

Correlation between Blood Pressure Levels and Clinical Signs and Symptoms of Hypertensive Patients: A Gender and Age Based Comparison

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Abstract

Objective: To determine correlation between systolic and diastolic blood pressure levels and selected signs and symptoms among different gender and age groups of hypertensive patients.

Methods: A cross-sectional study was carried out at urban hospital after taking ethical approval, among patients with self-reported history of hypertension and on anti-hypertensive medication. After taking ethical approval, a total of 372 patients aged 18 or above were included in the study by employing convenient sampling technique. A detailed history was taken from each patient about hypertension associated symptoms with the help of a questionnaire whereas designed specifically for the study. Blood pressure was measured using sphygmomanometer with stethoscope. SPSS version 20 was used to analyse the collected data and the duration of study was 6 months.

Results: Among males older age, belonging to older age group >40 years, having more height and positive history of irregular heartbeat/palpitation were highly correlated with increase in systolic blood pressure ($p < 0.001$ for all), among females, positive history of sleep apnoea was highly correlated with increase in systolic blood pressure ($p < 0.001$) and having more height and positive history of sleep apnoea were highly correlated with increase in diastolic blood pressure ($p < 0.001$ for both), among <40 years old milder change in urinary frequency was highly correlated with increase in systolic blood pressure ($p < 0.001$) whereas among >40 years old positive history of headache, vertigo, sleep apnoea and irregular heartbeat/palpitation were highly correlated with increase in systolic blood pressure ($p < 0.001$ for all) and having more height was highly correlated with increase in diastolic blood pressure ($p < 0.001$).

Conclusion: Among other signs and symptoms, positive history of irregular heartbeat/palpitation was found to be significantly correlated with both high systolic and diastolic blood pressure levels in both males and females as well as in >40 years old patients.

Keywords: Correlation, signs and symptoms, hypertension, gender, age.

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Introduction

Hypertension is among one of the most common chronic diseases and is associated with high mortality¹. It has been identified as the third leading risk factor for disease burden and as the leading global risk factor for mortality². According to World Health Organization estimates, hypertension affects about 40% of adults above 25 years of age and causes 7.5 million deaths annually³. It was estimated that more than a quarter of the world's adult

population had hypertension in the year 2000, that its overall prevalence was similar in both genders, and that such prevalence increased with age all over the world⁴. A meta-analysis reported the prevalence of hypertension in Pakistan to be 17% based on data gathered prior to 2004⁵. The World Health Organization's more recent estimate put the total prevalence of high blood pressure in Pakistan at 25.2% (25.6% and 24.8%) in males and females respectively⁶.

Hypertension is defined as a systolic blood pressure of 140 mmHg or more, or a diastolic blood pressure of 90 mmHg or more, or taking anti-hypertensive medication⁷. There are two types of hypertension namely 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 events⁸. Secondary hypertension is defined as increased systemic blood pressure due to an identifiable cause⁹.

The clinical presentation of high blood pressure differs from person to person and may depend upon several factors such as age, gender, and severity of hypertension. Literature search does not reveal ample data on gender and age wise comparison of signs and symptoms of high blood pressure in Pakistan. Our objective therefore was to determine correlation between systolic and diastolic blood pressure levels and selected signs and symptoms among different gender and age groups of hypertensive patients here by aiding in prioritisation of risk management in such patients.

Patients and Methods

A cross-sectional study was carried out at urban hospital after taking ethical approval among patients with self-reported history of hypertension and on anti-hypertensive medication. After taking ethical approval, a total of 372 patients aged 18 or above were included in the study by employing convenient sampling technique against a calculated sample size of 363 participants with 38.1% frequency of outcome factor and 5% margin of error. Patients with history of diabetes, cardiac events, neurologi-

cal disorders, cluster headaches, gastrointestinal disease, visual problems, epistaxis before being diagnosed with hypertension and morbid obesity were excluded from the study.

A detailed history was taken from each patient about hypertension associated symptoms with the help of a questionnaire designed specifically for the study. The questionnaire was designed based on 13 most frequently encountered symptoms by hypertensive patients which included headache, vertigo, oedema, chest pain, vision problems, dyspnoea, epistaxis, urinary frequency, nausea, sleep apnoea, irregular heartbeat/palpitation, fatigue and confusion. Blood pressure was measured using sphygmomanometer with stethoscope.

SPSS version 20 was used to code, enter and analyse the collected data. After checking for normality, inferential analysis was performed using Spearman correlation after stratifying on the basis of gender and age. The significance level was set at 0.05. The duration of study was 6 months.

Results

The total data collected were of 372 patients but after excluding missing data for various study variables the final data analysed were of 303 patients for gender wise comparison and of 299 patients for age wise comparison. The mean age of the study participants was 48.61 ± 12.54 years whereas 70.2% of them belonged to >40 years age group. A majority (51.5%) of them were males. Their mean weight was 68.21 ± 11.43 kg whereas their mean height was 160.6 ± 15.4 cms. Their mean systolic blood pressure level was 141.39 ± 14.59 mmHg whereas their mean diastolic blood pressure level was 85.26 ± 10.22 mmHg (Table 1).

The study results revealed that among males, older age ($p < 0.001$), belonging >40 years to older age group ($p < 0.001$), having more height ($p < 0.001$), longer duration of hypertension ($p = 0.045$), positive history of smoking ($p = 0.008$), positive history of headache ($p = 0.048$), increased severity of headache ($p = 0.006$), positive history of vertigo ($p = 0.031$), positive history of vision problems ($p = 0.048$), positive

history of dyspnoea ($p=0.005$), increased severity of dyspnoea ($p=0.013$), increased urinary frequency ($p=0.003$), milder change in urinary frequency ($p=0.022$), positive history of sleep apnoea ($p=0.001$), positive history of irregular heartbeat/palpitation ($p<0.001$), positive history of fatigue ($p=0.04$) and positive history of confusion ($p=0.01$) were significantly correlated with increase in systolic blood pressure whereas 40 years age group ($p=0.044$), having more height ($p=0.001$), positive history of smoking ($p=0.035$), increased severity of headache ($p=0.049$), positive history of vision problems ($p=0.033$), increased severity of dyspnoea ($p=0.017$) and positive history of irregular heartbeat/palpitation ($p=0.012$) were significantly correlated with increase in diastolic blood pressure.

Among females, increased severity of headache ($p=0.047$), positive history of vertigo ($p=0.047$), positive history of vision problems ($p=0.023$), milder change in urinary frequency ($p=0.036$), positive history of sleep apnoea ($p<0.001$), positive history of irregular heartbeat/palpitation ($p=0.001$) and positive history of confusion ($p=0.034$) were significantly correlated with increase in systolic blood pressure whereas greater weight ($p=0.041$), having more height ($p<0.001$), positive history of sleep apnoea ($p<0.001$) and positive history of irregular heartbeat/palpitation ($p=0.034$) were significantly correlated with increase in diastolic blood pressure (Table 2).

The study results further revealed that among ≤ 40 years old, being female ($p=0.036$), milder change in urinary frequency ($p<0.001$), positive history of sleep apnoea ($p=0.033$) and positive history of irregular heartbeat/palpitation ($p=0.041$) were significantly correlated with increase in systolic blood pressure, whereas having more height ($p=0.013$) and longer duration of hypertension ($p=0.034$) were significantly correlated with increase in diastolic blood pressure.

Among >40 years old, being tall ($p=0.004$), positive history of smoking ($p=0.016$), positive history of headache ($p<0.001$), increased severity of headache ($p=0.004$), positive history of vertigo ($p<0.001$), positive history of chest pain ($p=0.041$),

positive history of vision problems ($p=0.002$), positive history of dyspnoea ($p=0.005$), increased severity of dyspnoea ($p=0.008$), increased urinary frequency ($p=0.002$), milder change in urinary frequency ($p=0.028$), positive history of sleep apnoea ($p<0.001$), positive history of irregular heartbeat/palpitation ($p<0.001$), positive history of fatigue ($p=0.013$) and positive history of confusion ($p=0.005$) were significantly correlated with increase in systolic blood pressure, whereas having more height ($p<0.001$), increased severity of headache ($p=0.015$), increased severity of dyspnoea ($p=0.002$), positive history of sleep apnoea ($p=0.002$) and positive history of irregular heartbeat/palpitation ($p=0.007$) were significantly correlated with increase in diastolic blood pressure (Table 3).

Moreover, female patients were found to have higher mean systolic and diastolic blood pressure levels than male patients (Fig 1.), whereas >40 years old patients were found to have higher mean systolic and diastolic blood pressure levels than ≤ 40 years old patients (Fig. 2).

Table 1. Participants profile

Variables	Frequency (%) / Mean \pm S.D.
Age (Years) ¹	48.61 \pm 12.54
Age Group ¹	
≤ 40 Years	89 (29.8)
>40 Years	210 (70.2)
Gender ²	
Male	156 (51.5)
Female	147 (48.5)
Weight (Kg) ³	68.21 \pm 11.43
Height (ft) ⁴	5.27 \pm 0.51
Systolic Blood Pressure (mmHg) ⁵	141.39 \pm 14.59
Diastolic Blood Pressure (mmHg) ⁵	85.26 \pm 10.22

1n= 299 2n= 303 3n= 273 4n= 277 5n= 304

Table 2. Correlation of blood pressure with patient's characteristics and signs and symptoms: gender wise comparison

Variables	Males (n= 156)				Females (n= 147)			
	SBP		DBP		SBP		DBP	
	ρ	P	ρ	P	ρ	P	ρ	P
Age (Years)	0.304*	<0.001	0.163*	0.044	0.157	0.059	0.035	0.677
Age Groups	0.293*	<0.001	0.096	0.235	0.144	0.084	-0.001	0.995
Weight (Kg)	0.117	0.168	0.027	0.748	0.069	0.434	0.178*	0.041
Height (Ft)	0.322*	<0.001	0.283*	0.001	0.159	0.068	0.338*	<0.001
Duration of hypertension (Years)	0.164*	0.045	0.104	0.205	0.043	0.614	0.121	0.155
History of smoking	-0.212*	0.008	-0.170*	0.035	-0.159	0.057	-0.154	0.065
History of headache	-0.16*	0.048	0.016	0.84	-0.072*	0.39	-0.06	0.469
Headache duration	0.167	0.085	0.012	0.904	-0.079	0.42	-0.109	0.263
Severity of headache	0.263*	0.006	0.190*	0.049	0.189*	0.047	0.137	0.151
History of vertigo	-0.176*	0.031	0.112	0.171	-0.166*	0.047	-0.051	0.549
Severity of vertigo	-0.17	0.118	0.048	0.659	0.133	0.238	0.157	0.164
History of oedema	-0.144	0.081	0.012	0.884	0.051	0.558	0.027	0.756
Laterality of oedema	-0.133	0.346	0.073	0.609	-0.127	0.351	0.156	0.249
Grading of bilateral oedema	-0.095	0.472	0.026	0.846	0.047	0.713	-0.078	0.543
History of chest pain	-0.104	0.201	0.079	0.334	-0.096	0.254	0.006	0.943
Severity of chest pain	0.039	0.744	0.033	0.782	0.164	0.233	0.005	0.971
History of vision problems	-0.161*	0.048	-0.174*	0.033	-0.191*	0.023	-0.06	0.476
History of dyspnoea	-0.228*	0.005	-0.04	0.628	-0.112	0.178	-0.039	0.642
Severity of dyspnoea	0.274*	0.013	0.262*	0.017	0.132	0.251	0.172	0.135
History of epistaxis	-0.085	0.297	-0.091	0.267	-0.055	0.514	-0.066	0.43
Increased urinary frequency	-0.239*	0.003	-0.123	0.133	-0.121	0.154	-0.064	0.451
Change in urinary frequency	-0.265*	0.022	-0.161	0.167	-0.278*	0.036	-0.149	0.27
History of nausea	-0.069	0.397	-0.027	0.737	-0.12	0.147	0.044	0.6
History of sleep apnoea	-0.253*	0.001	-0.071	0.377	-0.346*	<0.001	-0.346*	<0.001
History of irregular heartbeat/palpitation	-0.327*	<0.001	-0.201*	0.012	-0.276*	0.001	-0.175*	0.034
History of fatigue	-0.165*	0.04	-0.049	0.542	-0.121	0.146	-0.093	0.262
History of confusion	-0.206*	0.01	-0.014	0.867	-0.175*	0.034	-0.052	0.53

*Correlation is significant at the 0.05 level

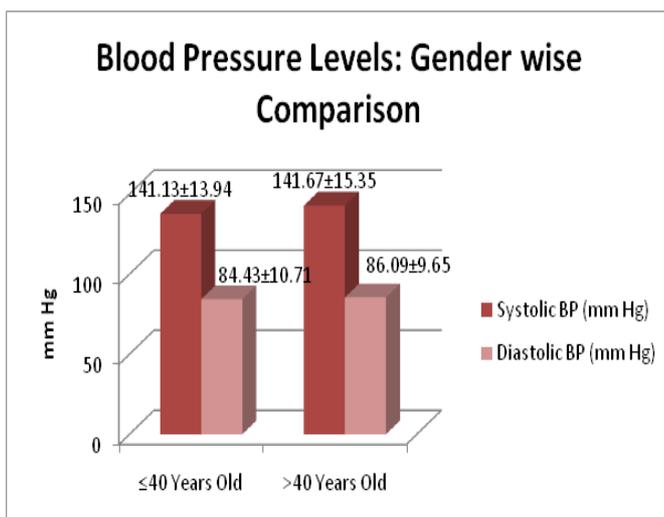


Fig 1. Gender wise comparison of blood pressure levels

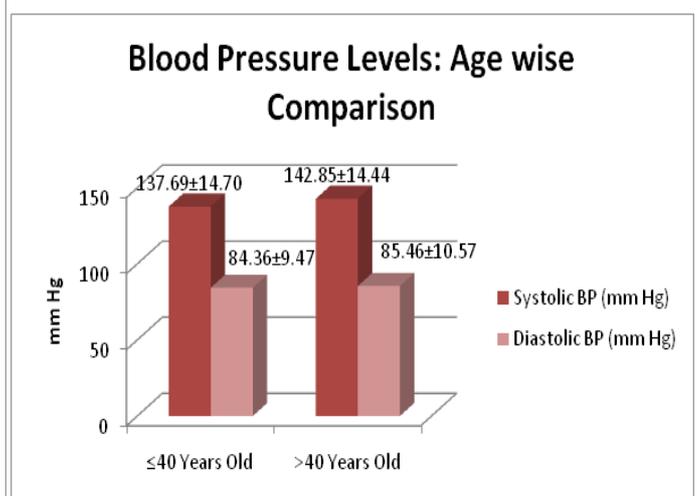


Fig 2. Age wise comparison of blood pressure levels

Table 3. Correlation of blood pressure with patients' characteristics and signs and symptoms: age wise comparison

Variables	40 Years (n= 89)				>40 Years (n= 210)			
	SBP		DBP		SBP		DBP	
	ρ	P	ρ	P	ρ	P	ρ	P
Gender	0.223*	0.036	0.179	0.093	0.005	0.939	0.062	0.372
Weight (Kg)	0.201	0.07	0.18	0.106	0.047	0.521	0.067	0.361
Height (Ft)	0.18	0.104	0.272*	0.013	0.209*	0.004	0.253*	<0.001
Duration of hypertension (Years)	0.113	0.303	0.231*	0.034	0.037	0.6	0.05	0.482
History of smoking	-0.104	0.34	-0.04	0.716	-0.167*	0.016	-0.133	0.055
History of headache	0.173	0.106	0.106	0.326	-0.243*	<0.001	-0.06	0.389
Headache duration	-0.142	0.246	-0.034	0.781	0.095	0.259	-0.051	0.542
Severity of headache	0.078	0.52	0.097	0.425	0.236*	0.004	0.202*	0.015
History of vertigo	0.089	0.417	-0.142	0.192	-0.249*	<0.001	0.101	0.151
Severity of vertigo	-0.031	0.845	0.099	0.534	-0.051	0.574	0.071	0.435
History of oedema	0.035	0.756	-0.218	0.05	-0.08	0.261	0.098	0.17
Laterality of oedema	-0.07	0.714	-0.047	0.806	-0.129	0.26	0.162	0.156
Grading of bilateral oedema	0.057	0.746	-0.028	0.874	-0.054	0.62	0.001	0.99
History of chest pain	0.143	0.185	0.014	0.901	-0.143*	0.041	0.071	0.314
Severity of chest pain	0.182	0.364	-0.179	0.371	0.081	0.418	0.087	0.386
History of vision problems	-0.004	0.972	-0.171	0.115	-0.220*	0.002	-0.122	0.083
History of dyspnoea	-0.045	0.674	-0.093	0.387	-0.195*	0.005	-0.026	0.716
Severity of dyspnoea	0.014	0.928	0.073	0.652	0.244*	0.008	0.285*	0.002
History of epistaxis	-0.087	0.43	-0.045	0.681	-0.06	0.392	-0.095	0.174
Increased urinary frequency	0.063	0.567	0.013	0.904	-0.221*	0.002	-0.122	0.084
Change in urinary frequency	-0.601*	<0.001	-0.305	0.101	-0.220*	0.028	-0.127	0.207
History of nausea	-0.029	0.79	0.06	0.581	-0.11	0.114	-0.014	0.836
History of sleep apnoea	-0.228*	0.033	-0.141	0.19	-0.299*	<0.001	-0.210*	0.002
History of erregular heartbeat/palpitation	-0.219*	0.041	-0.195	0.069	-0.328*	<0.001	-0.187*	0.007
History of fatigue	-0.055	0.61	-0.167	0.119	-0.170*	0.013	-0.034	0.625

Discussion

Similar to our study findings, though only marginally in females, age has been reported earlier to be significantly associated with high blood pressure irrespective of the gender in the multivariate analysis¹⁰. Moreover, like our study results, an earlier study also reported headache to be significantly associated with hypertension ($p<0.05$)¹¹ but contrary findings have been reported as well. One previous study did not find any association between headache and hypertension (OR 1.02, 95% CI 0.79 to 1.30)¹², while another did not find any significant difference in headache prevalence among hypertensive and normotensive subjects (38.1% vs. 39.6%, $p=0.848$)¹³. This difference in findings could be a result of different methods of blood pressure measurement i.e. direct versus indirect auscultatory method in the former study or to different population characteristics in the later study. Also the results were reported without stratifying by gender or age in both the studies.

Unlike our study results, an earlier study did not report any significant difference between the prevalence of visual disturbances among those with or without hypertension though without consideration for the gender or age of the study participants ($p=0.539$)¹³. Moreover, like our study findings, an earlier study also reported dyspnoea to be associated with elevated blood pressure though irrespective of gender or age of the study participants¹⁴.

Similar to our study results, an earlier study did not find epistaxis to be associated with hypertension though, unlike our study findings, it did not report weakness to be associated with hypertension¹¹. This difference in findings could be due to the use of different operational definitions of the terminology involved i.e. fatigue versus weakness and also due to the absence of stratification on the basis of gender or age in the later study.

With regard to the rest of the study findings a comparison could not be made with the literature due to lack of relevant published data. The gender

and age wise difference in correlation between blood pressure levels and clinical signs and symptoms of hypertensive patients observed in this study clearly demonstrates that it is imperative to understand the dissimilarities in manifestations of hypertension in different subpopulations of hypertensive patients in order to better identify the individuals who are in need to be prioritised for management of their illness.

It is acknowledged that the use of different anti-hypertensive medications by the study participants could be a potential source of bias for study results and the single reading of the level of blood pressure may be the reason of the observer bias in the study. Limitation of the study includes that the results may have been affected by a recall bias, an inherent weakness of a cross-sectional study design. In light of the study findings, it is recommended that the role of gender and age in the context of clinical presentation of hypertensive patients warrants further surveys, multicenter studies as this can have a significant implication for hypertension screening and management in such patients.

Conclusion

The study results revealed both high systolic and diastolic blood pressure levels were significantly related with males, being tall, positive history of smoking, vision problems, increased severity of dyspnoea and positive history of irregular heartbeat/palpitation and also in tall females >40 years, increased severity of headache, dyspnea, positive history of sleep apnoea and irregular heartbeat/palpitation

Conflict of Interest

Authors have no conflict of interests and no grant/funding from any organisation.

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