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Research Article

Liver function tests in acute hepatitis in children

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ABSTRACT

Background: Aim of study to analyse the elevation of liver enzymes of icteric children presenting as acute hepatitis and observe its association with hepatitis B surface antigen positivity rate. The liver function tests help us to monitor amount of hepatic dysfunction and early recognition and prediction of severity. This study was done to observe the degree of alteration in parameters of liver function test and predict the clinical outcome.
Methods: Study was done in sixty-four children (upto age 12 years) presenting with symptoms of acute hepatitis in the paediatric OPD and emergency of Patna Medical College and Hospital, Patna. Fifty healthy children were taken as controls. Liver functions were evaluated under following parameters as serum bilirubin, SGPT, SGOT and ALP. Statistical analysis was done for significance.
Results: The results showed higher HBsAg positivity in male children compared to females; also shows the pattern of enzyme elevation at first visit of the patient. Serum total bilirubin was raised (mean 3.94mg/dl ,SD was 0.62), the liver enzymes were also elevated with SGPT (mean 615.83IU/l, SD 98.2), SGOT (mean 562.86 IU/l, SD 110.18) and ALT(mean 330 IU/l, SD 115.82) levels. The rise was significant for SGOT and SGPT with hepatitis B surface antigen positivity rate, but levels of serum bilirubin and ALP remained non-significant.
Conclusions: This study helps us to analyze the incidence of HBsAg positive cases presenting with clinical features of acute hepatitis and degree of alteration of liver functions would help the physician in better management of the cases.

Keywords: Liver function tests, Hepatitis B surface antigen, Acute hepatitis, Children

INTRODUCTION

Hepatitis is a major public health problem and is endemic throughout the world especially in tropical and developing countries.[1] Hepatitis means inflammation of the liver. The liver is indispensible to our survival. It has synthetic, storage and detoxification functions.

In India all forms of viral hepatitis are seen in paediatric age group. Acute viral hepatitis is an important cause of morbidity and mortality in them. Viral hepatitis caused by hepatitis B virus is important because about 2 billion people worldwide have been infected with hepatitis B virus (HBV). About 360 millions are chronically infected and this stage develops when acute infection persists in the host for more than six months. The chronic stage in long term leads to incurable stage of liver cirrhosis or hepatocellular carcinoma.[2]

Acute hepatitis B can range from subclinical disease to fulminant hepatic failure; latter can lead to death of the patient in absence of liver transplantation. The severity of hepatic injury actually reflects the degree of immune response. Treatment of acute hepatitis is only symptomatic and supportive, where close monitoring of patient for recovery can be assessed by repeated assay of

liver function parameters. The following studies from different parts of India, shows the trends of association of HBV infection among children with acute hepatitis.

Prevalence of hepatitis B virus among patients with acute viral hepatitis is 5.4% in children and 28% in adults by Chadha et al.[3] Bendre et al from Mumbai showed HBV as cause of acute hepatic failure in 8.3%.[4] In 2002, study from Chandigarh done on children under 14 years showed HBV responsible for 7.6% of acute viral hepatitis.[5]

Genetic factors and host susceptibility affects the persistent carriage stage of Australia antigen. This study tries to assess the incidence of acute hepatitis caused by hepatitis B virus and analyses the LFTs for early diagnosis and severity of acute hepatitis. The sensitivity and specificity both increases for a particular etiology, when LFTs are analyzed in context of proper history and clinical examination.

METHODS

The study was carried out on 64 cases presenting with symptoms of acute hepatitis in the OPD or admitted in the paediatric wards of Patna Medical College and Hospital, Patna, India. Both boys and girls up to age 12 years were included in the study. Fifty normal healthy children of different age groups, socio-economic class were selected to serve as control. They were selected from the attendants of patients, doctors and other hospital staff. Consent was taken from parents. Detailed history and clinical examination was done, followed by appropriate blood tests, liver function tests, total serum bilirubin, Australia antigen status and USG liver.

A commercial kit Acon bioteck (M/s Acon biotech, Hangzhou Co. Ltd. China) One step hepatitis b surface antigen test device (serum/plasma) based on the principle of lateral immunoassay was used for testing of HBsAg. It is a qualitative, lateral flow immuno-assay for the detection of HBsAg in the serum or plasma. The presence of the coloured line at test line indicates positive result, while its absence indicates a negative result. There is less than 1% false positive result; so highly specific. End point is distinct and easy to read.

Serum ALT, AST, ALP were determined by enzymatic colorimetric techniques using commercial kits produced by Transasia Bio-Medicals Ltd, Germany, Erba on an automated clinical chemistry autoanalyzer.

The study group was divided into five according to age (0-1 years, 2-4 years, 5-7 years, 8-10 years and 11-12 years), sex of the child, parameters of liver function test and Australia antigen positivity rate.

Statistical analysis

All results were expressed as mean±SD for quantitative data. Frequency (%) was used for qualitative data like gender. The parameters of liver function tests were analyzed by Mann-Whitney U-test. The level of significance was set at $P < 0.05$. Data was analyzed using SPSS (IBM Corporation, Armonk, NY) version 22.

RESULTS

A total of 64 patients under age 12 years presenting with icterus and other symptoms of acute hepatitis were included in the study. The mean age of all patients was 5.8 years±3.38 (0 years to 12 years). There were 44 (68.75%) boys and 20 (31.25%) girls showing a male preponderance. All patients presented with icterus, fever, elevated liver enzymes at the time of diagnosis.

Table 1 shows that in each age group number of boys presenting with acute hepatitis outnumbered girls. There were 44 male children compared to 20 female children in total. Most cases were in 2-7 years age group. The difference is not significant statistically (Pearson chi-square=13.012, df=12, p=0.368).

Table 1: Gender distribution of children presenting with acute hepatitis in different age groups.

Age group (years)	Total boys (%)	Total girls (%)
0-1 (n=5)	3 (60)	2 (40)
2-4 (n=20)	14 (70)	6 (30)
5-7 (n=19)	12 (63)	7 (37)
8-10 (n=11)	8 (72)	3 (28)
11-12 (n=9)	7 (78)	2 (22)

According to Table 2 HBV is responsible for 18.75% of acute hepatitis in this study. According to age wise distribution, HBV is responsible for maximum cases in the 8-10 years age group. The difference is not significant statistically (Pearson chi-square=9.325, df=12, p=0.675). 9 boys (14%) and 3 girls were positive (4.6%) for HBsAg out of 64 children presenting with acute hepatitis (Table 3).

Table 2: Frequency distribution of hepatitis B surface antigen (HBsAg) according to age groups.

Age group	HBsAg		Total
	Positive	Negative	
0-1 year	1 (20)	4 (80)	5
2-4 years	3 (15)	17 (85)	20
5-7 years	3 (15.78)	16 (84.21)	19
8-10 years	3 (27.27)	8 (72.72)	11
11-12 years	2 (22.22)	7 (77.78)	9
Total	12 (18.75)	52 (81.25)	64

Table 3: Frequency distribution of hepatitis B surface antigen (HBsAg) status according to gender in cases of acute hepatitis.

Sex	HBsAg		Total
	Positive (%)	Negative (%)	
Boys	9 (20.45)	35 (79.54)	44 (68.75)
Girls	3 (15)	17 (85)	20 (31.25)
Total	12 (18.75)	52 (81.25)	64(100)

Table 4 shows a higher rate of positivity of HBsAg among male child compared to female child across all age groups except in 5-7 years age group were reverse trend was observed. This difference is statistically not significant (Pearson chi-square=9.325, df=12, p=0.675). Independent sample Mann-Whitney U test was performed to see the association of liver function test parameters with HBV infection. The elevation of SGPT and SGOT was significant in the HBsAg positive cases when compared to negative cases. Bilirubin and ALP values remained non-significant across the groups (Table 5).

Table 4: Frequency distribution of hepatitis B surface antigen positivity rate in different age groups of acute hepatitis subjects with gender.

Age group (years)	Boys HBsAg positive (%)	Girls HBsAg positive (%)
0-1 (n=5)	1 (20)	0 (0)
2-4 (n=20)	3 (15)	0 (0)
5-7 (n=19)	1 (5)	2 (11)
8-10 (n=11)	2 (18)	1 (9)
11-12 (n=9)	2 (22)	0 (0)

Table 5: A comparison of serum bilirubin, AST, ALT and ALP (IU/L) amongst HBsAg positive patients and HBsAg negative patients.

LFT parameters	HBsAg positive cases (Mean±SEM) IU/l	HBsAg negative cases (Mean±SEM) IU/l	P-value
Bilirubin	4.075±0.6196	3.913±0.6269	0.401
SGOT	495.67±115.03	578.37±90.75	0.044
SGPT	540.83±102.91	633.13±89.44	0.011
ALP	375.33±134.26	319.65±109.96	0.087

Figure 1 shows the boxplot histogram of distribution of parameters of LFT in both HBsAg positive and HBsAg negative cases. The box spans the interquartile range of a particular parameter, median is marked by a dark horizontal line across the box and whiskers are two lines outside the box that extends to the highest and lowest observations. The mean bilirubin level in HBsAg positive and negative cases are 4.07 mg/dl, SD.62 and 3.91 mg/dl, SD 0.627 respectively. The mean SGOT levels in HBsAg positive and negative cases are 495.67 IU/l, SD 115.035 and 578.37 IU/l, SD 90.752 respectively. The mean SGPT levels in HBsAg positive and negative cases are 540.83 IU/l, SD 102.906 and 633.13 IU/l, SD 89.44 respectively. The mean ALP levels in HBsAg positive and negative cases are 375.33 IU/l, SD 134.265 and 319.63 IU/l, SD 109.96 respectively.

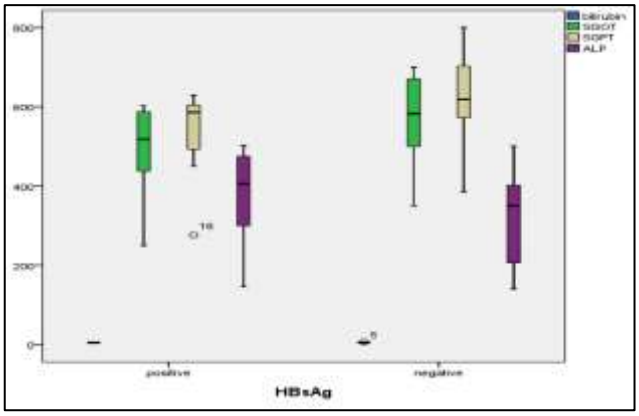

Figure 1: Boxplot histogram for bilirubin, SGOT, SGPT, ALP by HBsAg status.

DISCUSSION

In this study, Table 1 shows that more boys (44) presented with acute hepatitis than girls (20). Therefore acute hepatitis is commoner in boys. As per Table 2 Australia antigen was positive in 18.75% of cases diagnosed as acute viral hepatitis. Chadha et al from Pune reported HBV as a cause for 5.4% of acute viral hepatitis cases ; similarly in studies from New Delhi in 1984 and 2002 the rates were 9% and 7.6% respectively; also from Lucknow, the rate was 9.79%.[3,6-8] Study done from Hong Kong showed incidence of HBV to be 8% of all acute viral hepatitis in children less than 12 years.[9] From Kathmandu, Nepal HBV was responsible for 5% of causes of acute hepatitis in children under 15 years of age.[10]

As per table 2 there was slight increase in frequency of HBV infection in acute hepatitis with age from an average of 17.5% in less than 5 years age group to an average of 22.3% in more than 5 years age group. Similar results were seen by Panda et al were the values were 11.5% in <5 years to 57.5% in >10 years age group.[11] Thapa et al also documented an increasing incidence of HBV infection with age.[12]

Table 3 shows more boys were positive for HBsAg (20.45%) compared to girls (15%). Another study showed greater positivity amongst the males (18.1%) than females (15.8%).[13]

In India it is estimated that 15-25% of the current 40 million HBV carriers will develop cirrhosis and liver cancer, greater risk is seen when infection is acquired in infancy and early childhood years. Of the 26 million

infants born every year about 1 million is the risk group of getting chronically infected.[14]

Table 5 shows the liver function parameters where the mean bilirubin was 3.94 mg/dl, mean SGOT was 567.86 IU/l, SGPT was 615.83 IU/l and ALP was 330 IU/l at first diagnosis of the patients. Such level of transaminases indicates acute hepatic injury. In another study by Giannini et al similar findings were found with moderate elevation of transaminases.[15]

CONCLUSION

Over 4 million acute hepatitis B cases are diagnosed every year which leads to one fourth of cases becoming chronic carriers. The chronic stage accounts for 1 million deaths per year due to chronic active hepatitis, cirrhosis and hepatocellular carcinoma.[16] This study shows distribution of acute viral hepatitis cases with age group and gender in children. It also shows that HBV is responsible for 18.75% of acute hepatitis, so an important cause of morbidity in this part of the country. It shows that importance of liver function tests early in the clinical course to manage the acute stage of hepatitis because rapidly worsening liver functions shows an impending acute liver failure. The limitations of this study are that subjects were taken from the hospital and do not represent community statistics. Also sample size was quite small and only HBsAg status was looked into and taken into account.

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