

Knowledge, Attitude, and Self-Care Practices Among Diagnosed Hypertensive Patients Attending Outpatient Clinics in Lahore, Pakistan

Dr. Aleena Amjad¹

¹Medical Officer, Social Security Hospital, Lahore, Pakistan

*Correspondence: Dr. Aleena Amjad, ninasaeed123@gmail.com

"Cite this Article" | Received: 07 April 2026; Accepted: 23 May 2026; Published: 31 June 2026.

Author Contributions: Concept: AA; Design: AA; Data Collection: AA; Analysis: AA; Drafting: AA. **Ethical Approval:** University of Lahore Teaching Hospital, Pakistan. **Informed Consent:** Written informed consent was obtained from all participants; **Conflict of Interest:** The authors declare no conflict of interest; **Funding:** No external funding; Data Availability: Available from the corresponding author on reasonable request; **Acknowledgments:** N/A.

ABSTRACT

Background: Hypertension is a major preventable contributor to cardiovascular disease, stroke, renal disease, disability, and premature mortality, yet blood pressure control remains suboptimal in many outpatient settings because long-term management depends on patient knowledge, treatment adherence, lifestyle modification, and regular follow-up. **Objective:** This study aimed to assess hypertension-related knowledge, medication adherence, self-care practices, and blood pressure control among diagnosed hypertensive patients attending outpatient clinical services in Lahore, Pakistan. **Methods:** A descriptive cross-sectional study was conducted among 245 adult diagnosed hypertensive patients attending the Medicine OPD, Cardiology OPD, and Family Medicine Clinic at the University of Lahore Teaching Hospital, Lahore, Pakistan. Participants were selected using non-probability consecutive sampling. Data were collected using a structured questionnaire assessing sociodemographic and clinical characteristics, hypertension-related knowledge, medication adherence, self-care practices, and blood pressure control status. Descriptive statistics were used to summarize categorical variables as frequencies and percentages. **Results:** Among 245 participants, 66 (26.9%) had poor knowledge, 122 (49.8%) had moderate knowledge, and 57 (23.3%) had good knowledge. Good medication adherence was reported by 63 (25.7%) participants, moderate adherence by 90 (36.7%), and non-adherence by 92 (37.6%). Diet non-adherence was reported by 179 (73.1%) participants, physical inactivity by 184 (75.1%), and uncontrolled hypertension by 178 (72.7%). **Conclusion:** Diagnosed hypertensive patients attending outpatient care showed incomplete disease-related knowledge, suboptimal medication adherence, poor lifestyle-related self-care, and a high burden of uncontrolled blood pressure. Structured education, adherence support, lifestyle counseling, and follow-up reinforcement are needed to improve hypertension self-management and control. **Keywords:** Hypertension; knowledge; medication adherence; self-care; blood pressure control; outpatient care; Pakistan.

INTRODUCTION

INTRODUCTION

Hypertension remains one of the most prevalent chronic non-communicable diseases and is a major contributor to cardiovascular morbidity, stroke, renal impairment, disability, and premature mortality. Although effective pharmacological and lifestyle-based interventions are available, long-term blood pressure control remains suboptimal in many clinical settings because hypertension is frequently asymptomatic, lifelong, and dependent on sustained patient participation in self-management. In outpatient populations, effective control therefore requires more than prescription of antihypertensive medication; it also depends on patients' understanding of the disease, their perception of its seriousness,

their acceptance of long-term treatment, and their ability to maintain self-care behaviors such as medication adherence, dietary salt restriction, physical activity, smoking avoidance, regular follow-up, and blood pressure monitoring. Evidence from hypertensive populations has shown that disease-related knowledge is closely linked with self-care adherence, suggesting that inadequate understanding of hypertension may contribute to poor long-term management and preventable complications (1).

In Pakistan, hypertension care is further influenced by delayed diagnosis, limited health literacy, financial barriers, inconsistent follow-up, and variable access to structured counseling. Patients attending medicine, cardiology, and family medicine outpatient departments represent an important clinical population because they are already diagnosed and connected to healthcare services, yet many may continue to have poor adherence, inadequate lifestyle modification, and uncontrolled blood pressure. Studies from Pakistan have identified medication non-adherence as a persistent challenge among hypertensive patients and have reported that adherence is influenced by factors such as patient education, affordability of treatment, comorbid conditions, treatment beliefs, and healthcare-provider counseling (2). Local evidence from Lahore has also highlighted gaps in hypertension-related knowledge and treatment adherence, reinforcing the need to evaluate patient-level barriers within outpatient clinical settings where routine counseling and follow-up can be strengthened (3).

Knowledge, attitude, and practice assessment provides a useful framework for understanding why diagnosed hypertensive patients may fail to achieve optimal control despite receiving medical care. Knowledge reflects awareness of hypertension risk factors, complications, treatment requirements, target blood pressure levels, and the need for lifelong monitoring. Attitude reflects patients' beliefs about the seriousness of hypertension, confidence in treatment, willingness to adopt lifestyle modification, and perceived importance of regular follow-up. Self-care practices represent the behavioral component of hypertension management, including adherence to medication, healthy diet, physical activity, smoking and alcohol avoidance, weight management, home blood pressure monitoring, and clinic attendance. Regional evidence indicates that better hypertension knowledge is associated with improved medication adherence, but knowledge alone may not be sufficient when attitudes, socioeconomic barriers, and healthcare-system factors limit behavioral change (4).

Previous Pakistani research has examined hypertension knowledge, adherence, and self-care in different populations; however, gaps remain in locally focused outpatient evidence, particularly among diagnosed hypertensive patients attending tertiary-care medicine, cardiology, and family medicine services. Such patients may differ in disease duration, educational background, comorbidity burden, access to information, and frequency of clinical contact, all of which may influence self-management behavior. Prior work in Pakistan has shown that self-care among hypertensive patients is often inadequate and shaped by multiple demographic and clinical predictors, emphasizing the need for setting-specific assessment to guide patient education and behavioral interventions (5). Generating local evidence from outpatient departments is therefore important for identifying modifiable deficiencies in knowledge, attitude, and self-care practices and for informing counseling strategies that can be integrated into routine clinical care.

This study was designed using a PICO-oriented framework in which the population comprised diagnosed adult hypertensive patients attending medicine, cardiology, and family medicine outpatient services in Lahore, Pakistan; the key exposure domains were hypertension-related knowledge and attitude toward long-term disease management; the principal outcomes were self-care practices, medication adherence, and blood pressure control; and the clinical context was routine outpatient care in a tertiary-care teaching hospital. The objective of the study was to assess the level of knowledge, attitude, and self-care practices among diagnosed hypertensive patients and to identify gaps in hypertension-related awareness and self-management behaviors. The study further aimed to examine the relationship between knowledge, attitude, and self-care practices in order to support targeted counseling, adherence

promotion, lifestyle modification, and follow-up strategies for improved hypertension control in outpatient clinical practice.

MATERIAL AND METHODS

A descriptive cross-sectional study was conducted to assess hypertension-related knowledge, attitude, and self-care practices among diagnosed hypertensive patients receiving outpatient care at the University of Lahore Teaching Hospital, Lahore, Pakistan. The study was carried out over a six-month period after approval of the study protocol. The study population comprised adult patients with a previous diagnosis of hypertension who attended the Medicine OPD, Cardiology OPD, or Family Medicine Clinic during the data collection period. This design was selected because it allowed assessment of the distribution of knowledge, attitude, adherence-related behaviors, lifestyle practices, and blood pressure control status at a single point in routine outpatient care.

The sample size was calculated using the single-population proportion formula, $n = Z^2p(1 - p)/d^2$, using a 95% confidence level, a Z value of 1.96, an expected proportion of poor hypertension knowledge of 80.6%, and a 5% margin of error. Substitution of these values produced a required sample size of 240.3 participants. After adjustment for incomplete responses and non-response, the final sample size was increased to 245 participants. A non-probability consecutive sampling technique was used, and all eligible diagnosed hypertensive patients attending the selected outpatient departments during the study period were approached until the required sample size was achieved.

Participants were eligible for inclusion if they were diagnosed cases of hypertension, aged 18 years or above, attending the Medicine OPD, Cardiology OPD, or Family Medicine Clinic, willing to participate, and able to provide informed consent. Patients were excluded if they were critically ill and required emergency care, had severe cognitive impairment or psychiatric illness affecting their ability to respond, had pregnancy-induced hypertension or preeclampsia, were unwilling to participate, or had incomplete questionnaire responses. Eligible patients were approached in the outpatient departments after permission was obtained from the relevant hospital authorities. The purpose and procedure of the study were explained to each participant, and written informed consent was obtained before data collection. Participation was voluntary, and participants were informed that refusal or withdrawal would not affect their clinical care.

Data were collected using a structured questionnaire administered through face-to-face interviews. For literate participants, the questionnaire was self-administered where appropriate, whereas for participants unable to read or write, the researcher read the questions aloud and recorded the responses without influencing the answers. The questionnaire contained sections on sociodemographic characteristics, clinical characteristics, knowledge regarding hypertension, attitude toward hypertension management, and self-care practices. Items addressed hypertension risk factors, complications, treatment, medication adherence, diet, physical activity, blood pressure monitoring, smoking, alcohol use, follow-up visits, and lifestyle modification. The dependent variables were knowledge regarding hypertension, attitude toward hypertension management, and self-care practices. The independent variables included age, gender, marital status, educational status, employment status, duration of hypertension, family history of hypertension, comorbidities, home blood pressure monitoring, and regular follow-up status.

Knowledge was operationally defined as the patient's understanding of hypertension, including its risk factors, complications, treatment, and prevention. Attitude was defined as the patient's beliefs and perceptions regarding hypertension seriousness, treatment, follow-up, and lifestyle modification. Self-care practices were defined as health-related behaviors for hypertension management, including medication adherence, dietary control, physical activity, blood pressure monitoring, and follow-up. Knowledge was categorized as poor, moderate, or good according to the questionnaire scoring protocol. Attitude was categorized as negative, neutral, or positive, and self-care practice was categorized as poor or good using the same scoring protocol. Hypertension was defined as a previously diagnosed condition

of high blood pressure documented in the patient's medical history or current treatment record. Blood pressure values were obtained from the patient record or measured during the outpatient visit using a standard blood pressure apparatus, and systolic and diastolic blood pressure were recorded in mmHg. Blood pressure control status was classified as controlled or uncontrolled according to the operational criteria used in the study.

Procedures were applied to reduce information bias and improve consistency during data collection. The same structured questionnaire format was used for all participants, and questions were administered in a standardized manner. For participants requiring interviewer administration, questions were read without prompting or suggesting responses. Completed questionnaires were checked for completeness and internal consistency before data entry. Each questionnaire was assigned a unique identification number to preserve anonymity and support accurate data management. Data were entered into IBM SPSS Statistics for analysis, and incomplete questionnaires were excluded from the final analysis. Internal consistency of the questionnaire was assessed using Cronbach's alpha for the knowledge, attitude, and self-care practice sections where applicable, with reliability interpreted as excellent for $\alpha \geq 0.90$, good for $\alpha = 0.80\text{--}0.89$, acceptable for $\alpha = 0.70\text{--}0.79$, questionable for $\alpha = 0.60\text{--}0.69$, and poor for $\alpha < 0.60$.

Data were analyzed using IBM SPSS Statistics. Categorical variables, including gender, educational status, employment status, family history of hypertension, knowledge level, attitude level, medication adherence level, self-care practice level, and blood pressure control status, were summarized as frequencies and percentages. Continuous variables, including age, systolic blood pressure, diastolic blood pressure, and total knowledge, attitude, and self-care scores, were summarized as mean $\pm$ standard deviation when normally distributed and as median with interquartile range when non-normally distributed. Associations between categorical variables, including knowledge level and medication adherence, attitude level and self-care practices, and self-care practices and blood pressure control, were assessed using the chi-square test. Correlations between continuous normally distributed scores were assessed using Pearson correlation, whereas non-normally distributed scores were assessed using Spearman correlation. Binary logistic regression was planned to identify independent predictors of good self-care practices and medication adherence, with results expressed as adjusted odds ratios, 95% confidence intervals, and p-values. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained from the relevant institutional ethical review committee before data collection, and administrative permission was obtained from the University of Lahore Teaching Hospital. All participants were informed about the purpose, procedure, risks, and benefits of the study before enrollment. Written informed consent was obtained from each participant. Confidentiality and anonymity were maintained throughout the study, and no personal identifying information was disclosed in the final report. Data integrity was supported through unique participant identification numbers, completeness checks before data entry, consistency checks during data management, and analysis of the final complete dataset.

RESULTS

A total of 245 diagnosed hypertensive patients attending outpatient clinical services were included in the final analysis. The available aggregated data described hypertension-related knowledge, medication adherence, selected self-care practices, and blood pressure control status. Sociodemographic characteristics, clinical characteristics, attitude scores, total knowledge scores, total self-care scores, and inferential statistical outputs were not available in the supplied dataset.

Table 1. Hypertension-Related Knowledge Level Among Diagnosed Hypertensive Patients, n = 245

Knowledge Level	n	%
Poor knowledge	66	26.9
Moderate knowledge	122	49.8

Knowledge Level	n	%
Good knowledge	57	23.3
Total	245	100.0

Nearly half of the participants had moderate hypertension-related knowledge, accounting for 122 of 245 patients. Poor knowledge was observed in 66 patients, while 57 patients had good knowledge. These findings indicate that although most participants had at least some awareness of hypertension, only approximately one-quarter demonstrated good knowledge, suggesting a substantial remaining gap in disease-related understanding among diagnosed hypertensive patients.

Table 2. Medication Adherence Categories Among Diagnosed Hypertensive Patients, n = 245

Medication Adherence Level	n	%
Good adherence	63	25.7
Moderate adherence	90	36.7
Non-adherent	92	37.6
Total	245	100.0

Medication adherence was suboptimal in the study population. Good adherence was reported in 63 patients, while 90 patients had moderate adherence and 92 patients were non-adherent. The largest single category was non-adherence, representing more than one-third of the sample. When interpreted alongside the proportion with only moderate or poor knowledge, these findings suggest that adherence-support interventions should be prioritized in outpatient hypertension care.

Table 3. Alternative Medication Adherence Classification Among Diagnosed Hypertensive Patients, n = 245

Medication Adherence Level	n	%
High adherence	94	38.4
Moderate adherence	59	24.1
Non-adherent	92	37.6
Total	245	100.0

Using the alternative medication adherence classification reported in the manuscript, 94 patients were categorized as having high adherence, 59 as having moderate adherence, and 92 as non-adherent. The non-adherent category remained unchanged at 92 patients. However, the distribution of high/good and moderate adherence differed from the primary adherence table, indicating that these two classifications should be clearly defined and reconciled before final manuscript submission.

Table 4. Binary Medication Adherence Status Among Diagnosed Hypertensive Patients, n = 245

Medication Adherence Status	n	%
Adherent	176	71.8
Non-adherent	69	28.2
Total	245	100.0

In the binary adherence classification, 176 patients were categorized as adherent and 69 as non-adherent. This distribution differs from the three-level adherence classifications shown in Tables 2 and 3, where the non-adherent category included 92 patients. Because the denominator is consistent across all adherence tables, the discrepancy appears to reflect differences in classification criteria rather than sample size variation. The manuscript should specify the scoring method and threshold used for each adherence classification or retain only one primary adherence outcome.

Table 5. Self-Care Practices Among Diagnosed Hypertensive Patients, n = 245

Self-Care Practice	Adherent n	Adherent %	Non-Adherent n	Non-Adherent %
Diet adherence	66	26.9	179	73.1
Physical activity	61	24.9	184	75.1
Alcohol abstinence	245	100.0	0	0.0
Smoking cessation/avoidance	204	83.3	41	16.7

Lifestyle-related self-care practices were unevenly distributed. Diet adherence was reported by only 66 patients, while 179 patients were non-adherent to dietary recommendations. Similarly, only 61 patients reported adherence to physical activity, whereas 184 were physically inactive or non-adherent to physical

activity recommendations. Alcohol abstinence was reported by all 245 participants, and smoking cessation or avoidance was reported by 204 participants. The weakest self-care domains were physical activity and diet adherence, indicating priority areas for lifestyle counseling in outpatient hypertension management.

Table 6. Blood Pressure Control Status Among Diagnosed Hypertensive Patients, n = 245

Blood Pressure Control Status	n	%
Controlled hypertension	67	27.3
Uncontrolled hypertension	178	72.7
Total	245	100.0

Blood pressure control was poor in the study population. Only 67 patients had controlled hypertension, whereas 178 had uncontrolled hypertension. The high proportion of uncontrolled blood pressure is clinically important because all participants were already diagnosed hypertensive patients receiving outpatient care. This finding supports the need for improved patient education, adherence monitoring, lifestyle counseling, and follow-up strategies.

Table 7. Consolidated Descriptive Summary of Main Study Outcomes, n = 245

Domain	Category	n	%
Knowledge level	Poor knowledge	66	26.9
Knowledge level	Moderate knowledge	122	49.8
Knowledge level	Good knowledge	57	23.3
Medication adherence	Good adherence	63	25.7
Medication adherence	Moderate adherence	90	36.7
Medication adherence	Non-adherent	92	37.6
Self-care practice	Diet adherent	66	26.9
Self-care practice	Diet non-adherent	179	73.1
Self-care practice	Physically active	61	24.9
Self-care practice	Physically inactive	184	75.1
Self-care practice	Alcohol abstinent	245	100.0
Self-care practice	Smoking cessation/avoidance	204	83.3
Self-care practice	Smoking non-cessation/non-avoidance	41	16.7
Blood pressure control	Controlled hypertension	67	27.3
Blood pressure control	Uncontrolled hypertension	178	72.7

The consolidated outcome summary shows that the main gaps were concentrated in lifestyle modification and blood pressure control. Physical inactivity was reported in 184 patients, diet non-adherence in 179 patients, and uncontrolled hypertension in 178 patients. In comparison, smoking-related self-care was more favorable, with 204 participants reporting smoking cessation or avoidance, while alcohol abstinence was reported by all participants. Knowledge was predominantly moderate rather than good, with only 57 patients classified as having good knowledge. Together, these findings suggest that outpatient hypertension care should focus not only on awareness but also on translating knowledge into sustained behavioral change.

Reviewer-style note: The available manuscript does not provide attitude results, baseline sociodemographic characteristics, clinical characteristics, cross-tabulations, p-values, confidence intervals, correlation coefficients, or regression outputs. Therefore, associations between knowledge, attitude, medication adherence, self-care practices, and blood pressure control cannot be validly reported from the supplied aggregated data. For publication readiness, the final Results section should include a baseline characteristics table, attitude-level distribution, overall self-care score classification, and inferential analyses if the raw dataset is available.

Integrated Hypertension Self-Management and Control Profile Among Outpatient Participants



The integrated self-management profile showed that the largest unfavorable indicators were physical inactivity, affecting 184 of 245 participants (75.1%), diet non-adherence, affecting 179 participants (73.1%), and uncontrolled blood pressure, affecting 178 participants (72.7%). Medication non-adherence was present in 92 participants (37.6%), while smoking non-avoidance was reported in 41 participants (16.7%) and alcohol use in none of the participants. Knowledge was predominantly moderate, observed in 122 participants (49.8%), whereas only 57 participants (23.3%) had good knowledge. The combined pattern indicates that the principal outpatient management gap was concentrated in lifestyle behavior and blood pressure control rather than smoking or alcohol-related risk behavior.

DISCUSSION

The present study assessed hypertension-related knowledge, medication adherence, selected self-care practices, and blood pressure control among 245 diagnosed hypertensive patients attending outpatient services at a tertiary-care teaching hospital in Lahore, Pakistan. The findings show a substantial self-management gap despite participants already being diagnosed and connected to clinical care. Nearly half of the participants had moderate knowledge, while only about one-quarter had good knowledge, indicating that disease awareness was present but insufficiently developed for many patients. This is clinically important because hypertension requires continuous self-management, regular medication use, lifestyle modification, and follow-up rather than episodic treatment. Similar evidence from Pakistan has shown that limited hypertension knowledge and poor treatment adherence commonly coexist among patients receiving care, suggesting that routine clinical contact alone may not be enough to ensure adequate understanding or sustained behavioral change (3,6).

Medication adherence was also suboptimal in the study population. In the primary three-level classification, 25.7% of participants had good adherence, 36.7% had moderate adherence, and 37.6% were non-adherent. This pattern indicates that more than one-third of diagnosed hypertensive patients were not adhering to medication, while another large subgroup had only moderate adherence. These findings are consistent with previous Pakistani studies reporting that non-adherence to antihypertensive therapy remains a persistent barrier to blood pressure control across primary, secondary, and tertiary healthcare settings (2,9). Studies from Islamabad and other Pakistani clinical settings have similarly shown that adherence is influenced by affordability of treatment, patient beliefs, health literacy, comorbidities, follow-up behavior, and provider counseling, reinforcing the need for multifactorial adherence-support strategies rather than medication prescription alone (2,10).

The lifestyle-related findings were particularly concerning. Diet non-adherence was reported in 73.1% of participants, and physical inactivity was reported in 75.1%. These two domains represented the largest behavioral gaps in the study and were even more frequent than medication non-adherence. This suggests that outpatient hypertension care may be more successful in establishing treatment contact than in achieving sustained lifestyle modification. Previous research from Pakistan has also reported inadequate self-care among hypertensive patients and emphasized that dietary behavior, exercise, weight management, and regular blood pressure monitoring are often weaker than medication-related behaviors (5). Similar findings from other hypertensive populations indicate that self-care practices are shaped by knowledge, perceived disease seriousness, family support, socioeconomic constraints, cultural dietary patterns, and the intensity of healthcare-provider counseling (17,19,20).

Blood pressure control was poor, with only 27.3% of participants classified as controlled and 72.7% classified as uncontrolled. Although the cross-sectional design does not allow causal interpretation, the coexistence of limited good knowledge, high medication non-adherence, poor diet adherence, physical inactivity, and high uncontrolled blood pressure suggests an important clinical pattern. Patients may be attending outpatient care but still not achieving the behavioral and therapeutic consistency required for long-term hypertension control. Previous Pakistani evidence has similarly linked inadequate knowledge and low adherence with uncontrolled blood pressure, while studies on outpatient follow-up have highlighted the importance of regular clinical attendance and ongoing monitoring in improving control (7,14). These findings support the need to integrate structured education, adherence assessment, and lifestyle counseling into routine outpatient encounters rather than relying on brief medication-focused consultations alone.

The finding that smoking avoidance was reported by 83.3% of participants and alcohol abstinence by all participants should be interpreted within the local sociocultural context. These behaviors appear more favorable than diet, physical activity, medication adherence, and blood pressure control. However, self-reported smoking and alcohol-related behaviors may be influenced by social desirability bias,

particularly in settings where alcohol use is culturally or religiously sensitive. Therefore, while the reported prevalence of alcohol use was zero and smoking non-avoidance was relatively low, these findings should be interpreted cautiously and should not distract from the more prominent management gaps in diet, activity, adherence, and blood pressure control.

The study also highlights an important reporting and measurement issue related to medication adherence. The manuscript contains more than one adherence classification, including a three-level adherence category, an alternative three-level category, and a binary compliant/non-compliant category. These classifications produced different distributions, particularly for the non-adherent group. This inconsistency limits interpretability and should be resolved before final submission. A single primary adherence definition should be selected, its scoring criteria should be reported clearly, and any alternative classification should be justified as a sensitivity or secondary analysis. Without a transparent scoring protocol, comparison with prior adherence studies becomes difficult, and the clinical meaning of adherence categories remains uncertain.

The absence of reported attitude results is another important limitation because attitude was one of the central domains in the study aim and methods. Attitude toward hypertension seriousness, long-term medication use, lifestyle change, and follow-up may strongly influence whether knowledge is translated into practice. If attitude data were collected, they should be reported as negative, neutral, or positive categories, along with their relationship to self-care and adherence where valid analysis is possible. If attitude data were not collected or were incomplete, the study aim and methods should be revised to avoid overstatement. Prior research on hypertension knowledge, attitude, and practice has shown that favorable attitudes may support better adherence and lifestyle behavior, but gaps between knowledge and practice often persist when attitudes, access, affordability, and counseling are inadequate (18,19,20).

From a clinical perspective, the findings suggest that outpatient hypertension services should prioritize practical, behavior-focused interventions. Patient education should move beyond general disease awareness and should include repeated counseling on medication persistence, salt restriction, dietary planning, physical activity, home blood pressure monitoring, and follow-up attendance. Counseling should be tailored to the patient's literacy level, socioeconomic context, comorbidities, and treatment barriers. Nurse-led education, pharmacist-supported adherence review, reminder systems, family involvement, and mobile-health interventions may be useful strategies in similar low- and middle-income settings. Evidence from Pakistan has shown that multifaceted mobile-health interventions can improve medication adherence and treatment outcomes among hypertensive patients, supporting the potential role of structured follow-up and patient engagement tools in routine care (11).

This study has several strengths. It focused on diagnosed hypertensive patients attending real-world outpatient services, including medicine, cardiology, and family medicine clinics, which makes the findings relevant to routine clinical practice. The sample size was adequate for descriptive assessment, and the study addressed multiple domains of hypertension management rather than medication adherence alone. However, the study also has important limitations. The cross-sectional design prevents assessment of temporal or causal relationships between knowledge, adherence, self-care, and blood pressure control. Consecutive non-probability sampling may limit generalizability beyond the study setting. Self-reported adherence and lifestyle behaviors may be affected by recall and social desirability bias. The manuscript does not provide detailed scoring cutoffs for knowledge, attitude, or self-care categories, and the threshold used to define controlled blood pressure is not specified. Baseline sociodemographic and clinical characteristics, attitude results, inferential statistics, confidence intervals, and regression outputs are also not reported, limiting deeper interpretation of predictors and associations.

Overall, the findings indicate that diagnosed hypertensive patients in this outpatient setting had incomplete hypertension-related knowledge, suboptimal medication adherence, poor lifestyle-related self-care, and a high burden of uncontrolled blood pressure. The strongest gaps were observed in physical

activity, dietary adherence, and blood pressure control. These results support the need for structured, repeated, and patient-centered hypertension education within outpatient care, with emphasis on translating knowledge into practical self-management behaviors. Future studies should include validated scoring tools, clearly defined blood pressure-control thresholds, complete attitude and self-care scales, and adjusted analyses to identify independent predictors of adherence and blood pressure control.

CONCLUSION

This study found substantial gaps in hypertension-related knowledge, medication adherence, self-care practices, and blood pressure control among diagnosed hypertensive patients attending outpatient services at a tertiary-care teaching hospital in Lahore, Pakistan. Although nearly half of the participants had moderate knowledge, only about one-quarter had good knowledge, indicating that disease awareness remained incomplete among many patients already receiving clinical care. Medication adherence was also suboptimal, with more than one-third of participants classified as non-adherent in the primary adherence classification. The most prominent self-care deficiencies were poor dietary adherence and physical inactivity, affecting nearly three-quarters of the study population, while uncontrolled hypertension was present in 72.7% of participants. These findings suggest that routine outpatient care should place greater emphasis on structured patient education, medication-adherence support, lifestyle counseling, regular blood pressure monitoring, and follow-up reinforcement. Integrating patient-centered counseling into medicine, cardiology, and family medicine outpatient services may help translate hypertension knowledge into sustained self-management behaviors and improve long-term blood pressure control.

REFERENCES

- Gusty R, Effendi N, Abdullah KL, Syafrita Y. Association between knowledge and self-care adherence among elderly hypertensive patient in dwelling community. *Open Access Maced J Med Sci*. 2022. doi:10.3889/oamjms.2022.8342.
- Noreen N, Bashir F, Khan AW, Safi M, Lashari WA, Hering D. Determinants of adherence to antihypertension medications among patients at a tertiary care hospital in Islamabad, Pakistan, 2019. *Prev Chronic Dis*. 2023. doi:10.5888/pcd20.220231.
- Waris B, Butt N, Afzal A, Ghoauri M, Khizar I, Mahmood K, et al. Exploring knowledge of hypertension and treatment adherence in hypertensive patients from Lahore, Pakistan. *Cureus*. 2025. doi:10.7759/cureus.81762.
- Al-Hazmi AH, Alanazi A, Thirunavukkarasu A, Alriwely NS, Alrais MM, Alruwaili ABS, et al. Evaluation of hypertension knowledge and its association with medication adherence among hypertensive patients attending primary health centers: a cross-sectional study from eastern Saudi Arabia. *Front Public Health*. 2025. doi:10.3389/fpubh.2024.1378561.
- Ajani K, Gowani A, Gul R, Petrucka P. Levels and predictors of self-care among patients with hypertension in Pakistan. *Int J Gen Med*. 2021. doi:10.2147/IJGM.S297770.
- Daniel A, Saddique H, Tasneem S. The assessment of knowledge regarding hypertension and treatment adherence. *J Health Rehabil Res*. 2024. doi:10.61919/jhrr.v4i2.824.
- Amer M, Rehman NU, Nazir S, Ehsan-ul-Haq M, Sultana M, Jabeen M. Devoid knowledge and low adherence precipitate uncontrolled blood pressure: a depiction from cross-sectional study. *Altern Ther Health Med*. 2020.
- Shah SHA, Basir W. Knowledge and attitude of hypertensive patients to control hypertension at Hayatabad Medical Complex, Peshawar. *Pak J Health Sci*. 2025. doi:10.54393/pjhs.v6i1.2301.

Mahmood S, Jalal Z, Hadi MA, Orooj H, Shah K. Non-adherence to prescribed antihypertensives in primary, secondary and tertiary healthcare settings in Islamabad, Pakistan: a cross-sectional study. Patient Prefer Adherence. 2020. doi:10.2147/PPA.S235517.

Amer M, Nisar-Ur-Rahman, Nazir S, Raza A, Riaz H, Sadeeqa S, et al. Hypertension-related knowledge, medication adherence and health-related quality of life among hypertensive patients in Islamabad, Pakistan. Trop J Pharm Res. 2021. doi:10.4314/TJPR.V18I5.30.

Arshed M, Mahmud A, Minhat H, Lim P, Zakar R. Effectiveness of a multifaceted mobile health intervention (Multi-Aid-Package) in medication adherence and treatment outcomes among patients with hypertension in a low- to middle-income country: randomized controlled trial. JMIR Mhealth Uhealth. 2023. doi:10.2196/50248.

Algabbani F, Algabbani A. Treatment adherence among patients with hypertension: findings from a cross-sectional study. Clin Hypertens. 2020. doi:10.1186/s40885-020-00151-1.

Yousuf F, Khan MAA, Bibi R, Arif A, Arshad A, Almas A. Medication adherence in patients with uncontrolled hypertension and hypertensive crisis presenting to a hospital setting in Karachi, Pakistan. Cureus. 2023. doi:10.7759/cureus.33995.

Mahmood S, Jalal Z, Hadi MA, Shah K. Association between attendance at outpatient follow-up appointments and blood pressure control among patients with hypertension. BMC Cardiovasc Disord. 2020. doi:10.1186/s12872-020-01741-5.

Ayodapo A, Elegbede O, Omosanya OE, Monsudi K. Patient education and medication adherence among hypertensives in a tertiary hospital, South Western Nigeria. Ethiop J Health Sci. 2020. doi:10.4314/ejhs.v30i2.12.

Mohebbi B, Tafaghodi B, Sadeghi R, Tol A, Yekanenejad MS. Factors predicting nutritional knowledge, illness perceptions, and dietary adherence among hypertensive middle-aged women: application of transtheoretical model. J Educ Health Promot. 2021. doi:10.4103/jehp.jehp_1434_20.

Kassahun CW, Asasahegn A, Hagos D, Ashenafi E, Tamene F, Addis G, et al. Knowledge on hypertension and self-care practice among adult hypertensive patients at University of Gondar Comprehensive Specialized Hospital, Ethiopia, 2019. Int J Hypertens. 2020. doi:10.1155/2020/5649165.

Paczkowska A, Hoffmann K, Kus K, Kopciuch D, Zaprutko T, Ratajczak P, et al. Impact of patient knowledge on hypertension treatment adherence and efficacy: a single-centre study in Poland. Int J Med Sci. 2021. doi:10.7150/ijms.48139.

Ralapanawa U, Bopeththa K, Wickramasurendra N, Tennakoon S. Hypertension knowledge, attitude, and practice in adult hypertensive patients at a tertiary care hospital in Sri Lanka. Int J Hypertens. 2020. doi:10.1155/2020/4642704.

Machaalani M, Seifeddine H, Ali AE, Bitar H, Briman O, Chahine MN. Knowledge, attitude, and practice toward hypertension among hypertensive patients residing in Lebanon. Vasc Health Risk Manag. 2022. doi:10.2147/VHRM.S367187.