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RESEARCH ARTICLE

A Study on Hepatic aminotransferases among elderly hypertensive patients: a population based observation

Roy Himansu[1], Dan Subhasish[2], Rahaman Musfikur[3], Banerjee Prithwijit[4] *, Adak Shiuli Roy[5]

[1] MS, Associate Professor, Department of General Surgery, Medical College Kolkata, India.

[2] MD, Demonstrator, Department of Biochemistry, Medical College Kolkata, India.

[3] MD, Assistant Professor, Department of Pharmacology, Medical College Kolkata, India.

[4] MD, Demonstrator, Department of Pharmacology, Medical College Kolkata, India.

[5] MD. Associate Professor, Department of Biochemistry, North Bengal Medical College, Darjeeling, India.

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ABSTRACT

Background: Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) are the principal hepatic enzymes in clinical laboratory setup. ALT and AST are elevated in various types of hepatitis, cirrhosis and hepatic neoplasia. Recently, in some studies, the elevation of ALT has been observed in hypertension (HTN) and metabolic syndrome. **Objective:** To study the relationship of Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) with elderly hypertensive patients. **Materials and methods:** 95 elderly patients aged between 50 to 75 years of either sex and 92 age and sex matched control individuals were recruited into the study, after obtaining their informed consent. Serum AST and ALT levels of both the groups were analysed statistically. **Results:** Serum ALT level was significantly higher in HTN group than in control group ($p < 0.05$). However, no significant difference in AST levels was observed in two groups. **Conclusion:** ALT, beside its potential as a marker of hepatic disorders, may also be useful for timely detection of HTN and its subsequent deleterious consequences among elderly population.

Key words: ALT, AST, Hypertension

INTRODUCTION:

Hypertension (HTN) is defined as Systolic Blood Pressure (SBP) higher than 140 mmHg and/or Diastolic Blood Pressure (DBP) higher than 90 mmHg. The underlying pathology of 80-95% of cases of hypertension is not very clear. This type of hypertension without any well-defined etiopathology is called essential hypertension (EHTN).

Worldwide, the prevalence rate of hypertension in 2000 was 26.4% and the same is projected to be 29.2% in 2025. The estimated total number of adults with hypertension in 2000 was 972 million (957-987 million); 333 million (329-336 million) in economically developed countries and 639 million (625-654 million) in economically developing countries. The number of adults with hypertension in 2025 was predicted to increase by about 60% to a total of 1.56 billion.

In India, the prevalence of hypertension is 8.7 and 13.2 per cent in males and females respectively, as per data provided by a 2005 epidemiological study conducted by Non-communicable Diseases Division of Indian Council of Medical Research (ICMR) and sponsored by World Health Organisation (WHO).

Essential hypertension is often associated with insulin resistance (IR). 25-50 % of non-obese, non-diabetic patients with EHTN have IR[1].

ALT and AST are the principal aminotransferases of human body. The aminotransferases constitute a group of enzymes that catalyze the interconversion of amino acids to 2-oxo acids by transfer of amino groups.

Transaminases are widely distributed throughout the body. AST is primarily found in the heart, liver, skeletal muscle, and kidney. ALT is found primarily in liver and kidney, with lesser amounts in heart and skeletal muscle. AST is found in cytoplasm and mitochondria, but ALT is exclusively cytoplasmic.

Liver disease is the most important cause of increased transaminase activity in serum. In most types of liver disease, ALT activity is higher than that of AST, exceptions being alcoholic hepatitis, hepatic cirrhosis and liver neoplasia.

*Corresponding author: Banerjee Prithwijit / Email: drprithwijit@gmail.com

A number of cross-sectional studies have since shown relationships between GGT and ALT and the metabolic syndrome and insulin resistance, suggesting that GGT/ALT may serve as a marker for insulin resistance. Moreover, studies have suggested that hepatic inflammation may be another possible mechanism by which elevated hepatic enzyme levels are related to diabetes risk. Considering the role of ALT in incident type II Diabetes Mellitus and keeping in mind that the above-mentioned studies have been carried out in people of different ethnicity, there is a perceived need to verify if the association between GGT and hypertension holds for eastern Indian population too.

MATERIALS & METHODS:

Our study began after obtaining the approval from institutional ethics committee.

Study samples were collected from the OPD Clinical Biochemistry Laboratory at the Department of Biochemistry, Medical College, Kolkata from December 2011 to February 2012. The study subjects included essential HTN patients of both sex in the age group of 50-75 years and age and sex matched control individuals.

Patients who were either on any anti-hypertensive drugs or found to have Systolic Blood Pressure (SBP) higher than 140 mmHg and/or Diastolic Blood Pressure (DBP) higher than 90 mmHg on three consecutive days were considered as hypertensives. If all other secondary causes of hypertension were ruled out in them, then their hypertension was considered as essential hypertension. Patients who were neither on any anti-hypertensive drugs nor found to have Systolic Blood Pressure (SBP) higher than 140 mmHg and/or Diastolic Blood Pressure (DBP) higher than 90 mmHg on three consecutive days were considered as normotensives.

Inclusion criteria:

Essential hypertensive patients of either sex, aged 50-75 years and their age and sex matched controls, who attended the OPDs during the study period and gave their voluntary written informed consent for the study.

Exclusion criteria:

- Pregnant and lactating mothers.
- If the patient is suffering from any of the following conditions:

1. Diabetes Mellitus
2. Renal Disease
3. Liver Disease
4. Cardiac Disease
5. Active Infection
6. Any malignancy

On the first day (Study day 0), each patient was explained the details of the study rationale and confidentiality safeguards. Only those patients who gave their written consent were included in the study. Following informed consent administration, blood pressure (BP) was measured by physician of the trial team. The BP measurement was repeated for next two consecutive days (Day 1, 2). Patients who were found to have Systolic Blood Pressure (SBP) higher than 140 mmHg and/or Diastolic Blood Pressure (DBP) higher than 90 mmHg on three consecutive days were considered as hypertensive. On the Study day 2, blood sample were collected from all the study participants for estimation of serum ALT, cholesterol, triglyceride, HDL, fasting blood All samples were immediately centrifuged and stored at 2-8ºC until analysis for the relevant biochemical parameters. All analyses were performed within 3 hours of sample collection.

1. Serum Cholesterol was measured by XL600 autoanalyzer using CHOD-PAP principle.
2. Serum Triglyceride was measured by XL600 autoanalyzer using Glycerol Kinase principle.
3. Serum HDL was measured by ERBA Chem 5 V2 semi-autoanalyzer using PEG Precipitation principle.
4. Serum AST level was measured by XL600 autoanalyzer using Modified IFCC principle.
5. Serum ALT level was measured by XL600 autoanalyzer using Modified IFCC principle.
6. Patients' relevant anthropometric data were collected.

The serum levels of ALT, Cholesterol, Triglyceride, HDL of the two groups were compared for presence or absence of statistically significant differences.

Statistical Analysis:

The statistical software R version 2.11.1 was used to analyze the data. All values were expressed as mean $\pm$ one standard deviation unless otherwise indicated, and differences in mean values between two groups were analysed using Student's t-test (Figure 3, Table 1). Descriptive information regarding categorical variable were presented as frequency. Fischer's exact probability test was used for comparison of categorical data. All tests were two tailed and considered statistically significant if p-value < level of significance, 0.05.

RESULT:

Serum ALT level in HTN patients was higher than their NTN counterparts. There were no significant differences in age and serum levels of AST, cholesterol, triglyceride, HDL between the two groups. The details of the analysis are shown in table 1.

Table 1: The biochemical parameters of normotensive and hypertensive groups

	Control Group	Hypertensive Group	p-value
Number of patients	92	95	
Male/Female	50/42	54/41	0.840
Age (years)	63.71 ± 9.17	65.73 ± 8.28	0.323
SBP (mmHg)	126±12	140 ± 9	0.006*
DBP (mmHg)	79 ± 7	92 ± 9	0.017*
Waist Circumference (cm)	78 ± 9	79 ± 8	0.260
Total Protein (g/dL)	7.1 ± 0.5	6.9 ± 0.6	0.082
Albumin (g/dL)	5.1 ± 0.6	4.9 ± 0.5	0.083
Cholesterol (mg/dL)	192 ± 96	206 ± 98	0.840
Triglyceride (mg/dL)	151 ± 91	160 ± 79	0.170
HDL (mg/dL)	47 ± 10	44 ± 9	0.310
Aspartate Aminotransferase (U/L)	43.7 ± 8.1	46.8 ± 9.2	0.223
Alanine Aminotransferase (U/L)	34.7 ± 8.4	48.1 ± 11.2	0.006*

* indicates statistical significance ($p<0.05$)

DISCUSSION:

Our study results reconfirm in Indian population the findings of earlier studies investigating the association of ALT with hypertension[4].

It has been postulated that insulin resistance being one of the principal underlying pathology of essential hypertension as well as elevated hepatic enzymes, insulin resistance and accompanying inflammation may be the shared causal ancestor of both hypertension and elevated hepatic enzyme. Elevated hepatic enzyme has been interpreted as a marker for hepatic steatosis, hepatic insulin resistance and inflammation. Several possible mechanisms have been proposed to explain how hepatic enzymes are associated with essential hypertension and increase the risk of the metabolic syndrome and diabetes.

Regarding the inflammatory aspect of the putative link between hypertension and elevated hepatic enzymes, it has been shown that fat accumulation in the liver can stimulate cytokine production and inflammatory cytokines such as tumor necrosis factor-α and interleukin-6 can influence fatty acid metabolism in the liver and predispose to formation of fatty liver. Thus, another possible mechanism is that elevated liver enzymes may reflect inflammation, which in turn impairs insulin signaling in both the liver and other organs[9].

Evidence for a positive association between ALT and inflammation has come from studies examining subjects with abnormally high levels of ALT, which might reflect nonalcoholic steatohepatitis that can lead to liver inflammation. It has also been suggested that GGT/ALT might be an early marker of oxidative stress. Inflammation is one manifestation of oxidative stress, and the pathways that generate the mediators of inflammation such as adhesion molecules and interleukins are all induced by oxidative stress.

CONCLUSION:

The results of this population-based cross-sectional study suggest that ALT may serve as a marker for essential hypertension. It should be borne in mind in the clinical practice that elevated levels of ALT may not always indicate increased hepatitis, but may simply suggest the existence of the essential hypertension with its subsequent deleterious consequences viz. type II diabetes mellitus, metabolic syndrome and carotid atherosclerosis.

CONFLICT OF INTEREST:

There was nothing to best of our knowledge.

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