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Original Research Article

Plasma fibrinogen in essential hypertension patients

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Abstract: The aim of this study was to assess the plasma fibrinogen level in hypertensives and to compare whether there is difference in plasma fibrinogen level between obese and non-obese hypertensives and normal individuals. This case control study was conducted in the Department of Internal Medicine, Rajiv Gandhi Government General Hospital & Institute of Biochemistry, Madras Medical College, Chennai. 30 cases of hypertension without obesity, 30 cases of hypertension with obesity and 30 healthy controls were included in the study. Plasma fibrinogen level was measured by Clauss method. Hypertensive patients was found to have elevated plasma fibrinogen levels than control subjects (2.70±0.40g/l, p< 0.016) & among them Obese hypertensives had higher fibrinogen level (3.04±0.57g/l) than non obese hypertensives(1.83±1.84 g/l, p = 0.001). Plasma fibrinogen level was higher in hypertensive patients than healthy controls. Thus monitoring of plasma fibrinogen level among hypertensives and using drugs to reduce to normal level may prevent the development of thrombotic complications in hypertensive patients.
Keywords: Essential hypertension, obesity, fibrinogen.

INTRODUCTION

Plasma fibrinogen is an important component of the coagulation and also a major determinant of blood viscosity and blood flow [1]. Many factors including reduced blood flow due to elevated viscosity of plasma have been implicated in the pathogenesis of hypertension [2]. Fibrinogen is a soluble plasma glycoprotein synthesised by the liver and converted into fibrin by thrombin during blood coagulation [3]. Fibrinogen contributes more than other proteins to plasma viscosity in healthy subjects [4]. This contribution is greatly increased in disease states [5], particularly in hypertension [6]. Hypertension is classified as essential hypertension and secondary hypertension. About 90–95% of cases are categorized as "primary hypertension" which means high blood pressure with no obvious underlying medical cause [7].The remaining 5–10% of cases (secondary hypertension) is caused by other conditions that affect the kidneys, arteries, heart or endocrine system. Hypertension is considered as an important risk factor for stroke, myocardial infarction and cardiovascular disease and affects 18% of the adult population [8]. Hypertension leads to accelerated development of atherosclerosis and increased shear stress, leading to plaque rupture. Hypertension also clusters with other risk factors, such as hypertriglyceridemia, obesity, and insulin resistance [9,10]. Fibrinogen is also considered to play an important role in atherogenesis [8]. Fibrinogen is an important haemostatic and thrombotic risk factor as well as an inflammatory marker. Obesity was found to be significantly associated with fibrinogen. A study by James et al also showed that fibrinogen was found to increase with body mass index [10].

This study was done to compare the level of plasma fibrinogen in hypertensive patients and normal individuals. To compare whether there was difference in plasma fibrinogen level between hypertensives with obesity & hypertensives without obesity and normal subjects.

By this study we conclude that plasma fibrinogen was elevated in hypertensive patients compared to controls. Fibrinogen was one of the precipitating factors for thrombosis and its elevated level increases the risk of stroke and cardiovascular disease in hypertensives with obesity.

AIM OF THE STUDY

- To estimate the level of plasma fibrinogen in essential hypertensive patients.
- To compare plasma fibrinogen level between hypertensives with and without obesity and normal subjects.

MATERIALS AND METHODS

Cases between 30 – 60 years of age were selected from patients attending the Internal medicine outpatient department and ward of our hospital .30 hypertensives without obesity and 30 with obesity were included in Group 1 and Group 2 respectively. 30 age and sex matched healthy volunteers were selected as controls (Group 3). The diagnosis of hypertension is based on JNC 7 Criteria [11],

- Normal: systolic lower than 120 mm Hg, diastolic lower than 80 mm Hg
- Prehypertension: systolic 120-139 mm Hg, diastolic 80-89 mm Hg
- Stage 1: systolic 140-159 mm Hg, diastolic 90-99 mm Hg
- Stage 2: systolic 160 mm Hg or greater, diastolic 100 mm Hg or greater.

The body weight of the hypertensives and healthy subjects was calculated by weighing machine. Height of the subjects was calculated with metal scale and body-mass index of the subjects was calculated by body weight in kilograms divided by height in meter squares.

Blood pressure of the subjects was determined through auscultatory method by mercurial sphygmomanometer in sitting position. Five millilitres of venous blood was collected in a tube containing anticoagulant, citrate .The samples were centrifuged, separated and analysed. Plasma fibrinogen was measured by Clauss method.

Patients with clinical or laboratory evidence suggestive of secondary hypertension are excluded from the study. The study was conducted after getting informed consent from the study population.

Statistical analysis

Independent t-test was used to compare and p value obtained. P value < 0.05 was considered significant. Statistical analysis was done using SPSS software version16.

RESULTS

This study conducted with 60 hypertensive patients (cases) and 30 healthy volunteers (controls).Table-1 shows the comparison of plasma fibrinogen level between cases and controls. Table-2 shows the comparison of plasma fibrinogen level between obese and non-obese hypertensives.

Table-1: T-test comparison for plasma fibrinogen level between cases and controls

Biochemical Parameter	Cases n=60 Group 1 & Group 2	Controls n=30 Group 3	p value
Plasma fibrinogen(g/l)	3.04±0.58	2.70±0.40	<0.016(S)

There was significant difference in plasma fibrinogen level between cases (hypertensives with and without obesity) and controls (healthy subjects) with p value <0.016.

Table-2: T-test comparison for plasma fibrinogen level between obese and non-obese hypertensives.

Biochemical Parameter	Cases n=30 Group 1	Cases n=30 Group 2	P value
Plasma fibrinogen(g/l)	3.04±0.57	1.83±0.84	<0.001(S)

There was significant difference in plasma fibrinogen level between obese and non-obese hypertensives.

DISCUSSION

Fibrinogen is a soluble glycoprotein found in the plasma, with a molecular weight of 340 kDa. It comprises of three pairs of non-identical polypeptide chains (alpha, beta and gamma chains) linked to each other by disulphide bonds [12]. Fibrinogen has a biological half-life of about 100 h and is synthesized predominantly in the liver. As a clotting factor, fibrinogen is an essential component of the blood coagulation system, being the precursor of fibrin. However, at the 'usual' plasma levels of 1.5 to 4.5 g/l, its concentration far exceeds the minimum concentration of 0.5–1 g/l necessary for haemostasis. Lee et al found statistically significant elevated levels of fibrinogen among individuals with cardiac risk factors, hypertension, and diabetes [13]. Fibrinogen plays a vital role in a number of pathophysiological processes in the body, including inflammation, atherogenesis and thrombogenesis. Proposed mechanisms include the infiltration of the vessel wall by fibrinogen, haemorrheological effects due to increase in blood viscosity, increased platelet aggregation and thrombus formation [14]. Fibrinogen contributes more than other proteins to plasma viscosity in healthy subjects [5]. This contribution is greatly increased in disease states [6], particularly in hypertension. Furthermore, circulating levels of fibrinogen have been found to be elevated in hypertension and associated with systolic blood pressure [15]. Plasma fibrinogen concentration has been positively correlated with body mass index [16], Indeed, plasma fibrinogen level is significantly higher amongst patients with a body mass index of > 30 kg/m, compared to those with body mass index < 25 kg/m^2, and rises with higher quartiles of skin fold thickness.Because both complications of hypertension, myocardial infarction and stroke occur due to thrombosis rather than to hemorrhage, fibrinogen may exert its effect in part through promotion of a prothrombic state. Our present study compared plasma fibrinogen levels between hypertensives and control subjects. Further, comparisons in fibrinogen levels were made between obese and non obese hypertensives. A statistically significant difference was recorded in both the comparisons. Similarly, Lee et al, in a case-control population survey, found statistically significant elevated levels of fibrinogen among individuals with hypertension and obesity. McNicholas WT *et al*. [17] also recorded similar elevations in plasma fibrinogen in hypertensive and obese patients compared to normal subjects.

CONCLUSION

It is observed from this study that plasma fibrinogen le vels are significantly elevated in hypertensive patients compared to controls. A further rise in plasma fibrinogen level is noted in hypertensive patients with obesity. Increased fibrinogen level is an indication of prothrombotic state and hence the risk of stroke and cardiovascular diseases. Monitoring of plasma fibinogen level among hypertensives and using drugs to reduce to normal level may prevent the development of stroke and cardiovascular diseases.

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