

ARTICLE INFORMATION

Received: January, 10, 2025

Revised: April, 25, 2025

Available online: April, 27, 2025

at : <https://e-jurnal.iphorr.com/index.php/minh>

Factors influencing balanced diet in patients with type 2 diabetes mellitus based on theory of planned behavior

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Abstract

Background: Type 2 diabetes mellitus (DM) is a chronic disease that continues to increase globally, with a significant health and economic burden. A balanced diet is a key component of type 2 DM management.

Purpose: To analyze the factors that influence balanced diet behavior in patients with type 2 DM in Pekanbaru using the Theory of Planned Behavior (TPB) approach.

Method: This study used a quantitative method with a cross-sectional design. Data were collected from 117 patients with type 2 diabetes who were registered at the Pekanbaru Health Center. The variables studied included knowledge, attitude, family support, and the role of health workers in balanced diet behavior. Data analysis was performed using chi-square and Odds Ratio (OR) tests to determine the relationship and the chance of influence of independent variables on the dependent variable.

Results: The results showed that low knowledge (OR=4.9), negative attitude (OR=2.5), lack of family support (OR=2.8), and non-optimal role of health workers (OR=3.2) had a significant influence on balanced diet behavior in patients with type 2 diabetes ($p < 0.05$).

Conclusion: Factors such as knowledge, attitude, family support, and the role of health workers significantly influence the balanced diet behavior of patients with type 2 diabetes.

Suggestion: Education-based interventions and strengthening social support are needed to improve patient adherence to a balanced diet.

Keywords: Attitude; Balanced Diet; Family Support; Knowledge; Role of Health Workers; Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes mellitus (DM) continues to show an increasing trend in prevalence globally. In 2019, 463 million adults aged 20-79 years were known to be living with diabetes worldwide, causing 1.5 million deaths annually. The number of people with diabetes is projected to increase to 700 million by 2045 (Saeedi, Petersohn, Salpea, Malanda, Karuranga, Unwin, Colagiuri, Guariguata, Motala, Ogurtsova, Shaw, Bright, Williams, & IDF Diabetes Atlas Committee, 2019). Diabetes is also the eleventh leading cause of death in the world, mainly due to

macrovascular complications such as cardiovascular disease and microvascular complications such as retinopathy, nephropathy, and neuropathy (Kassebaum, Arora, Barber, Bhutta, Brown, Carter, Casey, Charlson, Coates, Coggeshall, Cornaby, & Biryukov, 2016). The burden of DM continues to increase significantly, especially in low- and middle-income countries, which face major challenges in its management (World Health Organization, 2016). In South Asia, the prevalence of DM has increased rapidly over the past few decades, driven by factors

such as poor diet, decreased physical activity, and sedentary lifestyle. Data from the International Diabetes Federation (IDF) shows that in 2017 there were approximately 82 million adults aged 20-79 years in Southeast Asia living with diabetes, representing a regional prevalence of 8.5% (Hills, Arena, Khunti, Yajnik, Jayawardena, Henry, Street, Soares, & Misra, 2018). In Indonesia, the prevalence of diabetes is also on the rise. Indonesia ranks seventh in the world in the number of people with diabetes, with 8.5 million people in 2021. Based on the 2018 Basic Health Research, the prevalence of DM based on a doctor's diagnosis in the 45-54 age group increased to 3.9%, up from 3.3% in 2013 (Purwandari, Wirjatmadi, & Mahmudiono, 2022).

A balanced diet is a key component in the management of type 2 DM, aiming to keep blood glucose levels stable and prevent macrovascular and microvascular complications. A healthy diet that includes complex carbohydrates, low-fat protein, healthy fats, and adequate fiber is effective in improving glycemic control. Research shows that medical nutrition therapy plays an important role in the management of type 2 DM. A well-designed diet with appropriate nutrient content can help patients maintain blood glucose levels and prevent long-term complications (Barrea, Vetrani, Verde, Frias-Toral, Ceriani, Cernea, Docimo, Graziadio, Tripathy, Savastano, Colao, & Muscogiuri, 2023; Joshua, Shin, Lee, & Kim, 2023). In addition, various dietary approaches have been identified to provide significant benefits for patients with type 2 DM. Some nutritional patterns such as low-carbohydrate, vegan, and Mediterranean are effective in improving glycemic control and aiding weight loss, which are important aspects in the management of type 2 DM. The importance of fiber-rich and low glycemic index diets in supporting better blood glucose control as well as improved body composition, which are crucial steps to prevent complications in patients with type 2 DM (Chester, Babu, Greene, & Geetha, 2019; Lewgood, Oliveira, Korzepa, Forbes, Little, Breen, Bailie, & Candow, 2021).

Previous studies have focused more on physiological factors and less on exploring how balanced diet behavior in patients with type 2 diabetes is influenced by factors such as knowledge, attitudes, family support, and the role of health workers. Nutritional knowledge is one important aspect, where

good health literacy supports patient compliance in choosing healthy foods such as foods high in fiber and low in glycemic index (Yeh, Wei, Weng, Tsai, Shih, Shih, & Chiu, 2018). In addition, social support, especially from family, plays a significant role in motivating patients to adopt a healthy diet (Horikawa, Hatta, Morikawa, Takeda, Takeuchi, Fujihara, Kato, Yokoyama, Kurihara, Iwasaki, Tanaka, & Sone, 2020). Other factors such as food preferences, culture, and stress levels play an important role in determining the success of dietary patterns in patients with type 2 diabetes (Shin, & Kim, 2020; Tariq, Rosten, & Huber, 2024; Sanjeevi, & Freeland-Graves, 2023).

This study aims to analyze the factors that influence balanced diet behavior in patients with type 2 diabetes in Pekanbaru. A Theory of Planned Behavior (TPB) based approach was used to explore the relationship between knowledge, attitude, family support, and the role of health workers in supporting the implementation of a balanced diet. This study is expected to contribute to the development of community-based intervention strategies that are relevant to the needs of patients in Indonesia.

RESEARCH METHOD

This study used a quantitative method with a cross-sectional design. The research was conducted in the working area of Puskesmas in Pekanbaru to analyze the factors that influence balanced diet behavior in patients with type 2 DM. The dependent variable in this study was balanced diet behavior, while the independent variables included knowledge, attitude, family support, and the role of health workers. The study population was patients with type 2 DM who were registered at the Pekanbaru Health Center. The sampling technique was done by purposive sampling, with inclusion criteria: 1) patients who are willing to participate in the study, 2) able to read and write, and 3) have a diagnosis of type 2 DM. Exclusion criteria included patients with critical health conditions or complications that made it impossible to participate. The total study sample was 117 people.

Data collection was conducted through a questionnaire that included: 1) respondent characteristics (age, gender, education, and occupation), 2) balanced diet behavior, and 3) knowledge, attitude, family support, and the role of health workers. Balanced diet compliance is

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categorized as 0 = poor if score $\leq$ mean/median, and 1 = good if score $\geq$ mean/median. Knowledge is categorized as 0 = low if score $< 75\%$, and 1 = high if score $\geq 75\%$. Attitude is 0 = negative if score $\leq$ mean/median, and 1 = positive if score $\geq$ mean/median. Family support and health worker role are categorized as 0 = poor if score $\leq$ mean/median, and 1 = good if score $\geq$ mean/median.

Data analysis was conducted univariately to describe the frequency distribution, bivariate using

chi-square test to determine the relationship between independent variables and balanced diet behavior, and further analysis with Odds Ratio (OR) value to measure the chance of influence of each variable on balanced diet behavior.

This research has been declared ethically appropriate according to the 7 WHO 2011 standards, by the STIKes Tengku Maharatu Health Research Ethics Committee with the number: 095/STIKes-T.MHRT/KEPK/X/2024.

RESEARCH RESULTS

Table Characteristics of the Respondents (N=117)

Variable	Results	p-value	OR 95% CI
Age (Mean $\pm$SD) (Range) (Year)	(45.98 $\pm$ 13.60) (18-65)		
Gender (n/%)			
Male	48/41.03		
Female	69/58.97		
Education (n/%)			
Elementary	16/13.68		
Junior High School	36/30.77		
High School	43/36.75		
College	22/18.80		
Employment Status (n/%)			
Employed	50/42.74		
Unemployed	67/57.26		
Balanced Diet Behavior (n/%)			
Poor	50/42.7		
Good	67/57.3		
Knowledge (n/%)			
Low	52/44.4	0.0001	4.904 2.225-10.809
High	65/55.6		
Attitude (n/%)			
Negative	57/48.7	0.022	2.573 1.211-5.465
Positive	60/51.3		
Family Support (n/%)			
Poor	68/58.1	0.015	2.813 1.287-6.145
Good	49/41.9		
Health Worker Role (n/%)			
Poor	63/53.8	0.005	3.250 1.496-7.059
Good	54/46.2		

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The table above shows that the average age of respondents in this study was 45.98 with a standard deviation of 13.60. The lowest age was 18 years, and the highest age was 65 years. Less than half of the respondents (41.03%) were male. The most education in the respondents of this study is high school (36.75%). A small proportion of respondents in this study were employed (42.74%).

That less than half of the respondents were poor in balanced diet behavior (42.7%), had low knowledge (44.4%), and had negative attitudes (48.7%). Most of the respondents had poor families (58.1%), and more than half of the respondents stated that the role of health workers was poor (53.8%).

It can be seen that respondents who knowledge and behavior in the balanced diet category using the chi-square test obtained a p-value of 0.0001, then H_0 is rejected, which means that there is a significant influence between knowledge and balanced dietary behavior in patients with type 2 diabetes mellitus. The odds test obtained an OR value of 4.904, which means that people who have low knowledge are 4.9 times more likely to have poor balanced diet behavior.

Respondents who an attitude and behavior in the balanced diet category, using the chi-square test obtained a p-value of 0.022, then H_0 is rejected, which means that there is a significant influence between attitude towards balanced dietary behavior in patients with type 2 diabetes mellitus. The odds test obtained an OR value of 2.5, which means that people who have a negative attitude are 2.5 times more likely to have poor balanced diet behavior.

Respondents who family support and balanced diet behavior, using the chi-square test obtained a p-value of 0.015, then H_0 is rejected, which means that there is a significant influence between family support on balanced dietary behavior in patients with type 2 diabetes mellitus. The odds test obtained an OR value of 2.8, which means that people who lack family support are 2.8 times more likely to have poor balanced diet behavior.

Respondents who stated that the of role of health workers and balanced diet behavior, using the chi-square test obtained a p-value of 0.005, then H_0 is rejected, which means that there is a significant influence between the role of health workers on balanced dietary behavior in patients with type 2 diabetes mellitus. The odds test obtained an OR value of 3.2, which means that if people state that the role

of health workers is not good then there is a 3.2 times greater chance of having a poor balanced diet behavior.

DISCUSSION

This study shows that there is a significant influence between the level of knowledge and balanced diet behavior in patients with type 2 diabetes. Low knowledge significantly increased the likelihood of poor dietary behavior. This finding is in line with a study in Nepal which found that knowledge level influences adherence to dietary recommendations and health of diabetics through improved sugar control (Baral, Karki, Thapa, Timalsina, Bhandari, Bhandari, Kharel, & Adhikari, 2022). In line with a study in Taiwan, health literacy and the level of knowledge about diabetes have a significant relationship with dietary adherence behavior in patients with type 2 diabetes (Yeh, et al., 2018). Other studies also support that good health education is associated with higher dietary adherence, thus contributing to better patient quality of life (Pratama, Andayani, & Kristina, 2019).

Locally, low knowledge can be attributed to a lack of access to health education and nutrition information. In the context of the Theory of Planned Behavior (TPB), knowledge influences attitudes toward a balanced diet, which in turn shapes intentions to adhere to dietary recommendations. Ajzen (1991) asserts that behavior is influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, Lange, Kruglanski, & Higgins, 2012). A positive attitude towards a balanced diet, coupled with social environmental support and confidence in managing the diet, will increase the intention to adhere to appropriate behavioral recommendations (Ranjbaran, Shojaeizadeh, Dehdari, Yaseri, & Shakibazadeh, 2020). In Pekanbaru, the low knowledge of a balanced diet among some respondents may be due to limited access to accurate information on nutritional management for people with diabetes. This may be exacerbated by the lack of educational activities routinely organized by local health institutions. Social support also varied, with some respondents expressing a lack of encouragement from family or neighborhood to adhere to the recommended dietary pattern. SDG-based education was found to be effective in increasing intention and action planning toward

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healthy dietary behavior through strengthening the components of attitude, subjective norms, and perceived behavioral control (Ranjbaran, et al., 2020).

This study shows that attitude has a significant influence on balanced diet behavior in type 2 Diabetes Mellitus (DM) patients ($p=0.022$; $OR=2.5$). Respondents who had a negative attitude were 2.5 times more likely to have poor dietary behavior compared to those who had a positive attitude. Negative attitudes may reflect a lack of understanding of the importance of a balanced diet or disbelief in its long-term benefits. This highlights the importance of reinforcing positive attitudes through appropriate and relevant education. A study in Saudi Arabia showed that attitudes toward food selection and perceived health benefits were closely associated with changes in dietary behavior in patients with type 2 diabetes (Sami, Alabdulwahhab, Ab Hamid, Alasbali, Alwadani, & Ahmad, 2020). In addition, other studies have also found that behavior-based education is effective in improving the attitudes of patients with type 2 diabetes towards a healthy diet, which in turn improves adherence (Ramadas, Chan, Oldenburg, Hussein, & Quek, 2018).

In Pekanbaru, this finding can be attributed to the lack of knowledge about the benefits of a balanced diet, which leads to a negative attitude towards the implementation of a healthy diet. In the Theory of Planned Behavior (TPB) framework, attitude is one of the main components that influence intention and actual behavior. Ajzen (1991) explains that a positive attitude towards a particular behavior, such as a balanced diet, will increase the intention to carry it out (Ajzen, et al., 2012). Attitudes towards a healthy diet, which include beliefs in the long-term benefits of a balanced diet, can strengthen motivation to follow the recommended dietary pattern. Attitude is also influenced by emotional control and belief in one's ability to adopt a healthy diet, which in turn contributes to dietary adherence (Ramadas, et al., 2018; Jin, Wang, Li, Dong, & Ji, 2023; Gal, Iatcu, Popa, Arhire, Mihalache, Gherasim, Nita, Soimaru, Gheorghita, Graur, & Covasa, 2024). Therefore, positive attitude reinforcement is highly recommended as a strategy to improve balanced diet behavior in patients with type 2 diabetes.

This study shows that there is a significant influence between family support and balanced diet behavior in patients with type 2 diabetes.

Respondents who lacked family support were 2.8 times more likely to have poor balanced diet behavior compared to those who received support. This finding is in line with a Japanese study, which found that positive family support, such as praise for dietary adherence, contributed to increased healthy food consumption in diabetic patients (Horikawa, et al., 2020). In line with research in Banten, it shows that family support increases dietary adherence in patients with type 2 diabetes in Indonesia (Ridwan, & Dewi, 2024). Other studies have also identified that family support plays an important role in improving self-care behaviors, including dietary management, in patients with diabetes (Primadani, Mulasari, & Sunarti, 2022).

In Pekanbaru, low family support can be attributed to the lack of awareness of family members about the importance of their role in helping patients with type 2 DM manage their diet. In the context of behavioral theory, family support is included in subjective norms, which is a major component of the Theory of Planned Behavior (TPB). Ajzen (1991) explains that subjective norms, i.e. social pressure or support from the environment, can strengthen the intention to carry out a desired behavior (Ajzen, et al., 2012). Emotional and instrumental support from family, such as reminders to adhere to the diet plan or providing healthy meals, increases patients' perceived behavioral control over their dietary management. Eating with family is one of the most effective forms of support in promoting dietary adherence in patients with type 2 diabetes (Ramadas, et al., 2018). Therefore, raising family awareness through community-based education is essential to support patients in managing their dietary behaviors.

This study shows that there is a significant influence between the role of health workers and balanced diet behavior in patients with type 2 diabetes. Respondents who stated that the role of health workers was lacking were 3.2 times more likely to have poor dietary behavior compared to those who stated that the role of health workers was good. This confirms the important role of education and guidance from health workers in shaping healthy dietary behavior in patients with type 2 diabetes. Previous studies have shown that providing personalized dietary advice by health workers improves patient adherence to a healthy diet and weight management. Another study identified that patient needs-based education is key to improving understanding and

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implementation of a healthy diet (Boocock, 2023). A study in Erbil city confirmed that active involvement of health workers in providing targeted dietary education correlated with improved patient adherence to a diabetic diet (Saber, Hassan, & Ismael, 2020).

CONCLUSION

This study revealed that balanced diet behavior in patients with type 2 diabetes mellitus in Pekanbaru was significantly influenced by factors of knowledge, attitude, family support, and the role of health workers. Low knowledge and negative attitudes towards a balanced diet significantly increase the risk of poor dietary behavior. Similarly, the lack of family support and the suboptimal role of health workers are also major obstacles in the implementation of a balanced diet.

SUGGESTION

A comprehensive health education program is needed to improve nutrition literacy and shape patients' positive attitudes toward a balanced diet. Family support can be improved through community-based programs that involve family members in healthy diet education. In addition, training for health workers on communication strategies and interventions based on patient needs is also needed to strengthen their role in supporting balanced diet adherence in patients with type 2 diabetes.

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