# A CROSS-SECTIONAL STUDY TO INVESTIGATE COST-RELATED NON-ADHERENCE AMONG DIABETIC PATIENTS IN TWIN CITIES

*Original Research*

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|---|---|

## ABSTRACT

**Background:** Medication nonadherence is a significant global health issue, particularly among diabetic patients, and is associated with worsened health outcomes and increased healthcare costs. In Pakistan, where diabetes prevalence is high, socioeconomic disparities exacerbate adherence challenges. Cost-related barriers, forgetfulness, and complex medication regimens are commonly cited reasons for nonadherence. Understanding the influence of socioeconomic factors such as income, education, and insurance coverage on medication adherence is essential to developing effective strategies for improving diabetes management.

**Objective:** To investigate the correlation between socioeconomic factors (income levels, education, and insurance coverage) and medication adherence among diabetic patients in Rawalpindi and Islamabad.

**Methods:** A cross-sectional study was conducted involving 300 diabetic patients from Rawalpindi and Islamabad. Data were collected using a validated self-administered questionnaire consisting of six sections, including demographics, adherence challenges, and coping strategies. Statistical analysis, including chi-square tests, was performed using SPSS version 23.0 to identify significant associations ($p<0.05$). Ethical approval was obtained from the university's ethical review board.

**Results:** Among the 300 participants, 45% reported nonadherence to medication regimens, primarily due to financial concerns (37.3%) and forgetfulness (50.3%). The majority (61%) were aged between 30 and 50 years, and 79.3% sought alternative financial support, while 80.3% were aware of community resources. Significant associations were observed between age and key adherence factors, including cost-related challenges ($p<0.001$). Despite awareness and financial assistance, adherence barriers persisted.

**Conclusion:** This study highlights the critical impact of socioeconomic factors on medication adherence among diabetic patients in Rawalpindi and Islamabad. Addressing nonadherence requires a multifaceted approach, including enhanced financial support, personalized counseling, and innovative interventions such as healthcare reminders, to improve diabetes management outcomes.

**Keywords:** Adherence, Diabetes Mellitus, Financial Assistance, Medication, Patient Compliance, Socioeconomic Factors, Surveys and Questionnaires.

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## INTRODUCTION

Diabetes, a chronic metabolic disorder characterized by hyperglycemia in fasting or postprandial states, is a significant global health concern. It arises due to either insufficient insulin production by the pancreas or the body's resistance to insulin, both of which impair the regulation of blood glucose levels and hinder glucose uptake into cells for energy production (1). Among the types of diabetes, type 2 diabetes mellitus (T2DM) is the most prevalent, accounting for over 90% of cases worldwide (2). Its rising prevalence is strongly correlated with obesity, sedentary lifestyles, and poor dietary habits, which are hallmarks of modern society. In countries like Pakistan, where healthcare systems face resource constraints, the burden of T2DM is particularly acute, with socioeconomic disparities further complicating disease management (3).

The effective management of T2DM requires a combination of lifestyle modifications, including increased physical activity, dietary control, and weight management, alongside pharmacotherapy to regulate blood glucose levels (4). However, medications for diabetes, which include insulin, oral hypoglycemics, and glucose monitoring supplies, are often associated with significant costs (5). These expenses can impose a considerable financial burden on patients, especially those in low-income settings, leading to cost-related non-adherence (CRN). CRN manifests as skipped doses, reduced medication intake, delayed refills, or foregoing prescriptions altogether (6). Such behavior undermines effective disease control, increasing the risk of complications such as cardiovascular diseases, neuropathy, nephropathy, and retinopathy, and ultimately leads to higher healthcare expenditures due to emergency visits or hospitalizations (7).

Medication non-adherence, a multifaceted phenomenon, stems from a variety of factors (8). Among these, economic constraints play a pivotal role, particularly in resource-limited settings where patients must often prioritize basic necessities over healthcare expenses (9). Additionally, psychological barriers, lack of awareness, and complex dosage regimens contribute to poor adherence. Despite the critical role of pharmacotherapy in mitigating the progression of diabetes and its associated complications, the inability to afford medications remains a pervasive barrier. This challenge is exacerbated in regions with limited insurance coverage, inadequate patient counseling, and minimal support systems for chronic disease management (10).

In Pakistan, the financial strain associated with diabetes management is a prominent issue, compounded by the absence of universal healthcare and a lack of subsidized medication programs (11). Many patients struggle to adhere to prescribed therapies due to the high costs of insulin, oral medications, and essential supplies such as test strips and glucose meters (12). Consequently, low-income and uninsured individuals are disproportionately affected, often experiencing suboptimal glycemic control and increased vulnerability to severe complications (13). Addressing this issue requires a comprehensive understanding of the socioeconomic factors influencing medication adherence, including income levels, education, and insurance coverage.

This study aims to investigate the relationship between socioeconomic determinants and cost-related medication adherence among diabetic patients in Pakistan's twin cities (14). By identifying the barriers to adherence, the research seeks to provide insights into strategies that can enhance treatment compliance, reduce healthcare disparities, and improve diabetes outcomes, ultimately contributing to more effective disease management in resource-constrained settings (15).

## METHODS

The study employed a cross-sectional survey design utilizing a self-administered questionnaire to collect data. The questionnaire was meticulously structured into six distinct sections, each addressing key aspects relevant to the study objectives. These sections included demographic information, health profiles, challenges related to medication adherence, the impact of cost on adherence, strategies for seeking assistance and awareness, and coping mechanisms alongside potential solutions. The questionnaire was developed and validated in accordance with prevailing national and international guidelines at the time of the study, ensuring the reliability and relevance of the questions. The protocol for the study outlined the scope, target population, study design, desired outcomes, and the methods for data collection and analysis, aiming to eliminate bias and promote transparency and accountability throughout the research process.

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Data collection was conducted using closed-ended questions, enabling systematic and consistent responses. Responses were documented and analyzed using SPSS software, version 23.0, after being initially entered into Microsoft Excel for organization and interpretation. Each response was scored based on predefined criteria, and these scores were converted into percentages for further analysis. Responses to key parameters, such as challenges, cost impacts, assistance-seeking behaviors, awareness, and coping strategies, were assessed through descriptive statistics. Associations between these variables and demographic factors, including age, gender, education, and financial status, were evaluated using chi-square analysis to identify significant relationships.

Ethical approval for the study was obtained from the Institutional Review Board of Ibadat International University Islamabad (IIUI), ensuring compliance with ethical standards for research involving human participants. All participants provided informed consent, and the study adhered to established ethical guidelines.

## RESULTS

The demographic analysis revealed a predominance of participants aged between 30 and 50 years, accounting for 61.0% of the sample, while 26.7% were over 50 years, and 12.3% were below 30 years. The gender distribution was nearly equal, with males comprising 50.3% and females 49.7%. Educational levels showed that 52.0% of participants had completed 12 years of education, while 40.0% had less than 10 years, and only 8.0% had 14 or more years of education. Employment status indicated that 43.3% were employed, 45.0% were unemployed, and 11.7% were retired. Monthly income analysis revealed that the majority, 59.7%, earned between 30,000 and 50,000 PKR, while 30.7% earned more than 50,000 PKR, and 9.7% earned less than 30,000 PKR. These findings underscored the socioeconomic diversity within the study population, with variations in income and education likely influencing medication adherence behaviors.

Adherence to prescribed medications was observed in 55.0% of participants, while 45.0% did not adhere, with high medication costs cited as a barrier by 37.3%. Forgetfulness emerged as the most common reason, affecting 50.3%, while side effects (5.3%) and complex dosage regimens (7.0%) were less frequent factors. Financial challenges in affording medications were reported by 55.0%, significantly associated with age but not gender. Glucose monitoring practices revealed that 26.0% checked daily, 68.3% weekly, and 5.7% monthly, with age significantly influencing these behaviors. A large proportion of participants (79.3%) reported reliance on financial assistance programs, while 47.3% discussed medication costs with healthcare providers, with older individuals more likely to engage in such discussions. These results highlight the multifaceted barriers to adherence, including financial constraints, forgetfulness, and age-related factors, emphasizing the need for targeted interventions to improve medication adherence.

**Table 1 Patient demographics**

| Classification | | Frequency | Percentage % |
|---|---|---|---|
| **Age** | less than 30 years | 37 | 12.3 |
| | between 30-50 years | 183 | 61.0 |
| | more than 50 years | 80 | 26.7 |
| **Gender** | Male | 151 | 50.3 |
| | Female | 149 | 49.7 |
| **Level of education** | less than 10 years | 120 | 40.0 |
| | 12 years | 156 | 52.0 |
| | 14 years or more | 24 | 8.0 |
| **Employment status** | Employed | 130 | 43.3 |
| | Unemployed | 135 | 45.0 |

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| | | | |
|---|---|---|---|
| | Retired | 35 | 11.7 |
| **Monthly income** | less than 30000 | 29 | 9.7 |
| | 30000-50000 | 179 | 59.7 |
| | more than 50000 | 92 | 30.7 |

The patient demographics revealed a predominance of middle-aged individuals, with 61.0% aged between 30 and 50 years, while 26.7% were over 50 years and 12.3% were below 30 years. Gender distribution was nearly equal, with males comprising 50.3% and females 49.7%. Educational attainment showed that 52.0% had completed 12 years of education, 40.0% had less than 10 years, and only 8.0% had 14 years or more. Employment status indicated that 43.3% were employed, 45.0% were unemployed, and 11.7% were retired. Regarding income levels, the majority (59.7%) earned between 30,000 and 50,000 PKR monthly, 30.7% earned more than 50,000 PKR, and 9.7% earned less than 30,000 PKR.

The impact of cost on medication adherence revealed that 79.3% of participants reported seeking alternative financial assistance programs, with a significant association with age ($p<0.05$) but no significant difference by gender. Additionally, 47.3% discussed their medication cost concerns with healthcare providers, while 52.7% did not. Notably, age showed a significant relationship with this behavior ($p=0.00$), indicating that older individuals were more likely to engage in cost-related discussions. These findings underscore the critical role of financial support programs and open communication with healthcare providers in addressing cost-related barriers to adherence.
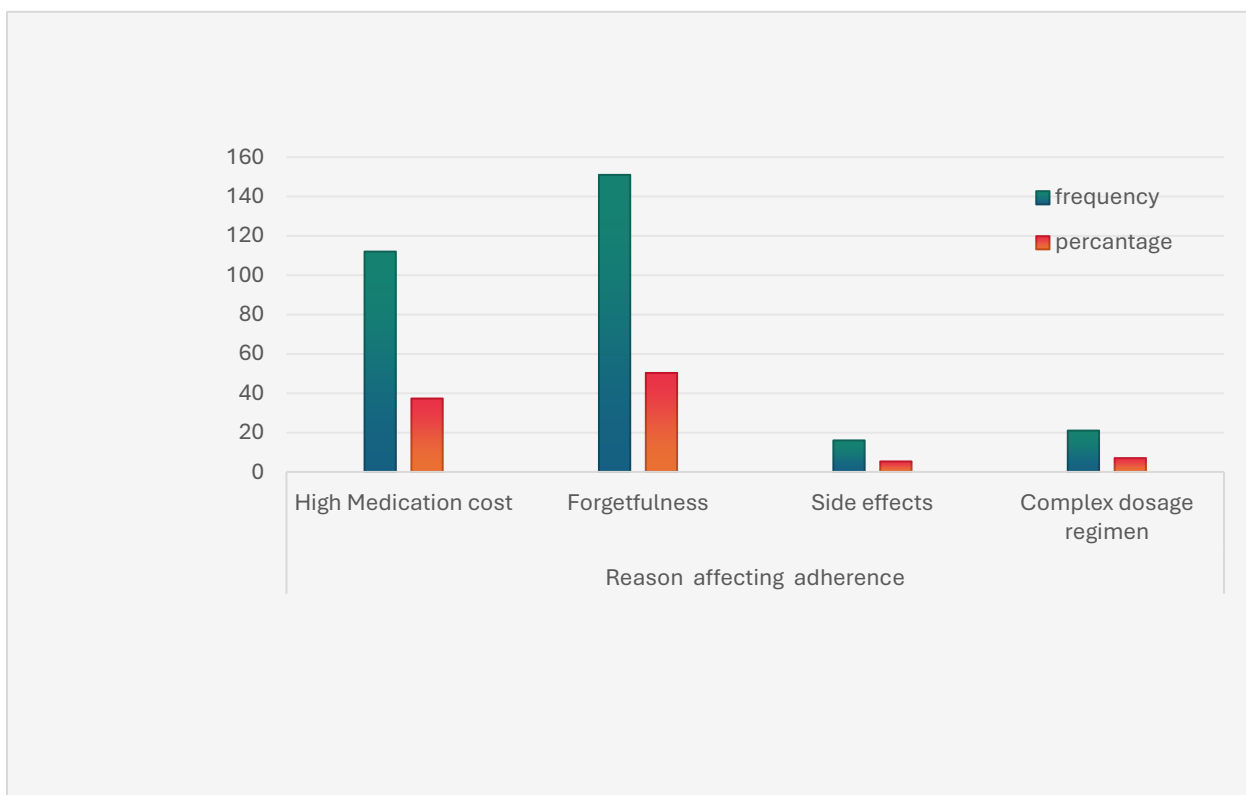


*Figure 1 reasons affecting medication adherence*

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**Table 2 Medication Adherence Challenge**

**Medication Adherence Challenge**

| | | Frequency | Percentage% | P value related to gender | P value related to age |
|---|---|---|---|---|---|
| **Medication adherence** | Yes | 165 | 55.0 | >0.05 | >0.05 |
| | No | 135 | 45.0 | | |
| **Reason affecting adherence** | High medication cost | 112 | 37.3 | >0.05 | <0.001 |
| | Forgetfulness | 151 | 50.3 | | |
| | Side effects | 16 | 5.3 | | |
| | Complex dosage regimen | 21 | 7.0 | | |
| **Challenges affording your medication** | Yes | 165 | 55.0 | >0.05 | <0.001 |
| | No | 135 | 45.0 | | |
| **Reduced or skipped doses** | Yes | 137 | 45.7 | >0.05 | <0.001 |
| | No | 163 | 54.3 | | |
| **Check blood glucose levels?** | Daily | 78 | 26.0 | >0.05 | <0.05 |
| | Weekly | 205 | 68.3 | | |
| | Monthly | 17 | 5.7 | | |
| **Comorbidities** | Yes | 248 | 82.7 | >0.05 | >0.05 |
| | No | 52 | 17.3 | | |
| **Following your dose regimen?** | Yes | 222 | 74.0 | >0.05 | <0.05 |
| | No | 78 | 26.0 | | |

The data on medication adherence challenges revealed that 55.0% of patients adhered to their medication regimen, while 45.0% did not, with no statistically significant differences related to gender or age. High medication costs affected adherence for 37.3% of participants, while forgetfulness was reported by 50.3%, side effects by 5.3%, and complex dosage regimens by 7.0%. Challenges affording medications were noted by 55.0% of participants, with significant associations observed with age (p<0.001) but not gender. Additionally, 45.7% reported reducing or skipping doses, which also showed significant associations with age (p<0.001). Regarding glucose monitoring, 26.0% checked daily, 68.3% weekly, and 5.7% monthly, with significant associations noted for age (p<0.05). Comorbidities were highly prevalent, reported by 82.7%, with no significant differences by gender or age. Furthermore, 74.0% followed their dosage regimen, while 26.0% did not, with age significantly influencing adherence (p<0.05). These findings highlight cost, forgetfulness, and age-related factors as critical barriers to medication adherence.

**Table 3 Impact of Cost on Adherence**

| | | Frequency | Percentage % | P value related to gender | P value related to age |
|---|---|---|---|---|---|
| Alternative financial assistance programs | Yes | 238 | 79.3 | >0.05 | <0.05 |
| | No | 62 | 20.7 | | |
| Discuss medication cost concerns with healthcare provider | Yes | 142 | 47.3 | >0.05 | 0.00 |
| | No | 158 | 52.7 | | |

The impact of cost on medication adherence revealed that 79.3% of participants reported seeking alternative financial assistance programs, with a significant association with age (p<0.05) but no significant difference by gender. Additionally, 47.3% discussed their medication cost concerns with healthcare providers, while 52.7% did not. Notably, age showed a significant relationship with this behavior (p=0.00), indicating that older individuals were more likely to engage in cost-related discussions. These findings underscore the critical role of financial support programs and open communication with healthcare providers in addressing cost-related barriers to adherence.
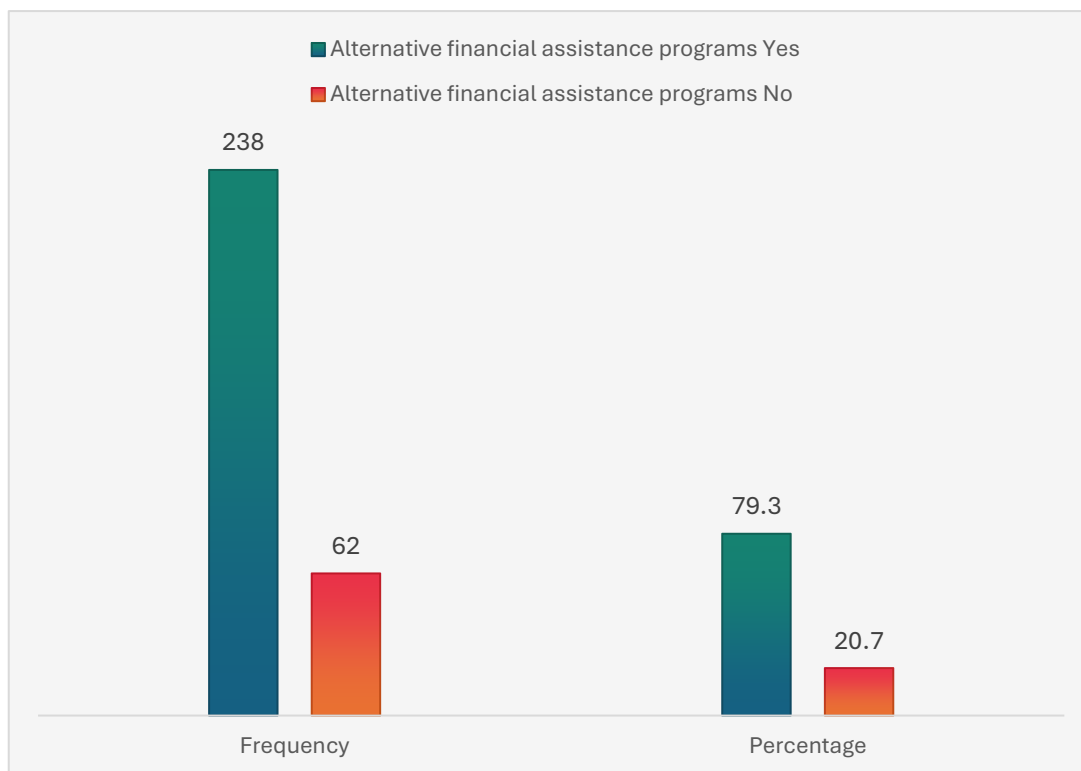


*Figure 2 frequency and percentage of patients having alternative financial programs*

Figure 2 highlights the frequency and percentage of patients utilizing alternative financial assistance programs. The majority, 79.3% (238 participants), reported having access to such programs, while 20.7% (62 participants) did not. This underscores the significant reliance on financial assistance to support medication adherence among the surveyed population.

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## DISCUSSIONS

This study aimed to evaluate medication nonadherence among diabetic patients in the twin cities of Rawalpindi and Islamabad, providing insights into the variables influencing adherence and their broader implications. The findings revealed that a significant proportion of participants (45%) faced challenges in adhering to their prescribed regimens, with forgetfulness and cost-related concerns emerging as the primary barriers. These results align with global observations, where cost-related nonadherence and behavioral factors such as forgetfulness have consistently been identified as critical barriers to effective diabetes management. While affordability plays a pivotal role, the data suggested that over half of the participants did not view it as the sole determinant of adherence, underscoring the multifactorial nature of the issue. This highlights the need for comprehensive strategies addressing both financial and behavioral dimensions of nonadherence (16).

The study also identified age as a significant factor influencing adherence, with younger patients demonstrating greater difficulties, potentially due to lifestyle constraints and psychological factors. This finding is consistent with existing literature indicating that nonadherence in younger populations may be linked to social and mental health challenges. Middle-aged patients, who represented the majority in this study, often followed complex regimens requiring multiple medications, reflecting the chronic nature of diabetes and the necessity for multifaceted treatment approaches. Additionally, the significant awareness and participation in financial assistance programs among participants emphasized the adaptive strategies adopted by patients to mitigate medication costs. These initiatives, while beneficial in reducing the financial burden, also indicated a systemic reliance on external support to manage chronic conditions effectively (17).

The study's strengths include its focus on a diverse patient population and its exploration of both financial and behavioral factors affecting adherence (18). However, certain limitations must be acknowledged. The reliance on self-reported data may have introduced response biases, and the cross-sectional nature of the study restricted the ability to establish causal relationships. Despite these limitations, the findings provide valuable insights into the complexities of medication adherence, emphasizing the interplay of socioeconomic, behavioral, and systemic factors. Addressing these issues requires an integrated approach combining financial support, patient education, and tailored interventions to improve adherence and, consequently, health outcomes in diabetic populations (19).

A comparative study conducted in 2020 examined the impact of financial assistance programs on medication adherence among diabetic patients in two socioeconomically diverse regions. The research evaluated adherence rates in patients who were provided subsidized medication through government programs versus those without access to such support. The study revealed a significant improvement in adherence among patients enrolled in financial assistance programs, with adherence rates exceeding 70% compared to less than 50% in the non-subsidized group. The findings also demonstrated a reduction in diabetes-related complications in the subsidized group, emphasizing the importance of addressing financial barriers to ensure effective diabetes management. Interestingly, the study highlighted that while financial support significantly influenced adherence, behavioral factors, such as patient education and consistent follow-up, also played a crucial role in sustaining long-term compliance (20).

## CONCLUSION

In conclusion, this study underscores the critical issue of medication nonadherence, particularly cost-related nonadherence, among diabetic patients in the twin cities of Rawalpindi and Islamabad. The findings highlight the multifaceted nature of nonadherence, influenced by financial constraints, behavioral factors such as forgetfulness, and the complexities of managing chronic conditions with intricate medication regimens. These challenges not only hinder effective diabetes management but also carry significant implications for overall health and economic outcomes. Addressing this pressing issue requires a comprehensive approach that combines financial assistance, patient education, and tailored support systems to improve adherence and enhance the quality of care for diabetic patients.

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## AUTHOR CONTRIBUTIONS

| Author | Contribution |
|---|---|
| Ayesha Sana | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Aneeb Ibrahim | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |
| Najam-us-Sahar | Substantial Contribution to acquisition and interpretation of Data<br>Has given Final Approval of the version to be published |
| Robaica Khan | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Zaid Saleem | Contributed to Data Collection and Analysis<br>Has given Final Approval of the version to be published |
| Iqtidar Aziz | Substantial Contribution to study design and Data Analysis<br>Has given Final Approval of the version to be published |
| Kashif Iqbal | Contributed to study concept and Data collection<br>Has given Final Approval of the version to be published |
| Muhammad Bilal | Writing - Review & Editing, Assistance with Data Curation |

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