

Prehypertension, Parental history of hypertension and Metabolic risk factors in young individuals

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Abstract:

Background & Aim : Hypertension is one of the biggest health challenges of 21st century. Persons with prehypertension are at an increased risk of developing hypertension than do those with lower BP levels. Risk factors for developing hypertension peculiar to Indian population are high familial aggregation. Prehypertension is associated with metabolic risk factors which are likely to further increase the risk of cardiovascular diseases. Hence we designed this study to analyse the association of prehypertension with parental history of hypertension. And to compare blood sugar and serum cholesterol levels between prehypertensives and normotensives.

Methods: In this cross-sectional study 250 males and 250 females were recruited from the Coimbatore Medical College. A detailed history including parental history of hypertension was collected. Blood pressure was recorded using a standardised mercury sphygmomanometer. Fasting blood sample was collected to assess blood sugar and serum cholesterol values.

Results : Prehypertension was positively associated with parental history of hypertension. Blood sugar and serum cholesterol values were significantly higher in prehypertensives compared to normotensives.

Conclusion: With the current knowledge, prehypertension should serve as an early warning system for patients and clinicians that metabolic changes that ultimately lead to cardiovascular disease may well be underway. We conclude that by screening for metabolic risk factors in prehypertensives at an early age, these patients can be targeted with effective public health education and early life – style modification interventions to provide important long-term benefits.

Keywords: Blood sugar, Prehypertension, Serum cholesterol

I. Introduction

Hypertension is a chronic disease of concern due to its role in the causation of coronary heart disease, stroke and other vascular complications. It is one of the major risk factors for cardiovascular mortality, which accounts for 20-50% of all deaths[1]. Patients with blood pressure above optimal levels (systolic BP 120 -139 mmHg and / or diastolic BP 80 – 89 mmHg) , but not clinical hypertension are defined as having prehypertension[2]. Prehypertension is a risk factor for overt hypertension and it increases the risk for coronary heart disease, stroke and other vascular complications. Prehypertension is not only one of the major risk factors for most forms of cardiovascular disease, but it is a condition with its own risk factors like obesity, genetic factors, age, sex, physical activity and environmental stress. 25% of children with one hypertensive parent and 50% of children with two hypertensive parents will eventually become hypertensives demonstrating that heredity plays a major role in the development of disease[3]. Elevated serum cholesterol and diabetes mellitus are independent risk factors for coronary heart disease. Prehypertension is associated with metabolic risk factors which are likely to further increase the risk of cardiovascular diseases. Hence in this study we aimed to analyse the relation between prehypertension and parental history of hypertension and to compare the blood sugar and serum cholesterol levels in prehypertensives and normotensives.

II. Materials And Methods

Ethical clearance was obtained from Institutional Ethical Committee. Informed consent was obtained from all participants. This is a cross sectional comparative study. This study was conducted in the Department of Physiology, Coimbatore Medical College, Coimbatore. A total of 500 subjects were included in the study of which 250 were males and 250 were females. They were of 18 – 23 years age group. The study subjects were randomly selected from the students of Coimbatore Medical College. The study subjects of both the sexes were divided into two groups based on their sex.

Group I – Prehypertensives,

Group II – Normotensives. Known hypertensives, Known cardiac patients, Acutely ill patients were excluded from the study.

A detailed history including parental history of hypertension was recorded from the study subjects. A standardized mercury sphygmomanometer, stethoscope, BP cuff of appropriate size were used to measure the blood pressure. BP was recorded in the right arm in sitting posture after 5 minutes of rest. The first and fifth korotkoff sounds were recorded as systolic BP and diastolic BP. Three recordings of BP were taken on three consecutive days. Average of the three readings was taken as the blood pressure of the subject. [4]

Blood samples were collected by sterile technique using disposable syringes. Fasting samples were collected in the morning after 12 hours of fasting from a group of 25 prehypertensives and 25 normotensives selected randomly from the study group. Fasting blood glucose and total serum cholesterol were estimated using an autoanalyser. Normal serum cholesterol < 200 mg/dl [4]. Normal fasting blood glucose < 140 mg / dl. [1]

III. Results

Mean and standard deviation were calculated. Student 't' test was used for intergroup comparison of the parameters - blood sugar and serum cholesterol. Parental history of hypertension among the two groups was compared by chi square test. We analysed the association of prehypertension with parental history of hypertension and found that prehypertension is significantly associated with positive parental history of hypertension. On comparing blood sugar and serum cholesterol levels between prehypertensives and normotensives, though the values were within normal range in both the groups, there was a significant difference in blood sugar and serum cholesterol levels between the two groups.

Table1: Comparison of parental history of hypertension

| | Positive parental H/O hypertension | Negative parental H/O hypertension |
|-------------------------|------------------------------------|------------------------------------|
| Prehypertensives (n=78) | 22 | 56 |
| Normotensives (n=422) | 63 | 359 |

P value = 0.008

Table 2: Comparison of Blood sugar and Serum cholesterol

| Variable | Prehypertensives(n=25) | Normotensives(n=25) | p value |
|-------------------|------------------------|---------------------|---------|
| Blood sugar | 91.60 ± 10.84 | 86.72 ± 4.93 | 0.0001* |
| Serum cholesterol | 162.64 ± 32.89 | 151.36 ± 31.66 | 0.0001* |

IV. Discussion

Prehypertensives were more likely to have a positive family history of Hypertension compared to Normotensives. This is consistent with the previous reports. Family history of hypertension was found to be a determinant of prehypertension among adult outpatients of Trinidad [5], Japanese females [6]. The observation contradicts with that of Yadav S et al who showed that family history of Hypertension is not an important contributor to prehypertension [7]. The current observation can be explained by the fact that blood pressure levels are determined in part by genetic factors and that the inheritance is polygenic. Blood pressure values of monozygotic twins are usually more strongly correlated than those of zygotic twins. It is a complex genetic disorder with genetic heritability averaging 30% [4]

Prehypertensives had significantly higher levels of blood sugar and serum cholesterol compared with Normotensives in the current analysis. The means of blood sugar in prehypertensives and normotensives lie within the normal range. This is probably because of the age group studied. But still there was a significant difference in blood sugar and serum cholesterol levels between prehypertensives and normotensives. Impaired glucose tolerance/ diabetes was significantly associated with prehypertension [7]. Studies point to a greater probability of hypercholesterolemia and hyperglycemia in prehypertensives than normotensives [8,9]. Some studies showed no significant association of Diabetes mellitus with prehypertension but have established a significant association between high serum cholesterol levels and prehypertension status [10,11]

Insulin resistance / hyperinsulinemia have been suggested as being responsible for the increased arterial pressure in patients with hypertension. The mechanisms include renal sodium retention and increased sympathetic activity by hyperinsulinemia, vascular smooth muscle hypertrophy secondary to

mitogenic action of insulin and modified ion transport across cell membrane potentially increasing cytosolic calcium levels of insulin – sensitive vascular or renal tissues resulting in heightened vascular responsiveness to vasoconstrictor agents[4].

Hypercholesterolemia is associated with increased risk for elevated arterial pressure. This is attributed to the fact that too much cholesterol in blood, builds up in the walls of the arteries causing hardening and narrowing of the arteries so that arterial pressure is elevated. The endothelial monolayer overlying the intima contacts blood. Hypercholesterolemia promotes accumulation of LDL particles in the intima. Sequestration within the intima favours oxidative modification. Such modified lipoprotein molecules may trigger a local inflammatory response responsible for signalling subsequent steps in lesion formation[4].

The specific events and time course for an individual are greatly affected by comorbidities especially dyslipidemia, cigarette smoking, diabetes mellitus, exogenous obesity and others like sedentary life style, salt intake & situational stress. Therefore controlling these risk factors among those with higher blood pressure are important public health goals.

V. Conclusion

The current analysis suggests that offsprings of hypertensive parents are at increased risk of developing prehypertension and later hypertension. Prehypertensives with associated metabolic risk factors are at increased risk of adverse outcomes. The observations re-emphasize the need for screening for metabolic risk factors in these subjects regardless of their age. And targeting these people with effective public health education and early life – style modification interventions aimed at healthy dietary habits, weight loss and increased physical activity can provide important long-term benefits[4].

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