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Adherence to Oral Antidiabetic Drugs among Outpatients with Type 2 Diabetes Mellitus

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ABSTRACT
Type 2 diabetes mellitus (T2DM) patients are often required to adhere to oral antidiabetic drugs (OADs) prescribed by healthcare professionals for maintaining optimal blood glucose levels. Therefore, this study aims to assess adherence to OADs among outpatients with T2DM. A descriptive cross-sectional design was used, involving 32 participants selected through convenience sampling at Adam Malik General Hospital in Medan, North Sumatra, Indonesia. Data collection was conducted in July 2024, and descriptive statistics were used to analyze adherence levels and sociodemographic characteristics. The results showed that the majority of participants were under 60 years of age (68.8%), male (65.6%), had completed high school education (59.4%), were employed (71.9%), and had a monthly household income below the regional minimum wage (65.6%). In addition, more than 50% had been living with diabetes for five years or longer (53.1%), were covered by national health insurance (90.6%), resided in urban areas (62.5%), and had no diabetes-related complications (81.3%). The mean adherence score to OADs was 6.66 (SD ±1.20), with moderate adherence being the most common (56.3%), followed by high (28.1%) and low levels (15.6%). The results also showed that only a limited number of T2DM patients exhibit optimal adherence to their treatment regimens. This shows the need for healthcare providers and relevant stakeholders to develop targeted interventions and support systems aimed at enhancing medication adherence among diabetic patients.

Keyword: Diabetes Mellitus, Medication Adherence, Hypoglycemic Agents, Outpatients

1. Introduction

Diabetes mellitus (DM) is a disease characterized by chronic increase in blood sugar levels, which affects various individuals across different countries. In addition, type 2 diabetes mellitus (T2DM) has been reported to be its most prevalent form (Alharbi, Alhofaian, & Alaamri, 2024). The disease is often caused by impaired carbohydrate, protein, and fat metabolism due to reduced secretion or action of the pancreatic hormone insulin. Several studies showed that its prevalence in Indonesia increased from 7.3 million in 2011 to 19.5 million in 2021, with Tarigan, Setiawan, and Megawati (2024) anticipating further annual increase.

One of the fundamental components of diabetes treatment is the maintenance of controlled blood glucose levels, which have a beneficial impact on physical parameters and quality of life through medication adherence. Eshete et al., (2023) and Kwakye, Kretchy, Peprah, & Mensah (2024) have shown that maintaining optimal

blood glucose levels can alleviate symptoms, conserve energy, and enhance mental well-being. However, the consumption of antidiabetic drugs for an extended period is a challenge due to various factors. The level of adherence also decreases as the duration of antidiabetic drug use increases, which has a catastrophic effect on the patients (Doya, Yahaya, Ngaiza, & Bintabara, 2024).

In diabetes management, several factors can decrease medication adherence, including the complexity of treatment, which requires changes in different aspects of lifestyle, such as diet, physical activity, and taking many drugs or doses in a day. Various biological, sociodemographic, cognitive, and psychological factors can also influence medication adherence. Studies have shown wide variations in the status of medication adherence among type 2 diabetic patients. For example, the results of 5 studies in the Gaza Strip, Korea, India, Botswana, and Singapore have showed good levels, with rates of 58%, 61%, 16.6%, 41.8%, and 42.9%, respectively. In addition, a systematic review in 2017 in Iran reported good medication adherence indices ranging from 37.2% to 87% (Benrazavy & Ali, 2019).

According to previous studies, suboptimal treatment is defined as nonadherence to medication, which is a discrepancy between the behavior of diabetic patients in using drugs and the recommendations of health professionals (Wu et al., 2024). Nonadherence to treatment can result in various complications. The most prevalent complication of diabetes among Indonesians is neuropathy (64%), followed by retinopathy (42%), small blood vessels (28%), large blood vessels (16%), and nephropathy (7%) (Soewondo et al., 2010). Medication adherence has been the subject of numerous studies in Indonesia. Medication adherence of DM patients in Indonesia has varying levels, as reported by 30 published articles, with low levels and nonadherence being the dominant categories (Pertiwi, Alfian, Nita, & Athiyah, 2022).

Adam Malik General Hospital is a prominent referral hospital in the northern region of Sumatra, including Medan City and North Sumatra, which offers a wide variety of medical services and facilities. The hospital accepts referrals of patients with complex cases that are beyond the capacity of the hospitals under its jurisdiction. However, the number of studies that specifically focus on diabetic patients in the outpatient unit of Adam Malik General Hospital Medan remains limited. Therefore, this study aims to determine the degree of adherence to oral antidiabetic medication at Adam Malik General Hospital Medan

2. Methods

This study used a descriptive cross-sectional design, including 32 respondents who were willing to participate, selected by the convenience sampling method. The inclusion criteria were patients using oral antidiabetic drugs for at least 1 year. A minimum sample size of 30 respondents (Dunn, 2001) and an additional 7% (2 respondents) was used in this study to account for potential low response rates. The minimum sample size was used because the diabetic patients who were treated in the outpatient unit of Adam Malik General Hospital, Medan, were dominated by those who used insulin injection treatment.

The data was collected in July 2024, obtaining ethical clearance from the ethical review board of the Universitas Sumatera Utara, number 602/KEPK/USU/2024, issued on June 6, 2024. Before data collection, the respondents received an explanation of the study steps and filled out an informed consent sheet. The modified Indonesian version of the MMAS-8 (Morisky Medication Adherence Scale-8) questionnaire was used to measure medication adherence. In addition, the instrument was proven to be valid based on the correlation test between items and was reliable with a Cronbach's alpha value of 0.712, consisting of 8 questions. For questions 1–7, the "yes" answer was given a score of 1, and the "no" answer was given a score of 0, except for question 5, and vice versa. For question number 8, the answer "never" was given a score of 1, while "occasionally," "sometimes," "usually," and "always" were given a score of 0. The level of adherence was categorized as high (score 8), moderate (score 6–7), and low (score <6) (Khotimah, 2018). However, in this study, validity and reliability tests were not used. Descriptive statistics (e.g., mean, standard deviation, frequency, and percentage) were used to analyze medication adherence and sociodemographic characteristics, and SPSS 23 was applied to perform data analysis.

3. Results

The majority of respondents were male (65.6%), aged <60 (68.8%), who had a high school education (59.4%), were working (71.9%), had a family income per month under the regional minimum wage (65.6%), had diabetes for ≥5 years (53.1%), had national health insurance (90.6%), lived in an urban area (62.5%), and they have no complications (81.3%). Table 1 presented the sociodemographic characteristics of the respondents.

Table 1 The respondents' sociodemographic characteristics

Characteristics	f	%
Age (Year)		
27–59	22	68.8
≥ 60	10	31.3
Gender		
Female	21	65.6
Male	11	34.4
Education level		
Elementary	2	6.3
Junior High School	4	12.5
Senior High School	19	59.4
University	7	21.9
Employment Status		
Not working	9	28.1
Working	23	71.9
Family income per month		
Under regional minimum wage	21	65.6
Above regional minimum wage	11	34.4
Length of Disease (Year)		
1–4	15	46.9
≥ 5	17	53.1
National health insurance		
No	3	9.4
Yes	29	90.6
Residence		
Urban	20	62.5
Rural	12	37.5
Diabetes complication		
No	26	81.3
Yes	6	18.8

Table 2 presented the respondents' detailed answers to the modified MMAS-8 questionnaire. The results with 8 questions showed that 59.4% of respondents forgot to use their medicine, 93.8% took medicine in the last 2 weeks, 93.8% had never reduced or stopped taking medicine without the knowledge of their doctor, and 75% never forgot to take medicine when travelling. Approximately 96.9% had their medicine yesterday, 96.9% had never stopped taking medicine due to their feeling, 81.3% did not feel bothered by the schedule of taking medication, and 87.5% did not have difficulty remembering to take medication. However, the data showed the opposite between having forgotten to take medication (59.4%) and taking medication in the last 2 weeks (93.8%). This showed that in the last 2 weeks, respondents were more compliant with taking medication than on the previous day.

Table 2 The respondents' answer to the modified MMAS-8

Questions	f (%)	
	Yes	No
Have you ever forgotten to take diabetes medication?	19 (59.4)	13 (40.6)
In the last 2 weeks, have there been any days where you did not take diabetes medication?	2 (6.3)	30 (93.8)
Have you ever reduced or stopped taking medication without telling your doctor because you feel your condition is getting worse?	2 (6.3)	30 (93.8)
Have you ever forgotten to bring your diabetes medication when travelling or out of town?	8 (25)	24 (75)
Did you take diabetes medication yesterday?	31 (96.9)	1 (3.1)
Have you ever stopped taking diabetes medication when you felt that your condition had improved?	1 (3.2)	31 (96.9)
Have you ever felt disturbed by your daily medication schedule?	6 (18.8)	26 (81.3)

Table 2 Continued

Questions	f (%)	
	Yes	**No**
How often do you have trouble remembering to take all your diabetes medications? a. Never b. Occasionally c. Sometimes d. Usually e. Always Note: Yes (if choosing b/c/d/e; No (if choosing a)	4 (12.5)	28 (87.5)

The results showed that the mean score of adherence to taking antidiabetic drugs was 6.66 (SD ± 1.20), which was dominated by moderate adherence levels (56.3%), followed by high adherence (28.1%) and low adherence (15.6%). Table 3 presented the respondents' level of medication adherence.

Table 3 The respondent's level of medication adherence

Adherence level	**f**	**%**
Low (<6)	5	15.6
Moderate (6 – 7)	18	56.3
High (8)	9	28.1

4. Discussion

This study observed that the average medication adherence score was 6.66 (SD ±1.20), with the highest percentage of patients at the moderate adherence level (56.3%). Compared to other studies in Indonesia, the results of a systematic review of adherence to antidiabetic drugs showed that 17 studies categorized adherence as high, moderate, and low. A total of 9 studies found that most diabetic patients had low adherence. Meanwhile, there were 9 studies categorizing adherence and nonadherence, showing that most diabetic patients had nonadherence to antidiabetic drugs (Pertiwi et al., 2022).

A moderate level of adherence was discovered in the study conducted at a Saudi Arabian hospital. In comparison to respondents with lower adherence, those with higher adherence showed a greater understanding of diabetes and a greater belief in the efficacy of treatment (Alharbi et al., 2024). The patients in another study conducted in one of Saudi Arabia's provinces exhibited a low adherence rate of 21.5%. Gender and the duration of the disease were significant factors that influenced adherence rates. The perception and knowledge of the disease were additional variables that were associated with adherence to antidiabetic drugs (Alsaidan et al., 2023).

In Tanzania, diabetic patients who visited a hospital were most likely to exhibit high adherence levels (63.3%), followed by moderate adherence (26.2%) and low adherence (10.5%). Doya et al. (2024) discovered that low education levels, alcohol consumption, and comorbidities were among the factors that contributed to low adherence. A 42.9% rate of low adherence was observed among respondents in a study conducted at numerous public health centers in China. Low self-efficacy was associated with low adherence, and male respondents exhibited a higher level of adherence than females (Wu et al., 2024). Liu et al. (2023) conducted an additional investigation in China, which identified that 25% of patients showed inadequate adherence in 4 public health centers and 4 hospitals.

Diabetic patients who visited a hospital in Nepal had a high rate of medication adherence, as much as 61% (Shakya, Shrestha, Karmacharya, Morisky, & Kulseng, 2023). However, a study in a hospital in Bangladesh showed that diabetic patients were most dominant at a low adherence level of 74% (Ahmed et al., 2023). In another study of a hospital in Bangladesh, the patients were found to have low adherence (42.8%). Sex did not affect adherence levels, while increasing age was negatively associated with low adherence (Islam et al., 2021). A community-based study in India observed that the majority had moderate adherence (55%), followed by low adherence (45%) (Angadi & DB, 2023). A study in one of Nigeria's hospitals showed that most respondents had moderate adherence (Eze, Akhumi, Iheanacho, & Saka, 2022).

Adherence to oral antidiabetic drugs was essential to achieve reasonable glycemic control in type 2 diabetic patients. Studies showed that good adherence to oral antidiabetic drugs was significantly associated with better glycemic control, with an odds ratio of 1.33. Consequently, compliant patients were 33% more likely to achieve reasonable glycemic control than those who were non-compliant (Piragine, Petri, Martelli, Calderone, & Lucenteforte, 2023).

Nonadherence was known as a complex issue influenced by various factors such as demographic, personal, social, religious, cultural, and health condition determinants. In the context of T2DM, non-medication adherence was identified as a critical concern. Several factors contributed to nonadherence, including inadequate healthcare integration, clinical inertia, younger age, and lower income and education levels. In addition, factors such as perceived inefficacy of treatment, the complexity of treatment regimens, the risk of hypoglycemia, and the burden of medical expenses had been identified as key contributors to nonadherence (Alharbi et al., 2024). However, a study conducted in India showed that none of the sociodemographic variables, including gender, age group, domiciliary status, level of education, occupation, and socioeconomic class, showed a statistically significant association with medication adherence. On analysis, medical variables, including the duration of T2DM, number of oral hypoglycemic agents consumed per day, number of comorbidities, yearly frequency of outpatient visits, and annual frequency of venous glucose monitoring, were found to be significantly associated with medication adherence (P et al., 2023).

Another investigation conducted in Surabaya, Indonesia, showed that 83.5% of the 321 patients who participated in the study were nonadherent to their medication. Those who did not engage in physical activity regularly were more likely to adhere to their medication regimen, and approximately 33.0% exhibited inadequate glycemic control. Male patients and older individuals were more likely to achieve satisfactory glycemic control (Suprapti et al., 2023).

The study was constrained by the minimum number of samples, because it was conducted in a single center, and the convenience of the sampling methods. Consequently, the results of this investigation could not be applied to the entire Indonesian populace.

5. Conclusion

In conclusion, this investigation discloses that only a small number of patients with T2DM maintain optimal adherence to antidiabetic medications. Health professionals and other associated parties are advised to develop and execute initiatives that enhance patient adherence, such as strategies to mitigate the financial burden of medications, behavioral modifications, and the improvement of drug delivery systems. To ensure that the results are generalized, it is recommended that future studies incorporate larger samples, random sampling techniques, and a greater number of health centers.

References

Ahmed, S., Saif-Ur-Rahman, K. M., Dhungana, R. R., Ganbaatar, G., Ashraf, F., Yano, Y., … Ahmed, M. S. A. M. (2023). Medication adherence and health-related quality of life among people with diabetes in Bangladesh: A cross-sectional study. Endocrinology, Diabetes & Metabolism, 6, e444. https://doi.org/10.1002/edm2.444

Alharbi, S., Alhofaian, A., & Alaamri, M. M. (2024). Correlation between illness perception and medication adherence among adult patients with type 2 diabetes mellitus in Saudi Arabia. Saudi Journal of Medicine & Medical Sciences, 12(3), 244–251. https://doi.org/10.4103/sjmms.sjmms_511_23

Alsaidan, A. A., Alotaibi, S. F., Thirunavukkarasu, A., ALruwaili, B. F., Alharbi, R. H., Arnous, M. M., … Alwushayh, Y. A. (2023). Medication adherence and its associated factors among patients with type 2 diabetes mellitus attending primary health centers of eastern province, Saudi Arabia. Medicina, 59, 989. https://doi.org/10.3390/medicina59050989

Angadi, N., & DB, S. (2023). Social support and medication adherence among people with type 2 diabetes mellitus in central Karnataka, India. National Journal of Community Medicine, 14(12), 834–841. https://doi.org/10.55489/njcm.141220233301

Benrazavy, L., & Ali, K. (2019). Medication adherence and its predictors in type 2 diabetic patients referring to urban primary health care centers in kerman city, southeastern iran. Shiraz E Medical Journal, 20(7), e84746. https://doi.org/10.5812/semj.84746

Doya, I. F., Yahaya, J. J., Ngaiza, A. I., & Bintabara, D. (2024). Low medication adherence and its associated factors among patients with type 2 diabetes mellitus attending Amana Hospital in Dar es Salaam, Tanzania: a cross-sectional study. International Health, 16(2), 200–207. https://doi.org/10.1093/inthealth/ihad042

Dunn, D. S. (2001). Statistics and Data Analysis for the Behavioral Sciences. Boston: McGraw-Hill.

Eshete, A., Getye, B., Aynaddis, G., Tilaye, B., Mekonnen, E., Taye, B., … Assefa, Y. (2023). Association between illness perception and medication adherence in patients with diabetes mellitus in North Shoa,

Zone: Cross-sectional study. Frontiers in Public Health, 11, 1214725. https://doi.org/10.3389/fpubh.2023.1214725

Eze, U. I. H., Akhumi, T. F., Iheanacho, C. O., & Saka, S. A. (2022). Drug therapy and medication adherence in type 2 diabetes in a care facility: A cross sectional survey. Exploratory Research in Clinical and Social Pharmacy, 8, 100200. https://doi.org/10.1016/j.rcsop.2022.100200

Islam, S. M. S., Islam, M. T., Uddin, R., Tansi, T., Talukder, S., Sarker, F., … Rawal, L. B. (2021). Factors associated with low medication adherence in patients with Type 2 diabetes mellitus attending a tertiary hospital in Bangladesh. Lifestyle Medicine, 2, e47. https://doi.org/10.1002/lim2.47

Khotimah, S. N. (2018). Evaluasi Tingkat Kepatuhan Penggunaan Anti Diabetes Oral pada Pasien Diabetes Melitus Tipe 2 di Poli Endokrin Instalasi Rawat Jalan RSUD Dr. Saiful Anwar, Malang. Universitas Brawijaya, Malang, Indonesia.

Kwakye, A. O., Kretchy, I. A., Peprah, P., & Mensah, K. B. (2024). Factors influencing medication adherence in co-morbid hypertension and diabetes patients: A scoping review. Exploratory Research in Clinical and Social Pharmacy, 13, 100426. https://doi.org/10.1016/j.rcsop.2024.100426

Liu, H., Yao, Z., Shi, S., Zheng, F., Li, X., & Zhong, Z. (2023). The mediating effect of self-efficacy on the relationship between medication literacy and medication adherence among patients with type 2 diabetes. Patient Preference and Adherence, 17, 1657–1670. https://doi.org/10.2147/PPA.S413385

P, A., Dsouza, D. J., S, S., UP, N., MA, S. A., Kolar, R., & Chand, S. (2023). Factors influencing adherence towards oral hypoglycaemic agents- A cross-sectional study among patients with Type II Diabetes Mellitus. Diabetes Epidemiology and Management, 12, 100163. https://doi.org/10.1016/j.deman.2023.100163

Pertiwi, M. V., Alfian, R., Nita, Y., & Athiyah, U. (2022). Medication adherence of diabetes mellitus patients in Indonesia: A systematic review. Pharmacy Education, 22(2), 188–193. https://doi.org/10.46542/pe.2022.222.188193

Piragine, E., Petri, D., Martelli, A., Calderone, V., & Lucenteforte, E. (2023). Adherence to oral antidiabetic drugs in patients with type 2 diabetes: Systematic review and meta-analysis. Journal of Clinical Medicine, 12, 1981. https://doi.org/10.3390/jcm12051981

Shakya, P., Shrestha, A., Karmacharya, B. M., Morisky, D. E., & Kulseng, B. E. (2023). Factors associated with medication adherence among patients with type 2 diabetes mellitus: A hospital-based cross-sectional study in Nepal. International Journal of Environmental Research and Public Health, 20, 1537. https://doi.org/10.3390/ijerph20021537

Soewondo, P., Soegondo, S., Suastika, K., Pranoto, A., Soeatmadji, D. W., & Tjokroprawiro, A. (2010). The DiabCare Asia 2008 study – Outcomes on control and complications of type 2 diabetic patients in Indonesia. Medical Journal of Indonesia, 19(4), 235. https://doi.org/10.13181/mji.v19i4.412

Suprapti, B., Izzah, Z., Anjani, A. G., Andarsari, M. R., Nilamsari, W. P., & Nugroho, C. W. (2023). Prevalence of medication adherence and glycemic control among patients with type 2 diabetes and influencing factors: A cross-sectional study. Global Epidemiology, 5(June), 100113. https://doi.org/10.1016/j.gloepi.2023.100113

Tarigan, M., Setiawan, & Megawati, E. R. (2024). Prediabetes, undiagnosed diabetes, and associated factors in North Sumatra, Indonesia: A community-based study. Romanian Journal of Diabetes, Nutrition and Metabolic Diseases, 31(4), 420–427. https://doi.org/10.46389/rjd-2024-1745

Wu, Y., Xiong, S., Zhu, G., Chen, X., Zhang, M., Gong, E., … Yan, L. L. (2024). Patient, family, and community factors associated with medication adherence among people with hypertension or diabetes: A cross-sectional analysis. Exploratory Research in Clinical and Social Pharmacy, 15, 100482. https://doi.org/10.1016/j.rcsop.2024.100482