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Epidemiology of Hepatitis Delta Virus among Pregnant Women in Pointe Noire, Republic of the Congo

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Abstract **Introduction:** HDV infection during pregnancy can lead to an increased risk of perinatal transmission and liver complications for both mother and child. The aim of this study was to evaluate the prevalence of anti-HDV antibodies among pregnant women in Brazzaville, republic of Congo. **Methods:** This was a cross-sectional study conducted among pregnant women in Pointe Noire, republic of Congo. A structured questionnaire was used to collect demographic data and risk factors for HDV infection. Participants blood samples were screened for anti-HDV. Statistical analysis was performed using SPSS version 21.0 with a P-values <0.05. **Results:** A total of 230 pregnant women with the mean age of 26.33±5.2 years old were included. Overall, 13/230 (5.6%) of the pregnant women were positive for HDV infection. Of these, age, occupation, body tattooing, history of surgery and multiple sexual exposure we're not significantly associated with HDV infection (p >0.05). **Conclusion:** This study showed a high rate of HDV infection in pregnant women, which suggest an importance of systematic screening and management of HDV.

Keywords: *Hepatitis Delta virus, pregnant, risks factors, prevalence, Congo*

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1. Introduction

Hepatitis is an infection characterized by inflammation of the liver caused by several viruses. It can cause a variety of clinical symptoms, leading to cirrhosis and hepatocellular carcinoma (HCC) [1]. Hepatitis delta virus (HDV) is a single-stranded negative-sense RNA virus that depends on Hepatitis B virus (HBV) envelope proteins for virion assembly and propagation [2]. Despite being a defective virus, HDV infection is widely perceived as the most severe and aggressive form of human viral hepatitis [3]. Chronic HBV and its co-infection with HDV continue to represent a major health burden worldwide [1]. Around 70% to 80% of hepatitis D patients progress to cirrhosis within 5 to 10 years [4]. According to recent meta-analyses, the rate of HDV infection is estimated at between 4.5% to 14.57% in the HBsAg-positive population, representing some 72 million individuals worldwide [5,6]. Mother-to-child transmission is considered the main route of transmission for both viruses [7]. Pregnancy has been considered a potential risk factor for virus replication due to the low immune response of pregnant women [7,8] Post-partum haemorrhage, high maternal mortality and neonatal death, acute or chronic liver disease, are well associated with viral hepatitis during pregnancy [9]. It has been reported that the severity and course of viral hepatitis are relatively different in pregnant and non-pregnant women in developing and developed countries [10]. HDV infection is endemic in the Republic of Congo, with rates ranging from 12.2% to 19.5% [11,12]. Most of the studies reported have focused on stratified groups of patients with hepatitis or patients at higher risk of HDV infection. In Brazzaville, no data is currently available regarding HDV infection among pregnant women. Thus, the current study aimed to investigate the prevalence and risk factors for HDV among pregnant women in Brazzaville.

2. Materials and Methods

2.1. Study Area

This cross-sectional study was conducted between October 2021 to June 2022, among pregnant women attending at Louandjili, Mouissou, Mvoumvou, Mbota

and Siafoumou health structures in Pointe Noire, Republic of Congo.

2.2. Data Collection

A structured questionnaire was used to collect sociodemographic data and other explanatory variables from study participants. Confidentiality as assured the targeted groups was maintained. The questionnaires administered included their demographic profile (age, marital status, and educational level) and risks factors of HDV infection. This information was obtained using coded questionnaires.

2.3. Sample Analysis

The blood was allowed to clot and the serum was separated by centrifugation at room temperature for 3000 revolution per minute (rpm) for 10 minutes into screw-capped plain bottles stored at -20°C. Hepatitis D virus antibody (HDV-Ab) status was determined using the ETI-AB-DELTAK-2, ELISA HDV Ab, enzyme-linked Immuno-sorbent Assay (Milan, Italy). All analyses were performed according to the manufacturers' instructions.

2.4. Statistical Analysis

The statistical analysis was performed using SPSS version 21 (SPSS Inc, Chicago, Ill, USA). The obtained values were expressed as mean±SD or frequencies. The level of the statistical significance was set at a P-value < 0.05.

3. Results

Table 1. Prevalence of HDV in relation to characteristics of pregnant women in Pointe Noire, republic of Congo

Characteristics	Total (%)	HDV positive (%)	OR (95%CI)	P value
Age groups (years)				
19 - 24	46(20.0)	3(6.5)	0.85(0.22-3.38)	0.823
25 - 34	106(46.1)	8(7.5)	0.32(0.07-1.56)	0.159
35 – 46	78(33.9)	2(2.6)	1	
Education level				
University/Graduate	49(21.3)	3(6.0)	1.24(0.26-5.79)	0.785
Secondary	101(43.9)	6(5.9)	1.20(0.33-4.41)	0.784
Primary	80(34.8)	4(5.1)	1	
Occupation				
Shopkeeper	21(9.1)	1(4.8)	0.708(0.08-6.22)	0.756
Government employees	49(21.3)	2(4.1)	0.603(0.12-3.11)	0.545
Student	69(30.0)	4(5.8)	0.87(0.24-3.22)	0.837
Unemployed	91(39.6)	6(6.6)	1	
Marital status				
Single	32(13.9)	4(12.5)	3.00(0.87-10.40)	0.083
Married/Cohabiting	198(86.1)	9(4.1)	1	
Gestational stage				
1st trimester	107(46.5)	6(5.6)	0.713(0.17-3.00)	0.644
2nd trimester	84(36.5)	4(4.8)	0.600(0.13-2.82)	0.518
3rd trimester	39(17.0)	3(7.7)	1	

A total of 230 consented pregnant women were enrolled, with a mean age of 26.33 ± 5.2 years. Of which, 106(46.1%) were in age groups 25-34 years while 101(43.9%) were in secondary education level and 91(39.6%) were unemployed. The majority of the study participants were married (86.1%) and (46.5%) were in the first trimester of pregnancy. In all, 13/230 (5.6%) of the pregnant women had detectable antibodies to HDV. The HDV prevalence was highest among pregnant women within age groups 25-34 years (7.5%), unemployed (6.6%) and Single (12.5%). However, prevalence of HDV infection did not vary significantly by age, residence, occupation, educational level, marital status, pregnancy trimester and income (Table 1). Univariate analysis was performed to assess independent risk factors for HDV infection. History of scarification (OR=0.88, 95%CI: 0.23-3.32), history of surgery (OR=2.09, 95%CI: 0.61-7.15), body tattooing (OR=2.44, 95%CI: 0.49-12.07), ear piercing (OR=1.30, 95%CI: 0.39-4. 42), history of blood transfusion (OR=2.68, 95%CI: 0.83-8.62) and multiple sexual exposure (OR=0.98, 95% CI: 0.12-8.00) were not statistically significant associated risk factors for HDV infection (Table 2).

Table 2. Risk factors associated with HDV positivity among pregnant women in Pointe Noire, republic of Congo

Characteristics	Total (%)	HDV positive (%)	OR (95%CI)	P value
Scarification				
Yes	58(25.2)	3(5.2)	0.88(0.23-3.32)	0.854
no	172(74.8)	10(5.8)	1	
History of surgery				
Yes	42(18.3)	4(9.5)	2.09(0.61-7.15)	0.238
no	188(81.7)	9(4.8)	1	
Tattooing				
Yes	17(7.4)	2(11.8)	2.44(0.49-12.07)	0.271
no	213(92.6)	11(5.2)	1	
Ear piercing				
Yes	59(25.6)	4(6.7)	1.30(0.39-4.42)	0.664
no	171(74.4)	9(5.3)	1	
History of blood transfusion				
Yes	46(20.0)	5(10.9)	2.68(0.83-8.62)	0.098
no	184(80.0)	8(4.3)	1	
Multiple sexual exposure				
Yes	18(7.8)	1(5.6)	0.98(0.12-8.00)	0.985
no	212(92.2)	12(5.7)	1	

4. Discussion

Hepatitis Delta virus (HDV) is a defective agent that depends on HBV for replication and can alter the course of HBV infection [1]. HDV infection during pregnancy can lead to an increased risk of perinatal transmission and liver complications for the mother and child [10]. The overall prevalence of HDV in this study was 5.6%. This rate is higher than those reported among pregnant women in Sudan (3.3%), Madagascar (3.6%) and Cameroon (4.0%) [13,14,15]. On the other hand, our result is lower than anti-HDV antibody rates among pregnant women in other African countries such as Benin (11.4%), Mauritania

(14.7%), Gabon (15.6%) and Pakistan (20.63%) [16,17,18,19]. The prevalence of HDV varies greatly from one region to another. These results must be interpreted with caution, due to the small number of individuals tested, the time period, the region and the quality of the testing methods. Furthermore, the introduction of HBV vaccination and changes in attitudes and practices have helped to reduce the incidence of HBV and HDV infection in all regions of the world.

In current study, HDV infection was more frequent among pregnant women in the 25-34 age group. Another study by Aftab et *al.*, in Pakistan showed that the prevalence of anti-HDV was also common among pregnant women aged 36 to 40 years [19]. Likewise, another study carried out in Mauritania showed that anti-HDV positivity was significantly correlated with age (>33 years) [17]. HDV infection can be contracted later in life than HBV infection. This suggests a high probability of iatrogenic or intra-familial transmission of HDV. In sub-Saharan Africa, HDV infection is widespread, and transmission in early childhood is considered the main route of infection [20].

Our results show that marital status, the presence of tattoos or scarification and surgical history are not associated with anti-HDV antibody positivity. This is in agreement with those reported in Mauritania and Pakistan [17,19]. In contrast, the study carried out in Cameroon by Besombes *et al.*, reported that people with more than 10 occasional sexual partners and those receiving injections are most at risk of contracting HDV [21].

However, the presence of HDV during pregnancy is associated with a high risk of vertical transmission and maternal complications. Thus, obtaining basic epidemiological data concerning this virus could be of great importance in setting up appropriate screening programs in antenatal care clinics. Also, vaccination against hepatitis B is an effective strategy for preventing and reducing the incidence of HDV infection.

5. Conclusion

This study showed that the frequency of hepatitis D infection is high among pregnant women in Brazzaville. Early detection, treatment of infected pregnant women and immunoprophylaxis of exposed newborns are therefore essential. Health education programs on prevention must be instituted.

Conflicts of Interest

The authors have declared that they have no conflicts of interest.

Authors' Contributions

BMA designed the study. BMA, JNM, SOM and FKK performed sample collection, sample processing, data collection, laboratory work, and interpretation. BMA, JNM and LRDY performed the data analysis, statistical analysis, visualization, and literature searches. EN and FRN supervised the present study. All authors contributed to the reviewed the manuscript and approved the final manuscript.

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