Prevalence of Hepatitis B Surface Antigen (HBsAg) and seropositivity Among Jaundice Children in Katihar

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Abstract- This study was carried out to detect hepatitis B surface antigen (HBsAg) and risk factors of transmission among children in katihar district of Koshi zone of Bihar State, India. In order to estimate the prevalence rate of HBsAg and to evaluate the influence of children demographics on HBsAg seropositivity, well-designed questionnaire was used to obtain data, considered risk factors for contracting HBsAg from consenting children. A total of 305 blood samples were collected from children attending the Katihar Medical College Hospital, Katihar. The male: female ratio was 1.38:1in the control group and 1.5: 1 in cases of jaundice. Blood samples were screened using HBsAg test kit, supplied by J. Mitra & Co. Pvt. Ltd, Delhi, India. HBsAg positivity rate among control was 3.5%. It gives fair idea about prevalence of HBsAg among healthy children of this region and does not indicate the carrier rate. The prevalence of HBsAg was higher among age group 9-12 years in jaundice patient. There is no significant difference in incidence of HBsAg positivity among males and females (p=0.317). Horizontal mode of transmission is found very significant. A higher rate of HBsAg positivity (17.64%) was found in patients of fulminant hepatic failure.

Index Terms- HBsAg, fulminant hepatic failure, hepatitis, horizontal transmission

I. INTRODUCTION

From the time immemorial, man has been suffering from Jaundice and trying to fight against it with regard to its etiology diagnosis, treatment and prevention. It is estimated that more than 780 000 people die every year due to the consequences of hepatitis B.[1] Hepatitis B prevalence is highest in sub-Saharan Africa and East Asia. Most people in these regions become infected with the hepatitis B virus during childhood and between 5–10% of the adult population are chronically infected. In Indian subcontinent, an estimated 2–5% of the general population is chronically infected. Less than 1% of the population in Western Europe and North America is chronically infected.

Evidence of Viral etiology of Jaundice stems in great part from the pioneering works of MacCallum and Bradely (1944), Heavens et al. (1945) and Paul et al (1945).[2] They identified immunologically two distinct type of hepatitis viruses, serum and infectious heaptitis. These observations were further extended by Mury et al (1955) and Krugman et al (1959, 1962). The discovery of Australia antigen by B.S. Blamberg and his associates (1967) has been spectacular advance in seemingly insolvable problem of hepatitis. For nearly two decades the only edition to the hepatitis virus was delta agent (HDV) a defective virus requiring hepatitis B virus for its replication. HBV is a hardy virus and has no animal reservoir. It belongs to the adenoviruses and classified as Adenovirus type I, HBV represents global health problem and sequel ranging from inapparent infection and acute and chronic hepatitis to development of cirrhosis to hepatocellular carcinoma. The situation is further compounded as seen from recent reported that HBV could also be the cause of extrahepatic immunologically mediated disease like primary billary cirrhosis, polyarteritis nodoss and glomerulonephropathies.[3]

The virus has been detected in peripheral mononuclear cells, tissues of pancrease, spleen, kidney and skin, and fluids like saliva, semen, sweat, breast milk, tears, urine and vaginal secretion (Chen et al., 2009).[4] HBV transmission occurs by exposure to Maternal Blood during perinatal period, through blood or blood product transfusion or via homosexual or hetrosexual contacts. However in 30 to 40% of cases there is no identifiable risk factor (CDC, USA, 1991). Most of HBV infections in developing countries are acquired. The risk of chronic infection is inversely related to age. It is highest for infant acquiring infection during the prenatal period and lowest for older children and adults. HBV has three distinct antigens namely HBsAg, HBeAg and HBvAg, which stimulate the production of corresponding markers of HBV infection. HBsAg also known as Australia antigen is first virological marker detected in serum, provides epidemiological markers in transmission of disease. According to WHO SEAR report, India has served as largest pool of HBV carriers in the world. There are 48 million carriers in Indian and nearly 10% of them are highly infectious. Approximately 25% of exposed persons will get liver disease. Nearly one third of cases of acute hepatitis, two third cases of chronic hepatitis and almost eighty percent cases of hepotocellular carcinoma in India are HBV related (Yu MC et al.2000)[5].

Adequate recommended precautions against HBV infection are not taken, so the transmission of disease related to HBV goes unabated. Even epidemiology of HBV infection is unknown for most of areas of country. Transmission is mostly through childhood horizontal spread due to sub-optimal hygiene and crowded living conditions. Horizontal mode of transmission defined as virus transmission unrelated to recognized perinatal and postnantal exposure which may be predominant mode of transmission in children below 10 years of age in under developed parts of the world. But the mode by which transmission occurs in our country is still unknown. This study was carried out to determine the prevalence of HBsAg in different age group of children among jaundiced children with different etiology.

II. Materials and Methods

Study Area

The study area was Katihar Medical College Hospital, located at north east part of Bihar in India and its geographical coordinates are 25° 21' 0" North, 87° 38' 0" East. In Koshi zone of Bihar city exerts a significant impact on education and health care. However, the city is vulnerable to flood and characterized by illiteracy, lack of sanitation facilities, poor water quality and improper wastes management especially in the core areas where population is dense and income is low.

Sample Collection

Blood sample was collected via venepuncture technique (Cheesbrough, 2006), with 5 ml syringe sufficient blood was collected and transferred into an EDTA bottle. Plasma was pipetted into sterile ependorf tubes after centrifuging the blood and stored at -20°C until analysis for HBsAg.

Assay for HBsAg

HEPACARD HBsAg Test strips (manufactured by J.Mitra & Co. Pvt. Ltd, Delhi, India), were used for the detection of HBsAg in the blood using one step immunoassay based on the antigen capture, or "sandwich" principle. The method uses monoclonal antibodies conjugated to colloidal gold and polyclonal antibodies immobilized on a nitrocellulose strip in a thin line. If the sample contains HBsAg, the collodial gold-antibody conjugate binds to the antigen, forming an antigen-antibody-collodial gold complex. The test strips has 100% Sensitivity & 99.4% Specificity by WHO Evaluation. The interpretation of test results was performed according to the manufacturer's specifications.

Data Analysis

[1] The data from study was analyses using SPSS computer software version 17.0 for Windows to determine any significant relationship between infection rate, age and gender.

III. Results

Overall prevalence of HBsAg among children

A total of 200 children were tested for HBsAg in the control group in which 116 children were males [116(58%)] while 42% (84) were females. Total 7 children were found to be HBsAg positive and no significant difference in male and female seropositivity. (Table 1 and 2)

Table –1 Showing HBsAg postivity among controls

Age Group	Total		HBsAg positive	
	Number	%	Number	%
<1yr	40	20	3	7.50
1-4yrs	32	16	0	0.00
5-8 yrs	44	22	1	2.27
9-12 yrs	84	42	3	3.57
Total	**200**	**100**	**7**	**3.5**

Table: 2 Showing HBsAg postivity among controls in relation with different age and sex

Age Group	Male		Female		Total	
	Number	%	Number	%	Number	%
<1yr	28	14	12	06	40	20
1-4yrs	12	06	20	10	32	16
5-8 yrs	30	15	14	07	44	22
9-12 yrs	46	23	38	19	84	42
Total	**116**	**58**	**84**	**42**	**200**	**100**

Detection of HBsAg in relation to Age and sex among cases of jaundice

Table-3 Showing age and Sex Distribution of Cases of Jaundice

Age Group	Male		Female		Total	
	Number	%	Number	%	Number	%
<1yr	12	11.43	9	8.57	21	20.00
1-4yrs	11	10.48	5	4.76	16	15.24
5-8 yrs	13	12.38	11	10.48	24	22.86
9-12 yrs	27	25.71	17	16.19	44	41.90
Total	63	60	42	40	105	100

In total of 105 cases of jaundice in various pediatric age groups incidence was significantly higher among age group 9 to 12 years.

(λ^2=17.248,p = 0.001).

Detection of HBsAg in relation to sex in children in cases of jaundice

Table-4 Showing Sex Distribution of HBsAg positive cases of Jaundice

Sex	Total		HBsAg Positive	
	Number	%	Number	%
Male	63	60	10	9.52
Female	42	40	6	5.71
Total	105	100	16	15.23

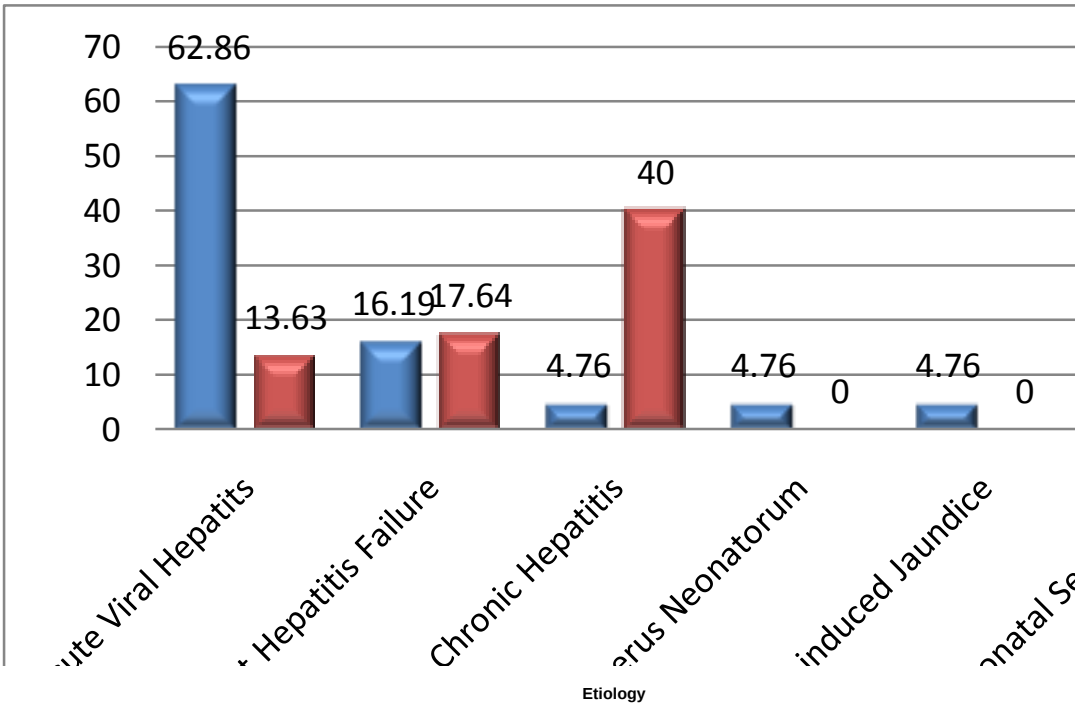
Table 4 shows the prevalence of HBsAg positivity in relation to sex of children among jaundice cases. 60% of the cases were males and 40% were females. There is no significant difference in incidence of HBsAg positivity among males and females.(λ2=0.49,p=0.49).

Detection of HBsAg among different etiology of jaundice

HBsAg positivity rate (50%) in cases of hemolytic Jaundice and 40% in case of Chronic Hepatitis. HBsAg positivity rate in acute viral hepatitis was 13.63 and 17.64% in fulminant hepatic failure. HBSAg positivity was significantly higher in cases of acute viral hepatitis than any other etiology of jaundice.(λ2 =8.5, p=0-037) In none of the other etiologies HBsAg was detected.

Table -5 HBsAg positivity among different etiology of jaundice

Etiology	Total Cases		HBsAg Positive Cases	
	Number	**%**	**Number**	**%**
Acute Viral Hepatits	66	62.86	9	13.63
Fulminant Hepatic Failure	17	16.19	3	17.64
Chronic Hepatitis	5	4.76	2	40.00
Icterus Neonatorum	5	4.76	0	0.00
Drug induced Jaundice	5	4.76	0	0.00
Neonatal Septicemia	3	2.85	0	0.00
Hemolytic Jaundice	4	3.81	2	50.00
	105	100	16	15.24



Detection of HBsAg among cases with definite history of parenteral exposure

Table -6 HBsAg positivity among jaundice cases with definite history of parenteral exposure

Age Group	Total HBsAg Positive cases	No of Positive cases with H/O parenteral exposure		No of Positive cases without H/O parenteral exposure	
		Number	%	Number	%
<1yr	1	1	100	0	0.00
1-4yrs	1	1	100	0	0.00
5-8 yrs	4	2	50	2	50
9-12 yrs	10	3	30	7	70
Total	16	7	**43.75**	**9**	**56.25**

Total 43.75% HBsAg positive cases had definite history of parenteral exposure (Blood transfusion / IM or IV injections) in last six months. In <1 yr and 1-4 Yrs age group 100% HBsAg positive cases had history of parenteral exposure, both were multiple transfused patients of Hemolytic Jaundice.

IV. Discussion

In India HBV is the second most common cause of acute viral hepatitis after HEV. The presence of HBsAg indicates ongoing HBV infection, and in newly infected persons, HBsAg is the only serologic marker detected during the first 3-5 weeks after infection. In persons who recover from HBV infection, HBsAg is usually eliminated from the blood in 3-4 months, and anti-HBs develop (Mast et al., 2005).[6] The global prevalence of HBV infection varies widely and its endemicity ranges from high (≥8%) to intermediate (2-7%) and low (<2%). [7] in India more than 40 million peoples are HBV carriers, and is considered intermediate level of endemnicity. In this study HBsAg seropositivity of 3.5% was observed in control group in Katihar, north east part of Bihar in India. No similar study was done in this zone earlier. The 3.5% HbsAg positivity among controls was observed in the present study in accordance with the observations of Kant L (1996) and WHO (1980). But this 3.5% positively among controls cannot be taken as HbsAg carrier rate of this region (North Bihar) because number of children taken as

control in the present study is less, the population under study is not representative therefore, not free from selection bias. Nonetheless, it indicates that HbsAg Carriers are present in the community and gives a fair idea about the epidemiology of HBV infection in this region.

A WHO collaborated study on viral hepatitis B in twenty countries had centre at Pune, India during 1980. The HBsA positivity rate among children below 15 years was 4.9% and 6.5% in adult (Sobeslansky O. 1980). According to study by Tondan et al. (1991) prevalence of HBsAg and anti HBS antibody was studied in 982 children, the overall carrier rate was found to be 2% which was close to carrier rate of 1.6% in adult population. They also concluded that major exposure to HBV occurs in preschool age group.[8] Another study was conducted by Panda S.K. et al, (1993) at New Delhi. Healthy children and adults were screened for HBV markers in which about 10% children under age of 15 were HBsAg carrier as compared to adult where it was 3.7%. Their finding indicated that major exposure to HBV occurs in children age group. A population based study conducted by Thyagrajan S.P. (1993) at Madras. The HBsAg carriage rate was 8 - 9% in children below 15 years and 5-4% in adults. Further they observed prevalence of 12.5% in children below 1 years showing high perinatal transmission.

In the present study no significant difference in the HBsAg positivity rate between males and females was observed. This finding is in accordance with the observation of West et al (1986), Jeli Co et al (1994) and INASL (1996), They also observed that no significant difference exists in the HBsAg positivity rate between males and females. However in a study by Pennap et al. (2010) the gender related prevalence of HBsAg was 9.5% in females and 24.1% in males was observed.[9]

The number of HbsAg positive children in the present study among total 105 cases of jaundice was 16 (15.24%). It was observed that incidence of HbsAg positivity increases with age. The maximum incidence (22.7%) was observed in the 9-12 years age group. The incidence of HBSAg positivity was significantly higher in 9-12 age group than any other age group(λ^2=13.50,p=0.004). This signifies other than prenatal and postnatal mode of transmission.

In present study there was significant increase in HBsAg prevalence with age. Tandon et al (1996) studied the epidemiological patterns of HBV prevalence and concluded that major exposure to HBV occurs-in the preschool age.[10] The age related HBsAg prevalence has been assessed in several studies. In a multicentric study Tandon et al have reported positivity in children less than 1 year age was 2.5%, in the 1-3 year age group it was 2.3%, and in the 4-5 years age group it was 1.6%.[8] Another study in Chennai by Jayaram S revealed a higher prevalence of 12.5% in children less than one year, 9.4% in 1-5 years, 6.3% in 6-10 years and 7.8% in 11-15 years age group.[11] Panda et al from Delhi identified 12.2% HBsAg positivity in 1-5 years and 10% in 6-15 years age group. These studies highlight the fact that the prevalence varies in different regions in India. In the present study increase, in HBsAg positivity rate is in accordance with WHO (1980). Significant increase in the HBsAg positivity rate among 5-8 years and 9-12 years children observed in the present study indicate that major exposure of HBV occurs in the preschool age and horizontal mode of transmission play significant role in acquisition of HBV infection.

The HBsAg positivity rate among cases of acute viral hepatitis in different study conducted by Tandon et al (1984) [12], Panda SK (1989) and Icchpujani (1990) reported HBsAg prevalence rates among acute viral hepatitis cases 9%, 20.2% and 10.2% respectively. The observed 13.63% HBsAg positivity of the present study is between the observation of Panda SK (1989) and Icchpujani (1990). Since HBsAg positivity rate varies in different geographic areas it is concluded that 13.63% cause of acute viral hepatitis among children of this region are likely to be due to HBV infection.

There is increase in HBsAg positivity with increase in age among cases of acute viral hepatitis of the present study. This is explained by the observation of Mac Mahon BJ et al (1985). They observed that development of symptoms with acute HBV infection is directly related to age. With acute infection symptoms develop in fewer than 5% of infants, 5- 15% of children between the age of 1-5 years and 33-50% of'children and adults.[13]

Tandon et al (1984) studied etiological spectrum of fulminant hepatitis in Delhi and reported that hepatitis B virus was the causative agent in 33% of cases of acute hepatic failure and 45% of cases of subacute hepatic failure.[12] In a similar study by Arankalle et al.(1996), observed 27% HBsAg positivity among acute hepatic failure. [14] Kumar s. et al. (2007) [15] and Raju et al.(1989)[16] observed 22.9% and 31% incidence of HBV markers in fulminant hepatic failure. Acharya et al (1996) observed 9% incidence of HBV markers in FHF.[17] In the present study total 17 (16.19%) cases of jaundice were due to FHF of which 17.64% were HBsAg positive. This observation is lower than observation of Tandon et al., Raju et al., and Arankalle et al. however more than acharya et al. This might be due to difference in HBsAg prevalence in different populations in which different studies were conducted.

Total 5 (4.76%) cases of chronic hepatitis were tested for HBsAg and 2 cases give positive result for HBsAg, Thus 40% cases of chronic hepatitis were HBsAg positive. However, Krishnamurthy et al (1976) observed that 73% of the cases of chronic hepatitis are HBsAg positive.[18] In another study by Acharay et al (1993) 50% patients of chronic heaptitis were HBsAg positive. INASL (1996) observed that 60% cases of chronic non - alcoholic liver disease in India is HBV related. All the studies were done in adult patients with advance liver disease, this may be the cause of the difference in the incidence of HBsAg positivity in chronic hepatitis between the present study and other studies.

Out of 4 cases of hemolytic jaundice HBsAg was detected in two- cases thus, 50% cases of hemolytic jaundice were HBsAg positive. None of the cases of hemolytic jaundice of the present stud had biochemical or clinical evidence of liver,disease. Both the HBsAg positive cases had received multiple blood transfusions from voluntary as well as professional blood donors. Moroni GA (1984) observed that thalassaemic required repeated blood transfusion and hence, are exposed to very high risk of HBV infection.[19] Gulati et al (1992) studied 100 patiens of thalassaemia and reported 49% HBsAg positivity whereas, Ambrapurkar (1992) reported 45% HBsAg positivity in thalassaemic children.[20,21] Ahmed Kamel Mansour et al. (2012)

was observed 29% HBsAg positivity among 111 cases of thalassemic patients. [22] Thus 40% HBsAg positivity of the present series among cases of hemolytic jaundice indicates that these children acquired HBV through multiple transfusions which is in accordance with observations of Gulati et al Ambrapurkar et al.

In the present study none of the cases of Neonatal sepsis, Icterus neonatorum, drug induced jaundice showed HBsAg in their blood. It is established that none of these conditions are HBV related. Hence, absence of HBsAg in these conditions is not surprising.

All the relatives of jaundice cases in the present study were asked for definite positive history of parenteral exposure during last 6 months, this period falls well within the incubation period of HBV. In this study 43.75% of HBsAg positive case had history of parenteral exposure within this period. Traditionally parental route has been recognized as main route of HBV transmission. But in less than half of the HBsAg positive cases, history of parenteral exposure was present. All the patients with positive history of parenteral exposure do not acquire HBV infection. This suggests other routes of transmission of HBV. Francis E. A. suggested person to person contact may transmit HBV infection from infected household contacts, through exposure of infected blood or body fluids, scratches, skin lesions, open wounds, shared needles. [23] Thus person to person contact (horizontal transmission) might have played role in acquiring HBV in about 60% HBsAg positive cases of present series.

V. Conclusion

It was concluded that HBV infection is an important health problem amongst healthy as well as jaundiced children of both sexes in this region. Horizontal mode of transmission pays important role in the spread of HBV infection among children. Large portion of the infected person is hidden in the society, who is increasing number of HBV carrier pool ever day. Further studies are recommended to find the role played by perinatal transmission in the spread of HBV infection by knowing the HBV replicative status i.e. HBeAg positivity among pregnant female and HBsAg carrier rate for < 1 year age children. The general population should be well informed about the prevalence, incidence and prevention horizontal transmission of hepatitis B infection.

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