

Hypertension and its Associated Factors: A Cross-Sectional Analysis

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Abstract

Objective: To evaluate systolic and diastolic hypertension and their associated factors in hypertensive patients.

Methods: A cross-sectional study was carried out in the outpatient department of a secondary care hospital of Karachi. A total of 304 patients, aged 18 or above, with self-reported history of hypertension and on anti-hypertensive medication were included in the study. The necessary data were collected by using a structured questionnaire whereas the blood pressure level was measured with the help of a sphygmomanometer and stethoscope. The data were analyzed on SPSS version 20 and the inferential analysis was performed using binary logistic regression.

Results: The multivariable analysis revealed that age ($p=0.003$), smoking history ($p=0.005$) and palpitation ($p=0.027$) were significantly associated with systolic hypertension whereas duration of hypertension ($p=0.022$) and palpitation ($p=0.040$) were significantly associated with diastolic hypertension.

Conclusion: It was concluded that certain participant characteristics such as older age, longer duration of hypertension, positive smoking history and presence of palpitation do affect or result from the presence of systolic and/or diastolic hypertension in such patients.

Keywords: Hypertension, associated factors, cross-sectional analysis

Introduction

Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more, or taking antihypertensive medication [1].

Based on the recommendations of the Seventh Report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC 7), blood pressure for adults aged 18 years or older has been classified into four categories as normal, Prehypertension, stage 1 hypertension and stage 2 hypertension: Normal (systolic <120 mm Hg, diastolic <80 mm Hg); Prehypertension (systolic 120-139 mm Hg, diastolic 80-89 mm Hg); Stage 1 Hypertension (systolic 140-159 mm Hg, diastolic 90-99 mm Hg) and Stage 2 Hypertension (systolic 160 mm Hg or greater, diastolic 100 mm Hg or greater) [2].

Hypertension can be of two types, essential and secondary. Essential hypertension can be defined as a rise in blood pressure of unknown cause that increases risk for cerebral, cardiac, and renal events [3]. Secondary hypertension is defined as increased systemic blood pressure due to an identifiable cause [4]. A vast majority of patients suffering from arterial hypertension have essential or primary hypertension and only 5 to 10% of them have secondary hypertension [4].

The estimated total number of adults with hypertension in 2000 was 972 million, 333 million in economically developed countries and 639 million in economically developing countries; the number of adults with hypertension in 2025 is predicted to increase by about 60% to a total of 1.56 billion [5]. It has been recently estimated that in 2010, 31.1% of the world's adults had hypertension; 28.5% in high-income countries and 31.5% in low- and middle-income countries; and an estimated 1.39 billion people had hypertension in 2010; 349 million in high-income and 1.04 billion in low- and middle-income countries.

Moreover, from 2000 to 2010, the age-standardized prevalence of hypertension decreased by 2.6% in high-income countries but increased by 7.7% in low- and middle-income countries [6]. Recently it has been estimated that the highest prevalence of high blood pressure globally has shifted from high middle income countries to low middle income countries [7]. Locally in Pakistan, a meta-analysis reported the prevalence of hypertension to be 17% based on data gathered prior to 2004, though according to World Health Organization recent estimate, the total prevalence of high blood pressure in Pakistan is 25.2% [8, 9]. Globally, 7.6 million premature deaths and 92 million DALYs are attributed to high blood pressure and over 80% of the attributable burden of disease is seen in low-income and middle-income regions [10]. Moreover, its high prevalence and poor control are said to be important determinants of the increasing epidemic of cardiovascular diseases in developing countries [11].

The clinical presentation of hypertension differs from person to person and may depend upon several factors. Identification of such factors is not only important from the management perspective, but it may have significant implications for the prognosis as well. Although a number of international studies have evaluated such a relationship, to the best of authors' knowledge, the pertinent local data is scarce at best. In order to establish a relevant data base, this study was therefore intended to evaluate systolic and diastolic hypertension and their associated factors in hypertensive patients.

Materials and Methods

After taking necessary ethical approval, a cross-sectional study was carried out in the outpatient department of a secondary care hospital of Karachi. A total of 304 patients, aged 18 or above, with self-reported history of hypertension and on anti-hypertensive medication were included in the study by employing convenient sampling technique. Patients with history of diabetes, cardiac events, neurological disorders, cluster headache, gastrointestinal disease, visual problems, and morbid obesity were excluded from the study.

After taking informed consent, the necessary data were collected with the help of a structured questionnaire designed specifically for the study whereas the blood pressure level was measured with the help of a sphygmomanometer and stethoscope. The data were entered and analyzed on SPSS version [20]. Multivariable analysis using binary logistic regression was performed to develop a risk assessment model for the study outcome whereas the significance level was set at 0.05. The duration of the study was 6 months.

Results

The study results revealed 51.6% of the participants were male, 70.7% of them were aged greater than 41 years whereas 59.9% of them had hypertension for less than 5 years.

Table 1: Participant Profile and Systolic Hypertension

Variables (n=304)		Adjusted Odds Ratio	95% Confidence Interval		p
			Lower Bound	Upper Bound	
Gender	Male	0.772	0.462	1.289	0.322
Age	>40 Years	0.833	0.466	1.49	0.538
Duration of Hypertension	>3 Years	1.841	1.094	3.1	0.022
Smoking History	Present	1.893	0.808	4.437	0.142
Headache	Present	1.077	0.601	1.93	0.803
Vertigo	Present	0.819	0.444	1.511	0.523
Edema	Present	0.73	0.417	1.278	0.271
Chest Pain	Present	0.645	0.324	1.284	0.212
Vision Problems	Present	1.361	0.801	2.313	0.254
Dyspnea	Present	1.116	0.634	1.965	0.704
Epistaxis	Present	1.747	0.405	7.54	0.455
Increased Urinary Frequency	Present	1.261	0.681	2.335	0.46
Nausea	Present	1.199	0.641	2.242	0.57
Sleep Apnea	Present	1.276	0.683	2.383	0.445
Palpitation	Present	2.069	1.034	4.14	0.04
Fatigue	Present	1.238	0.663	2.313	0.503
Confusion	Present	0.761	0.411	1.408	0.384

The multivariable analysis using binary logistic regression showed that after controlling for the confounding effect of all other variables age ($p=0.003$), smoking history ($p=0.005$) and palpitation ($p=0.027$) were significantly associated with systolic hypertension where patients who were >40 years old had significantly higher odds of having systolic hypertension than those who were up to 40 years old (AOR 2.556, 95% CI 1.377-4.743); patients who had a positive history of smoking had significantly higher odds of having systolic hypertension than those who did not (AOR 8.772, 95% CI 1.919-40.104) and patients who complained of palpitation had significantly higher odds of having systolic hypertension than those who did not (AOR 2.414, 95% CI 1.108-5.260) (table 1).

The multivariable analysis using binary logistic regression further showed that after controlling for the confounding effect of all other variables duration of hypertension ($p=0.022$) and palpitation ($p=0.040$) were significantly associated with diastolic hypertension where patients who had hypertension for more than 3 years had significantly higher odds of having diastolic hypertension than those who had it for up to 3 years (AOR 1.841, 95% CI 1.094-3.100) and patients who complained of palpitation had significantly higher odds of having diastolic hypertension than those who did not (AOR 2.069, 95% CI 1.034-4.140) (table 2).

Table 2: Participant Profile and Diastolic Hypertension

Variables (n=304)		Adjusted Odds Ratio	95% Confidence Interval		p
			Lower Bound	Upper Bound	
Gender	Male	0.755	0.434	1.315	0.321
Age	>40 Years	2.556	1.377	4.743	0.003
Duration of Hypertension	>3 Years	0.918	0.519	1.623	0.769
Smoking History	Present	8.772	1.919	40.104	0.005
Headache	Present	1.604	0.86	2.991	0.137
Vertigo	Present	1.392	0.711	2.727	0.335
Edema	Present	0.801	0.43	1.492	0.484
Chest Pain	Present	0.746	0.346	1.61	0.455
Vision Problems	Present	1.26	0.708	2.24	0.432
Dyspnea	Present	0.91	0.485	1.709	0.77
Epistaxis	Present	2.325	0.263	20.548	0.448
Increased Urinary Frequency	Present	0.941	0.472	1.877	0.863
Nausea	Present	0.918	0.444	1.899	0.818
Sleep Apnea	Present	1.486	0.73	3.026	0.275
Palpitation	Present	2.414	1.108	5.26	0.027
Fatigue	Present	1.012	0.515	1.99	0.972
Confusion	Present	1.025	0.533	1.972	0.941

Discussion

This study was an attempt to evaluate whether the selected participant characteristics were associated with presence of systolic and/or diastolic hypertension or not in order to better prioritize management in such patients. The multivariable analysis showed that age, smoking history and palpitation were significantly associated with systolic hypertension whereas duration of hypertension and palpitation were significantly associated with diastolic hypertension.

Being on anti-hypertensive therapy, it was only expected that the study participants had weaker associations between their symptoms and the level of hypertension. But as it is known that

blood pressure control while on anti-hypertensive medication can vary considerably, it was not unreasonable to suspect that such uncontrolled blood pressure can continue to manifest clinically in a given hypertensive patient[12].

The study results revealed that patients' age was significantly associated with presence of systolic hypertension. Literature reports several studies relating age with presence of hypertension. Jo I et al., in 2001 reported age to be significantly associated with presence of hypertension [13]. Reported the prevalence of hypertension to increase with increasing age with 8% in patients aged 30-39 years to 38% in patients aged ≥ 60 years [14]. Likewise, Esam MS&Husain AS in 2012 found hypertension prevalence to show an increasing trend with age with 9.5% in patients aged

15-18 years to 42% in patients aged >60 years [15]. Also found prevalence of hypertension to increase with increasing age of the study participants [16]. Similarly, reported age to be significantly associated with hypertension [17].

The study results further revealed smoking history to be significantly associated with presence of systolic hypertension. Similar to the study findings, Primatesta P et al., in 2001 reported that older male smokers had higher systolic blood pressure than non-smokers, though no such differences were observed among younger male smokers [18]. Literature frequently reports equivocal findings in this regard as well. Leone A in 2011 reported that a causal relationship between smoking history and increase in blood pressure is not yet clearly established [19]. Likewise, Virdis A et al., in 2010 reported that available data do not point out clearly towards a direct causal relationship between chronic smoking and blood pressure [20]. Moreover, Narkiewicz K et al., in 2005 also reported that the link between chronic smoking and development of hypertension is still not well established [21]. Surprisingly though; evidence depicting an inverse relationship between smoking and hypertension also exists. Okubo Y et al. in 2002 reported systolic and diastolic blood pressures in light, moderate and heavy smokers to be significantly lower than in non-smokers and ex-smokers [22]. Such heterogeneity of data warrants further and extensive evaluation of a potential relationship between smoking and hypertension by employing more rigorous study designs such as case control and cohort studies.

Interestingly, a positive association was found between both systolic and diastolic hypertension and palpitation in study participants, even though literature reports prevalence of palpitation to be lower in patients receiving anti-hypertensive therapy [23]. As discussed earlier, non-effective blood pressure control in such patients may be a cause of this finding. Unfortunately due to absence of any pertinent data, a meaningful conclusion could not be drawn.

Duration of hypertension is known to exert a negative influence on hypertension related manifestations and/or outcomes. It has been reported to be an independent predictor of anxiety symptoms in hypertensive patients [24]. It has also been found to negatively influence the survival in hypertensive patients [25]. The study results showed duration of hypertension to be positively associated with diastolic hypertension. Unfortunately, due to a dearth of pertinent published data, a meaningful comparison with previous literature could not be made.

For better generalizability, the findings of our study need to be verified by longitudinal studies as these may prove useful in identifying and establishing a high risk profile of hypertensive patients resulting in their better management and care.

Limitation

The prime limitation of the study was use of convenient sampling technique because of resource constraints, limiting the generalizability of study findings. Furthermore, as the assessments of certain study variables were history based

they may have suffered from limitation in recall. Moreover, it is acknowledged that the use of a larger sample size would have resulted in more precise estimates of the associations evaluated by this study.

Conclusion and Recommendation

Based on study results it can be concluded that certain patient characteristics such as older age, longer duration of hypertension, positive smoking history and presence of palpitation are associated with the presence of systolic and/or diastolic hypertension in such patients. It is therefore recommended that such characteristics, if present, should be taken into consideration by the treating physicians while deciding the management plan because of their potential implications for the prognosis of such patients.

Conflict of Interests

The authors report no conflict of interests.

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