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Unexpected HBsAg Positivity in Immunized Individuals: A Case Series

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Abstract

Infection with the hepatitis B virus (HBV) is a primary cause of chronic viral hepatitis and a significant public health issue. Since 2003, all infants in Bangladesh have received the HBV vaccine in their 6th week of age under the National Expanded Program on Immunization (EPI). Despite EPI vaccination campaigns, cases of HBV infection are still being discovered in children who were previously vaccinated. This article explored previously immunized individuals who incidentally turned out to have HBsAg during their routine evaluation.

Keywords

Hepatitis B Virus, HBsAg, Expanded Program on Immunization, Hepatitis B Virus-Birth Dose, HBV Elimination

1. Introduction

Many acute and chronic liver disorders are associated with hepatitis B virus (HBV) infection. Most individuals with the virus first develop an acute infection, which can persist for a few weeks. The disease can then clear up on its own or cause chronic or fulminant hepatitis, liver cirrhosis, liver cancer, and some extrahepatic illness symptoms. Early life exposure to HBV is associated with more severe liver damage. If a newborn is infected with HBV, the risk of chronic HBV infection ranges from 70% to 90% [1]. An estimated 250 million individuals worldwide are thought to be chronically infected with HBV, and the virus is believed to be a contributing factor in approximately 900,000 fatal instances of cirrhosis and hepatocellular carcinoma annually [2]. Bangladesh is considered an endemic zone for HBV infection, with the prevalence of HBV infection among the general population being

4%. The preventive strategies implemented in the country include screening blood and blood products before transfusion, adhering to standard precautions during surgical interventions, immunization through the EPI vaccination at 6, 10, and 14 weeks of age, screening the mother during prenatal checkups, and providing post-exposure prophylaxis in the case of a birth from a seropositive mother [3]. The hepatologist evaluates all HBV-infected cases, providing medical treatment based on clinical and laboratory investigations, with special attention to the outcomes of HBV-related studies, serological, biochemical, and virological markers. In many instances, patients are started on oral anti-HBV medications according to the viral load, following the guidelines [4].

To eliminate HBV infection, every neonate used to receive a pentavalent vaccine that included HBV under the EPI (**Table 1**) [5] [6]. Still, the findings of HBV positivity in a previously vaccinated individual were often surprising and required proper scientific attention.

Table 1. Hepatitis B vaccination schedule in Bangladesh and the new WHO-directed schedule.

Vaccination schedule	The EPI program in Bangladesh	The Vaccination schedule as per the WHO-directed schedule
Type of vaccine	Pentavalent (DTwP-Hep-B-Hib) (Easyfive-TT, Panacea Biotec Ltd., India)	Monovalent HBV Vaccines at birth and Pentavalent afterward
Doses	Dose 1: 6 weeks Dose 2: 10 weeks Dose 3: 14 weeks	Dose 1: At birth Dose 2: 6 weeks Dose 3: 10 weeks Dose 4: 14 weeks

2. Case Presentation

In the present research, we provide incidental HBsAg positivity in two chronic hepatitis patients with mild to moderate symptoms who came for a routine check-up for their medical conditions. The history, clinical findings, and investigation profiles of the patients are listed in **Table 2**.

Table 2. Case descriptions.

Salient features	Case 1	Case 2
History		
Age at present	11 years 10 months	17 years 5 months
Sex	Male	Male
Chief complaints	1. Abdominal pain 2. Constipation	1. Generalized weakness
History of past illness	He was first detected as HBsAg positive in 2008 while being evaluated for abdominal symptoms.	History of circumcision using conventional techniques, despite the hospital amenities.
Family history	Her mother is HBsAg positive and is receiving medications for HBV infection.	His parents and siblings are enjoying good health.
Transfusion history	He has no history of receiving blood transfusions.	Nothing significant.

Continued

Immunization history	Fully vaccinated according to the current EPI schedule.	Received only 1st dose of the HBV vaccine but missed out 2nd and 3rd doses of the EPI schedule.
Date of receiving the vaccination	July 16, 2013	December 9, 2007
Travel history	Not significant	Not significant
Birth history	The birth was performed via vaginal delivery.	The delivery took place vaginally as well.
Breastfeeding history	Exclusively breastfed	Exclusively breastfed
Physical examination		
Anaemia	Mildly anemic	-
Jaundice	-	-
Organomegaly	-	+
Investigations		
HBsAg	+	+
HBeAg	-	+
Anti-HBe	+	+
Anti-HBs	8.15 mIU/ml	346 mIU/ml
HBV-DNA	2.87×10^7 IU/ml Undetected (After treatment with Tab Entecavir, 0.5 mg)	2.59×10^7 IU/ml
USG of the whole abdomen	Nothing abnormal detected	Mild hepatomegaly
Investigations of the mother		
HBsAg	+	-
Anti-HBc total	+	Not available
Probable mode of infection	The boy might be infected through vertical transmission and/or breastfeeding at some point before the 1st vaccine dose.	Incomplete immunization failed to provide complete protection, as evidenced by the vaccination card. ? Surgical intervention using contaminated materials

Case 1

An 11-year-old male child presented with abdominal pain and constipation. During the current evaluation, he tested positive for HBsAg, negative for HBeAg, and positive for Anti-HBe. According to his medical history, he was first diagnosed with HBsAg at the age of 5. A thorough medical history evaluation regarding the transmission route and vaccination status for the Hepatitis B virus revealed that his mother did not receive adequate antenatal checkups during her pregnancy. His mother's HBV parameters were also positive on routine investigations. The child received vaccines according to the EPI schedule, which began at 6 weeks of age and continued as scheduled. Despite being vaccinated against HBV, he may have contracted the virus, possibly transmitted vertically during pregnancy or through breastfeeding prior to the first HBV vaccine at 6 weeks of age (**Figure 1**).

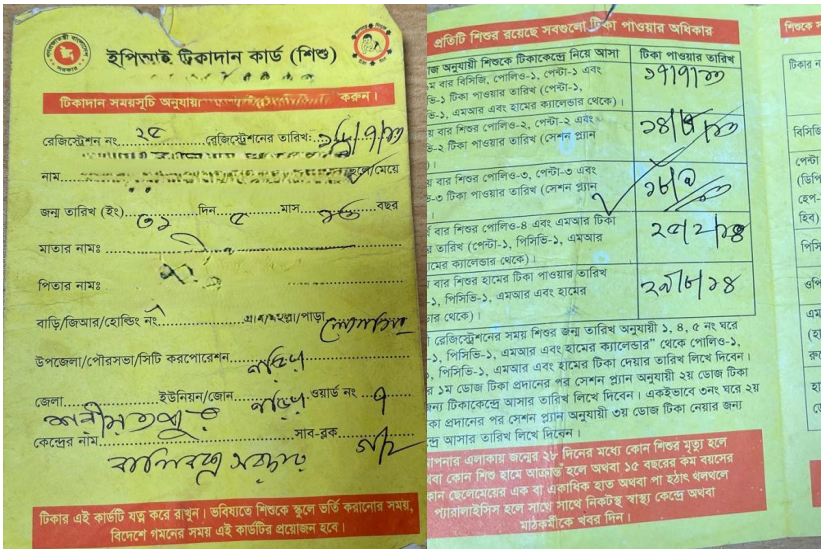

Figure 1. EPI vaccination card of Case 1.

The likely causal transmission sources were identified based on the patient's recollections during conversation and circumstantial evidence. Based on clinical findings and laboratory reports, the patient was managed accordingly by her treating physician and advised to undergo periodic follow-up. He is taking Entecavir (0.5 mg) as treatment.

Case 2

The circumstances of a 17-year-old male patient who arrived for his ongoing health checkup with chronic hepatitis were examined. Reviewing his EPI vaccination card revealed a history of inadequate HBV immunization; he had received the first dose but missed the second and third doses (**Figure 2**). His probable mode of infection could not be verified scientifically without considering the history of surgery using a conventional technique.

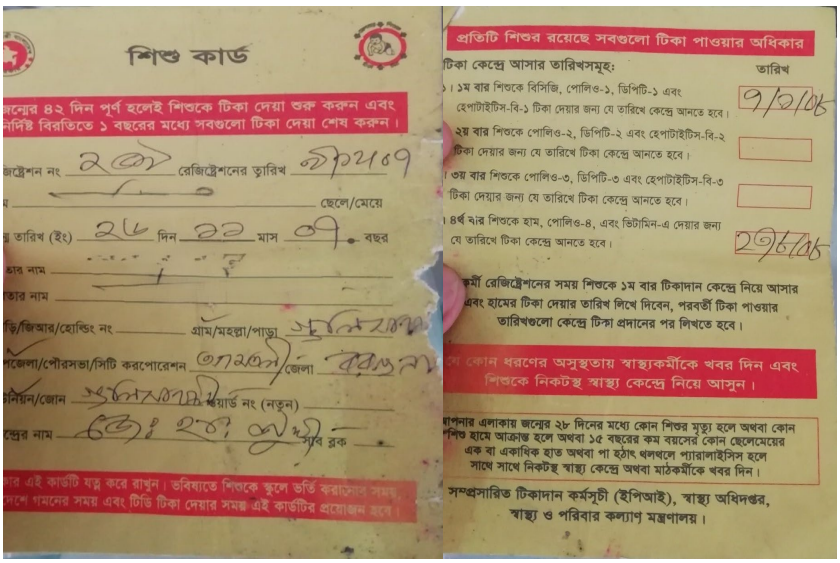

Figure 2. EPI vaccination card of Case 2.

3. Discussion

All five hepatitis viruses (hepatitis A, B, C, D, and E) were covered in the first global health sector strategy on viral hepatitis in 2016, focusing on hepatitis B and C because of the significant public health burden they represent. With a target to eliminate HBV within 2030, WHO is working to raise awareness and increase coverage of birth-dose vaccination globally [7]. Despite good vaccination coverage of 90%, HBsAg positivity in individuals under 20 is still rare worldwide [8]. In Bangladesh, the EPI vaccination launched on April 7, 1979, has achieved around 90% coverage nationwide, while several vaccines have been introduced from time to time since 2003, including the HBV vaccine [9].

The most probable transmission routes for HBV from mother to newborn are transplacental in utero, during delivery and during care or through breast milk after delivery [10]. This study shows that individuals under 20 years of age can test positive for HBsAg incidentally or may show symptoms of chronic hepatitis; however, scientifically verifying the actual route or vaccine failure is often difficult to determine. Here, case 1 probably got HBV infection from her HBV-infected mother. Still, in case 2, we found no potential root causes while inquiring with the patient's parents, except for the history of receiving traditional surgical intervention.

In the case of participants who completed the national vaccination schedule of three doses, the average response rate to the vaccine exceeds 90%, with 5% to 10% of vaccinated individuals not developing a sufficient level of protective immunity [11]. Although the occurrence of breakthrough infections among the previously vaccinated is not uncommon, as documented elsewhere [12].

Many countries have already adopted the Hepatitis B Virus-Birth Dose (HBV-BD) in addition to their usual vaccination schedule, and the global coverage of HBV-BD is 42% and 51% in Southeast Asia. Among the countries belonging to the Southeast Asia region, Bangladesh, Nepal, and Sri Lanka are the countries that have yet to initiate an HBV-BD-based vaccination schedule [13]. Many countries have experienced benefits from this implementation, as it is 90% - 95% effective in preventing vertical transmission [14].

Given the endemic nature of our nation, we need to prioritize reducing the incidence of Hepatitis B and aim for its eradication by 2030. Several countries have already made progress towards this goal by combining the continuing EPI program with the HBV-BD vaccination [15].

Bangladesh practices HBV vaccinations routinely in the current EPI schedule from 6 weeks of age. The interval between delivery and immunization may be crucial for transmitting the virus to the baby by healthcare personnel, parents, caregivers, or others who handle the baby very closely [16]. Though we are seeing success in immunization among children throughout the country, some challenges may hamper our efforts to achieve the goal due to poor screening for HBV in mothers during their antenatal period and postexposure prophylaxis in HBV-exposed newborns. Efforts should be enhanced during the screening of HBV in

pregnant women to prevent perinatal transmission. Additionally, a reminder app could be developed to notify parents about their child's vaccination dates, helping to avoid any dropout cases.

4. Conclusion

The case highlighted how important antinatal screening, post-exposure prophylaxis, and HBV-BD vaccination are in reducing and eliminating HBV infection. However, the study's focus on these cases limits its applicability to the broader pediatric population in Bangladesh. Further studies involving a more comprehensive range of children are necessary to better understand the vaccine's cost-effectiveness nationally. This will aid policymakers in determining the best way to conduct nationwide vaccination campaigns.

Consent

Informed consent was obtained from the patient's parents, as no identifiable particulars were included in this case's report.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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