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ORIGINAL RESEARCH

Determinants of Poor Treatment Adherence among Patients with Type 2 Diabetes

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ABSTRACT

Background: Glycaemic control is crucial in managing Type 2 Diabetes Mellitus (T2DM) to prevent or delay complications. Inadequate medication adherence remains a significant barrier to achieving optimal glycaemic control, leading to increased morbidity, mortality, and healthcare costs. Identifying factors influencing poor treatment adherence can help develop targeted interventions. **Methods:** A descriptive cross-sectional study was conducted from November 2023 to October 2024 at a tertiary healthcare hospital in central India. A total of 250 adult T2DM patients were recruited using systematic random sampling. Data were collected through face-to-face interviews using structured questionnaires, including the Eight-Item Modified Morisky Adherence Scale and additional questions to assess socio-demographic, clinical, psychological, and healthcare-related factors. Data were analyzed using SPSS with descriptive and inferential statistics, considering p-values <0.05 as significant. **Results:** Among the 250 participants, 28% demonstrated high adherence, 42% medium adherence, and 30% low adherence. Significant associations were found between poor adherence and factors such as male gender (p=0.0001), younger age (p=0.00001), employment status (p=0.00001), lack of knowledge about medication side effects (p=0.02334), lack of assistance (p=0.00001), long waiting times (p=0.00001), and forgetfulness due to busy schedules (p=0.0061). **Conclusion:** The study revealed moderate adherence levels among T2DM patients. Factors influencing poor adherence include socio-demographic characteristics, healthcare system barriers, and patient-related issues. Enhancing patient education, improving healthcare communication, and simplifying medication regimens can significantly improve adherence.

Keywords: Type 2 Diabetes Mellitus, Medication Adherence, Morisky Scale, Glycaemic Control, Non-Adherence Factors, Patient Education, Healthcare Barriers.

INTRODUCTION

Glycogenic control remains fundamental to the therapy of type 2 diabetes and is essential in preventing or delaying diabetic complications. Non-pharmacological methods are employed alongside pharmaceutical treatment for diabetes management. Patients often necessitate polytherapy due to the progressive nature of the condition. Inadequate medication adherence is the primary reason most people with type 2 diabetes fail to achieve optimal glycaemic control.[1]

The failure to meet glycaemic objectives is mostly attributable to inadequate medication adherence, which is rising at concerning rates. Non-adherence to treatment has been associated with elevated morbidity, mortality, and healthcare expenditures in people with diabetes.[2, 3] Individuals with chronic illnesses have diminished adherence rates due to the protracted nature of the conditions, resulting in adverse results. Consequently, alongside appropriate pharmacotherapy, the management of type 2 diabetes must prioritise medication adherence, as the complete benefits of the treatment can only be achieved with elevated adherence levels.[4-6]

Adherence to medication enhances patient results in both clinical and economic dimensions of diabetes management. Elevated medication adherence was correlated with reduced healthcare expenditures compared to inadequate medication adherence patterns. Inadequate medication adherence has been associated with increased treatment expenses and suboptimal clinical outcomes. Consequently, medication adherence is an essential element in the

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management of type 2 diabetes, especially in resource-limited environments.[7, 8]

Medication adherence has been assessed by several methods, including direct, sensitive, and invasive procedures, as well as indirect reporting-based techniques.[9, 10] Furthermore, research has identified various factors contributing to medicine non-adherence, including drug regimens, side effects, patient views, financial burdens, and additional elements.[8, 9] It is essential to identify the reasons for non-adherence to therapy and the correlation between various factors (therapy-related and patient-related) and medication adherence. This data can offer valuable insights and facilitate the creation of targeted treatments designed to improve medication adherence in diabetic patients within a specific therapeutic context.

The WHO asserts that effective adherence initiatives substantially influence population health.[11]A recent study indicates that multimodal techniques can enhance medication adherence. Diabetes management is optimised by an organisational structure that facilitates consistent remembering and evaluation of patients.[12]Examples of technological applications being researched for monitoring medication adherence include electronic pill bottles and boxes, ingestible sensors, electronic medication management systems, blister packs, patient self-report technology, video-based technology, and motion sensor technology.[13] Nonetheless, the application of these technologies in clinical environments has infrequently yielded success. Patient-centered education can facilitate improved health outcomes for patients.[14] Consequently, practical self-management solutions, such as mobile phones that may rapidly engage a large audience or uncomplicated pillboxes that monitor daily medicine consumption, can substantially enhance medication adherence.[15,16] The current research was conducted from this viewpoint.

The principal aim of the study (phase 1) was to evaluate the medication adherence patterns in patients with type 2 diabetes mellitus, classify these patterns as low, medium, or high, analyse the factors influencing medication non-adherence, and ascertain the relationship between adherence patterns and dosage forms, number of medications, and treatment modalities. The secondary objective of phase 2 of the trial was to evaluate the effect of pillbox or SMS reminder interventions on enhancing adherence patterns and glycaemic management in individuals exhibiting poor medication adherence.

MATERIALS AND METHODS

Study Design and Duration: This study employs a descriptive cross-sectional design to identify determinants of poor treatment adherence among patients with Type 2 Diabetes Mellitus (T2DM). The study will be conducted over a period of one year, from November 2023 to October 2024.

Setting: The research will take place in tertiary health care hospital in central India, which provide outpatient care for patients with T2DM.

Study Population: The study population includes adult patients diagnosed with Type 2 Diabetes who are receiving treatment at the selected healthcare facilities. Inclusion criteria include individuals aged 18 years and above, with a confirmed diagnosis of T2DM for at least six months, and who provide informed consent. Exclusion criteria include patients with cognitive impairments, severe comorbidities that hinder participation, or those unwilling to participate.

Sample Size: A total of 250 participants will be recruited for this study.

Sampling Technique: A systematic random sampling technique will be employed to select participants. Patients attending outpatient clinics during the study period will be approached, and every [nth] eligible patient will be invited to participate until the desired sample size is achieved.

Data Collection Methods: Data will be collected using a structured questionnaire administered through face-to-face interviews. The questionnaire will cover socio-demographic characteristics, clinical profiles, treatment adherence (using validated scales such as the Morisky Medication Adherence Scale), and potential determinants of poor adherence, including psychological, socio-economic, and healthcare system-related factors.

Data Analysis: Collected data will be coded, entered, and analyzed using statistical software such as SPSS version [insert version]. Descriptive statistics (means, standard deviations, frequencies, and percentages) will summarize the data. Inferential statistics, including chi-square tests and logistic regression analyses, will identify associations between independent variables and treatment adherence levels. A p-value of <0.05 will be considered statistically significant.

Ethical Considerations: Ethical approval will be obtained from [insert name of the ethical review board]. Written informed consent will be secured from all participants. Confidentiality and anonymity of the data will be maintained throughout the study, and participants will be assured of their right to withdraw at any time without repercussions.

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RESULT

Table 1: Eight item modified Morisky adherence scale.

Sl.no.	Questionnaire
1	Do you sometimes forget to take your medicine
2	Thinking over the past 2 weeks, were there any days when you did not take your medicine
3	Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it
4	When you travel or leave home, do you sometimes forget to bring along your medicines
5	Did you take all your medicines yesterday
6	When you feel like your symptoms are under control, do you sometimes stop taking your medicines
7	Taking medicine every day is a real inconvienience for some people, Do you ever feel hassled about sticking to your treatment plan and by choosing one of the options for the question
8	How often do you have difficulty remembering to take all your medicines, (A) Never/rarely, (B) Once in a while, (C) Sometimes, (D) Usually, (E) All the time

Table 1 presents the Eight-Item Modified Morisky Adherence Scale, which assesses medication adherence through a series of questions. The questionnaire includes whether patients sometimes forget to take their medicine, if there were any days in the past two weeks when they missed a dose, or if they have ever cut back or stopped taking their medication without informing their doctor due to feeling worse. It also examines whether patients sometimes forget to bring their medicines when traveling or leaving home and if they took all their medicines the previous day. Additionally, it explores whether patients stop taking their medication when they feel their symptoms are under control and whether they find taking medicine daily to be an inconvenience or feel hassled about adhering to their treatment plan. The final question assesses how often patients have difficulty remembering to take all their medicines, offering response options ranging from "Never/Rarely" to "All the time." This scale helps evaluate adherence behavior and potential barriers to consistent medication use.

Table 2: Questionnaire to evaluate the factors associated with non-adherance.

Patient- centered factors	**Patient knowledge Tobacco smoking or alcohol intake Forgetfulness - Busy schedule/Travel Lack of assisstance**
Therapy- related factors	Route of administration Treatment complexity Duration of the treatment period Medication side effects Taste of the medication
Healthcare system factors	Lack of accessibility Long waiting time Unhappy clinic visits
Economic factors	Cost and Income

Table 2 outlines the questionnaire used to evaluate factors associated with non-adherence, categorized into patient-centered, therapy-related, healthcare system, and economic factors. Patient-centered factors include lifestyle habits such as tobacco smoking or alcohol intake, forgetfulness due to a busy schedule or travel, and lack of assistance. Therapy-related factors assess the route of administration, treatment complexity, duration of the treatment period, medication side effects, and the taste of the medication, which may influence adherence. Healthcare system factors focus on barriers such as lack of accessibility, long waiting times, and unhappy clinic visits, which can discourage patients from following their treatment plans. Economic factors, including medication costs and income levels, also play a crucial role in adherence, as financial constraints may prevent patients from obtaining or consistently using their prescribed medications. This questionnaire helps identify key challenges that contribute to medication non-adherence and provides insights for targeted interventions.

Table 3: Eight item Morisky adherence scale.

Distribution of Scores	Total No. of Patients	Percentage (%)
High	70	28%
Medium	105	42%
Low	75	30%

Table 3 presents the Eight-Item Morisky Adherence Scale, showing the distribution of adherence scores among 250 patients. The results indicate that 70 patients (28%) exhibited high adherence, 105 patients (42%) had medium adherence, and 75 patients (30%) demonstrated low adherence.

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Table 4: Association between patient's socio-demographic characteristics, adherent and non adherent group.

Characteristics	No. of Patients (%)	Adherent (%)	Non-Adherent (%)	p-value
Gender				
Male	130 (52)	72 (40.95)	58 (77.77)	0.0001
Female	120 (48)	104 (59.04)	16 (22.22)	
Age (years)				
Young age (18-40)	20 (8)	-	20 (26.66)	0.00001
Middle age (41-60)	105 (42)	72 (40.95)	33 (44.44)	
Elderly age (>60)	125 (50)	104 (59.04)	21 (28.88)	
Educational status				
Primary	80 (32)	52 (31.42)	28 (33.33)	
Secondary	40 (16)	20 (11.42)	20 (26.66)	0.04527
Tertiary	10 (4)	10 (5.71)	-	
Illiterate	120 (48)	86 (51.42)	34 (40)	
Employment status				
Employed	80 (32)	34 (20)	46 (60)	
Unemployed	160 (64)	116 (72.38)	44 (40)	0.00001
Retired	10 (4)	10 (7.61)	-	
Place of residence				
City	30 (12)	20 (11.42)	10 (13.33)	0.74217
Village	220 (88)	166 (88.57)	54 (86.66)	
Social habits				
Smoker	40 (16)	24 (9.52)	16 (13.33)	
Alcoholic	50 (20)	18 (8.57)	32 (20)	0.00001
Both	64 (25.6)	16 (6.66)	48 (51.11)	
None	96 (38.4)	86 (75.2)	10 (15.55)	
Total	250	176	74	

Table 4 illustrates the association between patients' socio-demographic characteristics and adherence status among 250 patients. Regarding gender, 130 (52%) were male, with 72 (40.95%) adherent and 58 (77.77%) non-adherent (p=0.0001), while 120 (48%) were female, with 104 (59.04%) adherent and 16 (22.22%) non-adherent. Age-wise, 20 (8%) were in the young age group (18-40), all non-adherent (26.66%, p=0.00001), while 105 (42%) were middle-aged (41-60), with 72 (40.95%) adherent and 33 (44.44%) non-adherent. The elderly group (>60) comprised 125 (50%), with 104 (59.04%) adherent and 21 (28.88%) non-adherent. Educational status showed that 80 (32%) had primary education, 52 (31.42%) were adherent, and 28 (33.33%) were non-adherent. Among 40 (16%) with secondary education, 20 (11.42%) were adherent and 20 (26.66%) non-adherent (p=0.04527). Tertiary education was attained by 10 (4%), all adherent, while 120 (48%) were illiterate, with 86 (51.42%) adherent and 34 (40%) non-adherent. Employment status revealed that 80 (32%) were employed, with 34 (20%) adherent and 46 (60%) non-adherent, while 160 (64%) were unemployed, with 116 (72.38%) adherent and 44 (40%) non-adherent (p=0.00001). Additionally, 10 (4%) were retired, all adherent. Residence data showed that 30 (12%) lived in cities, with 20 (11.42%) adherent and 10 (13.33%) non-adherent (p=0.74217), while 220 (88%) were from villages, with 166 (88.57%) adherent and 54 (86.66%) non-adherent. Social habits indicated that 40 (16%) were smokers, with 24 (9.52%) adherent and 16 (13.33%) non-adherent. Among 50 (20%) alcoholics, 18 (8.57%) were adherent and 32 (20%) non-adherent (p=0.00001). Those with both habits numbered 64 (25.6%), with 16 (6.66%) adherent and 48 (51.11%) non-adherent, while 96 (38.4%) had no habits, with 86 (75.2%) adherent and 10 (15.55%) non-adherent. Overall, out of 250 patients, 176 were adherent, and 74 were non-adherent.

Table 5: Factors affecting both adherent and non adherent groups.

Sl. No	Factors	Adherent Group n = 176 (%)	Non-Adherent Group n = 74 (%)	p-value
1	Lack of knowledge about prescribed medication	62 (35.23)	30 (40)	0.5847
2	Lack of knowledge about side effects	107 (60.95)	59 (80)	0.02334
3	Lack of assistance	25 (14.28)	36 (48.88)	0.00001
4	Long waiting time	34 (19.04)	43 (57.77)	0.00001
5	Unhappy clinical visits	44 (24.76)	53 (71.11)	0.00001

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6	Treatment complexity	17 (9.52)	26 (35.55)	0.0003
7	Forgetfulness (nature of work/busy schedule)	114 (64.76)	64 (86.66)	0.0061
8	Not following advice on exercise	139 (79.04)	56 (75.55)	0.6699
9	Not following advice on diet	67 (38.09)	43 (57.77)	0.0317

Table 5 highlights the factors affecting both adherent and non-adherent groups among 250 patients. Lack of knowledge about prescribed medication was reported by 62 (35.23%) adherent and 30 (40%) non-adherent patients (p=0.5847), while lack of knowledge about side effects was more prevalent in the non-adherent group, affecting 59 (80%) compared to 107 (60.95%) in the adherent group (p=0.02334). Lack of assistance was a significant factor, affecting 36 (48.88%) non-adherent patients versus 25 (14.28%) adherent patients (p=0.00001). Long waiting times were reported by 43 (57.77%) non-adherent and 34 (19.04%) adherent patients (p=0.00001), while unhappy clinical visits were experienced by 53 (71.11%) non-adherent and 44 (24.76%) adherent patients (p=0.00001). Treatment complexity was noted by 26 (35.55%) non-adherent and 17 (9.52%) adherent patients (p=0.0003). Forgetfulness due to work or a busy schedule was a major issue, affecting 64 (86.66%) non-adherent and 114 (64.76%) adherent patients (p=0.0061). Not following advice on exercise was slightly more common in the adherent group, with 139 (79.04%) compared to 56 (75.55%) in the non-adherent group (p=0.6699). Lastly, not following dietary advice was observed in 43 (57.77%) non-adherent and 67 (38.09%) adherent patients (p=0.0317). These findings highlight key barriers to adherence, with significant differences in knowledge, assistance, clinical experience, and lifestyle factors.

DISCUSSION

Pharmacotherapy, along with dietary modifications and lifestyle adjustments, constitutes the primary approach to managing diabetes and its complications. Clinical experience indicates that glycaemic control is unattainable without patient compliance with medication. Adherence to treatment is a crucial element for those with diabetes.

The patient response Eight-Item Morisky Adherence Scale, showing the distribution of adherence scores among 250 patients. The results indicate that 70 patients (28%) exhibited high adherence, 105 patients (42%) had medium adherence, and 75 patients (30%) demonstrated low adherence. This finding aligns with the study conducted by Khaled Heissam et al. in Egypt, which reported adherence percentages of 26.1% for good adherence, 47.9% for fair adherence, and 26% for poor adherence.[17]

In contrast, Shobhana et al. showed a significantly high frequency of poor adherence (75%) attributed to low socioeconomic position.[18]This discrepancy relative to our study may be attributed to the availability of free pharmaceuticals in our government hospital system, as well as enhanced patient awareness and access to superior formulations.

The association between adherence and sociodemographic characteristics indicated that males were predominant and exhibited lower treatment adherence compared to females, consistent with the findings of the Lertmaharit study.[19]The impact of gender on medicine adherence rates contradicts other studies that indicate men exhibit stronger self-care adherence than women.[20.21]Furthermore, certain research failed to establish a correlation between gender and drug adherence.[22] Potential factors contributing to inadequate adherence observed in men in our study may include Smoking, alcohol consumption, and other lifestyle modifications frequently observed in them.

The majority of our subjects were elderly patients (59.04%) with no formal education (51.4%), and they demonstrated superior adherence compared to younger individuals and those with educational backgrounds. The rise in awareness of diseases and their complications may be plausible factors contributing to the higher adherence observed in senior people. A study conducted by Omar MS et al revealed that geriatric patients exhibited a substantial understanding of their medications and conditions, with a medication adherence rate of 66%.[23] A separate study revealed that adherence was highest in the younger age group at 51.8%, whereas lower adherence rates were observed in the elderly and middle-aged groups.[22]

The location of residence is a significant factor, as the majority of patients in our study were from rural areas and had strong treatment adherence. A comparable study indicated that 37.14% of urban patients exhibited a higher adherence rate than those in rural areas.[21]

In our study, patients with smoking and alcohol habits had poor adherence, perhaps due to forgetfulness in taking medication influenced by these social behaviours.

Adherence may also be influenced by patient-centric, physician-dependent, or healthcare institution variables. The questionnaire examined all three criteria and identified forgetfulness as a significant patient-centric issue, particularly prevalent among non-adherent patients, as the majority of respondents were from the senior age group. This aligns with the findings of the study by Aghoja et al. in Nigeria, which showed that non-adherence among respondents primarily results from forgetfulness.[24]

The physician-patient connection is crucial in ensuring the patient is well-informed about the medications they take, which may affect adherence.

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Twenty-one Patients lacking sufficient information regarding their medication regimens were likely at risk of non-adherence due to a failure to comprehend the proper administration of their drugs, resulting in frequent omissions. Numerous individuals disclosed that they experienced prolonged wait times to consult their physician, as well as insufficient contact between doctors and patients. Moreover, the majority were oblivious to the bad effects and the significance of omitted prescriptions. Consequently, it is essential to educate patients on their medication regimes and ensure their comprehensive understanding.

Financial difficulties in purchasing drugs were identified as a significant patient-centric factor that was more prevalent among non-adherent patients in other research.[25,21] However, we did not encounter this issue because the participants in the present study received complimentary medical care and medications.

CONCLUSION

Consequently, we ascertain that individuals within the scope of our study exhibited moderate adherence to their anti-diabetic drugs. Multiple factors influencing medication adherence were found and assessed. We recommend enhancing awareness of the significance of adherence in diabetes management through interventions such as patient education, medication counselling, improved communication between physician and patient, and simplifying drug regimens by reducing the number of medications, which will address these factors and enhance patient adherence.

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