Jurnal Info Kesehatan
Vol. 23, No. 1, March 2025, pp. 78-88
P-ISSN 0216-504X, E-ISSN 2620-536X
DOI: *10.31965/infokes.Vol23.Iss1.1920*
Journal homepage: *https://jurnal.poltekkeskupang.ac.id/index.php/infokes*

RESEARCH Open Access

Support in Shaping Pre-Diabetes Preventive Behavior Among Urban Productive-Age: A Path Analysis Study

Sobar[1a*], Risky Kusuma Hartono[2b]

[1] Department of Public Health, Universitas Indonesia Maju, South Jakarta, Jakarta, Indonesia

[a] Email address: sobardarma2020@gmail.com
[b] Email address: risky_kusuma@yahoo.com

Received: 12 February 2025 Revised: 1 March 2025 Accepted: 26 March 2025

Abstract
The productive-age population in urban areas is susceptible to diabetes, often without awareness of their pre-diabetic condition. This study examines the various roles in pre-diabetes preventive behavior among the productive-age group in urban communities. A quantitative cross-sectional design was employed, involving 363 respondents aged 20-69 years, selected through simple random sampling. The variables investigated include mindset, motivation, health literacy, social support, family support, and exposure to health information, all of which play significant leveraging roles in pre-diabetes preventive behavior. Path-based multivariate regression analysis was used to explore the direct and indirect influences among these variables. Health literacy was found to play a significant role in shaping mindset, which subsequently contributes to pre-diabetes preventive behavior, as demonstrated by family support ($\beta = 0.010$; $p = 0.013$). Social support ($\beta = 0.051$; $p = 0.006$) and motivation ($\beta = 0.059$; $p = 0.005$) also proved to have a meaningful impact. This study concluded that prevention of the high risk of pre-diabetes in the productive-age group, interventions should focus on improving health literacy, strengthening social and family support, and fostering motivation. The findings highlight the critical need for targeted health education and community-based support systems to address the growing risk of diabetes among urban populations, particularly those in the productive age group who may be unaware of their pre-diabetic status.

Keywords: Preventive Behavior, Pre-Diabetes Prevention, Health Literacy, Social Support, Family Support.

Corresponding Author:

Sobar Darmadja
Department of Public Health, Universitas Indonesia Maju, South Jakarta, Jakarta, Indonesia
Email: sobardarma2020@gmail.com

1. INTRODUCTION

Pre-diabetes is one of the rapidly emerging public health issues globally. This condition is characterized by blood glucose levels that are higher than normal but not yet high enough to be classified as type 2 diabetes mellitus (Francois and Oetsch, 2022). Without appropriate intervention, approximately 70% of individuals with pre-diabetes will progress to diabetes within a few years (Kalra, Singal and Kapoor, 2022). Data from the International Diabetes Federation (IDF) indicate that the global prevalence of pre-diabetes reached 7.3% in 2021, with risks continuing to rise due to modern lifestyle changes, including physical inactivity and diets high in sugar and fat (Kalra, Singal and Kapoor, 2022).

Indonesia is among the countries with a high number of pre-diabetes cases, particularly in urban areas, where sedentary lifestyles, work-related stress, and easy access to fast food exacerbate the condition (Wahidin et al., 2024). Epidemiological studies reveal that the productive-age group (21–55 years) has a high tendency to develop pre-diabetes due to unhealthy lifestyle factors, as well as social and economic pressures (Tuti, Fitriyani and Maulana, 2023). Public awareness of pre-diabetes remains low, resulting in many individuals being unaware of their high risk of developing diabetes (Formagini et al., 2023). This problem phenomenon among productive-age individuals in urban areas poses a significant challenge.

The often-vague symptoms of pre-diabetes hinder early detection, while risk factors such as obesity, physical inactivity, unhealthy diets, and high stress levels in urban areas further worsen the situation (Dong et al., 2022; Harcke et al., 2023). Additionally, unrecognized genetic factors also contribute to the risk of developing pre-diabetes (Merwass et al., 2024). The economic impact of this condition is significant, given the high cost of diabetes treatment, which is often not fully covered by healthcare systems (Wahidin et al., 2024). The productivity of affected individuals declines, leading to an overall reduction in quality of life. If left unaddressed, the number of diabetes cases in Indonesia is projected to rise dramatically in the future, further burdening the national healthcare system (Windah et al., 2023). If this trend is not addressed promptly, the incidence of type 2 diabetes will escalate, placing an overwhelming burden on both individuals and national health services.

Various studies have highlighted the importance of psychosocial factors in influencing preventive behaviors for chronic diseases, including pre-diabetes. The Health Belief Model (HBM) and Social Cognitive Theory (SCT) suggest that individuals' perceptions of health risks, motivation, and social environments play significant roles in shaping preventive behaviors (He, Liu and Mao, 2019; Subramaniam, Dhillon and Wan Ahmad, 2021). These factors can be categorized as internal and external determinants that work simultaneously to influence individuals' decisions to adopt healthy lifestyles. Internal determinants include motivation, health literacy, mindset, and stress levels, which contribute to raising awareness and readiness for preventive behaviors. Meanwhile, external determinants such as family support, social support, and exposure to health information serve as reinforcing factors for individuals' commitment to adopting healthy behaviors (Subramaniam, Dhillon and Wan Ahmad, 2021). Understanding these psychosocial determinants of pre-diabetes preventive behavior is essential for designing effective interventions that go beyond individual-level changes and incorporate broader social and environmental influences. Without effective approach, efforts to curb the increasing prevalence of pre-diabetes may remain problematics.

Existing literature, based on internal and external factors, provides insights into pre-diabetes prevention, there is a growing need for updated research that specifically addresses the interplay between psychosocial factors and pre-diabetes prevention in urban settings. However, to date, few studies have examined the dominant factors influencing pre-diabetes preventive behaviors, particularly in urban settings with unique lifestyle patterns and work-related pressures.

The formulation of this research is guided by the question: "To what extent do psychosocial factors influence pre-diabetes preventive behavior among urban productive-age individuals?" Therefore, this study aims to analyze the determinants of pre-diabetes preventive behaviors among the productive-age population in urban communities, focusing on the

influence of psychosocial factors such as mindset, motivation, health literacy, social support, family support, and exposure to health information. It seeks to explore how these psychosocial factors, both internal and external, contribute to individuals' decision-making processes in adopting healthy lifestyles and preventing pre-diabetes. By providing a comprehensive analysis of psychosocial determinants, this study produces policy recommendations and intervention strategies that can be implemented at both the community and national levels. Furthermore, the research output may serve as a foundation for future studies exploring behavioral interventions for the prevention of prediabetes in urban settings.

2. RESEARCH METHOD

This study employs a quantitative approach with a cross-sectional design, enabling data collection at a single point in time to assess the prevalence and relationships between the studied variables. The research location is Jakarta, representing an urban population with a modern lifestyle at high risk of pre-diabetes. The study period spans from November 2024 to January 2025.

The study population includes individuals aged 20 to 69 years, representing the productive-age group. The minimum sample size was calculated using the proportion formula n=Z2*P*(1-P)/d2, where Z is the Z-score for a 95% confidence level (1.96), P is the estimated proportion of productive age in urban populations based on national statistics data (62.5%), and d is the margin of error (5%). Based on this calculation, a minimum of 360 participants was required. However, to account for potential incomplete responses, additional participants were included in the recruitment process.

Sampling was conducted using simple random sampling, covering all areas of Jakarta except the Thousand Islands, which has rural characteristics. Participants were selected from the general population using a randomized approach to ensure representativeness. The inclusion criteria consisted of productive-age individuals who had not been medically diagnosed with diabetes and were willing to participate in the study. The final sample included only those respondents who completed the questionnaire in full and met all inclusion criteria. The exclusion criteria for this study were productive-age individuals who had been medically diagnosed with diabetes.

Data collection was carried out by distributing online questionnaires to 363 respondents and visiting office locations with diverse job sectors to ensure sample diversity. This study exceeded the minimum sample size to improve statistical strength, accuracy, and reliability, with all respondents meeting inclusion criteria and providing complete data. Data collection involved public health students who had received prior training on the research topic. The validity of the study was tested using established validity tests. Data were collected using a pre-validated questionnaire, which demonstrated high reliability with a Cronbach’s Alpha value of 0.915 and most of loading factors >0.6.

The dependent variable in this study is pre-diabetes preventive behavior, while the independent variables include internal factors (motivation, health literacy, and mindset) and external factors (family support, social support, and exposure to health information). Path analysis was conducted using bivariate regression to examine the pairwise relationships between psychosocial variables and pre-diabetes preventive behavior. This step helped identify initial associations without controlling for other variables. Subsequently, multivariate regression was employed to assess the combined influence of multiple psychosocial variables on pre-diabetes preventive behavior through explore both the direct and indirect effects among the studied variables. The results of the path analysis were interpreted by examining the path coefficients, which indicate the strength and direction of the relationships, and p value< 0.05 for assessing the significance of direct and indirect effects. This study has received ethical approval from the Universitas Indonesia Maju Ethics Committee with number 412/SKet/Ka-Dept/RE/UIMA/I/2025.

3. RESULTS AND DISCUSSION

Table 1. The Characteristics of Respondents.

Variables	N (363)	Percent (%)
Age		
20-29.9 years	69	19
30-39.9 years	152	41.9
40-49.9 years	87	24
50-59.9 years	47	12.9
60-69.9 years	6	1.7
>70 years	2	0.5
Gender		
Female	276	76
Male	87	24
Working Status		
Working	332	91.5
Not working	31	8.5
Distance of office location from home		
0-20 km	293	80.4
21-40 km	51	14
41-60 km	20	5.6

Table 1 shows that the characteristics of the respondents in this study indicate that the majority of respondents belong to the largest proportion, the most respondents were found in the 30-39 age group (41.9%). The respondents were predominantly female (76%), and most of them had active employment status (91.5%). Additionally, the majority of respondents resided within a relatively close radius to the office location, specifically less than 20 km (80.4%).

Table 2. Test Items Based on Variables.

Variables	Question Items	Factor Loading	Mean	Normality test	R^2
Motivation	Maintaining a healthy lifestyle is important.	0.617	3.56	W= 0.958 P= <0.001	NA
	Strong motivation to adopt healthy behaviors.	0.736	3.01		
	Following health professional's advice for a healthy life.	0.828	2.90		
	Taking advice from family or friends.	0.755	2.85		
	Living a long life as motivation for a healthy lifestyle.	0.913	3.67		
Family Support	Family provides motivation for healthier life.	0.868	3.11	W= 0.975 P= <0.001	NA
	Family reminds about maintaining a healthy diet.	0.794	2.97		
	Family provides instrumental support.	0.656	2.69		
	Family shares health-related information.	0.785	2.65		
	Rewards given for maintaining a healthy lifestyle.	0.758	2.14		
Social support	Friends or colleagues influence healthy living.	0.773	2.56	W= 0.951 P= <0.001	NA

	Workplace or friends encourage healthy eating.	0.867	2.47		
	Workplace or friends provide instrumental support.	0.627	2.26		
	Workplace or friends share health information.	0.806	2.53		
	Workplace or friends give rewards for healthy living.	0.563	1.93		
Health literacy	Good understanding of pre-diabetes risks.	0.794	2.84	W= 0.967 P= <0.001	0.313
	Good understanding of safe blood sugar levels.	0.920	2.90		
	Awareness of daily sugar consumption limits.	0.849	2.79		
	Knowledge of diabetes screening tests.	0.889	2.73		
	Actively seek information to prevent diabetes.	0.566	2.29		
Mindset	Healthy behaviors help prevent pre-diabetes.	0.696	3.42	W= 0.963 P= <0.001	0.373
	Frequently adoption of a healthier lifestyle.	0.452	2.97		
	Consideration of sugary drink consumption effects.	0.755	3.09		
	Consider reducing daily sugar intake.	0.894	3.07		
	Strategies to maintain blood sugar levels under control.	0.812	2.95		
Information exposure	Accessing pre-diabetes prevention information from TV, the internet, and social media.	0.644	2.46	W= 0.979 P= <0.001	0.233
	Health information from the media is relevant.	0.745	2.67		
	Awareness of diabetes prevention information.	0.747	3.40		
	Specific attitude toward received health information.	0.584	3.05		
	Frequent exposure to health information from specific sources.	0.920	1.67		
Prevention bahevior of pre-diabetes	Regular physical activity.	0.896	2.22	W= 0.967 P= <0.001	0.240
	Frequently consume fruits and vegetables.	0.769	2.93		
	Maintaining an average number of sleep hours.	0.913	2.41		
	Smoking behavior at a certain intensity.	0.873	1.93		
	Often around people who smoke.	0.875	1.60		
Reliability test (Cronchbach Alpha) = 0.915					

Table 2 shows that the respondents demonstrated an understanding of the importance of a healthy lifestyle, as evidenced by the high awareness of the need to maintain longevity, with an average response score of 3.67. The normality test indicated that all variables were not

normally distributed, with all p-values <0.001 for motivation, family support, social support, health literacy, mindset, information exposure, and pre-diabetes prevention behavior. Furthermore, pre-diabetes prevention behavior had an R^2 value of 0.24, meaning that the independent variables in this study explained 24% of the variance in pre-diabetes prevention behavior and 76% was from another variable that unobserved in this study.

In this study, the highest motivation was the desire to live longer (mean score = 3.67). This indicates that respondents understand the importance of maintaining health as a long-term investment. It is because motivation is a key factor in the adoption of a healthy lifestyle. The study by Brizga & Vijaikis (2024) on the Self-Determination Theory explains that individuals with intrinsic motivation are more likely to maintain healthy habits compared to those driven solely by external factors.

However, the findings also show that motivation based on recommendations from healthcare professionals or family members received lower scores. A study by Teoh et al., (2023) found that although advice from healthcare professionals can raise awareness, the implementation of healthy behaviors for pre-diabetes prevention remains highly dependent on an individual's personal motivation. Furthermore, research by Silva-Smith et al., (2024) on the Health Action Process Approach (HAPA) theory emphasizes that individuals tend to act only when they have a strong intention triggered by risk awareness and self-efficacy beliefs.

On the other hand, mindset is a cognitive aspect that influences how individuals process health information and make decisions regarding disease prevention behaviors Tol et al., (2023). In this study, a positive mindset toward a healthy lifestyle was significantly correlated with pre-diabetes prevention behaviors. This is reinforced by research from Dweck and Yeager (2019), which asserts that a growth mindset regarding health enhances an individual's readiness to adopt healthy habits. Another study by Kerrison et al., (2017) also found that an adaptive health mindset is closely associated with adherence to diet and exercise in pre-diabetes prevention.

Additionally, an individual's mindset toward health can also be influenced by the information they are exposed to. A study by Hagger and Hamilton (2022) found that individuals with a positive mindset are better able to interpret health information constructively, making it easier for them to adopt healthy habits compared to those with a fixed mindset. In this study, the highest scores in the mindset variable were found in the belief that a healthy lifestyle can prevent pre-diabetes (mean = 3.42) and the intention to reduce daily sugar consumption (mean = 3.07). These findings align with Kerrison et al., (2017), who stated that individuals with a growth mindset are more likely to continuously plan and evaluate their healthy habits. Therefore, fostering a proactive health mindset can be a key strategy in pre-diabetes prevention interventions.

Table 3. Bivariate Test of the Parameter.

Dependent Variables	Predictors	β	SE	95% Confidence Intervals		p-value
				Lower	Upper	
Mindset	Family support	0.1121	0.0388	0.01263	0.165	0.022
Mindset	Health literacy	0.3857	0.0341	0.23802	0.372	< .001
Mindset	Motivation	0.3333	0.0490	0.24508	0.437	< .001
Preventive behavior	Mindset	0.1528	0.0323	0.03304	0.160	0.003
Preventive behavior	Motivation	0.4019	0.0330	0.19435	0.324	< .001
Health literacy	Social support	0.0989	0.0500	0.00644	0.202	0.037
Health literacy	Information exposure	0.5128	0.0661	0.58639	0.845	< .001
Information exposure	Social support	0.2404	0.0396	0.10418	0.260	< .001
Information exposure	Family support	0.3183	0.0376	0.15471	0.302	< .001

Table 3 shows that the bivariate analysis results revealed significant relationships among several variables influencing mindset and pre-diabetes prevention behavior within the productive-age group. mindset was positively associated with pre-diabetes prevention behavior ($\beta = 0.1528$; $p = 0.003$), while motivation exhibited a strong correlation with pre-diabetes prevention behavior ($\beta = 0.4019$; $p < 0.001$). Additionally, health literacy was influenced by social support ($\beta = 0.0989$; $p = 0.037$) and information exposure ($\beta = 0.5128$; $p < 0.001$). Information exposure itself was influenced by social support ($\beta = 0.2404$; $p < 0.001$) and family support ($\beta = 0.3183$; $p < 0.001$), highlighting the crucial role of social and family factors in improving individual access to pre-diabetes prevention behaviors.

Social and family support played a crucial role in shaping pre-diabetes prevention behaviors in this result. The findings indicate that families provided relatively high motivational support, but instrumental support, such as providing healthy food, received a lower score. According to Brizga & Vijaikis (2024) social support consists of four aspects: emotional, instrumental, informational, and appraisal. When instrumental support is low, its impact on behavior change is also limited. Furthermore, research by Sihotang and Purwanto (2023) found that individuals who receive strong social support from their families are more likely to adopt a healthy lifestyle than those with weaker support. This highlights the need for social-based interventions to enhance adherence to pre-diabetes prevention behaviors. However, this study also indicates that social support from friends or colleagues scored lower than family support. This finding is consistent with research by Holt-Lunstad (2018), which states that strong family relationships have a greater impact on health compared to social relationships at the workplace.

Table 4. Direct and Indirect Effects of Pre-Diabetes Prevention Behavior in the Productive Age Group.

Label	Description	Parameter	β	SE	95% Confidence Intervals		p-value
					Lower	Upper	
IE1	Family support ⇒ Mindset⇒ Preventive behavior	p1*p4	0.017	0.005	-0.001	0.018	0.070
IE2	Family support ⇒ Information exposure ⇒ Health literacy ⇒ Mindset ⇒ Preventive behavior	p5*p7*p9*p4	0.010	0.002	0.001	0.009	0.013
IE3	Motivation ⇒ Mindset ⇒ Preventive behavior	p2*p4	0.059	0.010	0.009	0.050	0.005
IE4	Social support ⇒ Health literacy⇒ Mindset⇒ Preventive behavior	p3*p9*p4	0.051	0.012	0.009	0.056	0.006
IE5	Social support ⇒ Information exposure ⇒ Health literacy ⇒ Mindset ⇒Preventive behavior	p6*p7*p9*p4	0.007	0.002	0.001	0.007	0.019
IE6	Information exposure ⇒ Health literacy ⇒ Mindset ⇒Preventive behavior	p7*p9*p4	0.030	0.008	0.006	0.036	0.006

Table 4 shows that the path analysis presented various social and cognitive factors that were found to influence pre-diabetes prevention behavior through mindset as a mediating variable. Specifically, health literacy played a significant role in shaping mindset, which subsequently contributed to pre-diabetes prevention behavior, as shown in pathway IE2 (β = 0.010; p = 0.013) and IE6 (β = 0.030; p = 0.006). Social support also demonstrated a meaningful impact, both directly and through mediation mechanisms, as seen in pathway IE4 (β = 0.051; p = 0.006).

Meanwhile, the influence of family support on mindset and pre-diabetes prevention behavior IE1 (β =0.017; p = 0.07) and the pathway involving information exposure in enhancing health literacy (IE2) (β =0.010; p = 0.013) showed more significant effects. These findings emphasize the importance of health literacy-based interventions and social support in promoting more effective pre-diabetes prevention behaviors within the community.

In the context of this study, although respondents had a basic understanding of pre-diabetes, they lacked interactive and critical skills to seek and evaluate information independently. This is reinforced by research from Lee et al. (2016) and Byrne (2022) which emphasizes that low health literacy often hinders individuals from applying received information to their daily lives. Additionally, a study by Jokar et al. (2024) found that improving health literacy positively correlates with individuals' level of engagement in accessing credible health information. Therefore, it is crucial to enhance access to accurate information sources and improve health education through various communication channels.

The findings indicate that media is the primary source of information exposure related to pre-diabetes prevention. However, the relevance of the information received varies. This is consistent with Panahi et al., (2019) who stated that not all individuals have the same capacity to understand and process health information. The sources of information frequently accessed by respondents significantly influence their perception and actions toward health. According to a study by Pew Research Center (2019), social media is one of the primary sources of health information for many individuals but often disseminates unverified content. This aligns with the findings of this study, where the understanding score of diabetes prevention information exposure was relatively low compared to the health literacy score.

A study by Teoh et al., (2023) found that individuals who receive information more frequently from medical professionals or credible sources tend to have a better understanding than those who rely solely on social media. Moreover, this study suggests that health information supported by family and social environments enhances the adoption of pre-diabetes prevention behaviors among urban productive-age groups (Martines et al., 2024; McAnally & Hagger, 2023). Therefore, it is essential to improve evidence-based health communication strategies in social groups to ensure that the information received by the community is not only passive and varied but also verified and capable of driving better pre-diabetes prevention behaviors.

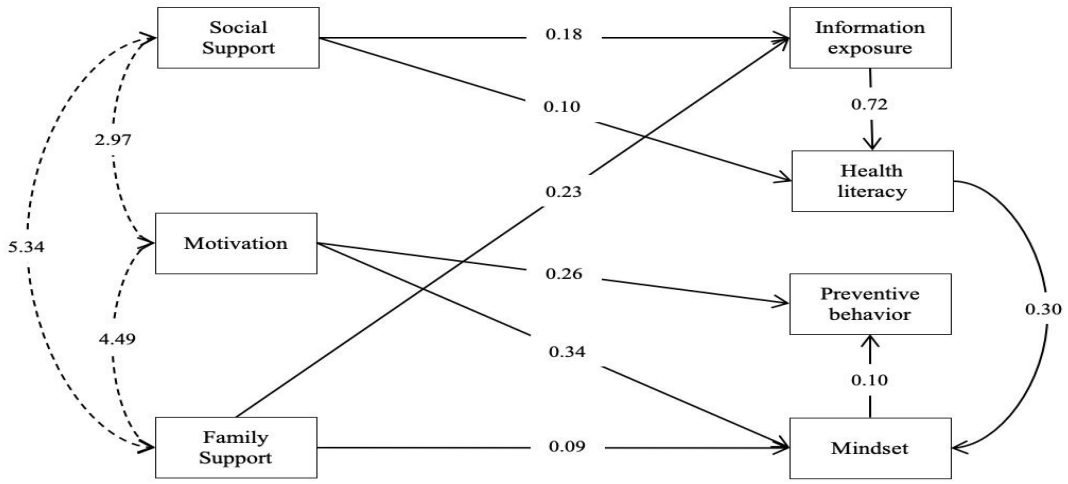

Figure 1. Effects of selecting different switching under dynamic condition.

Figure 1 shows that the path analysis results indicated that information exposure had the strongest effect on health literacy (0.72), while motivation significantly influenced mindset (0.34) and pre-diabetes prevention behavior (0.26). Additionally, mindset contributed to pre-diabetes prevention behavior (0.10). These findings highlight the interconnected role of social support, motivation, and family support in shaping individuals' engagement.

These findings are in line with the Health Belief Model, which suggests that perceived benefits and social influence drive individuals and communities to practice health prevention behavior (Alamer, 2024; Hagger and Hamilton, 2022). Therefore, strengthening social and family support, as well as enhancing motivation, can be effective strategies in improving health literacy and pre-diabetes prevention behavior.

The model was deemed to have an adequate fit, as indicated by a Chi-Square (X^2) value of 57.6, degrees of freedom (df) = 9, and $p < 0.001$, suggesting statistical significance. Additionally, the Standardized Root Mean Square Residual (SRMR) value of 0.078 was within an acceptable range. Overall, the model demonstrated a reasonably good fit in explaining the relationships among the variables.

The main finding of this study stated that health literacy, motivation, and social support significantly influence pre-diabetes prevention behavior through mindset as a mediating factor. Social and family support also play a key role by increasing information exposure and reinforcing healthy behaviors. These findings align with theories like the Health Belief Model and Social Cognitive Theory, emphasizing that knowledge, motivation, and social influence drive health decisions (Manjarres-Posada et al., 2020). Effective interventions should focus on improving health literacy, strengthening social support, and to encourage pre-diabetes prevention in urban populations (Srivastava et al., 2024).

The strength of this study lies in its analysis of behavioral aspects using a psychological approach within an epidemiological framework, particularly in pre-diabetes prevention. This research contributes to existing studies on various determinants of pre-diabetes prevention among younger age groups. However, a limitation of this study is that the questionnaire was distributed online. Nonetheless, respondents could contact the researchers immediately if they had difficulty understanding any questions.

4. CONCLUSION

This study demonstrates that health literacy, motivation, and social support significantly influence pre-diabetes prevention behavior, with mindset acting as a key mediating factor. Higher health literacy and motivation enhance mindset, which in turn improves preventive behavior, while social and family support strengthen information exposure and reinforce healthy habits. Prevention of the high risk of pre-diabetes in the productive-age group, interventions should focus on improving health literacy, strengthening social and family support, and fostering motivation. Workplaces should implement programs that enhance employees' awareness of diabetes prevention, while families play a crucial role in reinforcing healthy lifestyles through tangible support. Policymakers need to integrate health literacy education into public health strategies to ensure wider access to pre-diabetes prevention information. Future research should explore the long-term effects of psychosocial factors on preventive behavior and assess the role of digital health interventions in promoting sustainable lifestyle changes. Strengthening these preventive approaches will help mitigate the growing burden of diabetes in urban populations.

REFERENCES

Alamer, A. S. (2024). Behavior Change Theories and Models Within Health Belief Model Research: A Five-Decade Holistic Bibliometric Analysis. *Cureus*, *16*(6), 1–12. https://doi.org/10.7759/cureus.63143

Brizga, J., & Vijaikis, A. (2024). Energy Citizenship: Revealing the Intrinsic Motivational Factors Suggested by Self-Determination Theory. *Sustainability (Switzerland)*, *16*(21), 1–

13. https://doi.org/10.3390/su16219365
Byrne, D. (2022). Understanding and mitigating low health literacy. *Nursing Standard (Royal College of Nursing (Great Britain): 1987)*, 37(10), 27-34. https://doi.org/10.7748/ns.2022.e11875
Dong, W., Tse, T. Y. E., Mak, L. I., Wong, C. K. H., Wan, Y. F. E., Tang, H. M. E., ... & Lam, L. K. C. (2022). Non-laboratory-based risk assessment model for case detection of diabetes mellitus and pre-diabetes in primary care. *Journal of Diabetes Investigation*, 13(8), 1374-1386. https://doi.org/10.1111/jdi.13790
Dweck, C.S. and Yeager, D.S. (2019). Mindsets: A View From Two Eras, *Perspectives on Psychological Science*, 14(3), pp. 481–496. https://doi.org/10.1177/1745691618804166
Formagini, T., Brooks, J. V., Roberts, A., Bullard, K. M., Zhang, Y., Saelee, R., & O'Brien, M. J. (2023). Prediabetes prevalence and awareness by race, ethnicity, and educational attainment among US adults. *Frontiers in Public Health*, 11, 1277657. https://doi.org/10.3389/fpubh.2023.1277657
Francois, M. E., & Oetsch, K. M. (2022). *Prediabetes: Challenges, novel solutions, and future directions.* EMJ. https://doi.org/10.33590/emj/21-00148
Hagger, M.S. and Hamilton, K. (2022). Changing Health Behaviors Through Mindsets: A Meta-Analysis of Experimental Studies, *Health Psychology Review*, 16(1), pp. 54–78. https://doi.org/10.1080/17437199.2021.2008277
Harcke, K., Graue, M., Skinner, T. C., Olsson, C. B., & Saleh-Stattin, N. (2023). Making prediabetes visible in primary health care: a qualitative study of health care professionals' perspectives. *BMC Primary Care*, 24(1), 266. https://doi.org/10.1186/s12875-023-02230-2
He, M. K., Liu, X. J., & Mao, Z. F. (2019). Review of factors affecting health-related behaviors. *Zhonghua liu Xing Bing xue za zhi= Zhonghua Liuxingbingxue Zazhi*, 40(3), 366-370. https://doi.org/10.3760/cma.j.issn.0254-6450.2019.03.021
Holt-Lunstad, J. (2018). Why social relationships are important for physical health: A systems approach to understanding and modifying risk and protection. *Annual review of psychology*, 69(1), 437-458. https://doi.org/10.1146/annurev-psych-122216-011902
Jokar, M., Zandi, M., Ebadi, A., Momenan, A. A., Martini, M., & Behzadifar, M. (2024). Adults' perceived health promotion needs in the prediabetes stage: a meta-synthesis study. *Journal of preventive medicine and hygiene*, 64(4), E411–E428. https://doi.org/10.15167/2421-4248/jpmh2023.64.4.3152
Kalra, S., Singal, A., & Kapoor, N. (2022). Prediabetes: A Pragmatic approach to counselling and coaching. JPMA. *The Journal of the Pakistan Medical Association*, 72(4), 771-772. https://doi.org/10.47391/jpma.22-29
Kerrison, G., Gillis, R. B., Jiwani, S. I., Alzahrani, Q., Kok, S., Harding, S. E., ... & Adams, G. G. (2017). The effectiveness of lifestyle adaptation for the prevention of prediabetes in adults: a systematic review. *Journal of diabetes research*, 2017(1), 8493145. https://doi.org/10.1155/2017/8493145
Lee, Y. J., Shin, S. J., Wang, R. H., Lin, K. D., Lee, Y. L., & Wang, Y. H. (2016). Pathways of empowerment perceptions, health literacy, self-efficacy, and self-care behaviors to glycemic control in patients with type 2 diabetes mellitus. *Patient education and counseling*, 99(2), 287-294. https://doi.org/10.1016/j.pec.2015.08.021
Manjarres-Posada, N., Onofre-Rodríguez, D. J., & Benavides-Torres, R. A. (2020). Social cognitive theory and health care: Analysis and evaluation. *Int'l J. Soc. Sci. Stud.*, 8(4), 132. https://doi.org/10.11114/ijsss.v8i4.4870
Martines, K. R., Prabawati, D., & Supardi, S. (2024). Self-Efficacy Weight Management and Family Support on Risk Factors of Prediabetes Patient. *Journal of Nursing Science Update (JNSU)*, 11(2), 161–168. https://doi.org/10.21776/ub.jik.2023.011.02.07
McAnally, K., & Hagger, M. S. (2023). Health literacy, social cognition constructs, and health behaviors and outcomes: A meta-analysis. *Health Psychology*, 42(4), 213-234. Retrieved from: https://psycnet.apa.org/buy/2023-61291-001

Merwass, N. A., Alkhader, Y. K., Alharthi, S. A., Al Fardan, R. M., Alqahtani, A. M., Mahnashi, F. A., ... & Binobaid, A. (2024). The role of screening, risk factors, and early intervention in preventing diabetes in the obese population: A systematic review. *Cureus*, 16(7), 1-15. https://doi.org/10.7759/cureus.63952

Panahi, R., Aghaeian, N., Pishvaei, M., & Niknami, S. (2019). The need to pay attention to differences in health literacy and knowledge in health education interventions. *Journal of Research and Health*, 9(2), 95-96. https://doi.org/10.29252/jrh.9.2.95

Pew Research Center. (2019). *Share of U.S. Adults Using Social Media, Including Facebook, Is Mostly Unchanged Since 2018*. Pew Research Center. Retrieved from: https://www.pewresearch.org/short-reads/2019/04/10/share-of-u-s-adults-using-social-media-including-facebook-is-mostly-unchanged-since-2018/

Sihotang, E. M., & Purwanto, E. (2023). The Relationship between Family Support and Self-Care Behavior on Diabetes Mellitus Patients. *Formosa Journal of Science and Technology*, 2(5), 1243–1262. https://doi.org/10.55927/fjst.v2i5.4027

Silva-Smith, A. L., Hanson, C. L., Neubeck, L., Rowat, A., & McHale, S. (2024). Physical activity interventions framed by the health action process approach for adults with long-term conditions: a scoping review. *International Journal of Behavioral Medicine*, 31(6), 987-1017. https://doi.org/10.1007/s12529-024-10305-2

Srivastava, K., Rathod, H., Borgaonkar, C., Rathi, M., Akhil, R., & Sujanyal, S. (2024). Effectiveness of Multifaceted Lifestyle Interventions in Prediabetic Adults: A Field Study in an Urban Slum Population of Pune, India. *Cureus*, 16(9), e68635. https://doi.org/10.1186/s40814-019-0484-8

Subramaniam, S., Dhillon, J. S., & Wan Ahmad, W. F. (2021). Behavioral theory-based framework for prediabetes self-care system—design perspectives and validation results. *International journal of environmental research and public health*, 18(17), 9160. https://doi.org/10.3390/ijerph18179160

Teoh, K. W., Ng, C. M., Chong, C. W., Bell, J. S., Cheong, W. L., & Lee, S. W. H. (2023). Knowledge, attitude, and practice toward pre-diabetes among the public, patients with pre-diabetes and healthcare professionals: a systematic review. *BMJ open diabetes research & care*, 1, e003203. https://doi.org/10.1136/bmjdrc-2022-003203

Tol, A., Fooladvand, M., Yousefy, A., & Tedadi, Y. (2023). Harnessing the power of mindset interventions in health promotion. *Journal of education and health promotion*, 12(1), 461. https://doi.org/10.4103/jehp.jehp_1757_23

Tuti, D. A., Fitriyani, N. L. L., & Maulana, J. (2023). Literature Study: Risk Factors for the Incidence of Diabetes Mellitus in Productive Age in Indonesia. *Journal of Multidisciplinary Science*, 3(3), 288-296. https://doi.org/10.58330/prevenire.v2i6.413

Wahidin, M., Achadi, A., Besral, B., Kosen, S., Nadjib, M., Nurwahyuni, A., ... & Kusuma, D. (2024). Projection of diabetes morbidity and mortality till 2045 in Indonesia based on risk factors and NCD prevention and control programs. *Scientific reports*, 14(1), 5424. https://doi.org/10.1038/s41598-024-54563-2

Windah, A., Nurhaida, I., Aryanti, N. Y., & Corry, A. (2023). Calling for Multiculturalism-Based Communication Campaign in Early Prevention of Youth Diabetes: Examination of Contemporary Indonesia. International Journal Of Humanities Education and Social Sciences, 2(6), 2128-2140. https://doi.org/10.55227/ijhess.v2i6.536