Research Article

Correlation of demographic profile with Australia antigen positivity rate in children presenting with jaundice

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Abstract

Background: Viral hepatitis is a global health problem and causes a great chunk of morbidity in the pediatric population. The pediatric age is important because the outcome of hepatitis B virus (HBV) infection depends inversely with the age of acquiring the infection and the immune status of the host. Humans are the only source of cases and carriers of HBV, so targeting our immunization policy more toward susceptible groups can help stop hepatitis B infection transmission to nil. Based on different Hepatitis B surface Antigen carrier rate, countries are divided into three categories of high, intermediate and low endemicity. India lies in intermediate endemicity group with about 50 million Hepatitis B surface antigen (HBsAg) carriers.

Objective: To throw light on the relation of demographic factors such as age, gender, diet, and religion of the children who were icteric with Australia antigen positivity rate and to observe whether gender or religious/cultural practice of a particular section of the population had a positive correlation with the susceptibility of getting more often infected in the pediatric age group.

Materials and Methods: Study was conducted in 100 children (up to the age of 12 years) presenting with jaundice in the pediatric out patient department and emergency of Patna Medical College and Hospital, Patna, Bihar, India. They were divided into five groups (0–1, 2–4, 5–7, 8–10, and 11–12 years). Fifty healthy children were taken as controls.

Result: Of the total 100 children presenting with jaundice, 69 were boys and 31 were girls. Total children in the age groups 0–1, 2–4, 5–7, 8–10, and 11–12 years were 8, 30, 25, 24, and 13, respectively. Boys had higher HBsAg positivity rate compared with girls from all age groups except the age group of 5–7 years. There were 51 subjects who were nonvegetarian and 49 subjects who were vegetarian and the HBsAg positivity in them was 12 (23.5%) and 8 (16.3%), respectively. There were 81 subjects who were Hindus and 19 who were Muslims with the positivity rate in them being 17.3% and 32%, respectively.

Conclusion: Our study shows a high frequency of exposure to HBV infection in children, so this study shows the importance of universal immunization against HBV. It shows a different manner of frequency of HBV infection in our society as previous studies all reported urban/rural and general population versus tribal population differences.

KEY WORDS: Age, gender, HBsAg, jaundice, children

Introduction

According to the prevalence of hepatitis B surface antigen in general population, India falls under intermediate zone of the World Health Organization (WHO), and has an enormous burden of 50 million carriers, the second largest in the world.[1] Viral hepatitis is caused by various hepatotropic viruses: A, B, C, D, E, G, TT, and SEN.[2] When infection is acquired perinatally and in infants less than 1 year of age, chronic persistent infection develops in 80%–90% of cases. In children between 1 and 5 years of age, chronic infection develops in 30%–50% and in adults only 2%–6% develop chronic infection.[3]

Jaundice or icterus is a clinical term for yellow discoloration of skin and mucous membrane resulting from tissue deposition of bilirubin, which occurs because of serum hyperbilirubinemia. It is a sign of liver disease or hemolytic disorder. Hyperbilirubinemia is due to elevation of bilirubin more than 1 mg/dL in

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blood and when the concentration reaches up to 2.5–3.0 mg/dL, it diffuses into tissues to produce jaundice.[4]

Hepatitis is a major public health problem and is endemic throughout the world especially in tropical and developing countries.[5] Viral hepatitis caused by hepatitis B virus (HBV) is important because about two billion people worldwide have been infected with HBV. About 360 million people are chronically infected worldwide of whom 600,000 individuals die each year from HBV-associated liver cirrhosis or hepatocellular carcinoma.[6] In endemic countries, HBV transmission occurs mainly perinatally or in early childhood, whereas in low-endemic areas, HBV is more often contracted later in life, either through sexual contact or through the use of contaminated needles. Unless vaccinated at birth, the majority of children (80%) born to contagious mothers (Hepatitis B e antigen (HBeAg) carriers) become chronically infected. Among these, 25% in the long run will develop serious liver disease.[7] To stop HBV transmission, infections acquired perinatally must be checked. The different genotypes have different impacts on the course of HBV infection and pathophysiology.[8]

The primary source of HBV infection for infants and children is perinatal and horizontal from infected household contact.[9] For a newborn infant whose mother is positive for HBsAg and HBeAg, the risk for chronic HBV infection is 70%–90% by the age of 6 months in the absence of postexposure immunoprophylaxis.[10]

Children who are not infected at birth remain at risk from long-term interpersonal contact with their infected mother. HBV transmission rates in susceptible household contacts of chronically infected person vary from 14%–60%.[11] The alarming feature of HBV infection is to develop into chronic disease in the long run in the form of cirrhosis and hepatocellular carcinoma usually after a period of 30–50 years. In them, orthotropic liver transplantation is a life-saving treatment. According to WHO, boys are more likely to remain persistently infected than girls. Girls are more likely to remain infected for less time duration and subsequently develop protective anti-HBsAbs.[12] Genetic factors and host susceptibility affect the persistent carriage of Australia antigen. So this study was conducted to observe the association of demographic profile with HBsAg positivity rate in children presenting with icterus.

Materials and Methods

The study was carried out in 100 cases presenting with jaundice in the out patient department or admitted in the pediatric wards of Patna Medical College and Hospital, Patna, Bihar, India. Both boys and girls were included in the study. Fifty normal healthy children of different age groups and socioeconomic class were selected to serve as control. They were selected from the attendants of patients, doctors, and other staff.

Detailed history was taken from parents of the children about any blood transfusion, intravenous/intramuscular injection received, maternal history of jaundice before or during pregnancy, and mode of delivery. Intake of any hepatotoxic drugs, any risky behavior of drug abuse in the older children were also noted. Laboratory investigations included total leucocyte count, differential leucocyte count, haemoglobin (gram %), routine urine, blood sugar, liver function tests, total serum bilirubin, Australia antigen, and ultrasound 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 chosen because of its simplicity, cost benefit, and rapidity. It is a qualitative, lateral flow immunoassay for the detection of Hepatitis B surface antigen (HBsAg) in the serum or plasma. The presence of a colored line at the test line indicates positive result, whereas its absence indicates a negative result. To serve as a procedural control, a colored line always appears at the control line region indicating that a proper volume of specimen has been added and membrane wicking has occurred. There is less than 1% false positive result; so this method is highly specific. Endpoint is distinct and easy to read.

Plan

The study group was divided into age groups with 3-year interval, sex of the child, dietary pattern, and religion. Next, the incidence of Australia antigen positivity was analyzed under the same parameters as above.

Statistical Analysis

Chi-square (χ^2) test is used in this study as it involves categorical variables. Further, χ^2 test also calculates the equality of proportions between two populations. This test helps to analyze if there is a significant difference in the proportion of two populations that are being considered. $P < 0.05$ was considered as statistically significant. Data were analyzed using SPSS (IBM Corporation, Armonk, NY) version 22.

Result

Table 1 shows that in each age group, number of boys presenting with icterus outnumbered girls. In total, there were 69 boys compared with 31 girls. The difference is not statistically significant (Pearson's $\chi^2 = 0.479$, df = 4, $P = 0.976$).

Table 2 shows a higher HBsAg positivity rate among male children compared with female children across all age groups. There were a total of 16 positive boys and only 4 positive girls. This difference is statistically insignificant (Pearson $\chi^2 = 1.414$, df = 1, $P = 0.234$).

According to Table 3 the average rate of HBsAg positivity in subjects who were nonvegetarians across all age groups is higher than the subjects who were vegetarian (except for the age group of 5–7 years). This difference is statistically insignificant (Pearson $\chi^2 = 1.961$, df = 1, $P = 0.161$).

Table 4 shows that overall positivity was 17.3% in subjects who were Hindus compared with 32% in subjects who were Muslims. This difference is statistically insignificant (Pearson $\chi^2 = 1.966$, df = 1, $P = 0.161$).

Table 1: Gender distribution of children presenting with icterus in different age groups

Age group (years)	No. of children presenting with icterus		
	Boys (%)	Girls (%)	Total (%)
0–1	6 (75)	2 (25)	8 (100)
2–4	21 (70)	9 (30)	30 (100)
5–7	16 (64)	9 (36)	25 (100)
8–10	17 (71)	7 (29)	24 (100)
11–12	9 (69)	4 (31)	13 (100)
Total	69 (69)	31 (31)	100 (100)

Table 2: Comparison of HBsAg positivity rate in boy and girl child who are icteric of different age groups

Age group	Boys with icterus, HBsAg positive (%)	Girls with icterus, HBsAg positive (%)
0–1 year (*n* = 8)	2/6 (33.3)	0/2 (0)
2–4 years (*n* = 30)	7/21 (33.3)	1/9 (11.1)
5–7 years (*n* = 25)	2/16 (12.5)	2/9 (22.2)
8–10 years (*n* = 24)	3/17 (17.6)	1/7 (14.3)
11–12 years (*n* = 13)	2/9 (22.2)	0/4 (0)

Table 3: Association of HBsAg positivity with dietary pattern

Age group	HBsAg positive	
	Nonvegetarian (%)	Vegetarian (%)
0–1 year (*n* = 8)	2/4 (50)	0/4 (0)
2–4 years (*n* = 30)	5/19 (55)	3/11 (27)
5–7 years (*n* = 25)	2/17 (12)	2/8 (28)
8–10 years (*n* = 24)	2/7 (28)	2/17 (12)
11–12 years (*n* = 13)	1/4 (25)	1/9 (11)

Table 4: Association of HBsAg positivity with religion

Age group	HBsAg positivity	
	Hindus (%)	Muslims (%)
0–1 year (*n* = 8)	2/7 (29)	0/1 (0)
2–4 years (*n* = 30)	6/23 (26)	2/7 (29)
5–7 years (*n* = 25)	3/18 (17)	1/7 (14)
8–10 years (*n* = 24)	2/21 (9)	2/3 (67)
11–12 years (*n* = 13)	1/12 (8)	1/1 (100)

Discussion

This study shows that childhood transmission of HBV is more among boys than girls across all the age groups except the age group of 5–7 years. Majority of the positive subjects were nonvegetarian (23.5% vs. 16.3% vegetarians) and also higher rates of positivity were found in subjects who were Muslims (32%) than the subjects who were Hindus (17.3%).

Study by Kamat et al.[13] also showed higher HBsAg positivity among the male subjects (18.1%) compared with the female subjects (15.8%). Beasley[14] also showed higher prevalence in the male subjects globally. In India, the HBsAg positivity in children below 15 years ranges from 1.3% to 12.7%.[15] Community-based study in 2004 from Tamil Nadu[16] and from Aligarh showed high childhood transmission similar to ours. Like this study, the difference in positivity rates in male and female subjects was not statistically significant in both studies done in Aligarh[17] and by Singh et al. in 1997.[18] Also in African countries, there was a high childhood risk of acquiring HBV infection with the highest risk seen in the age group of 5–6 years (15.7%).[19] Studies from the European countries such as Bulgaria, Romania, and Serbia, all reported higher rates of HBsAg positivity in male subjects than in female subjects.[20–22] The impact of culture and diet on the transmission of HBV in the communities where food and utensils are shared is seen in the studies by Choe et al.,[23] Chen et al.,[24] Burke et al.,[25] and Buck et al.[26] With regards to age, incidence of HBsAg positivity in the age group of 0–1 year showed much higher overall incidence (16.67%) when compared with the study by Tandon et al.[27] (2.5%), but comparable results were seen in the studies conducted at Chennai[28] and Delhi[29] where the positivity rates were 12.5% and 12.2%, respectively. Positivity rates in the age group of 10–14 years as seen in a study conducted by Sobeslavsky[30] was 6.8%, whereas in a study conducted in Chennai was 7.8% (age group of 11–15 years), and in a study conducted in Delhi was 10% (age group of 6–15 years) as compared to about 17% positivity seen in this study (age group of 5–12 years).

The novelty of this study lies in the fact that it throws light on the pattern of HBV transmission in the society in relation with gender, dietary pattern, and religion across different age groups of children. The limitation of this study is that it is based on a very small sample size and also it failed to identify the vaccination status of the subjects. In this study, as there are more than double the number of boys than girls, the higher incidence of HBsAg positivity rate in boys might be an overestimate than actually is.

Conclusion

The gravity of problem can be assessed by looking at the huge population of India where every year 25 million children are born and of this over 1 million are at a lifetime risk of developing chronic HBV infection. In India, HBV infection accounts for 100,000 deaths annually.[31] Therefore, widespread public awareness about the modes of transmission, consequences, and preventive methods should be done by the effective use of media as is currently being done for polio, tuberculosis, HIV, and so on. Also incorporating hepatitis B detection in routine tests will help to identify other unrecognized modes of viral transmission in our society.[33] So far, all studies report the tribal/nontribal or urban/rural difference; the need of the hour is to conduct large population

surveys to pinpoint high-risk pockets in the society. This will help in formulating evidence-based policy to stop HBV transmission.

References

1. World Health Organization. Hepatitis B vaccines WHO position paper. WER 2004;79:255–63.
2. Papadakis MA, McPhee SJ. Current Medical Diagnosis and Treatment, 54th ed. McGraw Hill education book.
3. WHO. Hepatitis B (Fact sheet N 204) 2013. Geneva, Switzerland: World Health Organization, 2013. Available at: http://www.who.int/mediacentre/factsheets/fs204/en/ (last accessed on July 3, 2012).
4. Rodwell VW, Bender DA, Botham KM, Anthony KP. Weil, Harpers Illustrated Biochemistry, 30th ed, McGraw Hill Medical.
5. Dientardt F. Seroepidemiological study of hepatitis B. WHO Chr. 1983;37(6):203–4.
6. Andjaparidze AG. Viral hepatitis in South-East Asia Region. New Delhi, India: WHO-SEARO, 1989. Document SEA-ACHR 5.2. pp. 1–25.
7. Hou J, Liu Z, Gu F. Epidemiology and prevention of hepatitis B virus infection. Int J Med Sci 2005;2(1):50–57.
8. Stein LL, Loomba R. Drug targets in hepatitis B virus infection. Infect Disord Drug Targets 2009;9(2):105–116.
9. Acharya SK, Madan K, Dattagupta S, Panda SK. Viral hepatitis in India. Natl Med J India 2006;19(4):203–17.
10. Okada K, Yamada T, Miyakawa Y, Mayumi M. Hepatitis B surface antigen in the serum of infants after deliver from asymptomatic carrier mothers. J Pediatr 1975;87(3):360–3.
11. Beasley RP, Hwang LY. Postnatal infectivity of hepatitis B surface antigen-carrier mothers. J Infect Dis 1983;147(2):185–90.
12. WHO/CDS/CSR/LYO/2002.2: Hepatitis B©. Geneva, Switzerland: World Health Organization, 2002.
13. Kamat SP, Mehta PR, Paranjpe SM, Ingole NA. Hepatitis B virus (HBV) infection in liver disease patients in Mumbai, India with special reference to hepatitis B surface antigen (HBsAg) mutant detection. J Clin Diagn Res 2014;8(3):19–21.
14. Beasley RP. Hepatitis B virus: the major etiology of hepatocellular carcinoma. Cancer 1988;61(10):1942–56.
15. Thyagarajan SP, Jayaram S, Gopalakrishnan V, Hari R, Jeyakumar P, Sripathi MS. Epidemiology of hepatitis B in India: a comprehensive analysis. In: *Hepatitis B and C. Carrier to Cancer*, Sarin SK, Okuda K (Eds.). New Delhi, India: Harcourt India, 2002. pp. 25–39.
16. Kurien T, Thyagarajan SP, Jeyaseelan L, Peedicayil A, Rajendran P, Sivaram S, et al. Community prevalence of hepatitis B infection and modes of transmission in Tamil Nadu, India. Indian J Med Res 2005;121(5):670–5.
17. Qamer S, Shahab T, Alam S, Malik A, Afzal K. Age-specific prevalence of hepatitis B surface antigen in pediatric population of Aligarh, North India. Indian J Pediatr 2004;71(11):965–7.
18. Singh J, Prakash C, Panda R, Bora D, Jain DC, Datta KK. Acute sporadic viral hepatitis in urban population of a tribal district in Madhya Pradesh. Indian Pediatr 1998;35(2):105–9.
19. Fitzsimons D, Kojouharova M, Hallauer J, Hendrickx G, Vorsters A, Van Damme P. Burden and prevention of viral hepatitis in Bulgaria. Vaccine 2011;29(47):8471–6.
20. Voiculescu M, Iliescu L, Ionescu C, Micu L, Ismail G, Zilisteanu D, et al. A cross-sectional epidemiological study of HBV, HCV, HDV and HEV prevalence in the SubCarpathian and South-Eastern regions of Romania. J Gastrointestin Liver Dis 2010;19(1):43–8.
21. Gay N, Edmunds W, Bah E, Nelson C. Estimating the global burden of hepatitis B. Geneva, Switzerland: World Health Organization, Department of Vaccines and Biologicals, 2001. p. 34 (349A).
22. Choe JH, Chan N, Do HH, Woodall E, Lim E, Taylor VM. Hepatitis B and liver cancer beliefs among Korean immigrants in Western Washington. Cancer 2005;104(12 Suppl):2955–8.
23. Chen H, Tu S, Teh CZ, Yip M, Choe JH, Hislop TG, et al. Lay beliefs about hepatitis among North American Chinese: implications for hepatitis prevention. J Community Health 2006;31(2):94–112.
24. Burke N, Do H, Talbot J, Sos C, Svy D, Taylor V. Chumnguh thleum: understanding liver illness and hepatitis B among Cambodian immigrants. J Community Health 2011;36(1):27–34.
25. Buck JM, Morrow KM, Margolis A, Eldridge G, Sosman J, Macgowan R, et al. Hepatitis B vaccination in prison: the perspectives of formerly incarcerated men. J Correct Health Care 2006;12(1):12–23.
26. Tandon BN, Irshad M, Manikya R, Mathur GP, Rao MN. Prevalence of HBsAg and anti HBs in children and strategy suggested for immunization in India. Ind J Med Res 1991;93:337–9.
27. Jayaram S. Prevalence of HBV markers in different age groups in Madras. In: *Prevention and Control of Hepatitis B in Tamil Nadu*. PhD Thesis, University of Madras, 1992.
28. Kant L, Hall AJ. Epidemiology of childhood hepatitis B in India: vaccination related issues. Indian J Pediatr 1995;62(6):635–53.
29. Sobeslavsky O. Prevalence markers of HBV infection in various countries: a WHO collaborative study. Bull WHO 1980;58(4):621–8.
30. Dutta S. An overview of molecular epidemiology of hepatitis B virus (HBV) in India. Virol J 2008;5:156.
31. World Health Organization. *Introducing Hepatitis B Vaccine in Universal Immunization Programme in India. A Brief Scenario* (online). Available at: http://www.whoindia.org/en/section6/section8.htm (last accessed on September 2012).

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