

**RELATIONSHIP OF PATIENT CHARACTERISTICS WITH MEDICATION ADHERENCE IN TYPE 2 DM****Esri Rusminingsih*, Romadhani Tri Purnomo**

Nursing Study Program, Faculty of Health and Technology, Universitas Muhammadiyah Klaten, Jl. Jombor Indah No.KM. 1, Karangturi, Buntalan, Klaten Tengah, Kabupaten Klaten, Central Java 57419, Indonesia

*esrirusminingsih@yahoo.co.id**ABSTRACT**

Indonesia is predicted to have the seventh-highest number of people with type 2 DM worldwide in 2030. Consistent adherence to taking medication as prescribed is the key to diabetes self-care. Poor treatment adherence is associated with poor glycemic control, microvascular and macrovascular complications, and increased care costs. Treatment success is influenced by patient adherence to treatment which is a major factor in therapy outcomes. Objective to identify the relationship between patient characteristics and adherence to medication for patients with type 2 diabetes. This type of research is an analytic observational study with a cross-sectional approach. The samples used were 126 patients who were taken using a purposive sampling technique according to the inclusion criteria: being diagnosed with type 2 diabetes mellitus and receiving a prescription for antidiabetic drugs. The medication adherence instrument used the Morisky Medication Adherence questionnaire (MMAS-8). Data were analyzed using descriptive statistics and the Kendal-tau test. Adherence to taking medication in patients with Type 2 DM was mostly moderate (54%). There was a significant relationship between age ($p=0.043$), education level ($p=0.000$), gender ($p=0.008$), duration of suffering from Type 2 DM ($p=0.000$), frequency of taking medication ($p=0.001$), comorbidities ($p=0.000$), with adherence to taking DM medication. Still, there was no significant relationship between work type and adherence to DM medication ($p=0.333$). Type 2 DM patients mostly have a moderate level of medication adherence. Medication Compliance in Patients with Type 2 DM is influenced by several factors, including age, gender, education level, duration of suffering from DM, number of drugs taken, frequency of medication, and comorbidities.

Keywords: compliance with medication; patient; type 2 diabetes mellitus**First Received**

27 June 2022

Revised

22 July 2022

Accepted

12 August 2022

Final Proof Received

10 August 2022

Published

28 August 2022

How to cite (in APA style)

Rusminingsih, E., & Purnomo, R. (2022). Relationship of Patient Characteristics with Medication Adherence in Type 2 DM. *Indonesian Journal of Global Health Research*, 4(3), 603-610. <https://doi.org/10.37287/ijghr.v4i3.1316>.

INTRODUCTION

Indonesia is predicted to have the seventh-highest people with type 2 DM in the world in 2030, with a total of 13.7 million sufferers (International Diabetes Federation, 2019). An absolute increase occurred in the population aged 20-79, from 246 to 418 million (Bilous, R. & Donnelly, 2014). Diabetes Mellitus is a health problem in an ever-increasing population with an increased risk of cardiovascular disease and microvascular complications that can reduce the quality of life and cause premature death (Sánchez-Hernández et al., 2020). Annual health care costs for patients with Type 2 DM are two to three times higher than those of the same age and sex without diabetes. Eighty percent of medical expenses are spent on the treatment of complications (Zhang et al., 2020).

Diabetes mellitus is a chronic disease that requires long-term and complex treatment, where one of the determinants of the success of therapy depends on adherence to drug use. One of

the pillars of managing diabetes is pharmacological intervention in the form of oral hypoglycemic drugs. Treatment success is influenced by patient adherence to treatment which is a major factor in therapy outcomes. Poor adherence to oral hypoglycemic drugs plays a major role in treatment failure and glycemic control in Type 2 DM patients (Kharjul, Cameron, & Braund, 2019).

The standard of care in managing diabetic patients is glycemic control based on an HbA1c level of 7%. Glycemic control through healthy lifestyle behaviors and adherence to antidiabetic medication is associated with a reduced risk of developing microvascular and macrovascular complications. Still, less than 50% of diabetic patients can achieve optimal glycemic targets. Health services". Adherence to taking medication as prescribed consistently is the key to diabetes self-care. There is a relationship between medication adherence and quality of life in diabetic and hypertension patients who check at the Public Health Center (Mallah et al., 2019). Poor medication adherence are associated with poor glycemic control and make Type 2 DM patients more often hospitalized in hospitals (Trief et al., 2022),(Khayyat et al., 2019). Achieving blood glucose levels ideal and maintaining levels requires good medication adherence, a controlled diet, and increased physical activity.

It is estimated that most patients become non-adherent to treatment after six months of treatment initiation. There is an inverse relationship between adherence to oral antidiabetic drugs and HbA1c levels. Each 10% increase in adherence was associated with a 0.1% decrease in HbA1c ($p < 0.001$) (Ayoub et al., 2019). Non-adherence of diabetics in treatment is still one of the challenges for health workers in providing services to the community that are important and critical in diabetes management. Only 36-93% is the prevalence of hypoglycemic medication adherence.(Olickal et al., 2021) Patients with diabetes who do not adhere to medication have significantly worse clinical outcomes than patients who adhere to medication (Mallah et al., 2019). Medication nonadherence increases the cost of care (Denicolò, Perco, Thöni, & Mayer, 2021). Medication nonadherence also impacts the incidence of complications such as heart disease, kidney failure, stroke, and eye damage. Factors that influence medication nonadherence include patient factors, demographic factors, socio-economic factors, duration or duration of illness, and disease severity (Rasdianah, Martodiharjo, Andayani, & Hakim, 2016). Adherence to prescribed drugs is related to the quality of life of patients with type 2 diabetes mellitus (Farhat et al., 2019). Complex, polypharmacy, and drug side effects. This study aims to identify the relationship between patient characteristics and adherence to medication for patients with type 2 diabetes.

METHOD

This research is a cross-sectional study conducted at the Ceper Health Center, Klaten Regency, Central Java Province, Indonesia, in June – August 2021. The population in this study were all patients with type 2 Diabetes Mellitus who were registered at the Ceper Klaten Health Center, totaling 183 patients. The minimum sample size was calculated using the Slovin formula, obtaining 126 respondents. The inclusion criteria were being diagnosed with type 2 diabetes mellitus and receiving a prescription for antidiabetic drugs. The exclusion criteria were when the respondent could not communicate or had cognitive impairment. All willing-to-be samples are invited to the PROLANIS activity at the Ceper Health Center. Then respondents are asked to fill in demographic data, including age, gender, education level, occupation, and clinical data, namely length of suffering from Type 2 DM, comorbidities, and number and types of antidiabetic drugs consumed. In addition, the frequency of taking antidiabetic drugs. Finally, medication adherence was assessed from self-reported drug-taking behavior using the MMAS-8.

RESULTS

Characteristics of Type 2 DM Patients

Based on the study presented in Table 1 shows that most of the adult patients were 112 people (88.9%) with a mean age of 50.32+7.72 years. The gender of the patients were mostly women, as many as 75 people (59.5%), education mostly high school 47 people (37.3%), most of them working 71 people (56.3). Clinical data shows that the majority of patients suffer from Type 2 DM for more than one year, the majority take a combination of antidiabetic drugs 76 people (60.3%), the majority of patients have comorbidities 73 people (57.9%), and most of the medication adherence is in the moderate category—sixty-eight people (54%).

Table 1.
Characteristics of Type 2 DM (n = 126)

Characteristicd of respondents		f	%	Mean +SD
Age	Adult	112	88,9	50,32+7,72
	Elderly	14	11,1	
Sex	Male	51	40,5	59,5
	Female	75	59,5	
Education level	Did not finish elementary school	4	3,2	21,4
	Elemntary school	27	21,4	
	Middle school	39	31	
	High school	47	37,3	
	Bachelor	9	7,1	
Work	Not working	55	43,7	56,3
	Work	71	56,3	
Long Suffering from Type 2 DM	< 1 year	41	32,5	67,5
	≥ 1 year	85	67,5	
Amount of medication taken	Combination	76	60,3	39,7
	Single	50	39,7	
Fequency of taking medicine	> 1 time	74	59,5	40,5
	1 time	51	40,5	
Co-morbidities	None	53	42,1	57,9
	Exist	73	57,9	
Medication adherence	Low	26	20,6	54
	Medium	68	54	
	High	32	25,4	

Compliance with Medication for Type 2 DM Patients

The data presented in Table 2 shows that most answered "no" to question 1 (52.4%), question 2 (98.4%), question 3 (88.1%), question 4 (63.5), question 6 (96%), question 7 (87.3%), and question 8 (72.2%). A total of (47.6%) had forgotten to take antidiabetic drugs.

Table 2.
Profil of Drug Adherence to Type 2 DM

Question 1	Do you sometimes/ever forget to take your antidiabetic medication?
	Yes 60 (47,6)
	No 66 (52,4)
Question 2	Is there a day in 2 weeks that you don't take antidiabetic drugs?
	Yes 29 (1,6)
	No 124 (98,4)
Question 3	If you feel that your condition is getting worse/unwell by taking antidiabetic drugs, do you stop taking these drugs?
	Yes 15 (11,9)
	No 111 (88,1)
Question 4	When you go out/leave home, do you sometimes forget to bring your medicine?
	Yes 46 (36,5)
	No 80 (63,5)
Question 5	Did you take antidiabetic drugs yesterday?
	Yes 118 (93,7)
	No 8 (6,3)
Question 6	If you feel your condition is getting better, have you ever stopped/didn't use antidiabetic drugs?
	Yes 5 (4)
	No 121 (96)
Question 7	Have you ever been bothered by having problems sticking to your treatment plan?
	Yes 16 (12,7)
	No 110 (87,3)
Question 8	How often do you have difficulty remembering your medication?
	Yes 35 (27,8)
	Never/Rarely 91 (72,2)

The Relationship between Type 2 DM Patient Characteristics and Drug Adherence Levels

The analysis of the relationship between the characteristics of patients with type 2 diabetes and adherence to medication presented in Table 3 shows that there is a significant relationship between age ($p = 0.043$), gender ($p = 0.008$), an education level ($p = 0.000$), duration of suffering from type 2 diabetes. (0.000), number of DM drugs ($p = 0.000$), frequency of taking medicine ($p = 0.0001$), comorbidities ($p = 0.000$) with medication adherence.

Table 3.
Relationship of Patient Characteristics with Medication Adherence in Type 2 DM

Variabel		Tingkat Kepatuhan			Total	Sig
		Rendah(%)	Sedang (%)	Tinggi (%)		
Age	Adult	21 (18,8)	60 (53,6)	31(27,7)	112	0,043
	Elderly	5 (35,7)	8 (57,1)	1 (7,1)	14	
Sex	Male	15 (29,4)	28 (54,9)	8 (15,7)	51	0,008
	Female	11 (14,7)	40 (53,3)	24 (32)	75	
Education level	Did not	2 (50)	1 (25)	1 (25)	4	0,000

Variabel		Tingkat Kepatuhan			Total	Sig
		Rendah(%)	Sedang (%)	Tinggi (%)		
Work	finish elementary school					
	Elemetary school	12 (44,4)	15 (55,6)	0 (0)	27	
	Middle school	7 (17,9)	25 (64,1)	7 (17,9)	39	
	High school	5 (10,6)	23 (48,9)	19(40,4)	47	
	Bachelor	0 (0)	4 (44,4)	5 (55,6)	9	
	Not working	13 (23,6)	30 (54,5)	12(21,8)	55	0,333
	Work	13 (18,3)	38 (53,5)	20(28,2)	71	
Long Suffering from Type 2 DM	< 1 year	4 (9,8)	17 (41,5)	20(48,8)	41	0,000
	≥ 1 year	22 (25,9)	51 (60)	12(14,1)	85	
Amount of medication taken	Combination	22 (28,9)	44 (57,9)	10(13,2)	76	0,000
	Single	4 (9,8)	24 (48)	22(44)	50	
Fequency of taking medicine	> 1 time	21 (28)	41 (54,7)	13(17,3)	75	0,001
	1 time	5 (9,8)	27 (52,9)	19(37,3)	51	
Co-morbidities	None	4 (7,5)	27 (50,9)	22(41,5)	53	0,000
	Exist	22 (30,1)	41 (56,2)	10(13,7)	73	

DISCUSSION

Globally, developing countries show poor adherence to treatment for Type 2 DM. This condition is a major health problem. The results of this study indicate that most of the medication adherence in Type 2 DM patients is in the moderate category (54%). In several Asian countries, previous studies have shown that treatment adherence rates ranged from 35% - 60%. Poor adherence to treatment leads to serious physiological and economic consequences (Yao et al., 2021). This study found that there was a significant relationship between age ($p = 0.043$), gender ($p = 0.008$), level of education ($p = 0.000$), duration of suffering from Type 2 DM (0.000), number of DM drugs ($p=0.000$), frequency of taking medicine ($p=0.0001$), comorbidities ($p=0.000$) with medication adherence.

This study found that the average age of patients with Type 2 DM was 50.32 years. Age is a non-modifiable factor that can affect the increased risk of developing Diabetes Mellitus. Degenerative factors cause glucose intolerance at the age of 30 years and over, namely decreased body functions, especially the ability of beta cells to produce insulin for glucose metabolism. After 30 years, fasting blood glucose levels will rise 1-2 mg/dL/year, and blood sugar 2 hours after eating will rise 5.5-13 mg/dL. Men's fat is 15-20% of body weight, while women's is 20-25% (World Health Organization, 2017). The increase in fat levels in women is higher than in men, so the incidence of diabetes mellitus in women is 3-7 times higher than in women. Male is 2-3 times (Imelda, 2018). There is a significant relationship between age and medication adherence.

Medication adherence can control Type 2 DM if taken as prescribed. In this study, 20.6% had low medication adherence. This result is better than previous studies that showed poor medication adherence by 39% (Olickal et al., 2021). This variation in medication adherence

may be due to the use of different adherence questionnaires. Self-reported medication adherence also has limited social desirability bias, leading to overestimating adherence (Sánchez-Hernández et al., 2020).

This study found a significant relationship between gender and medication adherence ($p = 0.008$). Good adherence to medication was found in 24 women (32%) and more than eight men (15,7%). This differs from previous studies, which stated that medication adherence in women was worse than in men (Olickal et al., 2021). The results of this study also found a significant relationship between education level and medication adherence. Most patients with Type 2 DM have a high school education of 47 (37.3%). Several factors may be due to good patient-doctor communication and the increasing knowledge of patients about monitoring the disease and its complications (Farhat et al., 2019). Consistent with previous research, patients with higher education better receive the information provided by the counselor (Romera, 2018). Patients without formal education have a lower likelihood of improving medication adherence (Presley, Groot, & Pavlova, 2021).

The study results showed that most of the duration of suffering from Type 2 DM was more than one year, namely 85 respondents (67.5%). There is a significant relationship between the duration of suffering from Type 2 DM with medication adherence. Consistent with previous research that the duration of the disease affects medication adherence. Barriers to adherence can be caused by complex treatment regimens, duration of treatment, multitherapy, drug side effects, and lack of information provided by health care providers (Rasdianah Nur, 2016).

The use of multiple drugs in treating patients with Type 2 DM can influence adherence. This study found that most patients received a combination treatment of 2 drugs (60.3%). Barriers to adherence can be caused by complex treatment regimens, duration of treatment, multitherapy, drug side effects, and lack of information provided by health care providers. Previous studies stated that adherence to polytherapy regimens was 10-20% lower than those who received monotherapy regimens (Mallah et al., 2019). Type 2 DM patients who took the drug with a frequency of 1 time/day had 19 (37.3%) higher adherence rates in the high category compared with patients who got a frequency of 2 times/day 13 (17.3%). Prescribing drugs requiring a smaller frequency can increase patient medication adherence (Mallah et al., 2019). Important things to consider in medication adherence in Type 2 DM patients include taking the medication regularly according to the dose, amount, type, and frequency (Adelaide Bulu, Tavip Dwi Wahyuni, 2019).

This study found that most patients with Type 2 DM had comorbidities (57.9%). There is a significant relationship between comorbidities and medication adherence. These results are from previous studies that type 2 DM patients often have comorbidities such as hypertension, coronary heart disease, heart failure, and so on. These comorbidities are generally also prescribed oral medication so that adherence to other drugs can interfere with adherence to diabetes treatment (Sánchez-Hernández et al., 2020). Patients with chronic diseases have a greater need for care and treatment. The consumption of multiple drugs contributes to an increase in non-adherence (Uchmanowicz, Jankowska-Polańska, Wleklík, Lisiak, & Gobbens, 2018). The results of this study found that Type 2 DM patients who had comorbidities had a higher low/poor adherence rate (30.1%) than those without comorbidities (7.5%). However, these results differ from previous studies, which stated that patients with comorbidities were more prone to complications and more dependent on drug therapy (Olickal et al., 2021).

CONCLUSION

Type 2 DM patients mostly have a moderate level of medication adherence. Medication Compliance in Type 2 DM Patients is influenced by factors such as age, gender, education level, duration of suffering from DM, number of drugs taken, frequency of medication, and comorbidities.

REFERENCES

- Adelaide Bulu, Tavip Dwi Wahyuni, A. S. (2019). Hubungan Antara Tingkat Kepatuhan Minum Obat Dengan Kadar Gula Darah Pada Pasien Diabetes Melitus Tipe 2, 4.
- Ayoub, D., Mroueh, L., El-Hajj, M., Awada, S., Rachidi, S., Zein, S., & Al-Hajje, A. (2019). Evaluation of antidiabetic medication adherence in the Lebanese population: development of the Lebanese Diabetes Medication Adherence Scale. *International Journal of Pharmacy Practice*, 27(5), 468–476. <https://doi.org/10.1111/ijpp.12558>
- Bilous, R. & Donnelly, R. (2014). *Buku Pegangan Diabetes Edisi Ke 4*. Jakarta: Bumi Medika.
- Denicolò, S., Perco, P., Thöni, S., & Mayer, G. (2021). Non-adherence to antidiabetic and cardiovascular drugs in type 2 diabetes mellitus and its association with renal and cardiovascular outcomes: A narrative review. *Journal of Diabetes and Its Complications*, 35(7), 107931. <https://doi.org/10.1016/j.jdiacomp.2021.107931>
- Farhat, R., Assaf, J., Jabbour, H., Licha, H., Hajj, A., Hallit, S., & Khabbaz, L. R. (2019). Adherence to oral glucose lowering drugs, quality of life, treatment satisfaction and illness perception: A cross-sectional study in patients with type 2 diabetes. *Saudi Pharmaceutical Journal*, 27(1), 126–132. <https://doi.org/10.1016/j.jsps.2018.09.005>
- Imelda, S. (2018). fAKTOR - fAKTOR Yang Mempengaruhi Terjadinya Diabetes Melitus Di Puskesmas Harapan Raya. *Scientia Journal*.
- International Diabetes Federation. (2019). *Diabetes Atlas*.
- Kharjul, M. D., Cameron, C., & Braund, R. (2019). Using the Pharmaceutical Collection Database to identify patient adherence to oral hypoglycaemic medicines. *Journal of Primary Health Care*, 11(3), 265–274. <https://doi.org/10.1071/HC19017>
- Khayyat, S. M., Mohamed, M. M. A., Khayyat, S. M. S., Hyat Alhazmi, R. S., Korani, M. F., Allugmani, E. B., ... Abdul Hadi, M. (2019). Association between medication adherence and quality of life of patients with diabetes and hypertension attending primary care clinics: a cross-sectional survey. *Quality of Life Research*, 28(4), 1053–1061. <https://doi.org/10.1007/s11136-018-2060-8>
- Mallah, Z., Hammoud, Y., Awada, S., Rachidi, S., Zein, S., Ballout, H., & Al-Hajje, A. (2019). Validation of diabetes medication adherence scale in the Lebanese population. *Diabetes Research and Clinical Practice*, 156, 107837. <https://doi.org/10.1016/j.diabres.2019.107837>
- Olickal, J. J., Chinnakali, P., Suryanarayana, B. S., Saya, G. K., Ganapathy, K., & Subrahmanyam, D. K. S. (2021). Medication adherence and glycemic control status among people with diabetes seeking care from a tertiary care teaching hospital, south India. *Clinical Epidemiology and Global Health*, 11(April), 100742. <https://doi.org/10.1016/j.cegh.2021.100742>

- Presley, B., Groot, W., & Pavlova, M. (2021). Pharmacists' and patients' perceptions about the importance of pharmacist services types to improve medication adherence among patients with diabetes in Indonesia. *BMC Health Services Research*, 21(1), 1–16. <https://doi.org/10.1186/s12913-021-07242-1>
- Rasdianah, N., Martodiharjo, S., Andayani, T. M., & Hakim, L. (2016). Gambaran Kepatuhan Pengobatan Pasien Diabetes Melitus Tipe 2 di Puskesmas Daerah Istimewa Yogyakarta The Description of Medication Adherence for Patients of Diabetes Mellitus Type 2 in Public Health Center Yogyakarta, 5(4). <https://doi.org/10.15416/ijcp.2016.5.4.249>
- Rasdianah Nur. (2016). Gambaran Kepatuhan Pengobatan Pasien Diabetes Melitus Tipe 2 di Puskesmas Daerah Istimewa Yogyakarta. *Jurnal Farmasi Klinik Indonesia*, 5, 249–257.
- Romera, E. (2018). Studi Kepatuhan Pasien Diabetes Melitus Rawat Jalan di RSUD Kabupaten Sidoarjo. *Journal of Pharmacy Science And Technology*, 1, 28.
- Sánchez-Hernández, M. S., Rodríguez-Caldero, M. C., Martín-Pérez, M. P., Mira-Solves, J. J., Vitaller-Burillo, J., & Carratalá-Munuera, M. C. (2020). Impact of adherence to Mediterranean diet and/or drug treatment on glycaemic control in type 2 diabetes mellitus patients: DM2-CUMCYL study. *Primary Care Diabetes*, 14(6), 685–691. <https://doi.org/10.1016/j.pcd.2020.06.008>
- Trief, P. M., Kalichman, S. C., Wang, D., Drews, K. L., Anderson, B. J., Bulger, J. D., & Weinstock, R. S. (2022). Medication adherence in young adults with youth-onset type 2 diabetes : i Count , an observational study. *Diabetes Research and Clinical Practice*, 184, 109216. <https://doi.org/10.1016/j.diabres.2022.109216>
- Uchmanowicz, I., Jankowska-Polańska, B., Wleklik, M., Lisiak, M., & Gobbens, R. (2018). Frailty Syndrome: Nursing Interventions. *SAGE Open Nursing*, 4, 1–11. <https://doi.org/10.1177/2377960818759449>
- World Health Organization. (2017). Diabetes Media Centre.
- Yao, J., Wang, H., Shao, D., Yin, J., Guo, X., Yin, X., & Sun, Q. (2021). Association between availability of glucose-lowering drugs in primary health institutions and diabetes patients' medication adherence: a cross-sectional study in Shandong Province, China. *Global Health Journal*, 5(2), 83–89. <https://doi.org/10.1016/j.glohj.2021.04.002>
- Zhang, H. J., Chen, C., Ding, L., Shi, H. H., Wang, C. C., Xue, C. H., ... Wang, Y. M. (2020). Sea cucumbers-derived sterol sulfate alleviates insulin resistance and inflammation in high-fat-high-fructose diet-induced obese mice. *Pharmacological Research*, 160(June), 105191. <https://doi.org/10.1016/j.phrs.2020.105191>