



## Factors Related to The Level of Dietary Adherence in The Elderly with Type 2 Diabetes Mellitus

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### ABSTRACT

Type 2 diabetes mellitus is the most common type, especially in the elderly. Older people are more at risk of experiencing elevated blood sugar levels, so they are strongly encouraged to adhere to diet therapy to control their blood sugar levels. However, 85% of older adults with diabetes who conduct examinations at the Tlogosari Wetan Health Center have uncontrolled blood sugar levels caused by poor diet. This study aimed to determine the factors associated with dietary compliance in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center. This type of research is observational analytic research with a cross-sectional approach. The number of samples in this study was 61 respondents who were taken using a purposive sampling technique. The data analysis used was univariate analysis and bivariate analysis. The results showed that there was a relationship between the duration of type 2 diabetes mellitus ( $p$  value = 0.036), the level of knowledge ( $p$  value = 0.014), the frequency of participation in nutrition counseling ( $p$  value = 0.022) and the level of family support ( $p$  value = 0.023) with the level of dietary compliance in older adults with type 2 diabetes mellitus at Tlogosari Wetan Health Center. There is no relationship between gender ( $p$  value = 1.000), education level ( $p$  value = 0.421), and the level of support from health workers ( $p$  value = 0.343) with the level of dietary compliance in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center.

**Keywords:** dietary adherence factors, diabetes mellitus dietary adherence, elderly with type 2 diabetes mellitus

### INTRODUCTION

Diabetes mellitus is one of the non-communicable diseases; every year, the number of sufferers continues to increase. This disease is caused by a lack of the hormone insulin, resulting from the inability of the pancreas to produce it, or insulin cannot be used by the body's cells (Perkeni, 2021). As many as 90% of people with diabetes mellitus in the world have type 2 diabetes. (International Diabetes Federation, 2019). This disease is the most common in the elderly. (Ratnawati et al., 2018).

Globally, as many as 537 million people (10.5%) had diabetes mellitus in 2021 (International Diabetes Federation, 2021). The results of the 2018 Basic Health Research (Riskesdas) stated that nationally, the prevalence of diabetes mellitus in Indonesia was 1.5% with the prevalence of diabetes mellitus based on doctors' diagnosis at the age of 45 years increased from 2013, which was 0.5% -

1.8%. In 2022, Central Java Province had a prevalence of diabetes mellitus of 1.6%  $\geq$  (Central Java Health Office, 2023).

According to data from the Semarang City Health Office, the prevalence of diabetes mellitus in Semarang City in 2023 was 2.5%. In 2023, among the 37 health centers in Semarang City, Tlogosari Wetan Health Center is the health center with the highest number of people with type 2 diabetes mellitus in Semarang City, with a prevalence of 3.7%, where 82% of the people with type 2 diabetes mellitus at the Tlogosari Wetan Health Center are included in the elderly category (Semarang City Health Office, 2023).

Older people are 18.143 times more likely to experience increased blood sugar levels. (Gunawan & Rahmawati, 2021). This increase is due to the progressive reduction of pancreatic  $\beta$  cells, resulting in less than needed insulin production, and blood sugar levels increase. (Masrurroh, 2018). Therefore, it is highly recommended that older people control their blood sugar levels by adhering to dietary therapy. (Perkeni, 2021). Adem *et al* (2020) showed that patients who adhered to dietary recommendations were 3.56 times more likely to have reasonable glycemic control. The diet principle for people with type 2 diabetes mellitus is to pay attention to the regularity of the type, amount, and schedule of meals. (Charisma *et al.*, 2022).

However, there are still some people with type 2 diabetes mellitus who have not adhered to the recommended diet. This poor dietary adherence can lead to complications of diabetes mellitus (Sholichin *et al.*, 2023). These complications are in the form of cardiovascular disease, diabetic retinopathy, diabetic neuropathy, and diabetic nephropathy. (Ministry of Health of the Republic of Indonesia, 2018). This complication is responsible for 6.7 million deaths worldwide in 2021 (International Diabetes Federation, 2021).

Based on a preliminary study on older adults with type 2 diabetes mellitus. It was found that as many as 80% of the elderly said they did not adhere to the rules of the diabetes mellitus diet. The respondent said that they often ate outside the predetermined meal schedule because they ate when they felt hungry, ate in portions that were too large or too small, and sometimes still consumed foods that needed to be avoided because they consumed the same food as their families. This shows that older adults in the region still do not comply with dietary recommendations.

Many efforts have been made to increase dietary adherence in patients with diabetes mellitus, namely with nutritional counseling activities by doctors and nutritionists carried out by each control patient to the health center, the holding of prolanis and posyandu activities for the elderly which are carried out once a month to socialize the importance of regulating diet so that blood glucose can be controlled, dietary recommendations for diabetics, as well as blood glucose checks. However, the reality is that there are still people with type 2 diabetes mellitus who do not implement the dietary recommendations that have been given.

## METHOD

This study uses quantitative research with a methodological approach, Descriptive Analysis, and Research Design. *Cross-sectional*. The population in this study is Elderly persons with type 2 diabetes mellitus who are outpatients at the Tlogosari Wetan Health Center, with an average number of 243 people per month. This study involved 61 samples conducted in April–May 2024 with sampling techniques. *Purposive sampling*. Two data sources are used in this study, namely primary data in the form of interview results with the help of questionnaires, and secondary data in the form of respondent medical diagnosis data obtained from the medical records of the Tlogosari Wetan Health Center. In this study, the data were processed using univariate analysis, and bivariate analysis was tested using the *chi-square*.

## RESULTS AND DISCUSSION

This study analyzes the relationship or difference between dependent variables, namely dietary adherence, and independent variables, namely gender, education level, length of time of type 2 diabetes mellitus, level of knowledge, frequency of participation in nutrition counseling, level of family support, and level of support of health workers.

**Table 1. Results of Analysis of Factors Related to the Level of Dietary Adherence in the Elderly with Type 2 Diabetes Mellitus at the Tlogosari Wetan Health Center**

Variable	Dietary Levels	Compliance	<i>P value</i>	PR	CI 95%
	Low	High			
Gender					
Men	12 (30.8%)	6 (27.3%)	1.000	1.062	0,712 – 1.583
Woman	27 (69.2%)	16 (72.7%)			
Education Level					
1. Low	25 (64%)	11 (50%)	0.421	1.240	0.823 – 1.868
2. High	14 (36%)	11 (50%)			
Long Suffering from Type 2 Diabetes Mellitus					
1. Short	28 (72%)	9 (41%)	0.036	1.651	1.030 – 2.646
2. Long	11 (28%)	13 (59%)			
Knowledge Level					
1. Low	21 (54%)	4 (18%)	0.014	1.680	1.162 – 2.429
2. High	18 (46%)	18 (82%)			

Variable	Dietary Levels	Compliance	<i>P value</i>	PR	CI 95%
	Low	High			
Frequency of Participation in Nutrition Counseling					
1. Not Good	18 (46%)	3 (14%)	0.022	1.633	1.159 – 2.300
2. Good	21 (54%)	19 (86%)			
Family Support Level					
1. Not Good	22 (56%)	5 (23%)	0.023	1.630	1.113 – 2.386
2. Good	17 (44%)	17(77%)			
Healthcare Worker Support Level					
	10 (26%)	9 (41%)	0.343	0.762	0.475 – 1.222
1. Not Good	29 (74%)	13 (59%)			
2. Good					

### 1. The relationship between gender and the level of dietary adherence in older adults with type 2 diabetes mellitus at Tlogosari Wetan Health Center

Based on the analysis of the results of the research that has been carried out, it is concluded that there is no relationship between gender and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center. The absence of a relationship between gender and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center is because male and female respondents produce low dietary adherence behavior, so that the difference between the gender is less able to describe the level of dietary adherence in the elderly with type 2 diabetes mellitus ( $p = 1.000$ ).

These results are from the research by Wilson et al (2024), stated that there was no relationship between gender and dietary adherence. The study on patients with type 2 diabetes mellitus who went to Layla Qasim Hospital, Erbil City, Iraq, in 2022 showed similar results, namely, there was no significant relationship between gender and dietary adherence (Saleh, 2022). This is because in the study by Wilson et al (2024) and Saleh (2022) men follow the recommended diet more than women, but there was a less significant difference in the amount.

However, based on the theory of health behavior, Lawrence Green (1997) in Notoatmodjo, (2018) gender is one of the predisposing factors related to a person's health behavior. According to Ritchie & Roser (2019) females tend to have a longer life than men. This is because men tend to ignore their health by engaging in bad habits such as consuming large amounts of food, smoking, and consuming alcohol (Adhanty et al., 2021). In a study conducted by Vitale et al (2016) Two thousand five hundred 2,573 people aged 50-75 years enrolled in the study TOSCA. It showed that there was a relationship between gender and adherence to diabetes mellitus dietary

recommendations, where women were more compliant with diabetes mellitus dietary recommendations than men.

This difference in results can be caused by the different awareness of people with type 2 diabetes mellitus about carrying out a good diet, because individuals who already have awareness of carrying out a good diet have a greater desire to pay attention to their health. In addition, according to health belief theory, the gender model is not a factor directly related to compliance behavior (Kurniati & Alfaqih, 2022). Gender in adhering to the diabetes mellitus diet is not a problem because female and male respondents are required to follow a diabetes mellitus diet by the recommendations of health workers to avoid complications. Compared to gender, the awareness of people with type 2 diabetes mellitus in carrying out their diet well, which is different, is one of the reasons for this difference because a person who already has awareness in carrying out a good diet has a desire to pay attention to their health.

## **2. The relationship between education level and the level of dietary adherence in older adults with type 2 diabetes mellitus at Tlogosari Wetan Health Center**

Based on the analysis of the research results, it was concluded that there was no relationship between education level and diet compliance level in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p=0.421$ ). This result can be obtained because respondents with low education level and respondents with high education produce low dietary adherence behavior, so the difference between low and high education levels is less able to describe the level of dietary adherence in older adults with type 2 diabetes mellitus. Previous research that had similar results was Baral et al (2022) which shows that respondents with higher education have low levels of dietary adherence, but there is a less significant difference in the amount. However, the results of a study conducted on the population of type 2 diabetes mellitus in Ethiopia suggest that education level has a significant relationship with dietary adherence (Abate et al., 2022). This is because respondents in this study who fall into the category of low education level often consume foods with a lot of sugar and fat content compared to respondents with a higher education level.

By the theory put forward by Setianingsih (2017) in Talebong & Rannu (2022) this difference in results can occur because a person's level of compliance cannot be seen from their level of education. After all, all individuals with higher and lower levels of education must desire to recover from their illness. Suppose an individual already has a desire to be cured. In that case, the person will have the awareness to seek more information about his disease by being willing to come to health services and looking for sources of information available through various media. Therefore, counseling from health workers is needed so that individuals who have low access to information about their diseases can be better educated, so that it is hoped that their dietary adherence will also be increased (Rahayu, 2019).

### **3. The relationship between the length of time they have had type 2 diabetes mellitus and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center**

Based on the analysis of the results of the research that has been carried out, it is concluded that there is a relationship between the length of time having type 2 diabetes mellitus and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p=0.036$ ). This is because most respondents in this study have had type 2 diabetes mellitus for a long period of time, which falls into the short category, with an average of having type 2 diabetes mellitus for 5 years. Most respondents only found out they had type 2 diabetes mellitus when they accidentally checked their blood sugar levels while checking for other diseases or accompanying others to do health checks. The short duration of having type 2 diabetes mellitus causes the level of adherence to the diet to be low because the length of time a person has had the disease will make him have experience with everything he has felt, so that the person will feel obliged to comply with his diet. Individuals who have had diabetes mellitus for a long time have also received much education about their disease from health workers to increase knowledge of the disease and dietary adherence (Risti & Isnaeni, 2017).

The results of this study are similar to those of a study of control diabetics at the Felege Hiwot Referral Hospital in Northwest Ethiopia, which stated that there was a significant relationship between the length of diabetes and dietary adherence (Tirfie et al., 2020). This can happen because respondents who have a short duration of diabetes mellitus tend not to adhere to their diet. However, respondents who have a long duration of diabetes mellitus will have challenges in understanding the condition of the disease better and controlling their emotions so that they will perform and adhere to the recommended diet. In addition, research conducted by Khusna et al (2023) In patients with type 2 diabetes mellitus at the Depok Health Center, Sleman, Yogyakarta, 2018, also showed the same results. Research Khusna et al (2023) Showed that respondents who had diabetes mellitus for an extended period tended to have more information about their disease. This information will help the respondents have better diabetes control.

Different results were found in the study. Worsa et al (2021) stated that there was no relationship between the length of time you have had diabetes mellitus and dietary adherence. This can happen because of the respondents in the study. Worsa et al (2021) There was no significant difference between those who had diabetes for more than 5 years and those who had diabetes for less than 5 years, with the majority of both having good dietary adherence. Then, some respondents still have a longer duration of illness, but have low dietary adherence or vice versa. This is because sometimes a person with a longer illness duration is less motivated to recover. After all, the longer a person has a disease, the more bored they will feel in undergoing treatment and following the recommended diet (Parajuli et al., 2014). Therefore, support from the people around the patient is needed to increase their motivation to recover from their illness.

#### **4. The relationship between knowledge level and the level of dietary adherence in older adults with type 2 diabetes mellitus at Tlogosari Wetan Health Center**

Based on the analysis of the results of the research that has been carried out, it is concluded that there is a relationship between the level of knowledge and the level of dietary adherence in the elderly with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p=0.014$ ). This is because most of the respondents in this study have a level of knowledge that falls into the high category. After all, most of the respondents always get counseling about diabetes mellitus, which is obtained from participating in program for elderly people conducted by community health center and elderly integrated health post, which is carried out for 1 month/time or when undergoing treatment in the hospital, so that people with diabetes mellitus get the correct information about diabetes mellitus and management of their diet, so that adherence to their diet also increases. Therefore, counseling activities about a patient's disease are critical for the patient (Parajuli et al., 2014).

These results are similar to those of previous studies conducted by Abate et al (2022) stated that there is a relationship between knowledge level and dietary adherence in the type 2 diabetes mellitus population in Ethiopia, which results from most respondents with a high level of knowledge following a healthy diet, such as increasing the consumption of fruits and vegetables and reducing the consumption of sugar, fat, and salt. A study conducted on patients with type 2 diabetes mellitus who underwent treatment at the Zahedan hospital clinic in Iran showed that patients who had been given an intervention in the form of education about diabetes mellitus had a significant increase in dietary adherence (Moghimi et al., 2023). This result can occur because individuals who have good knowledge about diabetes mellitus and its diet management will have the awareness to make decisions about what needs to be done to cure the disease.

However, research conducted by Worsa et al (2021) shows that there was no relationship between diabetes knowledge level and dietary practices because between respondents who had a good level of knowledge and a poor level of knowledge resulted in high dietary adherence behaviors. Hence, the differences between knowledge levels were less able to describe the level of dietary adherence in older adults with type 2 diabetes mellitus.

#### **5. The relationship between the frequency of participation in nutrition counseling and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center**

Based on the analysis of the results of the research that has been carried out, it is concluded that there is a relationship between the frequency of participation in nutrition counseling and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p=0.022$ ). This is because most older adults with type 2 diabetes mellitus at the Tlogosari



Wetan Health Center frequently participate in nutrition counseling that falls into the good category. This is because, on average, in the last 3 months, respondents participated in nutrition counseling 3 times. This nutritional counseling is obtained from various places, such as during programs for elderly people, activities, elderly integrated health post activities, or when doing treatment in hospitals. There is a relationship between participation in nutrition counseling and dietary adherence because counseling about health is important in the management of diabetes mellitus, especially in the implementation of a diet that has been recommended. (Laumara et al., 2021). This is because individuals who participate in nutrition counseling will be given knowledge and skills regarding good diet management.

This research was conducted by Eshete et al (2023), who stated that there is an association between the provision of nutritional counseling and increased dietary adherence in patients with type 2 diabetes mellitus at the North Shoa Zone General Hospital, Amhara Region, Ethiopia. This study proves that respondents who have received nutrition counseling experience increased fruit and vegetable intake scores, low-glycemic index foods, fish, recommended oils, and high-fiber foods.

In contrast, a study conducted on patients with type 2 diabetes mellitus in Pantai Gemi Village showed that there was no significant relationship between participation in health counseling and type 2 diabetes mellitus diet (Maulida et al., 2022). This result is because respondents who participated in counseling did not have a good diet for type 2 diabetes mellitus. This is because at this time, counseling about a disease is very easy to get through the internet without directly participating in health counseling.

#### **6. The relationship between the level of family support and the level of dietary adherence in the elderly with type 2 diabetes mellitus at the Tlogosari Wetan Health Center**

Based on the analysis of the results of the research that has been carried out, it is concluded that there is a relationship between the level of family support and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p=0.023$ ). These results show that many older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center have a good level of family support, this statement can be seen from the average respondents' answers stating that family members always remind to comply with recommended dietary rules, remind them to control blood sugar levels, participate in delivering or accompanying when conducting routine check-ups to health service centers, and always serve and assist respondents when they need help. This research is by the researcher Ridwan & Dewi (2024) Regarding the relationship between family support and dietary adherence in individuals with type 2 diabetes mellitus in Banten, it was revealed that there was a relationship between family support and dietary adherence. This result can occur because the respondents in this study have families who always serve, accompany, and provide food according to the recommended diet.



Inversely proportional to the results of this study, the research conducted at the Shahid Madani and Imam Sajjad Hospital, Tabriz City, Iran, stated that there was no significant association between family support and dietary adherence in people with diabetes mellitus (Khalili Azar et al., 2024). The difference in this study's results can occur because of the study's respondents. Khalili Azar et al (2024) having less of a desire to heal because one's desire to heal will make an individual increase his or her dietary adherence. In addition, the patient's poor lifestyle can also be the reason, considering the current lifestyle where most of the food is unhealthy for people with diabetes mellitus to consume.

#### **7. The relationship between the level of health worker support and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center**

Based on the analysis of the results of the research that has been carried out, it is concluded that there is no relationship between the level of support of health workers and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center ( $p = 0.343$ ). This result is because in this study, most older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center have almost all good support from health workers. However, in terms of their dietary adherence, they are included in the low category. This can happen because health workers always provide information related to the recommended diet, provide motivation by constantly asking about the patient's progress and listening to the patients' complaints, and constantly remind people with type 2 diabetes mellitus to follow the recommended diet. However, some people with type 2 diabetes mellitus often forget the dietary recommendations that have been given because some patients are not accompanied by their families at the time of being given information. In addition, some patients are also unable to carry out the diet according to recommendations due to certain factors such as economic problems or low family support in preparing food for people with diabetes mellitus. A patient's confidence to recover is also one of the reasons for the absence of a relationship between the support of health workers and the dietary adherence of people with type 2 diabetes mellitus (Nasution et al., 2023).

Research that has similar results is research. Hestiana (2017) Similarly, results were found, namely that there was no relationship between the level of support of health workers and adherence to the diet in outpatients with type 2 diabetes mellitus in Semarang City. This result is because most respondents have low support from health workers and a high dietary adherence, compared to respondents with high support from health workers. There is a difference in the number that is not too significant.

In contrast to the results of previous research, based on research conducted on patients with type 2 diabetes mellitus in the working area of the Bangkinang City Health Center, it was shown that there was a relationship between health worker support and dietary adherence. (Kasumayanti & Rahayu,

2019). This result occurs because most respondents with good health worker support have dietary adherence that falls into the compliance category. This can happen because most respondents, with the support of good health workers, also have a high desire to get well, so their diet adherence will increase. In addition, according to Cahyono (2020) health workers are one of the factors most related to implementing dietary recommendations. This is because health workers have a role that functions as communicators, motivators, facilitators, and counselors in treating patients (Patimah & Megawati, 2021). The support of health workers is vital for patients because individuals who feel attention from health workers will tend to follow the advice given regarding their illness. (Eva Rahayu et al., 2014).

## **CONCLUSION**

Based on the results of the research that has been carried out, it is concluded that there is a significant relationship between the length of time of having type 2 diabetes, the level of knowledge, the frequency of participation in nutrition counseling, and the level of family support with the level of dietary adherence in the elderly with type 2 diabetes mellitus at the Tlogosari Wetan Health Center. In addition, there was no relationship between gender, education level, and level of support for health workers and the level of dietary adherence in older adults with type 2 diabetes mellitus at the Tlogosari Wetan Health Center.

The suggestion that can be given regarding the results of this study is that it is hoped that the Tlogosari Wetan Health Center can optimize nutrition counseling activities even better and always provide nutrition education specifically to people with diabetes mellitus and their families during routine control. It is hoped that further research can develop this research by researching other factors. In addition, research can be conducted on older adults with type 2 diabetes mellitus who are 65 years old and older, and can be researched with a larger number of samples because this study has limitations in the form of time constraints and a lack of workforce in data collection.

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