

Prevalence and Risk Factors of Hepatitis B Virus in a Population of Children and Teenagers in Ebolowa, Cameroon: A Community-Based Study

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Abstract

Background: This study aimed at determining the prevalence of hepatitis B virus (HBV) infection as well as risk factors associated with the infection in infants born after the introduction of the hepatitis B vaccine in the expanded program of immunization (EPI) in Cameroon.

Patients and Method: It was a cross sectional prospective community-based study hosted in the premises of the Ebolowa regional hospital from August to October 2019. All participants who met our selection criteria were enrolled. Demographic data, risk factors and HBsAg results were analyzed using the CS-Pro software. P-values less than 5% were considered significant on univariate analysis.

Results: A total of 208 participants with a mean age of 8.9 (\pm 3.4) years old were enrolled in the study, 53.8% of whom were male. The overall HBsAg prevalence was 1.9% (95% CI : 0.5 – 3.8), with no infection recorded among those aged between 10 to 14 years old. All those infected were at most in primary school. Upon univariate analysis, there was no significant association between hepatitis B virus infection and past history of surgery, blood transfusion, scarifications, tattooing, piercing, jaundice and family history of hepatitis B virus. As a matter of facts none of the infected infants had a past history of surgery, blood transfusion, jaundice, tattooing nor piercing.

Conclusion: The prevalence of HBV was 1.9%. Policies must be put in place to stop new infections as well as adequately following up infected infants.

Keywords: Prevalence, Hepatitis B, Infants, Teenagers, Cameroon

Introduction

Hepatitis B virus remains a major public health problem worldwide. The World Health Organization (WHO) estimates to over 2 billion the number of people that have been infected with the hepatitis B virus [1]. It is a leading cause of cirrhosis and hepatocellular carcinoma worldwide. As a matter of facts, over 50%

of cases of hepatocellular carcinoma are related to HBV [2-4]. It was estimated by the WHO that in 2019, 296 million people were chronically infected by the virus, with close to 1.5 million new infections yearly. In the same year, the virus resulted in close to 820000 deaths in the world, mostly as a result of cirrhosis and hepatocellular carcinoma [5].

Africa is disproportionately affected, with four million children younger than five years of age living with HBV infection and 990,000 children newly infected annually. In addition, one in ten deaths due to HBV infection globally occur in Africa [5]. Hepatitis B is a silent disease that progresses over decades to cirrhosis, liver failure, liver cancer, and premature death. The earlier the exposition in infants, the greater the chances of life-long infection ; about 90% of babies infected with HBV at birth will develop a lifelong infection [6].

In sub-Saharan Africa, the prevalence rate of HBV infection is between 8.00 and 20.00% [7]. It has been clearly established that most infections in sub-Saharan Africa occur either from an infected mother to her baby during child birth or during the first years of life. This is substantiated by the fact that most cases of both cirrhosis and hepatocellular carcinoma related to hepatitis B occur in young adults [8-10]. Cameroon with a national prevalence of 11.2% introduced the hepatitis B vaccine in its expanded immunization program in 2005 [11]. As per this program, infants receive the hepatitis B vaccine as part of a pentavalent vaccine at 6, 10 and 14 weeks of age respectively for the first, second and third dose.

Ebolowa is the regional headquarters of the South region. Few studies have been carried out within the region to evaluate the prevalence of hepatitis B virus in general, but more specifically among children and teenagers. This study aimed at determining the prevalence of hepatitis B virus (HBV) infection as well as risk factors associated with the infection in infants born after the introduction of the hepatitis B vaccine in the expanded program of immunization (EPI) in Cameroon.

Patients and Methods

It was a cross-sectional community-based study hosted within the premises of the Ebolowa regional hospital during a three months period (from August to October 2019), during a voluntary screening campaign. Children and teenagers were brought by their parents and guardians for screening following sensitization prior to the campaign. After registration of participants, a structured questionnaire was used to collect data. Parents were assisted by a health care worker in filling the questionnaire.

Informed verbal consent was obtained from them prior to the procedure. The questionnaire had three sections : a section for demographic data (age, gender, academic level), a section for risk factors of hepatitis B virus infection, and one for the result of the HBsAg test (which was filled later on after blood analysis)

A volume of 5ml of blood was aseptically collected from the participants into an EDTAK3 (ethylene diamine Tetra-Acetic Tri- Potassium) tube and sent to the hospital's laboratory for analysis. Following centrifugation, plasma was used for the detection of HBsAg by an immunochromatographic method using the PKL® kit of PARAMEDICAL srl laboratories (Corso Vittorio Emanuele 127-84123 Salerno (SA) Italy). The analysis was performed as per the manufacturer's instructions. Positive results were further confirmed by the ELISA method using the DIALAB® Laboratories kit (DIALAB, A-2351 Neudorf Austria). Positivity was established for a sample with an absorbance greater than 1.

Each participant who tested negative was referred to the Ebolowa International Vaccination Center for hepatitis B vaccination while those who tested positive were addressed to the hepatogastroenterologist of the hospital for management.

The data collected were compiled using the SPSS software version 18.0 and CSPro software version 7.7.3. The lone quantitative variable (age) was expressed as mean with the extremes. Qualitative variables were expressed as percentages with their respective confidence intervals (CI) set at 95%. To establish the relationship between two discrete variables, Chi square test was performed, with a Fischer's test done where appropriate. Statistical significance was set at a p-value < 0.05.

Results

A total of 208 children and teenagers were enrolled in our study. The mean age was 8.9 (\pm 3.4) years. There were 53.8% males, a sex ratio of 1.16 in favor of males. The overall prevalence was 1.9% (95% CI : 0.5 – 3.8). While none of the participants in the 10 – 14 years age group was infected, it was 4% (95% CI : 0 – 12%) among those aged 1 to 4 years old, while it was 3.3% (95% CI : 0 – 7.8) among these aged 5 to 9 years Table 1.

Table 1: Distribution of HBsAg Prevalence within to Sex and the Various Age Groups

Age groups	Prevalence of HBsAg % (CI)	Number N	Mean age (SD)	Sex		
				Males %	Females %	Total %
0 – 4 years	4.0 (0 – 12)	25	3.4 (0.6)	56.0	44.0	100.0
5 - 9 Years	3.3 (0 – 7.8)	90	7.1 (1.4)	57.8	42.2	100.0
10 - 14 Years	0 (0 – 100)	93	12.0 (1.5)	49.5	50.5	100.0
Overall	1.9 (0.5 – 3.8)	208	8.9 (3.4)	53.8	46.2	100.0

Of the 4 infected infants, two were males and 2 were females. Infected participants were at most in primary school (none of them was in secondary school) Table 2.

Table 2: Distribution of HbsAg Subjects with Respect to Demographic Data

Variables		n	%	HbsAg n(%)	Prevalence (CI)
Gender	Male	112	53.8	2	1.8 (0 – 4.5)
	Female	96	44.2	2	2.1 (0 – 5.2)
Age groups	0-4	25	12	1	4.0 (0 – 12)
	5-9	90	43.3	3	3.4 (0 – 7.8)
	10-14	93	44.7	0	0 (0 – 100)
Academic level	Preschool	62	29.8	2	3.2 (0 – 8.1)
	Primary	118	56.7	2	1.7 (0 – 4.2)
	Secondary	27	13.5	0	0 (0 - 100)

Table 3 shows that none of the participants had a past history of jaundice, nor had been exposed to blood transfusion, surgery, scarifications, tattoo and piercing. One of the 4 infected participants had a first degree relative with viral hepatitis B. There

was however no significant association between the participants HBsAg status and viral hepatitis B among the first degree relatives ($p=0.32$).

Table 3 : Distribution of HBsAg status with respect to past history

Variables		HbsAg positive N (%)	HbsAg negative N (%)	p-value
Jaundice	Yes	0 (0)	3 (100)	0.94
	No	4 (2)	201 (98.1)	
Blood transfusion	Yes	0 (0)	9 (100)	0.84
	No	4 (2.1)	195 (98)	
Surgery	Yes	0 (0)	5 (100)	0.52
	No	4 (2)	199 (98.1)	
Tattooing	Yes	0 (0)	0 (0)	NA
	No	4 (2)	204 (98.1)	
Piercing	Yes	0 (0)	65 (100)	0.22
	No	4 (2.8)	139 (97.3)	
Family history of HBV	Yes	1 (4.8)	20 (95.3)	20 (95.3) 184 (98.4)
	No	3 (1.7)	184 (98.4)	

Discussion

Mother-to-child transmission and early horizontal transmission of hepatitis B are the commonest routes of transmission of viral hepatitis B in Sub-Saharan Africa, making exposed infants more at risk of becoming chronic carriers and thus developing complications as young adults [8,9,12]. With the introduction of the hepatitis B vaccine in the expanded immunization program of Cameroon in 2005, with the first dose given as from the 6th week of life, this study aimed at determining the prevalence of hepatitis B virus in children born thereafter as well as describing risk factors associated to the infection.

A total of 208 participants were enrolled with a mean age of 8.9 (± 3.4) years old and a slightly male predominance (53.8%). According to data published by the World Fact Book, children aged between 0 to 14 years old represent 42.34% of the population of Cameroon, with a male to female ratio of 1.02 [13]. In our study, the male to female ratio was 1.16.

The overall prevalence was 1.9% (95% CI : 0.5 – 3.8). This is far less than the 19.9% reported in Cameroon by Chiamonte et al. in 1991 [14]. This is sufficient evidence of the impact of the

introduction of the hepatitis vaccine in the expanded immunization program. Our result though a little higher, is not far from the 1.02% obtained by Noah et al. in 2020 in Cameroon, and the 1.1% obtained by Gora Lô et al. in 2019 in Senegal, who noted a similar drop in the prevalence of hepatitis B in children following the introduction of the vaccine in the expanded immunization program [15,16]. Strikingly, none of those born between 2005 and 2010 were infected, that is to say, immediately after the introduction of the vaccine in the Expanded immunization program. Infections came in thereafter. Most infected subjects were at most in primary school. This goes a long way to highlight the need to evaluate titers of anti HBs antibodies. As a matter of facts, though Ephesians N et al. in a hospital-based study in two reference hospitals in the Southwest of Cameroon reported an immunization rate of 98.8%, Gora et al. in a community-based study in Senegal reported an immunization rate of 56% [16,17].

There was no association between the infected participants and the evaluated risk factors. Neither age nor sex was significantly associated with a positive hepatitis B surface antigen. These findings have been reported by Ayebo ES and Antoinette O. in Nigerian children in 2014 [18]. The prevalence in our study was

1.8% (95 % CI : 0 – 4.5) amongst males, while it was 2.1% (95 % CI : 0 – 5.2) amongst females. This difference was not statistically significant ($p=0.629$). Many studies have however reported a male predominance of hepatitis B infection [8,15,19].

The presence of jaundice (a hallmark of liver injury in hepatitis B viral infection) in the past history, has been reported as a risk factor of viral hepatitis B among adults in several studies [20,21]. None of our infected participants had a past history of jaundice. This can be accounted for by the fact that most infected infants are in the immune tolerant phase, presenting very minimal or no liver injury [22].

None of the infected participants had a history of blood transfusion, surgery, scarifications, piercing or tattoo. None had a known first degree relative infected by hepatitis B. Agbede et al. in Nigeria in 2007 reported a relationship between blood transfusion, mother's status and mode of delivery [23]. However, most studies do not report a relationship between the above-mentioned risk factors and infection with hepatitis B virus among children and teenagers [23,24].

Conclusion

Following the introduction of the hepatitis B vaccine in the expanded immunization program, Cameroon has witnessed a close to 10% drop in the prevalence of hepatitis B among children and teenagers between within a period of close to 30 years. We found a prevalence of 1.9% (95% CI : 0.5 – 3.8). Policies must be put in place to further limit new infections as well as adequately following up infected infants.

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