

ORIGINAL ARTICLE

Awareness of Cardiovascular, Renal, and Cerebrovascular complications of uncontrolled hypertension among hypertensive patients in a Tertiary Care Hospital of Abbottabad.

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ABSTRACT... Objective: To assess the level of awareness and its predictors in hypertensive patients in a tertiary health-care facility. **Study Design:** Cross-sectional study. **Setting:** Outpatient Department of a Tertiary Care Hospital in Abbottabad Medical Complex, Abbottabad. **Period:** 15 December 2025 to 15 March 2026. **Methods:** The study was conducted on a sample of 126 hypertensive patients who presented to the outpatient department of a tertiary hospital in Abbottabad, Pakistan. Data was collected through a designed, interviewer-based questionnaire. The operationalization of awareness was the ability to identify all three complications (cardiovascular, renal, and cerebrovascular) of uncontrolled hypertension. Chi-square and descriptive statistics were used for data analysis. **Results:** The overall awareness of all three major complications was 53.2% (67/126). The highest awareness was regarding cardiovascular complications (61.9%), followed by renal (55.6%) and cerebrovascular (54%) complications. A statistically significant correlation between the level of education and awareness was observed, in which the level of awareness progressed from illiterate patients (28.6%) to patients with higher education (78.0%). There were no significant correlations with age, sex, and years of hypertension ($p > 0.05$), indicating that these variables were not significant predictors of awareness. **Conclusion:** Patients in Abbottabad are still not adequately aware of the major complications of uncontrolled hypertension. The only significant predictor of awareness was education level. Specific educational interventions, particularly those aimed at individuals with lower educational levels, are immediately justified in order to improve awareness and prevent long-term complications.

Key words: Awareness, Cardiovascular Complications, Cerebrovascular Complications, Hypertension, Pakistan, Renal Complications.

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INTRODUCTION

Hypertension or the so-called silent killer is one of the most significant global public health issues, with the prevalence being estimated at 1.4 billion adults in the world by the World Health Organization (WHO).¹ Although there are effective pharmacologic and lifestyle management approaches, the proportion of uncontrolled hypertension remains very high especially in low- and middle-income countries where the level of awareness, screening, and compliance is low.² The disease is one of the major modifiable risks of cardiovascular, renal, and cerebral morbidity and mortality and hence it is a major contributor of premature morbidity and mortality across the world.³ The prolonged high blood pressure causes progressive destruction of the body organs. The most frequent non-malignant

consequences of uncontrolled hypertension are cardiovascular sequelae including coronary artery disease, heart failure and stroke. Hypertension is associated with about approximately one-half to one-fourth of all strokes, nearly half of all ischemic heart diseases, which highlights its central role in the burden of non-communicable illnesses on a global scale.⁴ A cohort study, which has a large cohort, revealed that an incremental 20mmHg in systolic or 10mmHg in diastolic pressure doubles the risk of cardiovascular events.⁵ In addition to cardiovascular damage, hypertension is also a major cause of renal dysfunction, both as a triggering cause and as a secondary effect of chronic kidney disease (CKD). Patients that have uncontrolled hypertension have the tendency of developing progressive nephropathy that leads to end-stage renal disease (ESRD).⁶

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Similarly, cerebrovascular disorders such as ischemic and hemorrhagic strokes have a direct correlation with uncontrolled hypertension and this correlation is further enhanced among the people with CKD or diabetes in comorbidity.⁷ Although the health implications of uncontrolled hypertension are immense, much is yet to be known about the complications with regard to the awareness about the same, particularly in developing countries like Pakistan. A number of researches have been carried out in South Asia indicating that less than 20 -25 percent of patients with hypertension attain appropriate blood-pressure, whereas the understanding of the target levels of blood-pressure and associated complications is low.⁸ A Karachi based study revealed that knowledge and awareness scores of patients with uncontrolled hypertension were found to be much lower than the patients who had controlled hypertension.⁹ In addition, a national survey showed that over two-thirds of treated hypertensive patients in Pakistan still have uncontrolled blood pressure, which indicated the prevalence of lapses in follow-up, adherence and health education.¹⁰ As per the past literature, this subject has not been explored in the region, therefore the current study was scheduled. Low awareness is one of the factors that delay diagnosis and also leads to poor compliance to treatment, non-compliance of lifestyle and the management of complications related to hypertension. The increase in the level of patient awareness of cardiovascular, renal, and cerebrovascular risks is essential to increase the level of control and avoid the irreversible damage to the organs. Thus, the awareness of hypertensive patients in tertiary care units is currently investigated to reveal the existing educational gaps and define specific public health interventions to address the issue and consequently minimize the complications of hypertension.

METHODS

This was a cross-sectional study that was conducted in the outpatient department of a tertiary care hospital in Abbottabad, between 15 December 2025 and 15 March 2026 among hypertensive patients. The sample population included adult patients (18 and above years) with a confirmed diagnosis of hypertension-identified using medical records or current antihypertensive treatment-and who agreed

to make a written informed consent. Those who came with acute illness or are cognitively impaired or unwilling to aid were excluded.

The sample size was calculated with one population proportion formula, which was $n = (Z^2 \times p \times (1-p)) / d^2$ wherein $Z = 1.96$ (suggesting the 95% level of confidence), $p = 0.20$ (the expected awareness percentage of 20% basing on a previous study related to the same), and $d = 0.05$ (suggesting the precision or margin of error as 5). This calculation implied a rough sample of 126; a minimum of 126 consecutive eligible patients was aimed and obtained using non-probability convenience sampling. The data were collected with the help of a structured and pre-tested, interviewer-administered questionnaire that included socio-demographic variables (age, gender, education level), clinical variables (duration of hypertension), and variables that assessed the familiarity with cardiovascular, renal, and cerebrovascular complications of uncontrolled hypertension (participants were considered to be informed in general in case they reported being aware all of the major complications). The questionnaire was initially designed in English and later translated to the Urdu language to help in understanding its meaning and back-translation was done to make it linguistically correct. Medical graduates were trained and to ensure that there was no bias, a supervisor would conduct the data collection.

The study was conducted within the principles of the Declaration of Helsinki as the ethical approval was obtained at the Institutional Review Board/Ethics Committee of the hospital (IREB/Med/03/2025), dated 13th October 2025. All the participants were recruited through informed consent, which was provided in form of a written document, thus protecting voluntary involvement and confidentiality as well as right to quit any time without affecting their medical treatment. The data were inputted in SPSS version 26 and analyzed using both descriptive statistic (frequencies, percentages) and inferential statistic (chi-square tests of associations) which were deemed appropriate; a p-value of less than 0.05 was regarded to be statistically significant.

RESULTS

The general level of knowledge related to cardiovascular, renal and cerebrovascular sequelae of uncontrolled hypertension was estimated to be 53.2 percent (67 out of 126 patients) in a cross sectional study conducted in the outpatient of a tertiary care hospital in Abbottabad on 126 hypertension patients. The most knowledge was observed on cardiovascular complications with a percentage of 61.9 (95% CI: 53.4-70.0 per cent). It was followed by renal complications with 55.6 (95% CI: 46.9-64.0 per cent) and cerebrovascular complications with 54.0 (95% CI: 45.3-62.5 per cent). The study sample included 68 males (54.0%), and 58 females (46.0%); most participants were aged 40-60 years (51.6%), 28.6 years (28.6%), and 19.8 years (19.8%). On the educational attainment, 27.8% were illiterate, 39.7% had primary to secondary education and 32.5% had higher education. 35.7% of patients had a hypertension duration of less than five years, 39.7% had a duration

of five to ten years, and 24.6% had a duration of over ten years. The chi-square test of bivariate analysis revealed that educational level was the only variable that showed a statistically significant relationship with overall knowledge ($\chi^2 = 18.899$, $p = 0.001$) with the awareness levels increasing progressively as the educational level rose, with the lowest level of 28.6 per cent among illiterate patients, the highest in 78.0 -70.0 per cent in patients with higher education with primary to secondary education. The awareness of every particular complication also showed an enlightening growth with increased educational levels. Otherwise, there were no statistically significant correlations between overall knowledge and age ($\chi^2 = 0.992$, 0.609), gender ($\chi^2 = 0.056$, 0.813), or length of hypertension ($\chi^2 = 3.643$, 0.162). These results note that formal education is the most powerful and the only major determinant of awareness pertaining to end-organ complications of uncontrolled hypertension among such a population.

TABLE-I

Socio-demographic characteristics of hypertensive patients and their association with overall awareness of complications of uncontrolled hypertension (N = 126)

Variable	Category	Total n (%)	Aware n (%)	Unaware n (%)	P-Value
Age (years)	< 40	25 (19.8)	15 (60.0)	10 (40.0)	0.609
	40–60	65 (51.6)	35 (53.8)	30 (46.2)	
	> 60	36 (28.6)	17 (47.2)	19 (52.8)	
Gender	Male	68 (54.0)	35 (51.5)	33 (48.5)	0.813
	Female	58 (46.0)	32 (55.2)	26 (44.8)	
Education Level	Illiterate	35 (27.8)	10 (28.6)	25 (71.4)	<0.001
	Primary to Secondary	50 (39.7)	25 (50.0)	25 (50.0)	
	Higher Education	41 (32.5)	32 (78.0)	9 (22.0)	
Duration of Hypertension (years)	< 5	45 (35.7)	25 (55.6)	20 (44.4)	0.162
	5–10	50 (39.7)	30 (60.0)	20 (40.0)	
	> 10	31 (24.6)	12 (38.7)	19 (61.3)	

P-Values from Chi-square test

TABLE-II

Awareness of Specific Complications of Uncontrolled Hypertension among Hypertensive Patients (N = 126)

Complication Type	Aware n (%)	Not Aware n (%)	95% CI for Awareness (%)
Cardiovascular complications	78 (61.9)	48 (38.1)	53.4 – 70.0
Renal complications	70 (55.6)	56 (44.4)	46.9 – 64.0
Cerebrovascular complications	68 (54.0)	58 (46.0)	45.3 – 62.5
Overall awareness (aware of at least one of the above)	67 (53.2)	59 (46.8)	44.5 – 61.8

Note: 95% confidence intervals calculated using the Wilson score method (continuity correction not applied).

TABLE-III

Awareness of cardiovascular, renal, and cerebrovascular complications stratified by education level (N = 126)

Education Level	N	Aware of Cardiovascular n (%)	Aware of Renal n (%)	Aware of Cerebrovascular n (%)	Overall Aware n (%)
Illiterate	35	14 (40.0)	12 (34.3)	11 (31.4)	10 (28.6)
Primary to Secondary	50	30 (60.0)	27 (54.0)	26 (52.0)	25 (50.0)
Higher Education	41	34 (82.9)	31 (75.6)	31 (75.6)	32 (78.0)
Total	126	78 (61.9)	70 (55.6)	68 (54.0)	67 (53.2)

This table highlights how awareness of each specific complication (and overall awareness) increases with education level — a pattern commonly emphasized in discussion sections of similar studies.

DISCUSSION

In this current study, conducted in a tertiary care hospital, Abbottabad, Pakistan, the awareness of significant complication of uncontrolled hypertension, i.e., cardiovascular, renal, and cerebrovascular pathology, was found to be only 53.2% with the greatest compliance with cardiovascular (61.93%) and renal (55.63%) and cerebrovascular (54%) complications. This fair degree of awareness is consistent with the findings in many low- and middle-income countries, in which significant gaps in knowledge related to hypertension-related end-organ damage are still widespread.^{11,12,13} Similar rates are reported in recent research, which has been done in Ethiopia, and awareness of hypertension complications was found to be light, between 40 and 55, on the institutional attendees.^{14,15} One of the best results of the latest research was that the overall awareness was significantly related to the level of education ($p < 0.001$). The familiarity increased gradually, starting with 28.6 per cent among the illiterate patients up to 78.0 per cent among higher education patients. This educational disparity was continually noted regardless of the cardiovascular, renal, and cerebral complications. The results support the already-established centralization of a formal education as a key health literacy determinant and hypertension complications awareness in resource-restricted settings.^{16,17} Likewise, findings have been found in Saudi Arabia and various Ethiopian cohorts whereby lower levels of education were consistently associated with less knowledge of end-organ damage and lower levels of treatment compliance.^{18,19} In the current study, no statistically significant correlations were found between the overall awareness and age, gender, and duration of hypertension. Such lack can

be associated with an erratic patient counselling strategy and a weak focus on complication-specific education during regular outpatient appointments in tertiary care in Pakistan.^{20,21} Pakistani and South Asian studies are also regional in which the lack of awareness and control rates of hypertension are also low mainly due to the lack of adequate health education.^{22,23} These findings highlight the necessity to consider the targeted, simplified, and structured educational interventions in both tertiary and primary healthcare settings, especially when it comes to patients possessing lower educational levels. Based on recent systematic reviews and meta-analyses, specific complication-based health education in terms of stroke, heart failure, and chronic kidney disease has shown significant potential to enhance medication adherence, lifestyle change, and blood pressure control, thus reducing the rate of end-organ damage that can be prevented in hypertensive populations in LMICs, including Pakistan.^{24,25}

This study has some limitations. It was conducted in a single tertiary care hospital in Abbottabad using convenience sampling, so the findings may not be generalizable to primary care settings or other regions of Pakistan. Awareness was assessed through self-reported responses, which may have led to social desirability bias. The cross-sectional design limits causal inference, and some important variables such as socioeconomic status and sources of health information were not evaluated.

CONCLUSION

This study revealed that awareness of cardiovascular, renal, and cerebrovascular complications of uncontrolled hypertension remains suboptimal among hypertensive patients in Abbottabad, with only

53.2% demonstrating overall awareness. Education level emerged as the strongest and only significant factor associated with higher awareness. These findings highlight the urgent need for structured, simplified, and targeted patient education programs in outpatient settings, especially for patients with lower educational attainment. Improving awareness through regular counselling and health education initiatives may enhance treatment adherence, promote better blood pressure control, and ultimately reduce the burden of preventable end-organ damage in this population.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Syyed Anas Shah: Data collection, analysis, writing.
2	Mohammad Javed: Discussion writing.
3	Abid Ali: Writing.
4	Yasir Khan: Literature review, data entry.