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Factors associated with non-adherence to antidiabetic medication: A single-centre study in South Punjab, Pakistan

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Abstract

Objective: To identify and evaluate key barriers to medication adherence among diabetes mellitus patients.

Method: The descriptive, cross-sectional study was conducted at Nishtar Hospital, Multan, Pakistan, from November 5 to December 10, 2024, and comprised diabetic inpatients aged at least 20 years. Data was collected using a predesigned questionnaire based on the Hill Bone Medication Adherence Scale. Data was analysed using SPSS 23.

Results: Of the 176 patients with mean age 51±8.6 years (range: 22-73 years), 92(52.3%) were females and 84(47.7%) were males. Factors having a significant association with non-adherence to anti-diabetes medication were age >60 years, monthly salary >50,000 Pak rupee, family history of diabetes, multiple doses, duration of diabetes 5 years or more, and education level beyond high school (p<0.05). Gender and the route of administration had no significant association with non-adherence (p>0.05).

Conclusion: Diabetic patients with higher income, family history and education were found to have better medication adherence, while advanced age and multiple doses decreased adherence.

Keywords: Patient compliance, Medication adherence, Diabetes mellitus, Pakistan, Hypoglycaemic agents.

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Introduction

Diabetes mellitus (DM) is a chronic condition associated with abnormally elevated plasma glucose levels. The condition arises from insufficient insulin secretion by the pancreas, resistance of the body to insulin, or a combination of both factors.[1] DM has the potential to result in cardiovascular disease, stroke, kidney failure, and vision impairment.[2]

Global prevalence of diabetes mellitus among adults aged 20-79 years is currently 11.1% with 589 million individuals being affected. By 2050, it is estimated that this number will surge to 853 million (13%). Estimated number of undiagnosed cases of diabetes among adults is 252 million worldwide. Among these, 219 million (86.9%) people reside in economically less developed countries. With age-standardized prevalence of 31.4%, Pakistan ranks first in the global prevalence of diabetes mellitus among 20-79 year old adults. The number of adults with diabetes mellitus in Pakistan is 34.5 million which is the highest number after China, India and USA.[3]

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Medication adherence means the degree of conformity between an individual's behaviour of taking medicine and the prescription of a health professional.[4] Diabetics require a lifelong treatment with anti-diabetes medication. Medication adherence is affordable for the patients as it reduces the need of costly stays at hospitals, lowers the risk of complications, and leads to a better prognosis.[5]

However, many diabetic patients face difficulty in adhering to their medication. Non-adherence to anti-diabetes medication may be intentional or unintentional. Some of the factors responsible for non-adherence to medication are lack of awareness, taking multiple doses, economic burden, personal beliefs, side-effects of medication, forgetfulness regarding taking medicine, and feelings of wellbeing.[6]

Due to the high DM prevalence in Pakistan, there is an urgent need to determine the extent of diabetic patients' adherence to their medication, and to point out the factors that account for non-adherence to medication. The current study was planned to fill the gap in literature by identifying and evaluating key barriers to medication adherence among DM patients.

Patients and Methods

The descriptive, cross-sectional study was conducted at Nishtar Hospital, Multan, Pakistan, from November 5 to December 10, 2024. The hospital is the largest tertiary care facility in South Punjab, and one of the largest hospitals in

South Asia. It provides services to a broad area, ensuring extensive patient exposure.

After approval from the institutional ethics review board, the sample size was calculated with confidence level 95% and margin of error 5% using the formula:[7]

$$n=Z^2\times p\times(1-p)/E^2$$

where n was the sample size, Z was the confidence level, p was the estimated prevalence derived from a pilot study that was conducted ahead of the main survey, and E was the margin of error. The sample was raised using simple random sampling technique. Those included were diabetic inpatients of either gender aged at least 20 years. Written informed consent was obtained from all the participants. Those aged <20 years and those not willing to participate were excluded.

Data was collected through a predesigned structured questionnaire based on the Hill-Bone Medication Adherence Scale (HB-MAS) in order to assess adherence level and correlate it with demographic data.[8,9] The questionnaire had nine items that were scored on a 4-point Likert scale, ranging from 1 = all of the time to 4=never. The total score ranged 9-36, with high scores indicating good adherence, and low scores indicating poor adherence. To get score in percentage terms, the actual score was divided by the total possible score and then multiplied by 100.

$$\% \text{ score} = \text{Actual score}/\text{Total score}*100$$

A score <80% was considered non-adherence.[10] A pilot study was conducted on 10 patients to test the questionnaire. The responses were excluded from the final results, but the patient feedback was used to improve the questionnaire's clarity.

Data was analysed using SPSS 23, and patient adherence scores were compared using univariate and multivariate logistic regression analyses. P<0.05 was considered statistically significant.

Results

Of the 176 patients with mean age 51±8.6 years (range: 22-73 years), 92(52.3%) were females and 84(47.7%) were males. Among the males, 62(73.8%) were adherent to medication, while 64(69.6%) females were adherent to their medication. Adherence to medication was also checked against demographic and clinical data (Table 1).

Univariate logistic regression analysis showed that age >60 years, income >50,000 Pak rupee (PKR), multiple daily doses, family history of diabetes, longer time since diagnosis, higher education level were significantly associated with adherence (p<0.05). Gender and route of administration were not significantly associated with adherence in univariate analysis (p>0.05) (Table 2).

Table-1: Demographic characteristics of the patients (n=102).

Measure	Adherence		Total
	Yes (Score≥80%) n (%)	No (Score<80%) n (%)	n (%)
Age (years)			
20 to 29	3 (75)	1 (25)	4 (2.3)
30 to 39	20 (71.4)	8 (28.6)	28 (15.9)
40 to 49	33 (68.8)	15 (31.2)	48 (27.3)
50 to 59	34 (65.4)	18 (34.6)	52 (29.5)
Over 60	27 (61.4)	17 (38.6)	44 (25.0)
Gender			
Male	62 (73.8)	22 (26.2)	84 (47.7)
Female	64 (69.6)	28 (30.4)	92 (52.3)
Monthly Salary (Pakistani Rupees)			
Less than 20 thousand	17 (60.1)	11 (39.9)	28 (15.9)
21 to 50 thousand	31 (64.6)	17 (35.4)	48 (27.3)
51 to 80 thousand	30 (68.2)	14 (31.8)	44 (25.0)
Above 80 thousand	42 (75.0)	14 (25.0)	56 (31.8)
Multiple doses daily			
Yes	63 (60.6)	41 (39.4)	104 (59.1)
No	56 (77.8)	16 (22.2)	72 (40.9)
Family history			
No	34 (65.4)	18 (34.6)	34 (29.5)
Yes	102 (82.3)	12 (17.8)	102 (70.5)
Time since diagnosis			
Less than a year	14 (87.5)	2 (12.5)	16 (9.1)
1 to 4 years	43 (71.7)	17 (28.3)	60 (38.6)
5 to 10 years	21 (65.6)	11 (34.4)	32 (18.2)
More than 10 years	40 (58.8)	18 (41.2)	68 (34.1)
Route of medication			
Injections	31 (64.6)	17 (35.4)	48 (27.3)
Tablets	80 (68.9)	36 (31.1)	116 (65.9)
Others	8 (66.7)	4 (33.3)	12 (6.8)
Education Status			
Uneducated	27 (56.2)	21 (43.8)	48 (27.3)
High school	25 (69.4)	11 (30.6)	36 (20.5)
College	18 (75.0)	6 (25.0)	24 (13.6)
University	57 (83.8)	11 (16.2)	68 (38.6)

Multivariate logistic regression analysis further confirmed the findings of univariate analysis (Table 3).

Discussion

Drug therapy is essential in managing diabetes, but many patients struggle to adhere to their prescribed medications. Non-adherence is a significant factor leading to high blood sugar levels and diabetic complications. The current study found that patients aged >60 years had lower adherence to anti-diabetes medications than those who were younger. A systematic review indicated that the adherence of patients to anti-diabetes medications was significantly lower in patients aged 60 years and older.[11] A study in Nowshera, Pakistan, showed that the adherence of patients decreased with increasing age.[12] Similarly, a cross-sectional study in Ethiopia showed that patients aged >60 years had lower adherence to anti-diabetes medications.[13] This could be explained by the fact that older individuals frequently

Table-2: Univariate logistic regression analysis for factors affecting non-adherence to anti-diabetes medication.

Variable	Univariate OR (95% CI)	*p*-value
Age (years)		
20-29 (Reference)	1.00	
30-39	0.78 (0.34–1.82)	0.58
40-49	0.66 (0.28–1.57)	0.47
50-59	0.62 (0.25–1.52)	0.30
60+	0.52 (0.31–0.87)	0.014*
Gender		
Male (Reference)	1.00	
Female	0.92 (0.55–1.53)	0.73
Monthly Salary (PKR)		
<20,000 (Reference)	1.00	
21,000-50,000	1.15 (0.61–2.16)	0.65
51,000-80,000	1.40 (0.79–2.80)	0.038*
>80,000	1.90 (1.12–3.34)	0.025*
Multiple doses daily		
Yes (Reference)	1.00	
No	2.22 (1.28–3.92)	0.007*
Family History of Diabetes		
Yes (Reference)	1.00	
No	0.43 (0.24–0.76)	0.003*
Time since diagnosis		
<1 year (Reference)	1.00	
1-4 years	0.76 (0.36–1.49)	0.48
5-10 years	0.52 (0.28–0.98)	0.048*
>10 years	0.33 (0.18–0.62)	0.001*
Route of medication		
Injections (Reference)	1.00	
Tablets	1.13 (0.88–1.35)	0.55
Others	1.05 (0.80–1.30)	0.62
Education Status		
Uneducated (Reference)	1.00	
High school	1.64 (0.90–2.96)	0.11
College	2.05 (1.15–3.88)	0.032*
University	3.50 (1.87–6.53)	0.001*

*$p<0.05$; OR: Odds ratio, CI: Confidence interval, PKR: Pak rupee.

Table-3: Multivariate logistic regression for factors affecting non-adherence to anti-diabetes medication.

Variable	Multivariate OR (95% CI)	*p*-value
Age (years)		
20-29 (Reference)	1.00	
30-39	0.80 (0.33–1.94)	0.70
40-49	0.70 (0.27–1.63)	0.63
50-59	0.65 (0.27–1.60)	0.54
60+	0.55 (0.24–0.92)	0.018*
Gender		
Male (Reference)	Not included	
Female	Not included	Not included
Monthly Salary (PKR)		
<20,000 (Reference)	1.00	
21,000-50,000	1.12 (0.60–2.09)	0.66
51,000-80,000	2.62	0.045*
>80,000	3.12	0.039*
Multiple doses daily		
Yes (Reference)	1.00	
No	2.05 (1.17–3.72)	0.031*
Family History of Diabetes		
Yes (Reference)	1.00	
No	0.47 (0.26–0.80)	0.021*
Time since diagnosis		
<1 year (Reference)	1.00	
1-4 years	0.72 (0.34–1.42)	0.44
5-10 years	0.50 (0.26–0.97)	0.049*
>10 years	0.31 (0.15–0.74)	0.032*
Route of medication		
Injections (Reference)		
Tablets	Not included	Not included
Others	Not included	Not included
Education Status		
Uneducated (Reference)	1.00	
High school	1.58 (0.87–2.88)	0.12
College	1.91 (1.01–3.72)	0.048*
University	3.17 (1.60–6.22)	0.028*

*$p<0.05$; OR: Odds ratio, CI: Confidence interval, PKR: Pak rupee.

forget whether or not they have already taken their medications. Moreover, the need to take medicines regularly can easily lead to feelings of frustration and irritation.

The current study showed that the difference in medication adherence between genders was not statistically significant, which was in line with the findings of a study in Sudan.[14] The possible reason for the equal adherence of both genders to anti-diabetes medications is the presence of similar motivational factors among them to manage this disease.

The current results showed that the adherence of patients increased with an increase in income, while those with lower income were less adherent to their anti-diabetes medications. Several studies in Iraq, India and Ethiopia have reported similar findings.[15-18] Patients with strong financial backgrounds tend to adhere more to their medications because they have their other needs met, making it financially easier for them to have access to their medicines.

The current results revealed that the adherence was slightly higher in patients who took a single dose of medication compared to those who took multiple doses. The finding is in agreement with a study in Jordan.[19] The reason for low adherence by patients with multiple doses is due to the burden they experience while having to take medicines multiple times during the day.

The current study also revealed that the route of medication administration did not significantly affect patients' adherence to anti-diabetes medications. This may be because individuals who are committed to managing their diabetes will take their medication regularly, whether it is an injection or a tablet. On the contrary, a study in Cameroon showed that patients who took insulin injections had lower adherence than those who took oral medicines.[20] This may be because most people fear injections and find oral medications easy to take.

The current study revealed that the patients with a family history of diabetes had high adherence compared to the patients who did not have any prior family history. There is

a huge literature gap on this factor. The possible reason for the higher adherence of patients with a family history of diabetes is the existence of a family support system. They are aware of the potential consequences of irregular medication intake, as they witness firsthand the impact of diabetes on their family members who suffer from the disease. This shared experience motivates them to fully adhere to their treatment plans. On the other hand, patients without a family history of diabetes are often unaware of the consequences of non-adherence as they lack such support systems.

The current study showed that patients diagnosed for more than 10 years had lower adherence rate compared to those diagnosed for 5-10 years, while patients with 1-4 years since diagnosis had an even higher adherence rate. Patients with less than a year since diagnosis had the highest adherence to anti-diabetes medications. Patients' adherence to medications had a negative correlation with the duration of diabetes. A study in Uganda also reported similar finding.[21] On the contrary, a study in Madagascar showed no correlation between the duration of diabetes and patients' adherence to anti-diabetes medications.[22] The possible reason for the increased rate of adherence in the initial years of diagnosis is the fear and anxiety that most of the patients experience during the early years, which makes them take their medicines regularly. On the other hand, people with >10 years since diagnosis develop a relaxed approach towards taking their medications, they gradually become non-adherent.

In the current study, the adherence of patients increased with their level of education status. This is in agreement with the findings of a systematic review, which showed that patients with higher education levels had greater adherence rates than those with lower education levels.[23] Similarly, a cross-sectional survey in India showed that higher education level was positively associated with the adherence of patients.[24] On the contrary, a study in Egypt showed no association between the level of education and the adherence of patients to medications.[25] The reason for the higher adherence rate among people with higher levels of education is that they understand the importance and benefits of taking the medications and the potential side-effects of not taking the treatment for diabetes.

Finally, the current study emphasised that patients with a family history of diabetes were more adherent to their medications compared to those without such a history. Such a finding could not be found in literature.

The current study has a few limitations. Due to financial constraints, it was conducted at only one hospital. A multicentre study with a large sample is recommended to validate the current findings. Also, being a questionnaire-based study, there is a potential risk of response bias on the part of the participants.

Conclusion

An increasing trend in patients' adherence to their anti-diabetes medications was found with higher income, family history of diabetes, and higher educational status. There was a decreasing trend in patients' adherence to their anti-diabetes medications with an increase in age, taking multiple doses of medicines daily, and more years since diagnosis. Gender and the route of administration had no significant difference in the adherence level of patients to their anti-diabetes medications.

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References

1. Shaikh SAA, Kumari J, Bahmanshiri Y. Assessing the adherence to antidiabetic medications among patients diagnosed with type 2 diabetes mellitus in Ajman, UAE. Cureus. 2023;15:e49325. doi:10.7759/cureus.49325
2. Galicia-Garcia U, Benito-Vicente A, Jebari S, Larrea-Sebal A, Siddiqi H, Uribe KB, et al. Pathophysiology of type 2 diabetes mellitus. Int J Mol Sci. 2020;21:6275. doi:10.3390/ijms21176275
3. International Diabetes Federation. IDF Diabetes Atlas, 11th edn. Brussels, Belgium: 2025. Available at: https://diabetesatlas.org Cited on 14th January, 2026
4. World Health Organization. Adherence to long-term therapies: evidence for action. Geneva: World Health Organization. [Online] [Cited 2023 May 12]. Available from: URL: https://iris.who.int/handle/10665/42682
5. Sahoo J, Mohanty S, Kundu A, Epari V. Medication adherence among patients of type II diabetes mellitus and its associated risk factors: a cross-sectional study in a tertiary care hospital of eastern India. Cureus. 2022;14:e33074. doi:10.7759/cureus.33074
6. Nakajima R, Watanabe F, Kamei M. Factors associated with medication non-adherence among patients with lifestyle-related non-communicable diseases. Pharmacy. 2021;9:90. doi:10.3390/pharmacy9020090
7. Pourhoseingholi MA, Vahedi M, Rahimzadeh M. Sample size calculation in medical studies. Gastroenterol Hepatol Bed Bench. 2013;6:14–17
8. Kim MT, Hill MN, Bone LR, Levine DM. Development and testing of the Hill-Bone compliance to high blood pressure therapy scale. Prog Cardiovasc Nurs. 2000;15:90–6.
9. Lambert EV, Steyn K, Stender S, Everage N, Fourie JM, Hill M. Cross-cultural validation of the Hill-Bone compliance to high blood pressure therapy scale in a South African primary health care setting. Ethn Dis. 2006;16:286–91.
10. Mishra A, Pradhan SK, Sahoo BK, Das A, Singh AK, Parida SP. Assessment of medication adherence and associated factors among patients with diabetes attending a non-communicable disease clinic in a community health centre in eastern India. Cureus. 2023;15:e43779. doi.org/10.7759/cureus.43779
11. Azharuddin M, Adil M, Sharma M, Gyawali B. A systematic review and meta-analysis of non-adherence to anti-diabetic medication:

evidence from low- and middle-income countries. Authorea Preprints. 2021;75:e14717. doi:10.22541/au.161248585.50624399/v1

12. Jehan AS, Roshan S, Hussain S, Maheen A, Mahmood J, Zada A. Prevalence and predictors of non-compliance with pharmacological treatment in diabetes. Pak J Health Sci. 2023;4:111–5. doi:10.54393/pjhs.v4i10.1089
13. Siraj J, Abateka T, Kebede O. Patients' adherence to anti-diabetic medications and associated factors in Mizan-Tepi University Teaching Hospital: a cross-sectional study. Inquiry. 2021;58:469580211067477. doi:10.1177/00469580211067477
14. Badi S, Abdalla A, Altayeb L, Noma M, Ahmed MH. Adherence to antidiabetic medications among Sudanese individuals with type 2 diabetes mellitus: a cross-sectional survey. J Patient Exp. 2020;7:163–8. doi:10.1177/2374373519831073
15. Hamalaw S, Hama Salih A, Weli S. Non-adherence to anti-diabetic prescriptions among type 2 diabetes mellitus patients in the Kurdistan Region of Iraq. Cureus. 2024;16:e60572. doi:10.7759/cureus.60572
16. Al-Qerem W, Jarab AS, Badinjki M, Hyassat D, Qarqaz R. Exploring variables associated with medication non-adherence in patients with type 2 diabetes mellitus. PLoS One. 2021;16:e0256666. doi:10.1371/journal.pone.0256666
17. Boshe BD, Yimar GN, Dadhi AE, Bededa WK. The magnitude of non-adherence and contributing factors among adult outpatient with diabetes mellitus in Dilla University Referral Hospital, Gedio, Ethiopia. PLoS One. 2021;16:e0247952. doi:10.1371/journal.pone.0247952
18. Araya EM, Gebrezgabiher HA, Tekulu GH, Alema NM, Getnet D, Gebru HT, et al. Medication non-adherence and associated factors among diabetic patients visiting general hospitals in the Eastern Zone of Tigrai, Northern Ethiopia. Patient Prefer Adherence. 2020;14:2071–83. doi:10.2147/PPA.S278148
19. Aminde LN, Tindong M, Ngwasiri CA, Aminde JA, Njim T, Fondong AA, et al. Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. BMC Endocr Disord. 2019;19:35. doi:10.1186/s12902-019-0360-9
20. Raharinavalona AS, Raherison E, Razanamparany T, Ralamboson SA, Rakotomalala DP, Vololontiana MD, et al. Factors of non-adherence to antidiabetic drugs in type 2 diabetics, Antananarivo, Madagascar. Int J Diabetes Endocrinol. 2021;6:125. doi:10.11648/j.ijde.20210604.11
21. Faisal K, Tusiimire J, Yadesa TM. Prevalence and factors associated with non-adherence to antidiabetic medication among patients at Mbarara Regional Referral Hospital, Mbarara, Uganda. Patient Prefer Adherence. 2022;16:479–91. doi:10.2147/PPA.S343736
22. Thapar R, Holla R, Kumar N, Aithal S, Karkera S, Rao C, et al. Factors influencing adherence to anti-diabetes medications among type 2 diabetes patients attending tertiary care hospitals in Mangaluru. Clin Epidemiol Glob Health. 2020;8:1089–93. doi:10.1016/j.cegh.2020.03.025
23. Wibowo MINA, Yasin NM, Kristina SA, Prabandari YS. Exploring determinants of anti-diabetic medication adherence in several regions of Asia: a systematic review. Patient Prefer Adherence. 2022;16:197–215. doi:10.2147/PPA.S347079
24. Kumar H, Abdulla AR, Lalwani H. Medication adherence among type 2 diabetes mellitus patients: a cross-sectional study in rural Karnataka, India. Athens J Health Med Sci. 2021;8:107–18. doi:10.30958/ajhms.8-2-2
25. Egypt J Community Med. Medication adherence and predictors of non-adherence among patients with type 2 diabetes mellitus in Sohag, Egypt. Egypt J Community Med. 2021;39:51–6. doi:10.21608/ejcm.2021.202264

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AK: Concept, drafting, writing, review, editing, software and formal analysis.
UA: Concept, investigation, drafting, data curation and methodology.
BA: Concept, investigation, data curation, visualization and drafting.
RM: Concept, investigation, drafting, data curation and project administration.
MFJ: Validation, supervision, concept, writing, review, editing and project administration.
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