



FACTORS AFFECTING BLOOD PRESSURE CONTROL IN HYPERTENSIVE PATIENTS VISITING A TERTIARY CARE HOSPITAL IN KHYBER PAKHTUNKHWA

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ABSTRACT

OBJECTIVE: To determine the factors affecting blood pressure (BP) control in adult hypertensive patients.

METHODS: A total of 246 adult hypertensive patients of both genders, age 20 years and above were included in this descriptive study conducted at the Department of Medicine, Lady Reading Hospital, Peshawar from May 2019 to September 2019. Statistical analysis of the data was done with SPSS version 21; Chi-square (χ^2) test was applied using crosstab/correlation for the association of factors affecting the control of BP in patients with hypertension. P-value ≤ 0.05 was considered statistically significant.

RESULTS: Out of 246 patients, 64 (26%) were males, and 182 (74%) were females. The mean age of patients was 56.09 ± 10.33 years. Overall, BP was controlled in 74 (30.1%) and uncontrolled in 172 (69.9%) patients. Among the total, 107 (43.5%) patients were adherent and 139 (56.5%) were non-adherent to medications. Among the 107 adherent patients, 72 (67.3%) had controlled BP and 35 (32.7%) were uncontrolled. Among the 139 non-adherents, 134 (96.4%) had uncontrolled BP and 05 (3.6%) had controlled BP ($p=0.000$). Economically, 10.5% ($n=4/38$) of the 'poor' and 33.7% ($n=70/208$) of the 'satisfactory' patients had controlled BP whereas 89.5% ($n=34/38$) and 66.3% ($n=138/208$) had uncontrolled BP respectively ($p=0.004$). Age, gender, education level, duration, comorbidity, and a class of antihypertensive drugs did not affect the control of BP significantly ($p > 0.05$).

CONCLUSION: Overall, one-third of the study participants had controlled BP and two-thirds of the adherents had controlled BP. Good adherence to medications and economic status significantly correlated with the control of hypertension.

KEYWORDS: Hypertension (MeSH); Blood Pressure (MeSH); Antihypertensive Agents (MeSH); Blood Pressure Determination (MeSH); Blood Pressure Control (Non-MeSH), Medication Adherence (MeSH); Patient Compliance (MeSH); Calcium Channel Blockers (MeSH) Angiotensin-Converting Enzyme Inhibitors (MeSH); Adrenergic beta-Antagonists (MeSH); Angiotensin Receptor Antagonists (MeSH).

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INTRODUCTION

Uncontrolled hypertension is a major predictor of cardiovascular/cerebral syndromes and chronic renal disease leading to high morbidity and mortality. Early diagnosis, effective treatment, and control of hypertension can prevent or reduce these complications. Over the

past few decades, a shift of the burden of hypertension from the high-income countries (HICs) to the low-income countries (LICs) in South Asia and Africa is observed, while it remained persistently high in Eastern/Central Europe.¹ Disparities in hypertension prevalence are large and increasing. Its prevalence in developed countries decreased by 2.6% but has increased in

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poor and developing countries by 7.7%. Similarly, the proportion of awareness, treatment, and control of hypertension in developed countries has increased but control of hypertension decreased in poor countries. Only 8-20% of patients in LICs and 18-42% in HICs were able to achieve BP control. Wide variations in the control of hypertension exist even in high-income countries; like the US (68.9%), UK (60.8%), China (37.5%), and Japan (37.1%).² Around one-third of people have hypertension worldwide, and around one-third of the treated have controlled BP. A meta-analysis revealed that globally 1.39 billion (31.1%) adults had hypertension in 2010; 31.5% in poor and developing countries and 28.5% in developed countries.^{2,3} Another multinational study of 142042 participants from high-, middle- and low-income countries reported hypertension prevalence of 40.8% and controlled BP in 32.5%.⁴ A major contributory factor in the control of treated hypertension is adherence to adequately prescribed anti-hypertensive medications. This ultimately leads to better clinical outcomes.⁵

A study of 13722 patients in Punjab, Pakistan reported 35.1% hypertension prevalence; BP was controlled in 22.3% of all hypertensive patients and 32.3% had controlled BP among the treated patients.⁶ Family history of hypertension, cardiovascular comorbidity, and married people had

better control, while age, obesity, and working people had poor control. A multinational study in South Asia showed that the majority of the treated hypertensive patients were not controlled in Pakistan (70.6%), Sri Lanka (56.5%), and Bangladesh (52.8%); with an overall uncontrolled rate of 58%.⁷ Poverty, single living, and poor adherence were contributory factors for uncontrolled BP.

The benefit of lowering high BP to prevent cardiovascular morbidity and mortality is obvious. It has been shown that a reduction of 10 mmHg in BP reduces the risk of major cardiovascular events, angina, stroke, heart failure, and all-cause mortality by 20%, 17%, 27% 28%, and 13% respectively.⁸ We found in our previous study that most of the hypertensive patients were non-adherent to medications.⁹ This finding generated our interest to further investigate the matter and determine the factors associated with the control of BP in hypertensive patients, like age, gender, education level and literacy, economic status of the patient, duration of disease, adherence, and a class of medications used. The objective of this study was, therefore, to determine various factors affecting the control of BP in hypertensive patients visiting a tertiary care hospital in Khyber Pakhtunkhwa. This study may be helpful in the patient's awareness of the problem and in devising better management plans by the policymakers. This study may further help identify the underlying barriers to hypertension control and create awareness to achieve BP control and thus reduce morbidity and mortality and improve quality of life.

METHODS

This descriptive observational study was conducted in the Medical OPD of Medical Teaching Institution/Lady Reading Hospital Peshawar, from 21-05-2019 to 20-09-2019. A total of 246 adult hypertensive patients of both genders, aging 20 years and above were included in the study. The sample size was calculated, with BP control of 20% population prevalence,^{2,6} 95% confidence level, and 5% margin of error, using WHO software. Patients were selected through consecutive sampling method. The study was

approved by the Institutional Research Ethical Board of Lady Reading Hospital Peshawar. Informed written consent was obtained from all the participants. The clinical history of the patient was taken, and a physical examination was carried out by a consultant physician. After a 10 minutes' rest, the patient's BP was measured in a sitting position, using YAMASU® (Japan) standard mercurial sphygmomanometer with an appropriate adult-size cuff and stethoscope. Three readings were taken and the last one was recorded on a proforma along with other details; like education level and economic status of the patient; duration of hypertension; details of medications prescriptions including dose, number, and frequency; level of adherence, cost and side effects of the drugs used; and any other factor affecting control of hypertension also noted. Complications/comorbidity, if any, was recorded. Relevant laboratory investigations like blood count, sugar, renal profile, lipid profile, ECG, echocardiography, etc. were carried out and results were recorded. Any patient with confusion/coma, acute complications, newly diagnosed, and that declining consent were excluded to control confounders.

Hypertension was defined as resting BP > 140/90, or previous diagnosis of hypertension, or a patient taking antihypertensive medications. A patient's BP < 140/90 was considered 'controlled' and BP ≥ 140/90 as 'uncontrolled'. Patients were divided economically into 'poor' living in a rented house with an adjusted monthly income of fewer than 100,000 rupees; and 'satisfactory' having their own house with an adjusted monthly income of rupees 100,000 or above.

Patients' data were entered and analyzed using IBM® SPSS® Statistics version 21. Mean ± standard deviations were calculated for numerical variables like age; frequency and percentages for categorical variables like gender, education, economic status, adherence, and drugs used. Chi-square (χ^2) test was applied using crosstab/correlation for the association of factors with the control of hypertension. P-value ≤ 0.05 was considered statistically significant. The study results, presented in tables, were compared with local, regional, and

international studies.

RESULTS

Out of 246 hypertensive patients, 64 (26%) were males and 182 (74%) were females with male to female ratio of 1:3. Mean age of the study participants was 56.09 ± 10.33 years. Out of 246 patients, overall BP was controlled in 74 (30.1%) and uncontrolled in 172 (69.9%) patients. Of the 246 patients, 107 (43.5%) were adherent and 139 (56.5%) were non adherent to medications. Among the adherents, 72/107 (67.3%) had controlled BP and 35/107 (32.7%) were uncontrolled; the difference was statistically significant (χ^2 (df1)=124.65, r=0.712, p=0.000), as shown in Table I. Economically, 10% of the 'poor' and 34% of the 'satisfactory' patients had controlled BP whereas 90% and 66% had uncontrolled BP respectively (χ^2 (df1)=8.171, r=0.182, p=0.004). Other factors affecting the control of hypertension are shown in Table I.

Of the 246 patients, 156 (63.4%) had comorbidities, whereas 90 (36.6%) had no comorbidity with hypertension. Among 156 with comorbidity, dyslipidemia (n=59, 37.8%), diabetes mellitus (n=34, 21.8%), obesity (n=14, 9%), and chronic kidney disease (n=2, 1.3%) were the common single comorbid conditions and 47 (30%) patients had multiple comorbidities in different combinations in our study patients; however the proportions of controlled BP in these patients were not significantly different (χ^2 (df 9)=11.622, r=0.086, p=0.178). Age of the patients, gender, education level, duration of hypertension, and class of the antihypertensive drug used did not affect the control of BP significantly (p>0.05), as shown in Table I.

DISCUSSION

Good adherence to anti-hypertensive medications and better economic status significantly affected control of hypertension in our study patients (p<0.05); whereas age, gender, education level, presence of comorbidity, duration of hypertension, and a class of antihypertensive drug used did not affect control of BP significantly (p>0.05). Overall, 30% of

TABLE I: FACTORS AFFECTING CONTROL OF BLOOD PRESSURE IN HYPERTENSIVE PATIENTS (N=246)

Factors		No. of Patients (%)	Controlled BP (%)	Uncontrolled BP (%)	Chi-square P-value
Gender	Male	64 (26%)	20 (31.3%)	44 (68.7%)	0.813
	Female	182 (74%)	54 (29.7%)	128 (70.3%)	
Age groups (years)	<40	20 (08.1%)	05 (25%)	15 (75%)	0.064
	>40 to 60	127 (51.6%)	40 (31.5%)	87 (68.5%)	
	>60	99 (40.3%)	33 (33.3%)	66 (66.7%)	
Economic Status	Poor	38 (15.4%)	04 (10.5%)	34 (89.5%)	0.004
	Satisfactory	208 (84.6%)	70 (33.7%)	138 (66.3%)	
Education of patients	Primary level	192 (78%)	56 (29.2%)	136 (70.8%)	0.306
	Secondary level	44 (18%)	12 (27.27%)	32 (72.72%)	
	Graduate level	10 (04%)	05 (50%)	05 (50%)	
Adherence to Medication	Adherent	107 (43.5%)	72 (67.3%)	35 (32.7%)	0.000
	Non-adherent	139 (56.5%)	05 (3.6%)	134 (96.4%)	
Duration of Hypertension	< 5 years	74 (30%)	17 (23%)	57 (77%)	0.180
	5 to 10 years	153 (62%)	51 (33.3%)	102 (66.7%)	
	> 10 years	19 (08%)	06 (31.6%)	13 (68.4%)	
Drugs Groups	ACEIs	05 (02%)	01 (20%)	04 (80%)	0.063
	ARBs	35 (14.2%)	15 (42.9%)	20 (57.1%)	
	Beta Blockers	75 (30.5%)	09 (12%)	66 (88%)	
	CCBs	39 (15.9%)	10 (25.6%)	29 (74.4%)	
	Combinations	92 (37.4%)	39 (42.4%)	53 (57.6%)	

ACEIs: Angiotensin converting enzyme inhibitors; *ARBs: Angiotensin II receptor blockers; CCBs: Calcium channel blockers

the study participants had controlled BP. Of the 107 adherent patients, 67.3% achieved control of hypertension. Most (96.4%) of the non-adherents had uncontrolled BP. The difference was highly significant ($p=0.000$). Most (90%) of the economically deprived 'poor' patients and 66% of the 'satisfactory' had uncontrolled BP; the difference was statistically significant ($p=0.004$).

Our study results are consistent with another local study of 13722 participants by Shafi et al.,⁶ in Punjab, Pakistan, where the BP control rate was 32.3% among the treated patients; being married, having a family history of hypertension, and having CVS comorbidity predicted control in these patients. The elderly and obese had poor control of BP.⁶ Another regional study by Jafar et al.,⁷ carried out in South Asia, reported rates of uncontrolled BP of 70.6% in Pakistan, 56.6% in Sri Lanka, and 52.8% in Bangladesh. Poverty, single living, and non-adherence to medications were predictors of uncontrolled BP.⁷ Other studies supporting our results include studies from India (35%),¹⁰ Turkey (30%),¹¹ Jordan (33%),¹² the Middle East (19%),¹³ Ethiopia (26.2%),¹⁴ and Ghana (42.3%).¹⁵ Our results are also

consistent with other international studies in the US (30%),¹⁶ and (39%).¹⁷ A large multinational study of 142042 participants conducted in high-, middle- and low-income countries by PURE Study Investigators also supports our findings, where 32.5% of patients had controlled BP.⁴

In contrast to our study findings, extremely lower rates of BP control were reported in two large Chinese studies. Yan et al.,¹⁸ reported 11.1% control among 640539 patients where older age, higher income, education, myocardial infarction, stroke, and diabetes were associated with control. Another Chinese study of 14420 participants by Liu et al.,¹⁹ showed control of 8.5%; gender, old age, obesity, and education affected the control of hypertension. Similarly, lower rates of 12.2% BP control were reported in studies from Vietnam,²⁰ where age, gender, obesity, and diabetes mellitus affected control; in Nepal (8.2%),²¹ where younger patients had the worst control, Tanzania (6.5%) and Egypt (8%),²² where women had better control of BP.

Conversely, other studies reported high rates of controlled BP in hypertensive patients; 75.4% in Thailand²³ where gender, age, diabetes mellitus, obesity,

and poly-pharmacy were associated with uncontrolled BP; 40% in Italy²⁴ where gender diabetes mellitus and increasing age of the patient and the GP correlated with uncontrolled BP. In Saudi Arabia,²⁵ 51.3% had controlled BP; older age predicted uncontrolled BP. In the US and Germany, around 70% of the treated patients were controlled. A high control rate of 85% in treated patients in Canada was reported, where adherence to adequately prescribed medications predicted better control of BP in these patients.⁵

The barriers to controlling hypertension are multifactorial; these factors may be patient-related, disease-related, or healthcare-system-related, like adherence, poly-pharmacy, affordability, and availability of drugs. In developing countries, patient-related factors like socioeconomic status, literacy, lifestyle behavior, beliefs, affordability, and adherence contribute to poor BP control. System-related factors like cost and availability of drugs and health care providers, availability of cheap alternatives, herbal medicines, homeopathy, and traditional healing, etc. play a role.¹⁵ A significant proportion of the hypertensive population remains undiagnosed and unaware of the silent killer disease and

hence not treated. Even the majority of those diagnosed and treated fail to achieve BP control.⁷ A major contributory factor in the control of treated hypertension is adherence to adequately prescribed anti-hypertensive medications, which ultimately leads to better clinical outcomes.^{5,7} In developed countries, better control of BP is observed in the urban population because of better awareness and access to treatment.⁴

LIMITATIONS OF THE STUDY

This is a single-center study with a comparatively small sample size; therefore, the results cannot be generalized to the community population. A large community-based study or multicenter study would be more appropriate for the generalization of the results.

CONCLUSION

One-third of the study participants had controlled BP and two-thirds of the adherent patients had controlled BP. Good adherence to medications and economic status significantly predicted control of hypertension in the study participants; whereas age, gender, education level, presence of comorbidity, duration of hypertension, and a class of antihypertensive drug used did not affect control of BP significantly.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

YA: Concept and study design, drafting the manuscript, approval of the final version to be published

MARA & ZA: Acquisition, analysis and interpretation of data, drafting the manuscript, critical review, approval of the final version to be published.

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.

CONFLICT OF INTEREST

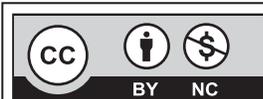
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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request



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