Assessment of Medication Adherence and Its Association with Health Literacy Among Hypertensive Patients

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ABSTRACT

Background: Hypertension management relies heavily on medication adherence, which is influenced by health literacy. Inadequate adherence can lead to complications, including cardiovascular diseases and stroke.

Objective: To assess the frequency of adherence to antihypertensive medication and its association with health literacy.

Methods: A cross-sectional study was conducted at the University of Lahore Teaching Hospital, involving 375 hypertensive patients aged 18 to 80 years. Medication adherence was evaluated using the Morisky Levine Green questionnaire, and health literacy was assessed using the Single Item Literacy Screener (SILS). Chi-square statistics were employed to determine the association between adherence and health literacy. Data was analyzed using SPSS version 26, with p-value ≤ 0.05 considered statistically significant.

Results: Out of 375 participants, 244 (65.1%) were adherent to medication. Among those with inadequate health literacy (n = 177), only 79 (32.4%) adhered to their medication, while 165 (67.6%) of those with adequate health literacy were adherent. A significant association was found between health literacy and medication adherence (p < 0.001).

Conclusion: Non-adherence to antihypertensive treatment is significantly associated with inadequate health literacy. Educational interventions are necessary to improve adherence and patient outcomes.

INTRODUCTION

Hypertension is a chronic medical condition characterized by high systemic arterial pressure that remains above the normal range. According to the European Society of Cardiology and European Society of Hypertension (ESC/ESH), hypertension is defined as a systolic blood pressure of ≥ 140 mmHg and a diastolic pressure of ≥ 90 mmHg. However, according to recent guidelines from the American College of Cardiology and American Heart Association (ACC/AHA), hypertension is classified as a blood pressure greater than 130/80 mmHg (1, 2).

The global prevalence of hypertension has escalated over the past few decades, with more pronounced impacts in low- and middle-income countries (LMICs). Globally, 1.39 billion adults (31.1%) developed hypertension over the past decade. This prevalence was higher among adults residing in LMICs (31.5%) compared to those in high-income countries (28.5%) (3). Hypertension is a grave public health issue and a significant predisposing factor for morbidity and mortality among the adult population worldwide (4). Gender variations in predisposing factors, as well as in awareness, management, and control of hypertension, have been well established (5). Advanced age, smoking, obesity, diabetes mellitus, and a positive family history are the main predisposing factors for hypertension in the Pakistani population (6). If uncontrolled, it can lead to cardiovascular, renal, and cerebrovascular diseases, and even death (5, 7).

Inadequate adherence to antihypertensive medication is a primary contributor to discrepancies in successful blood pressure control. It is an avoidable cause of treatment failure, poor blood pressure control, and serious complications among patients with hypertension (8, 9). Medication adherence is multifactorial and requires a deeper understanding before implementing treatment protocols to improve adherence to these medicines. Health literacy is a major contributing factor to medication adherence (8, 9). A Saudi study reported that 57.8% of adult patients were not adherent to antihypertensive treatment (10). Another study reported that a greater percentage of patients had minimal levels of adherence to antihypertensive medicines (88.4%) and insufficient health literacy (84.9%) (9). Non-adherence to antihypertensive medication ranged from 37.8% to 61.1% in the Pakistani population (8, 11). Among these patients, adequate health literacy was observed in only 54.6% (8).

The rationale of the current study is to find the frequency of adherence to antihypertensive medication and its association with health literacy. While a few studies are available, their statistics on non-adherence to antihypertensive treatment are inconsistent. Another study identified inadequate health literacy as a factor contributing to non-adherence to antihypertensive treatment (8).

The present study involved hypertensive individuals aged 18 to 80 years. If high rates of non-adherence and a strong association with inadequate health literacy are found, this

group will be classified as high-risk for non-adherence. Future interventions will aim to improve their health literacy through educational programs, which could enhance adherence rates and decrease the likelihood of related complications and mortality.

MATERIAL AND METHODS

A cross-sectional study was conducted at the Department of Medicine, University of Lahore Teaching Hospital, Lahore, Pakistan. The study was carried out over 3 months, from July 15, 2024, to September 15, 2024. A total of 375 cases were estimated using a percentage of non-adherence to antihypertensive treatment of 57.8% (10) with a 5% margin of error and a 95% confidence level. Data was gathered using consecutive sampling techniques. Patients aged 18 to 80 years, of either gender, with a clinically confirmed diagnosis of hypertension were included in the study. A patient was considered hypertensive if their resting blood pressure was more than 140/90 mmHg or if they had been taking antihypertensive medications for ≥ 3 months (12). Patients with a history of severe concomitant diseases or dementia, according to clinical records, were excluded as these conditions could affect adherence to antihypertensive medication.

After approval from the institutional committee and obtaining informed consent from 375 patients, data was collected from the Department of Medicine, University of Lahore Teaching Hospital, Lahore, Pakistan. Demographic details such as age and gender were recorded on a predesigned questionnaire. Medication adherence was assessed using the Morisky Levine Green adherence questionnaire (13). This four-item questionnaire evaluates both intentional and unintentional adherence based on forgetfulness, negligence, stopping medication when feeling better, and stopping medication when feeling worse. Each question was scored as 1 for "No" and 0 for "Yes". A score of 4 indicated the highest level of adherence to medication, while a score of < 4 was considered non-adherence (13). Health literacy was assessed using the Single Item Literacy Screener (SILS), which asked, "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?". Responses were rated on a scale from 1—Never to 5—Always. Inadequate health literacy was defined as a score of > 2, while a score of 1 or 2 was considered adequate health literacy (14).

The data was analyzed using SPSS version 26. Mean ± standard deviation was used for quantitative data such as age, duration of hypertension, and duration of medication prescribed. Frequency and percentage were calculated for gender, socioeconomic class, education level, area of residence, history of diabetes mellitus (BSR > 126 mg/dL) and cardiovascular disease, adherence to medication, and health literacy. The Chi-square test was employed to assess the association between adherence to antihypertensive medication and health literacy. Data was stratified by age, gender, duration of hypertension, treatment prescribed, history of diabetes mellitus and cardiovascular disease, socioeconomic class, education level, and area of residence to rule out effect modifiers. A p-value ≤ 0.05 was considered significant.

RESULTS

A total of 375 patients participated in the study. Table 1 shows the sociodemographic and clinical characteristics of the study participants. The average age of participants was 51.77 ± 12.36 years. Participants had hypertension for an average of 8.67 ± 7.94 years, and the average duration of medication prescribed was 7.32 ± 6.81 years. Regarding age groups, 125 (33.3%) of participants were aged between 18 and 45 years, while 250 (66.7%) were between 46 and 80 years. Gender distribution revealed that 158 (42.1%) participants were male, and 217 (57.9%) were female. In terms of medication duration, 169 (45.1%) participants had been on medication for less than 5 years, whereas 206 (54.9%) had been on medication for 5 years or more. Regarding the treatment prescribed, 166 (44.3%) participants were receiving a single regimen, and 209 (55.7%) were receiving combined regimens. Diabetes was reported in 173 (46.1%) participants, and 101 (26.9%) had a history of cardiovascular disease. Socioeconomic status revealed that 117 (31.2%) participants belonged to the lower class, 243 (64.8%) to the middle class, and 15 (4.0%) to the upper class. Educational status showed that 240 (64.0%) participants had qualifications below matric, and 135 (36.0%) had matric or above. In terms of area of residence, 282 (75.2%) participants lived in urban areas, while 93 (24.8%) resided in rural areas. Medication adherence was reported in 244 (65.1%) participants, and health literacy was classified as inadequate for 177 (47.2%).

Table 2 compares medication adherence with health literacy. It showed that 79 (32.4%) of those with inadequate health literacy were adherent to their medication, while 98 (74.8%) were non-adherent. Conversely, 165 (67.6%) of those with adequate health literacy were adherent, and only 33 (25.2%) were non-adherent. A chi-square test result of 61.581 with a p-value of ≤ 0.001 indicated a highly significant association between health literacy and medication adherence.

Table 3 presents the comparison of medication adherence and health literacy with respect to different effect modifiers. Among participants aged 18-45 years, 41 (48.2%) with inadequate health literacy were adherent, while 25 (62.5%) were non-adherent. In the 46-80 years age group, 38 (23.9%) with inadequate health literacy were adherent, and 73 (80.2%) were non-adherent (p < 0.001). Among males, 29 (27.6%) with inadequate health literacy were adherent, and 44 (83.0%) were non-adherent. Among females, 50 (36.0%) with inadequate health literacy were adherent, while 54 (69.2%) were non-adherent. The chi-square test result (χ^2 = 43.391, p < 0.001) showed that inadequate health literacy significantly impacted medication adherence more among males than females.

For participants on medication for less than 5 years, 40 (41.7%) with inadequate health literacy were adherent, while 49 (67.1%) were non-adherent. For those on medication for 5 years or more, 39 (26.4%) with inadequate health literacy were adherent, and 49 (84.5%) were non-

adherent (χ^2 = 57.546, p < 0.001). Among those prescribed a single treatment regimen, 32 (29.9%) with inadequate health literacy were adherent, while 46 (78.0%) were non-adherent. For patients on combination treatments, 47 (34.3%) with inadequate health literacy were adherent, while 52 (72.2%) were non-adherent.

Among participants with diabetes, 50 (41.3%) with inadequate health literacy were adherent, and 44 (84.6%) were non-adherent. In participants without diabetes, 29 (24.4%) with inadequate health literacy were adherent, and 54 (68.4%) were non-adherent.

Among those with a history of cardiovascular disease (CVD), 39 (44.3%) with inadequate health literacy were adherent, while 9 (69.2%) were non-adherent. For those without a history of CVD, 40 (25.6%) with inadequate health literacy were adherent, and 89 (75.4%) were non-adherent.

Table 1: Sociodemographic and Clinical Characteristics (n = 375)

Characteristics	n (%)
Age (years)*	51.77 ± 8.67
Age groups (years)	
18-45	125 (33.3%)
46-80	250 (66.7%)
Gender	
Male	158 (42.1%)
Female	217 (57.9%)
Diabetes Mellitus (DM)	
Yes	173 (46.1%)
No	202 (53.9%)
History of Cardiovascular Disease (CVD)	
Yes	101 (26.9%)
No	274 (73.1%)
Socioeconomic Class	
Lower	117 (31.2%)
Middle	243 (64.8%)
Upper	15 (4.0%)
Qualification	
Below Matric	240 (64.0%)
Matric and above	135 (36.0%)
Area of Residence	
Urban	282 (75.2%)
Rural	93 (24.8%)
Duration of Hypertension (years)*	8.67 ± 7.94
Duration of Medication (years)*	7.32 ± 6.81
Duration of Medication Groups (years)	
< 5	169 (45.1%)
≥ 5	206 (54.9%)
Treatment Prescribed	
Single Regimen	166 (44.3%)
Combined Regimen	209 (55.7%)
Adherence to Medication	
Adherent	244 (65.1%)
Non-adherent	131 (34.9%)
Health Literacy	
Adequate	198 (52.8%)
Inadequate	177 (47.2%)

Note: n = number of patients; % = percentage of patients; * = mean ± standard deviation; DM = diabetes mellitus; CVD = cardiovascular disease.

Table 2: Medication Adherence and Health Literacy Comparison (n = 375)

Health Literacy	Adherent n (%)	Non-Adherent n (%)	Total n (%)	χ^2	p-value
Inadequate	79 (32.4%)	98 (74.8%)	177 (47.2%)	61.581	<0.001**
Adequate	165 (67.6%)	33 (25.2%)	198 (52.8%)		
Total	244 (100%)	131 (100%)	375 (100%)		

Note: χ^2 = chi-square statistic; chi-square test was applied, and p ≤ 0.05 was considered significant.
p-value key: * = Significant, ** = Highly Significant.

In the lower socioeconomic class, 35 (64.8%) with inadequate health literacy were adherent, and 58 (92.1%) were non-adherent. In the middle class, 39 (21.7%) with inadequate health literacy were adherent, while 35 (55.6%) were non-adherent. In

the upper class, 5 (50.0%) with inadequate health literacy were adherent, and all 5 (100%) were non-adherent. Among participants with below matric qualifications, 59 (44.4%) with inadequate health literacy were adherent, while 78 (72.9%) were non-adherent. For those with matric or higher qualifications, 20 (18.0%) with inadequate health literacy were adherent, while 20 (83.3%) were non-adherent.

Table 3: Comparison of Medication Adherence and Health Literacy with Respect to Different Effect Modifiers

Effect Modifier	Health Literacy	Adherent n (%)	Non-Adherent n (%)	χ^2	p-value
Age Groups (years)					
18-45	Inadequate	41 (48.2%)	25 (62.5%)	2.221	0.136
	Adequate	44 (51.8%)	15 (37.5%)		
46-80	Inadequate	38 (23.9%)	73 (80.2%)	74.366	<0.001**
	Adequate	121 (76.1%)	18 (19.8%)		
Gender					
Male	Inadequate	29 (27.6%)	44 (83.0%)	43.391	<0.001**
	Adequate	76 (72.4%)	9 (17.0%)		
Female	Inadequate	50 (36.0%)	54 (69.2%)	22.146	<0.001**
	Adequate	89 (64.0%)	24 (30.8%)		
Duration of Medication					
< 5 years	Inadequate	40 (41.7%)	49 (67.1%)	10.780	0.001*
	Adequate	56 (58.3%)	24 (32.9%)		
≥ 5 years	Inadequate	39 (26.4%)	49 (84.5%)	57.546	<0.001**
	Adequate	109 (73.6%)	9 (15.5%)		
Treatment Prescribed					
Single regimen	Inadequate	32 (29.9%)	46 (78.0%)	35.264	<0.001**
	Adequate	75 (70.1%)	13 (22.0%)		
Combined regimen	Inadequate	47 (34.3%)	52 (72.2%)	27.215	<0.001**
	Adequate	90 (65.7%)	20 (27.8%)		
Diabetes Mellitus (DM)					
Yes	Inadequate	50 (41.3%)	44 (84.6%)	27.474	<0.001**
	Adequate	71 (58.7%)	8 (15.4%)		
No	Inadequate	29 (24.4%)	54 (68.4%)	39.840	<0.001**
	Adequate	94 (76.4%)	25 (31.6%)		
History of Cardiovascular Disease (CVD)					
Yes	Inadequate	39 (44.3%)	9 (69.2%)	2.819	0.093
	Adequate	49 (55.7%)	4 (30.8%)		
No	Inadequate	40 (25.6%)	89 (75.4%)	66.828	<0.001**
	Adequate	116 (74.4%)	29 (24.6%)		
Socioeconomic Class					
Lower Class	Inadequate	35 (64.8%)	58 (92.1%)	13.241	<0.001**
	Adequate	19 (35.2%)	5 (7.9%)		
Middle Class	Inadequate	39 (21.7%)	35 (55.6%)	25.306	<0.001**
	Adequate	141 (78.3%)	28 (44.4%)		
Upper Class	Inadequate	5 (50.0%)	5 (100%)	3.750	0.053
	Adequate	5 (50.0%)	0 (0.0%)		
Qualification					
Below Matric	Inadequate	59 (44.4%)	78 (72.9%)	19.710	<0.001**
	Adequate	74 (55.6%)	29 (27.1%)		
Matric or above	Inadequate	20 (18.0%)	20 (83.3%)	40.375	<0.001**
	Adequate	91 (82.0%)	4 (16.7%)		

Note: χ^2 = chi-square statistic; chi-square test was applied, and p ≤ 0.05 was considered significant. p-value key: * = Significant, ** = Highly Significant.

DISCUSSION

Hypertension is considered an epidemic worldwide and is associated with several complications, including cardiovascular disease, stroke, renal failure, and even death (3). Appropriate management of hypertension is needed to avoid high morbidity and mortality rates (15). Medication adherence plays a major role in the proper treatment of hypertension, and health literacy is vital to ensuring medication adherence (16). Increasing adherence to antihypertensive medication is a principal objective of interventions aimed at reducing the potential complications of uncontrolled hypertension (17). Therefore, this study was conducted to determine the frequency of antihypertensive medication adherence and the association of medication adherence with health literacy.

According to the current study, 131 (34.9%) patients were non-adherent to treatment. Among them, 98 patients (74.8%) had inadequate health literacy. This is worrisome because non-adherence to antihypertensive medication is linked to an increased likelihood of morbidity and mortality. These results are comparable to the findings in existing literature (10, 18, 19). In a systematic review conducted in Ethiopia, it was found that 65.41% of patients adhered to antihypertensive medication (19), which is similar to the present study (65.1%). It was also noted that knowledge about the disease and its treatment was associated with medication adherence (p = 0.04) (19).

Other studies have reported a higher non-adherence rate in hypertensive patients (10, 16) compared to the present study. An Iranian study revealed that the majority of patients (75.6%) had low adherence to medication (16). Another study conducted in Saudi Arabia revealed that 57.8% of patients were non-adherent to the regimen (10). This study also documented that patients with adequate knowledge of their condition and its consequences were more likely to adhere to medication (p < 0.01) (10), which is comparable to our results (p < 0.001). A cross-sectional study conducted in Panama found that low to moderate medication adherence was present in 78.2% of patients (20). Andala et al. reported that 28.5% of hypertensive patients adhered to medication, and this was strongly associated with health literacy (p < 0.01) (21), which aligns with the results of the current study. This study also has some limitations. These include potential sampling bias due to the use of consecutive sampling at a single institution, and reliance on self-reported data, which may introduce inaccuracies. The cross-sectional design also limits causal inference, and the use of the simplified tool (SILS) for health literacy assessment may not fully capture its impact on adherence.

CONCLUSION

The study highlights a significant prevalence of non-adherence to antihypertensive treatment among patients, with a strong association between health literacy and medication adherence. Targeted educational interventions are needed to enhance medication adherence and improve treatment outcomes.

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