

Age-specific Prevalence of Hepatitis B Surface Antigen in Pediatric Population of Aligarh, North India

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Abstract. Objective: To estimate the age-specific seroprevalence of hepatitis B surface antigen (HBsAg) in children upto 14 years of age. **Methods:** Equal number (115 each) of apparently healthy children of both sexes of different age groups i.e. <1, 1-4, 5-9 and 10-14 years, attending pediatric outpatient services and Well Baby Clinic of the hospital were tested for HBsAg using ELISA test. Positive results were confirmed by a second ELISA. **Results:** Overall 4.35% (95%CI, 2.44 - 6.25) of the 460 children tested were HBsAg positive. The prevalence rate was the highest (6.09%) in the 1-4 year age category. In the <1, 5-9 and 10-14 year age groups it was 4.35%, 4.35% and 2.61% respectively. The overall male to female ratio was 2.1:1, with no significant difference in seropositivity rates ($P = 0.816$). The difference in the prevalence rates between the rural (4.84%) and urban populations (3.77%) was also statistically insignificant ($P = 0.577$). **Conclusion:** Average HBsAg positivity in the pediatric population in this region is 4.35% (95%CI, 2.44 - 6.25). The prevalence progressively increases and peaks in the 1-4 years age group. It is least in 10-14 years age group. [Indian J Pediatr 2004; 71 (11) : 965-967]
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It has been estimated that more than 2 billion people are infected with Hepatitis B virus globally; this figure includes some 350-400 million chronically infected carriers of the disease.¹ The rate of carrier state is dependent on the incidence of infection and particularly on its age distribution. Thus while 90% of individuals acquiring infection at birth are likely to become chronic carriers, less than 5% become chronic carriers if the infection occurs after 6 years of age.² There are conflicting reports on the prevalence rates of HBsAg in India, more so in the pediatric population.^{3,4} Adequate data on age-specific prevalence is also lacking. Hence the present study was undertaken to estimate the age specific prevalence of HBsAg in children upto 14 years.

MATERIALS AND METHODS

The present study to assess age related prevalence of HBsAg was conducted in the departments of Pediatrics and Microbiology of this medical college, between May 2002 and June 2003. Apparently healthy anicteric children (as assessed by a detailed history followed by general and systemic examination) of both sexes of different age groups i.e. <1, 1-4, 5-9 and 10-14 years attending well baby clinics and pediatric outpatient services of this hospital qualified for inclusion in the study protocol. Demographical data, historical details and examination

findings were noted in a predesigned proforma. All subjects were enquired about past history of jaundice, blood transfusion, hospitalization with intravenous injection, intramuscular injection and other significant histories related with the risk of exposure to hepatitis B. Immunization history against hepatitis B and family history of jaundice was taken. A detailed maternal history for risk of perinatal transmission i.e. history of jaundice before or during pregnancy, blood transfusion, mode of delivery, etc was also taken. After informed consent from the subject's parents/attendants, 3 ml of venous blood was drawn from a peripheral vein using all aseptic precautions. Serum was separated and stored in the microbiology department at -20°C till tested. The serum was tested for HBsAg by enzyme-linked immunosorbent assay (ELISA) using a commercial test kit i.e. HEPALISA (J. Mitra and Co. Ltd., New Delhi). If a sample tested positive, a repeat ELISA was done for confirmation.

Statistical Analysis

Data collected was analyzed using SPSS 10.0 for Windows statistical software. Proportions in different categories were compared using Chi-square analysis or Fisher's exact test was used as appropriate to compare proportions in different categories. P value of <0.05 was taken as significant.

RESULTS

Of the total 460 children tested, 20 (4.35%; 95% CI: 2.44, 6.25) were found to be positive for HBsAg. One hundred and fifteen children belonged to each of the four age

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groups tested. The prevalence rate in the different age groups is shown in table 1. The male to female ratio in the study population was 2.1:1. The prevalence of HBsAg was 4.16% (95%CI, 1.90-6.42) in males and 4.73% (95%CI, 1.24-8.22) in females ($\chi^2=0.054$; $P=0.816$). The difference between male and female prevalence rates in the different age groups was also statistically insignificant (Table 2). HBsAg prevalence was more common among rural (4.84%; 95%CI: 2.11-7.57) than urban population (3.77%; 95%CI: 1.15-6.39), but the difference did not reach statistical significance ($\chi^2=0.312$; $P=0.577$). Out of the 7 children with history of vaccination against hepatitis B, one turned out to be seropositive. The seropositive and negative patients did not differ significantly with respect to the presence of various risk factors.

TABLE 1. Age Specific Prevalence of HBsAg

Age groups (years)	Mean age in year (S.D)*	Total no. of cases	No. of HBsAg positive cases	%Prevalence (95% CI)**
< 1	0.46 (0.30)	115	5	4.35 (0.54-8.15)
1 – 4	2.41 (0.97)	115	7	6.09 (1.62-14.35)
5 – 9	6.91 (1.4)	115	5	4.35 (0.54-8.15)
10 – 14	11.22 (1.02)	115	3	2.61 (0.0-5.58)
Total	5.27 (4.29)	460	20	4.35 (2.44-6.25)

*S.D = Standard Deviation

** 95% CI = 95% confidence interval

TABLE 2. Sex Specific Prevalence of HBsAg in Different Age Groups

Age groups (yrs)	Male		Female		P value*
	Total No. of cases	Sero positive cases	Total No. of cases	Sero positive cases	
< 1	90	3 (3.33)	25	2 (8.00)	0.297
1 – 4	81	5 (6.17)	34	2 (5.88)	0.633
5 – 9	74	3 (4.05)	41	2 (4.88)	0.588
10-14	67	2 (2.99)	48	1 (2.08)	0.616
Total	312	13 (4.16)	148	7 (4.73)	0.816

*comparing male and females in the same age group;

DISCUSSION

India has been placed into the intermediate zone of prevalence of hepatitis B (2-7% prevalence rates) by the WHO. The prevalence of HBsAg among the cohort of apparently healthy children included in the present study was found to be 4.35%, using ELISA, a 3rd generation test. Even if true prevalence is calculated [using the formula True Prevalence = [Estimated Prevalence - (1-Specificity)] / Sensitivity - (1-Specificity)], as suggested by Lodha *et al*, then taking the sensitivity and specificity of the test to be 98% each, a figure of 2.45% is obtained. Lodha *et al* in their review article on Hepatitis B epidemiology have suggested true prevalence rate in

India as 1-2%³. However, the present study sample was drawn from children attending Well Baby Clinic and the outpatient department, who may not be truly representative of the pediatric population in Aligarh. Moreover, since the study primarily aimed at estimating age-specific prevalence, equal number of children were drawn from each age category and it is difficult to project this figure to the entire pediatric population of the region; more so because of the limitations of the small sample size in our study due to financial constraint. However, in the absence of extensive data from community, the available data was analyzed. The prevalence rate obtained in the present study conforms to the figure suggested for Uttar Pradesh - Midpoint: 5.6%; Range: 1.2-10.0%.⁵ It also matches well with the hepatitis B prevalence of 4.86% in children below 15 years of age reported from Poona, using radio-immunoassay (RIA).⁶ Similar figure (4.73%) in children upto 14 years of age was recently reported by Singh *et al*, from a community-based study in Bangalore.⁷ The present study result also matches with the Indian National Association for Study of Liver Diseases consensus figure of 4.7% as the national average carrier rate among general population.⁸ At the same time these figures are well below the prevalence rates of 10.4% (95%CI, 8.2-12.7) and 8.9% (95%CI, 5.6-12.1) respectively from Delhi and Madras.⁹ However, Singh *et al* in their study have reported a prevalence of 2.73% in children below 15 years from Rajahmundry.

The age specific HBsAg prevalence noted in various age groups were 4.35%, 6.09%, 4.35% and 2.61% in less than 1 year, 1-4 years, 5-9 years and 10-14 year age groups respectively. These values are far more than the figures of 0%, 3.57% and 1.37% seroprevalence in 6 months – 4 year, 5-9 years and 10-14 years age groups respectively, reported by Pal *et al* using immunoelectro-osmophoresis technique.¹⁰ High rates in all the age groups in the present study could be because of increased exposure, high frequency of transmission, more sensitive ELISA test used for HBsAg detection and poor immunization coverage. Sobeslavsky reported prevalence rates of 0%, 2% and 6.8% in 0-4 year, 5-9 years and 10-14 year age groups respectively by using RIA technique.⁶ However, the number of children tested for HBsAg in the 0-4 year age group was just 6 and hence no meaningful conclusion can be drawn from such small samples. Comparable results include seroprevalence rates of 2.3%, 4.1% and 2.1%, in Rajahmundry and 5%, 5.5% and 2.2% in Bangalore, in 0-4 year, 5-9 years and 10-14 year age groups respectively.⁷ At the same time results of current study are much lower than the reported prevalence rates of 12.5%, 9.4%, 6.3% and 7.8% in less than one year, 1-5 year, 6-10 year and 10-15 year age groups respectively, by Thyagarajan *et al*.⁹

On comparing the seroprevalence among different age groups it was found that in the present study maximum prevalence was in the 1-4 years age group while peak prevalence among the 0-1 year age group has been noted by some other studies – in Rajahmundry (6.3%),

Age-Specific Prevalence of Hepatitis B Surface Antigen in Pediatric Population

Bangalore (7.3%) and Madras (12.5%).^{7,9} However, the seroprevalence rate of 4.35% in infancy in the present study was higher than the prevalence of 2.5% reported by Tandon *et al* in a multicentric study¹¹. On further analyzing the trend in infancy we noted that prevalence in the first six months was 3.5% (2/57), and in the latter half of infancy it rose to 5.2% (3/58). Although the HBsAg status of their mothers was not assessed, most if not all of these cases can be presumed to be the result of perinatal transmission. The high HBsAg prevalence in infancy contributes substantially to the carrier pool and disease burden in adulthood.

There was no statistically significant difference in sex related prevalence of HBsAg in the current study compared to other studies that observed male preponderance.⁶ In a study on hospitalized patients (including high risk pregnant women, hepatic and non-hepatic disorders) in Manipal, Dutta *et al* observed higher HBsAg positivity (35.3% versus 19.3%) among male population.¹² No plausible explanation has been given for higher prevalence in males in the general population, but probably females clear the HBV more efficiently as compared to males. Data from Rajamundry (prevalence rate 3.2% in males and 3.3% in females) and Bangalore (4.0% and 4.3% respectively in males and females), however, confirm our finding of similar prevalence rates among the two sexes.⁷

The seroprevalence in the present study in urban children was 3.77% as against 4.84% in rural children (P=0.577). This matches with the 3.3% and 4.2% seroprevalence noted by Singh *et al* in urban population of Rajamundry and Bangalore. However, a study on rural population of Western Maharashtra has noted higher seroprevalence of around 11.35%.¹³ The comparable seroprevalence in both rural and urban areas in the present study probably suggests that both the populations have similar risk of HBV exposure.

To conclude, this study confirms previous reports of high seroprevalence in early childhood in India. Larger data preferably community based and multicentric is urgently needed to clarify the picture.

Contributors

SQ, TS, SA, AM and KA contributed in the concept and designing of

the study. SQ collected the clinical data; AM performed the ELISA test. SQ, TS and KA analyzed the data. KA and TS drafted the article; KA will act as its guarantor.

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