Evaluation of Serum Levels of Hepatic Enzymes and Plasma Proteins between Different Types of Acute Viral Hepatitis

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ABSTRACT

This cross-sectional study was carried out in 80 serologically diagnosed cases of acute viral hepatitis to assess and compare the serum hepatic enzymes & plasma proteins between four different types (A, B, C, E), 20 in each group. Hepatitis E, hepatitis B and hepatitis C were more prevalent in males than that in females. The study showed that geometric mean of S.AST of all the four types differed significantly (F = 274.94, p< 0.001). Geometric mean of S.ALT, S.AST and S.ALP in cases of HCV were significantly lower than others (p< 0.001). Geometric mean of S.ALT & S.AST in cases of HEV were significantly increased than others (p< 0.001). But the geometric mean of S.ALP of HBV was significantly higher than others (p< 0.001). On the other hand though S.ALP of HAV and HEV was lower than HBV but significantly higher than HCV (p< 0.001). The mean±SD of serum albumin of HCV was decreased significantly in contrast to those of HAV and HBV (p< 0.001). A:G ratio of HCV was also significantly lower than other three (p< 0.001). It was revealed through the study that hepatic enzymes were most affected in cases of HEV but least affected in cases of HCV.

Key words: Viral Hepatitis, Hepatic Enzymes, Plasma Proteins

Introduction

Viral hepatitis is the inflammation of the liver caused by hepatitis viruses. It is defined as acute hepatitis when the inflammation resolves within six months. Viral hepatitis is known to occur throughout the world. The most common causes of acute viral hepatitis are the five unrelated hepatotropic viruses: hepatitis A, hepatitis B, hepatitis C, hepatitis D, and hepatitis E. Bangladesh is a small developing country in South East Asia with a population density of 830 per sq. km, virus related liver diseases are important causes of morbidity and mortality.

HAV transmitted through faeco-oral route, is common in developing countries with very poor sanitary and hygienic conditions (part of Africa, Asia and South Africa). HAV infection in children under five years is asymptomatic in more than 90% cases whereas symptomatic in about 70-80% adults².

WHO estimates that 2000 million people have been infected by HBV worldwide per year. Of these, more than 300 million are chronically infected carriers, of whom 25 percent are at risk of serious illness and eventually leading to death from cirrhosis or hepatocellular carcinoma. According to WHO, Bangladesh belongs to the intermediate (4.0%) zone of HBV carrier rate and has an estimated 7.4 million carriers³. In Bangladesh HBV accounts for 35% acute viral hepatitis¹. HBsAg prevalence among apparently healthy individuals varies between 2.3 and 9.7%⁴.
Blood samples were collected with all aseptic measures from antecubital vein by disposable syringes. Serum was separated by centrifugation at 3000-4000 rpm for 3-5 minutes. Estimations of serum bilirubin, ALT, AST, ALP, total protein and albumin were carried out by colorimetric method. Serum globulin and AG ratio were calculated.

The continuous variables were expressed in mean ± SD and other variables that did not show normal distribution were expressed as geometric mean ± SD. Test for significance between four groups were done by ANOVA and Boneferroni. A p value of <0.05 was accepted as level of significance. The data was analyzed by using statistical software SPSS-10.0 version for Windows.

**Results**

Geometric mean±SD (U/L) of ALT were 807.23±1.19, 866.16±1.35, 64.3±1.79 and 1900.20±1.44 in hepatitis A, B, C and E respectively. The geometric mean±SD (U/L) of serum AST were 239.77±1.23, 540.13±1.53, 53.3±1.56 and 1175.98±1.342 in the same sequence as above. Serum ALP showed its geometric mean±SD (U/L) in hepatitis A,B,C & E as 167.53±1.32, 353.43±1.30, 87.56±1.37 and 192.89±1.23 respectively. Mean±SD of A:G ratio of hepatitis A B, C and E were 1.23±0.16, 1.35±0.54, 0.79±0.23 and1.20±0.25 respectively. In ANOVA (Table I) we found S.ALT, S.AST were significantly (P< 0.001, F=289.88) higher in HEV than HAV, HBV & HCV. The same table showed significantly lower value of above parameters in HCV. On the other hand, S.ALP showed significantly higher (p< 0.001, F= 91.38) value in HBV than other three groups. Multiple
comparison by Boneferroni of serum enzymes level showed (Table II) significant difference between HAV & HBV regarding S.AST (p< 0.001) and S.ALT (p< 0.001). Significant differences were seen in all three enzyme levels (p< 0.001) between HAV and HCV. Same pattern was also seen between HBV & HCV, HBV & HEV, HCV and HEV. Only HAV & HEV showed significant differences (P< 0.001) in cases of S.AST, S.ALT. In respect of serum total protein no significant differences were observed among various groups except in between HAV vs HCV and HCV vs HEV (p< 0.001) (Fig.1 & Table III). Conversely, mean value of S.albumin of HCV differed significantly in between different groups (p< 0.001, F= 8.3) (Fig. 2). Multiple comparison by Boneferroni showed that serum albumin of HCV was decreased significantly than HAV and HBV (p< 0.001). A:G ratio of HCV was also reduced in contrast to those of other three groups. However, there is no significant difference between HAV vs HBV, HAV vs HEV and HBV vs HEV in respect of serum total protein, serum albumin and serum globulin.

**Table I:** Serum ALT, AST, ALP in study groups

<table>
<thead>
<tr>
<th>Parameters</th>
<th>HAV</th>
<th>HBV</th>
<th>HCV</th>
<th>HEV</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. ALT (G. mean±SD)</td>
<td>807.23 ± 1.19</td>
<td>866.16 ± 1.35</td>
<td>64.3 ± 1.79</td>
<td>1902 ± 1.44</td>
<td>&lt; 0.001</td>
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<tr>
<td>S. AST (G. mean±SD)</td>
<td>239.23 ± 1.12</td>
<td>540.13 ± 1.53</td>
<td>53.3 ± 1.56</td>
<td>1175.98 ± 1.34</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>S. ALP (G. mean±SD)</td>
<td>167.53 ± 1.32</td>
<td>353.56 ± 1.31</td>
<td>87.56 ± 1.37</td>
<td>192.89 ± 1.23</td>
<td>&lt; 0.001</td>
<td></td>
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</tbody>
</table>

**Table II:** Multiple comparisons by Boneferroni of hepatic enzymes

<table>
<thead>
<tr>
<th>Parameters</th>
<th>HAV vs HBV</th>
<th>HAV vs HCV</th>
<th>HAV vs HEV</th>
<th>HBV vs HCV</th>
<th>HBV vs HEV</th>
<th>HCV vs HEV</th>
<th>HCV vs HEV</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. ALT</td>
<td>NS</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
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</tr>
<tr>
<td>S. AST</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
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<td>&lt; 0.001</td>
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<tr>
<td>S. ALP</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
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</table>

**Table III:** Multiple comparisons by Boneferroni of hepatic proteins.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>HAV</th>
<th>HAV</th>
<th>HAV</th>
<th>HBV</th>
<th>HBV</th>
<th>HBV</th>
<th>HCV</th>
<th>HCV</th>
<th>HCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. ALT</td>
<td>NS</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>S. AST</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
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<tr>
<td>S. ALP</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>NS</td>
<td>&lt; 0.001</td>
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**Discussion**

In this cross-sectional study an attempt was made to evaluate biochemical parameters of different virulent hepatitis viruses in our population. It showed that serum level of ALT was high in all patients of our study groups but highest in case of hepatitis E followed by hepatitis B & hepatitis A, lowest in case of hepatitis C. S. AST followed the same pattern of S. ALT but to a lesser extent. Serum ALP was increased in hepatitis B and was within normal limit in other groups. So the above study showed that geometric mean of S.ALT, S.AST and S.ALP in cases of HCV were significantly
lower than others. Similar studies were also
done in our country, where results were almost
consistent to this study7,8. Also the geometric
mean of S. ALT of HBV was significantly
higher than others. Moreover S. ALP of HAV
and HEV was lower than HBV but significantly
higher than HCV. Similar result was found in
other studies abroad9. In respect to serum total
protein no significant differences were observed
among the groups, though the levels were low in
other studies. Serum albumin of HCV was
significantly decreased than HAV and HBV. As
hepatitis C is chronic in nature decreased value
of serum albumin is consistent with other
study10. A:G ratio of HCV were significantly
lower than other three groups10. Thus it was
revealed through the study that biochemical
parameters were mostly affected in HEV. This
may happen as HEV is self-limiting and does not
progress to chronic disease. On the other hand,
hepatic enzymes were least affected in HCV
than others except that of serum albumin. These
findings support that HCV may have a serious
outcome of the disease process as it may lead to
chronic hepatitis.

In conclusion, the present study shows that
biochemical parameters are mostly affected in
hepatitis E creating a panic of devastating illness
whereas relatively silent HCV, though affected
least biochemically, shows a vindictive outcome
of the disease process.

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