Original Article

Correlation between Aminotransferase Ratio (AST/ALT) and Other Biochemical Parameters in Chronic Liver Disease of Viral Origin

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Abstract

Background: *In recent years the ratio of aspartate aminotransferase (AST) to alanine aminotransferase (ALT) in patients of chronic liver disease (CLD) of various origins has gained much attention. This variable is readily available, easy to interpret, and inexpensive and the clinical utility of the AST/ALT ratio in the diagnostic workup of patients with CLD is quite promising.* ***Objective:*** *The present study was designed to find out the link between aminotransferase (AST/ALT) ratio with commonly measured biochemical parameters of liver function tests in CLD of viral origin.* ***Materials and method:*** *This cross sectional study was carried out in the department of Biochemistry, Sir Salimullah Medical College, Dhaka, Bangladesh. Forty four biopsy proven diagnosed subjects of chronic viral hepatitis without cirrhosis of both sex were selected purposively. With aseptic precaution 5 mL venous blood was collected from each subject and common liver function tests (serum AST, ALT, AST/ALT ratio, alkaline phosphatase, total bilirubin, serum total protein, serum albumin, serum globulin, serum albumin/globulin ratio, prothrombin time) and viral serology (HBsAg, Anti HDV antibody, Anti HCV antibody) were performed. Data were analyzed by SPSS version 19 for Windows. Pearson's correlation test was done to determine association between AST/ALT with other biochemical parameters.* ***Results:*** *Mean(±SD) age of the study subjects was 32.55±10.55 years (range 20-50 years) with 48 (77.7%) male and 14 (22.6%) female subjects. Pearson's correlation test was done between AST to ALT ratio with other biochemical parameters and prothrombin time showed significant positive correlation ($p < 0.01$).* ***Conclusion:*** *In our study we found significant positive correlation between AST/ALT with prothrombin time in CLD subjects without cirrhosis.*

Keywords: *Liver disease; aminotransferase ratio; AST/ALT.*

Delta Med Col J. Jan 2015;3(1):13-17

Introduction

Hepatitis, a general term referring to inflammation of the liver, may result from various causes, both infectious (i.e., viral, bacterial, fungal, and parasitic organisms) and noninfectious (e.g., alcohol, drugs, autoimmune diseases, and metabolic diseases).[1] Viral hepatitis is most commonly caused by hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), and hepatitis E virus (HEV). HBV and HCV can lead to chronic hepatitis which may remain asymptomatic even for many years.[2] Chronically infected patients may

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go on to develop cirrhosis and hepatocellular carcinoma (HCC).[3] Primary HCC can develop in a patient who has been infected with HBV or HCV anywhere from 9 to 35 years later.[2] Furthermore, chronic hepatitis carriers remain infectious and may transmit the disease for many years.[1] Chronic hepatitis is more common in HCV infections (85%) than in HBV infections (5-10%). About 70% of persons infected with HCV develop chronic liver disease; about 20% of patients develop cirrhosis of the liver, and 20% of cirrhotic patients experience liver failure. Only 10% of patients with chronic HBV develop cirrhosis of the liver and liver failure.[2, 4]

In the Middle East and the Indian subcontinent, an estimated 2-5% of the general population is chronically infected with HBV, whereas it is less than 1% of the population in Western Europe and North America. HCV infection is also a major global health problem with an estimated 170 million people chronically infected and 3-4 million people get new infections each year.[5] In Bangladesh, there is paucity of information on the prevalence of HBV and HCV infections among general population. A study conducted in Dhaka in 2006 revealed prevalence of HBV and HCV infections to be 6.5% and 0.2% respectively.[6] Chronic viral hepatitis costs (diagnostic, therapeutic, and follow-up) are a major health and economic concern. Therefore, simple, reproducible, low-cost, and noninvasive variables are needed to improve the care and follow-up of these patients. Chronic viral hepatitis is usually detected by elevated liver enzyme levels (AST and ALT). In recent years the ratio of aspartate aminotransferase to alanine aminotransferase (AST/ALT ratio) has been evaluated in different studies[7-12] conducted on patients with acute and also chronic liver disease (CLD) of various origins. These variables are readily available, easy to interpret, and inexpensive and the clinical utility of the AST/ALT ratio in the diagnostic workup of patients with chronic HCV infection is supported by several studies[11,13-15] conducted in different countries evaluating populations with various epidemiologic and ethnic backgrounds.

The present study was designed to find out the link between aminotransferase (AST/ALT) ratio with commonly measured biochemical parameters of liver function tests in CLD of viral origin.

Materials and method

This cross sectional study was undertaken in the department of Biochemistry, Sir Salimullah Medical College, Dhaka, Bangladesh. Forty four biopsy proven diagnosed subjects of chronic viral hepatitis without cirrhosis of both sex were selected purposively. Chronic hepatitis B was diagnosed on the basis of elevated serum aminotransferase activities, the presence of hepatitis B surface antigen (HBsAg) in serum for at least 6 months, the absence of antibody to the hepatitis D virus (Anti HDV ab) and compatible hepatic histology. Chronic hepatitis D was diagnosed on the basis of elevated serum aminotransferase activities, presence of hepatitis B surface antigen in serum together with high titre of anti HDV ab and compatible hepatic histology. Chronic hepatitis C was diagnosed on the basis of a definite history of parenteral drug abuse or history of transfusion of blood/blood products, elevations in serum aminotransferase activities and high titre of antibody to hepatitis C virus (Anti HCV ab) for at least 6 months and compatible hepatic histology. Alcoholic subjects were excluded from this study.

Serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), AST/ALT ratio, alkaline phosphatase, total bilirubin, serum total protein, serum albumin, serum globulin, serum albumin/globulin (A/G) ratio and prothrombin time were determined. Data were analyzed by SPSS version 19 for Windows. Pearson's correlation test was done to determine association between AST/ALT with other biochemical parameters. $p < 0.05$ was considered as the level of significance.

Results

Total 44 subjects with mean(±SD) age of 32.55±10.55 years, between 20 and 50 years age range and having CLD of viral origin without cirrhosis were included in this study. Among the

study subjects 48 (77.7%) were male and 14 (22.6%) were female.

Common liver function tests including serum bilirubin, serum aminotransfereses (ALT and AST), serum total protein, serum albumin, serum globulin, serum alkaline phosphatase and proththombin time were measured. Ratio between AST to ALT and albumin to globulin were also calculated obtained from the measurement. (Table I)

Table I: Distribution of parameters of liver function test

Parameters	Mean±SD (Range)
AST (U/L)	174.15±155.03 (26 – 590)
ALT (U/L)	245.20±170.25 (85.45 – 650)
AST/ALT	0.72±0.2 0.33 – 1.07
Total bilirubin (µmol/L)	19.95±14.98 (10.0 – 67.0)
Total protein (gm/dL)	7.88±0.49 (6.8 – 8.6)
Albumin (gm/dL)	4.30±.65 (3.05 – 5.30)
Globulin (gm/dL)	3.64±.56 (2.60 – 5.25)
Albumin/Globulin	0.89±0.28 (0.53 – 1.67)
Alkaline phosphatase (U/L)	277.86±290.77 (86.0 – 1442.0)
Prothombin time (Second)	14.55±1.29 (13.0 – 18.0)

Pearson's correlation test was done between AST to ALT ratio with other routinely measured biochemical parameters. With no other parameter except prothrombin time showed significant positive correlation. (Table II).

Table II: Correlation between AST/ALT with other parameters of liver function test

Parameters	Correlation coefficient value	p value
Total bilirubin	0.22	>0.05
Total protein	-0.10	>0.05
Albumin	-0.13	>0.05
Globulin	0.13	>0.05
Albumin/Globulin	0.08	>0.05
Alkaline phosphatase	0.14	>0.05
Prothrombin time	0.43	<0.01

Discussion

In this study an attempt was taken to find the correlation between AST to ALT ratio, getting from the most commonly measured parameters in all sorts of liver dysfunction with other routinely measured biochemical parameters. Though the parameters which were performed in our study should be carried out routinely, in perspective of our country, the reality is different. In common practice only serum AST and ALT along with serum bilirubin are done. But it can never be over ruled the necessity of different parameters in different situations.

Reversal of AST/ALT ratio is an important diagnostic and prognostic tool for CLD patients as it can be detected even without any other manifestation of cirrhotic changes of liver.[11] The usefulness and diagnostic ability of the AST/ALT ratio in patients with HCV-related CLD has been studied extensively over past two decades.[11,13,14,16] A study done by Giannini et al.[17] revealed that the AST/ALT ratio is correlated with both histologic stage and clinical evaluation in patients with HCV-related CLD and progressive liver functional impairment is reflected by an increase in the AST/ALT ratio. Though liver biopsy is considered the gold standard for assessing patients of chronic hepatitis for cirrhosis but has its own drawbacks and inconvenience.[18-20] So by using the AST/ALT ratio we can negate the necessity of doing the cumbersome procedure.

Some researchers have combined some other parameters like prolonged prothrombin time and low platelet count with the reversed aminotransferase ratio and found either of the combinations to be more specific for diagnosis of CLD.[21,22] Siddiqi et al.[21] concluded that prolonged prothrombin time and reversed (AST/ALT > 1) ratio together can prove a more specific indicator with a high positive predictive value for the detection of hepatic cirrhosis in patients of chronic liver disease of viral origin.

In our study we found significant positive correlation between AST/ALT with prothrombin

time in CLD subjects without cirrhosis. It is of no debate that CLD is a progressive disease and cirrhotic changes will occur if no measure is taken. From above discussion it can be hypothesized that reversal of AST/ALT with the positively correlated prothrombin time and progression to cirrhosis from non cirrhotic change in CLD all lie in the single spectrum.

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