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DETERMINANTS OF KNOWLEDGE AND MEDICATION ADHERENCE AMONG TYPE 2 DIABETES MELLITUS PATIENTS: EVIDENCE FROM A PRIMARY HEALTH CARE SETTING IN INDONESIA

Sucilawati[1], Zamharira Muslim[1*], Delta Baharyati[2], Reysa Pradifta[1]

[1]Department of Pharmacy, Poltekkes Kemenkes Bengkulu, Bengkulu, Indonesia
[2]Prodi S1 Farmasi, Universitas Bengkulu
**Correspondent :* muslim@poltekkesbengkulu.ac.id

Abstract

Diabetes mellitus type 2 (T2DM) is a chronic metabolic disease with increasing prevalence worldwide, including Indonesia. Optimal management requires continuous pharmacological therapy, yet treatment outcomes are often hindered by poor patient knowledge and low adherence to antidiabetic medication. Although several studies have examined knowledge and adherence in T2DM, limited data are available from primary health centers in Bengkulu, especially in Kuala Lempuing Health Center, where irregular medication intake and poor disease control are still reported despite ongoing education programs. This study aimed to determine the relationship between patient characteristics, knowledge level, and adherence to antidiabetic medication among T2DM patients at Kuala Lempuing Health Center, Bengkulu City. This research employed an analytic quantitative design with a cross-sectional approach involving 53 respondents selected purposively from January to April 2024. Data on patient knowledge were collected using a validated 12-item questionnaire, while medication adherence was assessed using a modified Morisky Medication Adherence Scale (MMAS-8). Statistical analysis was performed using the Chi-square test with a significance level of $p < 0.05$. Most respondents were female (77.36%), aged 51–68 years (66.04%), and had low education levels (56.60%). The majority had good knowledge (47%) and were categorized as adherent (45%). Chi-square analysis showed significant relationships between education level and knowledge ($p = 0.033$), as well as between education level and adherence ($p = 0.023$). Furthermore, a significant association was found between knowledge level and adherence ($p = 0.043$), indicating that patients with higher knowledge were more likely to comply with treatment. Education level plays a key role in determining both knowledge and adherence to antidiabetic therapy. Enhancing patient understanding through continuous health education and counseling is essential to improve adherence and optimize glycemic control among T2DM patients.

Keywords: Diabetes Mellitus Type 2, Knowledge, Adherence, Education

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INTRODUCTION

Diabetes mellitus (DM) is a non-communicable disease whose prevalence continues to increase significantly worldwide. The World Health Organization (WHO) estimates that the number of people with diabetes in the world will increase from 537 million in 2021 to more than 700 million in 2045 (Magliano & Boyko, 2021). Indonesia is among the top ten countries with the highest number of

people with diabetes in the world, with an estimated prevalence of 10.6% in 2021. The 2018 Riskesdas data shows that the prevalence of diabetes mellitus in Indonesia increased from 6.9% in 2013 to 10.9% in 2018, and this figure is expected to continue to increase along with changes in lifestyle, diet, and low public awareness of the importance of managing this chronic disease (Kemenkes RI, 2018). One of the important pillars in the management of type 2 DM is pharmacological therapy with oral antidiabetic drugs and insulin. However, the effectiveness of treatment is highly dependent on the patient's compliance in taking drugs according to the dose, time, and rules determined by health workers. Non-adherence to therapy can lead to uncontrolled blood glucose levels, increase the risk of complications, and reduce the patient's quality of life (Jimmy & Jose, 2011). Several studies have shown that diabetes adherence to treatment is still low, with non-adherence rates reaching 30-50% in many developing countries, including Indonesia (Kardas et al., 2013).

Adherence in taking antidiabetic drugs is influenced by various factors, including length of illness, complexity of drug regimens, drug side effects, family support, socioeconomic conditions, and the level of patient knowledge about the disease and its therapy (World Health Organization (WHO), 2003). Patients' knowledge of disease and treatment is one of the important determinants in adherence behavior. Patients who have a good understanding of their disease tend to be more able to manage their lifestyle, diet, and medication consumption regularly compared to patients who do not know the importance of blood glucose control (Notoatmodjo, 2010).

A low level of knowledge may lead to misperceptions about the disease and the medications used. On the other hand, well-informed patients will understand that treatment should be continuous, even when blood sugar levels are controlled, to prevent relapse and complications (Pharamita, 2023). This condition is also seen at the primary health care level such as Puskesmas, which plays an important role in controlling chronic diseases through the Prolanis (Chronic Disease Management Program) program. Puskesmas are at the forefront of public health services that provide education, treatment, and monitoring of diabetic patients. However, in some areas, including Bengkulu City, there are still patients who are irregular in control and do not comply with taking medication. This reflects the lack of knowledge and awareness of the importance of pharmacological therapy.

The number of patients with diabetes mellitus recorded in the working area of the Kuala Lempuing Health Center has increased in the last three years. Based on the Puskesmas monthly report, in 2021 there were 214 patients with type 2 DM, increasing to 265 patients in 2023 (Dinas Kesehatan Provinsi Bengkulu, 2023). Despite the increasing number of patients enrolled in the Prolanis program, there are still reports that some patients do not take their medication regularly and rarely make monthly control visits. This phenomenon indicates that there is still a problem in the aspect of education and awareness of the importance of medication adherence. Previous studies have examined the relationship between

knowledge level and medication adherence in patients with type 2 diabetes mellitus. Another study conducted in the tegal area showed that there was a significant relationship between the level of knowledge and adherence to taking medication ($p < 0.05$) (Ruhmiati et al., 2025). Similar results were reported by another study which found that patients with high levels of knowledge were 3 times more likely to adhere to treatment than patients with low knowledge (Marito & Lestari, 2021).

The relationship between the characteristics of type 2 diabetes mellitus patients with the level of knowledge and patient compliance may vary depending on the social, economic, cultural characteristics, as well as the health care system in each region. Therefore, local research in the working area of the Kuala Lempuing Health Center, Ratu Agung Subdistrict, Bengkulu City is important to understand the extent of the relationship between patient characteristics, the level of knowledge of patients with type 2 diabetes mellitus and compliance in taking antidiabetic drugs. The purpose of this study was to determine the relationship between characteristics with the level of knowledge and compliance of patients with type 2 diabetes mellitus in taking antidiabetic drugs.

METHODS

This research is an analytic quantitative research with a cross sectional study design. This approach is used because data collection regarding the level of knowledge and compliance with taking medication is carried out simultaneously at one time without any intervention from the researcher. This design is suitable to determine the relationship between the characteristics of type 2 diabetes patients with the level of knowledge and compliance in a particular population.

This study was conducted in the working area of the Kuala Lempuing Health Center, Ratu Agung District, Bengkulu City from January to April 2024. This area was chosen because it has a large number of type 2 diabetes mellitus patients who are actively undergoing treatment through the Prolanis program. Respondents who were willing to participate in this study were 53 people. Inclusion criteria for respondents in this study are: Patients who have been diagnosed with type 2 diabetes mellitus by a doctor; Patients who get oral antidiabetic drug therapy for at least the last 6 months; Patients who are actively registered in the Prolanis program or do routine controls at the Kuala Lempuing Health Center. This study has obtained ethical eligibility with certificate No. KEPK.BKL/136/04/2024.

Measurement of the level of knowledge of respondents using a knowledge questionnaire (12 questions) regarding patient knowledge about the meaning of Diabetes Mellitus, causes, symptoms, complications, and antidiabetic treatment. While measuring drug compliance in patients with diabetes mellitus using a modified MMAS-8 (Morisky Medication Adherence Scale) questionnaire sheet.

RESULTS AND DISCUSSION

Characteristics of Respondents

Based on the results of research conducted at the Kuala Lempuing Health Center, Ratu Agung District, Bengkulu City, a description of the characteristics of respondents with Type 2 Diabetes Mellitus was obtained (Table 1) based on age distribution, most respondents were in the 51-68year age group (66.04%). Judging from gender, the majority of respondents were female (77.36%). Based on the level of education, most respondents had the last education of elementary school (56.60%). In the employment variable, the majority of respondents were housewives (67.92%) and the majority of respondents had suffered from diabetes mellitus for more than 1 year (77.35%).

Table 1. Characteristic Respondence.

Characteristics		n	Persentage (%)
Age (Years)			
	29-48	12	22.64%
	51-68	35	66.04%
	70-77	6	11.32%
Sex			
	Male	12	22.64%
	Female	41	77.36%
Educations			
	Elementary School	30	56.60%
	Junior High School	9	16.98%
	Senior High School	8	15.09%
	Universities	6	11.32%
Job			
	House Wife	36	67.92%
	Self-Employed	2	3.77%
	Farmer	4	7.55%
	Retired	9	16.98%
Duration of illness (Years)			
	< 1	12	22.64%
	> 1	41	77.35%

Knowledge Level

The proportion of respondents with a good knowledge level indicates that most patients have sufficient understanding of diabetes mellitus, the importance of controlling blood sugar levels, and the role of antidiabetic drugs in disease management. This can be caused by health education from health workers at the Puskesmas and personal experience of patients who have been undergoing treatment for a long time. However, the presence of respondents with moderate and poor knowledge (53%) indicates that not all patients optimally understand the importance of regular treatment and factors that

can affect glycemic control. The relatively low level of education of most respondents could be one of the causes, as the level of education affects a person's ability to receive and understand health information. (Coughlin et al., 2020). In addition, limited access to information and people's habit of relying on personal experience or non-medical information can also affect the level of knowledge.

Level of Adherence

The level of adherence to taking antidiabetic medication showed that almost half of the respondents (45%) were classified as adherent. This shows that some patients already have the awareness to take medication regularly as directed by health workers. This compliance is likely influenced by a good level of knowledge, motivation to maintain health, and support from family in undergoing long-term therapy. Meanwhile, around 34% of respondents were classified as moderately adherence and 21% were not adherence with treatment. This non-adherence can be caused by several factors such as boredom in undergoing long-term treatment, drug side effects, feelings of recovery so that they stop the drug, and lack of understanding of the consequences of stopping taking medication. According to the theory proposed by WHO (2003), adherence to treatment of chronic diseases such as diabetes is influenced by factors of knowledge, motivation, relationships with health workers, and socioeconomic conditions (Lestari et al., 2025).

Relationship between Respondents' Characteristics and Knowledge Level

The characteristics of respondents (Table 1) show that most people with type 2 diabetes mellitus are in the elderly age group. This is in line with the theory that the risk of developing diabetes mellitus increases with age due to decreased insulin receptor sensitivity and changes in glucose metabolism in peripheral tissues (Bolinder et al., 1983). Although most of the respondents with good knowledge were in the 51-68 years age group, the statistical test results showed no significant relationship between age and knowledge level ($p = 0.314$).

Most of the respondents were female (77.36%), indicating that women are more likely to suffer from type 2 diabetes mellitus in the study area. This could be due to hormonal factors, lifestyle, and relatively lower physical activity compared to men (Estoppey et al., 2023). In addition, women often play a role in household affairs, which can affect diet and adherence to therapy. However, the statistical results did not find a significant relationship between gender and knowledge level ($p = 0.613$).

Education level data most respondents had the last education of elementary school (56.60%). The low level of education can affect the patient's understanding of the disease and the treatment being undertaken. Education level is one of the factors that influence people's understanding of health

conditions and healthy lifestyles. (Hoffmann & Lutz, 2019). Chi-square test showed a significant relationship between education and knowledge level (p = 0.033).
In the job variable, most respondents were housewives (67.92%), while others were retired (16.98%), farmers (7.55%), and self-employed (3.77%). The dominance of housewives indicates that most patients do not have high physical activity and tend to have an inactive lifestyle, which is a risk factor for diabetes mellitus (Srivastav et al., 2025). The statistical test results showed no significant relationship between occupation and knowledge level (p = 0.056).

Based on the length of illness, the majority of respondents had suffered from diabetes mellitus for more than 1 year (77.35%), while those who suffered for less than 1 year amounted to 22.64%. Length of illness is related to the patient's adaptation to the treatment regimen and adherence to taking medication (Putera et al., 2023). The test results showed that the length of time suffering from diabetes was significantly associated with the level of knowledge (p = 0.012). This shows that even though patients have had diabetes for a long time, they do not necessarily have good knowledge if they do not get routine education from health workers.

The results of the analysis using the Chi-Square test showed that the variables of education level and duration of diabetes had a significant relationship with the level of knowledge of patients with type 2 diabetes mellitus ($p < 0.05$), while the variables of age, gender, and occupation did not show a significant relationship ($p > 0.05$).

Relationship between Respondents' Characteristics and Adherence Level of Taking Medication

Based on the results of the Chi-square test, education and knowledge level have a significant relationship with adherence to taking antidiabetic drugs ($p < 0.05$). While age, gender, occupation, and length of illness did not show a significant relationship ($p> 0.05$). Although women dominated the respondents with good knowledge, this was more due to the proportion of a larger number of female respondents (77.36%) rather than real differences in knowledge. Statistically, there was no significant relationship between age and adherence level (p = 0.434). Although the 51-68 years age group tended to be more adherence, the difference between age groups was not significant. This suggests that adherence is not only determined by age, but is more influenced by individual awareness and family support.

Respondents with secondary and tertiary education (high school and college) had more good knowledge levels than those with basic education (elementary and junior high school). This is because education level affects the ability to understand medical information and follow health workers' explanations. Statistical tests also showed that education was significantly associated with medication adherence (p = 0.023). Respondents with secondary and tertiary education had better adherence than

those with primary education. A better understanding of the benefits of medication and the risk of complications increases the motivation to take medication regularly.

Respondents with retired and self-employed occupations appeared to have better knowledge, but the difference was not statistically significant. There was no significant association between occupation and adherence (p = 0.280). Respondents with active jobs (farmers and self-employed) tended to have lower adherence due to time constraints and busy activities, but the difference was not statistically significant. Similarly, the statistical test results showed no significant relationship between length of illness and adherence (p = 0.106). Respondents who have suffered for more than one year tend to have better adherence levels due to repeated education from health workers and personal experience in managing their disease, although saturation in long-term treatment can also affect adherence levels.

Overall, the characteristics of the respondents showed that most of the patients with type 2 diabetes mellitus in this study were elderly women with low education levels and more than one year of illness. The factors potentially affecting the level of adherence in taking antidiabetic drugs are the latest education while the variables of age, gender, occupation, and length of illness do not show a significant relationship. Research conducted in the U.S. found that adherence was independently associated with older age, male gender, higher education, higher income, and higher income (Kirkman et al., 2015).

Relationship between knowledge and medication adherence

In general, the results of this study showed a tendency that respondents with good knowledge tended to be more adherence in taking antidiabetic drugs. The results of the Chi-square test between the level of knowledge and the level of compliance showed a p value = 0.043 (p < 0.05), which means that there is a significant relationship between knowledge and compliance with taking antidiabetic drugs. Respondents with good knowledge were mostly included in the medication adherence group. This shows that knowledge plays an important role in shaping patient compliance behavior. Patients who understand the benefits of drugs and the consequences if they do not comply will be more motivated to follow the therapy as recommended by the doctor. The better the knowledge of diabetics about treatment, the higher the level of compliance in taking medication (Sinaga & Ahmed, 2024). Good knowledge allows patients to understand the benefits of treatment and the risk of complications if they are not adherence, thus increasing motivation to carry out therapy consistently.

Table 2. Knowledge Level and Adherence to Antidiabetic Medication Use (n=53)

Knowledge Level	**n**	**Persentage (%)**	**P Value**
Good	25	47%	
Moderate	22	42%	
Poor	6	11%	0.043
Compliance Level			

Adherence	24	45%
Moderately Adherence	18	43%
Non-adherence	11	

Another study revealed that education combined with support from healthcare professionals and family can significantly improve adherence rates (Contreras-Vergara et al., 2022). Patients who received pharmacist-provided education showed a significant increase in adherence scores, which correlated with better clinical outcomes, Improved adherence through education resulted in better glycemic control. Studies reported significant reductions in capillary glucose, glycosylated hemoglobin, blood pressure, cholesterol, and triglycerides that went hand in hand with improved medication adherence after education (Williams et al., 2014). This supports that education not only improves adherence but also produces meaningful health outcomes. The findings in this study confirm the importance of ongoing health education and individualized assistance to people with diabetes mellitus, especially those with low education and newly diagnosed, in order to improve knowledge and adherence to antidiabetic medication use.

CONCLUSION

Education level showed a significant relationship with both knowledge and medication adherence variables. Thus, it can be concluded that increasing knowledge through health education plays an important role in improving adherence of patients with diabetes mellitus to antidiabetic treatment. Efforts to provide continuous information, individual counseling, and family support are expected to improve adherence levels and optimize disease control. Respondents with a good level of knowledge tend to be more compliant with drug therapy.

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DECLARATION OF INTEREST STATEMENT

The authors declare that they have no conflict of interests.

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