

FACTORS INFLUENCING ADHERENCE TO RECOMMENDED TREATMENT AMONG INDIVIDUALS WITH TYPE 2 DIABETES: A CROSS SECTIONAL STUDY FROM TERTIARY HOSPITAL SWAT, PAKISTAN

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Abstract

Background: Diabetes is a chronic disorder and a global health concern. Individuals with diabetes require ongoing treatment to minimize complications. Patients must adhere to the prescribed treatment plan to achieve favorable outcomes. This cross-sectional study was conducted in the Saidu Group of Teaching Hospital, Swat, Pakistan, to identify factors influencing adherence to the recommended treatment among patients with type 2 diabetes. 233 participants, aged 20 and older and diagnosed with type 2 diabetes, were selected from the hospital. Following informed consent, patients completed a questionnaire that collected demographic data as well as possible barriers to adherence. To determine adherence to antidiabetic medicine, descriptive and inferential statistics were performed using SPSS version 25.

Result: The study revealed that 73.4% of participants consistently adhered to prescribed medications, while 26.6% reported non adherence. Major factors significantly associated with adherence included monthly income ($p < 0.001$), treatment information adequacy ($p < 0.001$), knowledge about diabetes diagnosis ($p < 0.001$), medication type ($p = 0.034$), and alternative medicine use ($p = 0.017$). Gender differences were significant ($p = 0.032$), with males showing better adherence. Only 16.7% of participants had attended diabetes education programs, and 53.2% reported insufficient treatment information. Financial constraints (43.5%) and forgetfulness (53.2%) were identified as primary reasons for non-adherence. Among participants, 26.2% reported using alternative medicines, which was negatively associated with conventional treatment adherence.

Conclusion: Poverty, lack of knowledge, non access to medications, alternative medication use, and lack of health care were identified as factors that affect adherence. Further studies are essential to uncover insights, enabling customized interventions about treatment adherence is important to improve diabetes care and optimize diabetes management on a global scale

INTRODUCTION

Background

Diabetes is a chronic disease characterized by high blood sugar levels (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both (1). It is an increasing global health problem. Type 2 diabetes is the most common form of diabetes, and Accounting for around 90% of all diabetes cases, it is caused by a combination of factors. According to the International Diabetes Federation (IDF), 540 million adults (20-79 years) are living with diabetes this number is projected to rise to 783 million by 2045. 75% of the world's diabetic population lives in low and middle income countries. In Pakistan, out of 123.53 million adults (20-79 years), 26.7% had diabetes (32.9645 million cases), with projections indicating an increase to 43.7 million cases by 2045 (2). Diabetes affects an estimated 6 to 7 million people in Khyber Pakhtunkhwa, Pakistan with an equal proportion experiencing symptoms but remaining undiagnosed (3). A study on prevalence of diabetes conducted in Swat report that 9.52% of the adult population in Swat had diabetes, and 21.36% had pre diabetes. This indicates that every 10th resident of Swat was diabetic, and one in five had pre diabetes (4). Poor treatment adherence is one of the leading causes of uncontrolled diabetes, which leads to an aggravation of the development of macro and microvascular complications and an increase in mortality (5). A recent scoping review found that in Pakistan, poor glycemic control ranges from 44.7% to 86.4%, and treatment adherence varies significantly due to factors like low literacy, medication cost, and fear of side effects (6). Another cross-sectional study revealed that only 33.3% of patients showed good adherence, and poor adherence was significantly associated with lower quality of life, especially among illiterate patients (7). Moreover, a multi-center study reported that over 60% of patients had uncontrolled fasting blood glucose levels and more than half had HbA1c levels above 7.0%, despite being on multiple oral antidiabetic agents indicating gaps in prescription practices and the need for lifestyle modification education (8). World Health Organization (WHO) reported that diabetes was the direct cause of 1.5 million fatalities in 2019, with 48% of all diabetes related deaths occurring before the age of 70.

According to WHO, adherence is the extent to which a person's behavior follows the agreed upon recommendations of a healthcare provider (9). Adherence to the recommended treatment is crucial in managing diabetes by enhancing control over blood glucose levels and lowering glycosylated hemoglobin (10). However, non-adherence to the treatment is prevalent among diabetic patients, and low adherence undermines the safety and efficacy of treatment, leading to increased mortality and morbidity (11). Several research studies have identified the factors that are associated with non-adherence to the treatment. This includes age, gender, education, cost of medication, forgetting medications, fear of side effects, employment status, poor follow ups, relying on quacks, etc. (12).

Materials and Methods

Study design and setting

The study was conducted after obtaining approval from the Institutional Ethical Board (PSNC IRB). Informed consent was obtained from each patient before the study. This cross-sectional study was conducted over six months, from July to December 2024. and data were collected from medical wards of the Saidu group of teaching hospitals (tertiary care hospital in Swat Khyber Pakhtunkhwa, Pakistan).

Participant, sample size, Sampling, and study variables

Our cross-sectional study focused on diabetic patients aged at least 20 who were hospitalized in medical wards. These patients gave their informed consent to participate in our research. We excluded people who were critically ill, pregnant women (Gestational Diabetes), or had just been diagnosed with diabetes (less than three months ago). Utilizing convenience sampling techniques, we selected a sample size of 233 patients for our study. The primary goal of the study was to assess the level of adherence of an individual to an antidiabetic medication and identify factors that influence it. We also looked into other variables of diabetes treatment, such as duration and type of medication used, drug availability, side effect experiences, time spent since the last consultation with a healthcare professional, use of alternative medicine, exposure to

diabetic education, understanding of their medication regimen, and whether they had received medication reminders or not.

Data Collection and Analysis Method

The data were collected using a structured questionnaire adapted from a similar study by Julia Davidsson(13) and was based on the study of Bogonza. (11). In the data collection tool first; there were demographic questions regarding age, gender, Marital status, education, employment, and monthly income. To assess individuals' medication adherence levels, they were asked questions about taking medications as prescribed, following a recommended diet, and meeting with their healthcare practitioner for monitoring. Respondents were asked about receiving diabetes education, understanding their prescription regimen, and whether they possessed sufficient knowledge about their diabetes diagnosis. To determine the factors associated with adherence to the recommended treatment among the participants, chi-square tests and logistic regression were performed using SPSS version 25. The

significance of the associations between adherence and other variables was evaluated, with a P-value less than 0.05 indicating statistical significance.

Results:

Sociodemographic

A total of 233 participants were questioned, with a considerable majority (67.0%) above the age of 49 and a notable female predominance (64.4%). The majority of participants (78.1%) were married. Body mass index (BMI) classifications revealed that 50.6% had a normal BMI (18.5-24.9), whereas 32.2% and 9.9% were overweight and obese, respectively. Monthly income statistics revealed a wide range, with 22.7% earning less than 20,000/month and 23.2% earning more than 40,000/month. A majority of participants (76.4%) had no formal education, demonstrating a general lack of education, and 7.3% had higher education. Employment status varied, with a large majority of housewives (53.6%) and a significant proportion of unemployed people (16.3%). Details of the respondents' demographic characteristics are summarized in Table 1.

Table 1 sociodemographic characteristics of respondents

Variables	Frequency	Percentage (%)
Age:		
20-29	15	6.40%
30-39	21	9.00%
40-49	41	17.60%
>49	156	67.00%
Gender:		
Male	83	35.60%
Female	150	64.45%
Marital status:		
Single	16	6.9%
Married	182	78.1%
Widowed	35	15.0%
Body mass index:		
<18.5	17	7.3%
18.5-24.9	118	50.6%
25-29.9	75	32.2%
>30	23	9.9%
Monthly Income:		
<20000/month	53	22.7%
20000-30000/month	90	38.6%
31000-40000/month	36	15.5%

>40000/month	54	23.2%
Education level		
No Formal Education.	178	76.4%
Elementary Level	18	7.7%
Secondary Level	10	4.3%
Intermediate Level	09	3.9%
Higher.	17	7.3%
Employment:		
Self Employed	44	18.9%
Govt. Employee	11	4.7%
Private Employee	15	6.4%
Housewife	125	53.6%
Unemployed	38	16.3%

Patient Awareness and Education on Diabetes Management

Effective diabetes management relies on patient education and understanding of their treatment regimen because well informed patients are more likely to adhere to prescribed therapies and engage in self care (14). Studies have shown that gaps in knowledge and inadequate communication from healthcare providers can significantly hinder treatment adherence (15,16). This section examines the patient responses regarding their awareness and education on diabetes management. Most patients (63.5%) had seen a healthcare worker within the last

three months, potentially impacting their treatment adherence. A high proportion (88.8%) reported understanding their drug regimen, indicating good awareness; however, 11.2% still lacked understanding. Participation in diabetes education programs was notably low, with only 16.7% of patients attending, while 83.3% did not participate. Additionally, over half of the respondents (53.2%) felt they had not received adequate information about their treatment. This lack of perceived information aligns with the finding that 54.9% of patients reported insufficient knowledge about their diabetes. Details are in Table 2.

Table 2 Patient Awareness and Education on Diabetes Management

Variable	Frequency (N)	Percentage (%)
Time since last seen health worker		
Less than 3 months ago	148	63.50%
More than 3 months ago	85	36.50%
Understanding of drug regimen		
Yes	207	88.80%
No	26	11.20%
Participation in diabetes education		
Yes	39	16.70%
No	194	83.30%
Adequacy of information about diabetes treatment		
Yes	109	46.80%
No	124	53.20%
Knowledge about diabetes diagnosis		
Yes	105	45.10%
No	128	54.90%

Adherence to Anti Diabetic Medication

Therapeutic adherence implies the extent to which patients comply with medical recommendations, including taking prescribed medications and adopting lifestyle changes proposed by healthcare professionals (17,18). Our study focused on patients' adherence to the diabetic medications they had prescribed. Among 233 respondents with diabetes, most (73.0%) have been using medication for more than 3 years, with 48.5% taking only oral medications and 9.0% using injections only. A significant majority (73.4%) always take their medication as prescribed, but 26.6% did not follow

the prescribed treatment, often forgetting or struggling to afford it. Regarding diet, 58.4% consistently follow recommended guidelines. 26.2% of the individual use alternative medicines, mainly homeopathic and herbal products. Most respondents (94.4%) trust the healthcare system, though 34.3% have avoided seeking medical attention for their condition. Among the 233 respondents, 73.4% reported consistently taking their medications as prescribed, indicating strong adherence within this group. However, 26.6% of participants did not adhere to their prescribed regimen. Details are in Table 3.

Table 3 Adherence to Anti Diabetic Medication

Variables	Frequency	Percentage (%)
Duration of Diabetes Medication Use		
≤ 3 years	63	27
> 3 years	170	73
Type of Diabetes Medication		
Orals only	113	48.5
Injections only	21	9.0
Both orals and injections	99	42.5
Adherence to Prescribed Medication		
Yes	171	73.4
No	62	26.6
Reasons for Not Taking Medication as Prescribed (those who answered no to the above question)		
Forgot to take medication	33	53.2
Could not afford medication	27	43.5
Did not know how to take medication	2	3.2
Adherence to Recommended Diet		
Always	136	58.4
Sometimes	82	35.2
Not at all	15	6.4
Use of Alternative Medicines for Diabetes Treatment		
Yes	61	26.2
No	172	73.8
Type of Alternative Medicine Used (those who answered YES to the above question)		
Homeopathic	34	55.7
Herbal preparation	27	44.3
Trust in the Healthcare System		
Yes	220	94.4
No	13	5.6
Avoidance of Healthcare for Medication or Monitoring		
Yes	80	34.3
No	153	65.7

Factors Affecting Adherence to Recommended Treatment

The analysis highlighted the influence of specific demographic and treatment related factors on drug adherence in individuals with type 2 diabetes. Among demographic factors, gender and income showed notable associations, with males adhering slightly better than females and higher income groups displaying greater adherence, likely due to better access to medications and healthcare. In contrast, age, marital status, education level, and employment status did not significantly impact adherence. Treatment related factors provided deeper insights; patients who felt adequately informed about

their treatment and knowledgeable about their diabetes diagnosis adhered more consistently additionally, those taking oral medications adhered better than those on injections or combination therapies. The use of alternative medicine was negatively associated with adherence, with non users adhering better. Interestingly, trust in the healthcare system and participation in diabetes education programs did not significantly influence adherence. Overall, the results emphasize the significance of financial stability, simplified treatment regimens, and patient centered education in enhancing drug adherence. Details are in Table 4.

Table 4 Factors Affecting Adherence to Recommended Treatment

Variable	Medication Adherence		P-Value
	(YES)	(NO)	
Age			0.927
20-29 years	10	5	
30-39 years	15	6	
40-49 years	30	11	
> 49 years	116	40	
Gender			0.032*
Male	54	29	
Female	117	33	
Marital Status			0.907
Single	11	5	
Married	134	48	
Widowed	26	9	
Monthly Income			< 0.001*
< 20,000/month	42	11	
20,000-30,000/month	51	39	
31,000-40,000/month	30	6	
> 40,000/month	48	6	
Education Level			0.268
No Formal Education	8	1	
Elementary Level	14	3	
Secondary Level	132	46	
Intermediate Level	11	7	
Bachelor and Higher	5	5	
Employment			0.301
Self Employed	28	16	
Govt. Employee	8	3	
Private Employee	9	6	
Housewife	96	29	
Unemployed	30	8	

Time Since Last Visit			
< 3 months ago	111	37	0.463
> 3 months ago	60	25	
Understand Drug Regimen			
Yes	153	54	0.611
No	18	8	
Participated in Diabetes Education			
Yes	30	9	0.584
No	141	53	
Adequate Information			
Yes	95	14	< 0.001*
No	76	48	
Knowledge About Diagnosis			
Yes	90	15	< 0.001*
No	81	47	
Duration of Medication Use			
≤ 3 years	47	16	0.246
> 3 years	124	45	
Type of Medication			
Orals Only	90	23	0.034*
Injections Only	17	4	
Both	64	35	
Use of Alternative Medicine			
Yes	37	23	0.017*
No	134	39	
Trust in Healthcare System			
Yes	164	56	0.101
No	7	6	

Discussion

This cross sectional study investigated factors influencing treatment adherence among individuals with type 2 diabetes at a tertiary hospital in Swat, Pakistan. The findings revealed several significant factors affecting medication adherence, including gender, income level, treatment information adequacy, diabetes knowledge, medication type, and use of alternative medicine. The study found that 73.4% of participants reported consistent medication adherence. In Pakistan, various studies have reported differing adherence rates among patients with type 2 diabetes. A study conducted in Islamabad found an adherence rate of 37.7% (19). Similarly, research from Quetta, Pakistan reported that 55.6% of Type 2 DM patients demonstrated adherence to their medication (20). Similarly, in Faisalabad, approximately 68.9% of participants

stated they never forget their medications (21). Another study from Sargodha indicated that adherence to medications among Type 2 DM patients varies widely, with estimates ranging from 36% to 94%(22). Furthermore, a nationally conducted systematic review highlighted significant variations in adherence levels across studies observed adherence level ranges from 44.7%-86.4% (23). Adherence level in our study was relatively higher than the global average adherence rate of 67.9% (95% CI: 65.8-70.0%), based on a meta analysis that included 447 studies (24). A recent systematic review and meta analysis evaluated adherence to therapy in patients with type 2 diabetes found that 54% (95% CI: 51-58%) were adherent to their therapy (25). However, this adherence level is still below the WHO's target of 80% adherence for chronic conditions (26,27). The adherence rate is

also higher than those reported in neighboring South Asian countries, such as in India adherence level was 43.4%–51% for an antidiabetic medication (28,29). And in Bangladesh 54% adherence in a study of 240 patients (30). Nevertheless, it is concerning that over one-quarter of patients (26.6%) demonstrated poor adherence, primarily due to financial constraints (43.5%) and forgetfulness (53.2%). These findings align with nationally conducted study which found that 37.2% of non-adherent patients cited cost as a primary barrier (31), while 94% reported forgetfulness as their main challenge (32). Gender differences in adherence were statistically significant ($p=0.032$), with males showing better adherence than females. This finding aligns with previous research indicating that males exhibit greater adherence to diabetes medication compared to females (33). Similarly, Differences in adherence levels between males and females have also been observed in other chronic diseases. A study conducted in Islamabad, Pakistan, found that female patients were less likely to be adherent to antihypertension medication as compared to males (34). Monthly income emerged as a crucial determinant of adherence ($p<0.001$), with higher income groups showing better compliance. In our study, patients earning over 40,000/month showed an adherence rate of 88.9% compared to 79.2% for those earning less than 20,000/month. Similarly, prior study involving 300 participants from Islamabad and Rawalpindi found that 45% of patients were nonadherent to their diabetic medication, due to financial constraints and forgetfulness as the primary obstacles (35). Another study conducted in Karachi reported that 74.2% of 151 participants were noncompliant with their prescribed diabetic treatment (36). Additionally, a systematic review on factors influencing diabetic medication adherence across several regions of Asia highlights that socioeconomic status, including income, plays a crucial role in determining adherence among diabetic patients (37). The study revealed a strong association between treatment information adequacy, diabetes knowledge, and adherence ($p<0.001$). Patients who had sufficient knowledge and received adequate treatment information demonstrated higher adherence rates, with knowledgeable individuals adhering at 52.6%

compared to 47.4% among those with insufficient knowledge. This statement is supported by a study conducted in Quetta, Pakistan, which reported that individuals with adequate health literacy were more likely to remember to take their medications compared to those with inadequate health literacy (38). Similarly, another study from Lahore found a significant association between diabetes related knowledge, treatment satisfaction, and medication adherence (39). There was a low participation rate in diabetes education programs (16.7%) which is particularly alarming, especially when compared to the rates in developed countries, where participation varies between about 40% and 55% (40). The type of medication significantly influenced adherence patterns ($p=0.034$), with patients on oral medications showing better adherence compared to those using injectable treatments or combination therapy. The case study from combined military hospital (CMH) Nowshera Pakistan revealed that patient on injectable antidiabetic therapy (insulin) had significantly higher rates of noncompliance (77.8%), to treatment therapy compared to those on oral hypoglycemic medications (32.1%) (31). This suggests insulin users face greater challenges in adhering to their prescribed treatment regimen which can lead to lower adherence rates (31,41). Alternative medicine use showed a significant negative association with conventional treatment adherence ($p=0.017$). Participants who reported using alternative medicines showed a low adherence to conventional treatments, compared to those non users. This statement is supported by the study conducted in Islamabad which indicate a significant association between the use of alternative therapies and medication adherence among diabetic patients. Those who did not rely on alternative treatments therapies demonstrated higher adherence to their prescribed diabetic medication. In contrast, patients who used homeopathic, herbal, or Hikmat therapies exhibited higher rates of nonadherence (19). These findings align with those of a systematic review, which indicates that adherence rates are higher with simpler medication regimens, such as once daily dosing and monotherapy, compared to more complex regimens involving multiple daily doses and polytherapy (42). Trust in the healthcare system, while high at 94.4%, did not significantly impact

adherence ($p=0.101$). This contrasts with findings from developed countries, where trust in healthcare systems typically correlates strongly with adherence (43).

Implications for Healthcare

Healthcare providers should implement targeted patient education programs addressing the knowledge gap evident in our study, where 54.9% of patients lacked understanding of their diabetes diagnosis. Simplified medication regimens should be considered for patients struggling with complex therapies. Policymakers should develop financial support mechanisms to address cost barriers, particularly for lower income patients who demonstrated significantly poorer adherence. Integration of diabetes education with primary care services could improve the currently low participation rate (16.7%) in education programs. Healthcare systems should also engage constructively with providers of alternative medicine to ensure complementary approaches to diabetes management.

Conclusion

This study at Saidu Group of Teaching Hospital in Swat, Pakistan, highlights the key factors influencing treatment adherence among patients with type 2 diabetes. While adherence rates of 73.4% are relatively favorable, financial constraints and forgetfulness remain major barriers, affecting over a quarter of patients. Gender, income level, adequacy of treatment information, patient knowledge, medication type, and the use of alternative medicine were all significantly associated with adherence. Notably, less than half of the patients fully understood their diagnosis, and participation in diabetes education programs was alarmingly low at just 16.7%, underscoring the urgent need for targeted educational initiatives.

Limitations

This study has several limitations that should be acknowledged. Firstly, the research was conducted at a single tertiary care hospital in Swat, which may limit the generalizability of the findings to broader populations or different healthcare settings. Secondly, the use of a convenience sampling technique may introduce selection bias, potentially

affecting the representativeness of the sample. Moreover, the cross-sectional design of the study restricts the ability to establish causal relationships between the identified factors and treatment adherence.

Recommendations

Future researchers should consider conducting multi-center studies to make findings more generalizable. The use of probability based sampling methods is recommended to reduce selection bias and enhance the representativeness of the study sample. Longitudinal research designs should be considered to explore causal relationships between the identified factors and treatment adherence. Furthermore, incorporating qualitative methods could also provide deeper insights into patients' perspectives, barriers, and motivations related to treatment adherence.

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