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ORIGINAL ARTICLE

Medication adherence in hypertensive patients - a cross-sectional study in a tertiary care hospital of Karachi.

Unaiza Khalid[1], Hiba Ashraf[2]

ABSTRACT… Objective: To assess medication adherence among hypertensive patients visiting Indus Hospital, Karachi. **Study Design:** Cross-Sectional Study. **Setting:** Outpatient Clinics of the Department of Family Medicine at Indus Hospital, Karachi. **Period:** May to October, 2023. **Methods:** A total of 383 hypertensive patients were enrolled via non-probability consecutive sampling. Data were collected through face-to-face interviews using a structured questionnaire, which included sociodemographic details and the validated 8-item Morisky Medication Adherence Scale (MMAS-8). Adherence was categorized as high (score=8), medium (score 6-7), or low (score ≤6). Statistical analysis was performed using SPSS version 25. **Results:** Among the 383 participants, 79.6% (n=305) were female, with a mean age of 53.1 ± 10.86 years. Most were Urdu-speaking (64%) and had a lower socioeconomic background (97.4%), with a mean monthly household income of 35,000 PKRs. Educational levels varied, with 60% having primary or secondary education and 27.7% having no education. Medication adherence was low in 44% (n=170) of the participants, whereas 27% (n=110) showed high adherence, and 29% (n=103) had medium adherence. Significant associations were found between adherence and education level (p = 0.000), monthly income (p = 0.000), and socioeconomic status (p = 0.010). **Conclusion:** This study emphasizes the need for health education and awareness programs to improve adherence to antihypertensive medications.

Key words: Economic Instability, Hypertension, Medication Adherence, Nonadherence, Primary Care, Silent Killer.

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INTRODUCTION

Hypertension is a serious medical condition that affects millions of people worldwide.[1] It is defined as a persistently elevated systolic blood pressure of 140 mm Hg or above and a diastolic blood pressure of 90 mm Hg or above. It affects approximately 1.13 billion people globally and is expected to increase by approximately half a billion people by 2025. It is often alluded to as a "silent killer", as it may remain asymptomatic for years until it reaches advanced stages, thus making early diagnosis and treatment initiation crucial.[2,3] Because it typically causes no noticeable symptoms, it remains largely uncontrolled.[1-3] Hence, acceptance of regular medication is challenging for patients. In a recent meta-analysis performed in Pakistan, approximately 26.3% of the population was found to be hypertensive[5], and according to the WHO, more than 70% of the Pakistani population (85% in rural areas) is not aware of their disease. This percentage continues to rise worldwide due to the increasing prevalence of obesity, smoking, a high-sodium diet and a sedentary lifestyle and is estimated to be approximately 50–70%.[4]

Another meta-analysis in 2018 reported that the prevalence of hypertension in Pakistan was approximately 23.64%; however, the exact updated data are still unavailable.[4] Hypertension, if uncontrolled, can lead to significant health sequelae as well as a major economic burden on the healthcare system. It may lead to cardiovascular and cerebrovascular diseases, cognitive decline and dementia, chronic kidney disease, peripheral arterial disease, vision loss, increased risk of preeclampsia and eclampsia during pregnancy, sexual dysfunction and increased risk of premature death; therefore, early recognition and optimal control are highly important for preventing these consequences.[5,6,7]

According to the World Health Organization, adherence is defined as 'the extent to which a person's behavior taking medication, following a diet, and/or executing lifestyle changes corresponds with

1. MBBS, PGR Family Medicine, The Indus Hospital and Health Network.
2. MBBS, FCPS (Family Medicine), Consultant Family Medicine, The Indus Hospital and Health Network.

Correspondence Address:
Dr. Unaiza Khalid
The Indus Hospital and Health Network.
unaizakhalid1995@gmail.com

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agreed-upon recommendations from a health-care provider. A recent meta-analysis revealed that the global prevalence of antihypertensive medication nonadherence was 27% to 40% and was greater in low- to middle-income countries and in nonwestern countries than in western countries.[8] Successful treatment and acquisition of therapeutic goals not only improve morbidity and mortality rates but also have a considerable impact on the health-care finances associated with the complications of the disease.[2]

The economic instability of Pakistan continues to rise. Family physicians deal with the majority of hypertensive populations at primary care clinics. Hence, it is important to assess the extent to which patients are adherent to their medications at the primary care level so that appropriate interventions can be planned to improve the outcomes of patients who may suffer from consequences of uncontrolled hypertension in the future, if not compliant.

METHODS

This Cross-sectional study was conducted in the outpatient clinics of the Department of Family Medicine at Indus Hospital, Karachi, between May to October, 2023. A sample of 383 participants was enrolled via nonconsecutive convenience sampling after obtaining ethical approval from the institutional review board (IRB no. IHHN_IRB_2023_02_017). The inclusion criteria comprised patients aged 18 years and above with a confirmed diagnosis of essential hypertension who had been receiving treatment for at least six months; those with comorbid conditions such as diabetes, hyperlipidemia, thyroid disorders, and obesity were also included. Exclusion criteria were designed to eliminate potential confounders and included patients recently diagnosed with hypertension (<6 months), those unwilling to participate, individuals with psychiatric illness or cognitive impairment, and pregnant females with pregnancy-induced hypertension.

The sample size of 383 was determined using OpenEpi software, based on a 95% confidence interval, a 5% margin of precision, and an assumed frequency of good medication adherence of 53.4% among hypertensive patients.[2] Data were collected through face-to-face interviews conducted by the principal investigator using a structured, interviewer-administered questionnaire. This tool consisted of three parts: the first captured sociodemographic variables (age, sex, ethnicity, monthly income, education level) categorized according to national survey standards; the second recorded health status details, including duration of hypertension, comorbidities, and medication profiles; and the third incorporated the validated 8-item Morisky Medication Adherence Scale (MMAS) to quantify adherence.

The MMAS scoring protocol was followed whereby responses of 'Yes' were assigned 0 points and 'No' 1 point, with the eighth item scored on a 5-point Likert scale. Total scores were categorized to define adherence levels: high adherence (score of 8), medium adherence (score >6 to <8), and low adherence (score ≤6). Prior to each interview, verbal consent was obtained after a detailed explanation of the study's purpose and procedures. The interviews, which lasted 10-15 minutes, also served as an opportunity to counsel participants on the importance of medication adherence. All data were recorded on a secure, self-designed platform, with confidentiality maintained by restricting access to the principal investigator and removing identifiable information.

For data analysis, SPSS version 25 was used. Quantitative variables were reported as mean (SD) or median (IQR) based on normality assessed by the Shapiro-Wilk test, while qualitative variables were expressed as frequencies and percentages. The association between medication adherence and independent variables was analyzed using ordinal regression. The analysis proceeded in two stages: a univariate analysis was first performed, with all variables exhibiting a p-value <0.25 being included in a subsequent multivariate model. Variables were retained in the final multivariable model based on clinical importance and a p-value <0.1. Both adjusted and unadjusted odds ratios with 95% confidence intervals were calculated, and a p-value ≤0.05 was considered statistically significant. Assumptions of ordinal regression, including multicollinearity and proportional odds, were checked prior to analysis.

RESULTS

A total of 383 participants were enrolled in the study, 305 (79.6%) of whom were females. The mean (± SD) age of the participants was 53.1 (±10.86) years. The median (IQR) monthly income of the participants was 35,000 (25,000--40,000) PKR. The majority of the participants were of low socioeconomic status (n=373, 97.4%). The most prevalent ethnicity of the participants was Urdu speaking (n=245, 64%), followed by Punjabi speaking (n=64, 16.7%). The participants had diverse education levels, with 36.8% (n=141) having a primary education level, 27.7% (n=106) having no formal education, and 24.5% (n=94) having a secondary education level.

The median (IQR) duration of hypertension was 5 (3--10) years, and the number of medications used was 3 (2--4). The most common comorbidity was hyperlipidemia (n=223, 66%), followed by diabetes (n=182, 53.8%). Approximately half of the participants reported that they had other comorbidities (n=190, 56.2%), and approximately 3% of the participants had asthma, COPD, or hyperthyroidism. The median medical adherence score was 6, with an interquartile range from 4--8. The percentages of the three categories—low, medium, and high—were 170 (44.3%), 103 (26.9%), and 110 (28.7%), respectively.

In terms of associations, statistically significant relationships were observed between medication adherence and variables such as monthly income (p≤0.001), socioeconomic status (p≤0.01), and level of education (p≤0.001). For monthly income and socioeconomic status, higher adherence was noted among participants with higher income levels and socioeconomic status. Education level also demonstrated a significant relationship, where the highest adherence corresponded to participants with higher education. The most common comorbidity with hypertension was hyperlipidemia (n=223, 66%), followed by diabetes (n=182, 53.8%), and approximately 3% of the participants had asthma, COPD, or hyperthyroidism. On the other hand, no significant associations were found with sex, ethnicity, duration of hypertension, number of medications, or the presence of comorbid conditions.

TABLE-I

Socio-demographic and clinical characteristics of hypertensive patients (N=383)

Variable	Categories / Summary	n (%) / Mean ± SD / Median (IQR)
Age (years)	—	53.1 ± 10.9
Gender	Male / Female	78 (20.4) / 305 (79.6)
Monthly Income (PKR)	—	35k (25k–40k)
Socio-economic Status	Low / Medium / High	373 (97.4) / 10 (2.6) / 0 (0)
Education level	None / Primary / Secondary / Intermediate / Graduate	106 (27.7) / 141 (36.8) / 94 (24.5) / 27 (7.0) / 15 (3.9)
Ethnicity	Urdu / Punjabi / Sindhi / Pakhtoon / Other	245 (64.0) / 64 (16.7) / 41 (10.7) / 26 (6.8) / 7 (1.8)
Duration of Hypertension (years)	—	5 (3–10)
Number of Medications	—	3 (2–4)
Comorbidities	Hyperlipidemia / Diabetes / Other	223 (66.0) / 182 (53.8) / 190 (56.2)

TABLE-II

Distribution of medication adherence categories (N=383)

Adherence Category	Score Range	n (%)
Low	≤5	170 (44.3)
Medium	6–7	103 (26.9)
High	≥8	110 (28.7)

TABLE-III

Factors associated with medication adherence

Variable	Test Used	P-Value	Significant Association
Gender	Chi-square	0.59	No
Age	Brown-Forsythe	0.084	No
Ethnicity	Chi-square	0.125	No
Monthly Income	Kruskal-Wallis	0.000	Yes
Socio-economic Status	Chi-square	0.010	Yes
Education Level	Chi-square	0.000	Yes
Duration of Hypertension	Kruskal-Wallis	0.422	No
Number of Medications	Kruskal-Wallis	0.413	No
Comorbidities	Chi-square	0.444	No

DISCUSSION

The demographic characteristics of the study revealed that the majority of the participants were females (79.6%), with a mean age of 53.1 years. This sex predilection could be due to the unbiased nature of the study or simply a description of the population characteristics of the cohort sample. This finding also raises concerns as to whether hypertension is more prevalent in females in the population, which prompts further studies. Age is also a key determinant whose impact on adherence varies. Some studies have shown lower rates of medication adherence with older age[7,9], whereas others have shown the opposite trend.[4,9,10] In our study, however, age was not a major variable that showed any association with it. Most participants came from a low socioeconomic background (97.4%) and had a primary education level (36.8%), reflecting a sample consistent with the national population. A significant proportion were Urdu-speaking individuals (64%), and the median monthly income was PKR 35,000, which further underscored the financial constraints prevalent in this group.

The findings revealed three key variables significantly associated with medication adherence: monthly income, socioeconomic status and education level. These findings highlight the importance of financial and educational factors in influencing medication adherence within this cohort. Consistent with the findings of one of the studies performed in Malaysia and Vietnam, where financial stability improved medication use, higher monthly income was also linked to better adherence in this study.[2,11,12]

In contrast, variables such as sex, ethnicity, duration of hypertension and number of medications used were not significantly associated with adherence in this study. These findings diverge from studies where gender played a notable role or where multidrug regimens were linked to adherence issues.[12] Despite the high prevalence of comorbidities such as dyslipidemia and diabetes, their direct association with medication adherence was not observed here, which contrasts with previous studies that noted that comorbid conditions exacerbate adherence challenges.[13]

According to the MMAS scoring, the study had varying levels of adherence, with the majority having low adherence (44.3%). Similarly, a study performed among Chinese people reported even worse results, and the percentage of people who were found to be nonadherent was 63.6%.[13] In the same study, education played a similar role in improving medication adherence. The greater the degree to which a patient lacks adherence, the greater the likelihood of experiencing a hypertensive crisis. In a recent study performed in a private setting in Pakistan, medication adherence was assessed among admitted patients during a hypertensive crisis, which revealed that the poorer the adherence was, the greater the chances of hypertensive crisis.[10] Hence, medication adherence is one of the important measures for assessing treatment effectiveness for any chronic illness prevailing in a population. It also results in better disease outcomes and reduces the economic burden of a country.[2,14] Hence, it becomes necessary for primary care physicians to advocate and reinforce the importance of adherence

in patients with chronic diseases.

This study highlights a significant gap in medication adherence among adults aged 18 years and older, with 44% of participants classified as nonadherent. Socioeconomic and educational status, along with monthly income, emerged as important determinants of adherence, underscoring the need for tailored interventions that address these social and economic barriers. The findings of this study are consistent with those of similar studies performed in developing countries, suggesting that the challenges associated with medication adherence are both widespread and multifaceted throughout the world. To improve adherence rates and reduce the burden of hypertensive complications, strategies such as increasing medication literacy, simplifying treatment regimens, and enhancing social support systems should be considered

LIMITATIONS

The sample size of 383 allows for statistically significant relationships and valid population conclusions. The study uses the proven and widely used MMAS technique to measure medication adherence consistently and reliably. This study's findings support and expand our understanding of hypertension management issues in low- and middle-income nations, making it relevant locally and worldwide.

We recognized some of our study's main weaknesses. First, medication adherence statistics may be self-reported, which may overestimate adherence due to recall and social desirability bias. The literature shows that sex can affect adherence, however this study found no significant link. At 79.6%, female participants may skew the results. This may restrict the findings' generalizability. Although common comorbidities were included, the study did not independently assess adherence in patients with different comorbidities, thus it may not have properly captured how various drugs affect adherence. The effects of nonadherence in comorbid individuals may require further study.

CONCLUSION

This study highlights a substantial burden of poor medication adherence among hypertensive patients in a tertiary care hospital in Karachi, with nearly half of the participants falling into the low adherence category. Socio-demographic determinants, particularly monthly income, socio-economic status, and level of education, were strongly associated with adherence, whereas gender, ethnicity, duration of hypertension, number of medications, and comorbidities showed no significant influence. These findings underscore that medication adherence is not merely a clinical issue but is closely tied to socioeconomic realities and health literacy.

ETHICAL APPROVAL

Approval was taken from the Institutional review board of Indus Hospital Karachi before conducting this research.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Unaiza Khalid:** Data collection, data analysis.
2	**Hiba Ashraf:** Discussion, writing, review of manuscript.