# Direct and indirect effects of stress, health literacy, social media use, and self-efficacy on diabetes prevention behaviors in youth: A path analysis

**Nina Nina[1*], Achmad Lukman Hakim[1], Hidayani Hindayani[1], Tukimin Bin Sansuwito[2]**

[1] Universitas Indonesia Maju, Jakarta, Indonesia
[2] Lincoln University College, Selangor Darul Ehsan, Malaysia

## Abstract

**Background:** Type 2 diabetes mellitus (T2DM) is increasingly affecting youth, particularly in low- and middle-income countries like Indonesia. Psychosocial and informational factors such as stress, health literacy, self-efficacy, and social media exposure may influence diabetes prevention behaviour. However, the interrelationships among these variables remain understudied.
**Purpose:** This study aimed to assess the direct and indirect effects of stress, T2DM knowledge, health literacy, self-efficacy, social media exposure, and nutritional status on diabetes prevention behaviour among Indonesian university students using path analysis.
**Methods:** A cross-sectional study was conducted among 380 undergraduate students aged 18–25 years at Universitas Indonesia Maju, Jakarta. Diabetes prevention behavior was measured using the Diabetes Prevention Behavior Questionnaire (DPBQ). Validated instruments assessed perceived stress (PSS-10), diabetes knowledge (modified DKQ-24), social media exposure to health information, health literacy (HLQ subscales 1, 2, 3, 5), and general self-efficacy (GSES). Body Mass Index (BMI) was calculated from self-reported height and weight. Path analysis evaluated direct and indirect effects and indirect effects were tested via bootstrapping (5,000 resamples).
**Results:** Participants reported moderately high engagement in T2DM prevention behaviors (M = 3.72, SD = 0.46). The final model showed good fit to the data. T2DM prevention behavior was positively predicted by self-efficacy (β = 0.31, p < 0.001), health literacy (β = 0.25, p = 0.001), social media exposure (β = 0.21, p = 0.008), and diabetes knowledge (β = 0.18, p = 0.015), and negatively predicted by perceived stress (β = −0.23, p = 0.002) and BMI (β = −0.12, p = 0.031). Self-efficacy mediated the relationship between stress and prevention behavior (indirect β = −0.08, p = 0.012), while health literacy mediated the effects of diabetes knowledge (indirect β = 0.10, p = 0.046) and social media exposure (indirect β = 0.07, p = 0.046) on prevention behavior.
**Conclusion:** Diabetes prevention behaviors in Indonesian youth are shaped by an interrelated network of psychosocial and digital factors. Self-efficacy and health literacy play central mediating roles, suggesting that future interventions should combine psychological empowerment, health literacy enhancement, and strategic use of social media to strengthen T2DM prevention in young populations. Longitudinal research is needed to confirm causal pathways.

**Keywords:** Health literacy; prevention behavior; self-efficacy; social media; stress type 2 diabetes mellitus; youth

## Introduction

Type 2 diabetes mellitus (T2DM) remains a major global public health concern, and its growing presence among younger people has become especially

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**Corresponding author**

**Nina Nina***
Universitas Indonesia Maju Jakarta, Indonesia; Address: Jl. Harapan No.50, RT.2/RW.7, Lenteng Agung, Kec. Jagakarsa, Kota Jakarta Selatan, Daerah Khusus Ibukota Jakarta 12610; Phone: +62821-2267-8042,

E-mail: naninna62@gmail.com

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alarming. Once viewed primarily as a condition affecting older adults, T2DM is now appearing more often in adolescents and young adults. This shift reflects broader changes in daily life, rising psychosocial stress, increasingly sedentary routines, and the powerful influence of digital platforms that shape how young people understand and engage in health behaviors (Pulungan et al., 2021; Chan et al., 2020). The problem is further intensified by higher rates of obesity, declining physical activity, and unhealthy dietary habits among youth (Zhang et al., 2022). This epidemiological shift is highly concerning because early-onset T2DM progresses more aggressively, is associated with earlier development of complications, and imposes a longer lifetime burden on individuals and healthcare systems (Zheng et al., 2018). Early diagnosis and prevention are therefore critical to reducing long-term morbidity and economic strain.

Globally, an estimated 537 million people were living with diabetes in 2021, with projections showing a rise to 783 million by 2045 (Saeedi et al., 2020). Importantly, more than 90% of these cases are attributed to T2DM (Zheng et al., 2018). Recent data further demonstrate a significant rise in T2DM among adolescents and young adults, a trend that was once rare but is now rapidly increasing in many low- and middle-income countries (Saeedi et al., 2020). This shift reflects an interplay of modifiable lifestyle factors, such as unhealthy diets, physical inactivity, increased screen time, stress exposure and limited health literacy among the younger generation.

In 2021, an estimated 19.5 million Indonesians were living with diabetes, placing the country among the top ten nations worldwide with the highest disease burden (IDF Diabetes Atlas, 2021). Alarming increases in T2DM among younger age groups mirror broader national trends, where physical inactivity, unhealthy dietary patterns, and chronic psychological stress have become increasingly common risk factors (Ministry of Health of the Republic of Indonesia, 2022). Because lifestyle habits are largely established during late adolescence and early adulthood, university students represent a critical population for early intervention, making this developmental stage a strategic window for promoting healthy behaviors and preventing the progression of diabetes.

Despite these efforts to raise awareness at the national level, a significant number of Indonesian young adults have insufficient knowledge of T2DM risk factors and have not yet adopted preventive actions (Widayanti et al., 2020). Previous studies found that health behavior has been determined by nutritional status, stress, and health literacy. Nutritional status as indicated by body mass index (BMI) and dietary habit can be a predictor and a consequence of eating behavior (Asril et al., 2020). High stress in university students has been associated with maladaptive coping and low motivation to perform health-promoting activities (Leblalta et al., 2022). However, previous literature has predominantly focused on these factors individually and explore how they interact within the context of a broader behavior model is lacking.

Knowledge about T2DM is a prerequisite for altering behaviour, but it needs to be underpinned by functional health literacy, defined as the ability to access, understand, and use health information (Nutbeam, 2000). Self-efficacy, or confidence in one's ability to perform targeted health behaviors, is equally important for translating awareness into sustained action (Bandura, 1997). In recent years, social media has become a major channel through which young people obtain health information and form health-related attitudes (Sun et al., 2022; Yeh et al., 2018). Platforms such as Instagram, TikTok, and YouTube can both support health promotion and spread misinformation, thereby influencing beliefs, norms, and decisions related to diet, physical activity, and other lifestyle behaviors among youth (Bozzola et al., 2022; Yonker et al., 2015; Zhang et al., 2022).

While the importance of psychosocial and digital factors in shaping health behavior continues to grow, relatively few studies have examined their combined influence on diabetes-prevention behaviors using multivariable analytical approaches. In particular, path analysis studies that simultaneously assess both direct and mediated effects of stress, knowledge, social media exposure, self-efficacy, health literacy, and nutritional status among university students are scarce. To address this gap, the present study investigates the pathways through which these interrelated factors affect T2DM prevention behaviors among Indonesian university students. By applying path analysis, this study seeks to clarify how psychosocial attributes and digital information exposure interact to shape preventive health actions. The findings are expected to inform the design of future interventions that aim to strengthen health-promoting behaviors and reduce diabetes risk among adolescents and young adults, particularly in low-resource settings. Specifically, this research examines the direct and indirect effects of stress, diabetes knowledge, social media exposure, self-efficacy, nutritional status, and health literacy on T2DM prevention behaviors within a comprehensive behavioral model.

## Materials and Methods

### Study Design

This was a cross-sectional study that used path analysis to understand the associations between the variables such as stress, diabetes-related knowledge, exposure to health information through social media, health literacy, self - efficacy, nutrition status, and behaviors of Type 2 diabetes prevention.

### Setting and participants

The research was conducted at Universitas Indonesia Maju (UIM) in Jakarta between November 2024 and

January 2025. UIM was selected as the study site for several reasons. First, it is a large private university with diverse academic programs, providing access to a broad cross-section of young adults as a population known to be in a critical developmental stage for establishing long-term health behaviors. Second, the university has previously collaborated in public health initiatives, offering a supportive environment for behavioral research and efficient participant recruitment. Third, Indonesian university students represent an important demographic for global diabetes prevention efforts, as rising rates of early-onset T2DM have been observed across low- and middle-income countries.

The study focused exclusively on undergraduate students aged 18–25 years, as this age group is at the transition between adolescence and adulthood, when lifestyle patterns such as diet, physical activity, and stress management become more independent and stable. University staff were not included because the study specifically targeted youth and emerging adults as a population with distinct psychosocial characteristics, digital media consumption patterns, and health literacy profiles compared with older adults in the same setting. Limiting the sample to students ensures that findings speak directly to this globally relevant risk group.

Based on G*Power 3.1 calculations, a minimum of 204 participants was required for medium effect size ($f^2 = 0.15$), six predictors, 0.95 power, and $\alpha = 0.05$ (Faul et al., 2009). To reduce variance, improve generalizability, and anticipate incomplete responses, the sample size was expanded to 384 participants. A stratified random sampling approach was used to capture representation across the university's major faculties. Each faculty served as a stratum, and the number of sampled students from each faculty was proportional to its enrollment size. Within each stratum, participants were selected through simple random sampling using student identification numbers as the sampling frame.

## Instruments

The study variables were measured using several validated instruments. Diabetes prevention behavior was assessed using the 20-item Diabetes Prevention Behavior Questionnaire (DPBQ), which evaluates engagement in physical activity, dietary practices, and lifestyle modifications on a 5-point Likert scale, with higher scores indicating stronger adherence to recommended preventive behaviors. The structure and behavioral domains measured by the DPBQ are consistent with validated lifestyle and diabetes-prevention behavior tools used in prior research (Toobert et al., 2000), supporting its conceptual and psychometric foundations. In the current study, the Bahasa Indonesia version demonstrated good internal consistency (Cronbach's $\alpha = 0.85$).

Stress levels were assessed using the Perceived Stress Scale (PSS-10) developed by Cohen et al. (1983), which consists of 10 items rated on a 5-point scale (0–4). PSS-10 is a globally validated psychological assessment tool with well-established content, convergent, and discriminant validity. The Indonesian version has demonstrated good reliability (Cronbach's $\alpha = 0.84$) in previous validation studies (Dwi et al., 2024).

Diabetes knowledge was measured using a modified youth-adapted version of the Diabetes Knowledge Questionnaire (DKQ-24), originally developed by García et al. (2001). The adapted 15-item instrument uses three response options ("True," "False," "I don't know"). The DKQ family of tools has previously demonstrated good criterion validity and sensitivity for detecting gaps in diabetes-related understanding.In the current study, internal consistency demonstrated acceptable (Cronbach's $\alpha = 0.78$).

Perceptions of social media exposure to health information were assessed using an 8-item scale adapted from Powell et al. (2024), which evaluates frequency and perceived credibility of diabetes-related content viewed on Instagram, TikTok, and YouTube. Prior work has demonstrated strong face and construct validity for this measure when assessing online health information exposure.In The current study, the adapted Indonesian version showed satisfactory reliability (Cronbach's $\alpha = 0.81$).

Health literacy was measured using four subscales (1, 2, 3, and 5) of the Health Literacy Questionnaire (HLQ) developed by Osborne et al. (2013), comprising 16 items. The HLQ is a widely used instrument with extensive evidence supporting its content validity, factorial validity, and cross-cultural measurement invariance across diverse populations.In the current study, the Indonesian version has demonstrated high internal reliability (Cronbach's $\alpha = 0.87$).

Self-efficacy was assessed using the General Self-Efficacy Scale (GSES) designed by Schwarzer and Jerusalem (1995), a 10-item instrument rated on a 4-point Likert scale. The GSES has demonstrated excellent convergent validity with behavior change and coping-related constructs, as well as strong reliability across global samples.The Indonesian adaptation has shown good psychometric properties (Cronbach's $\alpha = 0.86$) (Wardani et al., 2025).

Nutritional status was assessed using Body Mass Index (BMI) calculated from self-reported weight and height, classified according to WHO Asia–Pacific cutoffs for underweight, normal weight, overweight, and obesity (WHO Expert Consultation, 2004). BMI was also modeled as a continuous variable in path analysis.

A demographic questionnaire collected information on age, sex, academic year, faculty of study, parental history of diabetes, and previous exposure to diabetes-related education.

## Data Collection Procedure

Data collection was carried out following ethical approval from the Universitas Indonesia Maju Research Ethics Committee (Ref: 1650/Sket/Ka-Dept/RE/UimA/XI/2024). Participants were

**Table 1. Demographic Characteristics of Participants (N = 380)**

| Variable | Category | n | % |
|---|---|---|---|
| Age (years), Mean (SD) | | 20.8 (1.9) | |
| Gender | Male | 140 | 36.8 |
| | Female | 240 | 63.2 |
| Academic Year | First Year | 90 | 23.7 |
| | Second Year | 100 | 26.3 |
| | Third Year | 110 | 28.9 |
| | Fourth Year | 80 | 21.1 |
| Faculty | Medicine | 120 | 31.6 |
| | Nursing | 90 | 23.7 |
| | Public Health | 100 | 26.3 |
| | Pharmacy | 70 | 18.4 |
| Parental History of Diabetes | Yes | 160 | 42.1 |
| | No | 220 | 57.9 |
| Prior Exposure to Diabetes Education | Yes | 200 | 52.6 |
| | No | 180 | 47.4 |

**Table 2. Descriptive Statistics of Key Study Variables (N = 380)**

| Variable | Number of Items | Scale Range | Mean (SD) | Cronbach's α |
|---|---|---|---|---|
| T2DM Prevention Behavior (DPBQ) | 20 | 1 – 5 | 3.72 (0.46) | 0.85 |
| Perceived Stress (PSS-10) | 10 | 0 – 4 | 2.14 (0.68) | 0.84 |
| T2DM Knowledge (Modified DKQ-24) | 15 | 0 – 15 | 10.28 (2.31) | 0.78 |
| Social Media Exposure to Health Information | 8 | 1 – 5 | 3.49 (0.57) | 0.81 |
| Health Literacy (HLQ subscales 1, 2, 3, 5) | 16 | 1 – 5 | 3.68 (0.53) | 0.87 |
| General Self-Efficacy (GSES) | 10 | 1 – 4 | 2.91 (0.51) | 0.86 |
| Body Mass Index (BMI) | – | kg/m² | 22.7 (3.9) | – |

**Table 3. Pearson Correlation Coefficients Among Study Variables (N = 380)**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. T2DM Prevention Behavior | 1 | | | | | | |
| 2. Perceived Stress | –0.32** | 1 | | | | | |
| 3. T2DM Knowledge | 0.28** | –0.14** | 1 | | | | |
| 4. Social Media Exposure | 0.35** | –0.12* | 0.21** | 1 | | | |
| 5. Health Literacy | 0.40** | –0.29** | 0.25** | 0.38** | 1 | | |
| 6. Self-Efficacy | 0.44** | –0.34** | 0.22** | 0.30** | 0.47** | 1 | |
| 7. BMI | –0.11* | 0.18** | –0.09 | –0.05 | –0.12* | –0.14** | 1 |

Note: *p < .05, **p < .01

recruited through digital media channels, including online university announcements, institutional social media platforms, and electronic bulletin boards. These platforms were selected to ensure broad and accessible outreach to university students. Electronic informed consent was obtained through Google Forms, the same platform used to administer the survey. All submitted questionnaires were carefully reviewed to ensure completeness. When inconsistencies or missing responses were identified, participants were contacted via follow-up email for clarification. Data collection took place over a three-week period, resulting in a validated final dataset of 384 respondents..

## Data Analysis

Demographic characteristics and key study variables were summarized using descriptive statistics, including means, standard deviations, and frequency distributions. Pearson correlation coefficients were calculated to assess associations among continuous variables prior to model testing.

**Table 4. Model Fit Indices for the Path Analysis Model**

| Fit Index | Recommended Threshold | Observed Value | Model Fit Interpretation |
|---|---|---|---|
| Chi-Square ($\chi^2$) | Non-significant preferred | 98.52 (df = 72, p = 0.018) | Acceptable (slightly significant) |
| RMSEA (Root Mean Square Error of Approximation) | ≤ 0.08 | 0.042 | Good Fit |
| CFI (Comparative Fit Index) | ≥ 0.90 | 0.964 | Excellent Fit |
| TLI (Tucker-Lewis Index) | ≥ 0.90 | 0.952 | Excellent Fit |
| SRMR (Standardized Root Mean Square Residual) | ≤ 0.08 | 0.034 | Good Fit |

**Table 5. Path analysis results**

| Path | Standardized Coefficient (β) | p-value | 95% CI (Lower) | 95% CI (Upper) |
|---|---|---|---|---|
| Stress → T2DM Prevention Behavior | -0.23 | 0.002 | -367 | -93 |
| T2DM Knowledge → T2DM Prevention Behavior | 0.18 | 0.015 | 43 | 317 |
| Social Media Exposure → T2DM Prevention Behavior | 0.21 | 0.008 | 53 | 367 |
| Health Literacy → T2DM Prevention Behavior | 0.25 | 0.001 | 132 | 368 |
| Self-Efficacy → T2DM Prevention Behavior | 0.31 | 0.043 | 212 | 408 |
| BMI → T2DM Prevention Behavior | -0.12 | 0.031 | -238 | -2 |
| Stress → Self-Efficacy → T2DM Prevention Behavior (Indirect) | -0.08 | 0.012 | -158 | -2 |
| T2DM Knowledge → Health Literacy → T2DM Prevention Behavior (Indirect) | 0.10 | 0.046 | 22 | 178 |
| Social Media Exposure → Health Literacy → T2DM Prevention Behavior (Indirect) | 0.07 | 46 | 11 | 129 |

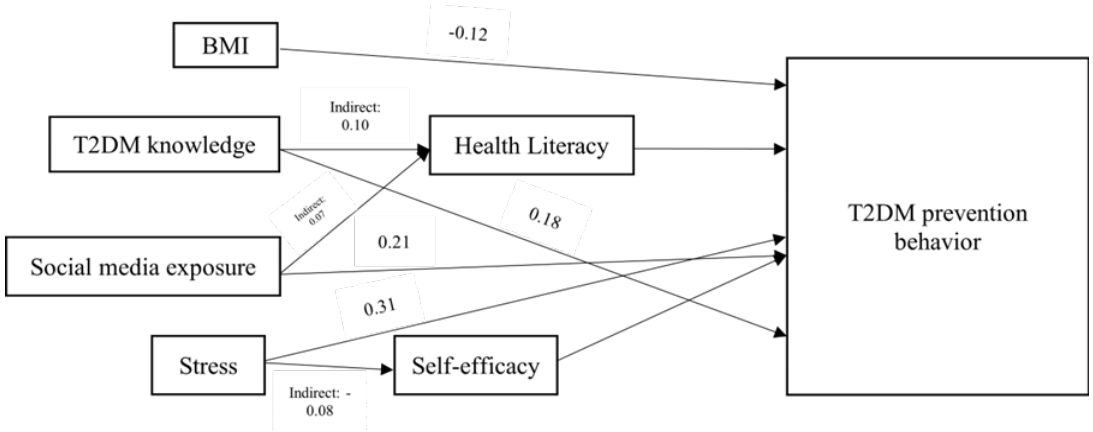


**Figure 1. Path analysis of T2DM prevention behavior**

To evaluate the hypothesized relationships among the study variables, path analysis was conducted using AMOS version 26. Path analysis is a form of structural equation modeling (SEM) that allows simultaneous examination of direct and indirect effects among variables based on a theoretically driven model. This approach was selected because it enables testing of complex causal pathways and mediation effects within a single analytical framework, offering deeper insight into the mechanisms linking the variables of interest.

Model fit was assessed using multiple goodness-of-fit indices. A non-significant chi-square ($\chi^2$) statistic suggested adequate model fit, although $\chi^2$ is known

to be sensitive to large sample sizes. Additional indices were therefore consulted, including the Root Mean Square Error of Approximation (RMSEA), where values ≤ 0.08 indicate acceptable fit; the Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI), with recommended thresholds above 0.90; and the Standardized Root Mean Square Residual (SRMR), with values < 0.08 reflecting good fit.

To evaluate mediation pathways and estimate indirect effects, a bootstrapping procedure with 5,000 resamples and bias-corrected 95% confidence intervals was applied. Bootstrapping is a robust, non-parametric method that improves the accuracy of indirect effect estimation and is widely recommended for mediation analysis.

## Results

Table 1 shows that participants had a mean age of 20.8 years (SD = 1.9), with more females (63.2%) than males (36.8%). Academic years were fairly balanced, with the highest proportion in the third year (28.9%). Most students were from Medicine (31.6%), followed by Public Health (26.3%), Nursing (23.7%), and Pharmacy (18.4%). A parental history of diabetes was reported by 42.1% of participants, and 52.6% had prior exposure to diabetes education.

Table 2 shows that participants had a moderately high engagement in diabetes prevention behaviors, with a mean DPBQ score of 3.72 (SD = 0.46). Perceived stress levels were moderate, averaging 2.14 (SD = 0.68). Knowledge of type 2 diabetes was fair, with a mean score of 10.28 out of 15 (SD = 2.31). Social media exposure to health information was also moderate at 3.49 (SD = 0.57). Participants demonstrated relatively good health literacy (M = 3.68, SD = 0.53) and self-efficacy (M = 2.91, SD = 0.51). The average BMI was 22.7 kg/m² (SD = 3.9), indicating that most participants were within the normal range based on WHO Asia-Pacific classifications.

Table 3 shows that T2DM prevention behavior was positively and significantly correlated with self-efficacy (r = 0.44), health literacy (r = 0.40), social media exposure (r = 0.35), diabetes knowledge (r = 0.28), and negatively correlated with perceived stress (r = –0.32). BMI showed a weak but statistically significant negative correlation with T2DM prevention behavior (r = –0.11). This correlation is considered weak because, in behavioral and health sciences, correlation coefficients closer to zero (typically |r| < 0.20) represent small or minimal associations. In practical terms, a weak negative correlation means that as BMI increases, T2DM prevention behaviors tend to decrease slightly, but the strength of this relationship is modest. These findings suggest that higher self-efficacy, better health literacy, greater exposure to health information on social media, and higher diabetes knowledge are associated with stronger engagement in preventive behaviors, while higher stress and BMI are associated with lower engagement.

This model indicates a good overall fit between the hypothesized structure and the observed data, with all key indices (RMSEA, CFI, TLI, SRMR) meeting recommended thresholds. Although the chi-square test is statistically significant, this is common in large samples and does not by itself indicate poor fit. The combination of low RMSEA, high CFI/TLI, and low SRMR supports the adequacy of the model for explaining T2DM prevention behavior among the participants (Table 4).

The path analysis results indicate that stress has a significant negative effect on T2DM prevention behavior (β = -0.23, 95% CI: -0.367 to -0.093, p = 0.002), while knowledge, social media exposure, health literacy, and self-efficacy show significant positive effects. Among these, self-efficacy has the strongest direct effect (β = 0.31, 95% CI: 0.212 to 0.408, p < 0.001). The indirect effects also support the mediating role of self-efficacy between stress and prevention behavior (β = -0.08), and of health literacy between both knowledge (β = 0.10) and social media exposure (β = 0.07) and T2DM prevention behavior, all statistically significant (Table 5). Visualization of indirect and direct effect also provided in Figure 1.

## Discussion

The aim of this study was to understand both the direct and indirect effects of psychosocial measures (e.g., self-efficacy, health literacy, knowledge, stress, and perceived effects of social media exposure) and informational measures on prevention behaviors associated with type 2 diabetes mellitus (T2DM) among young individuals. The findings showed that these predictors have a significantly predictive role on the preventive behavior alone or through the mediatory process.

Self-efficacy emerged as the most powerful predictor of all, consistent with Bandura's (2004) Social Cognitive Theory concept of self-belief as a crucial factor in behaviour change. Self-efficacy not only had a significant direct effect on T2DM prevention behavior, but also mediated the association between stress and behavior. This concept is indicative of the fact that those who have the strongest belief about their capability to engage in healthy behaviors, would be more resilient in the face of stress and be more likely to sustain long-term preventive actions. Previous studies have highlighted that self-efficacy is important for overcoming barriers, maintaining a change in lifestyle, and managing chronic diseases (Chen et al., 2022; Hagger et al., 2018; Schunk & DiBenedetto, 2020).

Health literacy was also another important predictor affecting directly and indirectly T2DM prevention. It was a mediator of the effects of diabetes knowledge and social media exposure, highlighting the role of the ability to understand and utilize health information in promoting behavior

change. Health literacy allows people to make choices, access and use health information, and engage in prevention of health (Nutbeam, 2000; Sørensen et al., 2012). Increased health literacy is associated with better diet behavioural and greater physical activity levels among young adults (Bae & Yoon, 2021; Osborne et al., 2013), thus attesting to the importance of this factor in this population.

Both direct and indirect effect of stress on preventive behavior were negative, which was mediated by self-efficacy. These results are consistent with the previous literature that described the relationship between higher stress and lower motivation (Baumeister et al., 2018), reduced self-regulation (Laurence & Kim, 2021), and more maladaptive strategy use such as emotional eating and more sedentary activities (Jafaru et al., 2022). In college students, academic and social stressors frequently interfere with their ability to execute long-term preventive strategis (Kim et al., 2022; Lee & Lim, 2022)

Of the media exposure, when mediated by high health literacy, media exposure had the moderate positive effect on T2DM prevention behavior. This indicates that, though digital media platforms are effective tools for health promotion, the potential effects of these tools are contingent at the level of user ability to critically evaluate information in the media. Social media has become one of the most popular channels that has influenced health attitudes and behaviors among youth (Salciccia et al., 2021; Sun et al., 2022). While such platforms can help increase awareness and change behaviors, the potential for misinformation is always present. Thus, health literacy is necessary to ensure young people interpret information correctly and use it properly (Bode & Vraga, 2021).

Notably, preventive behavior had a weak negative association with BMI. Although BMI is commonly used as an indicator of nutritional and health status, our results suggest that psychosocial and cognitive determinants exert a much stronger influence on preventive behaviors than BMI alone, particularly among young adults. This aligns with studies showing that BMI is often a poor standalone predictor of health behavior, as young individuals may not perceive elevated BMI as an immediate health threat (Friedman et al., 2025). Other studies similarly report that the relationship between BMI and preventive practices, including diet modification, exercise, and glucose monitoring tends to be weak or inconsistent in younger populations, partly because health behaviors are driven more by social norms, motivation, and digital influence than by clinical risk indicators (Bodega et al., 2023; Rounsefell et al., 2020). However, some individuals may use their awareness of weight and its long-term consequences as a motivator for behavior change (Asril et al., 2020). These findings support the interpretation that while nutritional status is relevant, behavioral intentions and psychological factors remain the dominant drivers of T2DM preventive behavior among youth.

T2DM knowledge was positively associated with preventive behavior in this study. Although knowledge alone does not automatically lead to behavioral change, it provides the essential cognitive foundation for recognizing personal susceptibility, evaluating the seriousness of diabetes, and understanding the rationale behind lifestyle modification (Liu et al., 2022; Tietjen et al., 2021; Widayanti et al., 2020). Individuals with higher diabetes-related knowledge are better equipped to identify early warning signs, interpret risk information, and appreciate the long-term benefits of preventive actions (Chu et al., 2023). However, knowledge must be accompanied by the skills to access, appraise, and apply health information in daily decision-making. When supported by stronger health literacy, diabetes knowledge is more likely to be translated into meaningful and sustained preventive behaviors, such as healthier dietary choices, regular physical activity, and proactive health monitoring (Banerjee et al., 2020). This interaction is consistent with evidence showing that knowledge becomes behaviourally impactful only when individuals possess adequate functional and critical health literacy, enabling them to convert understanding into actionable strategies for risk reduction.

These findings have important implications for public health strategies aimed at strengthening diabetes prevention among young people. The prominent role of self-efficacy highlights the need for interventions that actively build confidence through skill-development activities, personalized feedback, and realistic goal-setting. Such approaches can empower youth to adopt and sustain healthier lifestyle behaviors over time. Health literacy also emerged as a critical determinant and should be integrated into health education programs and community-based initiatives. Enhancing young people's ability to locate, interpret, and apply health information is essential, particularly in an era where digital content is abundant but varies widely in quality. Strengthening health literacy can help ensure that youth make informed choices based on credible information rather than misinformation commonly encountered online. The negative influence of stress underscores the importance of incorporating emotional well-being into preventive health efforts. Embedding stress-management strategies, mindfulness practices, and improved access to mental health support within educational settings may improve students' capacity to engage in health-promoting behaviors. Finally, social media, when paired with adequate health literacy, can serve as a valuable channel for health promotion. Curated, culturally relevant, and youth-friendly content delivered through platforms such as TikTok and Instagram has the potential to reach large audiences and positively shape health beliefs and behaviors. Leveraging these platforms thoughtfully could enhance the effectiveness of diabetes

prevention initiatives targeting young populations.

### Limitations

This study is not without its own limitations. The cross-sectional design of this study precluded drawing conclusions about causality. Longitudinal or intervention studies are required to establish the directionality of these associations. Secondly, information was self-reported, which may have led to recall and social desirability biases. Objective behavior-based or biometric measures would fortify future work.

Furthermore, the sample was largely comprised of health-related department students, and could be narrow in ecological validity to non-health major students or other subgroups. Additional exploration is needed with more heterogeneous and community-based samples. Finally, although indirect effects were statistically significant, confidence intervals were not bootstrapped, which may inflate those values. On this, findings would be more conclusive using structural equation modelling at a larger sample with more sophisticated estimation strategies.

## Conclusions

This research adds to an expanding literature on psychosocial and information predictors of type 2 diabetes prevention behavior in young people. Self-efficacy, health literacy, and stress were important; they had a direct and indirect impact on behavior. Intervention focus on psychological empowerment, health education and digital intervention, and developing a pathway to success while addressing the health literacy gap. The findings related to mediation roles of self-efficacy and health literacy suggest the need for multifactorial interventions to be developed in the direction of psychological empowerment in conjunction with health education and use of a digital screening tool. With lifestyle-related diseases increasing in younger age groups, this drives home the urgency of giving young people the tools, abilities, and confidence to make healthy decisions that stick.

### Declaration of Interest

No authors have declared a conflict of interest.

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### Author Contributions

Nina was responsible for coming up with the idea for the study, creating its layout, coordinating its data collecting, and penning its initial paper. Data analysis and interpretation were both done by Achmad Lukman Hakim. Hidayani helped write the discussion part and added to the literature review. Methodological advice and text critiques were offered by Tukimin bin Sansuwito. The final version was reviewed and approved by all writers.

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