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Path Analysis on Determinants Affecting Adherence to Pharmacological Treatment of Type 2 Diabetes Mellitus in Farmers

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ABSTRACT

Type 2 diabetes mellitus is a non-communicable disease and is a major chronic and long-term health problem in society. If uncontrolled, it tends to worsen due to complications. Diabetes mellitus requires long-term treatment. This study aims to determine the factors that affect adherence to pharmacological treatment of type 2 diabetes mellitus in farmers. This study used a quantitative method with a cross-sectional approach. The sample size was 165 farmers who were selected by purposive sampling. This study was conducted from May to June 2024 in the working area of Sukadamai Community Health Center, Natar, South Lampung, Indonesia. Data were collected based on questionnaires. The results showed that adherence to pharmacological treatment of type 2 diabetes mellitus is directly related to age (b=-1.601; 95%CI=-3.260-0.583; p=0.059), self-motivation (b=2.500; 95%CI=0.856-4.144; p=0.003), duration of illness (b=1.587; 95%CI=0.209-0.964; p=0.024), and family support (b=2.840; 95%CI=1.311-4.369; p=0.000). There is an indirect relationship between education and adherence through the knowledge variable (b=0.962; 95%CI=0.307-1.617; p=0.004). Indirectly, education is related to adherence through income (b=2.363; 95%CI=1.618-3.107; p=0.000), self-efficacy to adherence through self-motivation (b=0.261; 95%CI=-0.657-1.180; p=0.577), and family support through self-motivation (b=2.287; 95%CI=1.361-3.214; p= 0.000). Healthcare workers should repeatedly provide counseling on primary education materials, such as the importance of continuous control, pharmacological and non-pharmacological interventions, and other secondary prevention measures to prevent complications in patients diagnosed with type 2 diabetes mellitus.

INTRODUCTION

Diabetes mellitus is one of the major health problems in society. It is a non-communicable, chronic, and long-lasting condition. Diabetes mellitus is characterized by hyperglycemia caused by impaired insulin secretion, marked by increased blood sugar levels above normal limits. Long-term hyperglycemia affects the vascular system, including small blood vessels in the eyes, kidneys, nerves, and larger arteries, leading to accelerated atherosclerosis. Diabetes mellitus tends to worsen due to acute complications such as macrovascular and microvascular issues, as well as disturbances in motor, sensory, or autonomic neuropathy. Diabetes is the most common cause of blindness in the productive age group (Bilous & Donelly, 2015; PERKENI, 2021).

According to data from the International Diabetes Federation (IDF), the number of people with diabetes mellitus has increased by 1.2% compared to 2019, reaching 10.5%, or 537 million people. Indonesia ranks fifth in the world for the highest number of diabetes cases, with a prevalence of 10.9%, amounting to 20.4 million individuals. Within Indonesia, Lampung Province ranks eighth among all provinces regarding diabetes prevalence. (International Diabetes Federation, 2021; Ministry of Health Republic Indonesia, 2020).

Based on data from the Basic Health Research (*Riskesdas*) for Lampung Province, cases of diabetes mellitus in Lampung Selatan Regency rank third in prevalence, with a rate of 0.82%, equivalent to approximately 3,767 individuals (Ministry of Health Republic Indonesia, 2019).

According to data from the Directorate General of Disease Prevention and Control (P2PTM) of the Ministry of Health of the Republic of Indonesia, diabetes mellitus is the third leading cause of death, with a rate of 6.7 %. Of all diabetes mellitus cases, 90% are type 2 diabetes mellitus (Ministry of Health Republic Indonesia, 2018). Therefore, type 2 diabetes mellitus remains a significant problem.

Occupations are related to physical activity levels, with farming categorized as a high-physical-activity occupation, which lowers the risk of developing type 2 diabetes mellitus (Saftarina et al., 2023; Kusnadi et al., 2017). However, According to Basic Health Research 2018, the prevalence of diabetes cases among farmers in the employment category increased compared to Basic Health Research 2013. A preliminary study conducted by the author at the Sukadamai Community Health Center found that the majority of residents in its service area who suffer from type 2 diabetes mellitus are farmers, with a prevalence of 79.58% (Puskesmas Sukadamai, 2023).

Type 2 diabetes mellitus is a disease that requires long-term treatment. The treatment for diabetes mellitus patients aims to control blood sugar levels and prevent complications. The pillars of diabetes mellitus control include education, medical nutrition therapy, exercise, medication, and glucose monitoring (PERKENI, 2021). Adherence to pharmacological treatment for diabetes mellitus is one key parameter for successful diabetes mellitus control. According to the officer in charge of the non-communicable disease program (PTM) at Sukadamai Community Health Center, 35,3% of patients are not compliant with their treatment (Puskesmas Sukadamai, 2023).

Various scientific studies indicate that adherence to treatment for chronic diseases such as diabetes mellitus is still low (Sari & Afifah, 2019; Della et al., 2023; Lenny & Fridalina, 2018). Non-adherence to treatment contributes to the failure of blood sugar control in type 2 DM patients (Della et al., 2023). Diabetes complications increase mortality rates, providing concrete evidence of relatively low compliance with diabetes mellitus management, particularly in adhering to chosen therapies like oral anti-diabetic medications and insulin injections (Della et al., 2023; Ansyar & Abdullah, 2022).

So far, existing research studies have only examined a few variables, such as socio-demographic characteristics and the number of medications (Arfania et al., 2023) or the relationship between family support and adherence (Nugroho et al., 2018). They have not investigated whether there are variables that influence other variables or combine several variables, such as socio-demographic characteristics, self-motivation, duration of illness, self-efficacy, ownership of national health insurance (JKN), ease of access to health services, support from health workers, and family support. For farmers with type 2 diabetes mellitus, treatment adherence is critical in order to avoid complications and maintain their quality of life while remaining productive. So, researchers need to identify the factors influencing farmers' adherence to pharmacological treatment for type 2 diabetes mellitus at Sukadamai Community Health Centre, Natar District, South Lampung, Indonesia.

METHOD

This research used a quantitative method with a cross-sectional approach. We conduct simultaneous measurements of the independent and dependent variables. The dependent variable in this study is treatment adherence, and the independent variables are age, gender, income, education, knowledge, self-motivation, duration of illness, self-efficacy, ease of access to health services, ownership of national health insurance (JKN), support from health workers, and family support. We conducted this research from May to June 2024 in the working area of Sukadamai Community Health Center, Natar District, South Lampung, Indonesia.

The population in this study consists of all type 2 diabetes mellitus patients at Sukadamai Community Health Center, Natar District, South Lampung, Indonesia, totaling 240 respondents. Purposive sampling determined the sample based on inclusion and exclusion criteria. The sampling technique employed in this research is purposive sampling, with inclusion and exclusion criteria applied. The inclusion criteria in this study were that respondents were

farmers who had suffered from type 2 diabetes mellitus for at least 3 months without complications. The exclusion criteria were respondents who had complications such as hypoglycemia, hyperglycemia, and other health problems, making it impossible for them to become respondents in this study. Respondents who meet the inclusion and exclusion criteria will first be given a statement letter to become research respondents. If they agree, the author will provide an informed consent form to be signed by the respondents. This document explains the consent form to become a research respondent.

The socio-demographics of respondents consisted of age, gender, education level, duration of illness, and ownership of national health insurance, categorized based on previous research (Arfania et al., 2023; Della et al., 2023; Sari & Afifah, 2019; Lenny & Fridalina, 2018). We present the data in two categories. The age variable is divided into ≥60 Years and >60 Years. The gender variable is divided into two categories: female and male. The education variable is divided into two categories: higher education, which includes high school and university, and lower education, which includes no schooling, elementary school, and junior high school. The duration of illness variable is categorized into <5 Years and ≥5 Years. The JKN ownership variable is divided into two categories: owns JKN and does not own JKN. The income variable was categorized based on the regional minimum wage in South Lampung; we divided it into two categories: ≥Regional Minimum Wage (≥Rp.2.861.097) and <Regional Minimum Wage (<Rp.2.861.097).

Adherence to pharmacological treatment of type 2 diabetes mellitus in farmers is measured using scores obtained from the Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire Saibi et al. (2020). The categories of adherent if the value obtained is ≥ the median (≥6,75) value and non-adherent if the value obtained is < the median value (<6,75). We divide the interpretation of a knowledge questionnaire, which consists of 12 questions modified from (Agrimon, 2014; Ditha, 2021). We present data into two categories: good knowledge if the score ≥ the median value (≥7) and low knowledge if the score < the median value (<7).

A self-motivation questionnaire was adapted from Della et al. (2023). We present the data in two categories: high if the obtained score is ≥ the median value (≥41) and low if the score is < the median value (<41). Self-efficacy questionnaire using the Diabetes Self-Efficacy Scale (DSES) developed by (Ritter et al., 2016) and modified by (Silolonga et al., 2019). We divide the interpretation into two categories: high if the score ≥ the median value (≥43) and low if the score < median value (<43). We modified the healthcare access ease questionnaire adapted from (Ramadhani, 2017). The data is presented in two categories: easy access if the score is ≥ the median value (≥8) and difficult access if the score is < the median value (<8). Support from health workers questionnaire adapted from (Della et al., 2023). We divide the interpretation of the results into two categories: strong if the score is ≥ the median value (≥46) and weak if the score is < the median value (<46). Family support questionnaire adapted from (Della et al., 2023). We divide the interpretation of the results into two categories: strong if the score ≥ the median value (≥39) and weak if the score is < the median value (<39).

We tested the entire set of questionnaires for validity and reliability on 30 farmers with type 2 diabetes mellitus at Anak Tuha Community Health Center, Central Lampung. The overall questionnaires are deemed valid (computed correlation > table correlation (0.361)) and reliable (Cronbach's alpha ≥ 0.6). Based on the validity and reliability testing results, the MMAS-8 questionnaire yields a correlation coefficient of 0.621 - 0.915 and Cronbach's Alpha of 0.791, the knowledge questionnaire yields a correlation coefficient of 0.404 - 0.822 and Cronbach's Alpha of 0.748, the self-motivation questionnaire yields a correlation coefficient of 0.617 - 0.930 and Cronbach's Alpha of 0.937, the self-efficacy questionnaire yields a correlation coefficient of 0.548 - 0.744 and Cronbach's Alpha of 0.918, the healthcare access ease questionnaire yields a correlation coefficient of 0.395 - 0.911 and Cronbach's Alpha of 0.816, the healthcare worker support questionnaire yields a correlation coefficient of 0.441 - 0.852 and Cronbach's Alpha of 0.776, and the family support questionnaire yields a correlation coefficient of 0.425 - 0.872 and Cronbach's Alpha of 0.793.

We performed data analysis using a statistical application. We conducted path analysis to identify the independent variables' direct and indirect effects on the dependent variable, significantly influencing treatment adherence among farmers with type 2 diabetes mellitus in

the Sukadamai Community Health Center, Natar District, South Lampung, Indonesia. Statistical significance was accepted at a confidence level of 95%. The study was conducted after obtaining ethical clearance from the research ethics committee of Universitas Lampung with an approval number of 1918/UN26.18/PP.05.02.00/2024.

RESULTS

Table 1 shows that the majority of respondents in this study are male. Most participants involved in this research were < 60 years old, had low educational attainment, earned a minimum wage, had a good knowledge level, had been suffering from type 2 diabetes for approximately 5 years, and had national health insurance (JKN). 50.3% of respondents have high motivation, 45.5% have high self-efficacy, 57.5% have easy access to the health center, 57% receive good support from health workers, and 50.9% receive good support from their families. The level of treatment adherence shows that 50.9% of respondents adhere to their treatment regimen.

Table 1. Characteristics of respondents

Characteristics of respondents	Category	n	%
Adherence	Adherent	84	50,9
	Non- Adherent	81	49,1
Age	≥ 60 Years	44	26,7
	< 60 Years	121	73,3
Gender	Female	79	47,9
	Male	86	52,1
Income	≥Regional Minimum Wage	59	35,8
	<Regional Minimum Wage	106	64,2
Education	High	62	37,6
	Low	103	62,4
Knowledge	Good	85	51,5
	Low	80	48,5
Self_Motivation	High	83	50,3
	Low	82	49,7
Duration of illness	< 5 Years	102	61,8
	≥ 5 years	63	38,2
Sef_Efficacy	High	75	45,5
	Low	90	54,5
Ownership of national health insurance	Have	128	77,6
	Do not have	37	22,4
Access to health services	Easy	94	57,0
	Difficult	71	43,0
Support from health workers	Strong	94	57,0
	Weak	71	43,0
Family Support	Strong	84	50,9
	Weak	81	49,1

The path analysis model in this study examines the influence of 13 variables. The degree of freedom (df) indicates that path analysis can be performed: df=21 (df≥0). The exogenous variables are age, gender, education, duration of illness, self-efficacy, ownership of national health insurance, ease of access to health services, support from healthcare workers, and family support. In this study, the intervening variables consist of income, knowledge, and self-motivation variables, where the basis for selecting the income and knowledge variables is adapted from the study conducted by Hamidi et al. (2019), and the self-motivation variable is based on Bandura, (1997) theory and adapted from the study conducted by Putri (2019), while the endogenous variable is adherence to pharmacological treatment. The model specification in Figure 1 will explain the variables to be studied. Figure 1 shows that adherence to pharmacological treatment for type 2 diabetes in farmers is directly influenced by variables such as age, gender, education, income, knowledge, self-motivation, duration of illness, self-efficacy,

JKN ownership, ease of access, health worker support, and family support. Adherence to pharmacological treatment for type 2 diabetes in farmers is indirectly influenced by education through income and education. Adherence to pharmacological treatment for type 2 diabetes in farmers is also indirectly influenced by the duration of illness, self-efficacy, and family support through self-motivation.

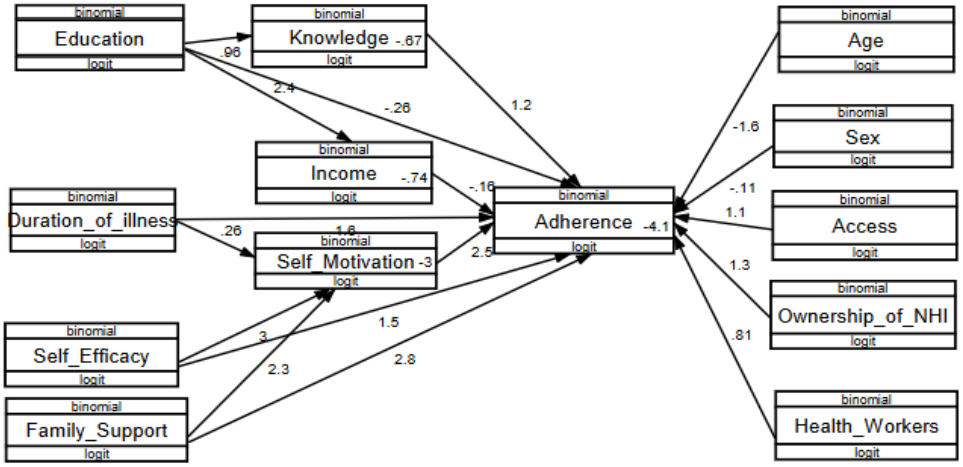

Figure 1. Structural Path Analysis Model with Estimation

Table 2. Result of determinant path analysis of adherence with pharmacological treatment of diabetes mellitus among farmers

Dependent variable	Independent variable	(b)	CI 95%		p
			Lower limit	Upper Limit	
Direct Effect					
Adherence	←Age	-1,601	-3,260	0,058	0,059
	←Sex	-0,110	-1,456	1,234	0,872
	←Income	-0,162	-2,123	1,798	0,871
	←Education	-2,605	-2,188	1,666	0,791
	←Knowledge	1,246	-0,261	2,754	0,105
	←Self-motivation	2.500	0,856	4,144	0,003
	←Long-suffering	1,587	0,209	2,964	0,024
	←Self-efficacy	1,510	-0,178	3,200	0,080
	←Ownership of national health insurance	1,307	-0,690	3,304	0,200
	←Access to health services	1,148	-0,1118	-0,289	2,586
	← support from healthcare workers	0,812	-0,614	2,239	0,265
	←Family support	2,840	1,311	4,369	0,000
Indirect Effect					
Knowledge	←Education	0,962	0,307	1,617	0,004
Income	←Education	2,363	1,618	3,107	0,000
Self-efficacy	←Self_Motivation	2,995	2,044	3,946	0,000
Duration of illness	←Self_Motivation	0,261	-0,657	1,180	0,577
Family support	←Self_Motivation	2,287	1,361	3,214	0,000
N observation	= 165				
Log Likelihood	= -290.7078				
AIC	= 623.4157				
BIC	= 688.6405				
df	= 21				

Table 2 shows that showed that adherence to pharmacological treatment of type 2 diabetes mellitus is directly related to age (b=-1.601; 95%CI=-3.260-0.583; p=0.059), self-motivation (b=2.500; 95%CI=0.856-4.144; p=0.003), duration of illness (b=1.587; 95%CI=0.209-

0.964; p=0.024), and family support (b=2.840; 95%CI=1.311-4.369; p=0.000). There is an indirect relationship between education and adherence through the knowledge variable (b=0.962; 95%CI=0.307-1.617; p=0.004). Indirectly, education is related to adherence through income (b=2.363; 95%CI=1.618-3.107; p=0.000), self-efficacy to adherence through self-motivation (b=2,995; 95%CI=2,044–3,946 ; p=0.000), duration of illness to adherence through self-motivation (b=0,261; 95%CI=-0,657-1,180; p=0.577, and family support through self-motivation (b=2.287; 95%CI=1.361-3.214; p=0.000).

DISCUSSION

This study's results indicate that age directly affected compliance with pharmacological treatment for type 2 diabetes mellitus in farmers but with a negative coefficient value. This means that when the farmer's age is ≥60 years, adherence to pharmacological treatment for type 2 diabetes mellitus will decrease. According to Norman et al. (2005), in the Protection Motivation Theory, it is explained that older individuals focus more on health because they are more aware of the health risks and the consequences of not adhering to treatment. However, in this study, it was found that in the ≥60 years age category, 56.8% were non-compliant with pharmacological treatment for type 2 diabetes mellitus, and only 43.2% were compliant. Therefore, it can be concluded that in this study, age cannot be used as a determinant for whether patients will comply with chronic treatment, particularly for type 2 diabetes mellitus. The decrease in compliance may be due to various factors, such as memory decline, perceptions about the necessity of treatment, or physical barriers to accessing healthcare facilities.

The results of this study indicate that gender does not directly affect adherence to pharmacological treatment of type 2 diabetes mellitus in farmers and has a negative coefficient, so it can be interpreted that female farmers will reduce compliance with pharmacological treatment of type 2 diabetes mellitus. The results of this study differ from the theory of Notoatmodjo (2010), which states that women take better care of their health and pay more attention to their health than men; in differences in illness behavior, women seek treatment more often than men. This result is likely due to the proportion of male respondents more than women. This is related to the farming profession; there are more male than female farmers (Central Bureau of Statistics, 2023).

This study's results align with research conducted by Almira et al. (2019) at Teluk Dalam Health Center in Banjarmasin, which stated that there is no significant relationship between gender and treatment adherence. This study explained that males have lower adherence compared to females. Males tend to neglect treatment.

The results of this study indicate that income does not directly affect adherence to pharmacological treatment of type 2 diabetes mellitus in farmers., with a coefficient of 0.16 and a negative value. In line with this study, research by Elmita et al. (2019) conducted at Teluk Dalam Health Center in Banjarmasin found no relationship between income and treatment adherence. The study explained that high-income respondents tend to be busy with work and thus do not have time for clinic visits. People in the low-income category can still afford clinic visits due to government social security.

The results of this study indicate that education does not directly affect adherence to pharmacological treatment of type 2 diabetes mellitus in farmers. In line with these results, research by Baedlawi et al. (2023) in the working area of Karangan Community Health Center, Landak District, West Kalimantan, an analysis result indicates that education does not have a significant relationship with treatment adherence.

Indirectly, there is a relationship between education and farmers' adherence to pharmacological treatment of type 2 diabetes mellitus through income. Through knowledge, there is an indirect relationship between education and adherence to pharmacological treatment of type 2 diabetes mellitus in farmers. Based on research by Hamidi et al. (2019), entitled Path Analysis on the Determinants of Adherence to Anti-Tuberculosis Drug Treatment in Kaur District, Bengkulu, Indonesia, states that education affects adherence to tuberculosis treatment through income. He explained that the correlation between education and income is that the

level of education determines a person's position in the social order related to job selection. Based on the study's results, there was a relationship between education and adherence to TB patient treatment through income. Hamidi et al. (2019) also found a relationship between education and adherence to TB treatment through knowledge.

According to Notoatmodjo (2018), behavioral changes due to education are likely to persist and endure due to individual awareness. This research shows that most respondents with higher education are adherent to treatment. According to field observations during the study, respondents who were adherent and had higher education clearly understood the questionnaire questions.

The result of this study indicates that knowledge does not directly affect farmers' adherence to pharmacological treatment of type 2 diabetes mellitus. In line with this study, research by Widiawati et al. (2024) at Pegayut Community Health Center in Ogan Ilir Regency found no relationship between knowledge and adherence to medication among type 2 diabetes mellitus patients. According to Notoatmodjo (2018). Knowledge results from sensing or knowing about an object through the senses (ears, eyes, nose, etc.). Thus, knowledge is greatly influenced by the intensity of attention and perception towards the object.

Self-motivation directly and positively affects farmers' adherence to pharmacological treatment for type 2 diabetes mellitus. This study aligns with research conducted by Almira et al. (2019), where it was found that those with good motivation (83.8%) exhibited high adherence behavior to anti-diabetic medication. They obtained a result of p=0.023 with a PR value of 3.320. Respondents with high motivation to take anti-diabetic medication to ensure stable blood sugar levels are driven by internal motivation. The level of motivation depends on self-awareness. Based on theory, self-motivation comes from within (Notoatmodjo, 2018). Motivation is a very important factor in realizing behavioral change. Self-motivation factors are positively correlated with the process of behavioral change, including in undergoing compliance. Respondents with good self-motivation can organize and carry out actions supporting the achievement of type 2 diabetes mellitus treatment (Della et al., 2023).

The duration of illness has a direct impact on farmers' adherence to pharmacological treatment for type 2 diabetes mellitus. The results of this study were in line with the study conducted by (Ridayanti et al., 2019) at the Cempaka Community Health Center in Banjarmasin, where 47% of respondents had a short duration of illness (≤5 years) and 34% had a long duration of illness (>5 years). Respondents with a longer duration of illness tend to exhibit non-compliance with treatment monitoring. The study results show a p-value of 0.027 and a prevalence ratio (PR) of 2.91, indicating a significant relationship between the duration of illness and compliance behavior in monitoring treatment. Furthermore, the duration of illness is identified as a risk factor influencing treatment compliance among type 2 diabetes mellitus patients at Cempaka Public Health Center, Banjarmasin.

Based on the author's field findings, the longer someone has diabetes, the more likely they are to become fatigued and bored with continuous medical treatment and medication. According to interviews with respondents, they sometimes feel exhausted and weary because they understand that their diabetes cannot be cured but only controlled.

Farmers' self-efficacy does not directly affect adherence to pharmacological treatment for type 2 diabetes mellitus. However, multivariate analysis showed that self-efficacy indirectly influences adherence to pharmacological treatment of type 2 diabetes mellitus among farmers through self-motivation.

According to Bandura (1997), in the self-efficacy theory, there are four principal psychological processes: cognitive, motivational, affective, and selection. The motivational process explains that motivational processes include beliefs about one's abilities, which can influence effort and perseverance. High self-efficacy can increase motivation, so a person is likelier to set and strive to achieve challenging goals. On the other hand, when a person has low self-efficacy, it will lead to a decrease in motivation and a tendency to avoid complex tasks. Diabetes mellitus is a chronic and long-term disease, which makes it a difficult task. Therefore, when a patient has low self-efficacy, it will make them less motivated to manage and take care of themselves to avoid complications.

This research is in line with a study conducted by Huang et al. (2021), a study conducted at the inpatient department of the First Affiliated Hospital of Chongqing Medical University in Chongqing, China, which concluded that self-efficacy directly affects medication adherence (β=0.139, p=0.023). The study explained that self-efficacy is also an important predictor of medication adherence in patients with type 2 diabetes mellitus. Patients with high self-efficacy may be more confident in achieving good health outcomes due to adherence and, as a result, are more likely to adhere to their medication.

There is no direct influence of having JKN (National Health Insurance) on adherence to pharmacological treatment of type 2 diabetes mellitus among farmers. This study, in line with the study conducted by Lenny & Fridalina, 2018 at Kabanjahe Regional Hospital, indicated no relationship between health insurance participation and adherence to outpatient treatment among type 2 diabetes mellitus patients. According to the study, 66.1% of 62 respondents with health insurance did not adhere to treatment, while only 33.9% did. Among 30 respondents without health insurance, 56.7% were non-adherent to treatment, and 43.3% adhered to treatment despite not having health insurance.

This study differs from the research conducted by Sari & Afifah (2019), which stated that a significant relationship exists between JKN ownership and adherence to type 2 diabetes mellitus treatment. Statistical analysis showed a result of (p=0.00). The study explained that the availability or ownership of JKN could serve as a factor facilitating the payment of treatment costs. The National Health Insurance Program (JKN) is a health insurance scheme established by the government to ensure the well-being of all segments of society. The presence of JKN significantly alleviates the financial burden of treating chronic illnesses such as diabetes mellitus (Ministry of Health of the Republic of Indonesia, 2019). According to research by Munawarah et al. (2024), there is a significant difference in the total medical expenses between type 2 diabetes mellitus patients receiving treatment under JKN and those seeking treatment independently. Utilizing JKN helps reduce the direct treatment costs and lessens the economic burden on patients and their families caused by type 2 diabetes mellitus.

Healthcare access ease does not directly influence farmers' adherence to pharmacological treatment for type 2 diabetes mellitus. This study, in line with the study conducted by (Ansyar & Abdullah, 2022) at Antang Community Health Center, Makassar, involving all type 2 diabetes mellitus patients to analyze determinants of treatment adherence, found that respondents with less accessible healthcare accessibility were non-adherent at a rate of 41.7%, while those with accessible healthcare accessibility and adherent treatment accounted for 65.8%. The p-value was 0.397 (>0.05), indicating no relationship between healthcare accessibility and treatment adherence among type 2 diabetes mellitus patients in the Antang Community Health Center area.

There is no direct effect of support from healthcare workers on adherence to pharmacological treatment for type 2 diabetes mellitus among farmers. In line with this study, research by Oktaviani et al. (2018) was conducted at Pudak Payung Community Health Center to identify factors related to the adherence of diabetes mellitus patients to treatment. Respondents who did not receive support from healthcare providers were non-adherent at a rate of 59.6%, while those who received support and were adherent to treatment accounted for 52.6%. The obtained p-value was 0.07 (>0.05), indicating no relationship between healthcare provider support and the adherence of diabetes mellitus patients to treatment.

This study also aligns with research conducted by Della et al. (2023). The study revealed that 21.7% of respondents did not adhere to treatment due to insufficient support from healthcare providers, whereas 43.3% reported receiving good support from healthcare providers. The statistical results revealed a significant relationship between healthcare provider support and adherence to diabetes mellitus treatment, with a p-value of 0.028.

Family support directly influences adherence to pharmacological treatment for type 2 diabetes mellitus among farmers. Indirectly, there is a relationship between family support and adherence to pharmacological treatment for type 2 diabetes mellitus among farmers through self-motivation. In line with this study, a study conducted by Ansyar & Abdullah (2022) at the Antang Health Center, Makassar, showed that respondents who received low family support were not compliant with treatment by 50.0%, while those who received high family support

were compliant with treatment by 88.4%. The p-value obtained was 0.004. Based on logistic regression analysis, an odds ratio (OR) value of 5.826 was obtained with a 95% CI of 1.771-19.161. This study is also in line with a study conducted by Azizah et al. (2023) in the work area of the Lembursitu Health Center, Kotabumi, to determine the relationship between family support and medication compliance in type 2 diabetes mellitus patients.

According to Friedman (1986), as cited in Yahya (2021), the family plays a crucial role in healthcare practices. When a family member falls ill, other family members provide healthcare services such as accompanying them to health facilities, preparing nutritious meals, reminding them to take medication, providing information about the importance of treatment, offering support, and more. All these actions significantly influence the overall health of the family.

CONCLUSION

An overview of farmers with type 2 diabetes mellitus in the working area of Sukadamai Public Health Center, Bandar Lampung, shows that 49.1% of respondents are non-adherent to treatment, duration of illness, and family support directly influences adherence to pharmacological treatment of type 2 diabetes mellitus. The knowledge variable indicates an indirect relationship between education and adherence. Education indirectly influences adherence through income, self-efficacy influences adherence through self-motivation, and family support influences adherence through self-motivation. Healthcare workers should repeatedly provide counseling on primary education materials, such as the importance of continuous control, pharmacological and non-pharmacological interventions, and other secondary prevention measures to prevent complications in patients diagnosed with type 2 diabetes mellitus.

AUTHOR'S DECLARATION

MHS: Formulated the research problem, designed the research framework, collected data, and processed the data; **FS:** Examined the results, discussion, and references; **SS:** Reviewed the discussion and data analysis. **DIA:** Review the discussion; **BAP:** Review the result, check grammar, and review the discussion.

Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

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