

## A Statistical Analysis of Hypertension as Cardiovascular Risk Factor

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**Abstract:** There was a continuous, strong and graded relation between blood pressure and cardiovascular disease but no clear threshold value separated hypertensive patients who would experience future cardiovascular events from those who will not. 600 patients were examined. T test, Chi square test and Logistic Regression were applied. According to T test 253 were hypertensive and 357 were not. The % age of hypertension was 42.2%. The frequency of cardiovascular patient was 344 out of 600. The % age of cardiovascular patients was 57.3%. The present study suggests that numerous factors definitely increase cardiovascular risk including age, sex, family history, raised cholesterol, smoking, diabetes mellitus, obesity, sedentary lifestyle and left ventricular hypertrophy.

**Key words:** Hypertension • Cardiovascular diseases • Pakistan

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### INTRODUCTION

Hypertension is one of the most important and modified cardiovascular risk factor. [1]. In industrialized countries it is a cause of stroke, congestive heart failure and peripheral vascular disease because of its high prevalence [2-4]. It accelerates atherogenesis, imparting a 2- to 3-fold increased risk of such events. [5] Extensive epidemiologic studies, particularly in the United States, published from 1963 onwards, have evidenced both the increase in blood pressure with age and the increased incidence of cerebral, vascular and cardiac complications with hypertension [6].

The cardiovascular and cerebrovascular risks associated with elevated blood pressure levels are greater in the elderly than in their younger counterparts. After the age of 60, women have a higher blood pressure than men. Systolic hypertension accounts for > 50 % of hypertensive cases in the elderly, probably as a result of arterial stiffening and loss of arterial compliance that occurs with ageing [7-8].

There are many causes of hypertension so it is multifactorial. Adrenergic activity through beta-receptor stimulation increases the heart rate and through alpha-receptor stimulation increases the peripheral arteriolar constriction and this can elevate the blood pressure. The damage of the inner lining of the arterioles release a vasoconstriction polypeptide 'endothelin' which

causes arteriolar constriction eventually a sustained BP rise and leakage of micro-albuminuria [9]. Certain salt sensitive individuals are more susceptible than others to a high dietary salt intake and are more likely to develop hypertension as a result of excessive salt intake in diet and it is more common in black than white particularly in USA [10]. Obesity seems to be directly related to hypertension and cardiovascular problems by insulin resistance and ventricular hypertrophy respectively [11, 2].

Cardiovascular disease, which encompasses heart disease, stroke and hypertension, was responsible for 16.7 million deaths in 2003. This number represented one-third of total deaths worldwide. In the United States, cardiovascular disease alone is responsible for approximately 1 in every 5 American deaths. It is estimated that by 2010, cardiovascular disease will also be the major cause of morbidity and mortality in developing countries [12].

Hypertension is a major health problem not only in Pakistan but all over the world. A lot of research work has been reported on its causes, effects and medication. Although there is a bulk of information but it is increasing day by day. The prevalence in Pakistan is much high due to poor hygienic, socioeconomic and environmental conditions. The purpose of present study was to evaluate the hypertension as a cardiovascular risk factor.

## MATERIALS AND METHODS

A survey was conducted in different areas of Pakistan during 2008- 2009 to evaluate the relationship of hypertension with cardiovascular diseases. Free Medical Camp was organized by department of Zoology, University of Gujrat in collaboration with family Hospital and Heart clinic at Panjan Kisana G.T. Road Gujrat on March, 2009 and Mines Welfare Hospital Choasaidan Shah Chakwal , 2008. More than six hundred patients were examined.

Various medical tests such as Blood pressure, blood sugar level at random, Cholesterol and body fat were tested by traditional clinic Methods. Data was collected on the basis of questionnaire.

Statistical analysis was applied on the data to find out the association between hypertension and Cardiovascular disease.

## RESULTS

600 patients were examined. T test, Chi square test and Logistic Regression were applied. According to T test 253 were hypertensive and 357 were not. The % age of hypertension was 42.2%.

The frequency of cardiovascular patient was 344 out of 600. The % age of Cardiovascular patients was 57.3%. All were in the range of 10 to 90 years of age group. According to chi square test, it was shown that there is consistent and continuous relations between blood pressure and the subsequent occurrence of various CV events .The inter relationship between hypertension and CVD is shown in Table 1.

According to Logistic Regression the patients of hypertension have 2.03 times more chance to get the cardiovascular diseases (Appendix 4). Table 2 depicts the relationship between hypertension and CVD in female. All the patients were divided in 7 different age groups. A gap of 10 years was taken in each group. The frequency of hypertension and CVD in male is shown in Table 3.

## DISCUSSION

Hypertension is the most common public health problem. The heart is a pump designed to force blood through our body. Blood is pumped from the heart through the arteries out to our muscles and organs. In 90 to 95 percent of high blood pressure cases, the cause is unknown. In fact, you can have high blood pressure for years without knowing it. That's why it's the

Table 1: The interrelationship between hypertension and cardiovascular diseases

Hypertension	Cardiovascular diseases		Total
Yes	170	83	253
No	174	173	347
Total	344	256	600

Table 2: Table showing hypertension as cardiovascular risk factor in female.

Age group	Female	Hypertensive	CVD
10-20	19	7	7
21-30	61	25	21
31-40	72	8	10
41-50	115	48	45
51-60	22	35	25
61-70	20	19	17
71-80	10	8	9

Table 3: A table showing the hypertension as CVD risk factor in male

Age group	Male	Hypertensive	CVD
10-20	15	12	11
21-30	39	28	25
31-40	32	45	30
41-50	91	43	39
51-60	64	8	11
61-70	30	18	16
71-80	10	7	8

“silent killer” When the cause is unknown, you have what's called essential or primary hypertension. In the remaining 5% or less of people with elevated blood pressure, a specific cause is known and they are considered to have "secondary hypertension." Examples of causes of secondary hypertension include kidney failure, narrowing of the arteries to the kidneys and various hormonal conditions [13].

Arterial hypertension continues to represent a major risk factor for heart disease, stroke and kidney disease. People with blood pressures (140-159 mm Hg systolic or 90-99mmHg diastolic) may have a high risk of developing cardiovascular disease e.g. stroke or angina (chest pains); [14].

The present study showed that relationship between Blood Pressure and risk of cardiovascular disease CVD events is continuous, consistent and independent of other risk factors (Table 1). The higher the Blood Pressure the greater the chance of myocardial infarction, heart failure (HF), stroke and kidney disease. For individuals aged 40 to 70 years, each increment of 20 mm Hg in systolic BP or 10 mm Hg in diastolic BP doubles the risk of CVD across the entire BP range from 115/75 to 185/115 mm Hg [15].

High blood pressure increases the heart's workload, causing the heart to thicken and become stiffer. It also increases your risk of stroke, heart attack, kidney failure

and congestive heart failure. When high blood pressure exists with obesity, smoking, high blood cholesterol levels or diabetes, the risk of heart attack or stroke increases several times [16, 17].

Elevated blood pressure is known to be a risk factor for death from coronary heart disease (CHD). However, it is unclear whether the risk of death from CHD in relation to blood pressure varies among populations [18].

Men have a greater risk of heart attack than women do and they have attacks earlier in life (Table 2&3). Even after menopause when women's death rate from heart disease increases. It is not as great as men's [19].

Elder patients with hypertension have a higher absolute risk of cardiovascular events than younger persons with hypertension and are more likely to have higher systolic blood pressure. A higher pulse pressure (increasingly recognized as an independent risk factor for cardiovascular events) and isolated systolic hypertension.

Elevated blood pressure has emerged as a prominent member of cardiovascular risk factors. The study's documentation of a strong link of blood pressure to development of cardiovascular events stimulated the pharmaceutical industry to develop medications for controlling blood pressure and, in turn, national campaigns to combat hypertension and its adverse vascular outlook [20].

Hypertension is one of the most prevalent and powerful contributors to cardiovascular diseases, the leading cause of death in the United States. There is, on average, a 20 mm Hg systolic and 10 mm Hg diastolic increment increase in blood pressure from age 30 to 65 years. Isolated systolic hypertension is the dominant variety. There is no evidence of a decline in the prevalence of hypertension over 4 decades despite improvements in its detection and treatment. Hypertension contributes to all of the major atherosclerotic cardiovascular disease outcomes increasing risk, on average, 2- to 3-fold [21].

A strong, graded relation between raised serum cholesterol and coronary artery disease is seen with total cholesterol values above 4.65 mmol/l. [22] The risk of cardiovascular disease in smokers is proportional to the number of cigarettes smoked and how deeply the smoker inhales and it is apparently greater for women than men [15].

Large population based studies consistently show continuous, strong and graded relations between blood

pressure and the subsequent occurrence of various atherosclerotic events.

The present study revealed that there is positive and significant relationship between heart disease and hypertension. The results showed that hypertension is also a major risk factor of cardiovascular disease. The patients of hypertension have 2.03 times greater chance to get the cardiovascular diseases.

Hypertension affects nearly 42% of individuals aged 10-90 years. A substantial number of individuals are unaware that they have hypertension and an even larger number has high normal blood pressure and is at risk for developing hypertension. This situation threatens to grow far worse as the population ages unless effective, population based efforts to lower blood pressure should be taken.

Cardiovascular disease (CVD) is the leading cause of the growing global disease burden due to non-communicable diseases. For successful prevention and control of CVD, strategies that focus on individuals need to complement population-wide strategies. Strategies that focus on individuals are cost effective only when targeted at high-risk groups. Risk prediction tools that easily and accurately predict an individual's absolute risk of CVD are keys to targeting limited resources at high-risk individuals who are likely to benefit the most. Health systems in low-income countries do not have the basic infrastructure facilities to support resource-intensive risk prediction tools, particularly in primary healthcare.

## REFERENCES

1. Mac Mahon, S., R. Peto, J. Cutler, R. Collins, P. Sorlie, J. Neaton, R. Abbott, J. Godwin, A. Dyer and J. Stamler, 1990. Blood pressure, stroke and coronary heart disease, part I: prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. *Lancet*, 335: 765-74.
2. Fiebach, N.H., P.R. Hebert, M.J. Stampfer, G.A. Colditz, W.C. Willett, B. Rosner, F.E. Speifzer and C.H. Hennekens, 1989. A prospective study of high blood pressure and cardiovascular disease in women. *Am. J. Epidemiol.*, 130: 646-54.
3. Stamler, J., R. Stamler and J.D. Neaton, 1994. Blood pressure, systolic and diastolic and cardiovascular risks: US population data; hypertension, 153: 598-615.

4. Wilson, P.W.F. and W.B. Kannel, 1995. Hypertension, other risks factors and the risk of cardiovascular disease. In: Laragh JH, Brenner BM (Eds). Hypertension: Patho physiology, Diagnosis and Management I. 2nd ed. Raven Press, NewYork, NY, pp: 99-114.
5. Leishman, A., 1963. Merits of reducing high blood pressure. Lancet, I: 1284-8.
6. Ostfeld, A.M., R.B. Shekelle, H. Klawards and H.M. Tuffo , 1974. Epidemiology of stroke inan elderly population. Is J Public Health, 64: 450-8.
7. Kannel, W.B. and J. Stokes, 1985. Hypertension as a cardiovascular risk factor. In: Robertson JIS, ed. Handbook of Hypertension: Epidemiology of Hypertension. Vol. 6. Amsterdam.
8. Blair, Dr. Glover, W.E. Greenfield and A.D.M. Roddie, 1959. Excitation cholinergic vasodilator nerves to human skeletal muscles during emotional stress J. Physiol., 148: 633-647.
9. Blaustein, M.P. and J.M. Hamlyn, 1991. Pathogenesis of essential hypertension: a link between dietary salt and high blood pressure. Hypertension, 18: 184-195.
10. Manson, J.E. and G.A. Faich, 1996. Pharmacotherapy for obesity -- do the benefits outweigh the risks? N Engl. J. Med., 335: 659-660.
11. World Health Organization. Global Strategy on Diet, Physical Activity and Health. Cardiovascular Disease: Prevention and Control, 2004.
12. Armughan Riaz, 2003. Article; Good Diet for High Blood Pressure & Hypertension. *Hypertens.*, pp: 1-2
13. Neal, M.D. and Neil Chapman, 1998. The effect of nisoldipine as compared with enalapril on cardiovascular outcomes in patients with non-insulin dependant diabetes and hypertension. N. Engl. J. Med., 338: 645-652.
14. Lewington, S., R. Clarke, N. Qizilbash, R. Peto and R. Collins, 2002. Prospective Studies Collaboration. Age-specific relevance of usual blood pressure to vascular mortality: a meta-analysis of individual data for one million adults in 61 prospective studies. Lancet. 360: 1903-1913.
15. Prescott, E., M. Hippe, P. Schnohr, H.O. Hein and J. Vestbo, 1998. Smoking and risk of myocardial infarction in women and men: longitudinal population study. BMJ 316: 1043-1047.
16. Stokes, J., W.B. Kannel, P.A. Wolf, R.B. D'Agostino and L.A. Cupples, 1989. Blood pressure as a risk factor for cardiovascular disease: The Framingham Study 30 years of follow-up. Hypertension, 31: I13-I18.
17. American Heart Association, Heart diseases and Stroke Statistics, 2009.
18. Van Den Hoogen, P.C.W., Feskens, E.J.M. Nagelkerke, N.J.D. Menotti, A. Nissinen and D. Kromhout, 2000. The relation between blood pressure and mortality due to coronary heart disease among men in different parts of the world. N. Engl. J. Med., 342: 1-8.
19. Kannel, W.B., 2000. Risk stratification in hypertension: new insights from the Framingham study. Am. J. Hypertens, 13: 3S-10S.
20. Kannel, W.B., 1996. Blood pressure as a cardiovascular risk factor: prevention and treatment. JAMA, 275: 1571-1576.
21. Neaton, J. and D. Wentworth, 1992. Serum cholesterol, blood pressure, cigarette smoking and death from coronary heart disease. The Multiple Risk Factor Intervention Trial Research Group. Arch. Intern Med., 152: 56-64.