Received: 06 Dec 2023 | **Accepted:** 08 Jan 2024 **Genel Tıp Derg. Volume** 34/**Issue** 2 (April), 258-262
DOI: 10.54005/geneltip.1401060

ORIGINAL ARTICLE

Preoperative Hepatitis B Seroprevalence and AntiHBs Levels in Children Consulted for Dental Procedures under Anaesthesia

Anestezi Altında Diş Girişimi İçin Konsülte Edilen Çocuklarda Preoperatif Hepatit B Seroprevalansı ve AntiHbs Antikor Düzeyleri

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How to cite ?

Sert S, Kaya F. Preoperative Hepatitis B Seroprevalence and AntiHBs Levels in Children Consulted for Dental Procedures under Anaesthesia. Genel Tıp Derg. 34(2): 258-262.

ABSTRACT

Background/Aims: Hepatitis B virus infection continues to be a major global and national public health concern. The aim of this study was to examine the seroprevalence of hepatitis B virus in children who were consulted to child health and diseases before dental intervention and to share our findings with the healthcare personnel involved in this subject.
Methods: A total of 932 children 533 of whom (57.2%) were boys and 399 (42.8%) were girls were enrolled in the study. In the blood samples taken; hepatitis B virus tests were studied with the Enzyme Linked Immunosorbent Assay method. The results of blood samples and demographic data of the patients were evaluated.
Results: HBsAg positivity was not found in any of the patients (0%). AntiHBs seropositivity was found in 73.8% of the whole patient population. No statistically significant difference was detected when comparing the anti-HBs levels based on gender. The average age of children with antiHBs seropositivity was statistically significantly lower than that of those with antiHBs seronegativity. The median anti-HBS antibody levels were significantly higher in the group of children under 5 years old than in the other two age groups older than five years old in our study. When investigating the association between the level of antiHBs and age, a weak negative correlation was determined.
Conclusion: Our study showed that the antiHBs seropositivity is higher in Konya province compared to previous studies. It suggests that the national vaccination program has a positive impact on antiHBs seroprevalence. Our study revealed that children under the age of five displayed the highest levels of anti-HBs seropositivity, while the anti-HBs levels diminished with advancing age.

Keywords: Children, Consultation, Hepatitis B virus, Preoperative period, Seroprevalence

ÖZ

Arka Plan/Amaçlar: Hepatit B virüsü enfeksiyonu küresel ve ulusal düzeyde halen önemli bir halk sağlığı sorunu olmaya devam etmektedir. Bu çalışmanın amacı, diş müdahalesinden önce çocuk sağlığı ve hastalıklarına danışılan çocuklarda hepatit B virüsü seroprevalansını incelemek ve bulgularımızı konuyla ilgili sağlık personeliyle paylaşmaktır.
Yöntemler: Çalışmaya toplamda 932 çocuk katılmış olup, bunların 533'ü (%57.2) erkek ve 399'u (%42.8) kızdır. Alınan kan örneklerinde; hepatit B virüsü testleri Enzim Bağlı İmmuno Sorbent Testi yöntemiyle incelenmiştir. Kan örneklerinin sonuçları ve hastaların demografik verileri değerlendirilmiştir.
Bulgular: HBsAg pozitifliği hiçbir hastada bulunmamıştır (%0). Tüm hasta popülasyonunun %73.8'inde AntiHBs seropozitifliği bulunmuştur. Cinsiyete göre anti-HBs seviyeleri karşılaştırıldığında istatistiksel olarak anlamlı bir fark bulunmamıştır. AntiHBs seropozitif olan çocukların ortalama yaşı, antiHBs seronegatif olanlardan istatistiksel olarak anlamlı düşük bulunmuştur. Çalışmamızda, 5 yaşından küçük çocukların anti-HBS antikor seviyeleri, 5 yaşından büyük diğer iki yaş grubundakilerden anlamlı olarak daha yüksek bulunmuştur. AntiHBs seviyesi ile yaş arasındaki ilişki incelendiğinde, zayıf bir negatif korelasyon bulunmuştur.
Sonuçlar: Çalışmamız, Konya'da antiHBs seropozitifliğinin önceki çalışmalara göre daha yüksek olduğunu göstermiştir. Bu, ulusal aşılama programının antiHBs seroprevalansı üzerinde olumlu bir etkisi olduğunu düşündürmektedir. Çalışmamız, beş yaşın altındaki çocukların en yüksek anti-HBs seropozitiflik düzeylerini sergilediğini, ilerleyen yaşla birlikte anti-HBs düzeylerinin azaldığını ortaya koymuştur.

Anahtar Kelimeler: çocuklar, danışma, Hepatit B virüsü, ameliyat öncesi dönem, seroprevalans

Introduction

Hepatitis B virus (HBV) infection continues to be a major global and national public health concern (1). Chronic viral hepatitis is mostly caused by the HBV (2). It has been reported that the global prevalence of chronic HBV infection is 3-5% (1). Nearly two million children under the age of five contract the virus each year, primarily as a result of early vertical or horizontal transmission (2). Our country is a moderate-endemic region in terms of hepatitis B prevalance (3). HBV infection is a significant cause of morbidity and mortality. Although there are antiviral treatment options, there is no definitive treatment for HBV infection (1, 3). HBV infection, during the acute stage, poses a risk to an individual's life and gives rise to grave complexities such as chronic hepatitis, hepatocellular carcinoma, and cirrhosis (1).

In addition to predominantly spreading through blood and serum, HBV can also transmit vertically from mother to child. The three most typical ways that HBV is contracted are through unsafe injection practices, sexual contact and vertical transmission (4). HBV infection is one of the most important infectious diseases in dental practice (5). During dental procedures,

Peer-Review: Double anonymized - Two External
Plagiarism Checks: Yes - intihal.net
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Selcuk University Press
Genel Tıp Dergisi | e-ISSN: 2602-3741
https://dergipark.org.tr/tr/pub/geneltip
https://yayinevi.selcuk.edu.tr/

HBV can be transmitted via direct contact with blood, oral fluids, or other bodily secretions. Indirect transmission of HBV can also occur through contact with contaminated tools and operator equipments. Consequently, dental professionals are susceptible to contracting hepatitis B (5, 6). Therefore, it is imperative to ascertain the results of HBV tests prior to invasive procedures, such as dental interventions. As a result, healthcare practitioners should undertake necessary precautions while performing the procedure.

Vaccination is the most reliable method of protection against the Hepatitis B virus. The number of cases of HBV infections has dropped dramatically since the vaccination were developed. Vaccinations against the HBV have been available in our country since August 1998. Accordingly, the hepatitis B vaccine is administered in three doses immediately upon birth, at the first month, and at the sixth month of life (7). In vaccinated children, antibody to hepatitis B surface antigen (anti-HBs) seroprevalence results differ. Today, a level of anti-HBs greater than 10 mIU/ml is regarded as protective (8). Clinical studies have shown that anti-HBs levels decrease as age increases in children vaccinated against hepatitis B (9). Therefore, knowing whether the children have protective antibody levels is another important issue before dental interventions in children. The findings of studies investigating at the seroprevalence of HBV in children in our country show that seroprevalence of anti-HBs differs depending on the community and region in which the study is conducted. In Konya, there are few studies on this topic in children (10, 11). In our study, we aimed to examine the HBV seroprevalence in children referred to child health and diseases before dental intervention and to share our findings with the healthcare personnel involved on this subject.

Material and Methods

This retrospective study included patients who were consulted before receiving general anaesthesia dental intervention at the Health Sciences University Konya Beyhekim Training and Research Hospital, Child Health and Diseases Outpatient Clinic, between January 2017 and December 2022. Test results for the hepatitis B virus surface antigen (HBsAg) and anti-HBs levels were reviewed in a retrospective manner. The results of blood samples and demographic data of the patients were evaluated. The study included children aged 1 to 18 who, in accordance with the family's declaration, had completed the hepatitis B vaccination schedule. In the blood samples taken; HBV tests were examined with the Enzyme Linked Immuno Sorbent Assay (ELISA) method. Anti-HBs levels more than 10 mIU/mL were considered seropositive. Ethical approval was received from Karatay University Research Ethics Board to conduct the research. This approval was granted with the decision number 2023/019, dated 17.11.2023.

Statistical analysis

The statistical analyses were conducted utilizing the Statistical Package for Social Sciences (SPSS) version 22 (IBM Corp. Armonk, NY, USA) program. The distribution of parameters was examined using the Shapiro-Wilk test. Parameters were given as mean±standard deviation if the data were normally distributed; otherwise, they were provided as median with interquartile range (IQR). Frequency and percentage values were used for categorical variables. Pearson Chi-square test was employed for the assessment of categorical data. In the comparison of parametric measurements between the groups, the Mann Whitney U test was used for the variables not conforming to the normal distribution of the groups. Kruskal-Wallis test was utilized to compare data from more than two groups that did not comply with normal distribution. Bivariate associations of continuous variables were assessed using Spearman's correlation coefficients. Significance level was accepted as $p<0.05$.

Results

A total of 932 children were enrolled in the study, 533 of whom (57.2%) were boys and 399 (42.8%) were girls. The age range of the participants varied from 1 year to 17 years 11 months, with an average age of 5.92±2.96 years (median: 5.10 years). In our study, HBsAg positivity was not detected in any of the patients (0%). The median anti-HBs level was found in the girls at 44.37 mIU/ml and in the boys at 33.01 mIU/ml. No statistically significant difference was determined when comparing the anti-HBs levels based on gender ($p= 0.212$). A presentation of the comparison of anti-HBs values based on gender and age groups is indicated in Table 1. When the participants were categorized into two groups based on anti-HBs seropositivity levels, specifically those with less than 10 mIU/ml and those with 10 mIU/ml or higher, no a statistically significant difference was found according to gender ($p= 0.181$). The average age of children with anti-HBs seropositivity was statistically significantly lower than the average age of those with anti-HBs seronegativity (5.59±2.73, 6.87±3.37 years, $p= 0.001$). Anti-HBs seropositivity was determined in 73.8% of the whole patient population. The distribution of gender, age group, and annual data based on anti-HBs levels are presented in Table 2. When investigating the association between the level of anti-HBs and age, there was a weak negative correlation ($p=0.001$, r:-0.109).

Table 1: Comparison of serum anti-HBs antibody level according to gender and age groups

		Median (IQR)	p
Gender	Boy	33.01 (113.04)	0.214
	Girl	44.37 (149.91)	
Age groups	< 4.9 years of age	60.69 (165.81)	<0.001
	5-9.9 years of age	25.20 (94.35)	
	> 10 years of age	16.91 (97.64)	
Total		36.8 (130.86)	

Table 2: Distribution of gender, age groups, and annual data based on seropositivity of anti-HBs

		Anti-HBs Negative (<10)	Anti-HBs Positive (≥10)	Total	p
Gender	Boy	133 (24.9%)	400 (75.1%)	533 (57.2%)	0.181
	Girl	111 (27.8%)	288 (72.2%)	399 (42.8%)	
Age groups	< 4.9 years of age	82[a] (19.3%)	341[b] (80.7%)	423 (45.4%)	<0.001
	5-9.9 years of age	126[a] (30.2%)	291[b] (69.8%)	417 (44.7%)	
	> 10 years of age	36[a] (39.1%)	56[b] (60.9%)	92 (9.9%))	
Years	2017	49 (22.6%)	168 (77.4%)	217 (23.3%)	0.202
	2018	56 (25.6%)	163 (74.4%)	219 (23.5%)	
	2019	66 (27.2%)	177 (72.8%)	243 (26.1%)	
	2020	7 (17.9%)	32 (82.1%)	39 (4.2%)	
	2021	16 (24.6%)	49 (75.4%)	65 (7.0%)	
	2022	50 (33.6%)	99 (66.4%)	149 (16.6%)	
Total		244 (26.18%)	688 (73.82%)	932 (100%)	

Data were presented as n (%).

Discussion

In many clinics, anti-HBs and HBsAg titers are used for the diagnosis of hepatitis B infections. HBsAg positivity is important to identify individuals infected with hepatitis B virus. Anti-HBs, on the other hand, indicates immunity after infection or vaccination (12). Therefore, the use of these screening tools to determine the sufficient antibody response in unvaccinated individuals or even in vaccinated individuals, and to detect possible hepatitis B infected individuals is particularly crucial, especially before dental procedures involving direct contact with the patient (13-15).

The seroprevalence of HBV shows variation across different countries. In the United States, the administration of the hepatitis B vaccine began in 1991, whereas in our country, it was commenced in 1998 (7, 16). Following the implementation of the hepatitis B vaccine, numerous countries have observed a notable reduction in the seroprevalence of hepatitis B (17). Hepatitis B is a viral disease that can be prevented through vaccination. Nevertheless, children who have received the hepatitis B vaccine experience a decline in the levels of anti-HBs due to several factors. It has been shown in different clinical studies that these factors include time after vaccination, gender, obesity, immunosuppression and variants of genotypes (18-22). In addition, it is suggested that the varying rates of anti-HBs positivity in clinical studies may be due to the age range of the patient group studied, socio-economic differences in the study area and different vaccination protocols (23).

In our country, the seroprevalence of HBV in children has been observed to vary in different geographic regions, and even in the same region at different times. In studies conducted in Turkiye, almost all of them show that as children grow older, the anti-HBs seroprevalence decreases. In a recent study conducted in Tokat, which included 10,175 children over an 8-year period, the rate of anti-HBs positivity was 85.8% in infants aged 1-23 months, 78.3% in children aged 2-6 years, 66.9% in children aged 7-12 years, and 61.6% in children aged 13-18 years. The study results have shown that anti-HBs levels decrease significantly with age, and when comparing genders, there is no difference in hepatitis B seroprevalence. Additionally, the seroprevalence of hepatitis B in children born before the hepatitis B vaccination is significantly lower than others. In the same study, the ages of children with anti-HBs seropositivity were significantly lower than those with anti-HBs seronegativity. HBsAg seropositivity was detected in 2% of the patients (3). Our study elucidated that individual under the age of five displayed the highest levels of anti-HBs seropositivity, while the response of anti-HBs diminished with advancing age. Moreover, we revealed that the median anti-HBs levels and the seroprevalence of Hepatitis B were not influenced by gender. Moreover, we identified a negative correlation between the levels of anti-HBs and age (p=0.001). Anti-HBs levels were significantly higher in the group of children under five years old than in the other two age groups older than five years old in our study when median anti-HBs levels were compared by age groups.

There were studies in Şanliurfa province that showed a decrease in HBsAg positivity after hepatitis B vaccination, with these rates reported as 12.5% in 1997 and 2% in 2002 (24,25). In a study including 720 children over a 2-year period in Uşak province, HBsAg positivity was found in 1 out of 720 patients, and anti-HBs seropositivity was detected in 65% of them. In comparison to other older age groups, the study indicated that the 1-3 age group had the highest levels of anti-HBs (26).

In a study involving 1332 children in Van province, the HBsAg positivity was 0.2%, while the anti-HBs seropositivity was approximately 73%, indicating that a large proportion of these individuals had been vaccinated against hepatitis B (27).

Studies conducted in Istanbul province reported that HBsAg positivity was 1% while anti-HBs seropositivity was 83.1-96.2%, indicating that these rates are better than those in Anatolian provinces (28, 29). In a study conducted on 200 infants in Antalya province, it was shown that almost all of them achieved protective levels of anti-HBs titers after vaccination (30). In these studies, the correlation of anti-HBs seropositivity with vaccination rates supports the relationship with socioeconomic levels.

In a study involving 4231 children in Ankara province, HBsAg positivity was found as 0.8% and the Anti-HBs seropositivity was approximately 75%. The study found significantly higher anti-HBs seropositivity in girls compared to boys (31). In another study involving 530

children in Ankara, HBsAg seropositivity was 0% and the anti-HBs seropositivity was approximately 66% (32).

Since there is no recent research demonstrating the seroprevalence of HBV in children in Konya province, our findings will make a valuable contribution to the existing literature by allowing for a comparison with previous studies. In two different previous studies in Konya, HBs Ag seropositivity was 0% and 1.6% respectively while the anti-HBs seropositivity was approximately 48% (10, 11). In our current study, the anti-HBs seropositivity of 74% indicates that the vaccination status in our region of Konya is better compared to previous years. Our hospital provides tertiary healthcare services and is located in an area where the population has a higher socioeconomic status, which may have contributed to these rates.

In a recent study involving 573 children who applied to the dental hospital in Eskişehir province, the anti-HBs seropositivity was 53%, and HBsAg was approximately 0.8%. This study showed that protective antibody levels were insufficient in almost half of the patients, highlighting the importance of knowing these results before dental procedures (33). This will provide an opportunity to administer booster hepatitis B vaccination to these patients. Our study revealed that the number of patients attending hospital for dental interventions has declined since 2020, which may be related to the COVID-19 pandemic.

Conclusion

The limitations of our study are that since it was planned retrospectively, we did not have information about the children's Hepatitis B vaccination status and vaccination cards. Nevertheless, we assumed that Hepatitis B vaccination had been administered.

In conclusion, we observed a complete absence of HBsAg in all patients. Our study showed that the anti-HBs seropositivity is higher in Konya compared to previous studies. It suggests that the national vaccination program has a positive impact on anti-HBs seroprevalence. Our study revealed that children under the age of five displayed the highest levels of anti-HBs seropositivity while the anti-HBs levels diminished with advancing age.

Declaration of Conflicting Interests: The authors declared no potential conflicts of interest.

Funding: The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical aspects of the research: The research obtained ethical committee approval, as evidenced by the ethical committee approval (2023/019)

Author contributions: SS and FK study design. SS and FK data collection. SS wrote the manuscript. All the authors have agreed to be accountable for all aspects of the study and have approved the final version of the manuscript.

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