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Prevalence and Predictors of Non-Adherence to Treatment in Patients with Type 2 Diabetes Mellitus

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Abstract

Background: Adherence to treatment is crucial for achieving effective glycaemic control and preventing complications in Type 2 Diabetes Mellitus (T2DM). However, poor adherence to pharmacological and non-pharmacological interventions remains a significant barrier worldwide. *Objectives:* This study aimed to assess the prevalence of treatment non-adherence among patients with T2DM, identify socio-demographic and clinical factors influencing adherence, and examine its impact on glycaemic control. *Methods:* A cross-sectional study was conducted at a secondary care hospital in King Koti, Hyderabad, from March to August 2025. One hundred patients with T2DM were randomly recruited. Data were collected via structured questionnaires assessing sociodemographic information, treatment adherence (pharmacological and lifestyle), glycaemic monitoring practices, comorbidities, and barriers to adherence. Descriptive statistics were used for analysis. *Results:* The mean age of the participants was 54.66 years for males and 53.69 years for females. A majority (93%) resided in urban areas. Obesity was prevalent in 91% of participants, higher among females (53%) than males (38%). Hypertension was the most common comorbidity (45%). Pharmacological adherence was better, with 63% on dual therapy; however, 15% reported medication non-adherence, which was more common in females (11%). Non-pharmacological adherence was poor, with only 53% following dietary recommendations and a mere 15% engaging in regular exercise. HbA1c testing was performed in 34%, mostly showing abnormal values. Forgetfulness, lack of awareness, and neglect of lifestyle modifications were the principal reasons for non-adherence. *Conclusion:* Non-adherence to treatment, especially lifestyle modification, remains a critical barrier to effective glycaemic control in T2DM. Along with general physician, pharmacist-led personalized counselling and structured education programs are recommended to improve adherence and diabetes outcomes in secondary care settings. In summary, the study findings validate and extend previous research emphasizing that medication adherence alone is insufficient to achieve optimal glycaemic control without concurrent lifestyle adherence and adequate monitoring. Addressing these multifactorial barriers requires a holistic, multidisciplinary, and patient-centered approach to diabetes management.
Keywords: Type 2 Diabetes Mellitus, Treatment Adherence, Pharmacist Intervention, Glycaemic Control, Lifestyle Modification.

INTRODUCTION

Adherence to medication refers to how well a person follows the recommendations from a healthcare provider (Jimmy & Jose, 2011). It describes an active and voluntary process where patients engage in behaviours necessary for achieving the best therapeutic results. Poor adherence is linked to treatment failure, higher healthcare costs, worsening complications, and increased mortality in patients with chronic conditions such as diabetes (Ho, Bryson, & Rumsfeld, 2009; Khotkar, Chudhari, & Jadhav, 2017).

Type 2 Diabetes Mellitus (T2DM) has become a major global public health concern. In 2011, the worldwide prevalence of diabetes was estimated at 366 million, and this number is projected to rise to 552 million by 2030 (Khotkar *et al.,* 2017). More than 4.6 million deaths globally in 2011 were linked to diabetes,

mostly occurring in individuals aged 40–59 years (Sahoo, Mohanty, Kundu, & Epari, 2022). Currently, diabetes ranks among the top five leading causes of death in developed countries (Anurupa, Aditya, & Angadi, 2019; Pattnaik, Ausvi, Salgar, & Sharma, 2019).

Globally, more than 425 million people are affected by diabetes, and this number continues to increase, creating a significant burden on health systems worldwide (Mukherjee, Sharma Sarkar, Das, Bhattacharyya, & Deb, 2013). In India, it is estimated that 77 million people have pre-diabetes, while 62.4 million live with T2DM; this number is expected to reach 101 million by 2030, leading researchers to call India the "diabetes capital of the world" (Brunetti & Kalabalik, 2012). The prevalence of T2DM varies from 5.6% in rural areas to 12.1% in urban centres, indicating a troubling epidemiological trend (Mosenzon, Pollack, & Raz, 2016).

Effective management of diabetes involves both pharmacological and non-pharmacological strategies. Pharmacological treatments mainly include oral antidiabetic medications and insulin therapies. The choice of treatment must be tailored to the individual, considering factors such as effectiveness, risk of hypoglycaemia, side effects, cost, and the impact on the patient's lifestyle (Brunetti & Kalabalik, 2012; Mosenzon *et al.,* 2016). In addition to medication, non-drug approaches such as dietary control, exercise, and long-term lifestyle changes are also crucial (Yuvaraj, Gokul, Sivaranjini, *et al.,* 2019).

Despite these advances, controlling blood sugar levels remains challenging due to poor adherence. Studies show that only about half of patients with chronic illnesses take their medications as prescribed (Jimmy & Jose, 2011; Laghousi, Rezaie, Alizadeh, & Jafarabadi, 2021). The reasons for non-adherence vary and include forgetfulness, lack of awareness, high costs, misconceptions about the disease, complex regimens, psychological issues, and fear of hypoglycaemia (Surekha, Fathima, Agrawal, & Misquith, 2016; Arulmozhi & Mahalakshmy, 2014). These factors greatly increase the risk of complications, hospital stays, and healthcare costs.

Given these challenges, healthcare professionals, including physicians, nurses, and particularly pharmacists, have a critical role to play in improving adherence. Pharmacists can contribute through counselling, simplification of regimens, identifying barriers, and providing ongoing patient education, thereby helping bridge the gap between prescribed therapy and real-world patient behaviour.

The aim of this study was therefore to assess the prevalence of non-adherence to treatment among patients with T2DM, to identify associated socio-demographic and clinical factors, and to evaluate its impact on glycaemic control. The findings could guide policymakers, healthcare practitioners, and pharmacists in developing targeted strategies and pharmacist-led interventions to improve treatment adherence, thereby reducing the clinical and socioeconomic burden of Type 2 Diabetes Mellitus

METHODOLOGY
Study Design and Setting
A cross-sectional study was conducted among patients with type 2 diabetes mellitus visiting the general Medicine department of a secondary care hospital located in King Koti, Hyderabad, Telangana. Data were collected from March 2025 to August 2025.

Sample Size
A total of 100 patients were randomly selected from the General Medicine Department, and data were collected from them.

Inclusion and Exclusion Criteria
Patients eligible for the study included those who had been previously diagnosed with type 2 diabetes mellitus, were willing to participate and provide consent, and were able to understand and complete the questionnaire. Conversely, patients who were critically ill and unwilling to participate, or those unable to understand and complete the questionnaire, were excluded from the study.

Data Collection
Data were collected using a questionnaire consisting of two parts. The first part included sociodemographic data such as age, gender, marital status, educational level, occupation, and place of residence. The second part contained information about strategies for managing blood sugar levels, such as oral medications, insulin, a nutritious diet, and exercise, and explored the causes of non-compliance with each treatment type. Additional information recorded included the duration of diabetes and any other chronic illnesses.

The questionnaire was pre-tested on ten diabetes patients to identify any necessary adjustments; however, no modifications were required. The questionnaire was administered to the selected patients by the investigator. Each patient's body mass index (BMI) was calculated based on their height and weight and categorized as underweight, normal, overweight, or obese according to the guidelines established by the Centre for Disease Control and Prevention (CDC).

Ethical Considerations
The study was conducted following ethical principles outlined in the Declaration of Helsinki. Approval was obtained from the Institutional Ethics Committee of the Anwarul Uloom college of pharmacy, Hyderabad prior to data collection commencement. Written consent was obtained from all participants after

explaining the study's purpose and procedures. Confidentiality of participant data was maintained throughout the study, and anonymity was ensured by assigning unique codes to each respondent. Participants were informed of their right to withdraw from the study at any time without any consequences to their medical care.

Statistical Analysis

Data collected from the questionnaires were entered into Excel and analyzed using descriptive statistics. Continuous variables, such as age and duration of diabetes, were summarized using means, while categorical variables, including gender, treatment adherence, and comorbidities, were presented as frequencies and percentages. Descriptive analysis provided a clear understanding of the prevalence of non-adherence and its associated factors among the study population.

RESULTS

A total of 100 participants were enrolled in the study, including 45 males and 55 females. The mean age of the male participants was 54.66 years, and for females, it was 53.69 years, with age ranges of 31–79 years and 31–80 years, respectively (Table 1). Most participants (93%) resided in urban areas. Regarding occupation, the majority of males were self-employed (41%), while most females were housewives (52%). Body mass index (BMI) analysis revealed that 91% of participants were overweight and obese, with a higher prevalence among females (53%) compared to males (38%) (Table 1).

The duration of Type 2 Diabetes Mellitus (T2DM) varied among participants; 70% had been diagnosed within the past five years, with males showing a longer mean duration of diabetes (5.88 years) compared to females (3.71 years) (Table 2). Comorbidities were common, affecting 57% of the study population. Hypertension was the most frequently reported comorbidity for both males (19%) and females (26%) (Table 2).

Pharmacological treatment patterns indicated that dual therapy was the most commonly prescribed regimen, used by 26% of males and 37% of females. Monotherapy was observed in approximately 26% of participants, while triple or quadruple therapies were less frequent (Table 3). Non-pharmacological adherence was suboptimal; just over half of the participants followed the recommended dietary guidelines (53%), and only 15% engaged in regular exercise, with exercise adherence notably lower among females (4%) compared to males (11%) (Table 3).

Regarding treatment monitoring and follow-up, 57% of participants reported regularly measuring their glucose levels. Knowledge of target fasting glucose levels was relatively high, with 78% aware of their goals. Recent fasting glucose results indicated that approximately 71% of participants had abnormal levels. HbA1c testing was performed in 34% of the participants, with the vast majority of tested individuals showing abnormal results (16% of males and 14% of females) (Table 4). Most participants (>90%) reported regular visits to their healthcare provider; however, medication non-adherence was reported by approximately 15% of the participants, with a higher proportion of females (11%) than males (3%) admitting to non-adherence (Table 4).

Table 1: Sociodemographic And Clinical Characteristics of Participants (N = 100)

Variables	Males in Percentage (%) (n = 45)	Females in Percentage (%) (n = 55)	Total Percentage (%)
Mean age (years)	54.66	53.69	54.1
Age range (years)	31–79	31–80	—
Place of residence	Urban: 42 Rural: 3	Urban: 51 Rural: 4	Urban: 93 Rural: 7
Occupation	Self-employed: 41 Not employed: 4	Housewife: 52 Others: 3	—
BMI category	Normal: 7 Overweight: 6 Obese: 32	Normal: 2 Overweight: 6 Obese: 47	Majority overweight/obese: 91

Note: BMI categorized as per CDC guidelines.

Table 2: Duration of Type 2 Diabetes Mellitus and Comorbidities

Variables	Males in Percentage (%) (n = 45)	Females in Percentage (%) (n = 55)	Total Percentage (%) (N = 100)
Duration of diabetes			
1–5 years	26	44	70
6–10 years	13	8	21
11–15 years	3	3	6
>15 years	3	0	3
Mean duration (years)	5.88	3.71	—

Variables	Males in Percentage (%) (n = 45)	Females in Percentage (%) (n = 55)	Total Percentage (%) (N = 100)
Presence of comorbidities	25	32	57
Most common comorbidity	Hypertension 19	Hypertension 26	Hypertension 45

Table 3: Pharmacological And Lifestyle Management Practices

Variables	Males in Percentage (%) (n = 45)	Females in Percentage (%) (n = 55)	Total in Percentage (%) (n = 100)
Pharmacological Treatment			
Monotherapy	12	14	26
Dual Therapy	26	37	63
Triple/Quadruple therapy	7	4	11
Non-Pharmacological Treatment			
Diet Adherence	24	29	53
Exercise Adherence	11	4	15

Table 4: Monitoring, Treatment Adherence, And Follow-Up Practices

Variables	Males (n = 45)	Females (n = 55)	Total (N = 100)
Measure Glucose Regularly	25	32	57
Know Target Fasting Glucose	37	41	78
Recent Fasting Glucose Levels	Abnormal: 32 Normal: 5 Not available: 8	Abnormal: 39 Normal: 3 Not available: 13	Abnormal: ~71%
HbA1c Test Done	19 Abnormal: 16	15 Abnormal: 14	34 tested, majority abnormal
Visit Doctor Regularly	42	50	92
Medication Adherence	Non-adherent: 3	Non-adherent: 11	~15% non-adherent

DISCUSSION

This present study revealed a high prevalence of overweight and obesity among participants, with 91% classified as overweight or obese according to CDC guidelines. This aligns with Bhattarai *et al.,* (2020), who highlighted obesity and poor lifestyle choices as significant contributors to non-adherence and poor glycaemic control among diabetic patients. The predominance of urban residents (93%) and the female majority being housewives reflects sociocultural patterns similar to those reported by Taher et al. (2018), confirming the urban concentration of diabetes in India and similar settings.

Regarding glycaemic monitoring, 57% of participants regularly measured glucose levels, but only 34% underwent HbA1c testing, with most showing abnormal results. This suboptimal laboratory monitoring mirrors findings in Rezaei's (2018) study, where economic challenges limited access to recommended investigations. In In this present study moreover, the poor HbA1c testing prevalence reinforces the notion that despite frequent doctor visits (>90%), gaps remain in comprehensive diabetes management.

Pharmacological treatment patterns indicated a preference for dual therapy in a majority of patients (63%), consistent with clinical guidelines and practices reported in other Indian cohorts (Yuvaraj *et al.,* 2019). However, medication non-adherence was recorded in approximately 15% of the study population, more pronounced in females (11%). This gender disparity concurs with Bhattarai *et al.,* (2020), who found educational and occupational status as significant adherence predictors, often differing between men and women. The finding emphasizes the necessity for gender-specific interventions tailored to socioeconomic contexts.

Non-pharmacological adherence, particularly exercise, was notably poor (15%). This is consistent with Taher *et al.,* (2018), where less than 10% engaged in regular physical activity. Such chronic low physical activity levels among diabetics in urban India call for targeted behavioural interventions. The barriers reported in earlier qualitative work (Rezaei, 2018), including disbelief in recommendations, economic hardship, and social constraints, likely contribute to this gap.

The emerging technology discussed by Toft *et al.,* (2023) in the context of smart insulin pens provides a promising solution for objectively monitoring insulin adherence. While our study relied on self-reports, the integration of such technology could address key issues like forgetfulness, which was identified as a major cause of poor adherence both in the current study and previous literature (Taher *et al.,* 2018; Bhattarai *et al.,* 2020). Incorporating pharmacists in multidisciplinary teams could optimize the use of these technologies by offering patient education and adherence support.

In summary, the study findings validate and extend previous research emphasizing that medication adherence alone is insufficient to achieve optimal glycaemic control without concurrent lifestyle adherence and adequate monitoring. Sociodemographic factors, psychological beliefs, and systemic barriers interplay to affect patient behaviours. Addressing these multifactorial barriers requires a holistic, multidisciplinary, and patient-centered approach to diabetes management.

CONCLUSION

This study highlights the increasing prevalence of Type 2 Diabetes Mellitus and the persistent challenges associated with treatment adherence among patients. Despite a majority of patients maintaining regular doctor visits, significant gaps remain in medication adherence and lifestyle modification, especially exercise and diet. Forgetfulness and lack of awareness are key contributors to suboptimal adherence, resulting in poor glycaemic control as evidenced by abnormal fasting glucose and HbA1c levels. Targeted interventions involving healthcare professionals, particularly pharmacists, alongside enhanced patient education and innovative monitoring technologies, are crucial to improve adherence and reduce the disease burden.

RECOMMENDATION

The study suggests integrating clinical pharmacists into diabetes care teams to offer personalized counselling and adherence monitoring, which can enhance treatment compliance. It emphasizes the need for structured patient education programs focused on medication adherence, diet, and exercise, along with adopting digital tools like smart insulin pens to combat forgetfulness. Regular follow-up with glycaemic monitoring and culturally tailored lifestyle support are crucial for improving patient outcomes. Additionally, policymakers should work to lower treatment costs and improve access to medications and diagnostics. Further research is needed to assess the impact of awareness campaigns and pharmacist-led interventions on long-term adherence and glycaemic control.

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