ORIGINAL ARTICLE

Hypertension associated risk factors in Pakistan: A multifactorial case-control study

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Abstract

Objective: To shed light on the association of age, smoking, educational status, family history, diabetes and kidney diseases with hypertension.

Methods: The case-control study was conducted at three different medical centres of Rawalpindi, Pakistan, from December 2016 to July 2017. Data from 549 hypertensive cases and 1451 normotensive controls was collected using a detailed questionnaire and through personal interviews by adopting nonprobability consecutive sampling technique. Overall 2000 adult individuals, both males and females excluding pregnant women, were the part of this study. Those with blood pressure ≥140/90mmHg and taking anti-hypertensive treatment were designated as the cases, while the rest were taken as normotensive controls. Blood pressure was measured by a physician. Multivariate logistics regression analysis was used to estimate the association of various different risk factors with hypertension. All the analysis was performed using software R 3.4.2 and SPSS 24.

Results: Of the 2,000 subjects, 549(27.45%) were hypertensive cases and 1451(72.55%) were normotensive controls. Mean age of the cases was 43.32±9.7 years and it was 31.8±10.1 years among the normotensives. Higher age, smoking, lower educational status, presence of kidney diseases, diabetes and family history of hypertension were significantly associated with hypertension ($p<0.01$ each).

Conclusion: In Pakistani population, age, smoking, illiteracy, kidney diseases, diabetes and family history were found to be associated with hypertension.

Keywords: Hypertension, Case-control, Smoking, Diabetes, Kidney diseases, Risk factors. (JPMA 69: 1070; 2019)

Introduction

Hypertension (HTN) is a major public health issue affecting more than one billion individuals worldwide.[1] HTN is the most common health problem in Asia as well.[2] It is a major contributing factor towards stroke, myocardial infarction (MI), heart and renal failure. Therefore, control of blood pressure (BP) is essential to prevent from adverse and life-threatening outcomes. Sometimes, HTN is asymptomatic and people do not consult any doctor, leading to complications.[3] Detection, control and monitoring of HTN is a major health challenge throughout the world. Prevalence of HTN increases with increased age even in the presence of proper monitoring and preventive measures. There is a continuous increase in HTN and associated cardiovascular morbidity among Asians, placing escalating and significant socioeconomic burden on this region.[1] According to the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-8), a person is considered hypertensive if systolic/diastolic BP is greater than 140/90 mmHg.[4]

HTN is a multifactorial disease linked with age, gender, ethnicity, socioeconomic status, education, smoking, body mass index (BMI), basic healthcare and treatment availability. Various studies have shown that increased age, smoking, low income, poor dietary habits and unavailability of basic medical treatment are factors associated with increased BP and poor disease management.

Diabetes is another risk factor associated with HTN among Asians. In Thailand, the National Health Examination Survey, Cycle III (NHES-III) had shown increased prevalence of HTN in diabetic patients.[5] In the Cardiovascular Risk Factor Prevalence Study-2, 58% diabetic patients had HTN.[6] It was observed that more than 50% diabetic patients having essential HTN were resistant to insulin.[7] Despite large number of available studies, BP control with diabetes is a serious health issue worldwide.[8]

Sedentary lifestyle, obesity and increased salt intake also

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contribute towards increased BP. Along with anti-hypertensive drug therapy, lifestyle modification should be adopted in HTN treatment to achieve better outcomes.[8-10] HTN is a risk factor for kidney disease. It is not only a cause but a consequence of kidney problem as well because kidneys play pivotal role in maintaining salt concentrations the in body. So, kidney-related issues are directly linked with HTN.[11]

Limited information is available on HTN-associated risk factors. Therefore, the current study was planned to explore risk factors associated with HTN, with basic focus on its association with age, smoking, educational status, family history, diabetes and kidney diseases.

Subjects and Methods

The case-control non-interventional study was conducted at the Armed Forces Institute of Pathology, Bilal Hospital and Ahmed Medical Complex, Rawalpindi, Pakistan, from December 2016 to July 2017. Approval was obtained from the ethics committees of all the three hospitals, and informed consent was obtained from all the participants. Data was collected using a detailed questionnaire and by interviewing all the subjects with the help of trained hospital staff. Demographic, social and physical factors were addressed in the questionnaire. Qualitative variables, like smoking, family history of HTN, diabetes and kidney disease, were taken as dummy variables. Literate was defined as, school or college-level education. Patients with blood pressure $\geq$140/90mmHg and taking anti-hypertensive treatment comprised the cases, while the rest were designated as normotensive controls. BP was measured by the attending physician. Pregnant women, disabled and severely ill subjects were excluded.

Continuous variables were expressed as mean ± standard deviation (SD). Fisher exact test was used for comparison of categorical variables. Risk factors for hypertensive cases were tested using multivariate logistic regression analysis. The goodness of fit was evaluated using deviance statistic and log likelihood statistic for the logistic model. All P values were calculated by 2-tailed test and a value of less than 0.01 was considered statistically significant. Independent variables tested were age, smoking, family history of HTN, diabetes, kidney diseases and educational status. Statistical analyses were conducted using R 3.4.2 and SPSS 24.

Results

Of the 2,000 subjects, 549(27.45%) were hypertensive cases and 1451(72.55%) were normotensive controls.

Table-1: Comparison of socio-demographic characteristics between Hypertensive cases and Normotensive controls.

Characteristics	Hypertensive (n=549)	Normotensive (n=1451)	Fisher exact test (p-value)
Mean Age (Years)	43.32±9.7	31.8±10.1	
Range	(22-60)	(15-60)	
Age group			
≤30	67(12.2)	8.6(55.5)	<0.001
>30	482(87.8)	645(44.5)	
Smoking Status			
Yes	288(52.5)	354(24.4)	<0.001
No	261(47.5)	1097(75.6)	
Kidney diseases			
Yes	157(26.6)	201(13.9)	<0.001
No	392(71.4)	1250(86.1)	
Diabetes			
Yes	227(41.3)	288(52.5)	<0.001
No	322(58.7)	261(247.5)	
Family History of Hypertension			
Yes	272(49.5)	227(22.5)	<0.001
No	277(50.5)	1124(77.5)	
Education			
Literate	346(63.0)	1060(73.1)	<0.001
Illiterate	203(37.0)	391(26.9)	

SD: Standard deviation.

Table-2: Multivariate logistic regression analysis of risk factors associated with systolic hypertension.

Variables	Hypertension OR(95% CI)	P(Wald's test)	P(LR-test)
Age	1.21(1.19-1.24)	0.000***	0.000***
Smoking	1.56(1.13-2.16)	0.008**	0.007582**
Kidney diseases	2.75(1.80-4.20)	0.000***	0.000***
Diabetes	1.49(1.05-2.12)	0.024*	0.025*
Family History of Hypertension	1.50(1.07-2.11)	0.02*	0.02*
Education	0.54(0.39-0.76)	0.000***	0.000***

Note: ***P<0.001, **P<0.01, *P<0.05 CI: Confidence interval. OR: Odds ratio.
Null deviance: 1882.5 on 1999 degrees of freedom
Residual deviance: 1033.8 on 1993 degrees of freedom
Deviance= 848.7, df= 6, p-val= 0.0000
Log-likelihood= -516.9036
No.ofobservations= 2000
AIC value= 1047.8072.

Mean age was 43.32±9.7 years among the cases and 31.8±10.1 years among the controls. Age, smoking, educational status, kidney diseases, diabetes and family history were significantly associated with HTN (p<0.01) (Table-1). Increased age was positively associated with onset of hypertension (Odds Ratio OR =1.21; 95% Confidence Interval CI: 1.19-1.24) (Figure-1). Multivariate logistic regression analysis also confirmed the findings (Table-2).

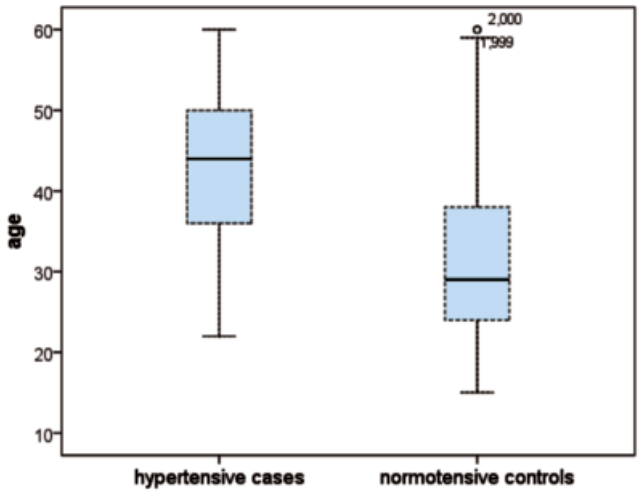

Figure 1: Box plot of age for hypertensive cases and normotensive controls.

Discussion

Pakistan, being a developing country, is going through rapid epidemiological and demographic transition. Provision of basic life necessities plays a pivotal role in such conditions. Unfortunately, economic burden, unhealthy lifestyle and poor dietary habits make individuals' life more miserable. According to a survey, prevalence of HTN is 35% in Pakistani population[12]. Many complications have been associated with HTN but the current study focussed only on some basic risk factors due to availability of limited data. A recent study conducted in Rawalpindi and Islamabad highlighted HTN risk factors but it was not a case-control study and data was collected from the general population.[13] The current study provides in-depth understanding of HTN risk factors. Increased age was found to be strongly associated with HTN. Various other studies have shown similar kind of results.[13,14] Even treatment becomes much more difficult in elderly patients because it is harder to change lifestyle and adopt vigorous exercises. However, healthy lifestyle in early ages could delay disease progression and reduce HTN-associated diseases.

Tobacco consumption is one of the most common causes of preventable cardiovascular mortality throughout the world.[15] Sympathetic nervous over-activity is the immediate response of smoking and is related to increased myocardial oxygen consumption because of raised BP, heart rate and myocardial contractility.[16] Cigarette smoking was found to be strongly associated with HTN in the current study which is concurrent with already available literature.[17,18]

People belonging to low socioeconomic group with lower literacy rate were more vulnerable to HTN in our study in line with other local and international studies.[12,19-20]

Obesity significantly contributes towards the onset of HTN, kidney diseases and diabetes.[21] In our study population, kidney diseases and diabetes were significantly associated with HTN. Other studies also reported direct association between HTN and progression of kidney diseases.[22] Kidneys play an important role in BP management and are directly linked with individual's sensitivity to salt.[21] HTN and diabetes frequently occur together. Substantial overlap exists between aetiology and disease mechanisms of HTN and diabetes. Literature has shown similar kind of results as reported by the current study.[12,23,24]

Family history is a major non-modifiable risk factor in any disease. In the current study, family history proved to be a strong candidate in the development of HTN as has been reported in literature.[14,25]

Studies with a bigger sample size and in-depth examination of all possible risk factors will help in elucidating more informed results.

Conclusion

Age, smoking, family history, kidney diseases and diabetes were found to be strong prognostic factors for the onset of HTN in Pakistani population.

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