STUDY ON SOME AMINO ACID METABOLISING ENZYMES AND TRACE MINERALS THEIR ASSOCIATED CHANGES IN CERTAIN HUMAN LIVER DISORDERS

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Background: The estimation of enzymes in serum is useful aids to detect and confirm a diagnosis of various hepatic disorders and their importance in clinical assessment of liver pathology is now well established.

Aims and objectives: To study serum enzymes ALT (Alanine transaminase) and AST (Aspartate transaminase), OCT (Ornithine carbamyl transferase), ARG (Arginase) and the disease associated changes in serum Copper, Zinc and bilirubin during liver disorders.

Material and Method: The clinical material for present study comprised of 46 normal healthy subjects serving as a control group (Group 1) and a study group of 91 (Group 2) patients suffering from liver disorders as diagnosed by attending physicians. Blood sample from all participants was analyzed for various parameters like HBsAg, ALT, AST, OCT, ARG, S. bilirubin and S. copper, S. Zinc at time of admission, 2nd day after admission, 1 week after admission, 2 weeks, 3 weeks and on discharge.

Results and Conclusion: Amongst the enzymatic parameters OCT activity was probably the most useful indicator of the severity of illness. Serum copper levels were indicative of severity of disease to some extent. High serum peak aminas activity were observed in post necrotic cirrhosis and hepatic encephalopathy. High and significant elevation of serum copper level was observed in all liver disorder during acute phase of disease except alcoholic hepatitis.

Key words: Liver Disease, OCT, ARG, Copper, Zinc

INTRODUCTION

The Human liver is the largest and from the metabolic standpoint the most complex internal organ discharging its diverse functions even in adverse circumstances till 15% of its parenchyma cells remains functional. It plays central role in the maintenance of the interior milieu or metabolic homeostasis. The estimation of enzymes in serum are useful aids to detect and confirm a diagnosis of various hepatic disorders and their importance in clinical assessment of liver pathology is now well established (Bergmeyer, 1983). Due to establishment of precise rapid and well studied on enzyme assay techniques with good correlation to the diseased states (Colinet et al., 1986). Physicians have begun to rely more heavily on these enzymes values and patterns in order to detect liver disease, mark the progression, severity and monitor follow up of the therapy. Conventionally ALT (Alanine transaminase) and AST (Aspartate transaminase) became accepted marker for liver injury but in subsequent year it was realised that the true markers happen to be the liver specific enzymes OCT (Ornithine carbamyl transferase), ARG (Arginase) etc (Jones, 1962). The major disadvantage of the ALT is that its lack of specificity (Coodley, 1968).

Concurrently ALT (Alanine Transaminase), AST (Aspartate transaminase), OCT (Ornithine carbamyl transferase), ARG (Arginase) are metabolising enzymes in this study.

AMINO ACID METABOLISING ENZYMES

Amino acid metabolism have been collectively called as amino acid metabolising enzymes in this study. Cu and Zn are intimately concerned with many liver disease and their major function in metabolism appear to be enzymatic, thus it is reasonable to speculate that their level in cells controls the physiological processes through the formation and regulation of activity of those enzymes dependant up on them (Prasad et al., 1976). Study of serum copper was also conducted with view to reveal whether any statistical correlation exist between serum trace metal concentration and diagnostic test enzymes ALT, AST, ARG, OCT and Bilirubin.

MATERIALS AND METODS

The present study was conducted at the Index medical college hospital and research centre, Indore, M.P, India. The clinical
material for present study comprised of 46 normal healthy subjects serving as a control group (Group 1) and a study group of 91 (Group 2) patients suffering from liver disorders as diagnosed by attending physicians.

Exclusion criteria: Patients having Diabetes malitus, Hypertension, COPD, Thyroid disorder, Cardiac disease and any other major illness apart from liver disease were excluded from study.

Sample collection: Informed consent was obtained from each patient before sample collection. 10 ml blood sample was collected from each subject in a plain vial by vein puncture and centrifuged at 2000 RPM for 10 min after allowing the blood to clot at room temperature. The serum will be separated into proper aliquots and will be analyzed for various parameter like HBsAg, ALT, AST, OCT, ARG, S.bilirubin and S.copper and S.Zinc at time of admission, 2nd day after admission, After 1 week, After 2 week, After 3 week (on discharge) and during first and second follow up. Serum HBS Ag was done by card test.

Estimation of Trace metal like serum copper and Zinc was done by colorimetry and rest of the parameter was measured by spectrophotometry. Obtained data were analysed statistically by calculating P-value and correlation coefficient.

Table 1. Distribution of study group patients according to Diagnosis, Sex and Range

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number(n)</th>
<th>Sex(M:F)</th>
<th>Age range(year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute viral hepatitis(HBsAg –ve)</td>
<td>91</td>
<td>58:33</td>
<td>14-52</td>
</tr>
</tbody>
</table>

Table 2. Concentration of various parameter determined serially during hospital stay and follow up in total cases of Acute viral hepatitis

<table>
<thead>
<tr>
<th>Interval</th>
<th>Total no of case</th>
<th>Cases discharged in period</th>
<th>Casedied</th>
<th>ALT (U/L) Means SD</th>
<th>AST (U/L) Means SD</th>
<th>OCT (U/L) Means SD</th>
<th>ARG (U/L) Means SD</th>
<th>T. Bilirubin (Mg/dl) Means SD</th>
<th>Serum copper (Microgm/dl) Mean ± SD</th>
<th>Serum zinc (Microgm/dl) Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>14.84 ±4.77</td>
<td>23.45 ±8.12</td>
<td>4.08 ±2.34</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
<tr>
<td>On admission</td>
<td>36</td>
<td>-</td>
<td>-</td>
<td>36.44 ±3.60</td>
<td>60.15 ±2.18</td>
<td>9.56 ±3.10</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
<tr>
<td>2 day after admission</td>
<td>35</td>
<td>1</td>
<td>1</td>
<td>30.42 ±1.24</td>
<td>43.86 ±1.30</td>
<td>9.17 ±1.24</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
<tr>
<td>After 1 week</td>
<td>35</td>
<td>-</td>
<td>-</td>
<td>36.44 ±3.60</td>
<td>60.15 ±2.18</td>
<td>9.56 ±3.10</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
<tr>
<td>After 2 week</td>
<td>35</td>
<td>2</td>
<td>2</td>
<td>14.84 ±4.77</td>
<td>23.45 ±8.12</td>
<td>4.08 ±2.34</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
<tr>
<td>After 3 week(on discharge)</td>
<td>33</td>
<td>33</td>
<td>33</td>
<td>14.84 ±4.77</td>
<td>23.45 ±8.12</td>
<td>4.08 ±2.34</td>
<td>0.60 ±0.42</td>
<td>112.92 ±10.34</td>
<td>101.89±10.46</td>
<td>68.63±3.17</td>
</tr>
</tbody>
</table>

* -- indicate P-value less than 0.05 (significant)

RESULTS

The study group consist of total 91 participants between 14-52 year age group. Among them 58 were male and 33 female. The number of participant in control group is 46 having age between 11-50 year. Obtained data are compared with control group by calculating P-value (Online student t-test calculator). P-value less than 0.05 was consider as a significant.

DISCUSSION

A study was conducted to find out whether the initial admission values of the four enzymes (ALT, AST, OCT, ARG) and associated factors like s. copper and T. bilirubin were able to indicate severity or distinguish the sever from moderate and mild hepatitis cases. It can be noted that no significant statistical difference was found between the mean admission values of serum ARG in these subgroups, hence amongst the enzymes, serum ARG was the poorest indicator of severity. Serum OCT and AST on the other hand indicated severity quite well between these various subgroup. Therefore it can be said that amongst these enzymes, serum OCT and AST indicated severity better than ALT and ARG and by comparison the serum level of OCT were found statistically superior to AST as indication of severity between these subgroup. This confirms the report of chausha et al. (1963), Ceriotti, (1976) and Gitlin, (1982), that serum OCT is a good indicator of severity in liver disorders. Among the associated factors serum copper and bilirubin was the poorest indicator, since statically significant difference was not observed in its levels between these subgroups. It was observed that mortality increased with increasing S.OCT activities beyond 40 U/L and that amongst the 3 cases of HBsAg positive viral hepatitis who died due to the disease, two had peak S.OCT activities greater than 80 U/L while one patients had peak S.OCT activity 71.3 U/L. Also seen from the table that, there was notable difference between average duration of hospitalization between these three categories.

Hence it can be stated that a high peak S.OCT activity indicates a delayed recovery and uncertain prognosis whereas a low S.OCT activity indicates a speedy and good prognosis.

Conclusion

Amongst the enzymatic parameters OCT activity wasprobable the most useful indicator of the severity of illness. The comparative usefulness in the order is OCT>AST>ALT>ARG. Total bilirubin was found to be very good indicator of severity, hepatic damage and prognosis. Serum copper level and copper/zinc ratio were indicative of severity of disease to some extent. Serum zinc was a poor indicator. High serum peak arginase activity were observed in post necrotic cirrhosis and hepatic encephalopathy.
High and significant elevation of serum copper level were observed in all liver disorder during acute phase of disease except alcoholic hepatitis.

REFERENCES


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