https://doi.org/10.29309/TPMJ/2025.32.02.8586

The Professional Medical Journal
www.theprofesional.com
2025, Volume, 32 Issue, 02

ORIGINAL ARTICLE

Hepatitis B Positivity among children screened at a tertiary care hospital and assessment of risk factors.

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Article Citation: Alvi QA, Parkash A. Hepatitis B Positivity among children screened at a tertiary care hospital and assessment of risk factors. Professional Med J 2025; 32(02):158-163. https://doi.org/10.29309/TPMJ/2025.32.02.8586

ABSTRACT… Objective: To determine the frequency of hepatitis b surface antigen (HBsAg) positivity and associated risk factors among children screened before surgical procedures. **Study Design:** Cross-sectional study. **Setting:** Department of Pediatric Medicine, National Institute of Child Health (NICH), Karachi, Pakistan. **Period:** 1st February 2024 to 30th July 2024. **Methods:** A total of 188 children of either gender, aged between 3 months to 15 years, and admitted for any surgical procedure were screened. Demographic information like gender, age, and weight were noted. Information regarding risk factors of HBV infection included evaluation of vaccination status, history of hospital admission, history of injection, blood transfusion, surgical procedure, body piercing, and family history of HBV. HBV infection was labeled on the basis of the presence of surface antigen tested using ELISA. **Results:** In 188 children, 122 (64.9%) were male, and the mean age was 7.23±7.00 years. HBsAg was positive in 57 (30.3%) children. HBsAg seropositivity was significantly associated with female gender ($p=0.001$), higher mean age ($p=0.001$), and higher mean weight ($p<0.001$). Absence of HBV vaccination ($p<0.001$), history of hospitalization (45.6% vs. 30.5%; $p=0.046$), injections (19.3% vs. 8.4%; $p=0.033$), blood transfusions (31.6% vs. 9.9%; $p<0.001$), family history of HBV ($p=0.015$), maternal HBV positivity ($p<0.001$), and body piercing (33.3% vs. 13.0%; $p=0.001$) were significantly associated with HBsAg positivity. **Conclusion:** The frequency of HBsAg positivity among children undergoing surgical procedures was high. Key risk factors associated with HBV seropositivity included absence of vaccination, maternal HBV positivity, family history of HBV, blood transfusions, hospital admissions, and body piercing.

Key words: Blood Transfusion, Hepatitis B Virus, Hospitalization, Seropositivity, Vaccination.

INTRODUCTION

Hepatitis B or HBV is one of the most frequent viral infections, affecting millions of people globally. It is estimated that around 300 million people suffer from chronic hepatitis B worldwide, with annual death burden of 1 million.[1] The Sub Saharan countries, South Asian countries, and the Amazon Basin especially, have the highest HBV prevalence rates (8-12%).[2] The prevalence of HBV depends on several factors, such as vertical transmission (mother to child or generation to generation passed through close contact or sanitary habits), horizontal transmission (through lesions, bites), and adult horizontal transmission (through sexual intimacy, drug use, or medical procedure exposure).[3] Horizontal transmission is particularly prevalent in most chronic cases of HBV infection among intermediate areas in Pakistan.[4]

The vaccine to prevent the HBV is included in Pakistan's Expanded Program for Immunization (EPI) program since 2009.[5] The first three doses are given to children completely free. However, it's between 59-73% of Pakistan's eligible pediatric population that actually received three doses.[6] The HBV vaccine is effective in preventing serious consequences of the HBV virus.[7,8] However, the complete treatment for HBV is very expensive for individuals in third world countries like Pakistan. There are limited studies that were undertaken in the past to indicate the HBV presence in the pediatric population of Pakistan. Much of the previous data focused on the HBV prevalence and risk factors among overall population.[9,10]

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Article received on: 21/09/2024
Accepted for publication: 26/11/2024

The determination of HBV prevalence and understanding the related risk factors can help in HBV eradication and enhancing the vaccine efficacy along with awareness among people to prevent transmission. The results of the study were thought to be useful for healthcare professionals, researchers, and government policy makers. By finding out the positivity ratio as well as the underlying factors of the HBV positive patients, the study's results can provide valuable insights. The scope of our study expands to pre-procedural children that are coming for any medical treatment or consultation. The aim of this research was to determine the frequency of hepatitis b surface antigen (HBsAg) positivity and associated risk factors among children screened before surgical procedures at NICH, Karachi.

METHODS

This cross-sectional study was conducted at the department of pediatric medicine, National Institute of Child Health (NICH), Karachi, Pakistan, from 1st February 2024 to 30th July 2024 following permission from the "Institutional Ethical Review Board" (letter number: IERB-28/2023, dated: 31-08-2023). A sample size of 180 was calculated considering the expected prevalence of HBV among children as 1.92%[11], with 95% confidence level, and 2% margin of error. The inclusion criteria were children of either gender, aged between 3 months to 15 years, and admitted for any surgical procedure. Children previously diagnosed of HBV infection, or those with chronic liver disease were excluded. Informed and written consents were obtained from parents/guardians of all study participants.

At the time of enrollment, demographic information like gender, age, and weight were noted. Information regarding risk factors of HBV infection included evaluation of vaccination status, history of hospital admission, history of injection, blood transfusion, surgical procedure, body piercing, and family history of HBV. A questionnaire was designed to collect all the study data. Under aseptic conditions, blood samples of each child was collected and sent to institutional laboratory for the determination of the Hepatitis B surface antigen. HBV infection was labeled on the basis of the presence of surface antigen tested using ELISA.

Data analysis was performed using IBM-SPSS Statistics, version 26.0. The data analysis will be carried out at three levels: descriptive analysis, univariate analysis, and multivariate analysis. Chi-square or fisher's exact test was applied to compare categorical data. Independent sample t-test or Mann-Whitney U test was performed for the comparison of continuous data. Multivariate binary logistic regression analysis was performed to measure associations between HBV infection and risk factors. For inferential statistics, $p<0.05$ was considered as statistically significant.

RESULTS

In a total of 188 children, 122 (64.9%) were male, and 66 (35.1%) female. The mean age, and weight were 7.23±7.00 years, and 19.34±19.00 kg, respectively. A total of 136 (72.3%) children had received the HBV vaccination. Past history of hospitalization was reported by 66 (35.1%) children, and 22 (11.7%) had a history of injections. History of blood transfusion was noted in 31 (16.5%) participants, while 63 (33.5%) had undergone surgical procedures. Family history of HBV was present in 53 (28.2%) children, and maternal HBV status was positive in 31 (16.5%). Thirty six (19.1%) children reported a history of body piercing. Table-I is showing demographic and clinical characteristics, along with risk factors evaluation of HBV infection.

Study variable		Total (n=188)
Gender	Male	122 (64.9%)
	Female	66 (35.1%)
Age in years		7.23±7.00
Weight in kg		19.34±19.00
HBV vaccination status	Yes	136 (72.3%)
	No	52 (27.7%)
Past history of hospitalization		66 (35.1%)
History of injections		22 (11.7%)
History of blood transfusion		31 (16.5%)
History of surgical procedure		63 (33.5%)
Family history of HBV		53 (28.2%)
Maternal status of HBV as positive		31 (16.5%)
History of body piercing		36 (19.1%)

Table-I. Demographical, and clinical characteristics along with risk factors evaluation (N=188)
HBV: Hepatitis B virus; IQR: Inter-quartile range

The frequency of HBsAg was positive in 57 (30.3%) children, while it was negative in the remaining 131 (69.7%) children (Figure-1).

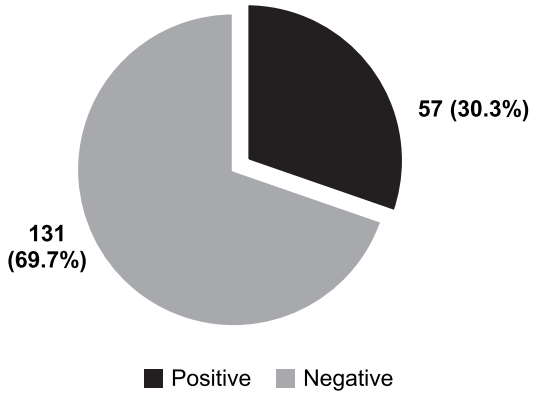

Figure-1. Frequency of Hepatitis B surface antigen (n=188)

Gender was significantly associated with Hepatitis B status, with a higher proportion of females testing positive (p=0.001). The mean age for the positive group was significantly higher (8.54±3.46 years vs. 6.66±3.43 years, p=0.001). The mean weight was higher among HBsAg positive cases (23.02±7.24 kg vs. 17.74±7.80 kg, p<0.001). Absence of HBV vaccination status showed a strong association with HBsAg seropositivity (p<0.001). A history of hospitalization was more common among HBsAg positive cases (45.6% vs. 30.5%; p=0.046). History of injections was reported more frequently in the HBsAg positive children (19.3% vs. 8.4%; p=0.033). Blood transfusions were also significantly associated with HBsAg positivity (31.6% vs. 9.9%, p<0.001). No significant difference was observed in the history of surgical procedures (33.3% vs. 33.6%, p=0.973). Family history of HBV was found to have significant association of positive HBsAg status (40.4% vs. 22.9%, p=0.015). Maternal HBV positivity was notably higher in the HBsAg positive children (33.3% vs. 9.2%; p<0.001). History of body piercing was more prevalent among HBsAg positive cases (33.3% vs. 13.0%; p=0.001). Table-II is showing association of HBsAg status with various demographical, and clinical characteristics, along with various risk factors of HBV.

DISCUSSION

The prevalence of HBsAg in our study was 30.3%, which indicates a higher burden of HBV in the pediatric population screened prior to undergoing surgery. This rate is much higher than what was found by another local study done by Malik et al where the researchers reported the prevalence of HBsAg among surgical patients as 3.9%.[12] Memon et al., in their study reported a 3.6% prevalence of HBsAg among surgical patients.[13] The higher prevalence in our pediatric sample could reflect variations in diagnostic evaluation, difference geographies and populations, increased exposure to risk factors, or the absence of routine HBV screening and vaccination programs at early stages of life. The results underscore the importance of preoperative screening to identify asymptomatic carriers and prevent transmission.

Study variable		Hepatitis B positive (n=57)	Hepatitis B negative (n=131)	P-Value
Gender	Male	27 (47.4%)	95 (72.5%)	0.001
	Female	30 (52.6%)	36 (27.5%)	
Age in years		8.54±3.46	6.66±3.43	0.001
Weight in kg		23.02±7.24	17.74±7.80	<0.001
HBV vaccination status	Yes	26 (45.6%)	110 (84.0%)	<0.001
	No	31 (54.4%)	21 (16.0%)	
Past history of hospitalization		26 (45.6%)	40 (30.5%)	0.046
History of injections		11 (19.3%)	11 (8.4%)	0.033
History of blood transfusion		18 (31.6%)	13 (9.9%)	<0.001
History of surgical procedure		19 (33.3%)	44 (33.6%)	0.973
Family history of HBV		23 (40.4%)	30 (22.9%)	0.015
Maternal status of HBV as positive		19 (33.3%)	12 (9.2%)	<0.001
History of body piercing		19 (33.3%)	17 (13.0%)	0.001

Table-I. Association of HBsAg seropositivity with various study variables
HBV: Hepatitis B virus; IQR: Inter-quartile range

Our study found a significant association between gender and HBV status, with females having a higher rate of positivity compared to males ((52.6% vs. 47.4%, p=0.001). This finding contrasts with the observations of Memon et al where they had found a male predominance in HBsAg positive cases.[13] In another study, the majority of seropositive cases were female, though the overall male-to-female ratio remained skewed towards males (2.3:1).[14] The gender disparity in the pediatric population may be attributed to differential healthcare-seeking behaviors, vaccination rates, or cultural practices affecting exposure to HBV. Further research is required to explore these gender-based differences in HBV transmission dynamics among children.

The mean age of children with HBV infection was significantly higher than the those with HBV-negative status (8.54±3.46 years vs. 6.66±3.43 years, p=0.001). These findings are consistent with the study conducted by Shefa Al-Amleh in Hebron, Palestine[15], which found that older age increased the likelihood of getting infection with HBV. The age-related increase in infection could reflect cumulative exposure to risk factors such as injections, surgeries, or body piercing over time.

Our results show that children who had not received HBV vaccination were significantly more likely to be HBsAg positive (54.4% vs. 16.0%, p<0.001). This aligns with findings from the study by Al-Amleh[15], which demonstrated that vaccination significantly reduces HBV transmission among children born to infected mothers. In our setting, the relatively high seropositivity rate among non-vaccinated children reflects gaps in immunization coverage and highlights the need for strengthening vaccination programs. Similar studies across Pakistan also emphasized the importance of vaccination in preventing HBV infection, with most HBV-positivecase in those lacking a vaccination history.[16]

A past history of hospitalization was more common among HBV-positive children in our study (45.6% vs. 30.5%; p=0.046). The association between hospital admissions and HBV transmission may be explained by exposure to invasive procedures and potential lapses in infection control practices.[17] In our study, a history of injections was also significantly associated with HBV infection (19.3% vs. 8.4%; p=0.033). This finding is consistent with prior research that identified parenteral injections as a major route of transmission.[18] Blood transfusion was another significant risk factor in our study (31.6% vs. 9.9%, p<0.001). This result is in line with previously conducted local research which also identified blood transfusion as a common risk factor for HBV and HCV transmission.[19] Despite improvements in blood safety protocols, our findings suggest that transfusion-related HBV transmission remains a concern, particularly in pediatric populations. Contrary to expectations, we did not find a significant association between a history of surgical procedures and HBV infection in our study (33.3% vs. 33.6%; p=0.973). This result differs from prior research in adult populations, where surgical procedures were frequently identified as a risk factor as was found in another local study where 60% of HBsAg-positive patients had undergone prior surgeries.[19] The lack of association in our study may reflect improvements in sterilization practices and surgical protocols in pediatric care settings.

Family history of HBV was significantly associated with HBV seropositivity in our study (40.4% vs. 22.9%; p=0.015). Maternal HBV positivity was notably higher in HBV-positive children (33.3% vs. 9.2%; p<0.001). These findings align with the study by Al-Amleh, which reported that HBV transmission was more common in families with a history of HBV infection and that maternal infection was a key predictor of HBV transmission to children.[15] The results highlight the importance of targeted interventions, such as screening pregnant women and providing immunoprophylaxis to newborns, to reduce vertical transmission. A history of body piercing was significantly associated with HBV infection in our study (33.3% vs. 13.0%; p=0.001). This finding supports previous research highlighting body piercing as a potential risk factor for HBV transmission.[20] Our findings emphasize the need for public health campaigns to raise awareness about the risks associated with body piercing and

the importance of using sterilized equipment.

The findings of this study demonstrate the complex interplay of demographic and clinical factors in the transmission of HBV among children undergoing surgical procedures. The significant associations observed with gender, age, weight, vaccination status, hospitalization, injections, and blood transfusions highlight the need for comprehensive screening and prevention strategies. The strong association with family and maternal HBV status underscores the importance of early interventions to prevent vertical transmission. Our results also point to gaps in vaccination coverage and the need for enhanced infection control practices, particularly in settings where children are exposed to healthcare interventions. Routine preoperative screening for HBV, combined with public awareness campaigns about safe practices, can help reduce the burden of HBV infection in pediatric populations. Moreover, improving vaccination coverage and ensuring timely administration of birth doses can play a pivotal role in preventing new infections.

CONCLUSION

The frequency of HBsAg positivity among children undergoing surgical procedures was high. Key risk factors associated with HBV seropositivity included absence of vaccination, maternal HBV positivity, family history of HBV, blood transfusions, hospital admissions, and body piercing. The findings highlight the need for comprehensive preoperative HBV screening, improved vaccination coverage, and strengthened infection control practices to prevent transmission, especially in high-risk pediatric populations.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Quratulain Ahmed Alvi	Data collection, Drafting, Responsible for data, Approval for publication.	
2	Arit Parkash	Study concept, Methodology, Proof reading, Approval for publication.