

## Cross Sectional Study Assessment of Medication Adherence in Hypertensive Diabetic Patients visiting OPD at a Government Tertiary Hospital

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### Abstract:-

**Background:-** Diabetes-related hypertension increases mortality risk by 7.2 times in the underdeveloped countries such as India, with a greater risk of death. In developing countries, patients' adherence to chronic illness treatments such as hypertension and diabetes is low. Nonadherence is linked to higher rates of hospitalization and poor health outcomes.

**Objectives:-** The aim of this study to determine the prevalence of medication adherence among the hypertensive diabetic patients and to identify factors that associated with poor or non-adherence to medications.

**Materials and Methods:** This is a hospital-based descriptive cross-sectional study. The study included a sample of 385 hypertensive diabetic patients of both gender, their ages above 25 years. The study was carried out from February 2022 to the end of May 2023 at the out patient department consultation clinic at Department of Internal Medicine, King George's Medical University, Lucknow. Following the written informed consent, the participants were interviewed using a prepared structured validated and reliable questionnaire that includes demographic characteristics & Morisky 7 Item Medication Adherence Scale (MMAS-7), 4 point likert scale was used to assess medication adherence.

**Results:** This study showed that more than half of the patients (51.2%) had low adherence, whereas 22.9% had medium adherence. Those with high adherence constituted 26.0%. There were statistically significant associations between good adherence and high level of education, younger age, and nonsmoking. Patients with good adherence to medications have better blood pressure and blood sugar control.

**Conclusion:** The level of medication adherence among diabetic hypertensive patients in King George's Medical University is low.

**Keywords:** Adherence; blood pressure; glycaemic control; hypertensive diabetic

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**INTRODUCTION:-** Patients with type 2 diabetes mellitus commonly display a cluster of metabolic abnormalities called the cardiometabolic or cardiorenal metabolic syndrome. [ 1 ]

The coexistence of hypertension and diabetes significantly increases the risk of cardiovascular disease, cerebrovascular accident, retinopathy, and nephropathy. [ 2 ]

The prevalence of diabetes co-occurring with hypertension is rising globally. [ 3 ] The rise in the number of diabetic, hypertensive patients causes burden, particularly in the Middle East & Asia. [ 4 ] Controlling hypertension in diabetics can have a significant impact on cardiovascular disease outcomes. [ 3 ]

Diabetes-related hypertension raises the probability of death by 7.2 times, with a greater chance in the underdeveloped & developing countries like India, Iraq. [ 5, 6 ] Furthermore, in these developing nations, patients' adherence to chronic illness treatments such as hypertension and diabetes is low. [ 7 ]

Pharmacotherapy, in conjunction with lifestyle changes, remains the cornerstone in the treatment of hypertension

and diabetes mellitus. Adherence to medication is critical for achieving the desired clinical outcomes. It is vital to assess medication adherence and the factors that influence it so that required steps may be adopted within primary care settings to enhance patients' medication adherence, minimize long-term negative consequences of nonadherence, and lessen the load on the secondary care. [ 8 ]

The World Health Organization defines medication adherence as "the degree to which a person's conduct conforms with the agreed-upon instructions from a health care practitioner." This most frequently relates to medication or drug compliance. [ 9 ]

Patients with chronic diseases, particularly those that are asymptomatic, such as hypertension and diabetes mellitus, are more likely to be noncompliant.

The lack of knowledge about the importance of adherence is a factor that contributes significantly to medication nonadherence. [ 10 ] In Iraq, the adherence to antihypertensive medication is about 28.36% [ 11 ] and

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to antidiabetic agents is about 45%. [ 12 ] This means that adherence to treatment is low.

**STUDY OBJECTIVES:-** The objective was to determine the prevalence of levels of medication adherence among the hypertensive diabetic patients and to identify factors that associated with poor or nonadherence to medications.

**MATERIALS AND METHODS:-**This is a tertiary hospital-based cross-sectional study. The study was conducted at the OPD consultation clinic at Department of Internal Medicine, King George's Medical University, Lucknow from the beginning of February through the end of May 2023. The study protocol was approved by the Institutional ethics committee of the institution and informed consents were obtained from all the study participants who were patients suffering from type 2 diabetes, hypertension attending the hypertension clinic of this institution during the study period. The study includes 385 hypertensive, diabetic individuals over the age of 25 who attended OPD consultation clinics. The study participants were selected on the basis of the following:-

#### **Inclusion Criteria**

- 1) Subjects having hypertension and diabetes and diagnosed according to AHA and ADA guidelines.
- 2) Patients with hypertension and diabetes and on anti-hypertensive, anti-diabetic medications.
- 3) The patients who were aged 30 years or above.
- 4) The patients who were non-pregnant or non-puerperal at the time of the interview (for female patients).
- 5) Those who gave informed consents to participate in the study.

The patients who were excluded from the study:-

#### **Exclusion criteria**

- 1) Patients with a critical illness or cognitive impairment.
- 2) Newly diagnosed patients with hypertension or diabetes at the first visit to the OPD clinic.
- 3) Patients not willing to give written informed consent.

Every participant was interviewed by using a pre-designed, pre-tested, structured enrollment form which included socio-demographic variables like age, sex, the educational and the marital status, the per-capita monthly income, and specific questions on the duration on diabetes, the type of medications which were prescribed, the compliance to anti-hypertensive drugs, the diet plan and the exercise schedule, and associated complications of hypertension and diabetes. A prepared structured questionnaire was used that includes questions about the medication compliance (adherence); the scale of adherence was based on the Morisky 7 items. The Morisky 7 Item Medication Adherence Scale (MMAS-7) was there to assess the patient's compliance with their prescribed course of therapy. This questionnaire has 7 questions and 4 responses each. A 4

point Likert scale was used for each questions The response "never" will be given a score of 4, "sometimes" (one to four times per month) score of 3, "often" (more than five times per month) score of 2 and "always" a score of 1. A total score of each patient will be calculated which could range from 7 (min) to 28 (max). [ 13 ]. Adherence will be defined as a score of 27 or more while non-adherence by a score of less than 27. This cut-off is guided by scoring system applied in the Morisky medication adherence scale if the subjects will take at least 95% of prescribed doses. It highlights forgetfulness of medication, measures medication use, stops to take medication when feel worse, forget to take medication when travel or go out of home, measures medication use in yesterday, stops to take medication when feel better, feeling dissatisfaction due to daily commitment to take hypoglycaemic medicine, facing difficulties to remember to take all medications.

Through a direct interview, a questionnaire form was filled up for each patient after obtaining his or her written informed consent. The investigator measures the blood pressure in a standard way HbA1c, fasting, prandial blood sugar results of all diabetic patients were studied or asked to be done. There were current smokers who smoke cigarettes during the OPD visit interview or those who used to smoke within the last 6 months. Nonsmokers are those who never smoked. Ex-smokers are previous smokers who had quit smoking for at least 6 months from the time of the study [ 14 ]. Also if a patient's HbA1c was greater than 7.5%, a patient was regarded to have poor glycaemic control [15] & systolic blood pressure >135 and diastolic blood pressure >85 (the target of blood pressure in diabetic patients is <130/80). [ 16 ].

**STATISTICAL ANALYSIS:-** The data analysis was carried out by using Statistical Package for Social Science (SPSS) for Windows IBM SPSS Statistics 28.0.1 version 2022. Data were analyzed as descriptive statistics (proportions, percentages, ratios, and frequency distribution tables) and expressed as mean (SD) or as percentages. For qualitative data (gender, education level, marital status, duration of the disease, comorbidities, drug regimen, income, smoking, committed to follow-up, relationship with prescribers, suffering from side effects, adherence level), frequency and percent were used. The categorical data such as for qualitative data (gender, education level, marital status, duration of the disease, comorbidities, drug regimen, income, smoking, committed to follow-up, relationship with prescribers, suffering from side effects, adherence level), frequency and percent were used. sex, race, age, duration of disease, body mass index, family history, comorbidities, and level of education are presented as frequency and percentage. Chi-square test was used to Statistical significance was accepted at the 95% confidence level. The chi-square test was used to test the association between categorical variables. P value < 0.05 was considered statistically significant. Bivariate analysis was performed with a P value of less than 0.05

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considered significant and was used to establish an association between adherence to hypertension & diabetes medication and patient-related, drug-related, disease-related, and service-related factors. For bivariate analysis, we categorized frequency of determinants among patients reporting good adherence ( score 27 or 28) and those reporting moderate adherence ( Adherence score 20-26) & low or non-adherence ( below 20 ) to antihypertensive & anti-diabetic therapy. Multivariate regression analysis was performed to identify independent predictors of adherence by using adherence status as the outcome variable and the other factors as

predictor variables. Binary logistic regression analysis was conducted to identify factors associated with non-adherence, while adjusting for covariates.

**RESULTS:-** This study included a total of 385 patients who were diagnosed as hypertensive and type 2 diabetic for duration of 12 months or longer. Gender distribution was almost equal between males and females. The vast majority of them are above 40 years of age (92.5%). Most of them have a secondary level of education and above. [ Table 1 ].

**Table:1 Characteristics of Study Participants**

Characteristic	Category	Frequency	Percentage %
1. Age (years)	<40	29	7.5
	40–65	232	60.3
	>65	124	32.2
2. Gender	Male	192	49.9
	Female	193	50.1
3. Marital status	Single	16	4.2
	Married	264	68.6
	Divorced	18	4.7
	Widow	87	22.6
4. Residence	Urban	227	59.0
	Rural	158	41.0
5. Education	Illiterate	46	11.9
	Read and write	17	4.4
	Primary	73	19.0
	Secondary	113	29.4
	Higher	136	35.3
6. Occupation	Employee	83	21.6
	Retired	70	18.2
	Free worker	85	22.1
	Housewife/not working	147	38.2
7. Income level	Well/enough	99	25.7
	Medium	172	44.7
	Poor/not enough	114	29.6

More than half of the patients (197 patients, forming 51.2%) had low adherence, whereas 88 patients (22.9%) had medium adherence. Those with high adherence were 100 patients, forming 26.0% of the total study sample [Figure 1].

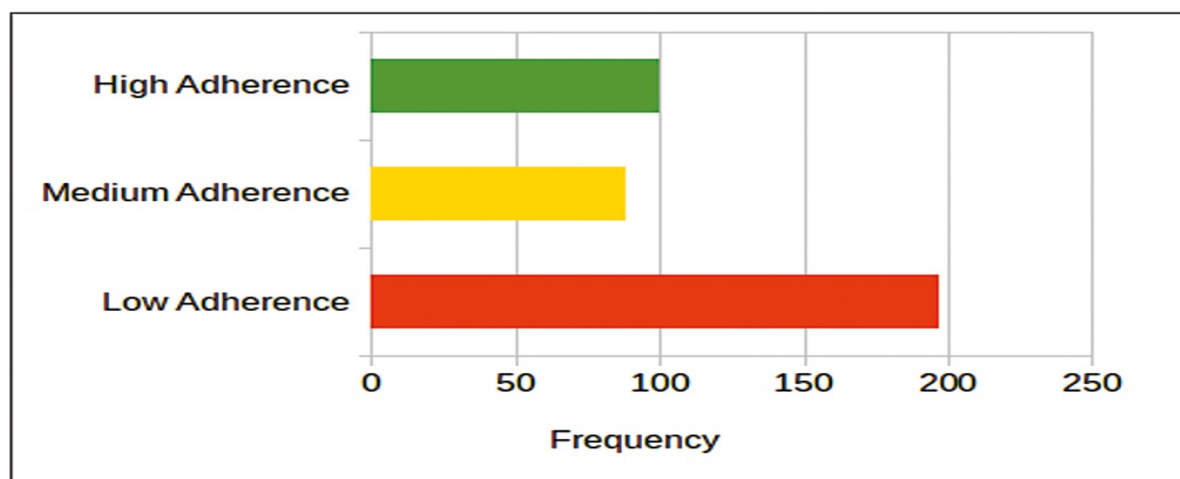


Figure 1: Levels of adherence of study patients (n = 385)

There was a highly significant association between age group (<40 years) and level of medication adherence ( $P < 0.001$ ). Younger patients had a higher level of adherence [Table 2].

Table 2: Demographic Characteristics vs Adherence Levels

Characteristic	Category	High (n=100)	Medium (n=88)	Low (n=197)	Total / P value
Age (years)	<40	17 (58.6%)	3 (10.3%)	9 (31.0%)	29 (100%)
	40–65	62 (26.7%)	54 (23.3%)	116 (50.0%)	232 (100%)
	>65	21 (16.9%)	31 (25.0%)	72 (58.1%)	124 (100%)
Gender	Male	30 (15.6%)	49 (25.5%)	113 (58.9%)	192 (100%)
	Female	70 (36.3%)	39 (20.2%)	84 (43.5%)	193 (100%)
Marital status	Single	4 (25.0%)	2 (12.5%)	10 (62.5%)	16 (100%)
	Married	79 (29.9%)	59 (22.3%)	126 (47.7%)	264 (100%)
	Divorced	4 (22.2%)	5 (27.8%)	9 (50.0%)	18 (100%)
	Widow	13 (14.9%)	22 (25.3%)	52 (59.8%)	87 (100%)
Residence	Urban	69 (30.4%)	51 (22.5%)	107 (47.1%)	227 (100%)
	Rural	31 (19.6%)	37 (23.4%)	90 (57.0%)	158 (100%)
Education level	Illiterate	2 (4.3%)	5 (10.9%)	39 (84.8%)	46 (100%)
	Read and write	1 (5.9%)	1 (5.9%)	15 (88.2%)	17 (100%)
	Primary	13 (17.8%)	12 (16.4%)	48 (65.8%)	73 (100%)
	Secondary	39 (34.5%)	26 (23.0%)	48 (42.5%)	113 (100%)
	Higher	45 (33.1%)	44 (32.4%)	47 (34.6%)	136 (100%)
Occupation	Employee	31 (37.3%)	26 (31.3%)	26 (31.3%)	83 (100%)
	Retired	21 (30.0%)	25 (35.7%)	24 (34.3%)	70 (100%)
	Free worker	9 (10.6%)	15 (17.6%)	61 (71.8%)	85 (100%)
	Housewife/not working	39 (26.5%)	22 (15.0%)	86 (58.5%)	147 (100%)
Income level	Well/enough	17 (17.2%)	43 (43.4%)	39 (39.4%)	99 (100%)
	Medium	66 (38.4%)	26 (15.1%)	80 (46.5%)	172 (100%)
	Poor/not enough	17 (14.9%)	19 (16.7%)	78 (68.4%)	114 (100%)

\*Significant at  $P < 0.05$

Females showed a highly significant level of adherence compared with males ( $P < 0.001$ ). Other demographic variables that were found to have significant relationship with the level of adherence are educational level, occupation, and monthly income level ( $P < 0.001$  for each). Higher education level was associated with higher adherence, so as the employment. Smoking was also found to exhibit a statistically significant relationship with medication adherence ( $P = 0.030$ ). More than 62% of active smokers had low adherence compared with 43.9% among nonsmokers [Table 3].

**Table 3: Smoking History vs Adherence Levels**

Smoking History	High	Medium	Low	Total / P value
Active smoker	17 (15.3%)	25 (22.5%)	69 (62.2%)	111 (100%)
Passive smoker	19 (28.8%)	13 (19.7%)	34 (51.5%)	66 (100%)
Ex-smoker	7 (20.0%)	10 (28.6%)	18 (51.4%)	35 (100%)
Nonsmoker	57 (32.9%)	40 (23.1%)	76 (43.9%)	173 (100%)
Total	100 (26.0%)	88 (22.9%)	197 (51.2%)	385 (100%)

\*Significant at  $P < 0.05$

Regarding the control of blood pressure and glycated haemoglobin (HbA1c), both are significant and highly associated with the level of adherence ( $P < 0.001$  for each). 60% of patients with high adherence have controlled blood pressure, whereas only 17.3% of those with low adherence have controlled blood pressure [Table 4].

**Table 4: Adherence Level vs Blood Pressure Control**

Level of Adherence	Controlled	Uncontrolled	Total	P value
High	60 (60.0%)	40 (40.0%)	100 (100%)	<0.001*
Medium	37 (42.0%)	51 (58.0%)	88 (100%)	
Low	34 (17.3%)	163 (82.7%)	197 (100%)	
Total	131 (34.0%)	254 (66.0%)	385 (100%)	

\*Significant at  $P < 0.05$

Similarly, a proportion of patients (63%) with high adherence have controlled blood sugar ( $HbA1c \leq 7\%$ ) compared with only 15.7% among those with low adherence [Table 5].

**Table 5: Adherence Level vs HbA1c Control**

Level of Adherence	Controlled	Uncontrolled	Total	P value
High	63 (63.0%)	37 (37.0%)	100 (100%)	<0.001*
Medium	37 (42.0%)	51 (58.0%)	88 (100%)	
Low	31 (15.7%)	166 (84.3%)	197 (100%)	
Total	131 (34.0%)	254 (66.0%)	385 (100%)	

\*Significant at  $P < 0.05$

**DISCUSSION:-** The findings of this study revealed that only 26% of patients in this study had good adherence to their antihypertensive and antidiabetic medications, whereas 51.2% of patients had poor adherence. This low rate of antihypertensive medication adherence is lower than that reported by other studies [11, 12, 17, 18]; these differences may be related to different factors such as sample sizes, health-care services levels, health insurances, availability of drugs in low prices, and other socio-economic status such as the level of public and health-care awareness about the importance of medication adherences for chronic diseases. The rate of adherence in the current study is higher than that reported by other researchers [19, 20, 21, 22].

In our study, the age range (<40 years) was significantly associated with medication adherent, whereas other researchers [12, 20, 23] reported the opposite finding. Young age group in this study has a high level of education; they are knowledgeable about the importance

of regular use of treatment to avoid complications of diabetes mellitus and hypertension.

Females in our study appeared to have better medication adherence than males, this agrees with the findings of other reporters [17, 24].

Generally, in some cases females are more mindful than males in following physician's instructions, particularly in relation to taking medications.

Our study found no significant relationship between marital status and medication adherence, which goes in line with other local study [25] and a study performed in Iran [26] but disagrees with another study [27].

This study confirms the findings of other local studies by finding no connection between study participants' residences and their level of medication adherence. [28] This may be related to the high proportion of the participants are living in urban areas which reflects the no difference of this independent variable, or may be due to the absence of clear-cut between rural and urban areas

during the last years related to the economic cultural and social situation of the participants.

In the current study, high levels of education were significantly linked to patients' adherence; this finding is consistent with those of other Iraqi study conducted [ 20 ] and the finding reported by an international study conducted by many researchers.[ 29 ] However, it disagrees with studies that show that patients with a low level of education have a higher rate of adherence.[ 25, 26 ] This could be explained that well-educated patients may have more knowledge about hypertension and diabetes mellitus, as well as the benefits of using drugs regularly to control these chronic diseases to avoid future complications.

The relationship between occupational status and drug adherence is well established; the rate of nonadherence is higher among unemployed and housewives compared with the employed participants. This finding is comparable to that reported by study conducted in Iraq [ 25 ] and other study conducted in the United States,[ 30 ] but disagrees with other study.[ 31 ] This could be due to financial constraints, which make the employed person more concerned about his or her health, as well as their ability to afford the cost of antihypertensive and antidiabetic medications.

More than 62% of active smokers have low medication adherence compared with nonsmokers, who are highly adherent; this finding agrees with other local study [ 11 ] and with findings of an international study.[ 32 ]

In this study, 60% of patients with high medication compliance had normal blood pressure, whereas 82.7 % of the patients with low medication adherence had a poor control of blood pressure; this difference is highly and significantly statistical association. This outcome was rationally sound and supported by research done in Iraq[ 11, 20 ] and other international studies.[ 23, 25 ]

In this study, 63% of patients with high medication adherence had a good glycaemic control (HbA1C < 7%), whereas those with low adherence, 84.2% of them, have a poor glycaemic control (HbA1C > 7%); this result agrees with findings explained by different studies.[ 33, 34 ]

Glycaemic control is hence the ultimate objective of any diabetes mellitus therapy. A good glycaemic control among type 2 diabetes mellitus patients involves an interplay of self-management measures including physical activity and diet in addition to medication adherence.[ 35 ] This can explain the discrepancy between the better medication adherence scores and poorer glycaemic control outcome in this study group.

**CONCLUSION:-** This study concludes that the level of medication adherence among diabetic hypertensive patients in government tertiary centre is low; female patients are more adherent than males; patients with higher education level are more adherent than those with low educational levels; and high level of medication adherence led to blood pressure and type 2 diabetes mellitus control. Urgent education campaigns are required to increase the level of public awareness about

the crucial importance of medication adherence as well as the awareness of health-care providers; further large scale studies are strongly recommended.

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