however, they reported greater intubation rates (41% in the control group and 40% in the prone group at the time of the study).

Considering the study's limited scope, the results cannot be relied upon to change current procedures. It's important to note that 65.7% of people got in a prone position for at least six hours every day. Although, there were no significant different between intervention and control group in term of age, sex, BMI, APACHE II score, comorbidity, initial oxygen delivery device, initiation oxygen saturation, initial FiO2, and initial P/F ratio, adherence may have been affected by a variety of factors, such as changes in nurse-to-patient ratios, the need for isolation, and cohorts, which restrict access to trial personnel. It is uncertain whether positional aides, such as mattresses, will permit prolonged prone positioning. Five of the thirty-five supine participants flipped over to rest on their stomachs. No rules were violated, as no one remained in a prone position for more than six hours, despite the substantial number of participants who switched roles.

Furthermore, to be included in this study, one did not have to show signs of illness. They may have been sick for a longer period of time than other patients. It is possible that this had an impact on the overall efficacy of the intervention. However, this study provides crucial data for designing larger definitive studies in terms of feasibility, incident rates, and safety. This research was done in hospitals and clinics at the height of the epidemic, when clinical trial infrastructure was still in its infancy or nonexistent. One of the major benefits is that it can be implemented in healthcare systems and countries with limited resources, which are typically left out of similar studies.

Conclusion

Clinical trials in awake prone patients who have not been intubated, as demonstrated in this study, show that this position is feasible and safe. For future large randomized controlled trials, the findings could be useful. Future studies may apply cross-over and increasing prone positioning compliance should be the focus of future studies.

Declaration of Interest

The author declares no conflict of interest.

Acknowledgment

None

Funding

None

Data Availability

None

References

Albert, H. (2014). Treatise on critical reason. http://digital.casalini.it/9781400854929

Bouadma, L., Lescure, F.-X., Lucet, J.-C., Yazdanpanah, Y., & Timsit, J.-F. (2020). Severe SARS-CoV-2 infections: Practical considerations and management strategy for intensivists. *Intensive Care Medicine, 46*(4), 579–582. https://doi.org/10.1007/s00134-020-05967-x

Broccard, A. F., Shapiro, R. S., Schmitz, L. L., Ravenscraft, S. A., & Marini, J. J. (1997). Influence of prone position on the extent and distribution of lung injury in a high tidal volume oleic acid model of acute respiratory distress syndrome. *Critical Care Medicine, 25*(1), 16–27. https://doi.org/10.1097/00003246-199701000-00007

Cammarota, G., Longhini, F., Perucca, R., Ronco, C., Colombo, D., Messina, A., Vaschetto, R., & Navalesi, P. (2016). New setting of neurally adjusted ventilatory assist during noninvasive ventilation through a helmet. *Anesthesiology, 125*(6), 1181–1189. https://doi.org/10.1097/ALN.0000000000001354

Cammarota, G., Ragazzoni, L., Capuzzi, F., Pulvirenti, S., De Vita, N., Santangelo, E., Verdina, F., Grossi, F., Vaschetto, R., & Della Corte, F. (2020). Critical care surge capacity

to respond to the COVID-19 pandemic in Italy: A rapid and affordable solution in the Novara hospital. *Prehospital and Disaster Medicine, 35*(4), 431–433.

Coelho, C. C., Padrão, T., Costa, L., Pinto, M. T., Costa, P. C., Domingues, V. F., Quadros, P. A., Monteiro, F. J., & Sousa, S. R. (2020). The antibacterial and angiogenic effect of magnesium oxide in a hydroxyapatite bone substitute. *Scientific Reports, 10*(1), 19098.

Coppo, A., Bellani, G., Winterton, D., Pierro, M., Soria, A., Faverio, P., Cairo, M., Mori, S., Messinesi, G., Contro, E., Bonfanti, P., Benini, A., Valsecchi, M., Antolini, L., & Foti, G. (2020). Feasibility and physiological effects of prone positioning in non-intubated patients with acute respiratory failure due to COVID-19 (PRON-COVID): A prospective cohort study. *The Lancet Respiratory Medicine, 8.* https://doi.org/10.1016/S2213-2600(20)30268-X

Cornejo, R. A., Díaz, J. C., Tobar, E. A., Bruhn, A. R., Ramos, C. A., González, R. A., Repetto, C. A., Romero, C. M., Gálvez, L. R., Llanos, O., Arellano, D. H., Neira, W. R., Díaz, G. A., Zamorano, A. J., & Pereira, G. L. (2013). Effects of prone positioning on lung protection in patients with acute respiratory distress syndrome. *American Journal of Respiratory and Critical Care Medicine, 188*(4), 440–448. https://doi.org/10.1164/rccm.201207-1279OC

Ding, L., Wang, L., Ma, W., & He, H. (2020). Efficacy and safety of early prone positioning combined with HFNC or NIV in moderate to severe ARDS: a multi-center prospective cohort study. *Critical Care (London, England), 24*(1), 28. https://doi.org/10.1186/s13054-020-2738-5

Elharrar, X., Trigui, Y., Dols, A.-M., Touchon, F., Martinez, S., Prud'homme, E., & Papazian, L. (2020). Use of prone positioning in nonintubated patients with COVID-19 and hypoxemic acute respiratory failure. *JAMA, 323*(22), 2336–2338. https://doi.org/10.1001/jama.2020.8255

Franco, C., Facciolongo, N., Tonelli, R., Dongilli, R., Vianello, A., Pisani, L., Scala, R., Malerba, M., Carlucci, A., Negri, E. A., Spoladore, G., Arcaro, G., Tillio, P. A., Lastoria, C., Schifino, G., Tabbì, L., Guidelli, L., Guaraldi, G., Ranieri, V. M., … Nava, S. (2020). Feasibility and clinical impact of out-of-ICU noninvasive respiratory support in patients with COVID-19-related pneumonia. *The European Respiratory Journal, 56*(5). https://doi.org/10.1183/13993003.02130-2020

Grasselli, G., Pesenti, A., & Cecconi, M. (2020). Critical care utilization for the COVID-19 outbreak in Lombardy, Italy: Early experience and forecast during an emergency response. *Jama, 323*(16), 1545–1546.

Grasselli, G., Tonetti, T., Protti, A., Langer, T., Girardis, M., Bellani, G., Laffey, J., Carrafiello, G., Carsana, L., Rizzuto, C., Zanella, A., Scaravilli, V., Pizzilli, G., Grieco, D. L., Di Meglio, L., de Pascale, G., Lanza, E., Monteduro, F., Zompatori, M., … Ranieri, V. M. (2020). Pathophysiology of COVID-19-associated acute respiratory distress syndrome: A multicentre prospective observational study. *The Lancet. Respiratory Medicine, 8*(12), 1201–1208. https://doi.org/10.1016/S2213-2600(20)30370-2

Guérin, C., Albert, R. K., Beitler, J., Gattinoni, L., Jaber, S., Marini, J. J., Munshi, L., Papazian, L., Pesenti, A., Vieillard-Baron, A., & Mancebo, J. (2020). Prone position in ARDS patients: Why, when, how and for whom. *Intensive Care Medicine, 46*(12), 2385–2396. https://doi.org/10.1007/s00134-020-06306-w

Guérin, C., Reignier, J., Richard, J.-C., Beuret, P., Gacouin, A., Boulain, T., Mercier, E., Badet, M., Mercat, A., Baudin, O., Clavel, M., Chatellier, D., Jaber, S., Rosselli, S., Mancebo, J., Sirodot, M., Hilbert, G., Bengler, C., Richecoeur, J., … Ayzac, L. (2013). Prone positioning in severe acute respiratory distress syndrome. *The New England Journal of Medicine, 368*(23), 2159–2168. https://doi.org/10.1056/NEJMoa1214103

Hallifax, R. J., Porter, B. M., Elder, P. J., Evans, S. B., Turnbull, C. D., Hynes, G., Lardner, R., Archer, K., Bettinson, H. V., Nickol, A. H., Flight, W. G., Chapman, S. J., Hardinge, M., Hoyles, R. K., Saunders, P., Sykes, A., Wrightson, J. M., Moore, A., Ho, L. P., Fraser, E., … Oxford Respiratory Group (2020). Successful awake proning is associated with improved clinical outcomes in patients with COVID-19: Single-centre high-dependency unit experience. *BMJ open respiratory research, 7*(1), e000678. https://doi.org/10.1136/bmjresp-2020-000678

Jagan, N., Morrow, L. E., Walters, R. W., Klein, L. P., Wallen, T. J., Chung, J., & Plambeck, R. W. (2020). The POSITIONED Study: Prone positioning in nonventilated coronavirus disease 2019 patients-a retrospective analysis. *Critical Care Explorations, 2*(10), e0229. https://doi.org/10.1097/CCE.0000000000000229

Jayakumar, D., Ramachandran Pratheema, D. N. B., Rabindrarajan Ebenezer, D. N. B., Vijayaraghavan Bharath Kumar Tirupakuzhi, M. D., Ramakrishnan Nagarajan, A. B., & Venkataraman Ramesh, A. B. (2021). Standard care versus awake prone position in adult nonintubated patients with acute hypoxemic respiratory failure secondary to COVID-19 infection—a multicenter feasibility randomized controlled trial. *Journal of Intensive Care Medicine, 36*(8), 918–924. https://doi.org/10.1177/08850666211014480

Longhini, F., Bruni, A., Garofalo, E., Navalesi, P., Grasselli, G., Cosentini, R., Foti, G., Mattei, A., Ippolito, M., Accurso, G., Vitale, F., Cortegiani, A., & Gregoretti, C. (2020). Helmet continuous positive airway pressure and prone positioning: A proposal for an

early management of COVID-19 patients. *Pulmonology, 26*(4), 186–191. https://doi.org/10.1016/j.pulmoe.2020.04.014

Ng, Z., Tay, W. C., & Ho, C. H. B. (2020). Awake prone positioning for non-intubated oxygen dependent COVID-19 pneumonia patients. *The European Respiratory Journal, 56*(1), 2001198. https://doi.org/10.1183/13993003.01198-2020

Nunnally, M. E., Ferrer, R., Martin, G. S., Martin-Loeches, I., Machado, F. R., De Backer, D., Coopersmith, C. M., Deutschman, C. S., & Levy, S. S. C. R. C. M. A. J. H. S. J. J. K. I. L. M. M. (2021). The Surviving Sepsis Campaign: research priorities for the administration, epidemiology, scoring and identification of sepsis. *Intensive Care Medicine Experimental, 9,* 1–26. https://doi.org/10.1186/s40635-021-00400-z

Raoof, S., Nava, S., Carpati, C., & Hill, N. S. (2020). High-flow, noninvasive ventilation and awake (nonintubation) proning in patients with coronavirus disease 2019 with respiratory failure. *Chest, 158*(5), 1992–2002. https://doi.org/10.1016/j.chest.2020.07.013

Sartini, C., Tresoldi, M., Scarpellini, P., Tettamanti, A., Carcò, F., Landoni, G., & Zangrillo, A. (2020). Respiratory parameters in patients with COVID-19 after using noninvasive ventilation in the prone position outside the intensive care unit. *JAMA, 323*(22), 2338–2340. https://doi.org/10.1001/jama.2020.7861

Scaravilli, V., Grasselli, G., Castagna, L., Zanella, A., Isgrò, S., Lucchini, A., Patroniti, N., Bellani, G., & Pesenti, A. (2015). Prone positioning improves oxygenation in spontaneously breathing nonintubated patients with hypoxemic acute respiratory failure: A retrospective study. *Journal of Critical Care, 30*(6), 1390–1394. https://doi.org/10.1016/j.jcrc.2015.07.008

Valenza, F., Guglielmi, M., Maffioletti, M., Tedesco, C., Maccagni, P., Fossali, T., Aletti, G., Porro, G. A., Irace, M., Carlesso, E., Carboni, N., Lazzerini, M., & Gattinoni, L. (2005). Prone position delays the progression of ventilator-induced lung injury in rats: does lung strain distribution play a role? *Critical Care Medicine, 33*(2), 361–367. https://doi.org/10.1097/01.ccm.0000150660.45376.7c

Valter, C., Christensen, A. M., Tollund, C., & Schønemann, N. K. (2003). Response to the prone position in spontaneously breathing patients with hypoxemic respiratory failure. *Acta Anaesthesiologica Scandinavica, 47*(4), 416–418. https://doi.org/10.1034/j.1399-6576.2003.00088.x

Villar, J., Ferrando, C., Martínez, D., Ambrós, A., Muñoz, T., Soler, J. A., Aguilar, G., Alba, F., González-Higueras, E., & Conesa, L. A. (2020). Dexamethasone treatment for the acute respiratory distress syndrome: a multicentre, randomised controlled trial. *The Lancet Respiratory Medicine, 8*(3), 267–276.

Winck, J. C., & Ambrosino, N. (2020). COVID-19 pandemic and non invasive respiratory management: Every Goliath needs a david. An evidence based evaluation of problems. *Pulmonology, 26*(4), 213–220. https://doi.org/10.1016/j.pulmoe.2020.04.013

Yang, X., Yu, Y., Xu, J., Shu, H., Xia, J., Liu, H., Wu, Y., Zhang, L., Yu, Z., Fang, M., Yu, T., Wang, Y., Pan, S., Zou, X., Yuan, S., & Shang, Y. (2020). Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: A single-centered, retrospective, observational study. *The Lancet. Respiratory Medicine, 8*(5), 475–481. https://doi.org/10.1016/S2213-2600(20)30079-5

Mental health and home life in the early phase of marriage: An evaluation of early married and non-early married women

Suhariyati Suhariyati[1*], Shinta Alifiana Rahmawati[2]

[1] Department of Community Health Nursing, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Indonesia
[2] Midwifery, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Indonesia

Abstract

Background: The first five years of marriage are a vulnerable period in home life, particularly for early married women. This is a challenge for them because of their lack of physical, mental and financial readiness.
Purpose: This study discusses the impact of early marriage on mental health—including depression, anxiety, and stress—as well as various dimensions of home life, such as domestic violence, life satisfaction, and marital satisfaction. Focusing on women in Lamongan, Indonesia, it compares those who married early with those who did not during the first five years of marriage.
Methods: This cross-sectional study included 210 women, both early married and non-early married. Depression, anxiety, and stress were assessed using the Depression Anxiety Stress Scale (DASS-42), while domestic violence was measured with the Dating Violence Questionnaire (DVQ). Life satisfaction was evaluated using the Satisfaction with Life Scale (SWLS), and marital satisfaction was assessed with the Kansas Marital Satisfaction Scale (KMS). Logistic regression analysis with α=5% and 95% confidence interval was conducted to determine the relationship between early marriage and depression, anxiety, stress, domestic violence, life satisfaction, marital satisfaction.
Results: Early marriage was significantly associated with higher levels of depression ($p<0.001$), anxiety ($p<0.001$), stress ($p<0.001$), domestic violence ($p<0.001$), life dissatisfaction ($p<0.001$) and marital dissatisfaction ($p=0.020$). Early married women were nearly nine times more likely to experience domestic violence compared to those who married later.
Conclusion: Early marriage needs to be prevented because its impact is very detrimental to women, especially in relation to domestic violence.

Keywords: domestic violence; early marriage; life satisfaction; marital satisfaction; mental health

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 51-58
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2693

Article Info

Received : December 27, 2024
Revised : April 14, 2025
Accepted : April 26, 2025
Published : April 27, 2025

Corresponding author

Suhariyati Suhariyati*
Department of Community Health Nursing, Faculty of Health Sciences, Universitas Muhammadiyah Lamongan, Indonesia.; Jl. Plalangan No.KM, RW.02, Wahyu, Plosowahyu, Kec. Lamongan, Kabupaten Lamongan, Jawa Timur; Postal Code: 62218; Phone: 085788938823,
E-mail: suhariyati@umla.ac.id

Citation

Suhariyati, S., & Rahmawati, S. A (2025). Mental health and home life in the early phase of marriage: An evaluation of early married and non-early married women. *Jurnal Keperawatan Padjadjaran, 13*(1), 51-58. http://dx.doi.org/10.24198/jkp.v13i1.2693

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Introduction

The legal age for marriage is set at 18 years; however, in practice, many women still marry before reaching that age. Thus, ending early marriage is a key priority in the Sustainable Development Goals (SDGs) to promote gender equality and safeguard children's rights (Kanji et al., 2023). Early marriage constitutes a human rights violation that leads to serious demographic and health impacts, yet the practice continues to be widespread (Kumari & Shekhar, 2023). The practice of early marriage occurs in various developing countries (Anggreni et al., 2023) and almost all Muslim countries in the world, including Indonesia (Sopyan et al., 2023). This is a challenge for Indonesia to achieve the Sustainable Development Goals.

The Central Statistics Agency (BPS) noted that Indonesia's early marriage rate stood at 10.82% in 2019 and declined slightly to 10.18% in 2020. Meanwhile, a report from the United Nations Children's Fund (UNICEF)

in 2018 estimated that around 1.2 million women were married before turning 18, with approximately 432,000 of them becoming pregnant as early as eight years old or younger (Sopyan et al., 2023).

Early marriage is widespread in various Muslim countries, this is related to socio-economic and socio-cultural factors (Abdallah et al., 2023; Agarwal et al., 2023; Suyanto et al., 2023; Torabi & Bagi, 2024), such as wealth index, unemployment, media exposure (Abdallah et al., 2023; Billah et al., 2023), age, difference in education of partners, age of first sexual intercourse, parity (Mathabatha & Tsawe, 2023), low education, living in rural areas and dependent on parental decision making (Cameron et al., 2023; Gebeyehu et al., 2023). The traditional Indonesian cultural view indirectly legitimizes the right of parents to hasten their daughters to marry regardless of age and who the child marries. In addition, another contributing factor of early marriage is teenage pregnancy (Widyastari et al., 2020), or dating (Grijns & Horii, 2018).

Home life requires physical, psychological, social, and financial readiness; so it is necessary to consider age. Psychological immaturity and economic difficulties of early married adolescents often cause marriage failure (Law et al., 2019). Additionally, arranged marriages and forced marriages among adolescents are also closely related to divorce (Kashif et al., 2020). This situation contradicts the true purpose of marriage, which is to build a peaceful, prosperous, and harmonious family. Family welfare can only be achieved if it is supported by strong pillars and fulfilled by physical and spiritual needs (Fauzan & Amroni, 2020).

In this context, the early phase of marriage becomes a highly crucial period, especially for women. Adaptation during this time significantly influences the quality and sustainability of the marriage in the future (Rocha et al., 2024; Yazdanpanahi & Beygi, 2019). Adjustment and responsibility of husband and wife are very important to build a successful home life. The early years of marriage are a vulnerable period and are also often referred to as a critical era in marriage because there is still little experience in living together, especially in the first five years (Afifah & Savira, 2023). The early years of marriage are often marked by conflict between spouses, leading to emotional tension. The first five years, in particular, can be a challenging period as couples frequently face disagreements in their home life (Sandri & Supraba, 2022).

As attention to the issue of early marriage has increased, several studies have highlighted its impact on women's well-being. Research has shown that early marriage often leads to school dropout (Garcia et al., 2025; Sagalova et al., 2021), economic dependency and poverty (Nagaraj & Theboral, 2024; Rahayu et al., 2020; Sagalova et al., 2021), and a higher risk of mental health disorders such as depression, anxiety, and stress (Ayşe, 2024; Jayawardana, 2022; Kaya et al., 2021; Sezgin & Punamäki, 2020; Yadav et al., 2022). In addition, early married women tend to face limitations in making decisions within the household compared to those who marry at a later age (Abera et al., 2020; Tauseef & Sufian, 2024). On the other hand, women who marry at a more mature age tend to show better psychological adjustment and experience greater satisfaction in their family lives (Jayawardana, 2022; Pekel & Gülçin, 2019).

Although there is a growing body of research on early marriage, comparative studies that directly examine the mental health conditions and household dynamics between early-married women and those who marry later remain relatively scarce—particularly during the initial stages of marriage. Most existing studies tend to emphasize long-term impacts or general health outcomes without delving into the critical transition phase immediately after marriage. However, this period is vital, as it significantly influences long-term marital satisfaction and women's psychological well-being. Therefore, this study adopts a different approach by evaluating the impact of early marriage on mental health—including symptoms of depression, anxiety, and stress—as well as various aspects of domestic life, such as experiences of domestic violence, life satisfaction, and marital satisfaction during the early phase of marriage. This analysis is conducted through a comparative lens between early-married and non-early-married women.

Materials and Methods

Design

This cross-sectional survey study was conducted in July-September 2024 in Lamongan Regency, Indonesia. This study used four subdistricts with the highest marriage rates in the last five years.

Participants and Setting

The sample size of 210 respondents was determined using quota sampling. Two groups were targeted: 105 women who experienced early marriage and 105 women who did not. These quotas were established to ensure equal representation of both groups, which are central to the research objectives. The sampling was conducted in regions within Lamongan Regency, Indonesia, known to have the highest rates of early marriage.

Participation was voluntary, and the recruitment followed non-probability sampling principles, meaning the sample size was not calculated using statistical formulas but rather guided by the set quotas. While this approach enabled focused comparison, it also introduces a limitation: individuals who chose to participate may have a particular interest or perspective on the topic, potentially affecting generalizability. The inclusion criteria for this study were women who were currently married or divorced, marriage age 0-5 years, and had only been married once. The exclusion criteria included women in polygamous or polyandrous marriages.

Variable

The independent variable in this study was marital status (early married vs. not early married). The dependent variables to be studied include stress, anxiety, and depression, which are aspects of a person's mental health (John et al., 2023). In addition, other variables studied include domestic violence, life satisfaction, and marital satisfaction, which are part of the aspects of home life (Koçak, 2025; Salari, 2023; Sztányi-Szekér et al., 2025).

Instruments

The instruments in this study consisted of a demographic questionnaire, Depression Anxiety Stress Scale (DASS-42), Dating Violence Questionnaire (DVQ), Satisfaction with Life Scale (SWLS), and Kansas Marital Satisfaction Scale (KMS). The demographic questionnaire was used to examine age, length of a marriage, education level, occupation, husband's occupation, family income and early marriage. The DASS-42 was used to measure depression (14 items), stress (14 items), and anxiety (14 items) (S. H. Lovibond & Lovibond, 1995). The validity and reliability results of the Cronbach's alpha coefficients for depression, anxiety, and stress were 0.91, 0.84; and 0.90, respectively (P. F. Lovibond, 1995). The DVQ was used to measure domestic violence experienced in the past year (i.e., in the past 12 months) with validity and reliability results of 0.92 (Indu et al., 2011). The SWLS is a widely used instrument designed to measure an individual's global life satisfaction, which is a key component of subjective well-being. The validity and reliability of the Cronbach's alpha coefficient for this scale was 0.87 (Diener et al., 1985). The KMS was used to measure marital satisfaction of married couples (Schumm et al., 1986).

Data collection

The data in this study were analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Prior to conducting the multivariate logistic regression analysis, a bivariate analysis was performed between each independent variable and the dependent variable to identify potential predictors. Variables with a p-value<0.25 in the bivariate analysis were considered for inclusion in the multivariate model.

Subsequently, a multivariate logistic regression analysis was conducted to evaluate the association

Table 1. Respondents' demographic data

Variables	Category	n	%
Age	Mean	21	
Lenghth of Marriages	<1 Year	14	6.7
	1 Year	44	21.0
	2 Years	55	26.2
	3 years	26	12.4
	4 years	31	14.8
	5 years	40	19.1
Occupation	Not Working	147	70.0
	Fisherman/Farmer	3	1.4
	Self-Employed	46	21.9
	Private Employee	10	4.8
	Civil Servant/Police/ Military	4	1.9
Husband's Occupation	Not Working	8	3.8
	Fisherman/Farmer	50	23.8
	Self-Employed	127	60.5
	Private Employee	21	10.0
	Civil Servant/Police/ Military	4	1.9
Educational Level	Elementary School	8	3.8
	Junior High School	62	29.5
	Senior High School	117	55.7
	Diploma/Bachelor	23	11.0
Family Income	<Minimum Wage	120	57.1
	≥Minimum Wage	90	42.9

Table 2. Multivariate Logistic Regression Analysis of Early Marriage and Its Association with Mental Health and Home Life Outcomes

Variabels	Non-Early Marriage		Early Marriage		Sig.	OR	95% Confidence Interval	
	N	%	N	%			Lower	Upper
Depression								
Normal	86	81.9	41	39.0	0.000	7.807	4.191	14.556
Mild	10	9.5	17	16.2				
Moderate	7	6.7	17	16.2				
Severe	2	1.9	13	12.4				
Very Severe	0	0.0	17	16.2				
Anxiety								
Normal	75	71.4	28	26.7	0.000	6.753	3.846	11.870
Mild	6	5.7	10	9.5				
Moderate	14	13.3	24	22.9				
Severe	6	5.7	12	11.4				
Very Severe	4	3.8	31	29.5				
Stres								
Normal	84	80.0	56	53.3	0.000	3.920	2.134	7.207
Mild	10	9.5	8	7.6				
Moderate	11	10.5	37	35.2				
Severe	0	0.0	4	3.8				
Domestic Violence								
No	98	93.3	62	59.0	0.000	9.710	4.110	22.941
Yes	7	6.7	43	41.0				
Life Satisfaction								
Extremely Dissatisfied	1	1.0	1	1.0	0.000	5.302	1.099	2.974
Dissatisfied	3	2.9	9	8.6				
Slightly Dissatisfied	10	9.5	40	38.1				
Neutral	21	20.0	26	24.8				
Slightly Satisfied	55	52.4	26	24.8				
Satisfied	15	14.3	3	2.9				
Extremely Satisfied	0	0.0	0	0.0				
Marital Satisfaction								
Extremely Dissatisfied	1	1.0	1	1.0	0.020	1.808	4.110	22.941
Very Dissatisfied	0	0.0	0	0.0				
Somewhat Dissatisfied	2	1.9	8	7.6				
Mixed	27	25.7	31	29.5				
Somewhat Satisfied	5	4.8	14	13.3				
Very Satisfied	20	19.0	15	14.3				
Extremely Satisfied	50	47.6	36	34.3				

between each independent variable and the dependent variable. This analysis included multiple predictors in the model simultaneously; however, no additional covariates were included for adjustment. The significance level for all statistical tests was set at $p<0.05$. In addition, this research received ethical approval from the Ethics Committee of Muhammadiyah University of Lamongan (Approval Number: 341/EC/KEPK–S2/12/2024), ensuring that all research procedures complied with the applicable ethical standards.

Results

The study included 105 early married women and 105 non-early married women, with a mean age of 21 years. The duration of the participants' marriages varied, with the majority having been married for two years (26.2%). In terms of employment, most of the women in this study were unemployed (70%), while the majority of their husbands were self-employed (60.5%). Regarding education, more than half of the participants had completed high school (55.7%). Additionally, most of the participants' families had an income below the applicable minimum wage (57.1%), reflecting their household's economic conditions.

In the logistic regression analysis, all predictor variables were treated as categorical, with non-early married women serving as the reference group. Table 2 shows that early marriage significantly influences multiple aspects of mental health and home life, including domestic violence (OR = 9.710; 95% CI: 4.110–22.941), depression (OR = 7.808; 95% CI: 4.191–14.556), anxiety (OR = 6.753; 95% CI: 3.846–11.870), stress (OR = 3.920; 95% CI: 2.134–7.207), life satisfaction (OR = 5.302; 95% CI: 1.099–2.974), and marital satisfaction (OR = 1.808; 95% CI: 4.110–22.941). These findings indicate that early marriage increases the risk of experiencing various mental health issues and challenges in home life. Compared to non-early married women, early married women were more likely to report depression, anxiety, stress, life dissatisfaction, and marital dissatisfaction.

Discussion

Our findings identify that early married women were at higher risk of experiencing domestic violence than non-early married women. In line with previous studies, early married women experience more violence from their partners than non-early married women (John et al., 2023). Early marriage is closely related to the occurrence of violence by intimate partners (Suyanto et al., 2023). Studies in Pakistan and Mesir indicate that women who marry early are more likely to experience physical and psychological abuse from their partners (Charan et al., 2024; Verma & Nair, 2022). In some cases we found, that psychological violence is often experienced by early married women, including restrictions on buying goods, restrictions on managing finances and restrictions on making decisions, even insults. Early married women usually depend on their husbands in terms of economy because the family's main income generally comes from their husbands (Zulfa et al., 2024). In addition, early marriage can place girls in a more disadvantageous position regarding decision making (Tomar et al., 2021). This dependency places them in a vulnerable position, making it more difficult to resist unwanted actions. Early married women also frequently experience insults from their partners, with verbal violence being a common occurrence during arguments (Zulfa et al., 2024). Individuals who marry early are often not emotionally mature enough to handle the responsibilities of marriage. When both partners, especially women, are unprepared for these challenges, conflicts and relationship issues can escalate, often resulting in verbal insults.

Early married women are at greater risk of experiencing depression, anxiety and stress than non-early married women. Early marriage has an impact on women's psychological well-being, which ultimately decreases overall psychological well-being, potentially increasing mental health problems later in life (John et al., 2023). Previous studies have shown that early marriage is associated with symptoms of anxiety, depression (Ayşe, 2024) and stress (Collier et al., 2023). Early married women are reported to experience higher levels of depression (Sezgin & Punamäki, 2020). Nearly 46% of depressive symptoms are experienced by individuals who marry early and the incidence of depression is associated with financial problems (Fakhari et al., 2020). In addition to lacking psychological readiness, early married couples are often not financially prepared. In this study, the majority of early married couples had an income below the minimum wage.

Early married women have a higher risk of life dissatisfaction than non-early married women. Early married women experience a lower trajectory of life satisfaction (Kanji et al., 2023). Early marriage affects adolescent girls' interpersonal relationships, narrowing educational and career opportunities, emotional well-being, and access to support networks (Nhampoca & Maritz, 2024). This makes early married womaan experience limited experience and self-development. They do not have the opportunity to explore their potential, whether in terms of education, career, or self-development. Marriage that occurs before reaching full emotional and mental maturity can limit their opportunities to pursue life goals, which can contribute to feelings of dissatisfaction.

Early married women have a higher risk of marital dissatisfaction than non-early married women. Previous studies have shown that there is a significant relationship between age of marriage and marital satisfaction (Hajihasani & Sim, 2019). Adolescents' hopes and expectations for marriage may be affected by romanticization factors or cultural influences that consider marriage to be the main goal in life. If marriage does not match these expectations, feelings of disappointment or dissatisfaction may arise.

This study offers valuable insights by directly comparing early-married and non-early-married women in the early phase of marriage, a period often overlooked in previous research. The use of validated instruments and the inclusion of diverse mental health and home life indicators strengthen the credibility of the findings. However, several limitations should be acknowledged. The use of

quota sampling limits the generalizability of the results, as the sample may not fully represent the broader population. Additionally, reliance on self-reported data could introduce response bias, particularly in sensitive topics such as domestic violence and marital dissatisfaction. Future studies employing longitudinal designs and more extensive, randomized samples are recommended to validate and expand upon these findings.

Conclusions

Early married woman may be more vulnerable to domestic violence, depression, anxiety, stress, life dissatisfaction, and marital dissatisfaction. They tend to be less emotionally and psychologically prepared to face home life. This can increase the potential for conflict in the home, such as in financial management, childcare, and communication with partners. They may have difficulty adjusting to their roles as wives and mothers, especially if they do not have economic independence or sufficient education. This study can reveal how differences in age at marriage affect mental health and home life. This study can be a basis for various parties, including the government, social institutions, and communities, in designing comprehensive premarital education policies and programs that need to be strengthened, especially for prospective brides and grooms who marry at a young age.

Declaration of Interest

None

Acknowledgment

We express our deepest gratitude to all parties who contributed to this research, especially early married and non-early married women who took the time to be respondents in this study. We also express our sincere gratitude to sub-districts in Lamongan district who allowed us to conduct the research.

Funding

This research is supported by the Directorate General of Higher Education, Research, and Technology in the Beginner Lecturer Research Grant based on Decree Number 0667/E5/AL.04/2024.

Data Availability

Datasets generated and/or analyzed during the current investigation are accessible from the corresponding author upon reasonable request.

References

Abdallah, A. S. R., Mohammed, M. O. M., & Mohamed, A. A. A. (2023). Early marriage and its association with the socioeconomic and sociocultural factors of women in Sudan: A predictive model. *The Open Public Health Journal, 16*(1), 1–7. https://doi.org/10.2174/18749445-v16-e230505-2022-167

Abera, M., Nega, A., Tefera, Y., & Gelagay, A. A. (2020). Early marriage and women ' s empowerment : The case of child-brides in Amhara National Regional State , Ethiopia. *BMC International Health and Human Rights, 20*(30), 1–16.

Afifah, E. R. N., & Savira, S. I. (2023). Women's adaptation in early marriage. *Character: Jurnal Penelitian Psikologi, 10*(03), 268–292.

Agarwal, M. K., Ojha, D. K., & Mishra, S. (2023). Socio-economic Correlates of Early Marriage of the Girl Child Empirical Evidence from India. *Economic and Political Weekly, 58*(50), 38–43.

Anggreni, D., Notobroto, H. B., & Soedirham, O. (2023). Determinants factors of early marriage in developing countries: A literature review. *Journal of Public Health in Africa, 14*(S2). https://doi.org/10.4081/jphia.2023.2543

Ayşe, İ. M. (2024). An evaluation of early marriage and the mental state of Roma women: A cross-sectional study. *Transcultural Psychiatry, 61*(1), 107–117. https://doi.org/10.1177/13634615231205815

Billah, M. A., Khan, M. M. A., Hanifi, S. M. A., Islam, M. M., & Khan, M. N. (2023). Spatial pattern and influential factors for early marriage: Evidence from Bangladesh Demographic Health Survey 2017-18 data. *BMC Women's Health, 23*(1), 1–11. https://doi.org/10.1186/s12905-023-02469-y

Cameron, L., Contreras Suarez, D., & Wieczkiewicz, S. (2023). Child marriage: Using the Indonesian family life survey to examine the lives of women and men who married at an early age. *In Review of Economics of the Household, 21*(3). Springer US. https://doi.org/10.1007/s11150-022-09616-8

Charan, I. A., Xin, S., & Soomro, S. (2024). Exploring the child marriage practices and their impact on women's lives in Pakistan: A qualitative analysis. *African Journal of Reproductive Health, 28*(September), 73–84. https://doi.org/10.29063/ajrh2024/v28i9.7

Collier, A., House, E., Helal, S., Michael, S., Davison, C. M., & Bartels, S. A. (2023). 'Now, she's a child and she has a child'—experiences of syrian child brides in Lebanon after early marriage. *Adolescents, 3*(2), 212–227. https://doi.org/10.3390/adolescents3020016

Diener, E., Emmons, R. A., Larsen, R. J., Griffin, S., Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment, 49*(1). https://doi.org/10.1207/s15327752jpa4901

Fakhari, A., Farahbakhsh, M., Azizi, H., Esmaeili, E. D., & Mirzapour, M. (2020). Early marriage and negative life events affect on depression in young adults and adolescents. *Arch Iran Med, 23*(2), 90–98.

Fauzan, A., & Amroni, H. (2020). The concept of sakinah family in the contemporary muslim

generation. *Al-'Adalah, 17*(1), 51–70. https://doi.org/10.24042/adalah.v17i1.6458

Garcia, C. S., Lastam, J. M. P., Chavez, J. V, Hayudini, M. A. A., & Tahil, S. K. (2025). Discourse analysis on learners halting their education due to early marriage. *Environment and Social Psychology, 10*(1), 1–11. https://doi.org/10.59429/esp.v10i1.2558

Gebeyehu, N. A., Gesese, M. M., Tegegne, K. D., Kebede, Y. S., Kassie, G. A., Mengstie, M. A., Zemene, M. A., Moges, N., Bantie, B., Feleke, S. F., Dejenie, T. A., Abebe, E. C., Anley, D. T., Dessie, A. M., Bayih, W. A., & Adella, G. A. (2023). Early marriage and its associated factors among women in Ethiopia: Systematic reviews and meta-analysis. *PLoS ONE, 18*(11 November), 1–20. https://doi.org/10.1371/journal.pone.0292625

Grijns, M., & Horii, H. (2018). Child marriage in a village in West Java (Indonesia): Compromises between legal obligations and religious concerns. *Asian Journal of Law and Society, 5*(2), 453–466. https://doi.org/10.1017/als.2018.9

Hajihasani, M., & Sim, T. (2019). Marital satisfaction among girls with early marriage in Iran: Emotional intelligence and religious orientation. *International Journal of Adolescence and Youth, 24*(3), 297–306. https://doi.org/10.1080/02673843.2018.1528167

Indu, P. V., Remadevi, S., Vidhukumar, K., Anilkumar, T. V., & Subha, N. (2011). Development and validation of the domestic violence questionnaire in married women aged 18-55 years. *Indian Journal of Psychiatry, 53*(3), 218–223. https://doi.org/10.4103/0019-5545.86811

Jayawardana, D. (2022). Happily ever after ? Mental health effects of early marriage in Indonesia. *Feminist Economics, 28*(4), 112–136. https://doi.org/10.1080/13545701.2022.2079698

John, N. A., Kapungu, C., Sebany, M., & Tadesse, S. (2023). Do gender-based pathways influence mental health? Examining the linkages between early child marriage, intimate partner violence, and psychological well-being among young Ethiopian Women (18–24 years Old). *Youth and Society, 55*(6), 1155–1172. https://doi.org/10.1177/0044118X221079375

Kanji, S., Carmichael, F., Darko, C., Egyei, R., & Vasilakos, N. (2023). The impact of early marriage on the life satisfaction, education and subjective health of young Women in India: A longitudinal analysis. *Journal of Development Studies, 0*(0), 1–19. https://doi.org/10.1080/00220388.2023.2284678

Kashif, M., Khan, H. A., Ahmad, N., Aamir, M., & Jan, M. (2020). Societal dynamics of early marriages in pushtoon society; Evidences from field survey of district Mardan Khyber Pakhtunkhwa-Pakistan. *Journal of Sociology and Anthropology, 4*(1), 1–7. https://doi.org/10.12691/jsa-4-1-1

Kaya, H., Alnak, A., & Sahin, D. (2021). Erken yaşta evliliklerin ruhsal sonuçları: Kadınların ruhsal ve cinsel sağlığındaki uzun dönem etkiler. *Klinik Psikiyatri, 25*, 57–66. https://doi.org/10.5505/kpd.2022.00187

Koçak, A. (2025). From marital conflict to life satisfaction : How basic psychological need satisfaction operates — A dyadic analysis study. *Asian Journal of Social Psychology, 27*(4), 923–938. https://doi.org/10.1111/ajsp.12648

Kumari, N., & Shekhar, C. (2023). Trend and determinants of early marriage in Rajasthan: Evidence from the national family health survey. *Children and Youth Services Review, 145*(December 2022), 106746. https://doi.org/10.1016/j.childyouth.2022.106746

Law, Y. W., Chan, M., Zhang, H., Tai, L., Tsang, S., Chu, P., & Yip, P. (2019). Divorce in Hong Kong SAR, 1999–2011: A Review of 1,208 family court cases. *Journal of Divorce and Remarriage, 60*(5), 389–403. https://doi.org/10.1080/10502556.2018.1558855

Lovibond, P. F. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther, 33*(3), 335–343.

Lovibond, S. H., & Lovibond, P. F. (1995). Manual for the depression anxiety stress scales (2nd. Ed.). Psychology Foundation.

Mathabatha, S. M. L., & Tsawe, M. (2023). Multilevel modelling of the determinants of early marriage among women aged 20-49 years in South Africa. *African Journal of Reproductive Health, 27*(8), 83–94. https://doi.org/10.29063/ajrh2023/v27i8.9

Nagaraj, V. B., & Theboral, P. (2024). Got hitched too soon; Life experiences of women in early marriage in India. *Asian Journal of Human Services, 27,* 85–99.

Nhampoca, J. M., & Maritz, J. E. (2024). Early marriage, education and mental health: Experiences of adolescent girls in Mozambique. *Front. Glob. Womens Health, 5*(June). https://doi.org/10.3389/fgwh.2024.1278934

Pekel, N., & Gülçin, U. (2019). Young adults ' perceptions of social clock and adulthood roles in the Turkish Population. *Journal of Adult Development, 26*(2), 105–115. https://doi.org/10.1007/s10804-018-9298-9

Rahayu, W. D., Wahyuni, H., Mada, U. G., & Mada, U. G. (2020). The influence of early marriage on monetary. *Journal of Indonesian Economy and Business Volume, 35*(1), 30–43.

Rocha, F. D. A., Maesima, G. M., Wagner, A., & Alegre, P. (2024). Qualidade conjugal na etapa de formação da conjugalidade : Fatores preditores e moderadores. *Psico-USF, 26*(e267953), 1–16. https://doi.org/10.1590/1413-8271202429E267953

Sagalova, V., Zagre, N. M., & Vollmer, S. (2021). Long-term consequences of early marriage and maternity in West and Central Africa : Wealth , education , and fertility. *Journal of Global Health, 11*. https://doi.org/10.7189/jogh.11.13004

Salari, S. (2023). Family violence and abuse: An encyclopedia of trends , issues , and solutions: Volume 1-2. Elsevier.

Sandri, R., & Supraba, D. (2022). Marital satisfaction reviewed from interpersonal communication in couples who married in their teenagers. Prosiding Seminar Nasional Fakultas Psikologi Universitas Airlangga, September 2022, 218–224.

Schumm, W. R., Paff-bergen, L. A., Hatch, R. C., Obiorah, F. C., Janette, M., Meens, L. D., Bugaighis, M. A., Paff-bergen, L. A., Hatch, R. C., Obiorah, F. C., Copeland, J. M., Meens, L. D., & Bugaighis, M. A. (1986). Concurrent and discriminant validity of the kansas marital satisfaction scale. *Journal of Marriage and Family, 48*(2), 381–387.

Sezgin, A. U., & Punamäki, R. L. (2020). Impacts of early marriage and adolescent pregnancy on mental and somatic health: The role of partner violence. *Archives of Women's Mental Health, 23*(2), 155–166. https://doi.org/10.1007/s00737-019-00971-7

Sopyan, Y., Muttaqin, Z. Z., Solihat, C., & Aripin, J. (2023). Child exploitation by parents in early marriage: Case study in Cianjur West Java, Indonesia. *Samarah, 7*(3), 1921–1942. https://doi.org/10.22373/sjhk.v7i3.14804

Suyanto, B., Sugihartati, R., Hidayat, M. A., Egalita, N., & Mas'udah, S. (2023). The causes and impacts of early marriage: The ordeal of girls in East Java, Indonesia. *Sociologia, Problemas e Praticas, 101*, 71–94. https://doi.org/10.7458/SPP202310126851

Sztányi-Szekér, B., Högye-Nagy, Á., & Szemán-Nagy, A. (2025). Connection between satisfaction with relationship- , life , well-being and the development of the family structure. *Psychiatria Hungarica : A Magyar Pszichiatriai Tarsasag tudomanyos folyoirata, 37*(2), 124–132.

Tauseef, S., & Sufian, D. (2024). The causal effect of early marriage on women's bargaining power: Evidence from Bangladesh and Farha Deba Sufian. *The World Bank Economic Review, 38*(3), 598–624.

Tomar, S., A, M. B., Johns, N., H, M. P., Challa, S., Ph, D., Brooks, M. I., Ph, D., Aliou, S., Ph, D., Abdoul-moumouni, N., Ph, D., Raj, A., Ph, D., Silverman, J., & Ph, D. (2021). Associations of age at marriage with marital decision-making agency among adolescent wives in rural niger. *Journal of Adolescent Health, 69*(6), S74–S80. https://doi.org/10.1016/j.jadohealth.2021.08.007

Torabi, F., & Bagi, M. (2024). Determinants of early marriage in Iran: A multivariate survivorship analysis using census microdata. *International Journal of Adolescence and Youth, 29*(1). https://doi.org/10.1080/02673843.2024.2312849

Verma, S., & Nair, V. V. (2022). The Association between early marriage and intimate partner violence in Egypt the association between early marriage and intimate. *Journal of Loss and Trauma, 27*(5), 461–473. https://doi.org/10.1080/15325024.2021.2006970

Widyastari, D. A., Isarabhakdi, P., Vapattanawong, P., & Völker, M. (2020). Marital dissolution in postmodern java, Indonesia: Does early marriage increase the likelihood to divorce? *Journal of Divorce and Remarriage, 61*(8), 556–573. https://doi.org/10.1080/10502556.2020.1799308

Yadav, R., Dhillon, P., Kujur, A., & Patel, S. K. (2022). Association between school dropouts , early marriages , childbearing , and mental health in early adulthood of women: Evidence from a cohort study in Bihar , India. *International Journal of Population Studies, 8*(1), 25–37.

Yazdanpanahi, Z., & Beygi, Z. (2019). An investigation into the correlation of marital adaptation with stress , anxiety , depression and sexual function and its components. *21*(3), 264–269.

Zulfa, V., Hasanah, U., Kusaini, F., & Education, F. W. (2024). The phenomenon of early marriage and its impact on family resilience. 48–58.

Estimating the 10-year fracture risk among persons with HIV and persons without HIV: A comparative study

Iqbal Pramukti[1]*, Kusman Ibrahim[2], Mamat Lukman[1], Hasniatisari Harun[2], Andri Nugraha[3,4], Chung-Ying Lin[5,6,7]

[1] Department of Community Health Nursing, Faculty of Nursing, Universitas Padjadjaran, West Java, Indonesia
[2] Department of Medical Surgical Nursing, Faculty of Nursing, Universitas Padjadjaran, West Java, Indonesia
[3] Doctoral Program in Medical Sciences, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia
[4] Department of nursing, STIKes Karsa Husada Garut, Indonesia
[5] Institute of Allied Health Science, College of Medicine, National Cheng Kung University, Tainan, Taiwan
[6] Biostatistics Consulting Center, National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Tainan, Taiwan
[7] School of Nursing, College of Nursing, Kaohsiung Medical University, Kaohsiung, Taiwan

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 59-65
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2715

Article Info

Received : Januari 17, 2025
Revised : April 24, 2025
Accepted : April 27, 2025
Published : April 28, 2025

Corresponding author

Iqbal Pramukti*
Department of Community Health Nursing, Faculty of Nursing, Universitas Padjadjaran, West Java, Indonesia; Address: Hegarmanah, Jatinangor, Sumedang Regency, West Java, 45363, Indonesia; Phone: +6281221610581, E-mail: iqbal.pramukti@unpad.ac.id

Citation

Pramukti, I., Ibrahim, K., Lukman, M., Harun, H., Nugraha, A., & Lin, C. Y. (2025). Estimating the 10-year fracture risk among persons with HIV and person without HIV: A comparative study . *Jurnal Keperawatan Padjadjaran, 13*(1), 59-65. http://dx.doi.org/10.24198/jkp.v13i1.2715

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Abstract

Background: The risk of osteoporotic fracture among persons with HIV was higher than the persons without HIV. Traditional factors are also found as the risk factor affecting fracture risk among persons with HIV and general population. Predicting the fracture risk among the high-risk group is important to develop a comprehensive fracture prevention program.
Purpose: This study aimed to compare the estimation of the 10-year fracture risk between persons with HIV and persons without HIV using the FRAX™ algorithm.
Methods: This study recruited 245 participants from August to November 2023, while 221 participants agreed to participate. The participants consist of 107 persons with HIV and 114 persons without HIV. The estimation of the ten-year probability of major osteoporotic and hip fractures was calculated using the FRAX™ algorithm. The participant's characteristics related to osteoporotic fracture risk was analyzed using a Chi-Square analysis.
Results: The overall mean score of 10-year probability of major osteoporotic fracture (MOF) was 3.1% (SD 1.9) for the HIV group and 2.7% (SD 2.3) for non-HIV. For the 10-year probability, hip fracture (HF) risk was 0.5% (SD 0.5) for the HIV group and 0.6% (SD 0.9) for non-HIV. For MOF, HIV persons with fracture history showed a lower score (3.5%) compared to persons without HIV (5.3%). Smoker HIV persons showed the same MOF score (4.6% vs. 4.6%) but lower HF score (0.8% vs. 1.6%) when comparing to persons without HIV, respectively. HIV persons with glucocorticoid use showed a higher MOF probability score than persons without HIV (2.8% vs 2.7%).
Conclusion: The 10-year fracture risk was higher among persons with HIV compared to persons without HIV. Fracture history, smoking behavior, and glucocorticoid use were identified as the potential factors associated with the risk. Further analysis using multivariate regression analysis may require to confirm the factors associated with high fracture risk.

Keywords: FRAX™, hip fractures, HIV, osteoporotic fractures, 10-year risk of fracture

Introduction

Persons with HIV were having higher bone fracture risk as high as three times compared to the persons without HIV (Prieto-Alhambra et al., 2014). As a consequence, it may lead to an increase of up to 12% in non-AIDS-related mortality (Hasse et al., 2011). An earlier study found that bone fractures prevalence among persons with HIV was 11.1% (Ilha et al., 2018). According

to the guidelines of bone fracture management from the United States, all persons with HIV should be evaluated for their fracture risk using an estimation tool such as FRAX™ (Brown et al., 2015). The FRAX™ tool is an algorithm that integrates clinical risk factors, with or without the inclusion of bone mineral density measurements, to evaluate an individual's fracture risk (McCloskey, 2009).

Fracture is a disease related to the associated factors. Among persons with HIV, there were several types of factors may affect the fracture risk, including traditional, ART, and HIV-related factors (Bedimo et al., 2016; Bedimo et al., 2012; Gedmintas et al., 2017; Gonciulea et al., 2017; Pramukti, Liu, et al., 2020). Identifying fracture risk among the population with HIV is crucial to investigating the leading cause of fracture (McGee & Cotter, 2024). Therefore, further comprehensive prevention programs may link the baseline need (Brown et al., 2015).

Over five million individuals living with HIV reside in the Asia and Pacific region (UNAIDS, 2023). Nevertheless, limited research has examined fracture risk among persons with HIV within this population. Previous research demonstrated that individuals with HIV infection exhibit a higher fracture risk when comparing to the individual without HIV (Pramukti et al., 2020). Moreover, age was identified as a significant factor affecting fracture risk (Pramukti et al., 2020). However, it is still unclear whether HIV condition or older age that affecting the fracture risk more. The present study aimed to estimate the 10-year risk of major osteoporotic fractures (MOF) and hip fractures (HF) among persons with HIV and middle-age persons without HIV using the FRAX™ tool, as well as to identify HIV-specific and general risk factors associated with fracture risk.

Materials and Methods

Design

A multi-center cross-sectional study was conducted at outpatients in the center of Bandung Referral Hospital and Sumedang Referral Hospital.

Sample and setting

All persons with HIV attending the HIV outpatient clinic, as well as patients without HIV who visited the general medical outpatient clinic between August and November 2023, were invited to participate in the study. Patients with active opportunistic infections, those who declined participation, and pregnant individuals were excluded. Among the 245 eligible participants, 24 (9.7%) declined participation for unspecified reasons, resulting in a final sample of 221 participants (107 persons with HIV and 114 persons without HIV) who were consecutively enrolled. In addition to demographic information, participants provided data necessary for FRAX™ assessment.

Variable

The primary variable measured in this study was the 10-year fracture risk, calculated using the FRAX™ tool, which incorporates clinical risk factors such as age, sex, weight, history of previous fractures, parental history of hip fracture, current smoking status, glucocorticoid use, rheumatoid arthritis, secondary osteoporosis, and alcohol consumption (>3 units per day). Data on all clinical risk factors, except for bone mineral density (BMD), were collected through a structured questionnaire. The 10-year probability of major osteoporotic fractures (MOF) generated by the FRAX™ algorithm was expressed as an absolute percentage score (Brown et al., 2015).

Instruments

The FRAX™ algorithm served as the primary instrument in this study and has previously been validated in HIV-infected populations. A 2014 study conducted in the United States involving 17,387 HIV-positive male veterans and 7,064 HIV-negative male veterans demonstrated comparable predictive accuracy for osteoporotic fracture risk, with scores of 1.62 and 1.69, respectively ($p = 0.03$) (Yin & Falutz, 2016). Similarly, a study in Italy reported that the FRAX™ tool exhibited a sensitivity of 77.3% and a specificity of 69% ($p = 0.02$) in assessing fracture risk among 57 Caucasian HIV-positive and 50 HIV-negative men (Pepe et al., 2012).

Data collection

Following approval from the facility's Research Ethics Committee, data collection was conducted from mid-August to December 2023. Eligible patients were identified through the HIV/AIDS information system by the HIV case manager and subsequently referred to the research team during clinic visits. Written informed consent was obtained from all participants, who were then asked to complete the demographic and FRAX™ questionnaires. HIV-related clinical data were extracted from medical records provided by the HIV case manager.

Data analysis

The 10-year probabilities of major osteoporotic fractures (MOFs) and hip fractures were calculated by inputting the relevant data into the FRAX™ computerized algorithm. Descriptive analysis was performed to summarize the study variables. A Chi-Square was used to identify the participant's characteristics related to osteoporotic fracture risk. All statistical analyses were performed using SPSS software version 27 for Windows.

Ethical consideration

The IRB approval has been obtained from the Research Ethics Committee Universitas Padjadjaran with the registration number 1002/UN6.KEP/EC/2023. Prior to the data collection, the subjects were explained about the study procedures including the assurance of confidentiality and anonymity principles. Afterward, the subjects asked for their consent to join the study. Those

Table 1. Participant characteristic (n=221)

Variable	n (%)
Sex, male (%)	102 (46.2)
Age (years) (mean) (SD)	41.6 (13.8)
Body weight (kg) (mean + SD)	56.9 (11.8)
Body height (cm) (mean + SD)	157.6 (16.9)
Marital status	
Not married	71 (32.1)
Married	128 (57.9)
Divorced	22 (10.0)
HIV status	
HIV positive	107 (48.4)
HIV negative	114 (51.6
Traditional risk factor	
Fracture history (%)	12 (5.4)
Parental hip fracture history (%)	63 (28.5)
Smoking (%)	19 (8.6)
Glucocorticoid use (%)	63 (28.5)
Rheumatoid Arthritis (%)	41 (27.0)
Alcohol abuse (%)	12 (5.4)
HIV-related risk factor	
Viral load (copies) (n=76)	
- > 40/ml	14 (18.5)
- Undetectable	62 (81.5)
ART-related risk factor	
Currently using ART (%)	105 (47.5)

ART=anti-retroviral therapy; SD=standard deviations

Table 2. Characteristic of persons with HIV and persons without HIV (n=221)

Variable	HIV status		P value
	HIV (+) (n=107)	(HIV (-) (n=114)	
Sex, male (%)	64 (59.8)	38 (33.3)	<0.001
Age (years) (mean) (SD)	37.6 (11.8)	45.4 (14.4)	<0.001
Body weight (kg) (mean + SD)	56.7 (9.7)	56.9 (13.1)	0.910
Body height (cm) (mean + SD)	160.9 (16.7)	157.7 (8.2)	0.071
Marital status			<0.001
Not married	55 (51.4)	16 (14.1)	
Married	42 (39.3)	86 (75.4)	
Divorced	10 (9.3)	12 (10.5)	
Fracture history (%)	4 (3.7)	8 (7%)	0.282
Parental hip fracture history (%)	38 (35.5)	25 (21.9)	0.025
Smoking (%)	12 (11.2)	7 (6.1)	0.179
Glucocorticoid use (%)	29 (27.1)	34 (29.8)	0.654
Rheumatoid Arthritis (%)	19 (24.7)	22 (29.3)	0.518
Alcohol abuse (%)	9 (8.4)	3 (2.6)	0.058

SD=standard deviations

Table 3. Major Osteoporotic Fracture risk and the related factors among persons with HIV and persons without HIV (n=221)

Characteristic	MOF score (%)		P value
	HIV	non HIV	
Overall	3.1 (1.9)	2.7 (2.3)	
Sex			.250
Male	2.8 (1.6)	2.5 (2.1)	
Female	3.4 (2.4)	2.8 (2.4)	
Fracture history			.002
Yes	3.5 (1.3)	5.3 (4.3)	
No	3.0 (2.0)	2.5 (1.9)	
Parents' hip fracture history			.933
Yes	3.4 (1.8)	2.1 (1.5)	
No	2.8 (2.1)	2.9 (2.4)	
Smoking			<.001
Yes	4.6 (1.7)	4.6 (1.7)	
No	2.8 (1.9)	2.7 (2.1)	
Glucocorticoid used			.017
Yes	3.7 (2.3)	3.1 (2.1)	
No	2.7 (1.8)	2.6 (2.4)	
Arthritis rheumatoid			.641
Yes	2.8 (1.5)	2.7 (2.3)	
No	5.9 (4.7)	2.7 (2.3)	
Alcohol used			.308
Yes	2.4 (1.8)	6.7 (2.7)	
No	3.0 (2.0)	2.6 (2.2)	

HIV=human immunodeficiency virus; MOF=major osteoporotic fracture; HF=hip fracture

who agreed to participate were enrolled in the study. During the data collection, the privacy of the subjects was maintained. Those who decided to stop their participation were allowed without any consequences.

Results

Demographics

The characteristics of the participants showed more than half were male participants (n=102, 46.2%) with a mean age of 41.6 (13.8) years (Table 1). The mean body weight was 56.9 (11.8) kg, while the body height was 157.6 (16.9) cm. Most of the participants were married (n=128, 57.9%). The number of participants with HIV was 107 (48.4%), while the those without HIV were 114 (51.6%). There were only 12 (5.4%) participants reported having a fracture history, and 63 participants (28.5%) had parents' hip fracture history. Only 19 participants (8.6%) were a smoker, while 63 (28.5%) were on glucocorticoid therapy. Related to the comorbidity, 41 participants (27.0%) had Rheumatoid Arthritis. For HIV related factors, among the fifty-five tested participants, most of the participants (n=44, 80.0%) showed undetectable viral load. For the antiretroviral therapy (ART) related factors, among the persons with HIV, most participants (n=105, 98.1%) were on ART.

The characteristic of participants with HIV and participants without HIV is showed in Table 2. The male proportion in the HIV group were higher (59.8%) than in the non-HIV group (33.3%). For the age, the participant in the HIV group were younger (mean age of 37.6 years) than in the non-HIV group (mean age of 45.4 years). For the body weight, both group were similar (56.7 kg vs 56.9 kg). Non HIV group were mostly married (75.4%), while the married participants in the HIV group were only 39.3%.

Major Osteoporotic Fracture risk among persons with HIV and persons without HIV

For the 10-year probability of major osteoporotic fractures (MOF), overall, the mean score among participants with HIV with fracture history showed significantly higher scores than those without history (3.5 vs 3.0) (Table 3). Among participants without HIV, those with fracture history scored higher than those without (5.3 vs 3.5). Compared with persons

Table 4. Hip Fracture risk and the related factors among HIV and non-HIV (n=221)

Characteristic	HF		P value
	HIV	middle-age non-HIV	
Overall	0.5 (0.5)	0.6 (0.9)	
Sex			.577
Male	0.4 (0.5)	0.6 (1.0)	
Female	0.5 (0.7)	0.6 (0.9)	
Fracture history			.351
Yes	0.3 (0.3)	0.9 (1.7)	
No	0.4 (0.5)	0.6 (0.9)	
Parents' hip fracture history			.754
Yes	0.6 (0.5)	0.4 (0.8)	
No	0.4 (0.5)	0.6 (1.0)	
Smoking			.002
Yes	0.8 (0.6)	1.6 (1.9)	
No	0.4 (0.6)	0.5 (0.9)	
Glucocorticoid used			.087
Yes	0.6 (0.4)	0.7 (1.2)	
No	0.4 (0.6)	0.5 (0.8)	
Arthritis rheumatoid			.054
Yes	0.4 (0.4)	0.8 (1.5)	
No	1.4 (1.5)	0.6 (0.9)	
Alcohol used			.184
Yes	0.4 (0.5)	2.23 (1.6)	
No	0.4 (0.6)	0.6 (0.9)	

HIV=human immunodeficiency virus; HF=hip fracture

without HIV, persons with HIV with fracture history showed lower scores (3.5 vs 5.3). Furthermore, among persons with HIV, those who were smokers showed significantly higher scores than non-smoker participants (4.6 vs 2.8). Among participants without HIV, the smoker participants also showed higher scores than the non-smokers. Regarding the medical treatment, among persons with HIV, those who had undergone glucocorticoid use showed higher scores than those who had not (3.7 vs 2.7). Among the persons without HIV, the participants with glucocorticoid use also showed higher scores than those who were not (3.1 vs. 2.6).

Hip fracture risk among persons with HIV and persons without HIV

For the 10-year probability of hip fractures (HF), among persons with HIV, the smoker participants showed higher scores than the non-smokers (0.8 vs 0.4) (Table 4). Among the participants without HIV, the smoker participants also showed higher score than those without history (1.6 vs 0.5). Compared to the persons without HIV who were smoking, the smokers persons with HIV group showed a lower score (0.8 vs 1.6).

Discussion

The study showed the various fracture risk scores according to the related factors. The primary finding of this study was that the 10-year risk of both major osteoporotic fractures (MOFs) and hip fractures (HFs) was predominantly higher among persons with HIV who exhibited several risk factors, including a history of fractures, parental history of hip fractures, smoking behavior, and glucocorticoid use. In contrast, HIV-related factors such as antiretroviral therapy (ART) duration, tenofovir disoproxil fumarate (TDF) exposure, and a history of drug and alcohol abuse were not associated with an increased risk of MOFs or hip fractures. Our earlier study in 2020 found that the factors affecting 10-year fracture risk among HIV-infected persons included age, fracture history, and HCV coinfection (Pramukti, Lindayani, et al., 2020; Pramukti Liu et al., 2020). Similar factors were found in another two studies explaining how traditional factors play an important role in affecting the fracture risk among persons with HIV (Gedmintas et al., 2017; Jiang et al., 2013)

When comparing between persons with HIV and persons without HIV group, the present study

findings suggested that the persons without HIV with fracture history showed a higher MOF score than HIV group. This difference may be due to the different age ranges among the two groups. In earlier studies, age has been found as a significant risk factor affecting fracture risk among HIV and non-HIV, as the non-HIV group is consisted of participants with older age than the HIV group (Pramukti et al., 2020; Ye et al., 2024). Furthermore, fracture history among the older population may affect their fracture risk more than the younger population (Honkanen et al., 1997; Ye et al., 2024).

Another possible risk factor for persons with HIV having fracture was associated with smoking behavior. Our study showed the same major osteoporotic fracture score between smokers with HIV and smokers in the non-HIV group. However, for the hip fracture, the middle-aged HIV group showed a higher score, which indicates smokers who are older in the general population may be at higher risk compared to smokers who are younger in the HIV population. This finding may be relevant to the previous study stating that a combination of smoking behavior and older age may affect a higher fracture risk than a smoker in the HIV population (Olofsson et al., 2005).

The use of glucocorticoid is also common among persons with HIV and may affect the fracture risk. In our study, persons with HIV with glucocorticoid use showed a higher major osteoporotic fracture risk than the non-HIV with glucocorticoid use. It indicates that the use of glucocorticoids among the HIV population may impact more fracture risk than among the middle-aged persons without HIV. This finding is relevant to a previous study which found that persons with HIV undergoing protease inhibitors may affect their bone loss (Moran et al., 2016).

Strengths and limitations of the study

Our study compared the fracture risk between persons with HIV and persons without HIV. Several limitations were found in this study. First, the different age ranges between HIV and non-HIV groups may be found as the confounding factor. However, the new finding on how the two factors, including HIV disease and older age, affect the fracture risk and the large sample size employed may overcome the limitation found. Furthermore, the multi-center used in this study design may improve the sample's representativeness and the finding of generalizability. Another limitation in this study is that the estimation of fracture risk did not consider bone mineral density (BMD) measurement in the laboratory. Therefore, it may affect the fracture risk score. However, FRAX™ is also reliable when calculating the fracture risk without the BMD data. In addition, the large sample size included may overcome the limitation.

Nursing Implication

This study predicted the fracture risk among persons with HIV persons as the vulnerable population for 10 years. The finding may be beneficial as the baseline data to determine the health promotion program in the nursing care, particularly among HIV populations. In addition, as the findings found how the risk differs in different groups, it may be beneficial for determining the specific program related to fracture prevention among those groups.

Conclusions

The 10-year fracture risk was elevated in persons with HIV who presented with multiple factors, such as a history of fractures, smoking behavior, and glucocorticoid use, compared to persons without HIV. Further investigation using multivariate regression analysis is necessary to confirm the specific factors associated with an increased fracture risk.

Declaration of Interest

There was no conflict of interest in this study

Acknowledgment

This study was supported by Universitas Padjadjaran.

Funding

None

Data Availability

None

References

Bedimo, R., Maalouf, N. M., & Lo Re, V., 3rd. (2016). Hepatitis C virus coinfection as a risk factor for osteoporosis and fracture. *Curr Opin HIV AIDS, 11*(3), 285-293. https://doi.org/10.1097/coh.0000000000000259

Bedimo, R., Maalouf, N. M., Zhang, S., Drechsler, H., & Tebas, P. (2012). Osteoporotic fracture risk associated with cumulative exposure to tenofovir and other antiretroviral agents. *Aids, 26*(7), 825-831. https://doi.org/10.1097/QAD.0b013e32835192ae

Brown, T. T., Hoy, J., Borderi, M., Guaraldi, G., Renjifo, B., Vescini, F., Yin, M. T., & Powderly, W. G. (2015). Recommendations for evaluation and management of bone disease in HIV. *Clin Infect Dis, 60*(8), 1242-1251. https://doi.org/10.1093/cid/civ010

Gedmintas, L., Wright, E. A., Dong, Y., Lehmann, E., Katz, J. N., Solomon, D. H., & Losina, E. (2017). Factors associated with fractures in HIV-infected persons: Which factors matter? *Osteoporos Int, 28*(1), 239-244. https://doi.org/10.1007/s00198-016-3704-6

Gonciulea, A., Wang, R., Althoff, K. N., Palella, F. J., Lake, J., Kingsley, L. A., & Brown, T. T. (2017). An increased rate of fracture occurs a decade earlier in HIV+ compared with HIV- men. *Aids, 31*(10), 1435-1443. https://doi.org/10.1097/qad.0000000000001493

Hasse, B., Ledergerber, B., Furrer, H., Battegay, M., Hirschel, B., Cavassini, M., Bertisch, B., Bernasconi, E., & Weber, R. (2011). Morbidity and aging in HIV-infected persons: The Swiss HIV cohort study. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America, 53*(11), 1130-1139.

Honkanen, R., Tuppurainen, M., Kroger, H., Alhava, E., & Puntila, E. (1997). Associations of early premenopausal fractures with subsequent fractures vary by sites and mechanisms of fractures. *Calcif Tissue Int, 60*(4), 327-331. https://doi.org/10.1007/s002239900237

Ilha, T., Comim, F. V., Copes, R. M., Compston, J. E., & Premaor, M. O. (2018). HIV and vertebral fractures: A systematic review and metanalysis. *Sci Rep, 8*(1), 7838. https://doi.org/10.1038/s41598-018-26312-9

Jiang, X., Westermann, L. B., Galleo, G. V., Demko, J., Marakovits, K. A., & Schnatz, P. F. (2013). Age as a predictor of osteoporotic fracture compared with current risk-prediction models. *Obstet Gynecol, 122*(5), 1040-1046. https://doi.org/10.1097/AOG.0b013e3182a7e29b

McCloskey, E. (2009). Identifying people at high risk of fracture International Osteoporosis Foundation. https://www.osteoporosis.foundation/sites/iofbonehealth/files/2020-04/FRAX-Identifying-People-At-High-Risk-of-Fractures.pdf

McGee, D. M., & Cotter, A. G. (2024). HIV and fracture: Risk, assessment and intervention. *HIV Med, 25*(5), 511-528. https://doi.org/10.1111/hiv.13596

Moran, C. A., Weitzmann, M. N., & Ofotokun, I. (2016). The protease inhibitors and HIV-associated bone loss. *Curr Opin HIV AIDS, 11*(3), 333-342. https://doi.org/10.1097/coh.0000000000000260

Olofsson, H., Byberg, L., Mohsen, R., Melhus, H., Lithell, H., & Michaëlsson, K. (2005). Smoking and the risk of fracture in older men. *J Bone Miner Res, 20*(7), 1208-1215. https://doi.org/10.1359/jbmr.050208

Pepe, J., Isidori, A. M., Falciano, M., Iaiani, G., Salotti, A., Diacinti, D., Del Fiacco, R., Sbardella, E., Cipriani, C., Piemonte, S., Romagnoli, E., Lenzi, A., & Minisola, S. (2012). The combination of FRAX and Ageing Male Symptoms scale better identifies treated HIV males at risk for major fracture. *Clin Endocrinol (Oxf), 77*(5), 672-678. https://doi.org/10.1111/j.1365-2265.2012.04452.x

Pramukti, I., Lindayani, L., Chen, Y. C., Yeh, C. Y., Tai, T. W., Fetzer, S., & Ko, N. Y. (2020). Bone fracture among people living with HIV: A systematic review and meta-regression of prevalence, incidence, and risk factors. *PLoS One, 15*(6), e0233501. https://doi.org/10.1371/journal.pone.0233501

Pramukti, I., Liu, H. Y., Chen, C. C., Chen, Y. C., Yeh, C. Y., Fetzer, S., Ibrahim, K., Tai, T. W., Ko, W. C., & Ko, N. Y. (2020). HCV co-infection among people living with HIV Is associated with Higher fracture risk. *J Infect Public Health, 13*(11), 1724-1728. https://doi.org/10.1016/j.jiph.2020.06.020

Prieto-Alhambra, D., Güerri-Fernández, R., De Vries, F., Lalmohamed, A., Bazelier, M., Starup-Linde, J., Diez-Perez, A., Cooper, C., & Vestergaard, P. (2014). HIV infection and its association with an excess risk of clinical fractures: A nationwide case-control study. *J Acquir Immune Defic Syndr, 66*(1), 90-95. https://doi.org/10.1097/qai.0000000000000112

UNAIDS. (2023). The HIV Epidemic in Asia and the Pacific. https://unaids-ap.org/wp-content/uploads/2023/07/asia-pacific-2023-global-aids-update-summary-report-1.pdf

Ye, C., Morin, S. N., Lix, L. M., McCloskey, E. V., Johansson, H., Harvey, N. C., Kanis, J. A., & Leslie, W. D. (2024). Age at first fracture and later fracture risk in older adults undergoing osteoporosis assessment. *JAMA Netw Open, 7*(12), e2448208. https://doi.org/10.1001/jamanetworkopen.2024.48208

Yin, M. T., & Falutz, J. (2016). How to predict the risk of fracture in HIV? *Curr Opin HIV AIDS, 11*(3), 261-267. https://doi.org/10.1097/coh.0000000000000273

The impact of interactive video-based exercise on quality of life among pregnant women in Indonesia: A pilot study

Dewi Marfuah[1,2], Tukimin bin Sansuwito[1*], Rathimalar Ayakannu[3]

[1] Faculty of Nursing, Lincoln University College Malaysia, Malaysia
[2] Diploma III program, Sekolah Tinggi Ilmu Keperawatan PPNI Jawa Barat
[3] Faculty of Applied Science, Lincoln University College Malaysia, Malaysia

Abstract

Background: Pregnant women experience lower quality of life compared to the general population and experience a decrease in their quality of life as their pregnancy progresses. Video interactive provides an interesting and interactive environment, so participants would be more likely to enjoy completing their physical activity regimen.
Purpose: This study aimed to determine the impact of video interactive-based exercise on quality of life among pregnant women in Indonesia.
Methods: A quasi-experimental study was carried out in Bandung, West Java, Indonesia from August 2023 to January 2024. The intervention and control groups involved healthy pregnant women aged above 18 years old, second trimester pregnant, advised by healthcare, literate, and willing to participate in physical activity. The study involved 264 pregnant women, with a response rate of 96%. Data was collected before (T0), immediately after (T1), and 2 weeks after the intervention (T2). The videos covered combination of exercise program for pregnant women, including warm-up, main phase (with an aerobic element, followed by strength and endurance exercises) and final stretching and relaxation. quality of life was measure using quality of life Gravidarum. The analysis was evaluated using repeated ANOVA test and difference-in-difference estimate.
Results: After a two-week follow-up, the intervention group showed a substantial increase in quality of life scores, with a moderate level of impact (effect size= 0.39). The difference-in-difference estimate showed a modest increase of 3.57 percentage points between groups.
Conclusion: The study demonstrated that video interactive exercise significantly improved the quality of life for pregnant women, indicating the potential for encouraging their participation in such activities.

Keywords: exercise, pregnant women, quality of life, video interactive

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 66-73
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2565

Article Info

Received : July 03, 2024
Revised : April 20, 2025
Accepted : April 26, 2025
Published : April 28, 2025

Corresponding author

Tukimin bin Sansuwito*
Faculty of Nursing, Lincoln University College Malaysia, Malaysia; Address: Wisma Lincoln, No. 12-18, Jalan SS 6/12, 47301 Petaling Jaya, Selangor Darul Ehsan, Malaysia.; Phone: +603-7806 3478; E-mail: tukimin@lincoln.edu.my

Citation

Marfuah, D., Sansuwito, T., & Ayakannu, R. (2025). The impact of interactive video-based exercise on quality of life among pregnant women in Indonesia: A pilot study. *Jurnal Keperawatan Padjadjaran, 13*(1), 66-73. http://dx.doi.org/10.24198/jkp.v13i1.2565

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Introduction

Quality of life (QoL) is defined by the World Health Organization (WHO) as “an individual’s perspective on their own life in light of their own cultural and value system, and in light of the importance they attribute to various aspects of their own life” (WHO, 2012). A previous study found that pregnant women experience lower quality of life compared to the general population and experience a decrease in their quality of life as their pregnancy progresses (Boutib et al., 2022a; Lagadec et al., 2018). Pregnant women at third trimester showed lower quality of life than in first and second trimester (Boutib et al., 2022b). Quality of life is influenced by material living conditions, psychosocial risks, work-related ill-being, lack of confidence in society, weak social ties, economic and physical insecurities, and health ; (Boutib et al., 2022a; Divilly et al., 2022; Lagadec et al., 2018; Shams et al., 2022) Prenatal quality of life can negatively affect postpartum life, increasing the risk of postpartum depression, labor complications, or birth defects (Mogos et al., 2013).

Physical activity is a modifiable health risk factor that positively impacts

maternal mental health and quality of life. The 2019 Canadian guideline for physical activity during pregnancy advises all pregnant women, except those with contraindications, to engage in at least 150 minutes of moderate-intensity physical activity, at least three days per week, to achieve clinically meaningful health benefits and reduce pregnancy complications (Vargas-Terrones et al., 2019) Women with higher quality of life reported higher energy expenditures related to occupational, sport/ exercise, and strenuous activities (Krzepota et al., 2018). Pregnancy-induced physical activity can reduce fatigue, tension, anxiety, and depression, and enhance breastfeeding outcomes (Nguyen et al., 2018; Vargas-Terrones et al., 2019). Another study suggested that prenatal exercise positively impacts prenatal depression but not anxiety or postpartum depression (Davenport et al., 2019; Takeishi et al., 2019). Ameta-analysis found that exercise significantly reduces anxiety and stress levels, improving overall quality of life (Liu et al., 2019). Despite its advantages, studies show a significant decrease in prenatal physical activity among pregnant women (Cooper et al., 2020; T. L. C. Nascimento et al., 2021). A study found that 75.2% of 109 pregnant women were sedentary, with slow walking being the most common type of exercise (Szablewska et al., 2023). Similarly, a study in Indonesia found that over half of pregnant women were sedentary (Astuti et al., 2021).

In Indonesia, intervention to promote quality of life among pregnant women have been studied. For example, using application-based education with social cognitive therapy, however the study focuses on pregnant women with gestational diabetic mellitus (Ariyani et al., 2022). Additionally, mindfulness interventions, progressive muscle relaxation, and murothal Al-Qur'an therapy have shown significant improvements in the quality of life of pregnant women (Aswitami et al., 2021; Indrawati et al., 2022). However, these interventions often require multiple in-person sessions, limiting accessibility for women in rural or resource-limited settings.

Interactive video-based interventions offer unique advantages compared to traditional or static approaches. Unlike standard in-person or app-based programs, interactive video formats can enhance engagement and adherence through real-time feedback, visual demonstrations, and customizable pacing. These features make the intervention more enjoyable and user-friendly, potentially improving long-term compliance. Additionally, video interventions can be accessed remotely, eliminating geographical barriers and allowing for greater scalability. Recent evidence suggests that video-based interventions can effectively increase physical activity levels in pregnant women, contributing to better maternal and fetal outcomes (Wowdzia et al., 2021). Structured exercise programs delivered via digital platforms have been shown to reduce anxiety and depression, enhance mental health, and improve overall quality of life (Sbrilli et al., 2020; Yang et al., 2019). By integrating interactive features tailored to the needs of pregnant women, this approach could amplify these benefits, offering a holistic solution for improving both physical and psychological health during pregnancy.

While previous interventions have demonstrated some effectiveness in enhancing quality of life, there is a limited focus on scalable, accessible, and culturally relevant solutions that integrate physical activity into pregnancy care (Sbrilli et al., 2020; Wowdzia et al., 2021; Yang et al., 2019). Few studies have investigated the use of technology, specifically video-based interactive interventions, to address the dual physical and psychological challenges faced by pregnant women, particularly in Indonesia. Therefore, this study aimed to determine the impact of video interactive-based exercise on quality of life among pregnant women in Indonesia.

Materials and Methods

Study design

A quasi-experimental study was carried out in Bandung, West Java, Indonesia from August 2023 to January 2024. Data was collected before (T0), immediately after (T1), and 2 weeks after the intervention (T2).

Sample

The inclusion and exclusion criteria for both intervention and control groups were as follows: healthy pregnant women aged 18 years or older, pregnant women in their second trimester, advised by a healthcare professional to engage in physical activity, literate, and willing to participate in the study. Pregnant women with mental health issues or pregnancy complications were excluded. Participants underwent a preliminary screening process conducted by healthcare professionals to ensure they met the inclusion and exclusion criteria. This process involved interviews, a review of medical records, and a short physical examination to confirm eligibility.

The sample size was calculated using G-Power Software Version 3.1.9.4 for a t-test, with a significance level of 0.05, an estimated effect size of 0.40 (Cohen, 1992), a power level of 0.80, two groups, and three repeated measures.

Participants were allocated to either the intervention or control group using a convenience sampling method. Allocation was performed sequentially based on the order of enrollment until the required sample size for each group was achieved. While convenience sampling may have limitations in randomization, efforts were made to ensure baseline characteristics between the groups were comparable through statistical analysis prior to the intervention.

Instrument

The demographic data sheet included information on pregnant women, such as age (in years at time of

data collection), level of education (primary school, secondary school, university or college), occupation (yes/no), gestational age (in week at time of data collection), parity (number of live children), and body mass index (body wight and height).

The quality of life gravidarum (QOL-GRAV) is a questionnaire designed to assess the quality of life of women during normal pregnancy (Zarei et al., 2018). It consists of nine items, rated on a 5-point Likert scale, and is designed as a supplement to the WHOQOL-BREF. Some items are supplemented by open-ended questions for more detailed descriptions of changes during pregnancy and coping strategies. The interpretation of the QOL-GRAV scale suggests that a lower score indicates a higher quality of life. The mean scores of the QOL-GRAV scale are generally lower than those of the WHOQOL-BREF questionnaire. The quality of life is rated as outstanding (9–18 points), very good (19–27 points), good (28–36 points), and not very good (937–45 points) based on the total score. The internal reliability in original study was 0.72 to 0.75 (Vachkova et al., 2013). The internal reliability in this study was 0.86.

Intervention

The intervention was intended for pregnant women who qualified based on the study's inclusion criteria. Immediately after undergoing the baseline assessments, participants assigned to the intervention group received access (via text message) to a standardized interactive video. This video was created to equalize access to the UEC and a guided, structured exercise regimen, consistent with established clinical practice guidelines. The intervention was conducted over four weeks, initiated by a 90-minute education and support session led by trained nurses and research personnel in week 1.

The video was a joint effort created by a multidisciplinary team, including a maternal health nurse educator, an exercise physiologist and an obstetrician. Its design was guided by evidence-based recommendations, exercise protocols tailored to accommodate the particular safety and health needs of pregnant women (adapted from Aguilar Cordero et al., 2016). The video content was validated by three external experts (1 senior obstetrician, 1 prenatal physiotherapy specialist and 1 midwifery academic) prior to its usage in the study to assess its clinical relevance, clarity and cultural appropriateness. To improve the instructional quality and usability of the video, it was revisited and reviewed multiple times based on their feedback.

The finished video clocked at around 45 minutes and was broken into sections, including a warm up, aerobic portion, strength and endurance exercises, cool down and stretching and relaxation section. To avoid any confusion and miscommunication through verbal strategies instead (tapping and clapping), visual columns were added. The video even had interactive elements where participants could pause and practice movements in real-time and then also be prompted to do self-reflection. They were specifically crafted to encourage action, inspire trust, and reinforce learning.call to action

Eight trained research assistants were recruited (two for each intervention group) with a nursing or public health background, who delivered the program. These assistants also were tasked with onboarding participants, providing technical support, and conducting weekly follow-ups and logbook reviews. In the first 90-minute session, the nurse and the designated assistant led participants through the exercises to ensure they were performed correctly and that it was safe to do so, particularly for exercise at home. All participants were provided with a standardized logbook for self-monitoring purposes. They were asked to log their daily exercise regimes such as duration, heart rate (assessing at home manually or using a personal device), perceived level of exertion and issues or discomfort encountered. Research assistants reviewed these records via phone or video consultations on a weekly basis. In addition, participants were provided coaching on how to stay within the protocol if deviations were identified.

The informational session also highlighted goal-setting as a source of motivation. Participants were invited to use their subjective definitions of minimum physical activity levels, validated with weekly SMS or telephone reminders. The lead researchers developed a standard reminder template to ensure a consistent approach to communication. This template could be easily tailored to each participant while maintaining the essence of the message, the research assistants could simply adjust the wording or drop unnecessary details. Each research assistant contributed an average of 8 to 16 hours per week of study support, depending on the needs for onboarding participants and monitoring their adherence. The core research team provided both in-person and virtual support to maintain fidelity to the intervention. A coordinated training initiative was developed for the entire team, as well as a detailed implementation protocol to ensure standardization of intervention delivery across study sites.

The control group continued receiving standard clinical care without the physical activity program and without additional supports. The participants in both the intervention and control groups were monitored during the entire study for adherence to the protocol and to keep the research outcomes valid.

Procedure

Prior to implementing the intervention, baseline data was collected using a standardized questionnaire that was sent using the Google Form platform. To minimize the possibility of inaccurate data entry or participant confusion, the form was filled out with detailed, step-by-step instructions. Eight competent study assistants, all with degrees in nursing, lent

Table 1. Demographic comparison between intervention and control group (N=240)

Variables	Intervention group n=120 (%)	Control group n=120 (%)	p-value
Age, years, Mean ± SD	26.67 ± 4.65	27.13 ± 3.25	0.672
Education level			0.134
Primary school	45 (37.5)	40 (33.3)	
Secondary school	63 (52.5)	64 (53.3)	
Higher than secondary school	12 (10)	16 (13.3)	
Employment status			0.076
Yes	45 (37.5)	52 (43.3)	
No	75 (62.5)	68 (56.7)	
Gestational age (years), Mean ± SD	20.3 ± 3.55	21.9 ± 2.11	0.228
Number of children, Mean ± SD	2.1± 0.23	2.5 ± 0.41	0.089
Body mass index, Mean ± SD	28.21± 4.56	29.01 ± 5.01	0.176

Table 2. Within group comparison of quality of life using ANOVA and Cohen's d test

Variable	T0	T1	T2	F	ANOVA Test	Cohen's d
	Mean ± SD	Mean ± SD	Mean ± SD		p-value	
Intervention group	85.51 ± 12.8	90.11 ± 17.4	92.54 ± 20.33	13.76	0.001	0.39
Control group	87.32 ± 15.5	86.76 ± 13.2	83.34 ± 15.7	-2.32	0.037	0.03

Note: P < 0.05 are considered significant; Note: before (T0), immediately after (T1), 2 weeks after the intervention (T2), respectively.

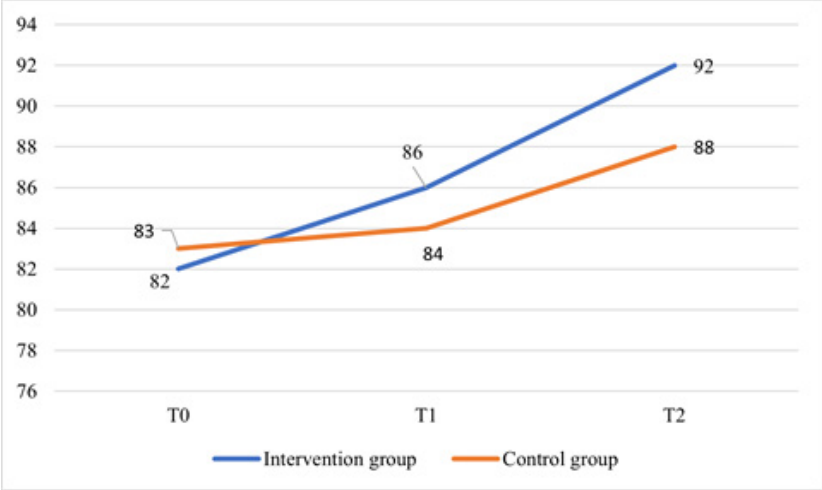


Figure 1. Change in quality of life between intervention and control groups overtime
Note: DDE: difference-in-difference estimate; ***: p < 0.001

credence to this method by walking participants through each step. These assistants are available in real-time via Zoom meetings and can handle issues like answering inquiries, clarifying concepts, fixing technical issues, and checking the accuracy of submitted answers.

The intervention consisted of a four-week exercise program led by videos that aimed to enhance stability, stamina, and strength. Physiotherapists, sports science professors, and nurse educators with expertise in community health were the members of the interdisciplinary team who collaborated to develop the exercise program. The program was tailored to the specific needs and skills of the study group, based on evidence-based recommendations for functional fitness. Prior to its implementation, the video was given the go light by rehabilitation experts who were well-versed in home-based exercise

programs. The clinical relevance, instructional clarity, and safety of the exercises were ensured by their remarks, especially for unmonitored use. Ten participants who were not included in the main study saw the film as a pilot to see how well it was understood and how easy it was to use.

A total of two hundred forty-four people were involved in the study. Their participation in the intervention was closely monitored by both the primary researchers and the research assistants. Contributions were time-stamped, participants were invited to join a specialized WhatsApp group, and participants were asked to check in at certain intervals during the week. Each research assistant had 33 participants to assist, compliance to be tracked weekly, and any signs of disengagement or lack of reactivity to be reported immediately to the primary investigator. To ensure that participants would respond to the post-intervention assessment, we used both email and WhatsApp to send them reminders. In order to guarantee consistency in communication, the research team developed a standardized message template. Reminders were sent two days before to the scheduled submission, on the day of the actual due date, and a third time two days later in the event that no response had been obtained.

Two weeks after the conclusion of the program, data was collected using the same Google Form platform used for the baseline survey. The study team oversaw the whole data collection and monitoring process; it consisted of two primary investigators and three associate researchers. In order to ensure consistency in procedures, the team had an alignment meeting before the intervention. Consistent check-ins during the intervention period ensured that all study participants cooperated and followed the procedure.

Data analysis

The analyses included frequency, mean, and standard deviation. The average difference in quality of life score overtime was calculated using repeated measure ANOVA test. The effect size was computed using the Cohen's d test. The efficiency of the intervention was evaluated using a difference-in-difference estimate (DDE). SPSS version 26 was used to code and analyze the data.

Ethical consideration

The research was approved by the International Review Board (IRB) of STIKep PPNI Jawa Barat, Indonesia. Before data collection, a detailed explanation of the study's objectives, methodologies, potential risks, and benefits was provided to all participants through an information session conducted online. Participants were assured of the confidentiality and anonymity of their responses, in line with ethical research practices. Written informed consent was obtained from each participant electronically using a Google Form consent sheet. Data were securely stored on a password-protected cloud platform accessible only to the research team, further safeguarding participants' privacy.

Results

The baseline data gathering involved 264 pregnant women in a cohort, with 20% of patients choosing not to participate, resulting in a response rate of 96%. The intervention group had an average age of 27.13 years and a standard deviation of 3.25. Furthermore, 52.5% of the participants had finished senior high school education. The mean gestational age was determined to be 20.3 ± 3.55 weeks. The mean number of children reported by the participants was 2.1 ± 0.23. The average body mass index (BMI) was determined to be 28.21 ± 4.56 (Table 1).

In the control group, the average age was 21.9 ± 2.11, and 53.3% of individuals had completed senior high school education. The mean gestational age was 35.9 years with a standard deviation of 2.11, the mean number of children was 2.5 with a standard deviation of 0.41, and the mean body mass index was 29.01 with a standard deviation of 5.01. No statistically significant differences were observed between the intervention and control groups regarding age, education, gestational age, number of children, and body mass index ($p>0.05$) (Table 1).

The repeated measures analysis of variance (ANOVA) showed a substantial rise in quality of life scores within the intervention group following a two-week follow-up. The effect size of 0.39 indicates a moderate level of impact. There was no significant increase in quality of life in the control group, as indicated by an effect size of 0.03, suggesting a negligible impact size (Table 2).

Figure 1 illustrates the change in quality of life over time in both the intervention and control groups. The intervention group saw an improvement in their overall quality of life score from T0 to T2. The difference-in-difference estimate (DDE) showed a modest rise of 3.57 percentage points. Throughout the trial period, the control group did not show any statistically significant improvement in quality of life.

Discussion

This study demonstrated that video interactive-based exercise led to a significant improvement in quality of life scores. The significant improvement in quality of life scores observed with video interactive-based exercise aligns with growing evidence supporting the role of digital health interventions in enhancing physical and mental well-being. Previous studies have shown that technology-mediated exercise programs can facilitate greater engagement and adherence compared to traditional exercise modalities (Zheng et al., 2023). The interactive nature of video-based exercises may promote a more enjoyable and accessible fitness experience, potentially reducing barriers such as lack of motivation and time constraints. According to a systematic review by Smith et al., 2022, participants

in video-based interventions reported higher levels of satisfaction and perceived enjoyment, which are crucial factors in maintaining long-term physical activity.

Moreover, the social components often integrated into these programs—such as virtual classes or community challenges—can foster a sense of belonging and support, further enhancing participants' motivation and commitment (Johnson et al., 2024). This aligns with the findings of Villa-(García et al., 2023), who noted that social support mechanisms are critical in improving exercise adherence and overall mental health outcomes. In addition, the COVID-19 pandemic has accelerated the adoption of digital health solutions, leading to a greater focus on home-based exercise interventions. The versatility of video-based exercise can cater to diverse populations, including those with limited mobility or those living in remote areas, thus broadening access to quality health resources (Thorpe et al., 2023).

Finally, while the results are promising, future research should explore the long-term effects of video interactive-based exercise on quality of life and investigate the specific components that contribute most significantly to these improvements. Tailoring interventions to individual preferences and needs may further enhance their effectiveness (Fang et al., 2024).

A systematic review found that exercise had a significant positive impact on the quality of life of pregnant women. Additionally, two out of the four studies indicated that resistance training could enhance the quality of life of pregnant women. This review presents evidence that exercise is a practical, acceptable, and beneficial intervention for improving women's quality of life during pregnancy, despite inconsistent outcomes from different studies (Liu et al., 2019). Barakat et al., (2011)conducted a study on 80 healthy pregnant women. The experimental group engaged in a moderate exercise program (35–45 min) three days a week from weeks 6–8 to 38–39 of pregnancy. These authors, like us, found that engaging in a program of moderate physical activity throughout all three trimesters of pregnancy enhances the mother's subjective health condition. Nevertheless, other research studies did not demonstrate a notable improvement in the quality of life for overweight/obese women who exercise (S. L. Nascimento et al., 2011) or pregnant women who engage in water gymnastic training (Vallim et al., 2011).

This study found a significant difference between groups in terms of quality of life. These basic nursing measures are part of daily patient care and nurses provide conventional oral education so frequently that presenting this education through video interactive exercises may not seem different to the patient. Video interactive-based exercise helps patients grasp the technique before the actual exercise, avoiding the need to absorb important information at inconvenient moments. Traditional educational approaches are typically carried out by healthcare professionals to instruct patients on exercising at a specific period. Patients frequently forget steps and need guided re-training for complex exercise routines at the end of their education. The intervention group in the study may independently evaluate the processes using interactive films, allowing them to preview the exercise process and revisit the experience as many times as necessary. However, the data could not be analyzed for the long-term effects of the intervention due to the absence of long-term follow-up. The research design can be enhanced in the future.

This study is a quasi-experimental study that is prospective in nature, where the intervention comes before the effect, establishing a very convincing causal relationship with feasibility and practicality. Clinical nursing research often use this method, which lacks randomized grouping and a control group, making it challenging to conclusively ascribe the results to the intervention, therefore reducing its credibility compared to experimental trials. The baseline surveys for the control group and intervention group in this study were uniform. Simultaneously, when comparing the two groups during the same timeframe, giving video access just to the intervention group could lead to interference causing a halo effect as a result of sharing the videos.

Conclusion

A video interactive exercise showed a significant enhancement in the quality of life for pregnant women. This study showed that it is possible to encourage pregnant women to engage in video interactive-based exercise. Future studies could conduct a long-term study to assess the sustained effects of video interactive exercises on the quality of life for pregnant women throughout different trimesters and postpartum. Moreover, examine the role of user engagement with video interactive content (e.g., frequency of use, preference for types of exercises) in influencing quality of life improvements.

Declaration of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Acknowledgments

We thank all the study participants for their cooperation.

Funding

This study was supported by STIKep PPNI Jawa Barat, Indonesia.

Data availability

The raw data supporting the conclusions of this

article will be made available as requested to the corresponding authors.

References

Aguilar Cordero, M. J., Rodríguez Blanque, R., Sánchez García, J. C., Sánchez López, A. M., Baena García, L., & López Contreras, G. (2016). Influencia del programa SWEP (Study Water Exercise Pregnant) en los resultados perinatales: protocolo de estudio. *Nutricion Hospitalaria, 33(*1), 156–161. https://doi.org/10.20960/nh.28

Ariyani, N. W., Wirawan, I. M. A., Pinatih, G. N. I., & Kusuma, A. A. N. J. (2022). The effect of an application-based educational intervention with a social cognitive theory model on pregnant women in Denpasar, Bali, Indonesia: A randomized controlled trial. *Osong Public Health and Research Perspectives, 13*(2), 153. https://doi.org/10.24171/j.phrp.2021.0209

Astuti, I. P., Sugita, S., & Mulati, T. S. (2021). The effect of pregnancy exercise on third trimester primigravida anxiety in dealing with childbirth. *Jurnal Kebidanan Dan Kesehatan Tradisional,* 76–83. https://doi.org/10.37341/jkkt.v0i0.227

Aswitami, N. G. A. P., Darma, I. G. G. M. S., & Ardi, N. M. S. M. (2021). The Effect of progressive muscle relaxation technique (PMRT) on the quality of life of third trimester pregnant women at Public Health Centre II, West Denpasar District. *Jurnal Profesi Medika: Jurnal Kedokteran Dan Kesehatan, 15*(2).

Barakat, R., Pelaez, M., Montejo, R., Luaces, M., & Zakynthinaki, M. (2011). Exercise during pregnancy improves maternal health perception: A randomized controlled trial. *American Journal of Obstetrics and Gynecology, 204*(5), 402-e1. https://doi.org/10.1016/j.ajog.2011.01.043

Boutib, A., Chergaoui, S., Marfak, A., Hilali, A., & Youlyouz-Marfak, I. (2022a). Quality of life during pregnancy from 2011 to 2021: systematic review. *International Journal of Women's Health*, 975–1005. https://doi.org/10.2147/IJWH.S361643

Boutib, A., Chergaoui, S., Marfak, A., Hilali, A., & Youlyouz-Marfak, I. (2022). Quality of life during pregnancy from 2011 to 2021: Systematic review. *International Journal of Women's Health,* 975–1005. https://doi.org/10.2147/IJWH.S361643

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science, 1*(3), 98–101. https://doi.org/10.1111/1467-8721.ep10768783

Cooper, A. L., Brown, J. A., Rees, C. S., & Leslie, G. D. (2020). Nurse resilience: A concept analysis. *International Journal of Mental Health Nursing, 29*(4), 553–575. https://doi.org/10.1111/inm.12721

Davenport, M. H., Ruchat, S.-M., Sobierajski, F., Poitras, V. J., Gray, C. E., Yoo, C., Skow, R. J., Garcia, A. J., Barrowman, N., & Meah, V. L. (2019). Impact of prenatal exercise on maternal harms, labour and delivery outcomes: A systematic review and meta-analysis. *British Journal of Sports Medicine, 53*(2), 99–107. https://doi.org/10.1136/bjsports-2018-099821

Divilly, P., Zaremba, N., Mahmoudi, Z., Søholm, U., Pollard, D. J., Broadley, M., Abbink, E. J., de Galan, B., Pedersen-Bjergaard, U., & Renard, E. (2022). Hypo-METRICS: Hypoglycaemia—MEasurement, ThResholds and ImpaCtS—A multi-country clinical study to define the optimal threshold and duration of sensor-detected hypoglycaemia that impact the experience of hypoglycaemia, quality of life and health economic o. *Diabetic Medicine, 39*(9), e14892. https://doi.org/10.1111/dme.14892

Fang, J., Lee, V. C. S., Ji, H., & Wang, H. (2024). Enhancing digital health services: A machine learning approach to personalized exercise goal setting. *Digital Health, 10,* 20552076241233250. https://doi.org/10.1177/20552076241233247

Indrawati, I., Yufdel, Y., & Elfira, E. (2022). The effect of murothal Al-Qur'an therapy on reducing anxiety and quality of life on pregnant women. *Jurnal Kebidanan, 12*(2), 119–123. https://doi.org/10.31983/jkb.v12i2.7718

Johnson, E., Corrick, S., Isley, S., Vandermeer, B., Dolgoy, N., Bates, J., Godfrey, E., Soltys, C., Muir, C., & Vohra, S. (2024). Mind-body internet and mobile-based interventions for depression and anxiety in adults with chronic physical conditions: A systematic review of RCTs. *PLOS Digital Health, 3*(1), e0000435. https://doi.org/10.1371/journal.pdig.0000435

Krzepota, J., Sadowska, D., & Biernat, E. (2018). Relationships between physical activity and quality of life in pregnant women in the second and third trimester. *International Journal of Environmental Research and Public Health, 15*(12), 2745. https://doi.org/10.3390/ijerph15122745

Lagadec, N., Steinecker, M., Kapassi, A., Magnier, A. M., Chastang, J., Robert, S., Gaouaou, N., & Ibanez, G. (2018). Factors influencing the quality of life of pregnant women: A systematic review. *BMC Pregnancy and Childbirth, 18,* 1–14. https://doi.org/10.1186/s12884-018-2087-4

Liu, N., Gou, W., Wang, J., Chen, D., Sun, W., Guo, P., Zhang, X., & Zhang, W. (2019). Effects of exercise on pregnant women's quality of life: A systematic review. *European Journal of Obstetrics & Gynecology and Reproductive Biology, 242*, 170–177. https://doi.org/10.1016/j.ejogrb.2019.03.009

Mogos, M. F., August, E. M., Salinas-Miranda, A. A., Sultan, D. H., & Salihu, H. M. (2013). A systematic review of quality of life measures in pregnant and postpartum mothers. *Applied*

Research in Quality of Life, 8, 219–250. https://doi.org/10.1007/s11482-012-9188-4

Nascimento, S. L., Surita, F. G., Parpinelli, M. A., Siani, S., & Pinto e Silva, J. L. (2011). The effect of an antenatal physical exercise programme on maternal/perinatal outcomes and quality of life in overweight and obese pregnant women: a randomised clinical trial. *BJOG: An International Journal of Obstetrics & Gynaecology, 118*(12), 1455–1463. https://doi.org/10.1111/j.1471-0528.2011.03084.x

Nascimento, T. L. C., Teixeira, C. S. S., Anjos, M. S. dos, Menezes, G. M. de S., Costa, M. da C. N., & Natividade, M. S. da. (2021). Associated factors with spatial variation of adolescent pregnancy in Brazil, 2014: An ecological study of spatial clusters. *Epidemiologia e Serviços de Saúde, 30,* e201953. https://doi.org/10.1590/S1679-49742021000100003

Nguyen, C. L., Pham, N. M., Lee, A. H., Nguyen, P. T. H., Chu, T. K., Ha, A. V. V, Duong, D. V, Duong, T. H., & Binns, C. W. (2018). Physical activity during pregnancy is associated with a lower prevalence of gestational diabetes mellitus in Vietnam. *Acta Diabetologica, 55,* 955–962. https://doi.org/10.1007/s00592-018-1174-3

WHO (2012). Programme on mental health whoqol user manual. in division of mental health and prevention of substance abuse World Health Organization.

Sbrilli, M. D., Duncan, L. G., & Laurent, H. K. (2020). Effects of prenatal mindfulness-based childbirth education on child-bearers' trajectories of distress: A randomized control trial. *BMC Pregnancy and Childbirth, 20*, 1–13.

Shams, L., Tajik, M., Heidari, P., Nasiri, T., & Mohammadshahi, M. (2022). Quality of life of Iranian and Afghan pregnant women in rural Iran. *Annali Di Igiene, Medicina Preventiva e Di Comunità, 34*(1).

Smith, R., Michalopoulou, M., Reid, H., Riches, S. P., Wango, Y. N., Kenworthy, Y., Roman, C., Santos, M., Hirst, J. E., & Mackillop, L. (2022). Applying the behaviour change wheel to develop a smartphone application 'stay-active'to increase physical activity in women with gestational diabetes. *BMC Pregnancy and Childbirth, 22*(1), 253. https://doi.org/10.1186/s12884-022-04539-9

Szablewska, A. W., Wierzba, J., Santos-Rocha, R., & Szumilewicz, A. (2023). Can pre-pregnancy body mass index and maternal exercise affect birth and neonatal outcomes—A cross sectional study. *Nutrients, 15*(23), 4894. https://doi.org/10.3390/nu15234894

Takeishi, Y., Nakamura, Y., Kawajiri, M., Atogami, F., & Yoshizawa, T. (2019). Developing a prenatal couple education program focusing on coparenting for Japanese couples: A quasi-experimental study. *The Tohoku Journal of Experimental Medicine, 249*(1), 9–17. https://doi.org/10.1620/tjem.249.9

Thorpe, H., O'Leary, G., Ahmad, N., & Nemani, M. J. (2023). "If you didn't exercise during lockdown, what were you even doing?": Young women, sport, and fitness in pandemic times. *Youth, 3*(3), 847–868. https://doi.org/10.3390/youth3030055

Vallim, A. L., Osis, M. J., Cecatti, J. G., Baciuk, É. P., Silveira, C., & Cavalcante, S. R. (2011). Water exercises and quality of life during pregnancy. *Reproductive Health, 8,* 1–7. https://doi.org/10.1186/1742-4755-8-14

Vargas-Terrones, M., Barakat, R., Santacruz, B., Fernandez-Buhigas, I., & Mottola, M. F. (2019). Physical exercise programme during pregnancy decreases perinatal depression risk: a randomised controlled trial. *British Journal of Sports Medicine, 53*(6), 348–353. https://doi.org/10.1136/bjsports-2017-098926

Villa-García, L., Davey, V., Peréz, L. M., Soto-Bagaria, L., Risco, E., Díaz, P., Kuluski, K., Giné-Garriga, M., Castellano-Tejedor, C., & Inzitari, M. (2023). Co-designing implementation strategies to promote remote physical activity programs in frail older community-dwellers. *Frontiers in Public Health, 11*, 1062843. https://doi.org/10.3389/fpubh.2023.1062843

Wowdzia, J. B., McHugh, T.-L., Thornton, J., Sivak, A., Mottola, M. F., & Davenport, M. H. (2021). Elite athletes and pregnancy outcomes: A systematic review and meta-analysis. *Medicine & Science in Sports & Exercise, 53*(3), 534–542. https://doi.org/10.1249/MSS.0000000000002510

Yang, X., Gu, J., Lv, H., Li, H., Cheng, Y., Liu, Y., & Jiang, Y. (2019). Uric acid induced inflammatory responses in endothelial cells via up-regulating (pro) renin receptor. *Biomedicine & Pharmacotherapy, 109*, 1163–1170. https://doi.org/10.1016/j.biopha.2018.10.129

Zarei, S., Mirghafourvand, M., Mohammad-Alizadeh-Charandabi, S., Effati-Daryani, F., & Shiri-Sarand, F. (2018). Predictors of quality of life in pregnant women visiting health centers of Tabriz, Iran. *Journal of Midwifery & Reproductive Health, 6*(2). https://doi.org/10.22038/JMRH.2018.10378

Zheng, S., Edney, S. M., Goh, C. H., Tai, B. C., Mair, J. L., Castro, O., Salamanca-Sanabria, A., Kowatsch, T., van Dam, R. M., & Müller-Riemenschneider, F. (2023). Effectiveness of holistic mobile health interventions on diet, and physical, and mental health outcomes: A systematic review and meta-analysis. *EClinicalMedicine, 66.* https://doi.org/10.1016/j.eclinm.2023.102309

Validating a mobile application for anemia prevention: Insights from expert feedback on AneMia_Prev®

Sri Rahayu[1]*, Mohamed Saifulaman Mohamed Said[2], Tukimin Bin Sansuwito[3], Sigit Mulyono[4]

[1] Universitas Faletehan, Indonesia
[2] Lincoln University Collage, Malaysia
[3] Lincoln University Collage, Malaysia
[4] Universitas Indonesia, Indonesia

Abstract

Background: Anemia remains a critical public health issue among adolescents, particularly in developing countries such as Indonesia. Poor nutritional knowledge and limited awareness of anemia-related symptoms, etiology, and prevention exacerbate this condition. Mobile health (mHealth) technologies have the potential to address these gaps through accessible, engaging, and scalable education tools.
Purpose: This study aimed to validate the content of AneMia_Prev®, a mobile application designed as an educational tool to enhance adolescent knowledge on the prevention of anemia.
Methods: A Delphi technique was employed involving two rounds of expert panel review. Twelve experts with clinical and academic backgrounds in nursing and public health evaluated the content of AneMia_Prev® based on relevance, clarity, layout, illustrations, language, and motivational features. The Content Validity Index (CVI) and modified kappa statistics were used to assess inter-rater agreement and content adequacy. Data were collected through an online survey using a 17-item validated questionnaire.
Results: In the first round, all 17 items achieved excellent content validity with I-CVI values ranging from 0.87 to 1.00 and kappa values above 0.87. Following minor expert recommendations, a revised version of the application was re-evaluated, resulting in unanimous ratings of excellence (I-CVI = 1.00; kappa > 0.92 for all items). Experts emphasized the application's innovation, relevance, and potential to promote anemia awareness among adolescents.
Conclusion: AneMia_Prev® demonstrated excellent content validity and is considered suitable for educational interventions targeting anemia prevention among adolescents. Future research is recommended to assess semantic validation, cognitive impact, and learning outcomes among adolescent users to further refine the tool and evaluate its effectiveness in real-world settings.

Keywords: anemia prevention, content validation, delphi technique, mobile application

Introduction

Anemia continues to be a pressing global health concern, particularly affecting adolescents during a critical stage of their physical and cognitive development. The World Health Organization (World Health Organization (WHO), 2023) reports that approximately one in four adolescents in developing nations suffer from anemia, with prevalence rates in Southeast Asia ranging between 27% and 55%. In Indonesia, this issue remains serious. Data from the 2018 national health survey indicate that 32% of individuals aged 15 to 24 years were affected by anemia (Mulianingsih et al., 2024). Notably, adolescent girls experienced higher rates compared to their male counterparts, with 22.7% and 12.4%, respectively (The Ministry of Health of Republic of Indonesia, 2018). When examined by region, rural communities demonstrated a slightly higher prevalence (37.8%) than urban areas (36.4%) (Statistik, 2020). Even more concerning, a local study

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 74-83
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2365

Article Info

Received : September 01, 2023
Revised : April 17, 2025
Accepted : April 28, 2025
Published : April 29, 2025

Corresponding author

Sri Rahayu*
Universitas Faletehan, Indonesia; Address: Jl. Raya Cilegon Drangong Serang - Banten No.Km. 06, Pelamunan, Kec. Kramatwatu, Kabupaten Serang, Banten; Phone: (0254) 32729; E-mail: s_rahayu_13@yahoo.co.id

Citation

Rahayu, S., Said, M. S. M., Sansuwito, T., & Mulyono, S. (2025). Validating a mobile application for anemia prevention: Insights from expert feedback on AneMia_Prev®. *Jurnal Keperawatan Padjadjaran, 13*(1), 74-83. http://dx.doi.org/10.24198/jkp.v13i1.2365

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

conducted in Serang, Banten Province, revealed that up to 92% of adolescents were anemic, with only 7.6% displaying hemoglobin levels within the normal range (The Ministry of Health of Republic of Indonesia, 2018). These figures highlight a growing public health challenge that demands targeted interventions. Effective responses may include comprehensive nutritional education, routine iron supplementation programs, and improved access to adolescent-centered health services (Mulianingsih et al., 2024; Saraswati, 2021).

Knowledge is an important determinant of anemia. Previous studies have noted that nutritional awareness has been argued to be strongly related to healthy living and healthy food preferences (Alaunyte et al., 2015). Previous study suggested that adolescents incorrectly answered certain questions such as symptoms of anemia which included dizzy eyes (79.0%), cold hands and feet (68.1%), rapid heart palpitations (80.7%), and nausea (88.2%) had more prevalent of anemia (Ghosal et al., 2020). More than 50% of adolescents lack knowledge of symptoms of anemia (Angadi & Ranjitha, 2016; Johnson et al., 2019). Cultural variables as well as perceived advantages of a specific diet impact food intake (Vosnacos & Pinchon, 2015a). In certain cases, female adolescent was also unaware of extreme anemia sequences (Vosnacos & Pinchon, 2015b). Adolescents need to know about the symptoms of anemia in order to predict themselves and take further measures to prevent and treat anemia when anemia occurs. However, previous studies were only focused on the knowledge related anemia symptoms not etiology of anemia or prevention and treatment of anemia. There is little information about the knowledge of female adolescent about anemia and the role of different dietary factors in causing anemia.

The usage of mobile technologies for health is rapidly rising. Because of their ease of use, extensive reach, and widespread acceptability, app features for exchanging health care information or real-time patient monitoring make them a valuable health tool. More than 53,000 medical apps were available in the Android Play Store (one of the primary download platforms) by the start of 2021 (Narrillos-Moraza et al., 2022). Diabetes (Kalhori et al., 2021; Kebede & Pischke, 2019), pain (Dantas et al., 2021; Kwan et al., 2019), rheumatic (Collado-Borrell et al., 2020; Terhorst et al., 2018), and psychiatric illnesses (Salehinejad et al., 2021; Singh, n.d.), as well as cancer (Ali et al., 2019; Amor-García et al., 2020; Jongerius et al., 2019), have all been targeted by medical apps. Apps for patients with hematological diseases are also available on the major download platforms, albeit there is little information available about them. However, there is limited uptake of online education platforms by adolescent due to lack of awareness and perceptions of low quality.

According to Dodt et al., (2012) and Fogg (2007), the development and application of mobile learning technologies have emerged as a tool to revolutionize learning and teaching as well as to foster new attitudes and behaviors in students. This viewpoint originated from the idea of the computer as a persuasive tool, which is known as Captology. Captology places an emphasis on the design, search for, and analysis of interactive goods (such as wireless technologies and mobile applications), which are intended to encourage people to change their attitudes and behaviors (Fogg, 2002). Additionally Fogg & Eckles, (2007) noted that the relevance of this kind of technology is supported by an emotional meaning due to the fact that it is omnipresent and has the power to facilitate problem solving and give knowledge at one's fingertips, without being constrained by time or distance.

Based on these considerations, we propose the development of a mobile application that will be called "AneMia-Prev." This application will be used as an online learning tool for teaching and learning about the prevention of anemia. However, in order to accomplish the goals that have been set, it is necessary to validate the content of the learning technology. Content validation involves systematic analysis and evaluation of reactions to theoretical concepts to determine if the tool has an adequate number of items to assess the material in general (Asch, 1998; Polit & Beck, 2010a; Wynd et al., 2003). Understanding the significance of the content validation process in achieving the objectives of the development of innovative educational technologies in the field of adolescent anemia prevention, this study aimed to describe the validation of a technology application content created for the purposes of learning and teaching about adolescent anemia prevention in our study.

Material and Methods

Design

This study adopted the Delphi technique as a structured and iterative method for reaching expert consensus regarding the content validity of the AneMia_Prev® mobile application (Keeney et al., 2011). Following the approach described by Keeney and colleagues and supported by Polit & Beck, (2010) the process involved multiple rounds of systematic input from a panel of experts. The validation process was conducted in eight distinct phases, beginning with the development of preliminary content and interface prototypes. This was followed by the construction of an evaluation tool, selection and invitation of suitable experts, and dissemination of the initial content along with the assessment instrument. Expert feedback from the first round was collected and synthesized to guide revisions. The updated version of the application and instrument was then redistributed for the second round of evaluation. Consensus was considered achieved once the second round demonstrated high levels of agreement and minimal new recommendations.

Twelve expert judges participated in the study, a sample size consistent with the guidelines proposed

by Rubio et al., (2003), which suggest six to twenty experts as sufficient for content validation using the Content Validity Index (CVI). The panel size was considered appropriate as data saturation was reached no substantial new input was introduced in the second evaluation round, and agreement across items was consistently strong (Keeney et al., 2011).

Study Setting and Panel Composition

The validation was conducted remotely through online communication platforms. Participants were drawn from the Indonesian provinces of Banten and West Java. To ensure appropriate expertise, selection criteria included a minimum of two years' professional experience as a registered nurse, advanced academic qualifications (master's or doctoral degrees, or specialist certification), and current employment in either higher education institutions or clinical public health services. Despite efforts to ensure diversity, the panel composition skewed toward academic professionals, comprising approximately two-thirds of the sample.

Mobile Application Development

The educational content for the AneMia_Prev® application was developed in alignment with official guidelines from the Ministry of Health of Indonesia and the World Health Organization. The app features several learning tools and resources, including foundational information about anemia, dietary guidance, food intake diaries, nutrition tracking tables, animated educational videos, interactive quizzes, and a function for virtual consultation. These features were designed to support adolescent users in understanding and preventing anemia in a user-friendly, accessible format (Figure 1).

Data collection and Evaluation Instrument

The expert panel received access to the application prototype along with a structured online questionnaire for content evaluation, distributed via Google Forms. The instrument was adapted from a validated tool developed by (de Souza Menezes et al., 2012) and consisted of 17 statements covering five key areas: content clarity, language appropriateness, relevance of visual illustrations, layout and design, and motivational impact (Table 1). Experts rated each item using a five-point Likert scale ranging from "strongly disagree" to "strongly agree." Additionally, space was provided for open-ended comments to encourage detailed feedback and suggestions for improvement.

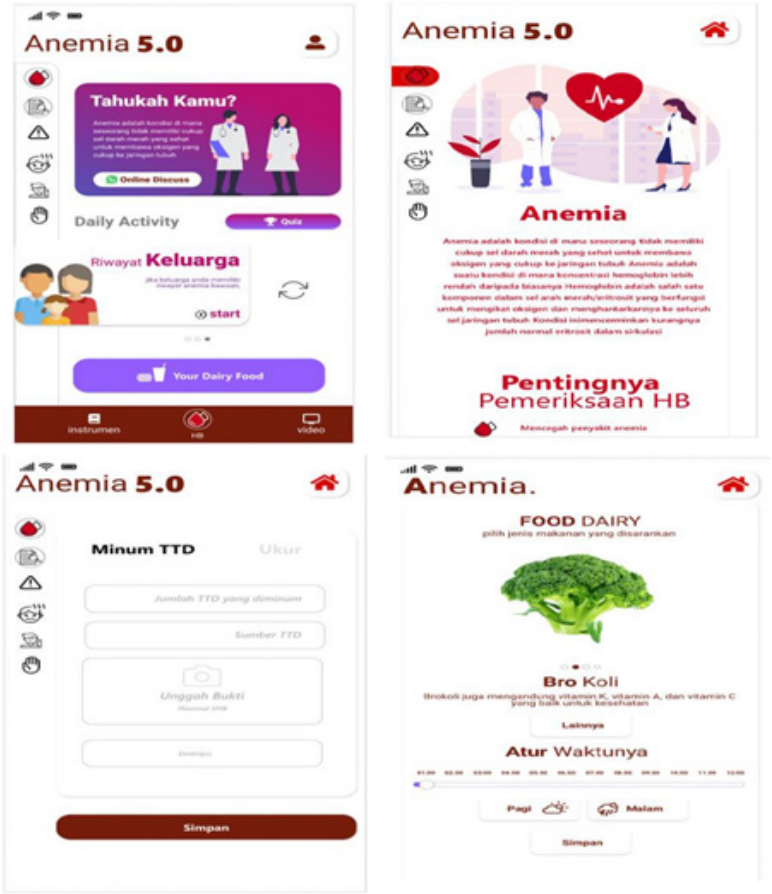


Figure 1. "AneMia_Prev®" mobile application

Table 1. Assessment instrument used in the study adopted from Souza and Turrini (2012)

	Item	5	4	3	2	1
Content	Is the content suitable for the intended audience?					
	Is the content division sufficient?					
	Is the content adequate for anemia prevention education?					
	Is the order of the menu logical and consistent?					
	Is the writing approach appropriate for the intended audience?					
Language	Is writing visually appealing?					
	Is the terminology objective and transparent?					
	Are the illustrations relevant to the content? Do they aid in elucidating the content?					
Illustrations	Are illustrations legible? Do they facilitate understanding?					
	Is the letter style suitable for reading?					
	Is the text layout appropriate for the screen?					
Layout	Is the letter size appropriate?					
	Is the visual arrangement appealing and well-organized?					
	5. Is the number of displays appropriate for the content?					
Motivation	Is the content interesting? Does it encourage the intended audience to proceed?					
	Is the text engaging to the reader?					
	Is the information essential for understanding about anemia prevention?					

Table 2. Content validation in the first round

Item	Expert	Mean	SD	Score 4 to 5	I-CVI[1]	Kappa[2]	Criteria[3]
1	12	4.32	0.52	11	0.90	0.90	Excellent
2	12	4.12	0.47	10	0.87	0.87	Excellent
3	12	4.45	0.49	12	0.92	0.92	Excellent
4	12	4.51	1.11	11	1.00	1.00	Excellent
5	12	4.24	0.76	11	0.92	0.92	Excellent
6	12	4.87	0.34	12	1.00	1.00	Excellent
7	12	4.43	1.21	12	1.00	1.00	Excellent
8	12	4.57	1.08	11	0.32	0.32	Excellent
9	12	4.60	0.78	10	0.90	0.90	Excellent
10	12	4.26	0.66	10	1.00	1.00	Excellent
11	12	4.38	0.75	11	0.90	0.90	Excellent
12	12	4.45	0.50	11	1.00	1.00	Excellent
13	12	4.49	0.63	10	0.93	0.93	Excellent
14	12	4.57	0.43	12	1.00	1.00	Excellent
15	12	4.66	0.71	10	0.91	0.91	Excellent
16	12	4.55	0.45	10	0.87	0.87	Excellent
17	12	4.83	1.32	11	0.90	0.90	Excellent

Note:
[1] I-CVI, item-content validity index.
[2] Modified kappa: k = (i-CVI − pc) / (1 − pc).
[3] The following definitions apply to the k statistic: Poor = k between 0.40 and 0.59, Good = k between 0.60 and 0.74, and Excellent = k > 0.74.

Table 3. Content validation in the second round

Item	Expert	Mean	SD	Score 4 to 5	I-CVI[1]	Kappa[2]	Criteria[3]
1	12	4.83	0.11	12	1.00	1.00	Excellent
2	12	4.83	0.23	12	1.00	1.00	Excellent
3	12	4.83	0.15	12	1.00	1.00	Excellent
4	12	4.75	0.19	11	0.92	0.92	Excellent
5	12	4.75	0.52	11	0.92	0.92	Excellent
6	12	4.92	0.24	12	1.00	1.00	Excellent
7	12	4.92	0.23	12	1.00	1.00	Excellent
8	12	5.00	0.00	12	1.00	1.00	Excellent
9	12	4.75	0.04	11	0.92	0.92	Excellent
10	12	4.92	0.17	12	1.00	1.00	Excellent
11	12	4.83	0.17	12	1.00	1.00	Excellent
12	12	4.92	0.22	12	1.00	1.00	Excellent
13	12	5.00	0.00	12	1.00	1.00	Excellent
14	12	4.92	0.12	12	1.00	1.00	Excellent
15	12	4.92	0.71	12	1.00	1.00	Excellent
16	12	4.92	0.15	12	1.00	1.00	Excellent
17	12	5.00	0.00	12	1.00	1.00	Excellent

Note:
[1] I-CVI, item-content validity index.
[2] Modified kappa: k = (i-CVI − pc) / (1 − pc).
[3] The following definitions apply to the k statistic: Poor = k between 0.40 and 0.59, Good = k between 0.60 and 0.74, and Excellent = k > 0.74.

Table 4.

Aspect	First Round Feedback	Actions Taken Before Round Two
Character and visual design	Characters were perceived as too generic and less culturally relevant	Characters updated with more localized, relatable designs and simplified animations
Language and grammar	Complex sentence structures; minor grammatical inconsistencies	Language was revised for clarity, age-appropriate vocabulary, and grammatical accuracy
Menu layout and navigation	Some menus perceived as cluttered or redundant	Streamlined menu structure; reduced information density per screen
Educational content	Mostly positive, though suggestions for reorganizing anemia etiology and treatment flow	Educational flow restructured into clearer modules: etiology → symptoms → prevention
Motivation and engagement	High engagement reported; minor feedback on enhancing interactivity	Quizzes were redesigned to include immediate feedback and gamified scoring

Integration of Expert Feedback

Qualitative comments were systematically reviewed and organized into thematic categories. These categories included changes deemed essential due to clinical or linguistic inaccuracy, those considered beneficial but not mandatory, suggestions based on personal preference or style, and those not aligned with the goals or capabilities of the app. Recommendations identified as critical or strongly advised were prioritized and incorporated into the updated version of the application. Suggestions not implemented were carefully reviewed, and the rationale for exclusion was documented based on relevance, feasibility, and target-user suitability.

Data Analysis

Quantitative data from expert ratings were analyzed using the Item Content Validity Index (I-CVI) and modified kappa statistics (Polit et al., 2007).The I-CVI was calculated by dividing the number of experts assigning a rating of 4 or 5 to an item by the total number of experts (Oliveira et al., 2008; Reberte et

al., 2012; Sousa & Turrini, 2012). An I-CVI score of 0.78 or higher was considered to reflect acceptable content validity. The modified kappa coefficient was used to determine the degree of agreement beyond chance, with values interpreted as follows: scores between 0.40 and 0.59 were considered poor, 0.60 to 0.74 as good, and 0.75 or higher as excellent. The analysis was conducted using SPSS software. Qualitative responses from the open-ended sections were analyzed thematically to complement and triangulate the quantitative findings.

Ethical consideration

The study was approved by the STIKep PPNI Jawa Barat Ethical and Research Committee (0189/KEPK/STIKep/PPNI/Jabar/XI/2022). All participants provided informed consent after receiving a full explanation of the study's objectives, methods, and voluntary nature. To ensure confidentiality, all expert responses were anonymized using alphanumeric codes.

Result

Twelve of the twenty experts who were invited to participate in the study. The majority were females (83.3%), with ages ranging from 37 to 45 years, residing in Banten and Bandung, and holding either a master's degree (41.7% of respondents) or a PhD (58.3% of respondents). Approximately 66.7% had more than ten years of experience as nurse nursing faculty members, and 33.3% had more than ten years of experience as registered nurses. The majority of specialists held positions in academic institutions.

In the first round of the competition, all of the panel of experts participated in the evaluation process by answering a series of questions posed by the AneMia_Prev® instrument. This was done in order to determine the overall quality of each of the 56 individual screens (Table 2).

The panel of experts made several specific ideas for improvements, such as changing the characters' look, altering the meaning of phrases, and adjusting the language to better comprehend the intended audience. No recommendations were made about structure. A new content version, consisting of 63 screens, was developed once all feedback was incorporated. The judges have been provided with this revised submission (Table 3).

The content validation process was completed over two Delphi rounds with participation from 12 expert panelists. In the first round, quantitative results demonstrated strong agreement across most items, with I-CVI values ranging from 0.87 to 1.00 and modified kappa values reflecting excellent inter-rater reliability. However, qualitative feedback provided essential insights into areas needing revision and improvement. Analysis of open-ended expert comments revealed three primary themes, namely visual and character design adjustments, linguistic clarity and readability, and pedagogical and motivational appeal.

Visual and Character Design Adjustments

Experts noted that certain design elements, particularly character illustrations and interface icons, did not align with adolescent preferences. These concerns centered on the appeal and relatability of visual features.

"Character design should be more youthful and culturally relevant to Indonesian adolescents." (Expert 6)

"Simplify some of the animations. They may be distracting rather than educational." (Expert 9)

Linguistic Clarity and Readability

Several experts emphasized the importance of revising sentence structure and grammar for better clarity and engagement. Suggestions were made to simplify language while maintaining scientific accuracy to suit the target adolescent demographic.

"Some text is too academic; simplify wording without losing the message." (Expert 2)

"Adjust grammar to match adolescent literacy levels for better engagement." (Expert 8)

Pedagogical and Motivational Appeal

Despite the constructive criticism, feedback also showed consensus on the app's strong potential for educational impact and user motivation. Experts appreciated the integration of quizzes, videos, and consultation features as engaging and behaviorally persuasive.

"The use of quizzes and interactive features is excellent for reinforcing learning." (Expert 11)

"This is an innovative digital intervention that has real potential to reach adolescents at scale." (Expert 4)

The following table outlines the modifications made between the first and second validation rounds, guided by both quantitative scores and thematic feedback (Table 4).

After integrating these changes, the second round of evaluation yielded perfect or near-perfect scores across all 17 items. Every item achieved an I-CVI of 0.92–1.00, and all modified kappa values were categorized as excellent ($\kappa > 0.75$). Experts indicated strong consensus, and no new themes or recommendations emerged, signaling data saturation. Overall, expert ratings and feedback indicated that AneMia_Prev® was a well-designed, contextually appropriate, and pedagogically sound tool for adolescent anemia prevention education. The high degree of consensus after the second round confirmed the tool's readiness for future pilot testing and implementation studies.

Discussion

This study sought to validate the content of AneMia_Prev®, a mobile-based educational application developed to promote anemia prevention among adolescents. Using a structured Delphi methodology,

the validation process involved iterative expert review, culminating in high levels of consensus regarding the app's content relevance, linguistic clarity, interface design, and pedagogical structure. Notably, the two-phase validation led to meaningful refinements, resulting in all 17 evaluated items attaining excellent content validity indices (CVI ≥ 0.92), reflecting enhanced instructional quality, consistency, and clarity.

Aligning with the principles outlined by Teixeira & Mota, (2011), the use of expert panels served as a rigorous and theory-informed strategy for refining digital educational interventions. Throughout the process, experts offered multidimensional feedback ranging from linguistic precision and visual effectiveness to conceptual coherence and interface usability. This depth of input, both qualitative and quantitative, exemplifies the value of collaborative refinement, echoing Walker (2013) perspective on the need for tailoring health education tools to the cognitive and emotional profiles of their intended users.

The results confirmed that the application's language was appropriately adapted to the comprehension level of adolescents, combining clarity with an engaging tone. This is particularly relevant, as research underscores the role of accessible and relatable language in improving learning outcomes among younger audiences (Preti, 2010; Teixeira & Mota, 2011). Visual components were also seen as a major asset, experts praised their ability to reinforce semantic understanding and support content retention, consistent with insights from Berglund et al., (2024) and Xelegati & Évora (2011), who stress the importance of integrating visuals and text to foster memory and meaningful learning.

Further supporting its theoretical foundation, AneMia_Prev® integrates the concept of persuasive technology as introduced by Fogg & Eckles (2007). The app is not limited to information delivery; rather, it seeks to promote sustained behavior change by encouraging proactive health behaviors through interactive features. The inclusion of gamified quizzes, self-assessment tools, and personalized feedback mechanisms reflects the principles of captology deliberately shaping user experiences to influence actions, particularly in the realm of preventive adolescent health.

From a practical perspective, the findings of this study offer valuable contributions to both nursing education and community health practice. Emphasizing the importance of integrating age-appropriate, evidence-based digital tools into health promotion strategies, the AneMia_Prev® application presents an opportunity to be applied in clinical and community settings. In these environments, nurses are well-positioned to actively engage adolescents in health education, reinforcing critical information through digital platforms. Furthermore, the validation framework outlined in this study may serve as a foundation for the future design of educational technologies aimed at preventing other modifiable health conditions. By incorporating digital interventions grounded in educational theory and behavioral science, nursing professionals can enhance health literacy and support proactive health behaviors, particularly among at-risk youth populations.

However, certain limitations should be acknowledged. While the panel of experts brought significant academic experience, the limited representation from clinical practitioners, public health professionals, and adolescent users themselves may have restricted the breadth of perspectives considered. Furthermore, the current validation phase was expert-driven, lacking direct input from the primary target users—adolescents. This omission limits the assessment of user comprehension, cognitive load, and real-world usability.

To advance the application's development, subsequent research should involve adolescents in usability testing and pilot implementation. Understanding how users interact with the app, identifying which features drive engagement, and determining whether knowledge gains translate into preventive behavior will be essential. Additionally, incorporating AneMia_Prev® into school-based health programs or broader digital health initiatives may amplify its reach and impact. Collaborating with developers, nutrition experts, and educators could further enhance the tool's functionality, cultural relevance, and scalability.

Nursing implication

The development and validation of AneMia_Prev® have major consequences for nursing practice, particularly in the field of promoting the health of adolescents. It is possible for nurses, who play an important role as educators and advocates for preventive health, to make use of digital tools like AneMia_Prev® in order to enhance the health literacy of adolescents specifically with regard to iron deficiency anaemia. By incorporating this application into school-based health programs, community outreach projects, and regular nursing education programs, nurses are able to give information that is standardised, based on research, in a way that is both engaging and accessible. Adolescents are able to adopt better eating habits and preventative measures with the assistance of nursing tactics that are focused on behaviour modification, which are aligned with the incorporation of persuasive design concepts. It is possible for nurses, in their capacity as frontline providers, to make a contribution to the iterative improvement of digital treatments by participating in usability tests and providing feedback from relevant clinical and community settings. The use of AneMia_Prev® in nursing practice has the potential to improve preventive health education, reduce the prevalence of anaemia in adolescents, and contribute to broader public health goals by using technology-driven approaches that are

culturally appropriate.

Limitation of the study

The experts recruited in this study mostly from academic setting. This homogeneity may restrict the generalizability of the results, underscoring the importance of including a more diverse group in future studies. Broader representation from dietitians, software developers, public health workers, and adolescent users would help ensure that the content is relevant, comprehensive, and contextually appropriate.

Conclusion

In conclusion, the findings from this study indicate that AneMia_Prev® possesses strong content validity and is grounded in well-established educational and behavioral science frameworks. It represents a promising model for the design of learner-centric digital health tools, particularly within adolescent nursing education. By integrating principles of persuasive design with evidence-based pedagogy, this intervention has the potential to significantly improve adolescent health literacy and contribute to the reduction of iron deficiency anemia as a preventable yet widespread condition.

Although expert validation confirmed the application's content quality and its alignment with adolescent health education needs, additional research is essential to enhance its practical effectiveness. Future investigations should prioritize usability testing involving adolescents to assess how well they engage with the app, understand the content, and navigate its features. It is also important to examine how cultural and language differences might influence user experience, ensuring the application remains relevant and meaningful across various demographic segments. Furthermore, long-term studies are recommended to evaluate the app's ongoing impact on adolescent health behaviors, particularly in areas such as nutritional choices, iron supplement use, and efforts to prevent anemia. With ongoing improvements guided by real-world feedback, AneMia_Prev® has the potential to evolve into a widely adopted, user-friendly digital learning tool that supports anemia prevention and health promotion among adolescents in Indonesia and other global settings.

Acknowledgement

Thanks to all experts for joining in this study

Declaration of interest

All authors declare no conflict of interest

Funding

The research was funding universitas faletehan

Data Availability

None

Reference

Alaunyte, I., Stojceska, V., & Plunkett, A. (2015). Iron and the female athlete: A review of dietary treatment methods for improving iron status and exercise performance. *Journal of the International Society of Sports Nutrition, 12*(1), 38. https://doi.org/10.1186/s12970-015-0099-2

Ali, E. E., Chan, S. S. L., Leow, J. L., Chew, L., & Yap, K. Y.-L. (2019). User acceptance of an app-based adherence intervention: perspectives from patients taking oral anticancer medications. *Journal of Oncology Pharmacy Practice, 25*(2), 390–397. https://doi.org/10.1177/1078155218778106

Amor-García, M. Á., Collado-Borrell, R., Escudero-Vilaplana, V., Melgarejo-Ortuño, A., Herranz-Alonso, A., Arija, J. Á. A., & Sanjurjo-Sáez, M. (2020). Assessing apps for patients with genitourinary tumors using the mobile application rating scale (MARS): Systematic search in app stores and content analysis. *JMIR MHealth and UHealth, 8*(7), e17609. https://doi.org/10.2196/17609

Angadi, N., & Ranjitha, A. (2016). Knowledge, attitude, and practice about anemia among adolescent girls in urban slums of Davangere City, Karnataka. *International Journal of Medical Science and Public Health, 5*(3), 416–419.

Asch, S. M. (1998). Developing a clinical performance measure. *American Journal of Preventive Medicine, 14*(3), 14–21. https://doi.org/10.1016/S0749-3797(97)00032-9

Berglund, M., Andersson, S., & Kjellsdotter, A. (2024). Reflection tools–support for patient learning in group education. *Reflective Practice, 25*(5), 634–649. https://doi.org/10.1080/14623943.2024.2384119

Collado-Borrell, R., Escudero-Vilaplana, V., Villanueva-Bueno, C., Herranz-Alonso, A., & Sanjurjo-Saez, M. (2020). Features and functionalities of smartphone apps related to COVID-19: Systematic search in app stores and content analysis. *Journal of Medical Internet Research, 22*(8), e20334. https://doi.org/10.2196/20334

Dantas, L. O., Carvalho, C., Prando, B. C., McAlindon, T. E., & da Silva Serrao, P. R. M. (2021). Mobile health technologies for the management of rheumatic diseases: A systematic review of online stores in Brazil. *Clinical Rheumatology, 40*(7), 2601–2609. https://doi.org/10.1007/s10067-020-05561-y

de Souza Menezes, F., Leite, H. P., & Nogueira, P. C. K. (2012). Malnutrition as an independent predictor of clinical outcome in critically ill children. *Nutrition, 28*(3), 267–270. https://doi.org/10.1016/j.nut.2011.05.015

Dodt, R. C. M., Ximenes, L. B., Almeida, P. C., Oriá, M. O. B., & Dennis, C. L. (2012). Psychometric

and maternal sociodemographic assessment of the breastfeeding self-efficacy scale-short form in a brazilian sample. *J Nurs Educ Pract, 2*(3), 66–73. http://dx.doi.org/10.5430/jnep.v2n3p66

Fogg, B. J. (2002). Persuasive technology: Using computers to change what we think and do. *Ubiquity, 2002*(December), 2. https://doi.org/10.1145/764008.763957

Fogg, B. J. (2007). Mobile persuasion: 20 perspectives on the future of behavior change. Mobile Persuasion.

Fogg, B. J., & Eckles, D. (2007). Mobile persuasion: 20 perspectives on the future of behavior change. (No Title).

Ghosal, S., Jana, S., Mani, A., Mitra, S., & Roy, S. (2020). Sex workers, stigma and self-image: Evidence from Kolkata Brothels (CSAE Working Paper Series, Issues 2020–03). Centre for the Study of African Economies, University of Oxford. https://doi.org/10.1162/rest_a_01013

Johnson, C. O., Nguyen, M., Roth, G. A., Nichols, E., Alam, T., Abate, D., Abd-Allah, F., Abdelalim, A., Abraha, H. N., Abu-Rmeileh, N. M. E., & others. (2019). Global, regional, and national burden of stroke, 1990--2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet Neurology, 18*(5), 439–458. https://doi.org/10.1016/S1474-4422(19)30034-1

Jongerius, C., Russo, S., Mazzocco, K., & Pravettoni, G. (2019). Tested mobile apps for breast cancer care: Systematic review. *JMIR MHealth and UHealth, 7*(2), e10930. https://doi.org/10.2196/10930

Kalhori, S. R. N., Hemmat, M., Noori, T., Heydarian, S., & Katigari, M. R. (2021). Quality evaluation of English mobile applications for gestational diabetes: App review using Mobile Application Rating Scale (MARS). *Current Diabetes Reviews, 17*(2), 161–168. https://doi.org/10.2174/1573399816666200703181438

Kebede, M. M., & Pischke, C. R. (2019). Popular diabetes apps and the impact of diabetes app use on self-care behaviour: A survey among the digital community of persons with diabetes on social media. *Frontiers in Endocrinology, 10,* 135. https://doi.org/10.3389/fendo.2019.00135

Keeney, S., McKenna, H. A., & Hasson, F. (2011). The Delphi technique in nursing and health research. John Wiley & Sons.

Kwan, Y. H., Ong, W. J., Xiong, M., Leung, Y. Y., Phang, J. K., Wang, C. T. M., & Fong, W. (2019). Evaluation of mobile apps targeted at patients with spondyloarthritis for disease monitoring: Systematic app search. *JMIR MHealth and UHealth, 7*(10), e14753. https://doi.org/10.2196/14753

Mulianingsih, M., Suriah, S., Hidayanty, H., Amiruddin, R., Hadju, V., Salmah, A. U., & Yusron, M. A. (2024). Nutritional deficiency anemia status among adolescent girls in North Lombok District, West Nusa Tenggara, Indonesia. *The Open Public Health Journal, 17*(1). http://dx.doi.org/10.2174/0118749445335372824113016404 5

Narrillos-Moraza, Á., Gómez-Martínez-Sagrera, P., Amor-García, M. Á., Escudero-Vilaplana, V., Collado-Borrell, R., Villanueva-Bueno, C., Gómez-Centurión, I., Herranz-Alonso, A., & Sanjurjo-Sáez, M. (2022). Mobile apps for hematological conditions: Review and content analysis using the mobile app rating scale. *JMIR MHealth and UHealth, 10*(2), e32826. https://doi.org/10.2196/32826

Oliveira, M. S. de, Fernandes, A. F. C., & Sawada, N. O. (2008). Educational handbook for self care in women with mastectomies: A validation study. *Texto & Contexto-Enfermagem, 17,* 115–123. https://doi.org/10.1590/S0104-07072008000100013

Polit, D. F., & Beck, C. T. (2010). Essentials of nursing research: Appraising evidence for nursing practice. Lippincott Williams & Wilkins.

Polit, D. F., Beck, T., & Owen, S. V. (2007). Focus on research methods is the CVI an acceptable indicator of content validity. *Res Nurs Health, 30*(4), 459–467. https://doi.org/10.1002/nur.20199

Preti, O. (2010). Produção de material didático impresso: orientações técnicas e pedagógicas. Cuiabá: UAB/UFMT, 175.

Reberte, L. M., Hoga, L. A. K., & Gomes, A. L. Z. (2012). Process of construction of an educational booklet for health promotion of pregnant women. *Revista Latino-Americana de Enfermagem, 20*, 101–108. https://doi.org/10.1590/S0104-11692012000100014

Rubio, D. M., Berg-Weger, M., Tebb, S. S., Lee, E. S., & Rauch, S. (2003). Objectifying content validity: Conducting a content validity study in social work research. *Social Work Research, 27*(2), 94–104. https://doi.org/10.1093/swr/27.2.94

Salehinejad, S., Niakan Kalhori, S. R., Hajesmaeel Gohari, S., Bahaadinbeigy, K., & Fatehi, F. (2021). A review and content analysis of national apps for COVID-19 management using Mobile Application Rating Scale (MARS). *Informatics for Health and Social Care, 46*(1), 42–55. https://doi.org/10.1080/17538157.2020.1837838

Saraswati, P. W. (2021). How national public policies in indonesia address maternal mortality from the perspective of health equity and intersectionality. https://doi.org/10.26656/fr.2017.8(4).339

Singh, J. L. (n.d.). H., Couch, D., & Yap, K.(2020). Mobile health apps that help with COVID-19 management: Scoping review. *JMIR Nursing, 3*(1), e20596. https://doi.org/10.2196/20596

Sousa, C. S., & Turrini, R. N. T. (2012). Construct validation of educational technology for

patients through the application of the Delphi technique. *Acta Paulista de Enfermagem, 25*, 990–996. https://doi.org/10.1590/S0103-21002012000600026

Statistik, B. P. (2020). Geographic and population information.

Teixeira, E., & Mota, V. (2011). Tecnologias educacionais em foco. *São Paulo: Difusão Editora, 72*. https://doi.org/10.1590/S0034-71672011000200024

Terhorst, Y., Rathner, E. M., Baumeister, H., & Sander, L. (2018). Help from the App Store?': A systematic review of depression apps in German app stores. *Verhaltenstherapie, 28*(2), 101–112.

The Ministry of Health of Republic of Indonesia. (2018). The Report of National Health Research 2018.

Vosnacos, E., & Pinchon, D. J. (2015). Survey of women's perceptions of information provided in the prevention or treatment of iron deficiency anaemia in an Australian tertiary obstetric hospital. *Women and Birth, 28*(2), 166–172. https://doi.org/10.1016/j.wombi.2014.11.004

Walker, H. C. (2013). Establishing content validity of an evaluation rubric for mobile technology applications utilizing the Delphi method. *Johns Hopkins University.* https://doi.org/10.5205/reuol.4761-42160-1-ED.0712201311

World Health Organization (WHO). (2023). Adolecents.

Wynd, C. A., Schmidt, B., & Schaefer, M. A. (2003). Two quantitative approaches for estimating content validity. *Western Journal of Nursing Research, 25*(5), 508–518. https://doi.org/10.1177/0193945903252998

Xelegati, R., & Évora, Y. D. M. (2011). Development of a virtual learning environment addressing adverse events in nursing. *Revista Latino-Americana de Enfermagem, 19*, 1181–1187. https://doi.org/10.1590/S0104-11692011000500016

Effect of warming gown use on shivering and body temperature in chronic kidney disease patients undergoing hemodialysis via catheter

Novita Anggraeni*, Saryono Saryono, Arif Setyo Upoyo

Departement of Nursing, Faculty of Health Science, Jenderal Soedirman University, Indonesia

Abstract

Background: Haemodialysis is often accompanied by shivering, especially in patients with catheter access, which can reduce comfort, impair treatment efficacy, increase the risk of complications and contribute to inadequate dialysis. Addressing this issue through non-pharmacological means, such as a warming gown, offers a potentially effective, safe, and economical solution to improve patient outcomes.
Purpose: To develop a warming gown as an innovation to reduce the incidence of shivering in chronic kidney disease patients undergoing haemodialysis with a haemodialysis catheter.
Methods: This study employed a two-stage Research and Development design. In the first stage, a reusable, adaptive warming gown for HD catheter patients was developed and validated (S-CVI/Ave = 0.99). Second, a quasi-experiment was conducted with 60 patients recruited through total sampling. Subsequently, patients were randomly allocated to either the intervention group (warming gown) or the control group (blanket) using computer-generated randomisation based on their identification numbers. Shivering (Crossley and Mahajan scale) and body temperature (digital thermometer) were measured at 0, 15, 30, 60, and 120 minutes. Data were analysed using Wilcoxon, Friedman, and Bonferroni-corrected repeated Mann–Whitney tests.
Results: The intervention group showed a significant reduction in shivering levels from 2.63 ± 1.27 to 0.37 ± 0.49 ($p < 0.001$) and an increase in body temperature from 36.36 ± 0.52 to 36.84 ± 0.29 ($p < 0.001$). In contrast, the control group showed no significant changes ($p > 0.05$).
Conclusion: The warming gown was proven effective in reducing shivering and increasing body temperature in haemodialysis patients, offering advantages in comfort, safety, and cost efficiency.

Keywords: body temperature, chronic kidney failure, haemodialysis, nursing innovation, shivering, warming gown

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 84-96
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2701

Article Info

Received : January 02, 2025
Revised : April 26, 2025
Accepted : April 28, 2025
Published : April 29, 2025

Corresponding author

Novita Anggraeni*
Departement of Nursing, Faculty of Health Science, Jenderal Soedirman University, Purwokerto, Indonesia; Address: Jl. Dr. Soeparno, Karangwangkal, Karang Bawang, Grendeng, Kec. Purwokerto Utara, Purwokerto, Jawa Tengah, Indonesia; Postal Code: 53122; Phone: +6282248060468; E-mail: novitaanggraeni89.na@gmail.com

Citation

Anggraeni, N., Saryono, S., & Upoyo, A. S. (2025). Effect of warming gown use on shivering and body temperature in chronic kidney disease patients undergoing hemodialysis via catheter. *Jurnal Keperawatan Padjadjaran, 13*(1), 84-96. http://dx.doi.org/10.24198/jkp.v13i1.2701

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Introduction

Hemodialysis (HD) is a globally recognized renal replacement therapy. Up to 70-90% of chronic kidney disease patients choose HD as their renal replacement therapy (Agarwal et al., 2019). In 2022, an estimated 843.6 million people worldwide were diagnosed with chronic kidney disease (Kovesdy, 2022). In Indonesia, as of 2018, there were 132,142 active HD patients (IRR, 2019), and this number is predicted to increase annually. At RSUD Banyumas, the number of chronic kidney disease patients undergoing hemodialysis in February 2024 reached 279 patients.

In performing HD procedures, all patients require vascular access. Vascular access for HD patients consists of two types: permanent vascular access and temporary vascular access. Permanent vascular access includes Arteriovenous Fistula (AVF) and Arteriovenous Graft (AVG) (Lok et al., 2020). Meanwhile, temporary vascular access currently involves central venous catheters or HD Catheters (Lok et al., 2020). However, in countries

with limited facilities and resources, creating ideal permanent vascular access poses significant challenges (Agarwal et al., 2019).

The use of HD Catheters in hemodialysis is associated with risks such as bloodstream infections, thrombosis, and venous stenosis (Al-Balas et al., 2019). The primary complications of HD Catheter use include infection and catheter dysfunction, which can lead to morbidity and mortality in HD patients using Hemodialysis Catheters (Winnicki et al., 2018). Infection is a leading cause of morbidity and hospitalization in hemodialysis patients and the second most common cause of death after cardiovascular disease (Shepshelovich et al., 2017). Clinical manifestations of HD Catheter-related infections often include fever accompanied by shivering and rigidity during the HD process (Sedhain et al., 2019). One manifestation of infection in HD patients is shivering, reported in up to 40% of cases (with or without fever) during HD (Syed et al., 2022).

Shivering is a common complication in hemodialysis patients, with incidence rates in Vietnamese hospitals ranging from 2.1% (shivering alone) to 14.4% (shivering with fever) per dialysis session. Common causes include catheter-related infections and physiological reactions to cold dialysate. Patients experiencing shivering during HD are typically hospitalized for broad-spectrum antibiotic therapy and observation until infection is ruled out (Shepshelovich et al., 2017).

Shivering during HD disrupts patient comfort and can be managed with pharmacological and non-pharmacological therapies. Pharmacological therapies include non-narcotic analgesics, antipyretics, NSAIDs, vasodilators, opioid analgesics, anesthetics, and sedatives. Non-pharmacological therapies, such as active skin warming (warming gowns), antipyretics, magnesium sulfate, and β-agonists, are more commonly used to enhance patient comfort. The use of warming gowns has been shown to effectively alleviate shivering and improve comfort during HD procedures (Jain et al., 2018).

One of the most frequently used non-pharmacological therapies for shivering in HD patients is the warming gown. Previous studies in anesthetic nursing have demonstrated that preoperative warming gown use for 30 minutes effectively reduces post-anesthetic temperature drops (de Bernardis et al., 2016). Additionally, optimal active warming strategies, such as warming gowns for cesarean section patients, reduce the incidence of shivering and hypothermia, enhance surgical optimization, and promote faster recovery. Other benefits of active warming include reduced complications such as wound infections, maternal shock, maternal mortality, neonatal hypothermia, and prolonged hospital stays (Chen et al., 2019).

Thermal gowns are more effective than warm cotton blankets in improving patient comfort and accelerating body temperature recovery, particularly when the patient's body temperature is below 36°C. Thermal gowns also provide better comfort and reduce the duration of stay in postoperative recovery rooms. Postoperative warming equipment must be safe, fast, reliable, and prevent burns in patients (Lee et al., 2015). Enhancing patient comfort through the use of warming gowns aligns with Kolcaba's theory of comfort, which encompasses physical, psychospiritual, environmental, and psychosocial aspects (Krinsky et al., 2014).

HD patients who experience chills and shivering during the HD process are typically rested (temporarily halting the HD process) and warmed using blankets. Currently, a better technology is available in the form of warming gowns. Warming gowns can be used to optimize the management of patients experiencing chills (de Bernardis et al., 2016). Warming gowns can be used to manage HD patients with HD Catheters who experience shivering during HD. By using warming gowns, the time required for patients to rest due to shivering can be reduced. Chills in haemodialysis patients may result from the use of an HD catheter or the dialysis process itself. Catheters can increase the risk of bloodstream infections, which often present with chills and fever. Additionally, the HD procedure may cause a drop in body temperature due to cool dialysate or room conditions, triggering shivering as a natural response. Both infection-related and non-infectious factors should be considered when assessing chills during dialysis.

Warming gowns, commonly used for post-anesthesia patients to manage shivering, are typically made of disposable spunbond material and cost approximately IDR 323,000. This study introduces an innovative reusable warming gown made of thick fabric as a heat insulator and a soft inner layer to prevent skin irritation. The production cost is approximately IDR 450,000, and the gown is washable and reusable. The warming gown for HD patients is equipped with a CDL Port to facilitate use without interfering with HD Catheter dressings. Its use reflects the principle of beneficence in nursing, aiming to improve the comfort of hemodialysis patients

Based on bibliometric analysis, no studies have evaluated the effectiveness of warming gowns in reducing the incidence of shivering in chronic kidney disease patients undergoing hemodialysis with HD Catheters. At RSUD Banyumas, among 279 CKD patients undergoing HD, 68 patients (24.3%) use HD Catheters, and 20 of them (29%) experience shivering during hemodialysis. To address the shivering, the nurse applied warm water compresses to specific areas, such as the chest, and covered the patient with a standard blanket. However, these measures were ineffective in alleviating the shivering, necessitating a temporary interruption of the dialysis session until the condition subsided. As a result, the duration of dialysis was shortened, leading to inadequate dialysis delivery. Therefore, strategies are needed to reduce the incidence of

shivering and enhance patient comfort (Anggraeni et al., 2024). Accordingly, this study aimed to design and develop a warming gown as a non-pharmacological innovation to mitigate shivering among chronic kidney disease patients undergoing haemodialysis using catheter access.

Materials and Methods

Design

This study was conducted in two phases. The research design employed was a Research and Development (R&D) design with a Prototype model, involving the development of the device and testing the product's effectiveness.

In the first phase, surveys and interviews were conducted with haemodialysis nurses to identify the need for a warming device. Based on their feedback, the warming gown design was developed using thick outer fabric and a soft inner lining. The device was equipped with an inlet for connection to a warm air source and a port for double-lumen catheters. Testing by five experts (comprising an electromedical technician from the hospital, a renal and hypertension specialist, a haemodialysis physician, and two haemodialysis nurses) demonstrated that the prototype was valid and reliable, after which it was further refined. Further refinement was carried out by incorporating a temperature sensor capable of automatically activating and deactivating the device based on the predetermined temperature range. The thermal sensor was configured to switch off when the temperature reached 40 °C and to reactivate when it dropped to 36°C.

In the second phase, the researcher conducted a product effectiveness test using a quantitative approach with a quasi-experimental pre–post test design involving a control group. A quantitative test was conducted on 60 HD patients at RSUD Banyumas, divided into two groups: an intervention group (using the warming gown) and a control group (using blankets). Patients were randomly assigned to intervention (warming gown) or control (blanket) groups using computer-generated randomisation based on identification numbers.

Sample and setting

This study was conducted in the Haemodialysis Unit of RSUD Banyumas. The sample size consisted of 60 respondents, who were subsequently divided into two groups: the control group and the intervention group. Simple random sampling was employed for sample allocation, whereby all respondents' identification numbers were input into a computer programme that generated a random assignment to groups.

The inclusion criteria for the study included patients who routinely underwent HD twice a week, had vascular access through an HD catheter, were fully conscious (compos mentis), were willing to participate in the study, and underwent haemodialysis for 4.5 hours. The exclusion criteria included patients with vascular access through an AV shunt or femoral access, patients undergoing emergency or initial HD sessions, patients who refused to participate, and patients with hyperthermia (body temperature ≥38°C). Cases of hyperthermia were excluded to avoid potential bias in temperature data analysis, as the temperature trend in hyperthermic patients typically decreases over time, in contrast to hypothermic patients whose temperature trend increases. Including both conditions could confound the interpretation of temperature changes.

Patients meeting the criteria were randomly assigned using simple random sampling to ensure an even distribution between the intervention and control groups. Additional data, such as patient characteristics, were also collected to support a more in-depth analysis.

Variable

The independent variable in this study is the use of the warming gown. The dependent variables are the level of shivering and body temperature. The measured variables are body temperature and shivering level, with a sample size of 30 participants per group.

Instruments

The research instrument used in this study was an observation sheet designed for CKD patients undergoing HD with an HD catheter, receiving either the warming gown treatment or standard treatment. The instrument included patient data, shivering levels, and body temperature.

Patient data covered information such as name, age, gender, comorbidities, education, weight, height, body mass index, and duration of haemodialysis. The level of shivering was measured using the Crossley and Mahajan Scale, a numerical scale used to assess the degree of shivering (Table 1). This instrument has undergone validity and reliability testing in previous studies.

Validity testing of the shivering degree measurement showed that the calculated r-value exceeded the critical r-value, with a p-value < 0.05, indicating the instrument was valid. Reliability testing yielded a Cronbach's Alpha value of 0.617, confirming the instrument's reliability (Nasution et al., 2022).

Patient body temperature was measured using a thermometer. The thermometer used was the SAMMORA Thermometer Gun, model IT-122, which features a red focus beam and is registered with the Indonesian Ministry of Health under registration number KEMENKES RI AKL 20901120621.

Intervention

After selecting participants based on the inclusion criteria, the researcher divided them into two groups: the control group and the intervention group. Simple random sampling was employed for sample allocation, whereby all respondents' identification numbers were input into a computer programme

that generated a random assignment to groups. In the intervention group, participants experiencing shivering were provided with the warming gown as an intervention, while in the control group, participants received the standard intervention of being warmed with a blanket. Subsequently, the research flow in this study can be seen in Figure 1.

Data collection

Data collection in this study was conducted through direct observation of CKD patients on HD with an HD catheter who met the inclusion and exclusion criteria. The data collected included the shivering level, measured using the Crossley and Mahajan Scale (Crossley & Mahajan, 1994), and the patient's body temperature, measured using a SAMMORA IT-122 digital thermometer. Measurements were taken at five time intervals: before the intervention (0 minutes) and after the intervention at 15, 30, 60, and 120 minutes. The intervention group received treatment using the warming gown, while the control group used only standard blankets.

Data analysis

The data analysis method in this study involved processing observational data on body temperature and shivering levels using statistical analysis. The statistical tests applied included the Wilcoxon test, Friedman test, and Mann-Whitney test. These tests aimed to compare within-group and between-group differences across various time intervals (0, 15, 30, 60, and 120 minutes). The analysis was conducted to measure changes in the dependent variables—shivering level and body temperature—as a response to the intervention of using the warming gown in the intervention group compared to the use of blankets in the control group.

The data used were on an interval and ratio scale, and the results of the analysis were utilised to test the research hypotheses. This allowed for conclusions to be drawn regarding the effectiveness of the warming gown in reducing shivering levels and increasing body temperature in patients.

Ethical consideration

This study received ethical approval from the Health Research Ethics Committee (HREC) of RSUD Banyumas, with the approval number 265/KEPK-RSUDBMS/VIII/2024. Data collection was conducted after the ethical clearance letter was issued, ensuring that the study adhered to the principles of research ethics, including informed consent, anonymity, confidentiality, beneficence, and justice.

Results

Phase 1 Study

The first phase of this study aimed to develop a prototype of a warming gown for haemodialysis patients. Based on surveys and interviews with nurses, it was found that existing warming tools had weaknesses, such as thin and easily torn fabrics. Therefore, the researchers designed a prototype with an outer layer made of thick fabric as a heat insulator and an inner layer made of smooth, soft, non-irritating fabric. The design was also compatible with HD catheters, allowing patients to remain comfortable without removing the catheter.

Validity testing using the Content Validity Index (CVI) showed excellent results, with an S-CVI/Ave score of 0.99 and an S-CVI/UA score of 0.93, indicating high content validity. Only item 8 had an I-CVI score of 0.80, which requires attention for future revisions. This aligns with a study by Ayu Dessy Sugiharni (2018), which states that an I-CVI score above the threshold of 0.80 indicates very high validity. According to Suryadi et al. (2023) content validity can be assessed by experts, with a minimum of three experts; however, this study involved five experts (comprising an electromedical technician from the hospital, a renal and hypertension specialist, a haemodialysis physician, and two haemodialysis nurses), further strengthening the validity results.

Reliability testing between experts using the Cohen's Kappa test resulted in a kappa value of 1.000 (p-value = 0.002), demonstrating a very strong and almost perfect level of reliability among experts. Additionally, usability testing using the USE questionnaire with five nurses showed highly favourable results, with scores ranging from 80–100%, indicating that the tool is highly effective, comfortable, and easy to use in haemodialysis units. These findings are consistent with a study by Parlika et al. (2022), which demonstrated excellent agreement among evaluators, with a Cohen's Kappa value of 1, and questionnaire analysis showing 100% validity. This assessment also aligns with the standards set by ISO 9241–11:2018 concerning user efficiency, effectiveness, and satisfaction.

The safety of this tool was ensured through automatic temperature regulation between 36°C and 40°C, adhering to recommendations for safe active warming temperatures. The temperature control feature, equipped with a thermal sensor and temperature controller, ensures safe warming without the risk of thermal injury. This is consistent with a study by Plengpanich et al. (2023), which recommends that active warming temperatures should not exceed 38°C to prevent discomfort. From this point onwards, the warming gown is referred to as 'TRESN0' by the researchers.

Overall, the study results show that the "TRESN0 warming gown" is an innovative solution that not only meets functional needs but also considers safety, comfort, and efficiency aspects in supporting the care of haemodialysis patients. This makes it highly suitable for use in CKD patients experiencing shivering during HD sessions.

Phase 2 Study

In the second phase of the study, quantitative testing was conducted to evaluate the effectiveness of the warming gown in reducing shivering levels and

2 Shivering Scale From Crossley & Mahajan

Level	Patient Behaviour	Explanation (Crossley & Mahajan, 1994)	Observed Condition
0	None	No visible signs or symptoms of shivering.	No shivering symptoms.
1	No visible muscle activity, but one or more of piloerection, peripheral vasoconstriction, or peripheral cyanosis.	No visible muscle activity, but reactions such as hair standing on end (piloerection), narrowing of blood vessels in the peripheral region (vasoconstriction), or peripheral skin discolouration (cyanosis).	Goosebumps, pale and cold extremities. Intermittent and mild tremors in the jaw and neck muscles.
2	Muscle activity in one muscle group.	At shivering level 2, visible muscle activity occurs in more than one muscle group, but does not involve the entire body. Examples include uneven muscle movements that do not affect the whole body.	Noticeable tremors in the chest muscles.
3	Muscle activity in more than one muscle group, but no visible generalised shivering.	Muscle activity in more than one muscle group without visible generalised shivering indicates movements in multiple muscle groups, but not to the extent of generalised tremors.	Intermittent tremors affecting the entire body.
4	Generalised muscle activity throughout the body.	Generalised muscle activity throughout the body at shivering level 4 is when visible muscle movements involve the entire body.	Strong and continuous muscle activity throughout the body.

increasing the body temperature of chronic kidney disease patients undergoing haemodialysis with HD catheters. The study used a quasi-experimental pre-post test design with a control group, in which 60 patients were randomly divided into two groups. The intervention group consisted of 30 patients who were provided with the warming gown as a warming device, while the control group consisted of 30 patients who were given standard warming using blankets. The research flow and intervention flow of this study can be seen in Figure 1 and Figure 2.

Respondent Characteristics

The characteristics of the respondents (Table 2) in this study include age, gender, and a history of comorbidities. The average age of the respondents was 57.1 years, with an age range of 30–70 years. Most respondents were male (66.7%), and the majority had comorbidities, including hypertension (70%) and diabetes mellitus (30%). All respondents were fully conscious (compos mentis) and underwent routine haemodialysis twice a week for 4.5 hours, with vascular access via an HD catheter.

Effect of Warming Gown on Shivering Levels and Body Temperature

Measurements were conducted at five time intervals: before the intervention (0 minutes) and at 15, 30, 60, and 120 minutes post-intervention. Shivering levels were assessed using the Crossley and Mahajan scale, while body temperature was measured with a digital thermometer.

The results showed that the use of the warming gown had a significant impact on the intervention group. The average shivering level significantly decreased from 2.63 ± 1.27 to 0.37 ± 0.49, with a p-value of <0.001 (Tables 3 & 4), indicating that the warming gown was highly effective in reducing shivering in patients. Additionally, the body temperature of patients in the intervention group significantly increased from an average of 36.36 ± 0.52°C to 36.84 ± 0.29°C, with a p-value of <0.001 (Tables 3 & 4).

In contrast, in the control group, which used blankets for warmth, no significant changes were observed in either shivering levels or body temperature, with a p-value of >0.05. The graphical representation of shivering levels and body temperature data for patients in both the control and intervention groups is presented in Figure 3.

Discussion

Respondent Characteristics

This study found no significant differences between the intervention and control groups across various variables, including gender, age, education level, comorbidities, BMI, duration of haemodialysis, and duration of CDL use, with p-values greater than 0.05 for each variable. These findings are consistent with (Plengpanich et al., 2023) and (Kameda & Okada, 2023), who stated that similar baseline characteristics between groups do not significantly influence study outcomes.

The prevalence of shivering was higher among patients with low body weight, aged ≥60 years, and females, aligning with the findings of (Salu et al., 2024), which identified age, gender, and BMI as risk factors for shivering. Furthermore, advanced age, female gender, and low BMI are associated with an increased risk of shivering due to impaired thermoregulation, body temperature fluctuations, and reduced fat reserves. (S. Syed et al., 2022) also noted a higher risk of shivering in older

Table 2. Respondent Charateristic

Variabel		Group				P Value
		Intervention (n=30)	Persentase (%)	Control (n=30)	Persentase (%)	
Gender	Male	11	36.7	12	40	0.791
	Female	19	63.3	18	60	
Age (years)	0–19	1	3.3	1	3.3	0.896
	20–24	0	0	0	0	
	25–39	4	13.3	3	10	
	40–59	16	53.3	17	56.7	
	60 and above	9	30	9	30	
Education Level	Elementary School	12	40	18	73.33	0.122
	Junior High School	7	23.33	5	16.67	
	Senior High School	7	23.33	5	10	
	Bachelor's Degree	3	10	2	3.33	
	Master's Degree	1	3.3	0	0	
Comorbid-ities	Hypertension	19	31.67	15	50	0.373
	Diabetes Mellitus	2	6.67	6	20	
	Hypertension and DM	6	20	3	10	
	Cervical Cancer	1	3.33	1	3.33	
	Kidney Inflammation	1	3.33	1	3.33	
	Lupus (SLE)	1	3.33	1	3.33	
	Kidney Stones	0	0	3	10	
Body Mass Index (BMI)	Underweight	8	26.7	4	13.3	0.670
	Normal Weight	9	30	13	43.3	
	Overweight	9	30	10	33.3	
	Obesity	4	13.3	3	10	
Body Mass Index (BMI)	< 6 months	25	83.33	26	86.67	0.500
	> 6 months	5	16.67	4	13.33	
Duration of CDL Usage	< 3 months	25	83.33	25	83.33	0.635
	> 3 months	5	16.67	5	16.67	

Table 3. Friedman Test Table for Shivering Level and Body Temperature Data in the Intervention and Control Groups

Measurement Time	Shivering Level			Body Temperature		
	Intervention group (n=30) (Mean ± SD)	Control group (n=30) (Mean ± SD)	P Value	Intervention group (n=30) (Mean ± SD)	Control group (n=30) (Mean ± SD)	P Value
0 minutes	2.57 ± 1.25	2.00 ± 1.08	0.078	36.31 ± 0.42	36.38 ± 0.42	0.801
15 minutes	2.20 ± 1.03	2.00 ± 1.08	0.412	36.46 ± 0.52	36.41 ± 0.45	0.331
30 minutes	1.67 ± 0.80	2.00 ± 1.08	0.337	36.63 ± 0.35	36.38 ± 0.38	0.023
60 minutes	1.03 ± 0.62	1.97 ± 1.13	0.001	36.73 ± 0.36	36.35 ± 0.36	0.001
2 hours	0.37 ± 0.49	1.93 ± 1.08	<0.001	36.84 ± 0.29	36.43 ± 0.39	<0.001
P Value (overall)	<0.001	0.632		<0.001	0.799	

Table 4. Mann-Whitney Test Table for Shivering Level and Body Temperature Data in Intervention and Control Groups

Measurement Time	Shivering Level				Body Temperature			
	Intervention group (n=30) (Mean ± SD)	Control group (n=30) (Mean ± SD)	Uji Mann Whitney	P Value As per Bonferonni Correction	Intervention group (n=30) (Mean ± SD)	Control group (n=30) (Mean ± SD)	Mann Whitney Test	P Value As per Bonferonni Correction
0 minutes	2.63 ± 1.27	2.07 ± 1.08	0.078	0.01	36.36 ± 0.52	36.37 ± 0.43	0.801	0.200
15 minutes	2.23 ± 1.04	2.03 ± 1.13	0.412	0.103	36.49 ± 0.57	36.39 ± 0.45	0.331	0.083
30 minutes	1.70 ± 0.84	2.03 ± 1.13	0.337	0.084	36.64 ± 0.36	36.39 ± 0.39	0.023	0.006
60 minutes	1.00 ± 0.64	2.00 ± 1.17	0.001	<0.001	36.74 ± 0.37	36.34 ± 0.34	0.001	<0.001
2 hours	0.37 ± 0.49	1.97 ± 1.16	<0.001	<0.001	36.84 ± 0.29	36.40 ± 0.38	<0.001	<0.001

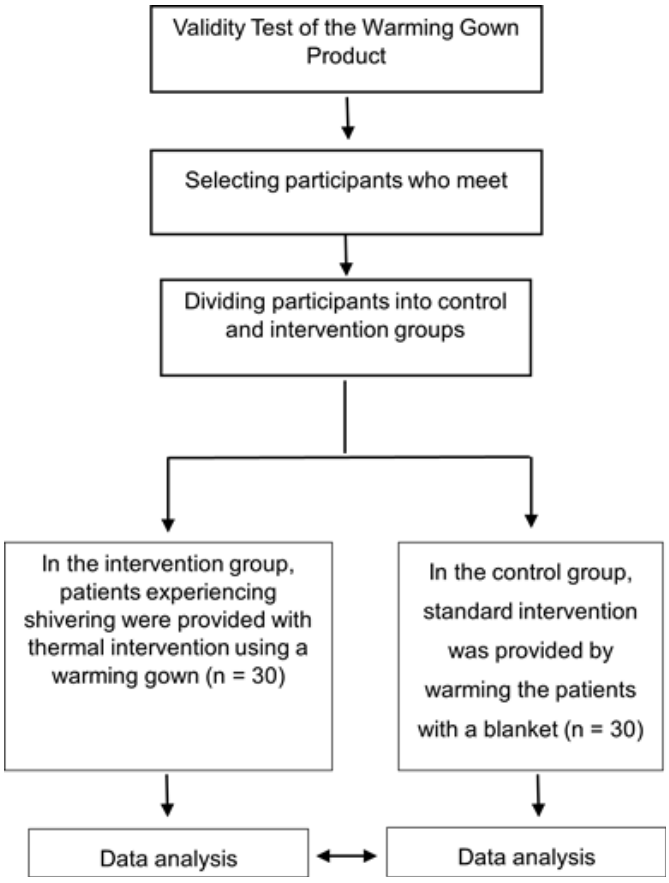


Figure 1. Research flow

The figure presents the research process, beginning with the validation of the developed instrument and concluding with data analysis. It further indicates that participants were randomly allocated to the intervention and control groups.

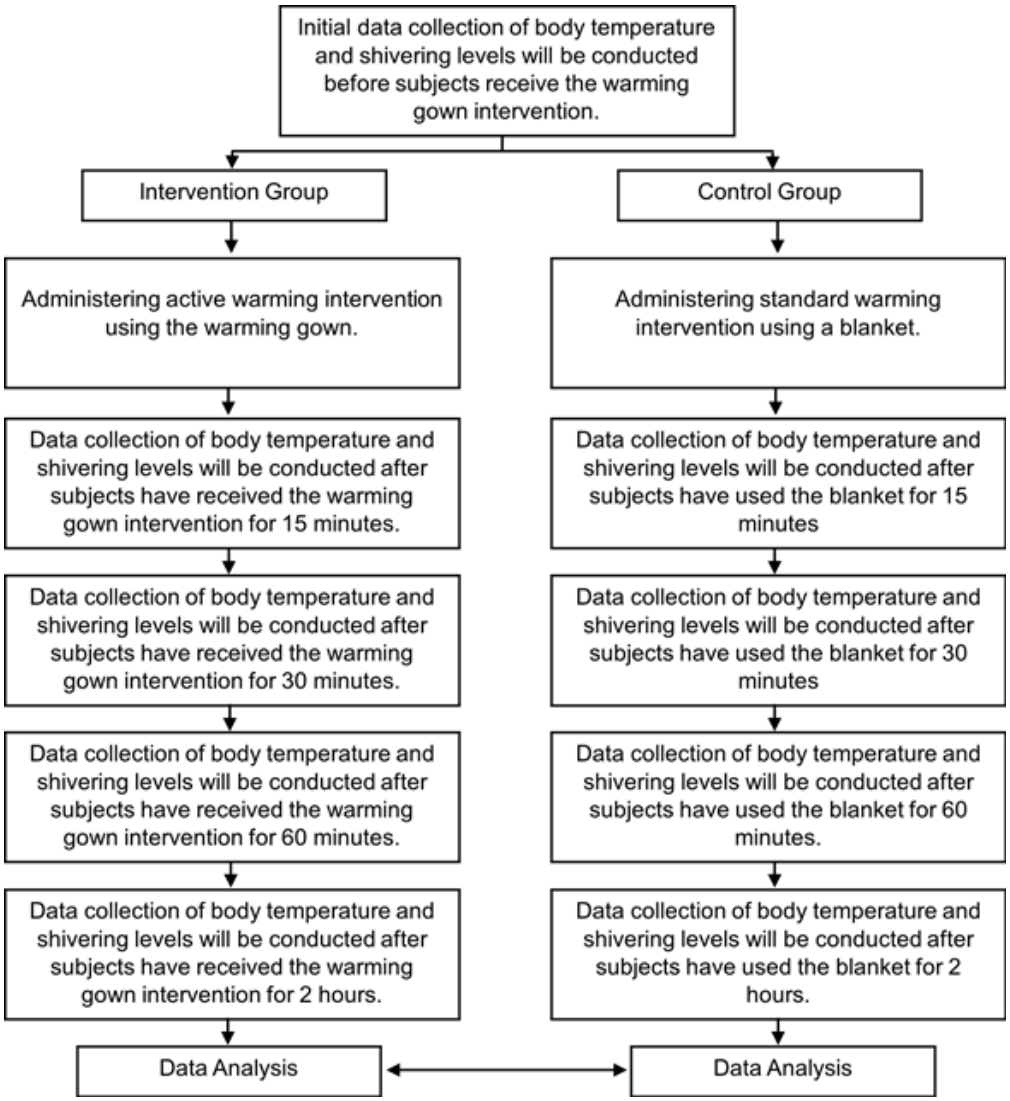


Figure 2. Intervention flow

This figure illustrates the intervention flow for both the intervention and control groups, beginning from the allocation of patients to their respective groups through to the data analysis stage

haemodialysis patients.

Hypertension and diabetes mellitus (DM) were the most prevalent comorbidities in both groups, with DM and hypertension being primary risk factors for ESRD (Saran et al., 2018). DM can exacerbate immunodeficiency, thereby increasing the risk of infection and shivering (Luh Widani & Suryandari, 2021).

Longer durations of haemodialysis and CDL use exceeding six months increase the risk of infection and shivering (Miller et al., 2016). The prevalence of CDL use among patients newly starting haemodialysis also heightens their vulnerability to complications, including shivering (S. A. Syed et al., 2020).

Low education levels among haemodialysis patients, with the majority having only primary school education, may impact their understanding of shivering and infection prevention. Adequate education is essential to reducing the risk of infection and shivering (Saran et al., 2018).

Discussion on the Effect of Warming Gown on Shivering Levels

This study demonstrated a significant reduction in shivering levels in the intervention group using the “warming gown” compared to the control group. In the intervention group, the average shivering score decreased from 2.57 ± 1.25 (0 minutes) to 0.37 ± 0.49 (2 hours) with a p-value of 0.001, while the control group showed only minimal changes from 2.00 ± 1.08 (0 minutes) to 1.93 ± 1.08 (2 hours) with a p-value of 0.632. This indicates that the warming gown intervention is more effective in reducing

Figure A
Graph of Shivering Level in the Intervention Group and Control Group

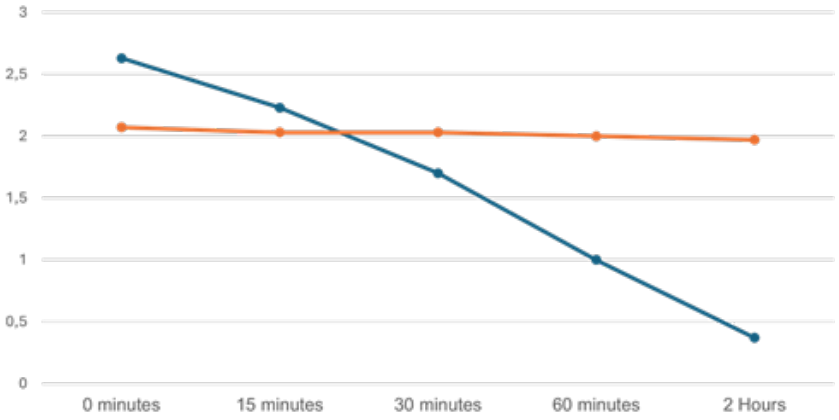


Figure B
Graph of Body Temperature in the Intervention Group and Control Group

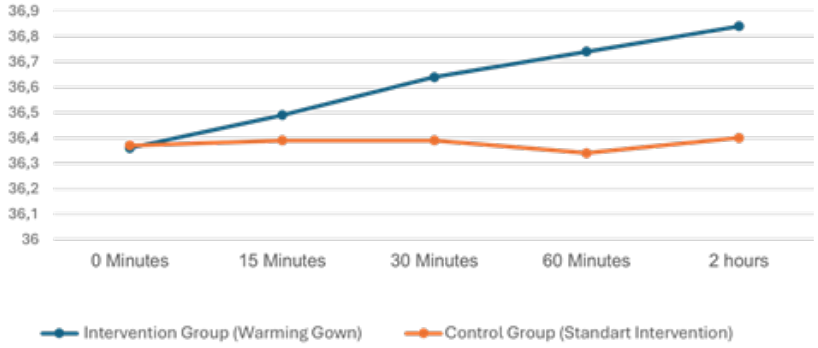


Figure 3. Graph of Shivering Level and Body Temperature in The Intervention Group and Control Group

This figure provides a graphical depiction of the changes in shivering levels and body temperature among patients in both the intervention and control groups, from 0 minutes up to 2 hours following the administration of the intervention in each group

shivering compared to standard care.

These findings align with the study by Kameda & Okada (2023), which showed that active warming therapy reduces the incidence of shivering and enhances patient thermal comfort. Non-pharmacological therapies, such as active warming (e.g., electric warming, water-circulating garments, and forced-air warming), have also been proven effective in managing shivering, particularly in clinical settings (Chen et al. (2019). Similarly, Switzer Tiara (2024) found that forced-air warming significantly reduced shivering incidence in patients with hypothermia, while the control group using passive warming exhibited more intense shivering. Additionally, Lee et al. (2015) reported that thermal gowns effectively reduced shivering levels and accelerated the return to normal body temperature in postoperative spinal patients. Susanto, (2022) confirmed the benefits of electric blankets in reducing postoperative hypothermia-induced shivering.

Graphical data demonstrate that the warming gown in the intervention group was more effective in reducing shivering within 60 minutes, compared to the control group, which showed no significant decrease (Figure 3). This is consistent with findings from (de Bernardis et al., 2016), which showed that thermal gowns delivering warm airflow at 40°C effectively prevented body heat loss and reduced shivering, unlike the control group that relied on standard blankets without active warming.

Discussion on the Effect of Warming Gown on Body Temperature

The study also showed that the use of the “warming gown” (intervention group) was effective in increasing patients’ body temperatures compared to the control group using standard care. In the intervention group, body temperature significantly increased from 36.36°C at 0 minutes to 36.84°C at 2 hours, with consistent improvements at each time

Figure 4. Design of TRESN0 Warming Gown

At the upper section, two CDL ports are positioned on the right and left sides, allowing for adjustment according to the patient's CDL placement. In the lower section, three thermal ports are provided to allow the entry of warm air from a device equipped with thermal sensors. One of these thermal ports may be selected based on the unoccupied side of the patient or the side opposite the haemodialysis machine.

point, particularly at 30 minutes, 60 minutes, and 2 hours ($p = 0.001$). Conversely, in the control group, body temperature increased only slightly from 36.37°C to 36.40°C, with no significant difference ($p > 0.05$).

These findings align with (Susanto, 2022), who found that electric blankets (active warming) effectively increased postoperative body temperature from 34.92°C to 36.57°C. (Lopez, 2018) also highlighted that active warming therapies improve body temperature by limiting heat redistribution and reducing radiant heat loss. (Dewi Listiyanawati & Studi Ilmu Keperawatan Universitas Alma Ata Yogyakarta, 2018) reported that electric blankets significantly increased body temperature (1.54°C) compared to regular blankets (0.85°C) with a p-value of 0.001.

According to de (de Bernardis et al., 2016), thermal gowns with active warming at 40°C for 30 minutes effectively prevented body temperature drops in the intervention group, especially in post-caesarean patients. (Kameda & Okada, 2023) also noted that active warming therapies help stabilise body temperature postoperatively, preventing hypothermia and reducing shivering. (Chen et al., 2019) similarly found that warm gowns and heated blankets effectively maintained body temperature during surgical procedures, particularly for operations lasting over 30 minutes.

Figure 3 illustrates that the intervention group using the "warming gown" experienced a faster and more significant rise in body temperature compared to the control group. This aligns with (Febriani et al., 2020), who found that electric blankets increased body temperature more effectively than regular blankets, with temperature gains ranging from 1.50°C to 1.96°C. (T. Lee et al., 2015) also reported that thermal gowns were more effective in raising body temperature and improving patient comfort postoperatively compared to cotton garments.

Based on Tables 3 and 4, the warming gown was effective in increasing body temperature after 30 minutes of use, with its effectiveness further improving after 2 hours. Statistical tests also showed that the warming gown effectively reduced shivering levels after more than 60 minutes of use, as supported by various studies. (de Bernardis et al., 2016) demonstrated that warming gowns reduced

shivering and increased body temperature within 30 minutes before spinal anaesthesia induction and during surgery. Similarly, (T. Lee et al., 2015) reported that by the 30th minute, 48% of patients using thermal gowns achieved body temperatures above 36°C, showing significant improvement within that time frame. (Bodhipadma, 2017)noted that heating devices were effective in increasing body temperature and reducing shivering after 2–3 hours of use, reflecting the time needed to achieve normothermia (36.5°C). Clinical practice guidelines also support these findings, indicating that in ICUs, it takes approximately 2 hours to raise body temperature from 35.0°C to 36.0°C and 3 hours to reach 36.5°C.

Electric blankets have also been shown to provide faster warming compared to regular blankets. According to (Febriani et al., 2020), the heat convection mechanism of electric blankets significantly increased body temperature and reduced shivering within 10–30 minutes. (Chen et al., 2019) also stated that the warming effects of therapies such as warm gowns and heated blankets became significant after 30 minutes of use. During this period, the body has enough time to respond to the warming, increasing core temperature. These active warming strategies are crucial, particularly during surgical procedures lasting over 30 minutes, to prevent hypothermia and related complications.

However, the study acknowledges certain limitations, such as variations in patient conditions that may affect the warming process. For instance, patient movements can disrupt heat distribution and reduce effectiveness. Overall, the warming gown has been proven to be an effective solution for improving patient comfort and safety during haemodialysis.

Conclusions

The use of a warming gown significantly reduced shivering levels from 2.63 ± 1.27 to 0.37 ± 0.49 and increased body temperature from 36.36 ± 0.52°C to 36.84 ± 0.29°C in chronic kidney disease patients undergoing haemodialysis with a catheter ($p < 0.001$). This demonstrates that the warming gown is an effective, safe, and comfortable non-pharmacological intervention to improve patient comfort during dialysis.

Declaration of Interest

There's no conflict of interest

Acknowledgment

Authors would like to express gratitude to Jenderal Soedirman University and haemodialysis nurses at Banyumas Regional Hospital for their support in conducting and completing this study

Funding

The author does not receive finansial support for research, authorship, or publication of this article.

Data Availability

The data supporting the findings of this study are available upon reasonable request from the corresponding author, NA. Due to privacy or ethical restrictions, access to the data may be restricted.

References

Agarwal, A. K., Haddad, N. J., Vachharajani, T. J., & Asif, A. (2019). Innovations in vascular access for hemodialysis. *In Kidney International, 95*(5), 1053–1063. Elsevier B.V. https://doi.org/10.1016/j.kint.2018.11.046

Al-Balas, A., Shariff, S., Lee, T., Young, C., & Allon, M. (2019). Clinical outcomes and economic impact of starting hemodialysis with a catheter after predialysis arteriovenous fistula creation. *American Journal of Nephrology, 50*(3), 221–227. https://doi.org/10.1159/000502050

Anggraeni, N., Awaludin, S., & Saryono, S. (2024). Beneficence in chronic kidney disease patients undergoing haemodialysis therapy: A concept analysis. *Malahayati International Journal of Nursing and Health Science, 7*(3), 379–385. https://doi.org/10.33024/minh.v7i3.170

Ayu Dessy Sugiharni, G. (2018). Testing the validity of interactive learning media content oriented to the creative problem solving model. *In Jurnal Penelitian dan Pengembangan Pendidikan, 2*(2).

Bodhipadma, S. (2017). Effectiveness of handmade forced-air warming blanket on body core temperature among post-cardiac surgery patients. *Journal of Applied Science, 16*(2), 8–14. https://doi.org/10.14416/j.appsci.2017.11.001

Chen, W. A., Liu, C. C., Mnisi, Z., Chen, C. Y., & Kang, Y. N. (2019). Warming strategies for preventing hypothermia and shivering during cesarean section: A systematic review with network meta-analysis of randomized clinical trials. *In International Journal of Surgery, 71,* 21–28. Elsevier Ltd. https://doi.org/10.1016/j.ijsu.2019.09.006

Crossley, A. W. A., & Mahajan, R. P. (1994). The intensity of postoperative shivering is unrelated to axillary temper a ture. *In Anaesthesia,49.*

de Bernardis, R. C. G., Siaulys, M. M., Vieira, J. E., & Mathias, L. A. S. T. (2016). Perioperative warming with a thermal gown prevents maternal temperature loss during elective cesarean section. *A randomized clinical trial. Brazilian Journal of Anesthesiology (English Edition), 66*(5), 451–455. https://doi.org/10.1016/j.bjane.2014.12.007

Dewi Listiyanawati, M., & Studi Ilmu Keperawatan Universitas Alma Ata Yogyakarta, P. (2018). The effectiveness of electric blankets in increasing body temperature in post-cesarean section patients experiencing hypothermia. *3*(2). http://journal.ugm.ac.id/jkesvo

Febriani, F., Agustina, M., & Kapadia, R. (2020).

Effectiveness of electric blanket in increasing body temperature of postoperative patients experiencing hypothermia: Literature review. *Scientific Journal Of Nursing Research, 2*(2), 50–53. http://ejournal.poltekkes-pontianak.ac.id/index.php/SJNR/index

IRR. (2019). 1 th Report Of Indonesian Renal Registry 2018.

Jain, A., Gray, M., Slisz, S., Haymore, J., Badjatia, N., & Kulstad, E. (2018). Shivering treatments for targeted temperature management: A review. *In Journal of Neuroscience Nursing, 50*(2), 63–67. Lippincott Williams and Wilkins. https://doi.org/10.1097/JNN.0000000000000340

Kameda, N., & Okada, S. (2023). Evaluation of postoperative warming care protocol for thermal comfort and temperature management immediately after surgery: Nonrandomized controlled trial. *Journal of Perianesthesia Nursing, 38*(3), 427–433. https://doi.org/10.1016/j.jopan.2022.07.001

Kovesdy, C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. *In Kidney International Supplements, 12*(1), 7–11. Elsevier B.V. https://doi.org/10.1016/j.kisu.2021.11.003

Krinsky, R., Murillo, I., & Johnson, J. (2014). A practical application of Katharine Kolcaba's comfort theory to cardiac patients. *Applied Nursing Research, 27*(2), 147–150. https://doi.org/10.1016/j.apnr.2014.02.004

Lee, T., Thamer, M., Zhang, Y., Zhang, Q., & Allon, M. (2015). Outcomes of elderly patients after predialysis vascular access creation. *Journal of the American Society of Nephrology, 26(*12), 3133–3140. https://doi.org/10.1681/ASN.2014090938

Lee, W. P., Wu, P. Y., Shih, W. M., Lee, M. Y., & Ho, L. H. (2015). The effectiveness of the newly designed thermal gown on hypothermic patients after spinal surgery. *Journal of Clinical Nursing, 24*(19–20), 2779–2787. https://doi.org/10.1111/jocn.12873

Lok, C. E., Huber, T. S., Lee, T., Shenoy, S., Yevzlin, A. S., Abreo, K., Allon, M., Asif, A., Astor, B. C., Glickman, M. H., Graham, J., Moist, L. M., Rajan, D. K., Roberts, C., Vachharajani, T. J., & Valentini, R. P. (2020). KDOQI clinical practice guideline for vascular access: 2019 UPDATE.

Lopez, M. B. (2018). Postanaesthetic shivering - from pathophysiology to prevention. *Romanian Journal of Anaesthesia and Intensive Care, 25*(1), 73–81. https://doi.org/10.21454/rjaic.7518.251.xum

Luh Widani, N., & Suryandari, H. (2021). Factors associated with the incidence of double lumen catheter infection in chronic kidney failure patients with hemodialysis at RS X Jakarta. http://jurnal.globalhealthsciencegroup.com/index.php/JPPP

Miller, L. M., Clark, E., Dipchand, C., Hiremath, S., Kappel, J., Kiaii, M., Lok, C., Luscombe, R., Moist, L., Oliver, M., & MacRae, J. (2016). Hemodialysis tunneled catheter-related infections. *Canadian Journal of Kidney Health and Disease, 3*(1). https://doi.org/10.1177/2054358116669129

Nasution, M. P., Fitriati, M., Veterini, A. S., Kriswidyatomo, P., & Utariani, A. (2022). Preoperative perfusion index as a predictor of post-anaesthetic shivering in caesarean section with spinal anaesthesia. *Journal of Perioperative Practice, 32*(5), 108–114. https://doi.org/10.1177/1750458920979263

Parlika, R., Mahendra, R. R., Aulia, M. R., Lutfi, R., Waritsin, R. K., Maulana, H., & Ramadhan, T. (2022). Validity test of extracurricular data collection website using pearson correlation and cohen kappa methods. *Jurnal Ilmiah Ilmu Komputer Fakultas Ilmu Komputer Universitas AL Asyariah Mandar, 8*(2). http://ejournal.fikom-unasman.ac.id

Plengpanich, P., Charoensuk, C., Chanthawong, S., Nonphiaraj, S., Prasongdee, S., Suttinarakorn, C., Ruenhunsa, T., & Kittiponghansa, A. (2023). Effect of short duration used of active prewarming for preventing hypothermia in non-anesthetized volunteer: A randomized-controlled trial. *Journal of the Medical Association of Thailand, 106*(1), 95–101. https://doi.org/10.35755/jmedassocthai.2023.01.13747

Salu, J., Kemal Firdaus, E., Novitasari, D., & Studi Keperawatan Anestesiologi Program Sarjana Fakultas Kesehatan Universitas Harapan Bangsa, P. (2024). Description of shivering incident in intra spinal anesthesia patients in the operating room of Lakipadada Tana Toraja Hospital. *Jurnal Ilmiah Kesehatan Promotif,* 1–14.

Saran, R., Robinson, B., Abbott, K. C., Agodoa, L. Y. C., Bragg-Gresham, J., Balkrishnan, R., Dietrich, X., Eckard, A., Eggers, P. W., Gaipov, A., Gillen, D., Gipson, D., Hailpern, S. M., Hall, Y. N., Han, Y., He, K., Herman, W., Heung, M., Hirth, R. A., … Shahinian, V. (2018). US renal data system 2017 annual data report: Epidemiology of kidney disease in the United States. *In American Journal of Kidney Diseases, 71*(3), A7. W.B. Saunders. https://doi.org/10.1053/j.ajkd.2018.01.002

Sedhain, A., Sapkota, A., & Mahotra, N. B. (2019). Hemodialysis catheter-related infection in a teaching Hospital of Central Nepal. www.jiom.com.np

Shepshelovich, D., Yelin, D., Bach, L. O., Halevy, N., Ziv, Y., Green, H., Rozen-Zvi, B., Ben-Zvi, H., Bishara, J., Gafter-Gvili, A., & Yahav, D. (2017). Chills during hemodialysis: Prediction and prevalence of bacterial infections – A retrospective cohort study. *American Journal of Medicine, 130*(4), 477–481. https://doi.org/10.1016/j.amjmed.2016.11.022

Suryadi, T., Alfiya, F., Yusuf, M., Indah, R., Hidayat,

T., & Kulsum, K. (2023). Content validity for the research instrument regarding teaching methods of the basic principles of bioethics. *Jurnal Pendidikan Kedokteran Indonesia: The Indonesian Journal of Medical Education, 12*(2), 186. https://doi.org/10.22146/jpki.77062

Susanto, I. M. (2022). Electric blanket can reduce shivering and hypothermia in post-caesarean section patients. I Made Susanto.

Switzer Tiara, H. (2024). Preoperative warming to improve patient outcomes: Implementation of a Warming Protocol [University of St. Augustine for Health Sciences]. https://doi.org/10.46409/sr.PUWX7781

Syed, S. A., Fayyaz, T., Tauseef, A., Chaudhry, M., Abdullah, M., & Malik, A. (2020). Prevalence of infection in patients having chills during haemodialysis. *In Annals of International Medical and Dental Research, 7*.

Syed, S., Stilwell, P., Chevrier, J., Adair, C., Markle, G., & Rockwood, K. (2022). Comprehensive design considerations for a new hospital gown: A patient-oriented qualitative study. *CMAJ Open, 10*(4), E1079–E1087. https://doi.org/10.9778/cmajo.20210271

Triage in disasters: A conceptual analysis

Asih Dewi Setyawati[1], Yu-Ying Lu[2*]

[1] PhD Candidate in Nursing, School of Nursing, College of Nursing, National Taipei University of Nursing and Health Sciences, Taipei, Taiwan
[2] Associate Professor, School of Nursing, College of Nursing, National Taipei University of Nursing and Health Sciences, Taipei, Taiwan

Abstract

Background: Disaster triage faces significant challenges due to definitional conflicts and ambiguities. Conducting a concept analysis of disaster triage is essential for clarifying its meaning, improving decision-making, ensuring effective training, and enhancing disaster preparedness for healthcare professionals.
Purpose: Thus, this study aims to define the concept of disaster triage and identify its attributes, antecedents, and consequences using Walker and Avant's framework.
Methods: The methodology involved a comprehensive literature review from 2013 to 2024, focusing on nurse-related triage during emergencies and disasters. Articles were gathered from databases such as Web of Science, PubMed, Scopus, Cochrane Library, and Google Scholar. After screening the titles, abstracts, and full texts, 30 articles met the inclusion criteria.
Results: Following Walker and Avant's framework, the concept analysis revealed that disaster triage is influenced by various antecedents, attributes, and consequences. Antecedents such as education, working experience, and disaster training provide the foundation for effective triage practices, while attributes such as clinical judgment, assessment skills, and effective communication are crucial in the triage process itself. The consequences of effective disaster triage include enhanced patient safety and care delivery efficiency.
Conclusion: In conclusion, this study provides valuable insights that deepen the understanding of the concept of disaster triage and also provides valuable guidance for clinical practice and informs future research in the fields of disaster management and emergency nursing.

Keywords: concept analysis, disaster management, disaster triage, nurse, walker and avant

Introduction

Triage stands as a cornerstone of nursing practice, embodying the principles of prioritization, efficiency, and compassionate care based on the severity of the patient's condition (Johnson et al., 2021). Nurses, equipped with clinical acumen and empathy, play a pivotal role in triage, navigating the complexities of patient presentations and allocating resources judiciously (AlMarzooq, 2020). However, conventional triage methods often grapple with challenges such as overcrowding, prolonged wait times, and limited accessibility, especially during a disaster (Brown, 2023). Enter the innovative paradigm of the Walking Avant Step, poised to revolutionize the triage concept in disaster.

The term "disaster triage" faces significant challenges due to definitional conflicts and ambiguities. Disaster triage involves prioritizing patients based on the severity of their conditions and the availability of resources, particularly in the high-stakes context of emergencies (Hamdi & Al Thobaity, 2023). However, varying interpretations and implementations across disciplines and disaster scenarios contribute to this confusion. Different triage models, such as START (Simple Triage and Rapid Treatment) and SALT (Sort, Assess, Life-Saving Interventions, Treatment/Transport), use distinct criteria,

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 97-106
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2601

Article Info

Received : August 29, 2024
Revised : December 20, 2024
Accepted : January 13, 2025
Published : April 29, 2025

***Corresponding author**

Yu-Ying Lu*
Associate Professor, School of Nursing, College of Nursing, National Taipei University of Nursing and Health Sciences, Taipei, Taiwan; Address: No. 365, Mingde Rd, Beitou District, Taipei City, Taiwan 112; Phone: No. 365, Mingde Rd, Beitou District, Taipei City, Taiwan 112; E-mail: yuyin@ntunhs.edu.tw

Citation

Setyawati, A. D., & Lu, Y. Y. (2025). Triage in disasters: A conceptual analysis . *Jurnal Keperawatan Padjadjaran, 13*(1), 97-106. http://dx.doi.org/10.24198/jkp.v13i1.2601

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-Non-Commercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

creating disparities in practice (Bazyar et al., 2020). Additionally, cultural and ethical considerations can further complicate decision-making, as local norms may clash with standardized protocols (Cuthbertson & Penney, 2023). The lack of a universally accepted definition exacerbates these issues, resulting in inconsistent training and application during crises.

Concept analysis is a rigorous process designed to clarify, validate, and define abstract concepts, aiding in theory development and improving communication (Walker & Avant, 2019). With disasters occurring more frequently worldwide, registered nurses must be well-prepared to respond effectively (Setyawati et al., 2020). Despite the critical role of disaster triage in patient care, current systems face significant challenges, including overcrowding, prolonged wait times, and limited accessibility. The incorrect application of disaster triage can have dire consequences, including resource misallocation (Wiedenfeld et al., 2021), prolonged wait times (Tam et al., 2018), and ethical dilemmas (Canatan, 2020). For example, misjudging a patient's severity may delay critical interventions for those in need, while scarce resources might be wasted on patients with lower urgency (Fekonja et al., 2023).

Innovative concepts like the Walking Avant Step show promise but there is a lack of comprehensive research on its implementation and impact on disaster triage. Moreover, existing studies have not fully explored how Walker and Avant's method can systematically refine triage practices. This gap underscores the need for rigorous investigation into how the Walking Avant Step can enhance current systems, providing a more efficient framework for nurses. Research is necessary to validate and quantify its benefits, particularly in reducing overcrowding, decreasing wait times, and improving accessibility, ultimately optimizing resource allocation and patient care. Employing this systematic approach could offer deeper insights into disaster triage, leading to the refinement of current methods and the development of innovative strategies in healthcare settings.

The purpose of this study is to analyze and provide a practical definition for disaster triage in nursing by using the systematic approach proposed by Walker and Avant within the prehospital context. By employing this step, nurses and healthcare professionals can gain deeper insights into the intricacies of disaster triage practice, leading to the refinement of existing methods and the development of innovative approaches to enhance patient care and optimize resource allocation in healthcare settings.

Methods

Walker and Avant's concept analysis involves several steps to thoroughly examine and clarify abstract concepts (Walker & Avant, 2019). The goal is to provide a practical definition of disaster triage in nursing by applying a systematic approach based on Walker and Avant's method. This approach involves defining the concept, determining the purpose of the analysis, and identifying its attributes, antecedents, consequences, empirical references, and case studies.

The analysis begins with a literature review. The current study examines the literature on the concept of triage in emergency and disaster situations. Articles published between 2013 and 2024 were gathered from databases such as Web of Science, PubMed, Scopus, Cochrane Library, and Google Scholar, using keywords such as triage, nurse, emergency, and disaster. The inclusion criteria were that the studies were written English and Bahasa Indonesia, published after 2013, focusing specifically on nurse-related triage in emergencies and disasters. The exclusion criteria included articles not focused on nurse-led triage in these settings. Initially, 16,864 relevant articles were identified then after filtering by date, excluding irrelevant articles, identifying duplicates using EndNote, and manually reviewing titles and abstracts, the count was reduced to 30. These 30 articles were deemed eligible for inclusion after a final assessment (Figure 1).

Results

Definition of disaster triage

The term originates from the French word "trier," meaning to sort or select. In essence, triage serves as a critical decision-making tool during emergencies, disasters, and everyday healthcare scenarios, ensuring that the limited resources are allocated efficiently to those who need them most urgently (Christian, 2019). Triage is a systematic process used in healthcare settings to prioritize patient care based on the severity of their condition and the available resources (Dippenaar, 2019).

Meanwhile, disaster triage can be defined as the process by which patients are assessed, classified, and sorted based on their presenting complaint and clinical urgency, providing assurance for timely access to emergency care during a disaster (Peta et al., 2023). Others argue that disaster triage is a critical process in emergency response, where healthcare professionals assess and prioritize patients based on the severity of their injuries to provide efficient and timely care (Ghanbari et al., 2019). This approach is particularly vital during large-scale disasters like earthquakes and floods where resources are limited, and immediate decision-making is necessary to minimize mortality and morbidity (Bazyar et al., 2019). Disaster triage aims to rapidly evaluate all victims, prioritize life-saving interventions, and allocate resources effectively under extreme conditions (Aldossari & Al Bensaad, 2024).

In conclusion, disaster triage is a systematic method used during emergencies to assess and prioritize patient treatment based on severity and resource availability. Its goal is to maximize survival

when casualties exceed healthcare capacity by quickly assessing, categorizing, and allocating resources to ensure the best possible outcomes in mass casualty situations.

Attributes for Disaster Triage

A review of disaster triage suggests that there are a handful of attributes commonly found in the references, including clinical judgment, assessment and intervention, the management of medical resources, timely decision-making, and communication. Clinical judgment refers to the nurse's ability to recognize, understand, and respond to a patient (Zhu et al., 2022). Moon and Cho (2022) emphasize that nurses need to have clinical judgment, which includes the ability to detect critical details, interpret data from diverse sources of knowledge, pick out essential elements from patient histories, prioritize tasks effectively, formulate nursing diagnoses, anticipate interventions, and reassess potential consequences.

Assessment in disaster triage means quickly and accurately determining patient priority through thorough examinations and understanding their needs. Interventions focus on addressing immediate needs and preventing further health decline by following triage protocols and guidelines (Bazyar et al., 2020; Mackway-Jones et al., 2014; Vatnøy et al., 2013). The Simple Triage and Rapid Treatment (START) system is used in many countries including Indonesia and was created in 1983, quickly assesses and categorizes patients based on injury severity by checking RPM (respiration, perfusion, and mental status). It is possible to determine disaster triage status within 60 seconds by checking pulse, breathing, capillary refill, bleeding, and responsiveness. Patients who can walk are marked green, those who can't but meet certain criteria are yellow, and those with severe abnormalities are red. Apnoeic patients are classified as black/expectant (Purwadi et al., 2021; Reinhardt, 2017; START, 2023).

In disaster triage, managing medical resources involves prioritizing patients based on the severity of their condition and collaborating with team members (Moon & Cho, 2022). Immediate care is given to life-threatening cases, while less urgent cases are addressed as resources allow. Effective management also includes allocating personnel, equipment, and facilities to ensure timely and appropriate care (Christian, 2019; Hick et al., 2012). Timely decisions in disaster triage means the ability to work under stressful situations, confidence about decisions made, flexibility, and agility (Moon & Cho, 2022; Moon & Park, 2017). Timely decision-making is essential for effectively prioritizing patient care, optimizing resource use, and improving overall survival rates in high-stress, resource-limited environments. When responders act quickly and efficiently when assessing patient needs, they ensure that the most critically injured receive immediate attention, which can be lifesaving (Shackelford et al., 2022). Confidence in decision-making also serves as a cornerstone, enabling swift and decisive actions without hesitation or doubt (Reay et al., 2020).

Communication in disaster triage means the ability to interview, listen actively, support non-verbally and verbally, and coordinate with other healthcare professionals, emergency responders, and patients (Hitchcock et al., 2014; Moon & Cho, 2022). The ICN framework highlights the importance of maintaining communication channels for information sharing and team coordination in high-stress situations (ICN, 2019). Clear and effective communication channels ensure the dissemination of disaster triage instructions, patient status updates, resource availability, and the coordination of patient transfers and evacuations during a disaster (Khorram-Manesh et al., 2021).

Antecedents of Disaster Triage

Effective disaster triage relies on triage education, working experience, and disaster training. Triage education equips healthcare professionals with the theoretical understanding and practical techniques necessary for patient prioritization and resource allocation (AlShatarat et al., 2022). The experience of nurses of disaster triage is crucial, as incorrect decisions can risk patient safety. Studies show that years of experience significantly influence the accuracy of triage decisions (Ghazali et al., 2020; Reblora et al., 2020) and provide guidance and reassurance to less experienced colleagues, fostering a secure triage team environment (Fathoni et al., 2013; Fekonja et al., 2024).

Disaster training programs emphasize disaster triage protocols, ensuring that healthcare professionals can swiftly assess and prioritize patients during mass casualty incidents (MCIs) (Bazyar et al., 2020). These programs include simulation-based exercises and hands-on training to develop practical skills for real-world emergencies (Loke et al., 2021). By integrating training with experiential learning from past disasters, healthcare professionals can enhance their triage skills, resilience, and response capabilities (Xue et al., 2020). Continuous training and education improve disaster response outcomes for both patients and responders.

Consequences of Disaster Triage

The consequences of disaster triage decisions extend across various dimensions, including patient safety, and the efficiency of care delivery within healthcare settings. Additionally, the safety of patients hinges on the accuracy and effectiveness of disaster triage decisions. Errors or delays in prioritizing patients based on acuity levels can jeopardize patient outcomes and result in adverse events. Ensuring patient safety is paramount in disaster triage scenarios. Vigilant monitoring and strict adherence

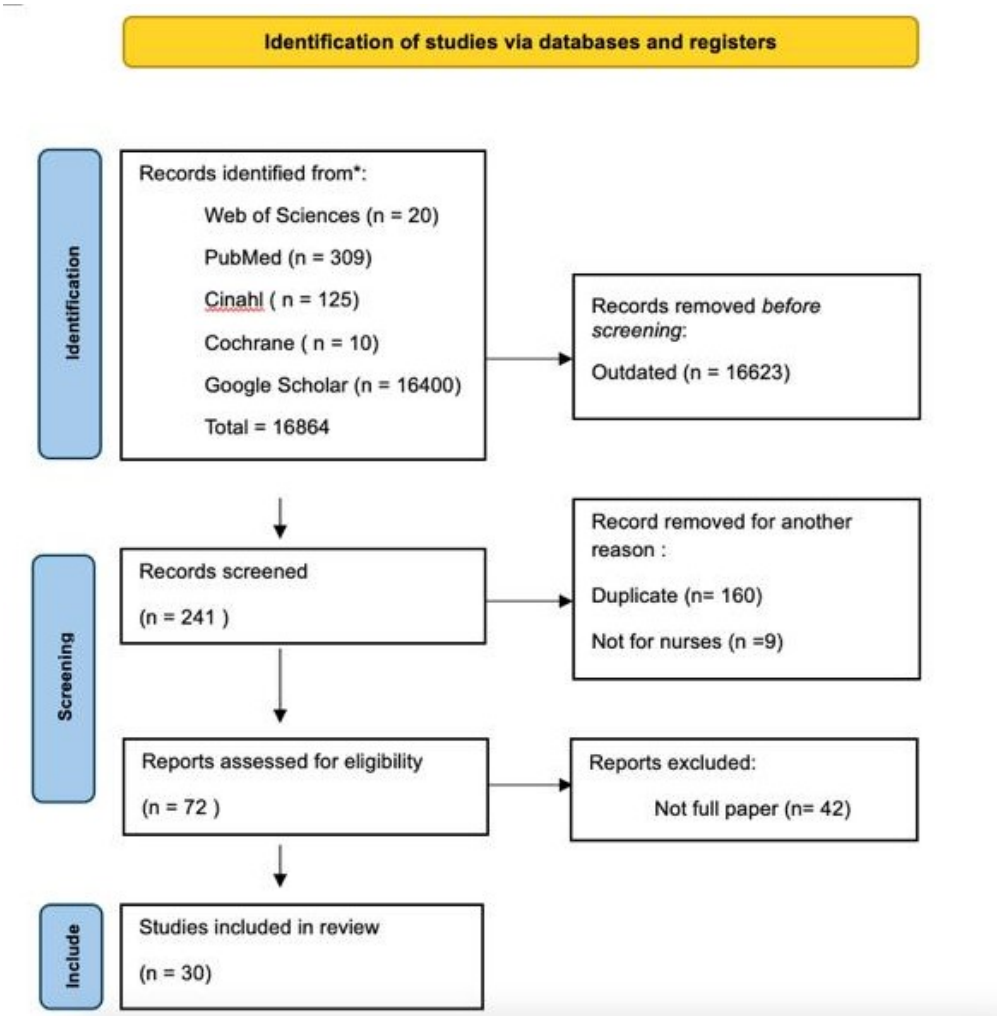


Figure 1. The Process of Literature Search and Study Selection for Disaster Triage

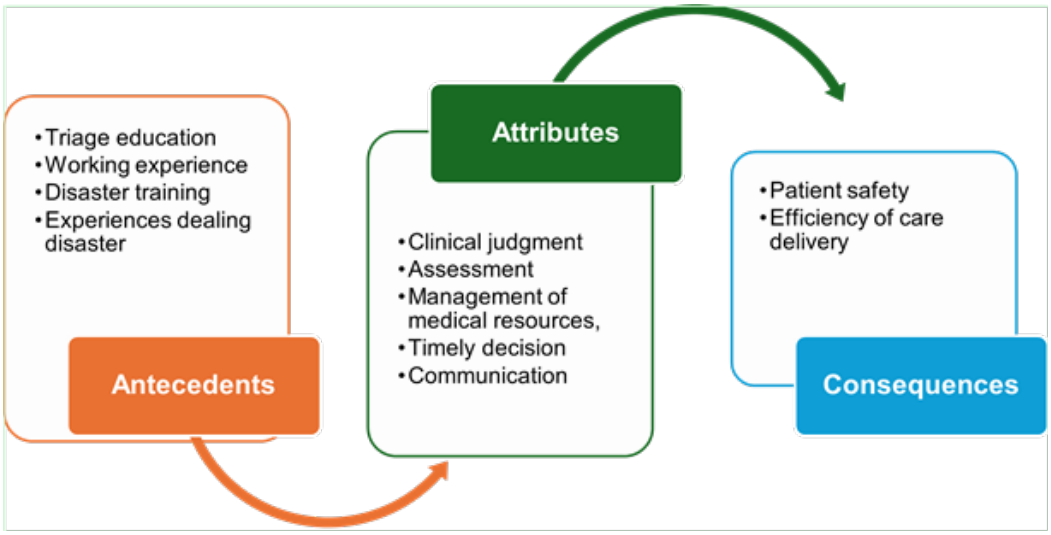


Figure 2. Concept Analysis for Disaster Triage

to established protocols are essential for reducing mortality (Ghanbari et al., 2019; Ghanbari et al., 2021). This approach allows healthcare providers to make rapid, informed decisions that prioritize critical cases and improve patient outcomes, even under challenging conditions (Zachariasse et al., 2019). Timely and appropriate allocation of resources based on patient needs optimizes workflow and reduces the length of the hospital stay (Williams et al., 2014), contributing to enhanced patient experiences and overall healthcare system performance (Phiri et al., 2020).

Empirical References

Empirical references for triage can be found in various research studies, guidelines, and standards established by healthcare organizations and academic institutions. One notable empirical reference is the Emergency Severity Index (ESI), a widely used triage algorithm developed to prioritize patient care based on the severity of their condition and resource availability (Gilboy et al., 2012). The ESI provides a standardized framework for triage assessment and decision-making, guiding healthcare providers in identifying patients who require immediate intervention versus those who can safely wait for treatment. Numerous studies have evaluated the reliability and validity of the ESI in different clinical settings, supporting its effectiveness in enhancing patient outcomes and optimizing resource utilization (Jafari-Rouhi et al., 2013). The use of standardized triage protocols, such as the Simple Triage and Rapid Treatment (START) system, has been validated through empirical research. Purwadi et al. (2021) confirmed that the START system enhances the consistency and reliability of triage decisions in disaster settings. Moreover, empirical references for disaster triage also encompass research articles examining various aspects of triage practice, including the impact of triage education on nursing performance (Faheim et al., 2019), the factors influencing triage accuracy (Tam et al., 2018), and the role of experience in triage decision-making (Hategeka et al., 2017).

Case Study

Three case study categories expand on the concept of disaster triage: the model case shows all defining attributes, the borderline case that includes most but not all attributes, and the contrary case illustrating what the concept is not (Walker & Avant, 2005; Yazdani et al., 2016).

Model Case

After earthquake 7,0 SR, a patient is found by the triage team with signs of respiratory distress. Drawing on years of experience, a triage nurse immediately recognizes the urgency and assesses the patient's vital signs and symptoms, assigning the highest priority level. After checking their respiration, perfusion and the mental status of the patient, the nurse alerts the other members of the team to prepare for immediate intervention, managing the medical resources and ensuring that the resuscitation room is ready with the necessary equipment and personnel. As the patient is rapidly assessed and stabilized, the triage nurse continues to communicate updates to the medical team, facilitating the smooth transition of care. Despite the chaos, the nurse remains calm and makes

Table 1. Analysis of Disaster Triage Attributes by Source, Discipline, and Thematic Cluster

Citation	Dicipline	Thematic Cluster	Attribute
Zhu, Brenna, McCoy, Atkins, and Das (2022); Moon and Cho (2022)	Nursing, Clinical Care	Recognition, understanding, response, prioritization, diagnosis formulation, intervention anticipation, reassessment	Clinical judgment
Bazyar et al. (2020); Mackway-Jones, Marsden, and Windle (2014); Vatnøy, Fossum, Smith, and Slettebø (2013); Purwadi, Breaden, McCloud, and Pranata (2021); Reinhardt (2017); START (2023)	Emergency Medicine, Disaster Response	Priority determination, immediate needs intervention, injury categorization (RPM: respiration, perfusion, mental status)	Assessment
Moon and Cho (2022); Christian (2019); Hick, Hanfling, and Cantrill (2012)	Health Administration, Emergency Management	Patient prioritization, personnel allocation, equipment management, facility use	Management of medical resources
Moon and Cho (2022); Moon and Park (2017); Shackelford et al. (2022); Reay, Smith-MacDonald, Then, Hall, and Rankin (2020)	Psychology, Emergency Medicine	Decision-making under stress, flexibility, agility, confidence	Timely decision
Hitchcock, Gillespie, Crilly, and Chaboyer (2014); Moon and Cho (2022); ICN (2019); Khorram-Manesh et al. (2021)	Communication Studies, Healthcare Coordination	Active listening, verbal/non-verbal support, coordination, information sharing	Communication

timely decisions, prioritizing critical interventions. Coordinating with other healthcare professionals, the nurse ensures that the patient receives prompt and appropriate treatment, optimizing outcomes.

Borderline Case

After an earthquake, the triage nurse observes another patient complaining of moderate abdominal pain and nausea. While the symptoms are concerning, they do not immediately indicate a life-threatening condition. After tagging patient with green, another triage team uses their clinical judgment and the nurse conducts a brief assessment, asking the patient about their medical history and any recent changes in their health. The nurse also checks the availability of medical resources, ensuring that essential equipment and staff are on hand if the patient's condition worsens. The nurse explains the assessment process to the patient and informs them of the plan for their ongoing observation. Additionally, the nurse communicates with the medical team to keep them informed of the patient's status and any changes in their condition. Nevertheless, the triage nurse experiences uncertainty when making a timely decision, as they weigh the urgency of the patient's symptoms against those of other cases in the ED.

Contrary Case

After a huge earthquake, a new nurse, inexperienced in disaster triage, faces a patient with severe chest pain and difficulty breathing. Overwhelmed and unsure how to allocate resources or make timely decisions, the nurse struggles with making a clinical judgment and engaging in communication. This situation highlights the need for proper training and experience in triage to ensure effective patient care.

Discussion

Effective disaster triage hinges on several critical attributes, including clinical judgment, assessment skills, the management of medical resources, timely decision-making, and communication. Clinical judgment is the cornerstone of disaster triage, enabling that healthcare providers quickly assess the severity of the patients' condition and prioritize treatment based on the likelihood of survival and the availability of resources (Aysha & Allam, 2020). This judgment is informed by both experience and education, allowing responders to make rapid yet accurate decisions under pressure (Alfaro-LeFevre, 2015). Closely tied to clinical judgment is the ability to conduct swift and accurate assessments. In disaster scenarios, where the volume of casualties can be overwhelming, the ability to efficiently assess each patient's condition is vital for effective triage. This assessment must be thorough yet expedited to ensure that patients receive the appropriate level of care (McCuistion et al., 2021).

Our findings confirm that effective management during disaster triage is essential for directing critical supplies like medication, equipment, and personnel to where they are most needed (Rezapour et al., 2018). In a disaster, resources are often limited, so this careful allocation ensures that the most critical patients receive the necessary care, ultimately improving outcomes even in challenging conditions (Zhou et al., 2018). Timely decision-making is another essential attribute, as delays can exacerbate patient outcomes and strain already scarce resources. Quick, informed decisions are necessary to maintain the flow of triage and treatment in chaotic environments (Alanazi et al., 2019). Finally, communication plays a crucial role in disaster triage. Clear, concise communication among team members, and between different levels of command, ensures that everyone is aware of the situation, resource availability, and any changes in patient condition (Gamst-Jensen et al., 2017; Liu et al., 2018). Effective communication is also key when it comes to coordinating the efforts among multiple agencies and responders, which is often required in large-scale disasters (Steigenberger, 2016). These attributes collectively support a robust disaster triage process, enabling responders to deliver the best possible care under challenging circumstances.

The effectiveness of disaster triage is heavily influenced by several antecedents, including triage education, working experience, disaster training, and prior experiences dealing with disasters. Disaster triage education lays the groundwork for a competent disaster response by teaching healthcare professionals how to prioritize care in mass casualty situations (Natareno, 2018). Simulation exercises and real-world scenarios are crucial for building the knowledge and skills required in such high-stakes environments (Cicero et al., 2019). Alongside formal education, working experience, particularly in emergency and trauma care settings, enhances a responder's ability to make swift, informed decisions under pressure. This hands-on experience is invaluable, as it builds the practical skills and situational awareness that are critical during disasters (Fathoni et al., 2013). Furthermore, targeted disaster training, using seminars and workshops which focus on specific scenarios such as natural disasters, terrorist attacks, or pandemics, prepares responders for the unique challenges they may encounter (Gorick & Rai, 2024). Regular drills and interprofessional training sessions can improve coordination and communication among the response teams (Olvera et al., 2020). Lastly, past experiences in dealing with actual disasters provide insights that cannot be fully replicated in training environments. These experiences help responders develop their resilience, adaptability, and a deeper understanding of the complexities involved in disaster management (Xue et al., 2020). Together, these factors create a robust foundation for effective disaster triage, ensuring that responders are prepared to act decisively and efficiently in crisis situations.

Finally, the consequences of effective disaster triage, namely patient safety and the efficiency of care delivery, are well-supported by the literature. Research supports that effective triage significantly enhances patient safety and care efficiency, as noted by Fekonja et al (2024), and that accurate triage leads to better patient outcomes and streamlined healthcare delivery. While our findings align with the existing literature, they also point to areas needing further study, such as balancing formal education with practical experience and integrating technology into clinical judgment. These considerations are crucial for the continued development of triage practices in emergency care.

Clinical Implications and Limitations

Understanding disaster triage is crucial for clinical practice as it helps allocate resources effectively, improves patient outcomes by prioritizing severe cases, and enhances overall efficiency. Standardized disaster triage protocols ensure consistency and better training for healthcare professionals. However, limitations such as unaddressed cultural or socio-economic factors and practical implementation challenges highlight the need for ongoing research and validation to improve healthcare delivery.

Conclusions

Disaster triage is a complex process that involves sorting and prioritizing patients based on their medical needs. Through a concept analysis following Walker and Avant's framework, we discovered that disaster triage is influenced by several key factors. Antecedents like education, experience, and disaster training form the groundwork for effective triage. Attributes such as clinical judgment, assessment skills, resource management, decision-making, and communication are crucial for healthcare providers to navigate triage situations effectively. The outcomes of efficient disaster triage include improved patient safety and streamlined care delivery, as critical cases receive prompt attention and resources are utilized optimally. This framework not only delineates the components necessary for effective triage but also illustrates how enhancing these elements can lead to significant improvements in patient care. Additionally, the recognition that triage outcomes extend beyond individual patient care to encompass overall healthcare system efficiency adds depth to the understanding of disaster response dynamics.

Declaration of Interest

The author(s) declare that there is no conflict of interest regarding the publication of this article titled "Triage in Disasters: A Conceptual Analysis".

All sources of funding for the research have been acknowledged, and there are no financial, personal, or professional relationships with other people or organizations that could inappropriately influence or bias the content of this article.

The views expressed in this article are solely those of the author(s) and are based on an objective analysis of the data and evidence. The author(s) affirm that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment

The author(s) declare that there are no acknowledgments for this article.

Funding

This article did not produce specific findings or results. The focus of this work is on [provide a brief description of concept analysis.

Data Availability

The analysis is based on theoretical and conceptual frameworks drawn from existing literature

References

Alanazi, I. M., Almutairi, S. H., Alanizi, H. G., Alanazi, S. M., Alotaibi, H. F., Alharbi, S. A., Almutairi, F. G., Alotaibi, B. N., & Alshammri, A. S. (2019). Navigating chaos: A critical analysis of decision-making in emergency medicine. *Journal of Namibian Studies: History Politics Culture, 26,* 165-193.

Aldossari, F. M., & Al Bensaad, H. S. (2024). Field Triage Tools in Mass Casualty Incidents: A Narrative Review. *Asian Journal of Medicine and Health, 22*(6), 30-36.

Alfaro-LeFevre, R. (2015). Critical Thinking, Clinical Reasoning, and Clinical Judgment E-Book. Elsevier Health Sciences.

AlMarzooq, A. M. (2020). Emergency department nurses' knowledge regarding triage. *International Journal of Nursing, 7*(2), 29-44.

AlShatarat, M., Rayan, A., Eshah, N. F., Baqeas, M. H., Jaber, M. J., & M, A. L. (2022). Triage Knowledge and Practice and Associated Factors Among Emergency Department Nurses. *SAGE Open Nursing, 8,* 23779608221130588.

Aysha, Z. M. S., & Allam, Z. A. (2020). Efficacy of START Triage Algorithm Scenario-Based Education on Nursing Students' Knowledge, Attitude, Competencies, and Clinical Judgment. *IOSR J Nurs Health Sci IOSR-JNHS, 9*(1), 39-56.

Bazyar, Farrokhi, M., & Khankeh, H. (2019). Triage systems in mass casualty incidents and disasters: a review study with a worldwide approach. *Open access Macedonian journal of medical sciences, 7*(3), 482.

Bazyar, Farrokhi, M., Salari, A., & Khankeh, H. R. (2020). The Principles of Triage in Emergencies and Disasters: A Systematic Review. *Prehosp Disaster Med, 35*(3), 305-313.

Brown, M. L. (2023). Implementation of a Triage Algorithm to Assign Acuity to Improve Access to Care and Improve Waiting Times Northwestern State University of Louisiana].

Canatan, H. (2020). An Investigation On The Concept Of Triage In The Event Of Disasters And Emergences: Definition, Ethical Decision-Making. *Journal of International Health Sciences and Management, 6*(12), 74-82.

Christian, M. D. (2019). Triage. *Critical care clinics, 35*(4), 575-589.

Cicero, M. X., Whitfill, T., Walsh, B., Diaz, M. C. G., Arteaga, G. M., Scherzer, D. J., Goldberg, S. A., Madhok, M., Bowen, A., & Paesano, G. (2019). Correlation between paramedic disaster triage accuracy in screen-based simulations and immersive simulations. *Prehospital emergency care, 23*(1), 83-89.

Cuthbertson, J., & Penney, G. (2023). Ethical decision making in disaster and emergency management: A systematic review of the literature. *Prehospital and disaster medicine,* 1-6.

Dippenaar, E. (2019). Triage systems around the world: A historical evolution. *International Paramedic Practice, 9*(3), 61-66.

Faheim, S. S., Ahmed, S. S., Aly, E. F., & Hegazy, S. M. (2019). Effect of triage education on nurses' performance in diverse emergency departments. *Evidence-Based Nursing Research, 1*(2), 53-63.

Fathoni, M., Sangchan, H., & Songwathana, P. (2013). Relationships between triage knowledge, training, working experiences and triage skills among emergency nurses in East Java, Indonesia. *Nurse Media Journal of Nursing, 3*(1), 511-525.

Fekonja, Z., Kmetec, S., Fekonja, U., Mlinar Reljić, N., Pajnkihar, M., & Strnad, M. (2023). Factors contributing to patient safety during triage process in the emergency department: A systematic review. *Journal of clinical nursing, 32*(17-18), 5461-5477.

Fekonja, Z., Kmetec, S., Fekonja, U., Reljić, N. M., Pajnkihar, M., & Strnad, M. (2024). Emergency triage nurses' perceptions of caring behaviors and the safety of the patient during triage encounters: A grounded theory study. *BMC Nursing, 23*(1), 1-11.

Gamst-Jensen, H., Lippert, F. K., & Egerod, I. (2017). Under-triage in telephone consultation is related to non-normative symptom description and interpersonal communication: a mixed methods study. *Scandinavian journal of trauma, resuscitation and emergency medicine, 25,* 1-8.

Ghanbari, V., Ardalan, A., Zareiyan, A., Nejati, A., Hanfling, D., & Bagheri, A. (2019). Ethical prioritization of patients during disaster triage: A systematic review of current evidence. *International emergency nursing, 43,* 126-132.

Ghanbari, V., Ardalan, A., Zareiyan, A., Nejati, A., Hanfling, D., Bagheri, A., & Rostamnia, L. (2021). Fair prioritization of casualties in disaster triage: a qualitative study. *BMC Emergency Medicine, 21*, 1-9.

Ghazali, S. A., Abdullah, K. L., Moy, F. M., Ahmad, R., & Hussin, E. O. D. (2020). The impact of adult trauma triage training on decision-making skills and accuracy of triage decision at emergency departments in Malaysia: A randomized control trial. *International emergency nursing, 51,* 100889.

Gilboy, N., Tanabe, P., Travers, D., & Rosenau, A. M. (2012). Emergency Severity Index (ESI): a triage tool for emergency department care, version 4. Implementation handbook, 2012, 12-0014.

Gorick, H., & Rai, A. S. (2024). Training nurses to triage: A scoping review. *Emergency Nurse, 32*(1).

Hamdi, A., & Al Thobaity, A. (2023). Enhancing disaster triage competencies through simulation-based training: An interventional study among undergraduate nursing students. *Sustainability, 15*(21), 15513.

Hategeka, C., Mwai, L., & Tuyisenge, L. (2017). Implementing the Emergency Triage, Assessment and Treatment plus admission care (ETAT+) clinical practice guidelines to improve quality of hospital care in Rwandan district hospitals: Healthcare workers' perspectives on relevance and challenges. *BMC health services research, 17*(1), 1-12.

Hick, J. L., Hanfling, D., & Cantrill, S. V. (2012). Allocating scarce resources in disasters: Emergency department principles. *Annals of emergency medicine, 59*(3), 177-187.

Hitchcock, M., Gillespie, B., Crilly, J., & Chaboyer, W. (2014). Triage: An investigation of the process and potential vulnerabilities. *Journal of Advanced Nursing, 70*(7), 1532-1541.

ICN. (2019). ICN Framework of Disaster Nursing Competencies; World Health Organization: . https://www.icn.ch/sites/default/files/inline-files/ICN_Disaster-Comp-Report_WEB.pdf

Jafari-Rouhi, A. H., Sardashti, S., Taghizadieh, A., Soleimanpour, H., & Barzegar, M. (2013). The Emergency Severity Index, version 4, for pediatric triage: A reliability study in Tabriz Children's Hospital, Tabriz, Iran. *Int J Emerg Med, 6*(1), 36.

Johnson, K. D., Punches, B. E., & Smith, C. R. (2021). Perceptions of the essential components of triage: A qualitative analysis. *Journal of emergency nursing, 47*(1), 192-197.

Khorram-Manesh, A., Nordling, J., Carlström, E., Goniewicz, K., Faccincani, R., & Burkle, F. M. (2021). A translational triage research development tool: Standardizing prehospital triage decision-making systems in mass casualty incidents. *Scandinavian journal*

of trauma, resuscitation and emergency medicine, 29, 1-13.

Liu, B. F., Fowler, B. M., Roberts, H. A., & Herovic, E. (2018). Keeping hospitals operating during disasters through crisis communication preparedness. *Public Relations Review, 44*(4), 585-597.

Loke, A. Y., Guo, C., & Molassiotis, A. (2021). Development of disaster nursing education and training programs in the past 20 years (2000–2019): A systematic review. *Nurse education today, 99*, 104809.

Mackway-Jones, K., Marsden, J., & Windle, J. (2014). Emergency triage: Manchester triage group. John Wiley & Sons.

McCuistion, L. E., DiMaggio, K. V., Winton, M. B., & Yeager, J. J. (2021). Pharmacology E-Book: A Patient-Centered Nursing Process Approach. Elsevier Health Sciences.

Moon, S.-H., & Cho, I.-Y. (2022). The effect of competency-based triage education application on emergency nurses' triage competency and performance. Healthcare,

Moon, S. H., & Park, Y. H. (2017). Concept analysis of triage competency in emergency nursing. *Journal of Korean Critical Care Nursing, 10*(3), 41-52.

Natareno, K. (2018). Disaster knowledge and awareness of nurses related to triage in mass casualty incidents.

Olvera, L., Smith, J. S., Prater, L., & Hastings-Tolsma, M. (2020). Interprofessional communication and collaboration during emergent birth center transfers: A quality improvement project. *Journal of midwifery & women's health, 65*(4), 555-561.

Peta, D., Day, A., Lugari, W. S., Gorman, V., & Pajo, V. M. T. (2023). Triage: A global perspective. Journal of emergency nursing, 49(6), 814-825.

Phiri, M., Heyns, T., & Coetzee, I. (2020). Patients' experiences of triage in an emergency department: A phenomenographic study. *Applied Nursing Research, 54*, 151271.

Purwadi, H., Breaden, K., McCloud, C., & Pranata, S. (2021). The SALT and START triage systems for classifying patient acuity level: A systematic review.

Reay, G., Smith-MacDonald, L., Then, K. L., Hall, M., & Rankin, J. A. (2020). Triage emergency nurse decision-making: Incidental findings from a focus group study. *International emergency nursing, 48*, 100791.

Reblora, J. M., Lopez, V., & Goh, Y.-S. (2020). Experiences of nurses working in a triage area: An integrative review. *Australian Critical Care, 33*(6), 567-575.

Reinhardt, M. R. (2017). A systematic approach to evaluation of performance deficiencies in ED triage. *Journal of emergency nursing, 43*(4), 329-332.

Rezapour, S., Naderi, N., Morshedlou, N., & Rezapourbehnagh, S. (2018). Optimal deployment of emergency resources in sudden onset disasters. *International Journal of Production Economics, 204*, 365-382.

Setyawati, A.-D., Lu, Y.-Y., Liu, C.-Y., & Liang, S.-Y. (2020). Disaster knowledge, skills, and preparedness among nurses in Bengkulu, Indonesia: A descriptive correlational survey study. *Journal of emergency nursing, 46*(5), 633-641.

Shackelford, S. A., Remley, M. A., Keenan, S., Kotwal, R. S., Baker, J. B., Gurney, J., Rush, S., & Friedrichs, P. (2022). Evidence-based principles of time, triage and treatment: refining the initial medical response to massive casualty incidents. *Journal of trauma and acute care surgery, 93*(2S), S160-S164.

START. (2023). START Adult Triage Algorithm. Radiation Emergency Medical Management: REMM (US Department of Health and Human Services). https://remm.hhs.gov/startadult.htm

Steigenberger, N. (2016). Organizing for the big one: A review of case studies and a research agenda for multi-agency disaster response. *Journal of Contingencies and Crisis management, 24*(2), 60-72.

Tam, H. L., Chung, S. F., & Lou, C. K. (2018). A review of triage accuracy and future direction. *BMC Emergency Medicine, 18*, 1-7.

Vatnøy, T. K., Fossum, M., Smith, N., & Slettebø, Å. (2013). Triage assessment of registered nurses in the emergency department. *International emergency nursing, 21*(2), 89-96.

Walker, L. O., & Avant, K. C. (2005). Strategies for theory construction in nursing (Vol. 4). Pearson/Prentice Hall Upper Saddle River, NJ.

Walker, L. O., & Avant, K. C. (2019). Strategies for theory construction in nursing (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Wiedenfeld, D. A., Alberts, A. C., Angulo, A., Bennett, E. L., Byers, O., Contreras-MacBeath, T., Drummond, G., da Fonseca, G. A., Gascon, C., & Harrison, I. (2021). Conservation resource allocation, small population resiliency, and the fallacy of conservation triage. *Conservation Biology, 35*(5), 1388-1395.

Williams, P., Csipke, E., Rose, D., Koeser, L., McCrone, P., Tulloch, A. D., Salaminios, G., Wykes, T., & Craig, T. (2014). Efficacy of a triage system to reduce length of hospital stay. *The British Journal of Psychiatry, 204*(6), 480-485.

Xue, C. L., Shu, Y. S., Hayter, M., & Lee, A. (2020). Experiences of nurses involved in natural disaster relief: A meta-synthesis of qualitative literature. *Journal of clinical nursing, 29*(23-24), 4514-4531.

Yazdani, S., Hosseini, F., & Ahmady, S. (2016). System based practice: A concept analysis. *Journal of advances in medical education & professionalism, 4*(2), 45.

Zachariasse, J. M., van der Hagen, V., Seiger, N., Mackway-Jones, K., van Veen, M., & Moll, H. A. (2019). Performance of triage systems in emergency care: A systematic review and meta-analysis. *BMJ open, 9(*5), e026471.

Zhou, L., Wu, X., Xu, Z., & Fujita, H. (2018). Emergency decision making for natural disasters: An overview. *International Journal of Disaster Risk Reduction, 27*, 567-576.

Zhu, J., Brenna, C. T., McCoy, L. G., Atkins, C. G., & Das, S. (2022). An ethical analysis of clinical triage protocols and decision-making frameworks: what do the principles of justice, freedom, and a disability rights approach demand of us? *BMC Medical Ethics, 23(*1), 11.

Posterior communicating artery aneurysm presenting as isolated oculomotor palsy: The role of rapid identification, intervention, and multidisciplinary care - A case study

Raden Andi Ario Tedjo[1,2*], Subandi Subandi[1,2], Teddy Tejomukti[1], Baarid Luqman Hamidi[1,2], Christopher Daniel Tristan[3], Muhammad Farid Hamka[4], Awalil Rifqi Kurnia Rahman[3], Stefanus Erdana Putra[1], Muhammad Hafizhan[1]

[1] Department of Neurology, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[2] Doctoral Program of Medical Sciences, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[3] Department of Anatomy, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia
[4] Department of Biochemistry, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia

OPEN ACCESS

Jurnal Keperawatan Padjadjaran (JKP)

Volume 13(1), 107-114
© The Author(s) 2025
http://dx.doi.org/10.24198/jkp.v13i1.2587

Article Info

Received : August 01, 2024
Revised : April 13, 2025
Accepted : April 24, 2025
Published : April 29, 2025

***Corresponding author**

Raden Andi Ario Tedjo*
Department of Neurology, Faculty of Medicine, Universitas Sebelas Maret Surakarta, Indonesia; Address: Ir. Sutami Street Number 36A Kentingan, Jebres, Surakarta, Central Java, Indonesia 57126; Phone: +628-122-653-523 ;E-mail: andi.tedjo@staff.uns.ac.id

Citation

Tedjo, R. A. A., Subandi, S., Tejomukti, T., Hamidi, B. L., Tristan, C. D., Hamka, M. F., Rahman, A. R. K., Putra, S. E., & Hafizhan, M. (2025). Posterior communicating artery aneurysm presenting as isolated oculomotor palsy: The role of rapid identification, intervention, and multidisciplinary care - A case study . *Jurnal Keperawatan Padjadjaran, 13*(1), 107-114. http://dx.doi.org/10.24198/jkp.v13i1.2587

Website

http://jkp.fkep.unpad.ac.id/index.php/jkp

This is an **Open Access** article distributed under the terms of the Creative Commons Attribution-Non-Commercial 4.0 International License.

E-ISSN: 2442-7276
P-ISSN: 2338-5324

Abstract

Background: Posterior communicating artery (PCOM) aneurysms are the prevalent type of aneurysm with high rupture risks. Isolated oculomotor nerve (CN III) palsy is a key symptom warranting heightened awareness in primary care. Given the need for advanced imaging, early referral is paramount. This study highlights the significance of prompt identification, targeted intervention, and comprehensive management in optimizing patient outcomes.
Case: A 58-year-old woman presented with isolated CN III palsy. The patient underwent rapid referral to tertiary care with magnetic resonance angiography (MRA) and digital subtraction angiography (DSA), revealing an aneurysm in the PCOM. Subsequently, coiling was performed to achieve complete occlusion. The procedure resulted in significant neurological recovery, with restoration of CN III function. Post-coiling, the patient receives close nurse monitoring, incorporating fall management and comprehensive education before discharge. CN III palsy is one of the unique-noticeable presentations of PCOM aneurysms, though symptoms may include facial pain, occasional headaches, and migraines. Coiling was chosen due to its less invasiveness and was recommended for posterior circulation aneurysms. Blood pressure control is essential to prevent aneurysm formation, rupture, and recurrence. Regular imaging follow-ups were needed to ensure long-term outcomes.
Conclusion: PCOM aneurysm care involves a multidisciplinary approach. Rapid identification, early referral, immediate occlusion, and comprehensive rehabilitative programs were mandatory to improve patient outcomes.

Keywords: aneurysm; coiling; oculomotor nerve palsy; posterior communicating artery

Introduction

Cerebral artery aneurysms are a condition that is commonly the focus among clinicians due to its potential for sudden rupture and causing life-threatening conditions. The posterior communicating artery (PCOM) is one of the most prevalent sites for cerebral aneurysms, accounting for 25% of all intracranial aneurysms that are considered to be at high risk of rupture (Chen et al., 2015; Chung et al., 2017; Elhadi et al., 2014). In primary care settings, aneurysm in PCOM is often challenging to identify, as the symptoms frequently vary or are minimal. One of the typical symptoms that can appear in PCOM aneurysm

is oculomotor or cranial nerve III (CN III) paralysis, given the close anatomical relationship between the PCOM and CN III as it exits the brainstem (Corliss & Hoh, 2019).

Accurate imaging, primarily digital subtraction angiography (DSA) is required to confirm an aneurysm in PCOM. Hence, a precise examination and prompt referral are crucial, as delays may increase the propensity for rupture (Hackenberg & Etminan, 2021). Therefore, a thorough knowledge of signs and symptoms is imperative for primary care practitioners, including nurses and general practitioners, since PCOM aneurysms tend to have symptoms that are difficult to distinguish from other cerebral aneurysm locations (Chen et al., 2020). In this case study, we reported a case of a 58-year-old female with PCOM aneurysm presented as isolated right CN III palsy that was successfully treated with coiling. This study aims to highlight isolated CN III palsy as one of the signs and symptoms of PCOM aneurysms and demonstrate the practical and efficient interprofessional approach to managing PCOM aneurysms.

Case Presentation

A 58-year-old female came to the hospital with a complaint of inability to open her right eyelid. The sudden complaint arose while she was working in a field. Concurrent with the onset of right eyelid ptosis, the patient experienced throbbing, moderate to severe intensity gripping pain in the right side of her head that she never experienced before. The patient reported feeling generally well and fully conscious during the ptosis event. There were no issues with urination, defecation, speech slurring, or drooping lips. The patient also denied any previous ocular disorder and sensory disturbances. A computed tomography (CT) scan was performed for diagnostic purposes, yielding results within normal limits. Due to the requirement for further investigation with advanced tertiary care modalities, the patient was referred to Dr. Moewardi General Hospital for confirmation of diagnosis and management.

The patient came to Dr. Moewardi General Hospital three months later for evaluation. The ptosis of the right eye persisted, not exacerbated by activity, and remained unchanged since onset. Additionally, the patient complained of blurry vision, double vision, and glare in bright environments, specifically worsening when looking upwards or toward the right-lateral direction. The patient did not report pain upon eye movement, had no history of ocular disease, and did not wear corrective lenses. Notably, the patient had not experienced similar complaints previously. From past medical history, it was known that the patient had uncontrolled hypertension for the past 7 years. After being assessed by the interprofessional collaboration team, the patient was hospitalized for five days and underwent coiling management. The patient's complaints improved significantly, and she was scheduled for evaluation one week after discharge from the hospital.

Intervention or Clinical Examination

Ethical consideration

Informed consent was obtained directly from the patient. The patient agreed that her case/conditions was written as a case study manuscript and published in a journal. Copies of the written consent were available.

Clinical Findings

On physical examination, the patient's general impression and vital signs were within normal limits except for blood pressure, 161/96 mmHg, with a mean arterial pressure of 117.67 mmHg at the presentation time. Neurological examination revealed no higher brain dysfunctions. All meningeal signs yielded negative and normal results. Motor, reflex, coordination, autonomic, and sensory systems were normal. Examination of the right eye with ptosis revealed lateral-inferior temporal gaze direction with complete closure due to ptosis and absence of direct and indirect pupillary reflex in the right eye, indicative of a lesion of right CN III palsy (Figure 1). Examination of the left eye revealed no abnormalities. Other cranial nerve examinations were within normal limits. A yellow hand band was given to the patient to indicate the high risk of falling, as determined by a Morse Fall Scale score of 46.

Imaging Findings

Further diagnostic tests were conducted to identify the cause of the patient's symptoms. Magnetic resonance imaging (MRI) was performed, which did not show any signs of bleeding, infarction, or space-occupying lesions in the brain parenchyma on T1, T1 with contrast, T2, fluid-attenuated inversion recovery (FLAIR), diffusion-weighted imaging (DWI) axial, and gradient recalled echo (GRE) sequences. However, MRI fast imaging employing steady-state acquisition (FIESTA) and magnetic resonance angiography (MRA) revealed a saccular-type aneurysm of the right internal carotid artery at the level of the cavernous sinus, which was compressing the right CN III (Figure 2).

Visual evoked potential (VEP) was also performed, and findings of prolonged attention of right P100 with interpretation of prechiasmal lesion were obtained, eliminating the suspicion of optic nerve lesion (Figure 3A and Figure 3B). DSA was then performed to confirm the diagnosis definitively. The DSA results revealed a saccular-type aneurysm measuring 5.75 mm x 8.78 mm with a long shape and wide neck in the PCOM, suspected to be compressing the CN III exiting through the oculomotor sulcus of the cerebral peduncle, leading to the patient's CN III lesion. Subsequently, the patient was scheduled for coiling of the aneurysm under general anesthesia. The doctor and nurse explained the procedure to the patient and her family

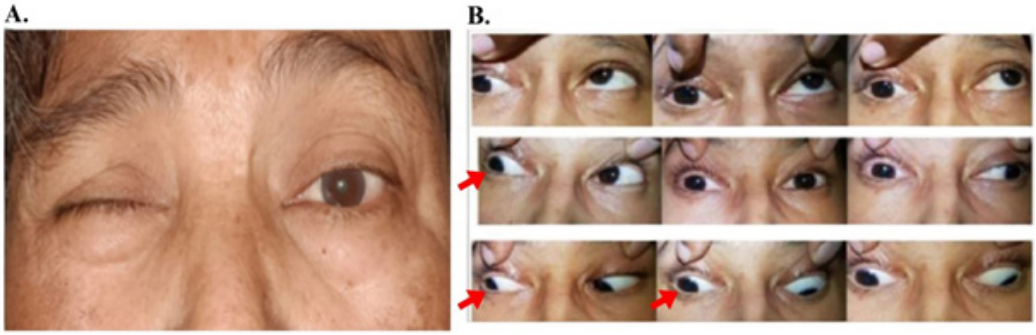


Figure 1. (A) Ptosis of the right eyelid. (B) Lateral-inferior temporal gaze. The right eyeball can only move laterally and inferiorly (red arrow), indicating palsy of the right medial rectus, right inferior rectus, and right inferior oblique muscles innervated by the oculomotor nerve.

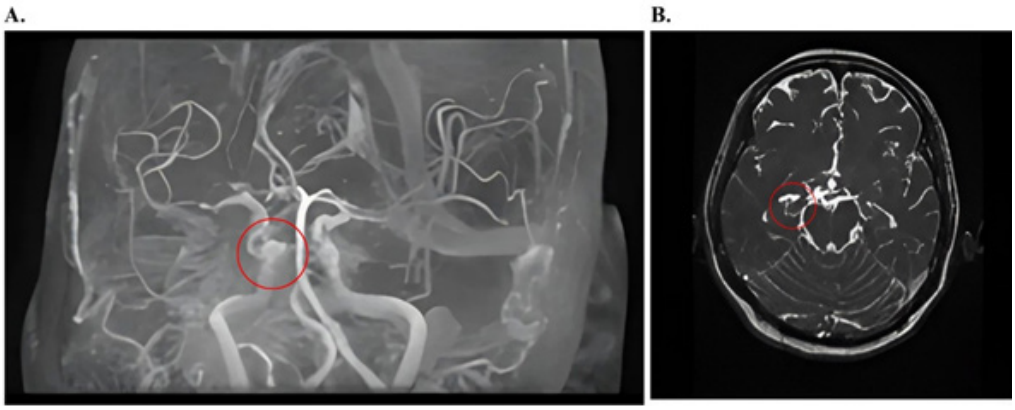


Figure 2. (A) Magnetic resonance angiography (MRA) imaging showed a saccular-type aneurysm in the posterior communicating artery (PCOM) at the level of the cavernous sinus (red circle). (B) Magnetic resonance imaging fast imaging employing steady-state acquisition (MRI-FIESTA) confirms the presence of PCOM aneurysm at the level of the cavernous sinus (red circle).

before the intervention. Coiling was performed using Axium Prime 3D 5 mm x 10 cm coil, Axium Prime Helix 4 mm x 10 cm coil, and Axium Prime Helix 4 mm x 8 mm coil into the aneurysm feeder, achieving 99% aneurysm occlusion (Figure 3D).

The patient was closely monitored for 48 hours in the high-care unit post-procedural. The nurses regularly assessed vital signs, including blood pressure and heart rate, and frequent neurological examinations to detect any new deficits or signs of altered mental status. After two days, the patient was clinically stable without throbbing pain in the right head, although the ptosis in the right eye had not improved. The patient began standing and walking again with the assistance of a walking frame for support during slow-paced walking exercises. After three days, the patient was discharged under close monitoring by family members and was provided discharge education on fall management, including using a walking frame daily and ensuring a safe home environment by removing tripping hazards by the nurses and the physiotherapist.

In addition, before discharge, the patient was given an order to follow the dietary approaches to stop hypertension (DASH) diet and prescribed antihypertensive drugs daily by the doctor and the dietician. A follow-up was scheduled for one week, along with routine CT angiography (CTA) imaging every 6-12 months to monitor the progress and probability of recurrence. A week after the coiling procedure, the patient returned to the outpatient clinic and showed minimal ptosis in the right eye. Movement of the right eye, apart from abduction, remained restricted, but improvement was noted in other eye movements (Figure 4). The patient's condition was stable, and no headaches or pain were experienced. Neurological evaluation did not reveal any deficits; the patient recovered well overall.

Discussion

PCOM aneurysm is concerning due to the frequent misdiagnosis, particularly in the early stage, as the symptoms may be various or minimal. Therefore, great clinical judgment through anamnesis, along with excellent clinical identification from interprofessional healthcare practitioners, are required to improve prognosis and reduce the likelihood of aneurysm rupture, reducing the mortality rate for this condition (Chen et al., 2020). Our case demonstrated a successful approach to

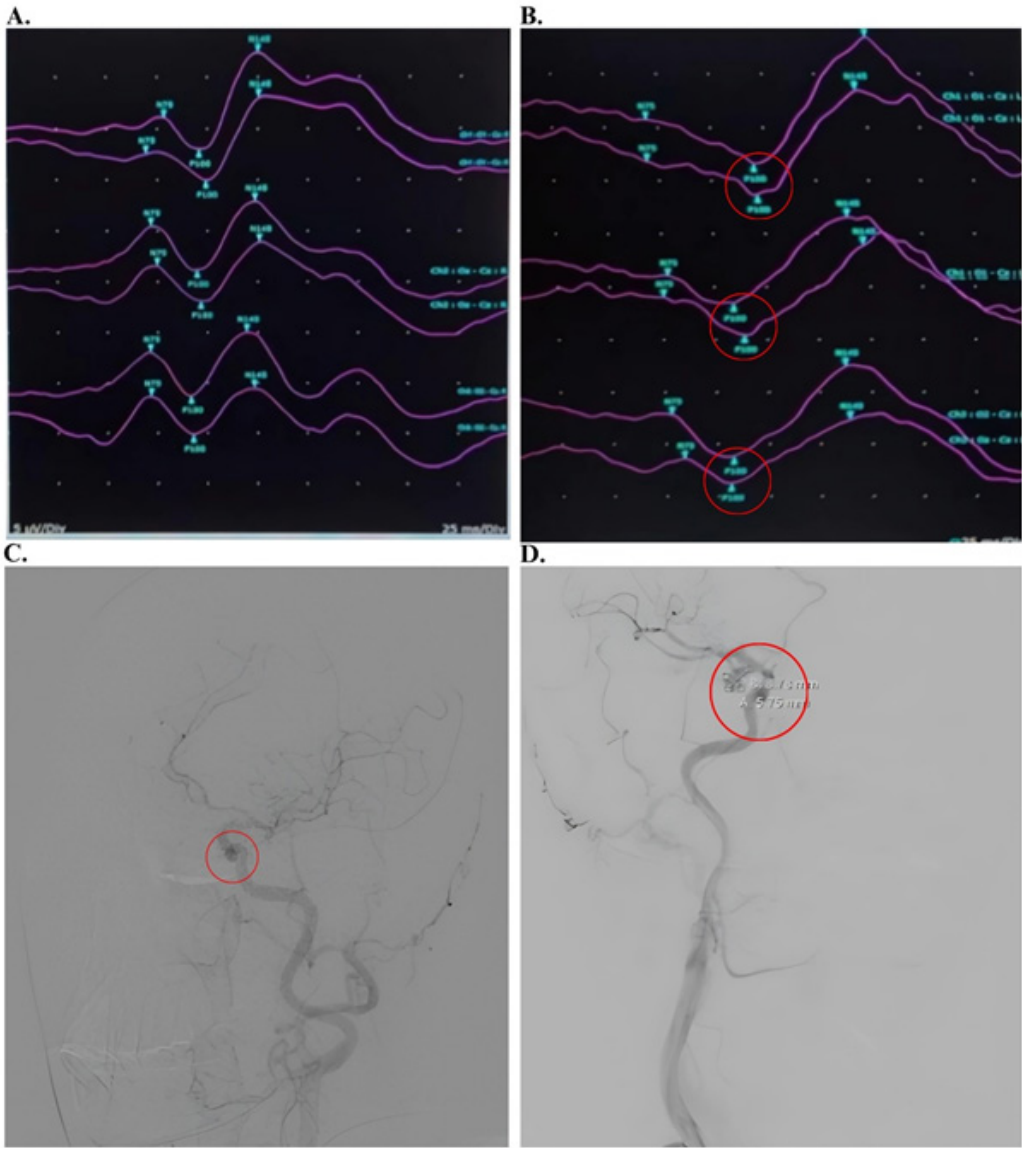


Figure 3. (A) Normal visual evoked potential (VEP) on the left eye. (B) VEP showed prolonged latency of the right P100 (red circle), suggesting a prechiasmal lesion of the right optic nerve, supporting the diagnosis of CN III palsy. (C) Digital subtraction angiography (DSA) before the coiling procedure showed a posterior communicating artery (PCOM) aneurysm (red circle). (D) DSA, after the coiling procedure, showed complete occlusion (red circle).

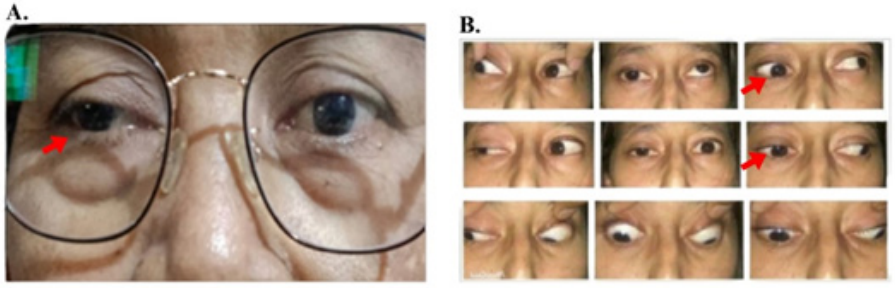


Figure 4. (A) Minimal ptosis in the right eye (red arrow). (B) The right eye can move medially (red arrow) but still has limited upward movement.

Table 1. Angioarchitecture type of PCOM aneurysm (Chung et al., 2017)

Type	Location
Type 1	Lateral aneurysm with the orifice on the ICA or PCOM away from the bifurcation.
Type 2	Bifurcation aneurysm with the orifice near the ICA-PCOM bifurcation.
Type 3a	Aneurysm lesion where the dilation occurs along an axis different from the PCOM axis.
Type 3b	Infundibulum, where the dilation is primarily parallel to the PCOM axis.
Type 4	Lateral aneurysm with the orifice on the ICA or PCOM away from the bifurcation.
Type 5	Bifurcation aneurysm with the orifice near the ICA-PCOM bifurcation.
Type 6	An aneurysm that does not visually show the PCOM.
Type 7	Lateral aneurysm with the orifice on the ICA or PCOM away from the bifurcation.
Type 8	Bifurcation aneurysm with the orifice near the ICA-PCOM bifurcation.

ICA: internal carotid artery; PCOM: posterior communicating artery.

this condition with interprofessional collaboration. Referral to a tertiary hospital with available DSA in ptosis eyelid without a suspected ocular condition is necessary, as PCOM aneurysm may present with only isolated CN III palsy.

The isolated CN III palsy resulted from a significant anatomical relationship between the PCOM and CN III. The CN III originates from the oculomotor nucleus, which is more ventral to the cerebral aqueduct at the level of the superior colliculus. The CN III exits through the interpeduncular fossa of the oculomotor sulcus of the mesencephalon. Subsequently, the CN III exits and travels close to the circle of Willis. In particular, it travels between the posterior cerebral artery (PCA) and the superior cerebellar artery (Corrêa et al., 2022; Davis et al., 2016; Joyce et al., 2024; Park et al., 2017). Additionally, when the CN III travels around the PCA, it travels close to the PCOM. If an aneurysm forms on the PCOM site, the enlarged blood vessels may apply pressure on the adjacent CN III, causing nerve compression. This compression leads to impaired function. Thus aneurysms in PCOM are presented as CN III palsy, as evidenced by a large number of case reports (Almaghrabi et al., 2021; Chaudhry et al., 2018; Daniel et al., 2022; Danko & Williams, 2021; Guo & Wu, 2019; Jacob et al., 2023; Kajitani et al., 2021; Lee et al., 2016; Sun et al., 2016; Toyota et al., 2014).

While PCOM aneurysms often correlate with CN III palsy manifestations such as lateral-inferior gaze, pupil dilation, and ptosis of the eyelids, primary healthcare must acknowledge other variations of symptoms. In the absence of CN III compression, the PCOM aneurysm has been reported to manifest as facial pain due to direct compression on the trigeminal root and cavernous sinus (Zelman et al., 2016). PCOM aneurysm can compress nearby arteries, such as the anterior choroidal artery or small perforating arteries that supply the internal capsule and thalamus, resulting in hemiparesis and sensory deficit (Cai et al., 2022; Tanaka et al., 2023). In the different scenarios, oligosymptomatic with only occasional headaches or migraines was previously documented (Danko & Williams, 2021; Sirakov et al., 2020).

These various signs and symptoms require an explicit confirmation of diagnosis through visualization, which can be facilitated through angiographic techniques. In such cases, DSA is considered the gold standard. Once diagnosis is confirmed, occlusion of the aneurysm lumen has to be accomplished. In our case, we chose the coiling method to achieve occlusion due to several factors. First, the complex anatomical structure of the posterior circulation made surgical clipping challenging (Zhu et al., 2022). Second, coiling offers a significantly less invasive technique to achieve occlusion (Tsianaka et al., 2019). Third, the coiling approach is recommended in posterior circulation aneurysms based on Indonesia's neuro-interventional consensus 2020 (Sani, 2020). Fourth, the dome-to-neck ratio aneurysm is anticipated to be greater than two in this case. Therefore, the enormous dome makes the coil more stable within the aneurysm sac. This stable coil position efficiently limits coil movement or herniation into the parent vessel (Darsaut et al., 2023; Zhu et al., 2022).

Immediate clinical identification, precise visualization, and rapid occlusion are essential to control the rupture risk, as PCOM aneurysms were highly at risk of rupture. In particular, bifurcation type 2 and type 5 (based on Chung et al.; Table 1) have a significantly higher risk of rupture due to higher shear stress on the blood vessel wall (Chung et al., 2017). Aneurysm rupture is considered life-threatening, with an estimated 50% mortality rate and only about a quarter of survivors achieving full recovery.

Consequently, the most logical recommendation for preventive and rehabilitative approaches is controlling blood pressure. Control of blood pressure is a triple strategy to prevent aneurysm formation and rupture, along with the rehabilitative approach to prevent recurrence (Czekajło, 2019). Therefore, we are also highlighting the post-operative care for this patient, including the DASH diet and routine blood pressure control drugs. This approach is aligned with the recommendation of the American Heart Association/American Stroke Association (AHA/ASA) (Thompson et al., 2015). Although there is not yet a consensus on blood pressure target in post-

occlusion intracranial aneurysms, the European Stroke Organization (ESO) suggests <130/80mm/Hg would be beneficial for those with unruptured cases (Etminan et al., 2022).

Moreover, rehabilitative care for this patient needs to involve a multi-faceted approach with long-term follow-up. Post-coiling, patients need to be observed for immediate complications such as bleeding, infection, altered mental status, and new neurological deficits. Along with close monitoring after occlusion, nurses should implement fall management to prevent additional injuries. Patients should be provided with mobility aids such as handrails or grab bars for home safety precautions, given the high risk of falls in such cases (Comino-Sanz et al., 2018). A yellow hand band needs to be implemented to enhance the awareness of high fall risk, particularly in elderly patients with reduced mobility and independence (Wisconsin Hospital Association, 2007). Postoperative status and neurological diseases are among the leading causes of falls, making assessment and risk detection is crucial in reducing fall incidents (Montejano-Lozoya et al., 2020)

Radiographic follow-up is also an essential part of the education that must be provided before discharge. AHA/ASA recommended follow-up with MRA or CTA at regular intervals. An initial follow-up study is suggested 6 to 12 months after the initial intervention, followed by subsequent annual imaging, which may be considered reasonable for ongoing monitoring (Thompson et al., 2015).

Nursing Implication

This case emphasized the important role of a multidisciplinary approach in such a high-risk neurovascular case. Nurses, as one of the primary healthcare providers, should give immediate identification in the clinical setting with the primary goal of rapid referral to the tertiary hospital for complete occlusion, as delayed treatment may result in rupture and permanent damage to the optic pathways and adjacent cerebral regions (Al-Abdulwahhab et al., 2020; Taweesomboonyat et al., 2019). Post-intervention patient close monitoring with adequate fall assistive modalities and education on adherence to a strict therapeutic diet was essential to be implemented.

Strengths and Limitations of the Study

This case highlights successful comprehensive care in a PCOM aneurysm patient. In the current case, we perform multiple modalities to exclude possible differential diagnoses, such as VEP to rule out any optic neuropathy or other visual pathway disorders that could mimic aneurysm-related symptoms. However, this case study is limited by the lack of a long-term follow-up report and the absence of radiographic imaging of the patient during the post-treatment period.

Conclusion

PCOM aneurysm is a common intracranial aneurysm that potentially becomes life-threatening if ruptured, demanding a prompt multidisciplinary approach. Isolated CN III palsy without ocular suspects represents one of the key symptoms that primary healthcare should recognize. Early identification requires clear anamnesis and clinical judgment in primary care, followed by immediate referral to a tertiary hospital for investigation using DSA as the gold standard. Given the significant risk of rupture, swift occlusion must be accomplished, with coiling being more favored due to its less invasiveness and efficacy on posterior circulation. Post-occlusion care includes close monitoring, fall management, blood pressure control, and regular long-term radiographic follow-up. This comprehensive care aims to ensure better patient recovery.

Declaration of Interest

All authors declare that this case study has no conflict of interest.

Acknowledgment

All gratitude is acknowledged to Dr. Moewardi General Hospital, Surakarta, Central Java, Indonesia, for facilitating this case study.

Funding

No financial support was received.

Data Availability

The data is available from the corresponding author's email at a reasonable request.

References

Al-Abdulwahhab, A. H., Al-Sharydah, A. M., Al-Suhibani, S. S., Almulhim, A. S., Al-Dhafeeri, O. M., & Al-Jubran, S. A. (2020). A ruptured posterior communicating artery aneurysm presenting as tentorial and spinal isolated subdural hemorrhage: A case report and literature review. *BMC Neurology, 20*(1), 102. https://doi.org/10.1186/s12883-020-01682-8

Almaghrabi, N., Fatani, Y., & Saab, A. (2021). Cavernous internal carotid artery aneurysm presenting with ipsilateral oculomotor nerve palsy: A case report. *In Radiology case reports, 16*(6), 1339–1342. https://doi.org/10.1016/j.radcr.2021.03.008

Cai, Y., Zhang, T., Zhao, J., Li, G., Chen, J., Zhao, W., & Xiong, N. (2022). Cerebral ischemia after treatment of posterior communicating artery aneurysms: Clipping versus coiling. *BMC Neurology, 22*(1), 436. https://doi.org/10.1186/s12883-022-02962-1

Chaudhry, N. S., Brunozzi, D., Shakur, S. F., Charbel, F. T., & Alaraj, A. (2018). Ruptured posterior cerebral artery aneurysm presenting with a

contralateral cranial nerve III palsy: A case report. *In Surgical neurology international, 9*, 52. https://doi.org/10.4103/sni.sni_430_17

Chen, X., Li, H., Wang, M.-Z., Li, M., Cao, Y., Zhang, D., Zhang, Y., Wang, H., & Wang, S. (2020). Clinical features and outcomes of PComA aneurysms originating from fetal posterior communicating arteries in a single institution. *Chinese Neurosurgical Journal, 6*(1), 23. https://doi.org/10.1186/s41016-020-00200-6

Chen, Z., Niu, Y., Tang, J., Li, L., Feng, Z., Feng, H., & Zhu, G. (2015). Endovascular treatment of posterior communicating artery aneurysms in the presence of the fetal variant of posterior cerebral artery. *Interventional Neuroradiology, 21*(4), 456–461. https://doi.org/10.1177/1591019915590532

Chung, B. J., Doddasomayajula, R., Mut, F., Detmer, F., Pritz, M. B., Hamzei-Sichani, F., Brinjikji, W., Kallmes, D. F., Jimenez, C. M., Putman, C. M., & Cebral, J. R. (2017). Angioarchitectures and hemodynamic characteristics of posterior communicating artery aneurysms and their association with rupture status. *AJNR. American Journal of Neuroradiology, 38*(11), 2111–2118. https://doi.org/10.3174/ajnr.A5358

Comino-Sanz, I. M., Sánchez-Pablo, C., Albornos-Muñoz, L., Beistegui Alejandre, I., Jiménez De Vicuña Marin, M., Uribesalgo Pagalday, L., & Gamarra Santa Coloma, E. (2018). Falls prevention strategies for patients over 65 years in a neurology ward: A best practice implementation project. *JBI Database of Systematic Reviews and Implementation Reports, 16*(7), 1582–1589. https://doi.org/10.11124/JBISRIR-2017-003628

Corliss, B. M., & Hoh, B. L. (2019). 14C315 Posterior communicating artery aneurysm presenting with and without third nerve palsy. In P. Nakaji & M. Levitt (Eds.), Cerebrovascular Neurosurgery (p. 0). Oxford University Press. https://doi.org/10.1093/med/9780190887728.003.0003

Corrêa, D. G., Hygino da Cruz, L. C., & Freddi, T. de A. L. (2022). The oculomotor nerve: Anatomy and pathology. *Seminars in Ultrasound, CT and MRI, 43*(5), 389–399. https://doi.org/10.1053/j.sult.2022.04.009

Czekajło, A. (2019). Role of diet-related factors in cerebral aneurysm formation and rupture. *Roczniki Panstwowego Zakladu Higieny, 70*(2), 119–126. https://doi.org/10.32394/rpzh.2019.0061

Daniel, R., Souza, M. R. De, Pipek, L. Z., Fagundes, C. F., Solla, D. J. F., Carlos, G., Godoy, D. A., Kolias, A. G., Luis, R., Amorim, O., & Paiva, W. S. (2022). External validation of the Glasgow coma scale-pupils in low- to middle-income country patients with traumatic brain injury: Could " motor score-pupil " have higher prognostic value ? *Surgical Neurology International, 13*(510), 1–5. https://doi.org/10.25259/SNI

Danko, C., & Williams, D. (2021). A case report of posterior communicating artery aneurysm presenting as cranial nerve 3 palsy in a young female patient with migraines. *Journal of Education & Teaching in Emergency Medicine, 6*(1), V5–V8. https://doi.org/10.21980/J8QW83

Darsaut, T. E., Findlay, J. M., Bojanowski, M. W., Chalaala, C., Iancu, D., Roy, D., Weill, A., Boisseau, W., Diouf, A., Magro, E., Kotowski, M., Keough, M. B., Estrade, L., Bricout, N., Lejeune, J.-P., Chow, M. M. C., O'Kelly, C. J., Rempel, J. L., Ashforth, R. A., … Raymond, J. (2023). A pragmatic randomized trial comparing surgical clipping and endovascular treatment of unruptured intracranial aneurysms. American Journal of Neuroradiology. https://doi.org/10.3174/ajnr.A7865

Davis, A. R., Almarzouqi, S. J., Morgan, M. L., & Lee, A. G. (2016). Cranial Nerve III (Oculomotor Nerve) BT - Encyclopedia of Ophthalmology (U. Schmidt-Erfurth & T. Kohnen (eds.); pp. 1–2). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-35951-4_1168-1

Elhadi, A. M., Kalani, M. Y. S., McDougall, C. G., & Albuquerque, F. C. (2014). Endovascular treatment of aneurysms (M. J. Aminoff & R. B. B. T.-E. of the N. S. (Second E. Daroff (eds.); pp. 57–62). Academic Press. https://doi.org/10.1016/B978-0-12-385157-4.00807-1

Etminan, N., de Sousa, D. A., Tiseo, C., Bourcier, R., Desal, H., Lindgren, A., Koivisto, T., Netuka, D., Peschillo, S., Lémeret, S., Lal, A., Vergouwen, M. D. I., & Rinkel, G. J. E. (2022). European Stroke Organisation (ESO) guidelines on management of unruptured intracranial aneurysms. *European Stroke Journal, 7*(3), V. https://doi.org/10.1177/23969873221099736

Guo, S., & Wu, X. (2019). An unruptured posterior communicating artery aneurysm ruptured during angiography: A case report. *Medicine, 98*(44), e17785. https://doi.org/10.1097/MD.0000000000017785

Hackenberg, K. A. M., & Etminan, N. (2021). Chapter 8 - Neurovascular disease, diagnosis, and therapy: Brain aneurysms. In S. W. Hetts & D. L. B. T.-H. of C. N. Cooke (Eds.), Interventional Neuroradiology (Vol. 176, pp. 121–134). Elsevier. https://doi.org/10.1016/B978-0-444-64034-5.00001-8

Jacob, T. J., Berry, S., Peketi, S. H., Abraham, A., Joshi, J., Rashid, S., & Rankov, L. (2023). Posterior communicating artery aneurysm with referred tooth pain: A case report. *Cureus, 15*(9), 13–16. https://doi.org/10.7759/cureus.46027

Joyce, C., Le, P. H., & Peterson, D. C. (2024). Neuroanatomy, cranial nerve 3 (Oculomotor).

Kajitani, T., Karibe, H., Narisawa, A., Saito, H., Goto, M., Kameyama, M., & Tominaga, T. (2021). Oculomotor nerve palsy caused by the posterior communicating artery with impending ruptured internal carotid–posterior

communicating aneurysm: A case report. *Japanese Journal of Neurosurgery, 30*(1), 59–63. https://doi.org/10.7887/jcns.30.59

Lee, T.-Y., Ting, C.-Y., Tsai, M.-J., & Tsai, M.-J. (2016). Third nerve palsy and internal carotid aneurysm. *QJM: An International Journal of Medicine, 109*(11), 755–756. https://doi.org/10.1093/qjmed/hcw139

Montejano-Lozoya, R., Miguel-Montoya, I., Gea-Caballero, V., Mármol-López, M. I., Ruíz-Hontangas, A., & Ortí-Lucas, R. (2020). Impact of Nurses' Intervention in the Prevention of Falls in Hospitalized Patients. *International Journal of Environmental Research and Public Health, 17*(17). https://doi.org/10.3390/ijerph17176048

Park, H. K., Rha, H. K., Lee, K. J., Chough, C. K., & Joo, W. (2017). Microsurgical anatomy of the oculomotor nerve. *Clinical Anatomy, 30(*1), 21–31. https://doi.org/https://doi.org/10.1002/ca.22811

Sani, A. F. (2020). Konsensus nasional neurointervensi. Airlangga University Press.

Sirakov, A., Abu Elhasan, H., Aguilar Pérez, M., Bäzner, H., & Henkes, H. (2020). Posterior Communicating Artery Aneurysm: Progressively Enlarging, Symptomatic, and Partially Thrombosed Fusiform True Posterior Communicating Artery Aneurysm, Treated by Coil Occlusion of the Parent Artery and Disconnection of the Posterior Communicating (H. Henkes, P. Lylyk, & O. Ganslandt (eds.); pp. 427–440). Springer International Publishing. https://doi.org/10.1007/978-3-319-77827-3_164

Sun, Y., Li, G., Hou, K., Gao, X., & Zhu, X. (2016). A case of delayed contralateral oculomotor nerve palsy after microsurgical clipping of a posterior communicating artery aneurysm. *International Journal of Clinical and Experimental Medicine, 9*(7), 12964–12966. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84982764452&partnerID=40&md5=7372a1e93c4f33ed100613bab4f80908

Tanaka, K., Furukawa, K., Ishida, F., & Suzuki, H. (2023). Hemodynamic differences of posterior communicating artery aneurysms between adult and fetal types of posterior cerebral artery. *Acta Neurochirurgica, 165(*12), 3697–3706. https://doi.org/10.1007/s00701-023-05840-y

Taweesomboonyat, C., Tunthanathip, T., Kaewborisutsakul, A., Saeheng, S., Oearsakul, T., Riabroi, K., & Khumtong, R. (2019). Outcome of ruptured posterior communicating artery aneurysm treatment comparing between clipping and coiling techniques. *World Neurosurgery, 125*, e183–e188. https://doi.org/https://doi.org/10.1016/j.wneu.2019.01.037

Thompson, B. G., Brown, R. D., Amin-Hanjani, S., Broderick, J. P., Cockroft, K. M., Connolly, E. S., Duckwiler, G. R., Harris, C. C., Howard, V. J., Johnston, S. C. C. Ia., Meyers, P. M., Molyneux, A., Ogilvy, C. S., Ringer, A. J., & Torner, J. (2015). Guidelines for the management of patients with unruptured intracranial aneurysms: A guideline for healthcare professionals from the american heart association/american stroke association. *In Stroke; a journal of cerebral circulation , 46*(8). https://doi.org/10.1161/STR.0000000000000070

Toyota, S., Taki, T., Wakayama, A., & Yoshimine, T. (2014). Unruptured internal carotid-posterior communicating artery aneurysm splitting the oculomotor nerve: A case report and literature review. *Journal of Neurological Surgery Reports, 75*(01), e180–e182. https://doi.org/10.1055/s-0034-1378155

Tsianaka, E., Al-Shawish, A., Potapov, A., Fountas, K., Spyrou, M., & Konovalov, N. (2019). Clipping versus coiling in posterior circulation intracranial aneurysms: A meta-analysis. *Chinese Neurosurgical Journal, 5*, 16. https://doi.org/10.1186/s41016-019-0163-x

Wisconsin Hospital Association. (2007). The color of safety: Standardization and implementation manual. https://wha.org/getmedia/1d75a023-3103-4636-aff6-7451ccad972d/Wristband_Color_Codes.pdf

Zelman, S., Goebel, M. C., Manthey, D. E., & Hawkins, S. (2016). Large posterior communicating artery aneurysm: Initial presentation with reproducible facial pain without cranial nerve deficit. *Western Journal of Emergency Medicine, 17*(6), 808–810. https://doi.org/10.5811/westjem.2016.8.30457

Zhu, W., Ling, X., Petersen, J. D., Liu, J., Xiao, A., & Huang, J. (2022). Clipping versus coiling for aneurysmal subarachnoid hemorrhage: A systematic review and meta-analysis of prospective studies. *Neurosurgical Review, 45*(2), 1291–1302. https://doi.org/10.1007/s10143-021-01704-0

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Author Index

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Subject Index

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Advisory and Editorial Board expressed sincere appreciation to peer reviewer as follows:

Prof. Dr. Ah yusuf, S.Kp., M.Kes
(Universitas Airlangga)
Dr. Ns. Dwi Novrianda, M.Kep
(Universitas Andalas)
Christina Yeni Kustanti, PhD
(Sekolah Tinggi Ilmu Kesehatan Bethesda Yakkum)
Dr. Sirikanok Klankhajhon
(Naresuan University)
Ninik Yunitri, M.Kep.,Ns., Sp.Kep.J., Ph.D
(Universitas Muhammadiyah Jakarta)
Neti Juniarti, PhD
(Universitas Padjadjaran)
Bayhakki, M.Kep., Sp.KMB., PhD
(Universitas Riau)
Dr Syarifah Farradinna
(Universitas Islam Riau)
Rosliana Dewi, S.Kp., M.H.Kes., M.Kep
(Sekolah Tinggi Ilmu Kesehatan Sukabumi)
Nursiswati, S.Kp, M.Kep.,Sp.KMB
(Universitas Padjadjaran)
Windy Rakhmawati, S.Kp.,M.Kep., Ph.D
(Universitas Padjadjaran)
Prof. Dr. Saryono, S.Kp., M.Kes.
(Universitas Jenderal Soedirman)
Efri Widianti, S.Kep.,Ners.,M.Kep., Sp.Kep.Jiwa
(Universitas Padjadjaran)
Anastasia Anna, S.Kp., M.Kes
(Universitas Padjadjaran)
Saldy Yusuf.,PhD.,ETN
(Universitas Hasanuddin)
Mira Trisyani Koeryaman., S.Kp.,MSN PhD
(Universitas Padjadjaran)
Dr. Rosnani, S.Kp, M.Kep. Sp.MAT
(Poltekkes Kemenkes Palembang)
Yulia Kurniawati
(Universitas Jember)
Prof. Irma Nurbaeti S.Kp., M.Kes., Sp.Mat., Ph.D
(UIN Syarif Hidayatullah Jakarta)
Restuning Widiasih.,S.Kp.,M.Kep.,Sp.Mat., Ph.D
(Universitas Padjadjaran)

p-ISSN : 2338-5324 e-ISSN: 2442-7276

Qorinah Estiningtyas Sakilah Adnani, SST, M.Keb, Ph.D
(Universitas Padjadjaran)
Eka Afrima Sari,S.Kep.,Ners.,M.Kep
(Universitas Padjadjaran)
Ayu Prawesti, S.Kep.Ners.,M.Kep
(Universitas Padjadjaran)
Fitria Endah Janitra
(Universitas Islam Sultan Agung)
I Gede Putu Darma Suyasa, SKp., MNg., PhD
(Institut Teknologi dan Kesehatan Bali)

Thanks to the excellent cooperation for supporting the Jurnal Keperawatan Padjadjaran

Editor