ORIGINAL ARTICLE

ADHERENCE TO ANTIHYPERTENSIVE MEDICATION AMONG PATIENTS WITH HYPERTENSION IN PESHAWAR, PAKISTAN: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: To assess the adherence to antihypertensive therapy and its associated sociodemographic factors among hypertensive patients attending public sector tertiary care hospitals in Peshawar.

Materials and Methods: A cross-sectional descriptive study was conducted from May to November 2024 using the Hill-Bone Compliance to High Blood Pressure Therapy Scale (CHBPTS). A sample of 390 was collected through consecutive sampling from three public-sector tertiary care hospitals in Peshawar. Data were analyzed using SPSS version 25. Continuous outcomes were compared using the Mann–Whitney U test and the Kruskal–Wallis test, with Dunn–Bonferroni post hoc tests for significant pairwise comparisons. Spearman's rank correlation coefficient was used to assess correlations between variables.

Results: The study included participants with a mean age of 54.0 ± 10.3 years, of whom 39.2% were men and 60.8% were women. The mean overall adherence score on the Hill-Bone Compliance to High Blood Pressure Therapy Scale (Hill-Bone CHBPTS) was 27.27 ± 6.8. The mean subscale scores were 17.52 ± 4.98 for medication-taking, 5.03 ± 1.38 for reduced sodium intake, and 4.70 ± 1.38 for appointment-keeping. According to the Hill-Bone CHBPTS scoring criteria, 44.6% of participants were adherent to antihypertensive treatment.

Conclusion: The study results showed that adherence to antihypertensive treatment requires attention to better control of hypertension in our local context. Sociodemographic factors play an important role in adherence to antihypertensive treatment.

Keywords: Hill Bone Compliance Scale, Hypertension, adherence.

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INTRODUCTION

Hypertension has been defined as "a progressive cardiovascular syndrome due to multiple etiologies that results in physical & operational changes to the heart and vascular systems."[1] Hypertension has emerged as a global epidemic affecting nearly 1.4 billion individuals worldwide and is responsible for 57 million disability adjusted life years, which accounts 3.7% of the total disability adjusted life years. [2] The prevalence of hypertension in Pakistan is approximately 18% in individuals above 15 years, with higher rates in urban areas and in females rather than men. It is a highly common condition in Pakistan, impacting about 18% of individuals aged 15 years and older, so every fourth person in Pakistan is suffering from hypertension. [3] As hypertension is a chronic condition that requires lifelong adherence to treatment.

The control of Hypertension is considered to be inadequate in most Asian countries. Literature shows that developed countries have a higher percentage of patients with controlled hypertension as compared to developing nations like Pakistan, where the control rate is 6%. [4, 5] Additionally, it is increasingly among the most frequent reasons for hospital visits in our setting, but still, adherence towards antihypertensive treatment remains a key challenge to achieve optimal blood pressure control and reduce complications.

Adherence can be defined as the extent to which patients follow medical instructions given by physicians. [6, 7] In addition to treatment, several daily lifestyle modifications are crucial for disease control & management. [8] In addition, a variety of other factors, including patient-related characteristics, treatment regimens, socioeconomic status, and patients' awareness levels, also influence ad-

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herence to the treatment regimen. [9]

Studies have shown that adherence rates can vary widely across different populations, with compliance reported to range from approximately 33% to 86%. [10, 11] Therapeutic adherence towards anti-hypertensive treatment remains a substantial challenge in our society. Hypertension remains a critical public health challenge globally, with effective treatment largely dependent on patient adherence to prescribed therapeutic regimens. However, adherence rates vary widely, influenced by psychosocial, economic, and health system factors. [12] Non-adherence contributes significantly to poor blood pressure control and increased cardiovascular risk. Understanding factors influencing compliance using validated scales enables targeted interventions to improve health outcomes. [13]

This study aimed to assess the role of sociodemographic factors towards adherence to antihypertensive treatment in our local context, thus to design interventions to improve the management of hypertension and patient care outcomes.

MATERIALS AND METHODS

A cross-sectional study was conducted from May to November 2024 in three public-sector tertiary care hospitals: Lady Reading Teaching Hospital, Khyber Teaching Hospital & Hayatabad Medical Complex, in the district of Peshawar, Pakistan. A sample size of 390 participants was calculated using the prevalence formula, with an estimated good adherence of 50% (Desired precision of 0.05 at a 95% confidence level). Participants were selected through a consecutive sampling method. [14]

Inclusion criteria were individuals aged 35 years or older with a documented diagnosis of hypertension for at least 12 months, as confirmed by medical records and physician notes. The hypertensive patients with comorbidities and having psychiatric issues were excluded. The tool for data collection used in our study was a standardized Hill-Bone Compliance to High Blood Pressure Therapy Scale (Hill-Bone CHBPTS) with high internal consistency and reliability of Cronbach's alpha value (0.84). [15] As per the literature, adherence is defined as the extent to which an individual's behavior, including medication-taking, dietary practices, and lifestyle modifications, corresponds to the recommendations provided by a healthcare professional. [16]

Hill-Bone CHBPT is a widely used, validated 14-item tool that helps identify specific behavioral barriers to controlling blood pressure through self-reporting by hypertensive patients. It assesses patient adherence to antihypertensive medication across three behavioral domains, including:

Medication Adherence (9 items) tracks behaviors that lead to forgetting, missing, or running out of medicines.

Reduced Salt Intake (3 items) assesses dietary habits focusing on salt intake in their daily life.

Appointment keeping (2 items) reflects the patient's consistency in attending follow-up visits with physicians.

Each item is scored on a 4-point Likert scale. The minimum overall score for the Hill-Bone CHBPTS is 14, and the maximum is 56. The maximum scores for the medication adherence, sodium intake, and appointment-keeping subscales are 36, 12, and 8, respectively. Adherence was operationally defined as the sample mean score on the Hill-Bone CHBPTS. Study participants scoring below the mean were categorized as adherent, while those with scores equal to or exceeding the mean were classified as non-adherent. Because there is no universal cutoff, many studies use the group mean or a specific threshold (such as a score of 50% in certain adapted versions) to categorize patients as "adherent" or "non-adherent".

Ethical approval was obtained from the Rehman Medical Institute (Letter No: RMI/RMI-RMC/Article Approval/122), and administrative permissions were acquired from Khyber Teaching Hospital, Lady Reading Hospital, and Hayatabad Medical Complex, Peshawar. Data were collected through interviews with patients using the validated CHPBT questionnaire.

Data analysis was conducted using SPSS version 25. A comparison between 2 groups was performed using the Mann-Whitney test, and a comparison between 3 or more groups was performed using the Kruskal-Wallis test. When a statistically significant difference was detected, a post hoc analysis was performed using the Dunn test to identify significant differences among groups. Spearman's rank correlation coefficient was used to assess correlations between variables. For independent influences of relevant variables, multivariate analysis of the numerical variable was performed using linear regression. The results are presented as standardized beta coefficients from a regression model, with 95% CIs; values with P-values < 0.05 are considered statistically significant.

RESULTS

The outcomes of our study are described in two sections.

1. DEMOGRAPHIC SECTION

The demographic data of the study participants were summarized as shown in Table 1:

The overall adherence score for hypertension treatment among the study participants was 27.2745±6.83, indicating moderate adherence according to the criteria outlined in the methodology section. The results for the three

subscales of the Hill-Bone Compliance to High Blood Pressure Therapy Scale (CHBPTS) are shown in Table 2:

Medication-taking had the highest mean adherence score (17.52 ± 4.98), followed by reduced salt intake (5.03 ± 1.38) and appointment-keeping (4.70 ± 1.38). The overall mean adherence score was 27.27 ± 6.83, indicating moderate adherence among participants.

Note: P values were calculated using the Mann–Whitney U test for comparing between two groups, and the Kruskal–Wallis H test was used for comparisons among three or more groups. Pairwise comparisons were performed using Dunn's post hoc test.

MULTIVARIATE ANALYSIS OF MEDICATION TAKING SUBSCALE

The analysis showed that individuals who were single, divorced, or widowed had significantly lower adherence scores (= −1.024, p = 0.019). Similarly, participants who were employed or self-employed showed a modest but significant decrease in adherence (= −0.44, p = 0.047). The regression model explained 22.3% of the variance in the medication-taking subscale ($R^2 = 0.223$), indicating moderate explanatory power.

MULTIVARIATE ANALYSIS OF REDUCED SALT INTAKE SUBSCALE

No independent variable reached statistical significance. However, urban residence (p = 0.079), employment (p = 0.068), and income level (p = 0.074) were marginally associated. The model accounted for 12.0% of the variation in reduced salt intake scores ($R^2 = 0.120$).

MULTIVARIATE ANALYSIS OF APPOINTMENT KEEPING SUBSCALE

Two factors were significantly associated with the outcome. Lower educational attainment (primary or no formal education) was significantly associated (p = 0.013). In addition, a duration since diagnosis of 1–10 years was associated with a 0.275-point increase in the score (= 0.275, p = 0.022). The model explained 17.8% of the variance in the outcome ($R^2 = 0.178$), indicating modest explanatory power.

DISCUSSION

Our study results revealed that 44.6% of the participants demonstrated good adherence to antihypertensive treatment, whereas 55.7% exhibited poor adherence. The study participants exhibited the lowest adherence to appointment-keeping, while relatively better adherence was observed for medication-taking.

The literature shows that several studies using different adherence tools, including the Hill-Bone CHBPTS, have reported challenges with adherence among hyper-

Table No 1: Demographic data of the Hypertensive Patients

Variables	Mean (SD)	Median (quartile)
Age	54.03(10.3)	55(45—62)
Features	n	%
Gender		
Male	153	39.2
Female	237	60.8
Residence		
Rural	242	62.1
Urban	148	37.9
Living Arrangements		
Living alone	52	13.3
Living with family	338	86.7
Marital status		
Single	10	2.6
Married	321	82.3
Divorced	19	4.9
Widowed	40	10.3
Education		
None	169	43.3
primary	109	27.9
Secondary	64	16.4
Tertiary	48	12.3
Occupation		
Employed	88	22.6
Self employed	77	19.7
Unemployed	209	53.6
Retired with pension	16	4.1
Income		
Below 20,000 Rs	121	31.0
20,000-50,000 Rs	151	38.7
50,000-100,000 Rs	98	25.1
Above 100,000 Rs	20	5.1
Medication		
Less than 2 drugs	288	74.1
3 drugs or more	102	25.9
Duration of Disease		
1-5 Years	180	46.2
6-10 years	143	36.7
11-15 years	56	14.4
More than 15 years	11	2.8

Table No 2: Hill-Bone CHBPTS - Adherence Scores

Total Score	Mean Adherence Score ±SD
Reduced sodium intake	5.03 ± 1.38
Appointment keeping	4.70 ± 1.38
Medication taking	17.52 ± 4.98
Overall Adherence Score	27.27 ± 6.8

Table No 3: Comparison of adherence scores

Male	**26 (22-30)**	5 (4-6)	4 (3-5)	**17 (14-20)**
Female	26 (23-29)	5 (4-6)	4 (4-5)	17 (14-19)
P-value*	0.533	0.156	0.563	0.640
Residence				
Rural	26 (21-29)	5 (3-6)	4 (4-5)	16 (13-19)
Urban	27 (24-31)	5 (4-6)	4 (4-5)	18 (14-21)
P-value*	0.006	0.077	0.111	0.013
Living				
Living Alone	27 (24-31)	5 (3-6)	5 (4-5)	18 (15-21)
Living with Family	26 (22-29)	5 (4-6)	4 (3-5)	17 (14-19)
P-value*	0.037	0.515	0.049	0.073
Marital Status				
Married (A)	26 (22-29)	5 (4-6)	4 (4-5)	16 (13-19)
Single or Divorced (B)	32 (28-35)	5 (4-8)	5 (4-5)	22 (20-23)
Widowed (C)	27 (23-29)	4 (3-6)	4 (4-5)	18 (14-19)
P-value*	0.004	0.601	0.941	0.000
Post hoc**	B>A,C	A,B>C	B>AC	B>AC
Education				
Primary or None (A)	26 (23-29)	5 (4-6)	4 (4-5)	18 (14-20)
Secondary (B)	27 (25-32)	5 (4-6)	4 (4-6)	17 (15-20)
Tertiary (C)	27 (23-31)	5 (4-6)	4 (3-5)	18 (14-20)
P-value*	0.004	0.044	0.049	0.022
Post hoc**	C>A	-	-	AC>B
Employment				
Employed or Self em-ployed (A)	27 (22-32)	5 (4-6)	4 (4-6)	17 (14-21)
Unemployed (B)	25 (21-29)	5 (3-6)	4 (4-5)	16 (13-19)
Retired with pension (C)	28 (25-30)	6 (5-7)	5 (4-6)	16 (15-20)
P-value*	0.049	0.027	0.353	0.047
Post hoc**	C>A	C>A	C>A	A>C
Income				
Below 20,000 Rs (A)	27 (22-30)	5 (4-5)	5 (4-6)	18 (13-20)
20,000-50,000 Rs (B)	26 (22-29)	5 (3-6)	4 (4-5)	17 (14-20)
50,000-100,000 Rs (C)	26 (21-29)	5 (4-6)	4 (3-5)	16 (14-19)
above 100,000 Rs (D)	26 (21-31)	6 (5-6)	4 (3-5)	16 (12-19)
P-value*	0.732	0.015	0.011	0.568
Post hoc**	A>D	D>A	A>D	A>D
Duration of Disease				
1-5 Years (A)	25 (21-28)	5 (3-6)	4 (3-5)	16 (13-18)
6-10 years (B)	27 (23-31)	5 (4-6)	4 (4-5)	18 (14-21)
11-15 years (C)	28 (25-32)	4 (3-6)	4 (4-6)	18 (15-21)
More than 15 years (D)	24 (19-28)	5 (4-6)	5 (4-6)	16 (10-17)
P-value*	0.000	0.451	0.073	0.000
Post hoc**	C> A,B,D	A>C	D>A	B,C>A,D

Note: P values were calculated using the Mann–Whitney U test for comparing between two groups, and the Kruskal–Wallis H test was used for comparisons among three or more groups. Pairwise comparisons were performed using Dunn's post hoc test.

tensive patients in developing countries. A study conducted at a tertiary care hospital in Quetta, Pakistan, found that 83.4% had imperfect adherence, while 16.2% had perfect adherence. Several demographic factors, such as gender, age, marital status, and income, showed a strong correlation with adherence to antihypertensive treatment in this study. [17] Another study reported that only 55.9% of the study population adhered to antihypertensive treatment in the Middle East. [18] Similarly, about 53.4% were found adherent to antihypertensive treatment in a study conducted in Malaysia. Female patients were found to show more compliance towards antihypertensive treatment. The multi-drug prescription to hypertensive patients and increased daily dose frequency are the main predictors of non-compliance towards hypertensive treatment. [19] A study conducted in Primary health care centers in Saudi Arabia showed overall good compliance but highlighted patterns of intentional non-adherence and frequent running out of medicines as the main factors contributing to non-adherence. [20] In a study conducted in Dhaka, Bangladesh, revealed that 54.83% of study participants had shown good medication adherence. The most frequent predators for irregular medication use were forgetfulness (20.29%), followed by work-related commitments (7.71%). Among sociodemographic associations, medication adherence was notably higher among married patients than unmarried participants, consistent with our study results. [21] A study conducted in rural India reported that 46% of patients had high adherence to their medication, 41.3% had moderate adherence, and 12.7% showed low adherence. The main challenges linked to poor adherence were being asymptomatic at the time of diagnosis, poor knowledge of hypertension complications, and obtaining medication from government pharmacies. [22] Our study showed that sociodemographic factors, specifically urban residency, tertiary education, and participants with a longer duration of diagnosis, exhibited better overall adherence, but there is no statistically significant difference in the adherence levels between males and females whereas a study conducted in Nigeria stated a gender difference towards adherence patterns in their population, with males exhibiting better adherence than females. [22]

This study has a few limitations, such as selection bias due to the convenience sampling method and recall bias, as we rely on patient self-reported information, which limits the generalizability of the study findings. Further research in a wider community is recommended to address this important public health issue.

CONCLUSION

The study results showed that adherence to antihypertensive treatment requires attention to improve hypertension control in our local context. This study underscores the need for targeted, context-specific interventions, particularly those focused on socially vulnerable groups and individuals with lower educational levels, to enhance adherence and improve health outcomes.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Ghayyur US	✓	✓	×	×	✓	×
Aliya B	✓	×	✓	✓	✓	×
Syed S	✓	✓	×	×	×	✓
Ghani MA	✓	×	✓	✓	✓	×
Azam M	✓	✓	×	×	×	✓
Rafi S	✓	×	✓	✓	✓	×

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical Approval:

This Manuscript was approved by the Ethical Review Board of Rehman Medical College, Peshawar. Vide No. RMI/RMI-REC/Article Approval/122. Dated 07, 04, 2024.

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