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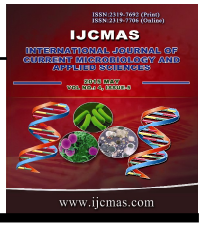

Original Research Article

Parallel and Overlapping Hepatitis B and C Virus Infection Among Pregnant Women Attending Antenatal in a Rural Clinic in Northern Nigeria

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HBV, HCV, Co-infection, Seroprevalence, Pregnant women, Nigeria

A B S T R A C T

Infections due to hepatitis B and C viruses in pregnant women, a group known to have depressed immunity and capable of vertical viral transmission resulting in neonatal ill health or death is a public health concern. This study was aimed at investigating the prevalence and possible predisposing factors for hepatitis B and C viruses among pregnant women registered for antenatal care between May and December 2014 in a rural clinic. Rapid diagnostic test kits were used to screen for HBsAg and anti-HCV antibody from blood samples of 300 consenting pregnant women. Information of their sociodemographic parameters and clinical history were obtained through oral interviews. The overall prevalence of HBV and HCV in the study population was 11.0% while HBV was 8.7%, HCV 3.0% and HBV-HCV coinfection was 1.0%. Of all the possible risk factors studied for both viruses none was statistically associated with their prevalence. Based on the World Health Organization standard, HBV had a low endemicity while HCV had a low endemicity in this population. This is a cause for alarm, therefore requiring the inclusion for routine screening of these viruses at the point of registration for antenatal care and also before delivery.

Introduction

Viral hepatitis caused by hepatitis B (HBV) and C (HCV) viruses with its attendant morbidity and mortality is of public health significance. Worldwide, it is the most common cause of hepatic dysfunction among pregnant women (Esan *et al.*, 2014) with an increased risk for complication (Murad *et al.*, 2013) especially as this state leaves them with a depressed immunity (Kolawole *et al.*, 2012; Oluboyo *et al.*, 2014). However, pregnancy is not a risk factor for HBV infection (Yakassai *et al.*, 2012). Common outcomes of the viral infections in mother and neonate lead to liver failure, cirrhosis, hepatocellular carcinoma, (Apuzzio *et al.*, 2012), postpartum haemorrhage, coagulation defects, jaundice, anorexia, still births and malaise (Esan *et al.*, 2014). Coinfection is common in areas of high endemicity and among those at risk for parenteral infection (Oluboyo *et al.*, 2014).

HBV, a DNA virus is reported to have infected 350-400 million people worldwide with a resultant 1 million deaths/year (Hahne *et al.,* 2013). It is the most infectious of all viruses that can be transmitted sexually (Apuzzio *et al.,* 2012), being 50-100 times more infectious than human immunodeficiency virus (HIV), 10 times more infectious than HCV (Samuel *et al.,* 2004) and can remain infectious outside the body for more than 7 days (Apuzzio *et al.,* 2012). Transmission is mainly through infected blood, sexually and vertically in the perinatal period (Esan *et al.,* 2014). While the viral surface antigen (HBsAg) is the serologic hallmark of infection, the soluble extractable protein (HBeAg) depicts the infectious state (Esan *et al.,* 2014). Ten percent (10%) of infants born to women with acute HBV infection during the first trimester of pregnancy are HBsAg positive at birth and 80-90% of neonates become HBs Ag positive if acute maternal infection develops during the third trimester (Mehta *et al.,* 2013). The World Health Organization hopes to reduce chronic HBV among children over 5 years of age to 1% by 2017 (Xenatvongsa *et al.,* 2014).

Similarly, HCV an RNA virus is known to have infected about 170 million people worldwide (Oluboyo *et al.,* 2014) resulting in about 350,000 deaths per year (Hahne *et al.,* 2013). Transmission is similar to HBV and differ only in efficiency (Alter, 2006). Vertical transmission has been reported in 3-10% of pregnant women (Esan *et al.,* 2014). However, the most efficient method of transmission is through percutaneous exposure to blood and less efficiently by mucosal exposure to blood (e.g sexually, accidental needle). Risk factors for Nigeria have remained much obscured (Obienu *et al.,* 2011).

While HBV endemicity is classified as low (<2%); intermediate (2-8%) and high (>8%) (Esan *et al.,* 2014), HCV is classified as high (≥ 3%), moderate (2-2.9%), low (1.0-1.9%) and very low (<1.0%) (Alter, 2006).

Although there is an effective vaccine for HBV, none exists for HCV but there are antivirals to which the duo respond well. In view of the asymptomatic nature of these viral infections, screening as an instrument for disease detection and intervention is important. This study was therefore to investigate the seroprevalence of infection by these viruses among apparently healthy pregnant women; the knowledge of which might help initiate beneficial packages in antenatal care.

Materials and Methods

This study was carried out in a rural antenatal clinic in Northern Nigeria among 300 consenting pregnant women who accessed the clinic between May – December 2014.

About 2ml of blood was collected from each participant, allowed to settle and centrifuged. The serum was harvested into a new tube labeled and stored at $4^{o}C$ until ready for use (usually overnight).

The presence of HBsAg as a surrogate for HBV infection was detected using a commercially available rapid test strip (Acon Laboratories Inc, San Diego, USA) according to the manufacturer's instructions. Similarly the HCV infection was determined by using a commercially available rapid test strip to detection HCV antibodies in serum and plasma (Acon Laboratories Inc, San Diego, USA). The test was carried out according to the manufacturer's instructions.

Ethical approval

This study was conducted with the approval of the protocol by the Ethical Committee on

Health Research involving humans of the Federal Medical Centre, Keffi, Nasarawa State, Nigeria. Informed consent was obtained from all the participants.

Statistical analysis

All data from this study were analyzed using descriptive statistical analysis. A comparison of the frequency was analysed using the Chi- square test and a P value of ≤ 0.05 was considered statistically significant.

Results and Discussion

Of the 300 pregnant women that participated in this study, 8.7%, 3.0% and 1.0% were seropositive for HBV, HCV, and HBV-HCV co-infection. None of the studied risk factors had a statistically significant outcome ($p > 0.05$). However some showed some interesting arithmetic differences in the stratification. Table1 shows the results as stratified for sociodemographic characteristics of the participants.The prevalence for HBV was highest among those aged 24 -29 years and 30-35 years for HCV. With respect to the level of education attained the highest prevalence of HBV occurred among those that had a secondary school education(12.2%) but for HCV it was among those with a primary school education(6.4%). The only three cases of co-infection were among those with fewer deliveries. With respect to clinical characteristic (Table 2), prevalence of both viruses was higher among those that had had a history of blood transfusion (20.8% for HBV and 4.2% for HCV).

A wide range of HBV and HCV infection prevalences have been reported in different countries and even different regions of the same country. The frequency of HBV, HCV and HBV-HCV infection among pregnant women in this study was 8.7%., 3.0% and 1.0% respectively. HBV exhibited an intermediate endemicity similar to reports of 8.2% in Maiduguri (Okoloba *et al.,* 2011) and 8.18% in Minna (Omalu *et al.,* 2012). However, similar studies among pregnant women in different parts of Nigeria have reported higher rates like 11.4% (Osazuwa, 2012), 12.5% (Ugbebor *et al.,* 2011) and 16.5% (Kolawole *et al.,* 2012) in Abuja, Benin and Osogbo respectively. Likewise, prevalence rates lower than what were reported in this study have been obtained in other parts of Nigeria. These include 7.9% in Kano (Yakassai *et al.,* 2013), 6.9% in Maiduguri (Ajayi *et al.,* 2013), 6.78% in IdoIkiti (Esan *et al.,* 2014), 6.6% in Keffi (Pennap *et al.,* 2011), 6.0% in Nnewi (Oluboyo *et al.,* 2014), 5.3% in Niger Delta (Bugeri *et al.,* 2010), 3.0% in Osogbo (Adeleke *et al.,* 2013), 22% in Onitsha (Mbamara and Osiechina, 2010) and 2.2% in Benin City (Oladeinde *et al.,* 2013).

Similar studies from other parts of the world have reported 0.1% in Norway (Rimseline *et al.,* 2011), 2.9% in India (Mehta *et al.,* 2013), 10.8% in Yemen (Murad *et al.,* 2013) 1.75 in Egypt (El-Shabrawi *et al.,* 2013) and 4.1% in Saudi Arabia (Bani *et al.,* 2012).

HCV prevalence in the present study was found to be low (1.0%). This same rate was reported in Nnewi (Oluboyo *et al.,* 2014); 1.39% in IdoIkiti (Esan *et al.,* 2014) and 1.6% in Maiduguri (Ajayi *et al.,* 2013). Other studies that recorded very low endemicity include 0.4% in Calabar (Mboto *et al.,* 2010) 0.5% in Niger Delta (Bugeri *et al.,* 2010). 0.5% in Benin City (Ugbebor *et al.,* 2013) and 0.8% also in Benin City (Oladeinde *et al.,* 2013). Some studies reported HCV prevalence rates classified as high endemicity. These include reports of 3.0% in Abaji (Osazuwa, 2012), 3.9% in Irrua (Okunsanya *et al.,* 2013) and 4.5% in Kaduna (Sheyin *et al.,* 2012).

The prevalence of infection for both HBV and HCV did not show any obvious pattern when compared to what obtained from previous studies from other parts of the country. It contradicts the position of Sheyin *et al.* (2012) that there is a consistent pattern of HCV prevalence increase from Northern to Southern Nigeria.

These differences in similar studies within the country might be as a result of differences in the sensitivity of detection methods, sample number, cultural practices, environmental risk factors, sociodemographic background, geographical endemicity, and even the effect of the interactions of these viruses in a HIV endemic region.

Among participants aged less than 18 years, neither HBV nor HCV infection was detected. This might have been as a result of the paucity of samples screened. Even though early marriage is a common feature in the study area, only few women of this age bracket were available for the study. The highest prevalence of HBV infection was among those aged 24–29 years (12.0%) and 30–35 years (4.4%) for HCV. They must have all been exposed earlier than now. And for HBV that is easily transmitted sexually, this coincides with the age of high sexual activities (Okoloba *et al.,* 2011). This also supports the position by earlier researchers that of all sexually transmitted infections, high risk individuals have a higher probability of getting infected with HBV due to its infectious dose.

Although the history of blood transmission was not a statistically significant risk factor for the viral infection in this study as reported in a study by Oladeinde *et al.* (2013), it was arithmetically high. The prevalence was 20.8% for HBV and 4.2% for HCV among those with a history of transfusion. Screening of blood for these viruses before transfusion has only been introduced in recent years. In fact, HCV is not widely screened for in the rural areas. Despite screening for HBV, it has been reported that the HBsAg used as a surrogate of infection is not adequate as HBsAg seronegatives have been shown to be positive for other markers that indicate viral infection (Okoloba *et al.,* 2011). Based on this fact, it is very possible that the prevalence of infection was even underestimated. Other markers will need to be included for a very safe blood transfusion.

Worthy of note is the impending inherent danger of having 10% of HBV positive infants from the positive mothers of this study population that are in their first trimester and 80 -90% from those that are in their third trimester (Mehta *et al.,* 2013). Similarly, 3–10% of the HCV positive mothers are likely to transmit the virus vertically (Esan *et al.,* 2014). These infants will now serve as a reservoir of lateral infection as well as a population with an impending danger for the development of hepatic related diseases (Apuzzio *et al.,* 2012, Esan *et al.,* 2014).

Co-infection was reported in 1.0% of the participants. This is higher than reports of 0.5% from Benin (Ugbebor *et al.,* 2013), 0.4% from Calabar (Mboto *et al.,* 2010) and similar to the report of 1.3% in IdoIkiti (Esan *et al.,* 2014). There were only three cases of co-infection which occurred among women classified as having had 1 - 3 deliveries. This observation had no statistical significance, and it proportionately occurred in the most populous group in the stratification.

Table.1 HBV and HCV infection prevalence in relation to the sociodemographic characteristics of the pregnant women

Characteristic	No. screened	HBV +ve (%)	HCV+ve(%)	HCV/HBV+ve (%)
Age (years)				
12-17	5	0(0.0)	0(0.0)	0(0.0)
18-23	147	13(8.8)	3(2.0)	1(0.7)
24-29	58	7(12.0)	1(1.7)	0(0.0)
30-35	68	6(8.8)	3(4.4)	1(1.5)
≥36	22	0(0)	0(0)	1(4.5)
Education attained				
Non-formal	163	13 (8.0)	5 (3.1)	1 (0.6)
Primary	47	3(6.4)	3(6.4)	21(4.2)
Secondary	74	9(12.2)	1(1.3)	0(0.0)
Tertiary	16	1(6.2)	0(0.0)	0(0.0)
Occupation				
Civil servant	8	0(0.0)	0(0.0)	0(0.0)
Traders	132	11(8.3)	7(5.3)	1(0.7)
Students	4	1(25.0)	0(0.0)	0(0.0)
Others	156	14(9.0	2(1.3)	2(1.3)
Parity				
1-3	183	22(12.0)	6(3.3)	3(1.6)
4-6	97	3(3.1)	3(3.1)	0(0.0)
≥7	20	1(5.0)	0(0.0)	0(0.0)
Gestation				
1st trimester	113	9(8.0)	4(3.5)	1(0.9)
2nd trimester	149	15(10.1)	3(2.0)	2(1.3)
3rd trimester	38	2(5.3)	2(5.3)	0(0.0)

However, co-infection is known to occur with its attendant complication and must therefore not be ignored especially in pregnant women who are likely to transmit the infection to their neonates. In fact, Ugbebor posits that HCV transmission predominantly occurs during pregnancy and delivery (Ugbebor *et al.*, 2011) while Esan also noted that HBV is transmitted vertically during the perinatal period (Esan *et al.*, 2014). On the whole, the expected risk factors for viral infection that was studied (level of education, occupation, parity, history of miscarriage, sexually transmitted diseases and bodily incisions) were not significantly associated with the infections. There is no obvious explanation for this. An earlier report noted that risk factor for HCV have remained obscured for Nigeria (Obienu *et al.*, 2011). More epidemiological studies will be required.

In view of the possibility of vertical transmission, the prevalence of 8.7% and 3.0% for HBV and HCV respectively reported in the present study justifies instituting the compulsory screening for these viruses at the time of antenatal registration in the study area.

Table.2 HBV and HCV infection prevalence in relation to the clinical characteristics of the pregnant women

Characteristic	No. screened	HBV+ve (%)	HCV+ve (%)	HCV/HBV +ve (%)
History of miscarriage				
Yes	72	8(11.1)	1(1.4)	0(0.0)
No	228	18(7.9)	8(3.5)	8(3.5)
History of blood transfusion				
Yes	24	5(20.8)	1(4.2)	0(0.0)
No	276	21(7.6)	8(2.9)	3(1.1)
History of Surgery				
Yes	22	2(9.1)	2(9.1)	0(0.0)
No	278	24(8.6)	7(2.5)	3(1.1)
History of sexually transmitted disease				
Yes	92	9(9.8)	7(7.6)	3(3.3)
No	208	17(8.2)	2(1.0)	0(0.0)
Scarification				
Yes	178	12(6.7)	4(2.2)	2(1.1)
No	122	14(11.5)	5(4.1)	1(0.8)

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