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Treatment nonadherence factors among rural South African patients with diabetes mellitus attending primary care facilities

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ABSTRACT

Introduction

Diabetes mellitus (DM) is a significant global public health challenge, with effective management relying heavily on patient adherence to treatment protocols. In South Africa, particularly in low-resource settings like the Soweto area in the Johannesburg Health District, treatment nonadherence among diabetic patients is a pressing concern, contributing to poor health outcomes and increased healthcare costs.

Purpose

This study aimed to identify and analyze factors associated with treatment nonadherence among patients diagnosed with diabetes mellitus attending primary healthcare facilities in Soweto, Johannesburg Health District, South Africa.

Methods

This was a cross-sectional quantitative study conducted among 490 diabetic patients attending primary healthcare facilities in Soweto using structured anonymous questionnaires. The chi-squared test was used to assess associations between treatment nonadherence and various factors. SPSS version 27 was used to analyze the data.

Results

The average age of the patients was 59 years, and 66% were female. The nonadherence rate among the patients was 31%, with 80% having occasionally missed a dose of their medication. Gender, marital status, monthly household income, number of years living with diabetes, and adherence to diet were significantly associated with nonadherence to diabetes treatment ($p < 0.05$).

Conclusion

The study highlights the multifaceted nature of treatment nonadherence among diabetic patients in Soweto. Addressing these factors requires a comprehensive approach, including improving patient education, enhancing social support, and addressing socioeconomic barriers.

INTRODUCTION

Diabetes is a severe medical disorder marked by elevated blood plasma glucose levels, known as hyperglycemia, caused by irregularities in insulin production, insulin effectiveness, or both. Hyperglycemia manifests in several forms with diverse presentations and leads to functional abnormalities in the metabolism of carbohydrates, fats, and proteins. The diagnostic biomarker for diabetes is hyperglycemia (Banday et al., 2020). Given the consistent rise in diabetes rates over the past several decades, diabetes is a significant public health issue (International Diabetes Federation [IDF], 2021). The rising incidence of diabetes and other non-communicable diseases in Africa can be attributed to an epidemiological shift influenced by the growing urbanization of communities. Approximately 19 million people aged 20–79 were diagnosed with diabetes in Africa in 2019, and this number is projected to rise to 47 million by 2045 (IDF, 2021). Furthermore, Africa has been reported to have the highest proportion of undiagnosed individuals, with 60% of those living with diabetes unaware of their condition. Additionally, hyperglycemia during pregnancy affects 1 in every 9 live births in Africa (IDF, 2021).

Interventions used to manage diabetes encompass health promotion advocacy for adopting healthy lifestyles, a limited selection of generic medications, patient education to enhance self-care, and routine screening for timely identification and management of complications. Health-promoting interventions include a regimen of nutritious diet, regular physical exercise, abstaining from tobacco use, and avoiding harmful alcohol consumption (Banday et al., 2020).

In diabetes care, patients play a crucial role in achieving blood glucose control through lifestyle adjustments. These adjustments include consuming nutritious meals and beverages, controlling calorie intake for weight management, and engaging in regular physical exercise. However, individuals with diabetes must also adhere strictly to the prescribed pharmaceutical regimen provided by their healthcare providers (Sapra et al., 2023). Therapeutic approaches for diabetes vary based on the specific type of diabetes. Treatment for type 1 diabetes involves insulin administration via injection or pump, while managing type 2 diabetes involves using tablets, insulin, or a combination of both, depending on the disease's severity (Sapra et al., 2023). Effective management of diabetes necessitates strict adherence to medication and lifestyle modifications.

Nonadherence is defined as deviating from the recommended prescription regimen by less than 80%. The World Health Organization (WHO, 2022) defines nonadherence as any deviation from the prescribed course of medicine. Key indicators of nonadherence include missed appointments, failure to collect or renew prescriptions, and not taking prescribed medication at the recommended dosage or time. Numerous studies have demonstrated that individuals with chronic diseases, such as diabetes, are more prone to nonadherence to their prescriptions than those with acute illnesses (WHO, 2022; Waari et al., 2018). The global nonadherence rate for diabetic medications is expected to be around 50%, especially for chronic diseases, with even lower rates in developing countries due to budgetary constraints (WHO, 2022). Studies indicate that more than 50% of individuals diagnosed with diabetes fail to achieve optimal glycemic control, with this gap being particularly pronounced in East African countries (Waari, 2019). This phenomenon can be largely attributed to several factors, including the high costs of anti-diabetic drugs like insulin, medication side effects, health literacy, substance misuse, treatment fatigue, and psychosocial characteristics, among others (Mirahmadizadeh et al., 2020; Aminde et al., 2019).

The prevalence of diabetes among South Africans aged 21 to 79 is estimated to be 7%, with recent estimates showing an upward trend (IDF, 2021). The most recent population projections for South Africa suggest that approximately 3.85 million individuals in this age group may be affected by diabetes. Around 87% of diabetes cases in South Africa are believed to be associated with excessive body weight. This is a concerning factor, as research indicates that a significant proportion of men (38%) and women (69%) in South Africa have been classified as overweight or obese since 2013.

Given the unique socioeconomic, cultural, and healthcare system challenges present in the region, investigating nonadherence among diabetes mellitus patients in rural Soweto, within the Johannesburg Health District, is of

utmost importance. Access to healthcare, medications, and transportation is restricted by factors such as poverty and unemployment. Additionally, traditional beliefs and reliance on alternative medicine often hinder the effectiveness of prescribed treatments. Stigma and a lack of adequate social support can further impact adherence. Moreover, the healthcare system in rural areas faces substantial challenges, including clinics with limited resources, unreliable medication supplies, and communication barriers between healthcare personnel and patients. Nonadherence remains only partially understood among historically disadvantaged populations with diabetes. Therefore, this study aimed to identify factors associated with nonadherence among patients diagnosed with diabetes mellitus attending primary healthcare facilities in Soweto, South Africa.

METHODS

This study was a cross-sectional quantitative study conducted at two healthcare facilities in Soweto within the Johannesburg Health District. Soweto consists of 29 facilities, 15 of which are local authority facilities and 14 under provincial government authority. The services generally provided by these primary healthcare (PHC) facilities include the management of acute conditions, minor ailments and emergencies, as well as mother and child health services, including child immunizations, family planning, antenatal care, and chronic condition care, such as for HIV, hypertension, and diabetes.

The study population comprised all patients aged 18 and above diagnosed with diabetes mellitus who attended the facilities for routine checkups. An estimated 1,200 patients diagnosed with diabetes mellitus visit the two facilities monthly. Using the Raosoft sample size calculator with a margin of error of 5%, a confidence interval of 95%, and a response distribution of 50%, the sample size for the study was calculated to be 348. This sample size was increased to 380 to account for incomplete or poorly filled questionnaires.

Prior to data collection, visits were made to the health facilities to obtain permission and make necessary arrangements with facility managers at suitable times for data collection. A time slot to introduce the study was requested each morning. Patients diagnosed with diabetes mellitus were recruited using a systematic random sampling method in which every third patient was invited to participate. Those who agreed were taken to a private room where they received further information and were invited to complete a consent form.

A questionnaire was developed specifically for the study and piloted at Diepkloof Community Health Centre, one of the health facilities in Soweto. Testing of the tool allowed the researcher to identify any potentially vague or unclear questions and estimate the time required for data collection. No modifications to the questionnaire were necessary.

The questionnaire was initially developed in English and subsequently translated into Zulu and Sotho to enhance participants' comprehension. The questionnaire was self-administered for participants who could read and write, while the researcher and research assistants administered it to those who could not. The research assistants received thorough training on the tool to ensure data quality. Data collection took place over three months.

The collected data were entered into Microsoft Excel. Descriptive statistics, including frequencies and percentages, were used to identify factors and reasons for non-adherence. The Chi-squared test was employed to assess associations between non-adherence and other variables, with a p-value of less than 0.05 considered statistically significant.

Ethical approval for the study was granted by the Sefako Makgatho Health Sciences University Ethics Committee (Ref: SMUREC/H/320/2018: PG). Participants completed informed consent forms before participating in the study. Anonymity and confidentiality were maintained at all times. Participation was voluntary, and participants could withdraw from the study at any time without penalty.

RESULTS

A total of 490 patients participated in this study, with an average age of 59 years. Two-thirds of the participants (66%) were female, over a quarter (29%) were married, 28% were single, and 20% were widowed. Just over half of the participants (51%) had a secondary education, while 25% had primary education. About half (47%) of the participants were pensioners, with only 9% self-employed.

In terms of household income, more than half (60%) reported a total income between R1000 and R3000, while only 14% reported an income of R5000 or more. The average household size was six members, with an average of three children per household. Approximately two-thirds of participants (63%) resided in brick houses, while 5% lived in shacks (Table 1).

Table 1:
Socio-demographic information of the participants (n=490)

Variables	Frequency	Percent
Mean Age	59 years (Min: 28 Yrs, Max: 99 Yrs)	
Gender		
Male	167	34
Female	323	66
Marital status		
Married	141	29
Single	139	28
Widowed	100	20
Divorced	61	12
Co-habiting	49	10
Education status		
No schooling	39	8
Primary	123	25
Secondary	250	51
Matric	64	13
Tertiary	14	3
Employment status		
Pensioner	229	4
Employed	123	25
Unemployed	91	18
Self-employed	47	9
Household income		
R0-R1000	17	3
R1000-R3000	292	60
R3000-R5000	115	23
>R5000	69	14
Average number of household members	5.63 (2,29)	
Average number of adults	2.95 (1,66)	
Average number of children	2.76 (1,85)	
Type of house		
Brick house	310	63
RDP house	154	31
Shack house	26	5

Table 1 provides detailed socio-demographic information of the participants (n=490).

More than half (54%) of participants had been living with diabetes for six to sixteen years, while 7% had lived with the condition for between 22 and 30 years. The study found that 43% of participants were on combination oral therapy, and most (84%) had comorbidities. Among those with comorbidities, 78% had been diagnosed with hypertension, followed by HIV and cholesterol (7% each). Nearly half of the participants (46%) reported experiencing side effects, with dizziness and tiredness being the most common (33% and 25%, respectively) (Table 2).

Table 2:
Frequency distribution of clinical data for the patients participated in the study

Variables	Frequency	Percent
No of years living with diabetes		
1-5 years	134	27
6-11 years	183	37
12-16 years	90	18
17-21 years	49	11
22-30 years	34	7
Treatment of diabetes		
Combination oral therapy	210	43
Monotherapy	116	24
Combination of oral and insulin	113	23
Insulin therapy	51	10
Had Comorbidities		
Yes	413	84
No	77	16
Name of Comorbidities		
Hypertension	365	78
HIV	36	7
Cholesterol	36	7
Coronary artery disease	15	3
Depression	7	1
Arthritis	6	1
Experienced side effect		
Yes	227	46
No	263	54
Types of side effect		
Diarrhoea	2	1
Dizziness	70	33
Low blood sugar	39	18
Skin Rashes	8	4
Tiredness	54	25
Upset Stomach	39	18

Table 2 presents a frequency distribution of clinical data for the patients who participated in the study.

Approximately one-third of participants (31%) reported missing their medication doses as prescribed, with most of these individuals (80%) missing doses occasionally. The primary reasons for missing doses included forgetting (31%) and being away from home (29%). Additionally, 16% of participants indicated a desire to stop their medication, with the main reasons being perceived inefficacy of the medication (32%), treatment fatigue (31%), and feeling better (12%). Regarding appointment adherence, about a quarter of participants missed appointments, citing long queues (33%), work leave challenges (29%), and being away from home (13%) as primary reasons. The study found that 44% of participants did not adhere to a diet as prescribed by clinicians, with financial difficulties (37%) cited as the main reason for

non-adherence, followed by a lack of information (35%) and poor self-discipline (28%) (Table 3).

Table 3:
Adherence to medication and reasons for non-adherence

Variables	Frequency	Percent
Missed dose		
No	338	69
Yes	152	31
How often missed doses		
Regularly	28	18
Occasionally	121	80
Reasons		
Avoiding side effects	4	3
Away from home	44	29
Denial	5	3
Felt better	5	3
Felt sick	13	9
Lack of food	7	5
Ran out of pills	26	15
Simply forgot	47	31
Thought of stopping Medications		
No	415	84
Yes	75	16
Reasons for stopping medications		
Denial	5	7
Felt better	9	12
Felt sick	3	4
Long ques	3	4
Medication not working	24	32
Ran out of pills	2	3
Treatment fatigue	23	31
Use of traditional Meds	6	8
Missed appointment		
No	378	77
Yes	113	23
Reasons for missed appointment		
Away from home	13	13
Forgot	7	7
Lack of transport money	3	3
Problems with leave at Work	29	29
Long ques	44	33
Other commitments	5	5
Staff attitude	4	4
Treatment Fatigue	5	5
Had fallen ill	2	2
Adhering to diet		
Yes	274	56
No	216	44
Reasons for non-adherence to diet		
Financial difficulties	81	37
Lacked information	75	35
Poor self-discipline	60	28

Table 3 provides data on medication adherence and reasons for non-adherence among participants.

The study revealed statistically significant associations between non-adherence to diabetes treatment and various socio-demographic and clinical variables, including gender, marital status, monthly household income, number of years living with diabetes, and adherence to diet ($p < 0.05$) (Table 4).

Table 4 illustrates the association between non-adherence to diabetes treatment and socio-demographic and clinical variables among participants.

Table 4:
Association between non-adherence of diabetes treatment and socio-demographic and clinical variables

Socio-demographic and clinical variables		Adherence to Diabetes treatment		Chi-squared value	p-value
		No	Yes		
Gender	Female	208	115	9.3040	0.002
	Male	130	37		
Marital status	Co-habiting	35	14	8.5098	0.0075
	Divorced	51	10		
	Married	93	48		
	Single	96	43		
	Widowed	63	37		
Household income	R0-R1000	9	8	23.2942	0.0001
	R1000-R2000	97	49		
	R2000-R3000	108	38		
	R3000-R5000	84	31		
	R5000 and above	40	37		
No of years living with diabetes	<5 years	109	18	154.8776	<0.001
	5-9 years	88	62		
	10-14 years	99	13		
	15 years or more	42	59		
Adherence to diet	No	139	77	3.8661	0.049
	Yes	199	75		

DISCUSSION

The objective of this study was to establish the association between non-compliance with diabetes treatment and socio-demographic and clinical factors. Approximately one-third of the study participants did not receive the treatment. The study revealed a notable relationship between gender, marital status, monthly family income, number of years living with diabetes, and adherence to diet, as well as non-adherence to diabetes medication.

Proper adherence to medication is a crucial determinant in maintaining good health, with adherence levels differing greatly among various chronic illnesses. Accurate identification of significant disparities in adherence rates among individuals with diabetes is essential to reduce the likelihood of complications (McGovern et al., 2018). Approximately 33% of participants in this trial deviated from their prescribed therapy. A previous systematic study reported that the percentage of individuals with diabetes who adhere to their prescribed medication ranges from 38.5% to 93.1% (Krass et al., 2015). Studies conducted

in Uganda and Ethiopia also revealed a high frequency of non-adherence, with rates of 71% and 69%, respectively (Kalyango et al., 2008; Howe et al., 2009). Differences in sample populations and research contexts may explain the divergence between our study and those studies. These significant variations may be attributed to factors such as the research setting, methods used to assess medication adherence, and the accessibility and availability of appropriate diabetes care services.

The current investigation identified gender as a primary factor associated with low levels of medication adherence. Previous studies in Nigeria and Pakistan found a higher proportion of female participants (Adisa & Fakeye, 2014; Butt et al., 2023). Other research has identified a notable correlation between gender and non-compliance with diabetes therapy (Parajuli et al., 2014; Yasmin et al., 2020). Variations in study settings and sociocultural factors across countries and regions likely account for the differences observed in these international studies (McGovern et al., 2018). Policymakers should consider implementing gender-specific initiatives in all Primary Health Centres (PHCs).

The research reveals a significant imbalance between family income and household size, suggesting that the households of study participants experienced excessive financial strain. This finding aligns with a South African study, where the majority of participants were unemployed or retired and relied on social assistance (Adegbola et al., 2016). Another study in Bangladesh found that patients from the lowest socioeconomic group exhibited lower adherence to tuberculosis medication, with financial constraints identified as a primary obstacle to drug compliance and regular follow-ups (Banu et al., 2024). Previous research has shown that individuals with lower socioeconomic status have reduced access to healthcare services and inadequate self-management of diabetes (Kassahun et al., 2016; Divya & Nadig, 2015).

A considerable number of participants did not perceive the importance of reporting adverse effects to their physicians. Insufficient reporting of side effects may stem from a lack of understanding of diabetes management, which can negatively impact adherence and self-care. This finding aligns with results from a study conducted on diabetes knowledge and related factors in the rural Eastern Cape region of South Africa, which revealed a deficiency in understanding various aspects of diabetes care (Owolabi et al., 2022).

A significant number of individuals in our study who failed to take their prescribed dose reported that they had intentionally forgotten to take their medication. Research conducted in the United Arab Emirates (UAE) and Sudan identified several prevalent factors contributing to non-compliance with prescription treatments, including forgetfulness, adverse effects, concurrent use of multiple drugs, and extended duration of therapy (Shaikh et al., 2023). The concurrent use of multiple medications, requiring different dosages at various times of day, may result in missed doses. A busy lifestyle or interruptions to one's routine may further contribute to forgetfulness. Additionally, side effects can negatively impact quality of life, leading to skipped doses. Extended therapy duration, which can lead to feelings of discouragement, also plays a role in non-compliance (Shaikh et al., 2023; Yosef et al., 2023).

Diet plays a significant role in diabetes management and achieving effective glycaemic control, which is associated with improved health outcomes. This study found a notable association between diet and adherence to diabetes treatment recommendations. This finding is consistent with a South African study, which found that failure to follow dietary recommendations was linked to insufficient understanding, lack of family support, and low motivation (Mphasha et al., 2021). Research from Nepal and Bangladesh also showed a strong correlation between inadequate knowledge of nutrition and failure to follow dietary recommendations (Parajuli et al., 2014; Banu et al., 2024).

Patients often face challenges in accurately recalling details about medication intake and health behaviours over long periods, potentially leading to both underreporting and over-reporting of adherence. Patients may underreport non-adherence due to social desirability bias, fearing potential judgement from healthcare providers. Misunderstandings about what constitutes adherence may also lead to inaccurate self-reports. The study sample's inclusion of only patients who visit clinics regularly may

limit the findings' generalisability, as it may not represent the broader population, including those from remote areas or those less likely to attend follow-ups. Objective adherence measures, such as electronic monitoring, pharmacy records, or shorter recall periods, and regular follow-ups or phone check-ins for real-time data collection could reduce recall bias in future research. Combining self-reported data with clinical assessments, medication monitoring apps, and qualitative interviews may increase accuracy. To improve representativeness, random sampling and community-based efforts should be employed to reach patients from both urban and remote areas, especially those less engaged with the healthcare system.

CONCLUSIONS AND RECOMMENDATIONS

The lack of adherence to all parameters of diabetes self-management by a substantial proportion of patients is concerning. Factors contributing to non-adherence are identified as linked to patient characteristics, the nature of the disease, therapy, and the quality of healthcare services. To overcome these challenges, it is essential to consider aspects such as expertise, service quality, and patient engagement. Furthermore, designing comprehensive health programs requires tailoring interventions to the socio-demographic characteristics of participants.

This study highlights the need for adopting comprehensive and multifaceted programs aimed at enhancing adherence. Developing and implementing educational interventions, counselling sessions, and awareness programs for patients and their families is crucial. Additionally, these programs should incorporate modern technologies such as mobile phone reminders and personal digital assistants on smartphones to assist patients in managing diabetes effectively.

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Conflicts of Interest: None declared.

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