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Relationship of Prehypertension with Cardiovascular disease risk factors in Medical Professionals of Jammu region.

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Abstract:
Introduction *: Prehypertension leads to hypertension and cardiovascular disease risk. Identification of cardiovascular risk factors in prehyperensives will reduce the burden of hypertension and cardiovascular disease risk factors in medical professionals of jammu.*
Material & methods *: Study included 184 medical professionals from medical colleges of jammu region. Fasting blood glucose and lipid variables were measured.*
Results *: Biochemical parameters like total cholesterol, triglycerides, LDL cholesterol were statistically significantly high in prehypertensives. Fasting blood glucose and HDL cholesterol were high but not stastically significant.*
Conclusion*: From the study association has been found between prehypertension and risk of developing cardiovascular disease and related morbidity and mortality, and hence life style modifications are suggested.*
Keywords: *Cardiovascular disease, Lipid profile, Prehypertension.*

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I. Introduction

Hypertension is likely the most common disease on earth[1]. It is associated with an increased risk of morbidity and mortality from cardiovascular disease and represents the single greatest preventable cause of death in humans.

The standard definition of hypertension as blood pressure (BP) ≥140/90 mmHg is based on the observation that the risk of CVD increases sharply above this level. However, data have shown that an increased risk of CVD is present in persons with BP levels as low as 115/70 mmHg and that this risk increases steadily with rising BP[2].

Patients with hyperkinetic borderline hypertension later proceed to develop established high resistance form of hypertension. The most likely mechanism for this transition is a change in cardiac and vascular responsiveness due to prolonged excess sympathetic stimulationcombined with structural pressure induced changes in these organs[3].

In its report, the Joint National Comittee-7 introduced a new BP category, "prehypertension" defined as a systolic BP (SBP) of 120 to 139 mmHg and/or a diastolic BP (DBP) of 80 to 89 mmHg. Prehypertension is based on the increased cardiovascular risks and events associated with blood pressure in this range[4]. Prehypertension is a precursor of clinical hypertension and is closely associated with increased incidence of cardiovascular disease. Patients with prehypertension have increase risk of cardiovascular related morbidity and mortality as compared to patients having normal blood pressure (<120/80 mmHg)[5]. The global CVD risk profile among prehypertensive subjects, as manifested by the Framingham risk score, shows that prehypertensive subjects carry more than double the risk of a future CVD event than do normotensive subjects. This is most likely because of the fact that prehypertension is associated with a higher prevalence of the additional CVD risk factors, which collectively result in a risk-heavy profile. This finding probably explains the increased rate of CVD events observed among prehypertensive subjects[6,7]. Atherosclerosis results from interaction of multiple factors. Many recent reports have identified that industrialization, modernization, technical advancement through lack of physical exercise, excess body weight and obesity in adults, chronic anger and stress, appear to influence prevalence of coronary artery disease risk factors, namely blood pressure, diabetes mellitus, abnormal lipid profiles, etc[8]. Much of the present interest in cholesterol arises out of its occurrence in atheromatous lesions and the possibility that there may be a relationship between elevated serum cholesterol level and ischaemic heart disease[9].The link among prehypertension, cardiovascular risk factors and the increased risk of cardiovascular morbidity and mortality may be explained by the proinflammatory nature of prehypertension and the association of this condition with increased C-reactive protein levels, tumor necrosis factor α, amyloid A,

and homocysteine[10,11].Lifestyle modifications, including weight loss, sodium restriction and dietary approaches should be recommended and adopted by all individuals with prehypertension and hypertension [12].
Aims & Objectives was to study the relationship of prehypertension with cardiovascular disease risk factors in medical professionals of Jammu region.

II. Material & Methods

The present study entitled "To study the relationship of prehypertension with cardiovascular disease risk factors in medical professionals of Jammu region" was undertaken for a period of one year w.e.f. November 1, 2012 to October 31, 2013 in the Postgraduate Department of Physiology in collaboration with the Department of Biochemistry, Government Medical College, Jammu. The aim was to Study the relationship of prehypertension with cardiovascular disease risk factors namely, bloodpressure, blood glucose levels and blood lipids (serum total cholesterol, serum triglycerides, serum HDL cholesterol and serum LDL cholesterol) in medical professionals of Jammu city. The study included 184 medical professionals from Medical Colleges of Jammu region. They were grouped in to males and females. All the subjects were requested to present themselves in Postgraduate Department of Physiology, Government. Written consent were taken from all the subjects. World Health Organization (WHO) stepwise approach was used to study the profile of risk factors of cardiovascular disease. A brief personal and family history of subjects participating in the study was taken and subjects with known risk of cardiovascular disease were excluded from study Medical College, Jammu.

Exclusion Criterion
Subjects with Diabetes mellitus, Hypertension, Obesity and Hypothyroidism
Smokers and alcoholics
Subjects with history of cardiovascular disorders

Blood pressure

The blood pressure was recorded by auscultatory method using mercury sphygmomanometer. Subject was made to sit and after a gap of 5min, the cuff of blood pressure apparatus was placed around the upper arm with the centre of bag lying over the brachial artery, keeping its lower edge about 3 cm above the elbow. The chest piece of the stethoscope was placed at the level of bifurcation of brachial artery. Cuff was inflated and pressure was raised to about 40 to 50 mmHg above systolic blood pressure (found by palpatory method). The pressure was lowered gradually until a clear tapping sound was heard which was taken as systolic blood pressure. The pressure was further lowered and the level at which sound became muffled was taken as diastolic blood pressure. Mean of the three readings were taken[13]. Prehypertension was defined as systolic blood pressure 120-139 mmHg and/or diastolic blood pressure 80-89 mmHg. Hypertension was taken as systolic blood pressure $\geq$140 mmHg and diastolic blood pressure $\geq$90 mmHg.

Biochemical measurements

Subjects were instructed not to take fatty, fried and heavy diet two days prior to test and were asked to fast for 14 hours before the day of test. This was to avoid the influence of diet on serum lipid profile and blood sugar.

5 ml of venous blood was drawn from anticubital vein under all aseptic precautions for the estimation of biochemical parameters. The sample from disposable syringes was transferred immediately to plain vacutainers which were marked already and were kept in the rack and allowed to clot at room temperature for more than 30 minutes. These samples were centrifuged in Remilab centrifuge at 3000 rpm for 15 minutes. Serums were separated and transferred to other dry test tubes which were then capped with cotton plugs and taken to the Department of Biochemistry for analysis of the following biochemical parameters

1. Fasting blood glucose
2. Serum total cholesterol
3. Serum triglycerides
4. Serum HDL cholesterol
5. Serum LDL cholesterol

All the above parameters were measured using standard biochemical procedures as follows:

1. **Fasting blood glucose** estimation was done by fully enzymatic glucose oxidase-peroxidase method (GOD-POD)[14].
2. **Serum total cholesterol** estimation was done by fully enzymatic cholesterol oxidase-peroxidase method (CHOD-POD) [15].
3. **Serum triglycerides** estimation was done by fully enzymatic glycerol phosphate oxidase-peroxidase method (GPO-POD) [16].

4. **Serum high density lipoprotein (HDL) cholesterol** estimation was done by autozyme precipitation reagent method in conjunction with autozyme cholesterol reagent[17].
5. **Serum low density lipoprotein (LDL) cholesterol** was calculated by the method of Friedwald formula[18].

Lipid profile values were assessed according to the National Cholesterol Education Programme of USA **(NCEP, 1994)** which classifies total cholesterol as desirable (<200 mg/dL), borderline high risk (200 – 239 mg/dL) and high risk (≥240 mg/dL); triglycerides as desirable (<200 mg/dL), borderline (200 – 400 mg/dL), high (400 to 1000 mg/dL) and extremely high (>1000 mg/dL) and HDL cholesterol as low (<35 mg/dL), normal (35 – 59 mg/dL) and high (>60 mg/dL). The blood glucose values were assessed according to Harrison's Principles of Internal Medicine,which classifies blood glucose values as normal (75 – 110 mg/dL), impaired glucose tolerance (111 – 125 mg/dL) and diabetes mellitus (>125 mg/dL)[19].

Plan of analysis

Data were analyzed using computer software MS Excel for Windows and EPI info version 6.1. Results were expressed as mean ± standard deviation. Student's t-test was used to compare the parameters.

III. Observations & Result

Table 1: Comparison of total cholesterol (TC) of normotensive and prehypertensive subjects

Study Groups	TC (mg %) Mean ± Standard deviation	Equality of means 't'-value	Statistical inference (2-tailed)
Normotensive (n=47)	185.72 ± 31.31	-2.45	p=.015; Highly significant
Prehypertensive (n=137)	199.90 ± 35.16		

The above table shows comparison of mean total cholesterol (TC) of normotensive and prehypertensive subjects.

- Mean TC of normotensive subjects is 185.72 ± 31.31 mg% and that of prehypertensive subjects is 199.90 ± 35.16 mg%.
- The difference between the two groups is statistically highly significant (p=.015).

Table 2: Comparison of low-density lipoprotein cholesterol (LDL-C) of normotensive and prehypertensive subjects

Study Groups	LDL-C (mg %) Mean ± Standard deviation	Equality of means 't'-value	Statistical inference (2-tailed)
Normotensive (n=47)	112.68 ± 32.68	-2.69	p=.008; Highly significant
Prehypertensive (n=137)	127.46 ± 32.37		

The above table shows comparison of mean low-density lipoprotein cholesterol (LDL-C) of normotensive and prehypertensive subjects.

- Mean LDL-C of normotensive subjects is 112.68 ± 32.68 mg% and that of prehypertensive subjects is 127.46 ± 32.37 mg%.
- The difference between the two groups is statistically highly significant (p=.008).

Table 3: Comparison of triglycerides (TG) of normotensive and prehypertensive subjects

Study Groups	TG (mg %) Mean ± Standard deviation	Equality of means 't'-value	Statistical inference (2-tailed)
Normotensive (n=47)	130.19 ± 34.30	-2.012	p=.013; Highly significant
Prehypertensive (n=137)	152.32 ± 52.12		

The above table shows comparison of mean triglycerides (TG) of normotensive and prehypertensive subjects.

- Mean TG of normotensive subjects is 130.19 ± 34.30 mg% and that of prehypertensive subjects is 152.32 ± 52.13 mg%.
- The difference between the two groups is statistically highly significant (p=.013).

Table 4: Comparison of high-density lipoprotein cholesterol (HDL-C) of normotensive and prehypertensive subjects

Study Groups	HDL-C (mg %) Mean ± Standard deviation	Equality of means 't'-value	Statistical inference (2-tailed)
Normotensive (n=47)	44.59 ± 5.06	-1.60	p=.110; Non significant
Prehypertensive (n=137)	45.12 ± 5.20		

The above table shows comparison of mean high-density lipoprotein cholesterol (HDL-C) of normotensive and prehypertensive subjects.

- Mean HDL-C of normotensive subjects is 44.59 ± 5.06 mg% and that of prehypertensive subjects is 45.12 ± 5.20 mg%.
- The difference between the two groups is statistically non-significant (p=.110).

Table 5: Comparison of fasting blood glucose (FBG) of normotensive and prehypertensive subjects

Study Groups	FBG (mg%) Mean ± Standard deviation	Equality of means 't'-value	Statistical inference (2-tailed)
Normotensive (n=47)	85.80 ± 9.30	-1.10	p=.272; Non significant
Prehypertensive (n=137)	87.99 ± 12.44		

The above table shows comparison of mean fasting blood glucose (FBG) of normotensive and prehypertensive subjects.

- Mean FBG of normotensive subjects is 85.80 ± 9.30 mg% and that of prehypertensive subjects is 87.99 ± 12.44 mg%.
- The difference between the two groups is statistically non-significant (p=.272).

IV. Discussion

In the present study we found that there is no statistically significant difference in fasting blood glucose among normotensives and prehypertensives. However total cholesterol, LDL and triglycerides are higher in prehypertensives compared to normotensives and the difference is statistically significant. HDL is higher in prehypertensives but the difference is statistically non significant. This shows that the prehypertensives are at higher risk of developing Cardiovascular diseases

Over the last decade, attention has been drawn to the diagnosis and treatment of disease during the preclinical stages, before the progression to overt clinical manifestations. The true question regarding prehypertension is not the mere method of its progression to overt hypertension but rather the global CVD risk associated with this condition and the potential risk reduction to be gained by early initiation of treatment[20].

Also a simulation model has shown that elimination of prehypertension results in a substantial public health benefit, thus providing the rationale for an interventional approach to this condition[21].

Hence relationship of blood pressure to cardiovascular outcomes and the high rate of progression from prehypertension to hypertension is the strongest support for a more aggressive approach to treat prehypertension. Various studies have been reviewed and found to have similar results as our study.

Our study is in agreement with [22], who conducted a study to see association between blood pressure and serum lipids in Tromso, Norway and found that total cholesterol increased significantly with increase in systolic and diastolic blood pressure. In men, association between blood pressure and total cholesterol decreased with age, whereas in women, it increased with age.

Similar observations were made by [23], who studied association between serum cholesterol and blood pressure in 16,525 Oslo men. The study found that serum cholesterol value was 0.71 mmol/L higher at diastolic blood pressure >110 mmHg than at diastolic blood pressure <70 mmHg. BMI and serum triglycerides significantly influence relationship between blood pressure and cholesterol.

Our study is in agreement with study conducted by[24], who found that increased HDL cholesterol is associated with high prevalence of prehypertension.

Our study is also in agreement with that of [25], who assessed the prevalence of prehypertension and its associated risks in rural Taiwanese population and found that prehypertensives had higher levels of triglycerides than normotensives. Early lifestyle modifications, healthy diet, optimal weight control and exercise were recommended interventions.

Hence it can be concluded that there is association between prehypertension and risk of developing cardiovascular diseases and related morbidity and mortality. Detection and prevention of prehypertension may curtail these risk factors, and hence life style modifications are suggested especially for medical professionals who do not take adequate care of their health, and are reluctant to seek medical advised.

Apart from preventing prehypertension, prevention of progression of prehypertension to overt hypertension is very important factor. Life style modifications like weight lost, salt restriction, regular exercise and regular check up are strongly recommended, as to prevent cardiovascular diseases and related morbidity and mortality which will reduce the burden on society.

V. Conclusion

From the study association has been found between prehypertension and risk of developing cardiovascular disease and related morbidity and mortality Detection and prevention of prehypertension and

progression of prehypertension to overt hypertension, may curtail these risk factors and hence life style modifications are suggested especially for medical professionals who do not take adequate care of their health.

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