ORIGINAL ARTICLE

FREQUENCY TO ANTI-HBS ANTIBODY POSITIVITY (≥ 10 MLU/ML) IN CHILDREN AGED 5-10 YEARS AFTER HEPATITIS B VACCINATION IN INFANCY

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ABSTRACT

Background: Hepatitis B is an infection of liver by hepatitis B virus (HBV) which is potentially fatal. The response of hepatitis B vaccine can be seen after 6-8 weeks of immunization and the child is considered protected when he has anti-HBS levels ≥ 10mIU/ml. however few studies have shown that response of hepatitis B vaccination diminishes overtime.

Objectives: To determine the frequency to anti- HBS antibody positivity (≥10mIU/ml) in children aged 5-10 years after hepatitis B vaccination in infancy.

Results: It is Cross-sectional Study, conducted on 343 cases at Department of Pediatrics, PAC Hospital Kamra. Duration was 6 months. Mean age was 7.4606 ± 1.80741 years (minimum was 5 and maximum was 10 years) 47.8% cases had titer less than 10, 43.1% had equal to or more than 10 and 9% had titer equal to or more than 100. 52.2% had immune status positive and 47.8 had negative status.

Conclusion: Although majority of our cases were immune to HBV infection but difference was only minor when compared to numbers in non-immune group. After EPI vaccination; immune status was found to be more retained in females as compared to males.

Keywords: HBV, HBV vaccine, Anti HBsAg titer

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INTRODUCTION

Hepatitis B is an infection of liver by hepatitis B virus (HBV) which is potentially fatal. It can lead to chronic infection of liver, cirrhosis, hepatocellular carcinoma and death. Approximately 257 million people are affected by this virus globally and it resulted in 887000 deaths due to its complications in 2015 alone[1] the prevalence of hepatitis B is variable throughout the world. However, one study determined that the prevalence of hepatitis B in children in Pakistan is 2.4%[2] Children if contact the virus is more prone to have a chronic disease as compared to adults.

First hepatitis B vaccine was approved in United States in 1981. However, it was introduced in Extended Program of Immunization (EPI) in Pakistan in 2009.

Three doses are given to children in first year of life at 6, 10 and 14 weeks of age.[3]

Hepatitis B vaccination is 95% effective against hepatitis B infection.[1] The response of hepatitis B vaccine can be seen after 6-8weeks of immunization and the child is considered protected when hw has anti-HBS levels ≥ 10mIU/ml. However few studies have shown that the response of hepatitis B vaccination diminishes overtime with almost one-third of vaccinated children continue to have protective levels of anti-HBS antibody at age of 15 years.[4]

Similarly, another study highlighted the fact that although hepatitis B vaccine confers a good protection but the factors which lead to decreased immune response should be evaluated.[5,6] Few studies have questioned the long-term protection from hepatitis B vaccination in infancy. There has been evidence of loss of amnesic response with increasing age and debate is going on whether to have a booster dose during adulthood or not.[7] Another study conducted in Turkey for evaluation immune response in 2-12 years old children showed that only 66.4% had protective antibody titer. [8]

Pakistan is one of the endemic countries with chronic hepatitis B infection. Vaccinations against hepatitis B started at large scale in neonates in Pakistan in 2009.[3] There are no studies available in Pakistan regarding immune response to hepatitis B vaccination in children. As there is evidence of reduced immune response with progressing age.[9] So, it is necessary to determine the immune response in our children. Furthermore, it will help in guiding the requirement of booster dose in adulthood.

METHOD

This cross-sectional study was conducted 1st October 2023 to 1st April2024 at pediatric department, Pakistan Aeronautical Complex Kamra. 343 sample sizes were calculated with 95% confidence interval & 5% margin of error by taking anti-HBS antibody positivity to be 66.4%

Patients having age 5-10 years irrespective of gender and completed vaccination of hepatitis B during infancy were included in the study. Patients who refused to consent and without complete vaccination of hepatitis B during infancy were excluded

Blood samples were taken for anti-HBS antibody titer. Patients with anti-HBS antibody levels ≥10mIU/ml were considered to have positive response to vaccination. Those having anti-HBS titre ≤10mIU/ml were considered to have negative response to vaccination against hepatitis B infection. Data was entered using the Performa

Data was entered and analyzed done using SPSS version 20.0 Age, antibody titres was expressed as mean and Standard Deviation. Categorical data such as gender was presented as frequency & percentage. Chi square test was done to access the relationship between advancing age and immune response positivity and p <0.05 will be considered significant.

RESULTS

Total 343 patients were enrolled. The mean age was 7.46 ± 1.80 years. The mean anti-HBS titer was 24.03 +- 29.032. There were 184 (53.6%) male and 159 (46.4%) female. 191 (55.7%) had age less than or equal to 7 years and 152 (44.3%) had age more than 7 years. (Table 1)

164 (47.8%) had titer less than 10, 148 (43.1%) had equal to or more than 10 and 31 (9%) had titer equal to or more than 100. (Table 2) 179 (52.2%) had immune status positive and 164 (47.8%) had negative status (Table 3)

Stratification of immune status was done with regards to age groups and gender. P values were found to be 0.883 and 0.000 respectively.

Table 1: Gender & Age Distribution

		Frequency (%)
Gender	Male	184 (53.6%)
	Female	159 (46.4%)
Age	Mean ± SD	7.46 ± 1.80
	≤7years	191 (55.7%)
	>7years	152 (44.3%)

Table 2: Distribution of Anti-HBS titer group among study cases

Anti HBS titer Groups	Frequency
< 10 mIU/ml	164 (47.8%)
≥ 10mIU/ml	148 (43.1%)
≥ 100mIU/ml	31 (9%)

Table 3: Distribution of Immune status among study cases

Immune Status	Frequency (%)
Yes	164 (47.8%)
No	179 (52.2%)

Table 4: Stratification of Immune Status with regards to Age groups and Gender

		Immune Status (Anti HBS Titer Equal to or more than 10mIU/ml)		P Value
		Yes	No	
Gender	Male	69	115	0.002
	Female	95	64	
Age Group	Up to 7 Y	92	99	0.88
	> 7 years	72	80	

DISCUSSION

Hepatitis B is a highly contagious disease that affects people all over the world. There are 350 million chronic hepatitis B virus carriers, according to estimates. The prevalence of chronic HBV infection varies by region, ranging from high (>8%), intermediate (2-7%), to low (less than 2%).[10] It is a hepatotropic virus that causes immunological energy in humans and can cause a long-term infection.

Currently, the world's population is infected 3.5% with HBV on a long-term basis. Despite the fact that the incidence of HBV infections is reduced as a result of vaccination and other measures, to less extent, the antiviral therapy uses to reduce the load of infected individuals.[10, 11]

Vaccine responses are strongly influenced by age, particularly at the extremes of life. Infants should be immunized as soon as possible to reduce the time; they are vulnerable to infections. Neonatal, on the other hand, produce fewer antibodies can interfere with immunization responses. [12, 13]

My study was conducted on 343 cases. Mean age was 7.4606 ±1.80741 years. The mean Anti-HBS titer was 24.0321 ± 29.03211 (minimum was 3 and maximum was 109) 47.8% had titer less than 10. 43.1% had equal to or more than 10 & 9% had titer equal to or more than 100. 52.5% had immune status positive and 47.8 had negative status

Hepatitis B vaccination is 95% effective against hepatitis B infection. In study 20634 tested individuals. Average age at testing was 14.8 years. Average anti-HBS Ab levels decrease with time to 16.39 mIU/ml in the 15-20 year of age group (P < 0.001) after 15 years the proportion of unfavorable outcomes increased gradually (P 0.0001) to 66.7 percent. After a booster dosage, 604 to 644 seronegative individuals (93.8%, 95%) became seropositive, according to anamnestic assessment response. HBs Ag was found in 91 of the 20634 samples.[4]

Out of 170 candidates who were negative for HBs Ag & Anti-HBS Ab 4469 supplied blood samples after the 1st booster dosage, with Anti-HBS levels of 10mIU/ml in 14.5% and 10-100mIU/ml in 29%, to get 97.2% of these participants to respond with an anti-HBs titer >100 mIU/ml. a three-dose booster was necessary (7). Indeed, at the age of 15 years up to half of the children who had been vaccinated at birth had no anamnestic responses to booster vaccination. 94 (77.1%) children showed detectable antibody levels (HBsAb ≥ 10mIU/ml) in that other study at Gold Y et al: High antibody levels were seen in 59 (48.4%) of the youngsters. 38 (22.9%) children had antibodies that were undetectable (HBsAb titer 10mIU/ml) Once the children were divided into 3 groups based on how long it had been since they had been vaccinated, it was shown that antibody levels decreased overtime (P 0.009)[14] in another study, during the 30 years period 243 people (56%) reacted to the initial primary series but did not receive any more doses, anti-HBS levels of less than 10mIU/ml were found in 125 (51%) of the participants.[15]

In one study, vaccine effectiveness against infection and carriage was 83.4% and 96.5%. When limited to primary responder, vaccine effectiveness against disease was similar (85.3%) however, there was a significant effect of maximum antibody concentration. With age, both vaccine effectiveness & anti-hepatitis B surface antibody levels decreased, results in 70.9% (95% CI, 60.4-80.5%) and 91.1% vaccination efficacy for infection or carriage among 20–24-year-old individuals (95% and 75%) respectively. 15 years after vaccination less than half of the vaccines had detectable anti-HBS antibodies. [16]

In our study, stratification of immune status was done with regards to age groups and gender. P values were found to be 0.883 and 0.000 respectively

CONCLUSION

Majority of our cases were males and had younger age at the time of testing for efficacy of HBV vaccination. Although majority of our cases were immune to HBV

infection but difference was only minor when compared to numbers in non-immune group

Immune status was not associated significantly with increasing age but it was significant with gender. After EPI Vaccination immune status was found to be more retained in females as compared to males.

Although the positive immune status is lower in our age group as compared to in early years of life as described in previous literature but same decreasing trend in positive immune status was not observed in our age group

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AUTHOR'S CONTRIBUTIONS

HBS, NH: Manuscript Writing
MI: Proof reading and editing
NA: Drafting, Revision
AA: Proof Reading
SI: Data Collection