



THE EFFECT OF KNOWLEDGE LEVEL ON THERAPEUTIC ADHERENCE IN TYPE II DIABETES MELLITUS PATIENTS AT THE ADAN-ADAN HEALTH CENTER, KEDIRI REGENCY

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Abstract

Diabetes mellitus (DM) is a chronic disease with a high mortality rate, characterized by elevated blood sugar levels due to insulin dysfunction. Treatment success is influenced by patient adherence to antidiabetic medication, which is also affected by the level of knowledge in controlling the disease and preventing complications. The purpose of this study was to determine the effect of knowledge level on therapy adherence in outpatients at the Adan-Adan Health Center, Kediri Regency. The type of research conducted used quantitative research that was analytic in nature with a cross sectional approach. Sampling using non probability sampling with incidental sampling technique. The research instrument used DKQ-24 and MMAS- 8 questionnaires that have been tested for validity and reliability. Data analysis used is simple linear regression test. The results of the analysis conducted on 100 respondents found 76% of respondents had a moderate level of knowledge, 14% low, and 10% high. While at the level of adherence, 49% of respondents had a moderate level of adherence, 38% were low, and 13% were high. The conclusion of this study is that there is an influence between the level of knowledge about diabetes and adherence to the use of antidiabetic drugs, this is evidenced by a significance value of 0.000 and the value of t count > t table. Then the influence between the level of knowledge and adherence is 24.9%.

Keywords: *Type 2 diabetes mellitus; Knowledge; Adherence; DKQ-24; MMAS-8.*

Introduction

Diabetes mellitus is a heterogeneous metabolic disorder characterized by hyperglycemia due to impaired insulin secretion, impaired insulin action, or both (Punthakee *et al.*, 2018). Diabetes can be diagnosed by demonstrating an increase in glucose concentration in venous plasma or an increase in A1C in the blood. Diabetes is conventionally classified into several clinical categories (e.g., type 1 or type 2 diabetes, gestational diabetes mellitus, and other specific types arising from other causes, such as genetic causes, exocrine pancreatic disorders, and medications) (American Diabetes Association, 2024). Type 2 diabetes mellitus (T2DM) is one of

the most common metabolic disorders worldwide. More than 90% of diabetes mellitus cases are T2DM (Galicia-Garcia *et al.*, 2020).

According to the 2021 report from the International Diabetes Federation (IDF), the global number of people living with diabetes reached 537 million, equivalent to 10.5% of the adult population. In Indonesia, the number of diabetes cases has increased rapidly over the past decade, reaching 19.5 million people, or approximately 7% of the population. This places Indonesia as the fifth-ranked country globally in terms of the highest number of diabetes cases (IDF Diabetes Atlas, 2024). Based on a health report by the East Java Health Office in 2021, the number of people with diabetes mellitus in East Java is estimated to reach 867,257 (Dinkes Provinsi Jatim, 2022).

The increasing prevalence of diabetes mellitus requires effective management to prevent complications and ensure glycemic control, where adherence to therapy is a key determinant of successful treatment outcomes (Almira *et al.*, 2019). Adherence is an individual's action in implementing recommendations from medical personnel regarding medication, diet, and a healthy lifestyle in accordance with recommendations (WHO, 2003). Non-adherence to diabetes mellitus treatment can be caused by a lack of knowledge.

Good knowledge among patients with diabetes mellitus is an important factor in disease control, as it enhances medication adherence and contributes to improved glycemic control (Menino *et al.*, 2017). In patients with type 2 diabetes mellitus (T2DM), adequate knowledge improves understanding of treatment information and consequently enhances medication adherence, whereas insufficient knowledge may reduce adherence, increase the risk of complications, and raise treatment costs. Therefore, this study aims to evaluate treatment knowledge and medication adherence, as well as to analyze the relationship between these two variables in patients with T2DM.

Materials and Methods

This study is a quantitative study with an observational analytical design using a cross-sectional approach, which allows for the measurement of variables at a specific point in time without any intervention from the researcher. This study was conducted at the Adan-Adan Community Health Center, Kediri Regency, which was chosen as the location for the study because it has a high number of type II diabetes mellitus patients. The study was conducted from October to November 2024, after obtaining permission from the Malang University Ethics Committee, as stated in letter No. 25.10.4/UN32.14.2.8/LT/2024.

The population in this study included all type II diabetes mellitus patients undergoing treatment at the Adan-Adan Community Health Center. To ensure that the sample used was relevant to the research objectives, inclusion criteria were established, which included patients who had been diagnosed with type II diabetes mellitus by a doctor, were undergoing therapy with oral hypoglycemic drugs or insulin, and were willing to participate by signing an informed consent form. Conversely, patients with severe comorbidities other than diabetes mellitus and those with cognitive impairments that could hinder their understanding of the questionnaire were excluded from this study. Sampling was conducted using a non-probability sampling method with incidental sampling technique, where respondents were selected based on availability and ease of contact during the study. Non-probability sampling is a sampling technique that does not provide equal opportunities for each member of the population to be selected as a sample.

The independent variable in this study was patients' knowledge of type II diabetes mellitus, while the dependent variable was diabetes therapy adherence. Knowledge was assessed using the Diabetes Knowledge Questionnaire (DKQ-24), and therapy adherence was assessed using the Morisky Medication Adherence Scale-8 (MMAS-8). The DKQ-24 questionnaire developed by Larasati *et al.* consists of 24 items with three response options: yes, no, and do not know. Correct answers were scored 1, whereas incorrect and "do not know" responses were scored 0, resulting

in a total score ranging from 0 to 24. Higher scores indicate better patient knowledge regarding diabetes (Almira dkk, 2019).

Patient treatment adherence was assessed using the MMAS-8 instrument developed by Anggraini and Puspasari. The instrument consists of eight items, with yes/no response options for items 1–7 and graded response options for item 8. For unfavorable questions (questions 1, 2, 3, 4, 6, and 7), the answer “no” is given a score of 1, while “yes” is given a score of 0. Conversely, for favorable questions (question 5), the answer ‘yes’ is given a score of 1, while “no” is given a score of 0. For question number 8, which is classified as unfavorable, the scores vary, with always = 0, usually = 0.25, sometimes = 0.5, rarely = 0.75, and never forget = 1. The final score is calculated by summing all the points obtained, with a range of values from 0 to 8. The higher the score, the better the patient's compliance with diabetes treatment (Anggraini dkk, 2019).

The research procedure began with explaining the purpose and benefits of the study to the respondents. After understanding the information provided, respondents who were willing to participate signed an informed consent form before being asked to complete the DKQ-24 and MMAS-8 questionnaires. Data collection was conducted through face-to-face interviews guided by the researcher to ensure that each respondent understood the questions asked. After all questionnaires were collected, the data obtained was checked for completeness before proceeding to the analysis stage.

Data analysis was performed using SPSS software version 20. To obtain an overview of the characteristics of the respondents, univariate analysis was performed, which included the distribution of demographic characteristics, knowledge levels, and therapy compliance. Furthermore, the relationship between knowledge level and therapy adherence was analyzed using a simple linear regression test. In this analysis, the significance level was set at $p < 0.05$, with a confidence interval (CI) of 95%, so that it could be determined whether there was a meaningful relationship between the two variables studied.

Results and Discussion

Demographic Data

This study involved 100 participants, whose demographic details are presented in Table 1. The majority of participants were in the 55-64 age group (50%) and were predominantly female. In terms of education level, 40% of participants had elementary school education and only 2% had D4/S1 education. Regarding employment, 58% of participants were recorded as workers, while 43% were unemployed.

Table 1. Social demographics of research participants (n= 100)

Details	n (%)
Age (years)	
25-34	0(0)
35-44	2(2)
45-54	35(35)
55-64	50(50)
65-75	13(13)
Gender	
Male	19(19)
Female	81(81)
Level of education	
SD	40(40)
SMP	29(29)
SMA	25(25)
D3	4(4)
D4/S1	2(2)
Work	

Working	58(58)
Not Working	42(42)

Based on the data in the table above, it can be seen that age, gender, education level, and occupation influence the occurrence of diabetes. Age is one of the factors that contribute to diabetes. As we age, the body experiences a decline in physiological functions, especially in the pancreas, which can lead to a decrease in insulin secretion or insulin resistance. As a result, the body's ability to control high blood glucose levels becomes less effective (Puspitasari dkk, 2022). Gender is one of the factors associated with the risk of type 2 diabetes mellitus. Women tend to have a greater risk of developing type II diabetes mellitus. This is due to higher cholesterol levels in women compared to men. Men have a body fat percentage of between 15-20% of their body weight, while women have a body fat percentage of between 20-25%. As a result, women have higher body fat levels than men, with a 3-7 times higher risk of diabetes mellitus compared to men, who have a 2-3 times higher (Agustina dkk, 2024). Educational level has a strong correlation with the incidence of diabetes mellitus. Individuals with higher educational levels generally have better knowledge about health, including attention to lifestyle and efforts to prevent diabetes mellitus. With this knowledge, a person will be more aware of maintaining their health (Puspitasari dkk, 2022)..

Diabetes Knowledge Questionnaire

Participant scores for each question are tabulated in Table 2. It can be seen that questions 1, 3, 4, 11, 12, and 17 were answered incorrectly by most participants. Based on question 1, almost all participants (93.93%) had the misconception that excessive consumption of sugar and sweet foods can cause diabetes. A large number of participants (98.98%) thought that diabetes was caused by the kidneys' failure to keep sugar out of the urine. Almost as many participants (84.84%) did not know that there are two types of diabetes, type 1 and type 2 (non insulin dependent). Many participants (90.90%) thought that insulin reactions (severe hypoglycemia) were caused by eating too much. Finally, most respondents (84.84%) did not know that people with diabetes should not clean wounds with iodine and alcohol.

Table 2. Number of respondents who answered the diabetes knowledge questionnaire correctly

Questions	n (%)
1. Eating too much sugar and other sweet foods causes diabetes.	7(7%)
2. A common cause of diabetes is a lack of effective insulin in the body.	24(24%)
3. Diabetes is caused by the kidneys' failure to filter sugar from urine.	2(2%)
4. The kidneys produce the hormone insulin.	4(4%)
5. In untreated cases of diabetes, blood sugar levels usually rise.	95(95%)
6. If I have diabetes, my children have a greater chance of developing diabetes.	75(75%)
7. Diabetes can be cured.	61(61%)
8. A fasting blood sugar level of 210 is too high.	84(84%)
9. The best way to check for diabetes is to have a urine test.	75(75%)
10. Regular exercise increases the need for insulin or other diabetes medications.	49(49%)
11. There are two types of diabetes: type 1 (insulin-dependent) and type 2 (insulin-resistant).	16(16%)
12. Insulin reactions are caused by eating too much.	10(10%)
13. Treatment is more important than maintaining a healthy diet and exercising to control my diabetes.	72(72%)

14. Diabetes often causes poor circulation.	76(76%)
15. Wounds and cuts on people with diabetes take longer to heal.	79(79%)
16. People with diabetes should be more careful when cutting their nails.	63(63%)
17. A person with diabetes should clean their wounds with iodine and alcohol.	16(16%)
18. How I prepare my food is just as important as the food I eat.	88(88%)
19. Diabetes can damage my kidneys.	71(71%)
20. Diabetes can cause numbness in my hands, fingers, and feet.	87(87%)
21. Trembling and sweating are signs of high blood sugar levels.	41(41%)
22. Frequent urination and feeling thirsty are signs of low blood sugar levels.	46(46%)
23. Tight elastic stockings or socks are not bad for people with diabetes.	59(59%)
24. The diet of people with diabetes consists mostly of special foods.	32(32%)

Knowledge levels are categorized as high if the score is in the range of 17-24, moderate if the score is in the range of 10-16, and low if the score is in the range of 0-9. The categorization of respondents' knowledge levels about diabetes mellitus can be seen in Table 3.

Table 3. Categorization of knowledge levels about diabetes mellitus

Score range	Category	n (%)
0-9	Rendah	14(14%)
10-16	Sedang	76(76%)
17-24	Tinggi	10(10%)

It can be seen that most of the knowledge level about diabetes among type 2 diabetes patients at the Adan Adan Community Health Center in Kediri Regency is in the moderate category, namely 76 respondents (76%).

Morisky Medication Adherence Scale-8

The MMAS-8 instrument has been widely used to measure medication adherence in diabetic patients. Table 4 shows the number and percentage of respondents who answered each questionnaire question.

Table 4. Number of respondents who correctly answered the questionnaire on adherence to antidiabetic medication

Questions	n (%)
1. Do you sometimes forget to take your diabetes medication?	64(64%)
2. Try to remember, were there any days in the past two weeks when you did not take your diabetes medication?	61(61%)
3. If you feel that your condition worsens when taking your diabetes medication, do you stop taking it?	95(95%)
4. When traveling or leaving home, do you sometimes forget to bring your medication?	65(65%)
5. Did you take your diabetes medication yesterday?	76(76%)
6. If you feel your condition has improved, have you ever stopped taking or not used your diabetes medication?	73(73%)
7. Does taking medication every day make it difficult for you to adhere to your treatment?	80(80%)
8. How often do you have difficulty remembering to take your medication?	64(64%)

Compliance is categorized as high if you score 8, moderate if you score between 6 and 7, and low if you score between 1 and 5. The categorization of respondents' compliance levels for diabetes mellitus patients can be seen in Table 5.

Table 5 Categorization of antidiabetic medication compliance levels

Score range	Category	n (%)
1-5	Low	38(38%)
6-7	Medium	49(49%)
8	High	13(13%)

It can be seen that the level of compliance of type II diabetes mellitus patients at the Adan-Adan Community Health Center in Kediri Regency in consuming antidiabetic drugs is in the moderate category, namely 49 respondents (49%). This means that most outpatients at the Adan-Adan Community Health Center are not compliant in consuming the prescribed antidiabetic drugs.

Simple Linear Regression Analysis

Table 6. Results of simple linear regression analysis

Model	Unstandardized Coefficients	t	Sig.
	B.		
Knowledge	235	5.702	.000

Based on Table 6, the significance value (Sig.) obtained was 0.000, which is smaller than the significance value of 0.05. Therefore, it can be concluded that there is an influence between the level of knowledge and the level of therapy compliance in patients with type 2 diabetes mellitus at the Adan-Adan Community Health Center in Kediri Regency. This can be seen from the t-value of 5.702. Then, in this study, a t-table value of 1.984 was obtained, which was calculated using the formula ($\alpha/2$; n-k-1). Based on these results, it can be said that the t-count value is greater than the t-table value, so it can be concluded that there is an effect between the level of knowledge and the level of therapy compliance in type 2 diabetes mellitus patients at the Adan-Adan Community Health Center in Kediri Regency.

Coefficient of Determination

Table 7. The result of the coefficient of determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.499 ^a	.249	.241	1.16469

Based on Table 7, it can be seen that the correlation coefficient (R) value of 0.499 from the output obtained a coefficient of determination or R Square value of 0.249. Therefore, it can be said that the influence of knowledge level on therapy compliance among type 2 diabetes mellitus patients at the Adan-Adan Community Health Center is 24.9%, while the remaining 75.1% is determined by other factors not examined in this study.

Discussion

This study aims to determine the level of knowledge of patients regarding type 2 diabetes mellitus (DM), identify the level of therapy adherence of type 2 DM patients, and analyze the effect of knowledge level on therapy adherence in type 2 DM patients at the Adan-Adan Community Health Center in Kediri Regency. The study was conducted by distributing questionnaires related to knowledge levels and therapy adherence levels to determine the

relationship between the two. Table 1 shows that the majority of participants in this study were female, with a total of 81 participants. These results are in line with data on the number of type 2 diabetes mellitus patients at the Adan-Adan Community Health Center in 2024, which shows that there are more female patients than male patients, with 785 (79.13%) female patients and 207 (20.87%) male patients. These results are in line with existing theory, which states that women tend to have a greater risk of developing type 2 diabetes mellitus (Agustina dkk, 2024). This is caused by higher cholesterol levels in women compared to men. In addition, this is caused by a decrease in estrogen levels, especially during menopause (Arania dkk, 2021). Postmenopausal women who experience monthly syndrome facilitate the accumulation of body fat distribution, thereby increasing their susceptibility to type 2 diabetes mellitus (Rohmatulloh dkk, 2024). This is also in line with research findings showing that participants were predominantly in the 55-64 age group, at which age women have already experienced menopause.

Based on the questionnaire results (Table 2), almost all participants (93.93%) believed that excessive sugar consumption was the main cause of diabetes. Sugar is not the main cause of diabetes, but it can increase the risk of developing type 2 diabetes (Astutisari dkk, 2022); (Tarmizi dan Siregar, 2024). Lifestyle changes have been linked to an increased risk of developing type 2 diabetes. Therefore, respondents may have misunderstood the concept that excessive consumption of sweet foods can cause diabetes. A large number of participants (98.98%) thought that DM was caused by the kidneys' failure to keep sugar out of the urine. This shows that there is a misconception that DM occurs due to hyperglycemia caused by insulin disorders (Sulastris dkk, 2021). This misunderstanding may be due to the fact that kidney disease is a common but dangerous complication in people with type 2 diabetes. Most participants (84.84%) were unaware that there are two types of diabetes, namely type 1 and type 2. Knowing the type of diabetes a patient has is very important, as it affects how they understand, manage, and respond to their disease. Many participants (90.90%) thought that insulin reactions (severe hypoglycemia) were caused by eating too much. This misconception can be dangerous because it can cause patients to not take the appropriate steps to prevent or treat hypoglycemia. Finally, most respondents (84.84%) did not know that people with diabetes should not clean wounds with iodine and alcohol. This misconception can increase the risk of complications and reduce the patient's quality of life. Another study conducted by Laili et al. (2023) showed that the majority of patients' knowledge of type 2 DM at the X Community Health Center in Kediri City was in the moderate category (Laili dkk, 2017). These results are in line with the results of this study (Table 3), where the majority of participants had knowledge in the moderate category.

The Morisky Medication Adherence Scale-8 (MMAS-8) questionnaire was used to assess the level of adherence among type 2 DM patients at the Adan-Adan Community Health Center in Kediri Regency. Almost all participants (95.95%) correctly answered that stopping antidiabetic medication without consulting a doctor could be risky. Most participants (73.73%) also understood that antidiabetic drug therapy is only administered to maintain normal blood sugar levels, so they continued to take their medication to prevent complications (Sholihah dkk, 2023). The study also showed that participants (80.80%) agreed that taking medication every day was not a reason for not complying with the prescribed therapy. The questionnaire results showed that the majority of participants had a moderate level of compliance (Table 5). These results were directly proportional to the percentage of respondents' knowledge of diabetes mellitus, which was categorized as moderate. Simple linear regression analysis shows that the level of knowledge affects the level of therapy compliance in type 2 DM patients at the Adan-Adan Community Health Center in Kediri Regency (p -value<0.05). However, the effect is only 24.9%, while the remaining 75.1% is determined by other factors not examined in this study. These results are in line with the study by Tresnayanti et al. (2023), which obtained the same results (Tresnayanthi, 2023). The better the patient's knowledge about medication adherence, the higher their level of adherence (Sidrotullah, 2023).

Conclusion

The majority of respondents at the Adan-Adan Community Health Center, Kediri Regency, had a moderate level of knowledge regarding type II diabetes mellitus, accounting for 76% of the participants. Similarly, most respondents demonstrated a moderate level of adherence to type II diabetes mellitus therapy, representing 49% of the participants. A significant relationship was found between knowledge level and therapy adherence among patients with type II diabetes mellitus, as indicated by a significance value of 0.000 and a t-value > t-table value. Furthermore, knowledge level contributed 24.9% to therapy adherence among patients with type II diabetes mellitus.

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References

1. Z. Punthakee, R. Goldenberg, and P. Katz. (2018) "Definition, Classification and Diagnosis of Diabetes, Prediabetes and Metabolic Syndrome," *Can. J. Diabetes*, vol. 42, pp. S10–S15, doi: 10.1016/j.jcjd.2017.10.003.
2. A. D. Association. (2024) "Introduction and Methodology :Standards of Care in Diabetes—2024," *Diabetes Care*, vol. 47, no. January, pp. 1–4, doi: <https://doi.org/10.2337/dc24-SINT>.
3. U. Galicia-garcia et al.(2020) "Pathophysiology of Type 2 Diabetes Mellitus," *International Journal of Molecural Sciences*, vol. 21, pp. 1–34, doi: 10.3390/ijms21176275.
4. I. F. (2024) Diabetes, "IDF Diabetes Atlas 10th edition." Accessed: Feb. 26. [Online]. Available: <https://diabetesatlas.org/>
5. Dinas Kesehatan Provinsi Jatim. (2022) Profil Kesehatan 2021. Dinas Kesehatan Provinsi Jawa Timur.
6. N. Almira, S. Arifin, dan Rosida. L. (2019) "Kepatuhan Minum Obat Anti Diabetes Pada Penderita Diabetes Melitus Tipe 2 Di Puskesmas Teluk Dalam Banjarmasin". *Homeostasis*, 2:1–12.
7. World Health Organization (WHO). (2003) Adherence To Long-Term Therapies Evidence For Action, World Health Organization.
8. E. Menino, M. Dos, and M. Clarisse. (2017)"Validation of Diabetes Knowledge Questionnaire (DKQ) in the Portuguese Population," *Diabetes Obes. Int. J.*, vol. 2, no. 1, pp. 1–8.
9. T. D. Anggraini and N. Puspasari. (2019) "Tingkat Kepatuhan Penggunaan Obat Antidiabetik Pada Pasien Diabetes Melitus Tipe 2 Di Apotek Sehat Kabupaten Boyolali," *Indonesian Journal On Medical Science*, vol. 6, no. 2, pp. 1–8.
10. D. Puspitasari, M. B. A. Kadir dan Nisa, D. (2022) "Hubungan Kepatuhan Penggunaan Obat Terhadap Kadar Gula Darah Dan Kualitas Hidup Pasien Diabetes Mellitus Di Puskesmas Kandangan Kabupaten Kediri", *Jurnal Mahasiswa Kesehatan*, 3: 213–236.
11. I. S. Agustina, Y. Hasneli, and E. Erwin. (2024) "Pengaruh Senam Apiyu Terhadap Kadar Glukosa Darah Pasien Diabetes Mellitus (DM) Tipe II Di Puskesmas Rejosari Kota Pekanbaru," *Jurnal Medika Nusantara*, vol. 2, no. 1, pp. 89–101.
12. R. Arania, T. Triwahyuni, F. Esfandiari, and F. R. Nugraha. (2021) "Hubungan Antara Usia, Jenis Kelamin, Dan Tingkat Pendidikan Dengan Kejadian Diabetes Mellitus Di Klinik Mardi Waluyo Lampung Tengah," *Jurnal Medika Malahayati*, vol. 5, no. 3, doi: 10.33024/jmm.v5i3.4200.

13. V. R. Rohmatulloh, R. Riskiyah, B. Pardjianto, and L. S. Kinasih. (2024) “Hubungan usia dan jenis kelamin terhadap angka kejadian diabetes melitus tipe 2 berdasarkan 4 kriteria diagnosis di Poliklinik Penyakit Dalam RSUD Karsa Husada Kota Batu,” *PREPOTIF: Jurnal Kesehatan Masyarakat*, vol. 8, no. 1, pp. 2528–2543.
14. I. D. A. E. C. Astutisari, A. Y. D. AAA Yuliati Darmini, and I. A. P. W. Ida Ayu Putri Wulandari. (2022) “Hubungan Pola Makan Dan Aktivitas Fisik Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe 2 Di Puskesmas Manggis I,” *Jurnal Riset Kesehatan Nasional*, vol. 6, no. 2, doi: 10.37294/jrkn.v6i2.350.
15. M. Tarmizi and F. A. Siregar. (2024) “Hubungan faktor metabolik dan konsumsi makanan minuman manis dengan kadar gula darah pada usia 30-60 tahun di Puskesmas Simalingkar,” *Tropical Public Health Journal*, vol. 4, no. 1, pp. 27 34.
16. N. H. Dewi, E. Rustiawati, and T. Sulastri. (2021) “Analisis Faktor-Faktor Yang Berpengaruh Terhadap Kejadian Hiperglikemia Pada Penderita Diabetes Mellitus Tipe 2 Di Poliklinik Penyakit Dalam Rsud Dr. Dradjat Prawiranegara Serang,” *Jurnal Ilmiah Keperawatan*, vol. 7, no. 3.
17. N. F. Laili, N. Probosiwi, and T. Ilmi. (2023) “Hubungan Karakteristik Responden Terhadap Pengetahuan Pada Pasien Diabetes Mellitus di Puskesmas X Kota Kediri,” *Jurnal Inovasi Farmasi Indonesia (JAFI)*, vol. 4, no. 2, doi: 10.30737/jafi.v4i2.4552.
18. S. H. Sholihah, N. A. Milla, E. Retnowati, N. Manik, and A. Akhyasin. (2023) “Evaluasi Pengetahuan Pasien Terhadap Aturan Minum Obat Antidiabetes Mellitus,” *IJF (Indonesia Jurnal Farmasi)*, vol. 8, no. 1, pp. 16–23.
19. K. A. S. Tresnayanthi, A. N. Mahendra, A. W. Indrayani, and I. W. Sumardika. (2023) “The effect of knowledge level of type ii diabetes mellitus patients on outpatient compliance with oad therapy at community health centers of gianyar district during the covid-19 pandemic,” *E-Jurnal Medika Udayana*, vol. 12, no. 7, doi: 10.24843/mu.2023.v12.i07.p07.
20. M. Sidrotullah, N. Radiah, and E. Meditia. (2023) “Hubungan Tingkat Pengetahuan Dengan Kepatuhan Minum Obat Pada Pasien Diabetes Mellitus Tipe 2 di Puskesmas Montong Betok Kecamatan Montong Gading Lombok Timur Tahun 2022,” *Jurnal Ilmu Kesehatan dan Farmasi*, vol. 10, no. 2, doi: 10.51673/jikf.v10i2.1393.