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Path Analysis: Implementation of Information Motivation Behavioral Skill Model on Tertiary Preventive Behavior in Type II Diabetes Melitus

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ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia. Hyperglycemia over a long period of time increases the occurrence of complications. Complications due to type 2 DM can be prevented or delayed by implementing tertiary preventive behavior. This study aims to analyze the influence of the Information Motivation and Behavior Skill Model on tertiary preventive behavior in type 2 DM patients.
Subjects and Method: This research with a cross-sectional design was conducted in Boyolali Regency, Central Java from November to December 2023. The research was conducted at 25 posbindu in Ngemplak and Nogosari Districts. The sample size was 200 adults with a diagnosis of type 2 DM who were selected using the stratified random sampling method. The dependent variable is tertiary preventive behavior. The independent variables are information, motivation, behavioral skills, age, gender, education, and employment. Data collection was carried out using questionnaire interviews. Data were analyzed using path analysis in the STATA 13 application.
Results: There is a positive relationship between behavioral skills and tertiary preventive behavior (b= 0.16; 95% CI= 0.02 to 0.29; p= 0.023). There is a positive relationship between information and behavioral skills (b= 0.25; 95% CI= 0.13 to 0.38; p<0.001). There is a positive relationship between motivation and behavioral skills (b= 0.38; 95% CI= 0.15 to 0.41; p<0.001). The path analysis model has good model suitability, as indicated by the following suitability indicators: p= 0.244; RMSEA= 0.045; CFI= 0.98; TLI= 0.95; SRMR= 0.032.
Conclusion: Tertiary preventive behavior in adult type 2 DM patients is directly influenced by behavioral skills. Tertiary preventive behavior is indirectly influenced by information and motivation. Tertiary preventive behavior in type 2 DM patients increases with good information, strong motivation and good behavioral skills.

Keywords: diabetes mellitus, tertiary preventive behavior, information motivation behavioral skill model.

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BACKGROUND

Diabetes Mellitus (DM) is a chronic disease that occurs when the pancreas does not produce enough insulin or when the body cannot use the insulin it produces effectively. In general, Diabetes Mellitus is classified into Type 1 Diabetes Mellitus, Type 2 Diabetes Mellitus, and Gestational Diabetes (Mukhtar et al., 2020).

Global prevalence of DM, the International Diabetes Federation (IDF) in 2021 reported 537 million adults (aged 20-79 years) or 1 in 10 people living with DM worldwide. DM sufferers are predicted to increase to 643 million (1 in 9 adults) in 2030. Countries in the Arab-North Africa region are ranked first among 7 regions in the world with the prevalence of DM in the population aged 20-79 years, namely 12.2%.

The Southeast Asia region, where Indonesia is located, is ranked 3rd with a prevalence of 11.3% (Infodatin, 2020). Indonesia is ranked 5th highest in the world with a total of 19.47 million sufferers with a population of 179.72 million, which means the prevalence of diabetes in Indonesia is 10.6% (IDF, 2021).

The prevalence of DM in Indonesia based on doctor's diagnosis in residents aged >15 years has increased from 1.5% in 2013 to 2% in 2018. The results of Basic Health Research (Riskesdas) in 2018 show that the prevalence of DM in Central Java province based on doctor's diagnosis in residents aged ≥ 15 years is 2.1%, which means it is higher than the national average. DM ranks second in Non-Communicable Diseases (NCD) in Central Java after hypertension. Therefore, DM is a priority in controlling NCDs in Central Java (Infodatin, 2020).

The prevalence of DM in Central Java Province was reported as 132,565 cases based on doctor's diagnosis in residents of all ages (Riskesdas, 2018). DM sufferers in Boyolali Regency over the last 3 years have reportedly experienced an increase. The number of DM sufferers in 2020 was recorded at 16,069 cases, in 2021 there were 17,700 cases, and in 2022 there were 18,531 cases. The Boyolali District Health Service stated that the three community health centers with the highest number of DM sufferers were Ngemplak Community Health Center with 1,529 cases, Nogosari Community Health Center with 1,241 cases, and Andong Community Health Center with 1,079 cases (Boyolali District Health Office, 2022).

As many as 90% of DM cases are type 2 DM. Type 2 DM is a chronic, degenerative disease and cannot be cured but can be controlled (Suryasa et al., 2021). Type 2 DM has the potential for long-term chronic complications and multiple organ damage that can cause premature disability and death. IDF (2021) states that DM causes 6.7 million deaths or 1 every 5 seconds. In 2019, DM and kidney disease due to DM caused around 2 million deaths.

Type 2 DM can be controlled by controlling blood sugar through a combination of diet, physical activity, medication, blood pressure and lipid control to reduce the risk of cardiovascular and other complications. The Indonesian Ministry of Health's efforts to control DM currently focus on controlling DM risk factors through promotive and preventive efforts without ignoring curative and rehabilitative efforts (Ministry of Health, 2019).

DM sufferers in Boyolali Regency are still increasing over the last three years. Therefore, it is necessary to carry out appropriate behavior change interventions in order to reduce the increase in the number of DM sufferers and their complications. The Information Motivation Behavioral Skill (IMB) model is a theoretical model of

behavior change that involves three elements of the behavior transformation process, namely information, motivation and behavioral skills. According to Yao et al. (2021) using the IMB model in interventions for type 2 DM patients can effectively increase the level of self-management of type 2 DM patients, reduce drug dependence, and increase the frequency of physical exercise.

Based on the description above, This study aims to analyze the influence of the Information Motivation and Behavior Skill Model on tertiary preventive behavior in type 2 DM patients.

SUBJECTS AND METHOD

1. Study Design

This research was conducted using a cross-sectional research design in Boyolali Regency, Central Java, Indonesia from November to December 2023.

2. Population and Sample

The population in this study were all integrated development post participants in Ngemplak and Nogosari Districts. The research sample was 200 adults diagnosed with type 2 DM using the stratified random sampling method.

3. Study Variables

The dependent variable is tertiary preventive behavior. The independent variables are information, motivation, and behavioral skills.

4. Operational Definition of Variables

Information is the amount of information possessed or the level of knowledge of DM patients regarding type 2 DM and its prevention.

Motivation is an internal or external factor that encourages a person to carry out or not carry out tertiary preventive behavior for type 2 DM.

Behavioral skills are an individual's ability to carry out, achieve goals, or overcome obstacles in carrying out tertiary preventive behavior for type 2 DM.

Tertiary preventive behavior is healthy behavior and lifestyle to reduce or delay the occurrence of complications due to type 2 DM.

5. Study Instruments

This research instrument uses a questionnaire consisting of questions, the independent variables are information, motivation, behavioral skills and the dependent variable is tertiary preventive behavior.

6. Data analysis

Univariate analysis was carried out to obtain the frequency distribution and percentage characteristics of the research subjects. Bivariate analysis to analyze the influence of independent and dependent variables using Chi Square with a significance level of $p<0.050$, and multivariate analysis uses the PATH analysis model.

7. Research Ethics

This research obtained research ethical permission from the Health Research Ethics Commission of the Faculty of Medicine, Muhammadiyah University of Surakarta with No.5105/B.1/KEPK-FKUMS/XI/2023.

RESULTS

1. Sample Characteristics

Table 1 shows that the age variable measurement has a mean value of 55.72 and a standard deviation of 7.59 with the lowest age being 25 and the highest being 65. The information variable has a mean value of 6.13 and a standard deviation of 1.31 with the lowest information being 1 and the highest being 7. The motivation variable has a mean value. of 12.73 and a standard deviation of 2.07 with the lowest motivation being 4 and the highest being 14. The behavioral skills variable has a mean value of 4.11 and a standard deviation of 0.93 with

the lowest behavioral skill being 1 and the highest being 8. The tertiary preventive behavior variable has a mean value of 5.46 and a standard deviation of 0.88 with the lowest tertiary preventive behavior being 3 and the highest being 6.

Table 2 shows the results on the gender variable of 200 respondents, 68 (34%) men and 132 (66%) women. The age variable shows that 91 (45.50%) respondents were <56 years old and 109 (54.50%) were >56 years old. The education level variable shows that 134 (67%) respondents had <high school education and 66 (33%) had >high school education. The employment variable shows that 102 (51%) respondents are no longer actively working and 98 (49%) are still actively working. The information variable shows that 120 (60%) respondents were well exposed to information. The motivation variable shows that 131 (65.50%) respondents had high motivation. The behavioral skills variable shows that 181 (90.50%) respondents have good behavioral skills. The tertiary preventive behavior variable shows that 133 (66.50%) respondents have good tertiary preventive behavior.

Table 1. Characteristics of research subjects (Continous data).

Variable	n	Mean	Std. Dev	Min.	Max.
Age	200	55.72	7.59	25	65
Information	200	6.13	1.31	1	7
Motivation	200	12.73	2.07	4	14
Behavioral skills	200	4.11	0.93	1	8
Tertiary preventive behavior	200	5.46	0.88	3	6

Table 2. Frequency distribution of respondent characteristics (categorical data)

Characteristics	Category	Frequency (n)	Percentage (%)
Age	<56 years old	91	45.50
	≥56 years old	109	54.50
Gender	Male	132	66%
	Female	68	34%
Education	<Senior high school	134	67.0
	≥Senior High School	66	33.0
Working status	Not working	102	51.0
	Working	98	49.0
Information	Lacking	80	40.0
	Good	120	60.0
Motivation	Low	80	40.0
	High	120	60.0
Behavioral skills	Lacking	19	9.50
	Good	181	90.50
Tertiary preventive behavior	Lacking	67	33.50
	Good	133	66.50

2. Bivariate analysis

Table 2 shows the results of the Chi Square test on the influence of patient characteristics, information, motivation and behavioral skills on tertiary preventive behavior in type 2 DM patients.

a. The influence of gender on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between gender on the tertiary preventive behavior of type 2 Diabetes Mellitus patients, and this influence is not statistically significant. Male

patients have odds (odds) of carrying out tertiary preventive behavior 1.25 times lower than male patients (OR= 1.25; 95% CI= 0.66 to 2.35; p= 0.449).

b. The influence of age on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between age on tertiary preventive behavior of type 2 Diabetes Mellitus patients, and this influence is statistically significant. Patients aged <56 years had odds (odds) of carrying out tertiary preventive behavior 4.49 times lower than patients aged >56 years (OR= 4.49; 95% CI= 1.31 to 17.38; p= 0.004).

c. The influence of education on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between education on tertiary preventive behavior of Type 2 Diabetes Mellitus patients, and this influence is not statistically significant. Patients with an education level <high school have the odds (odds) of carrying out tertiary preventive behavior 0.85 times lower than patients with an education level >high school (OR= 0.85; 95% CI= 0.44 to 1.67; p= 0.621).

d. The influence of work on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between work on tertiary preventive behavior of Type 2 Diabetes Mellitus patients, and this influence is not statistically significant. Patients who do not work have odds (odds) of carrying out tertiary preventive behavior 0.75 times lower than patients who do not work (OR= 0.75; 95% CI= 0.39 to 1.41; p= 0.342).

e. The influence of information on tertiary preventive behavior of type 2 diabetes mellitus patients

There is an influence between information on tertiary preventive behavior of Type 2 Diabetes Mellitus patients, and this influence is statistically significant. Patients who are less exposed to information have the odds (odds) of carrying out tertiary preventive behavior 4.64 times lower than patients who have good exposure to information (OR= 4.64; 95% CI= 2.37 to 9.15; p< 0.001).

f. The influence of motivation on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between motivation on tertiary preventive behavior in type 2 DM patients, and this influence is statistically significant. Patients with low motivation have a probability (odd) of carrying out tertiary preventive behavior 4.78 times lower than patients with high motivation (OR= 4.78; 95% CI= 2.42 to 9.46; p< 0.001).

g. The influence of behavioral skills on tertiary preventive behavior in type 2 diabetes mellitus patients

There is an influence between behavioral skills on tertiary preventive behavior of type 2 DM patients, and this influence is statistically significant. Patients whose behavioral skills are poor have the odds (odds) of carrying out tertiary preventive behavior 9.30 times lower than patients whose behavioral skills are good (OR= 9.30; 95% CI= 2.75 to 39.82; p< 0.001).

Table 3. Bivariate analysis of differences in performance scores with information, motivation and behavioral skills

Variable	Preventive Behavior				OR	95%CI		p
	Lack		Good			Lower Limit	Upper Limit	
	N	%	n	%				
Gender								
Female	20	29.41	48	70.59	1.32	0.67	2.64	0.379
Male	47	35.61	85	64.39				
Age								
<56	75	68.80	34	31.20	1.25	0.66	2.35	0.449
≥56	58	63.74	33	36.26				
Education								
<SHS	24	36.36	42	64.64	0.85	0.44	1.67	0.621
≥SHS	43	32.09	91	67.91				
Working status								
Not working	36	36.74	62	63.26	0.75	0.39	1.41	0.342
Working	31	30.40	71	69.60				
Information								
Lacking	24	20	96	80	4.64	2.37	9.15	<0.001
Good	43	53.75	37	46.25				
Motivation								
Low	28	21.37	28	21.37	4.78	2.42	9.46	<0.001
High	39	56.52	39	56.52				
Behavioural Skill								
Lacking	52	28.72	129	71.30	9.30	2.75	39.82	<0.001
Good	15	78.95	4	21.05				

3. Path analysis

Figure 1 showed the SEM results model which presents the measurement components of the motivational construct and the structural components of the variables that influence performance.

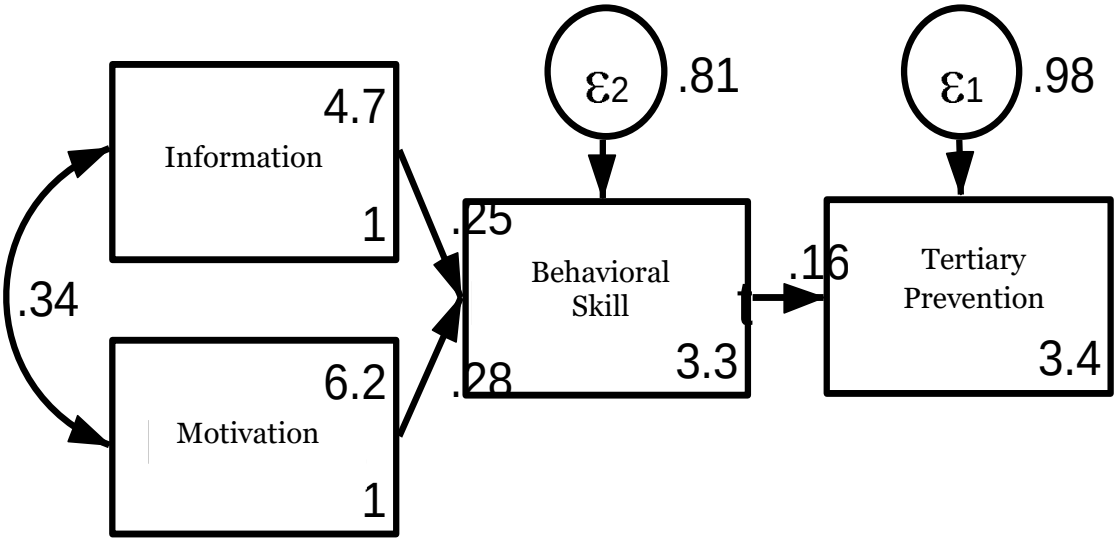

Figure 1. Path analysis of the relationship between information and motivation with behavioral skills and tertiary preventive behavior of patients

Table 4. Path analysis results

Dependent variable	Independent variable	b	CI 95%		p
			Lower Limit	Upper Limit	
Indirect effect					
Behavioral skill	Information	0.25	0.13	0.38	<0.001
	Motivation	0.38	0.15	0.41	<0.001
Direct Effect					
Tertiary preventive behavior	Behavioral skill	0.16	0.02	0.29	0.023
n=observation 200					
p=0.244					
RMSEA=0.045					
CFI=0.98					
TLI=0.95					
SRMR=0.032					

a. The influence of information on behavioral skills

Table 4 shows that there is a positive relationship between information and behavioral skills, and this relationship is statistically significant. Every increase of 1 information score will be followed by an increase in behavioral skills of 0.25 (b= 0.25; 95% CI= 0.13 to 0.38; p<0.001).

b. The influence of motivation on behavioral skills

There is a positive relationship between motivation and behavioral skills, and this relationship is statistically significant. Every 1 increase in motivation score will be followed by an increase in behavioral skills of 0.38 (b= 0.38; 95% CI= 0.15 to 0.41; p<0.001).

c. The influence of behavioral skills on tertiary preventive behavior

Table 4 shows that there is a positive relationship between behavioral skills and preventive behavior, and this relationship is statistically significant. Every 1 increase in behavioral skills score will be followed by an increase in preventive behavior of 0.16 (b= 0.16; 95% CI= 0.02 to 0.29; p= 0.023).

d. Model suitability

This path analysis model in Figure 1 has good model suitability, as indicated by the following suitability indicators: p=0.24; RMSEA= 0.045; CFI= 0.98; TLI= 0.95; SRMR= 0.032.

DISCUSSION

This research analyzes the influence of the Information Motivation Behavioral Skill Model on the tertiary preventive behavior of type 2 DM patients in adults in Ngemplak and Nogosari Districts, Boyolali. The lowest age of respondents was 25 years and the highest was 65 years with an average age of 55.72.

1. The influence of information on behavioral skills

Based on the results of research that has been carried out, a positive relationship between information and behavioral skills is obtained, and this relationship is statistically significant. Every increase of 1 information score will be followed by an increase in behavioral skills of 0.25 (b= 0.25; 95% CI= 0.13 to 0.38; p<0.001). This is in accordance with research by Nelson (2018), which states that information influences tertiary preventive behavior in DM patient medication adherence through behavioral skills (indirect effect b= -0.19, 95% CI= -0.33 to -0.09; p<0.001). Chavan et al. (2015) stated that DM patients with good knowledge can improve diabetes management efforts.

Lee et al. (2016), stated that health literacy relatively influences the self-care behavior of DM patients. Self-care behavior relatively influences glycemic control in type 2 DM patients. Health literacy is an individual's capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions and act accordingly. Health literacy can influence self-care behavior and subsequently influence HbA1c levels in type 2 DM patients.

Uly et al. (2022) stated that good self-care behavior in DM patients will control diabetes management and prevent complications and make the quality of life of DM patients better. Therefore, education for DM patients needs to be improved so that patient knowledge increases and patients understand how to manage diabetes properly so that they can prevent or delay complications and improve their quality of life.

2. The influence of motivation on behavioural skills

Based on the research that has been conducted, a positive relationship between motivation and behavioral skills is obtained, and this relationship is statistically significant. Every 1 increase in motivation score will be followed by an increase in behavioral skills of 0.38 (b= 0.38; 95% CI= 0.15 to 0.41; p<0.001). This is in accordance with research by Nelson (2018), which states that social motivation influences tertiary preventive behavior in medication adherence in DM patients through behavioral skills (indirect effect b= -0.24, 95% CI= -0.37 to -0.14; p<0.001).

Success in achieving behavior change depends on patient motivation. Patient motivation is a key element of success in carrying out tertiary preventive behavior for type 2 DM patients, such as physical activity, diet management, medication compliance, blood sugar control and avoiding risky behavior. The research results of Morowatisharifabad et al. (2018) with logistic regression shows that an increase in the physical activity intention score shows that there is a significant relationship between motivation and the intention to do physical activity with the possibility of doing physical activity being 3.4 times (OR= 3.4).

Research by Uly et al. (2022) states that motivation has a significant effect on the self-care behavior of type 2 DM patients (p<0.001). Type 2 DM patients who have strong motivation to carry out tertiary preventive behavior will be more skilled in self-care or tertiary preventive behavior for type 2 DM.

3. The influence of behavioural skills on tertiary preventive behaviour

Based on the research that has been conducted, a positive relationship was obtained between behavioral skills and preventive behavior, and this relationship is statistically significant. Every 1 increase in behavioral skills score will be followed by an increase in preventive behavior of 0.16 (b= 0.16; 95% CI= 0.02 to 0.29; p= 0.023). This is in accordance with research by Bakir et al., (2021) which states that behavioral skills have a significant effect on glycemic control in DM patients (p<0.001). Behavioral skills are needed so that diabetes sufferers can control their behavior from behavior that risks aggravating complications. Kurtanty et al., (2023) divide behavioral skills into three components, namely self-management, motor skills and social skills.

According to the IMB model, DM-related information, motivation (personal and social), and behavioral skills all determine the tertiary preventive behavior of type 2 DM patients. The IMB model theorizes that each component may have a direct or indirect effect on tertiary preven-

tive behavior. Information and motivation to carry out tertiary preventive behavior acts through behavioral skills to influence the tertiary preventive behavior of type 2 DM patients. In type 2 DM, the IMB model has been proven to predict tertiary preventive behavior among adults with type 2 DM. Results of the path analysis model in This study has good model suitability, as indicated by the following suitability indicators: p=0.244. RMSEA= 0.045. CFI = 0.98. TLI= 0.95. SRMR=0.032.

From the description above, it can be concluded that tertiary preventive behavior in adult type 2 DM patients is directly influenced by behavioral skills. Tertiary preventive behavior is indirectly influenced by information and motivation. Tertiary preventive behavior in type 2 DM patients increases with good information, strong motivation and good behavioral skills.

AUTHOR CONTRIBUTION

Aktif Cahyaning Tyas collects and analyzes data. Didik Gunawan Tamtomo and Bhisma Murti reviewed the first draft of the paper. All authors have read and approved the final version of the manuscript.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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