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SEROPREVALENCE OF HEPATITIS B AND C CO-INFECTIONS AMONG PREGNANT WOMEN ATTENDING BINGHAM UNIVERSITY TEACHING HOSPITAL JOS, NIGERIA

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ABSTRACT

Hepatitis B and C virus infections continue to be a major problem in developing countries, Nigeria inclusive. This study aimed to determine the sero-prevalence of Hepatitis B and C virus (HBV and HCV) among pregnant women attending ante-natal clinics in Bingham University Teaching Hospital (BUTH) Jos. Blood specimens were collected from 100 pregnant women and tested for hepatitis B and C virus using HBV and HCV one step rapid test strip (Diaspot Diagnostic, USA). Out of 100 subjects screened, 12(12.0%) and 3(3.0%) were positive for HBV and HCV respectively. No co-infection was observed among the pregnant women tested. The prevalence in relation to age shows that the infection was more prevalent among the age group 16-20 years and 21-25 years of age in the case of Hepatitis Bwith prevalence of 1(20.0%) and 3(20.0%) respectively while, 36-40 years in the case of hepatitis C with prevalence of 2(11.0%). The prevalence of the viruses in relation to the educational status of the subjects revealed that those with non- formal education had the highest prevalence of HBV with 1(16.7%) while those with MS.c had the highest prevalence for HCV with a total of 1(20.0%). However, the relationship was statistically non- significant (P>0.005). The prevalence of HBV in relation to trimester showed that those in second trimester had the highest with 4(12.0%) however, those in their third trimester had the highest prevalence of HCV with prevalence of 2(5.6%). In all, the difference was statistically not significant (p>0.05). In conclusion the study has shown that HBV and HCV are still prevalent among pregnant women in the study area. Therefore there is need for routine testing of all pregnant women at first and postnatal visit so that HBV and HCV positive mothers can receive prompt intervention.

INTRODUCTION

Hepatitis B virus (HBV) is a DNA virus of the family *Hepadnaviridae*and the causative agent of hepatitis B infection. It is 50 - 100 times more infectious than HIV and 10 times more infectious than hepatitis C virus (Pungpapong*et al*., 2007). Many carriers do not realize they are infected with the virus, thus it is referred to as a "silent killer" (Samuel *et al*.,2004).Hepatitis C virus is an RNA virus of the *Flaviviridae*family and appears to have humans and chimpanzees as the only species susceptible to its infection (Isa, *et al*., 2016). Apart from being detected in blood, it has also been detected in semen (Cavallero*et al*., 2008) and saliva (Chen *et al*., 2006).HBV and HCV account for a substantial portion of liver diseases worldwide and infected individuals can remain asymptomatic for decades (Oluboyo*et al*., 2014).

Infections with the Hepatitis B virus (HBV) or the Hepatitis C virus (HCV) are public health problems and are highly endemic in the sub-saharan Africa (Kemebradikumo and Isa. 2013).Hepatitis B is one of the world's most common and serious infectious diseases. It is estimated that more than one third of the world's population has been infected with the hepatitis B virus. About 5% of the populations are chronic carriers of hepatitis B virus. and nearly 25% of all carriers develop serious liver diseases. HBV infection causes more than one million deaths every year (WHO 2014).

Worldwide. there are about 350 million HBV carriers and 130 to 170 million people infected with HCV (Liu and Hou, 2006;Eke *et al.*, 2011;WHO. 2011) with Nigeria classified among the group of countries endemic for HBV infection.

Viral hepatitis during pregnancy is associated with high risk of maternal complications (Kramvis and Kew, 2007). The minimum infectious dose is so low that such practices like sharing a tooth brush or a razor blade can transmit infection (Chang, 2008). HBV also shares similar routes of transmission with HIV (Willey *et al.*, 2008). Perinatal transmission of this disease occurs if the mother has had acute Hepatitis B infection during late pregnancy. in the first postpartum or if the mother is a chronic HBsAg carrier (Levy *et al.*, 1991). Hepatitis C transmission occurs predominantly around time of delivery and pregnancy (WHO. 1999).

Among pregnant women. chronic infection with HBV and HCV are often asymptomatic. and can lead to coagulation defects. postpartum haemorrhage. organ failure and high maternal mortality and poor outcomes of their newborns such as still births. neonatal deaths (NND). jaundice. anorexia (poor appetite). malaise. acute and chronic liver disease (liver cirrhosis) and hepatocellular carcinoma.Co-infection of HBV and HCV seems to result in more severe disease than either infection alone (Esan *et. al.*, 2014).

In Nigeria. the prevalence rates of HBV and HCV in pregnant women differ from one locality to another. Yakasai*et. al.* (2012) reported a prevalence of 7.9 and 7.6% of HBsAg among pregnant women and non-pregnant women respectively in Kano, Nigeria. SimilarlyOladeinde*et. al.*(2013) reported a prevalence of 8 (2.2%) and 3 (0.8%) for HBV and HCV infections respectively among pregnant women in Benin City.Nigeria.HBV/HCV co-infection rate of 6.8% was obtained in Ado Ikit among pregnant women (Esan. *et. al.*,2014). The study was aimed at determining the seroprevalence of HBV and HCV among pregnant women attending antenatal clinic of Bingham University Teaching Hospital, Jos.

MATERIALS AND METHODS

Study Area

The study was carried out in Jos Plateau State Nigeria between April and June 2016.Plateau State is roughly located in the centre of Nigeria between Latitude $80^{0}24^{`}$N and Longitude $9^{0}56^{`}$North and $8^{0}53^{`}$East. The altitude ranges from around 1,200 metres to a peak of about 1,829 metres above sea level. With an area of 391square kilometers. the population was estimated to be 900,000 in 2006according to National Population commission. 2006 census.The city contains a vast number of public and private hospitals including Bingham University Teaching Hospital (BUTH). BUTH has a sizeable population of subjects, many social amenities, different wards and adequate emergency unit and antenatal care services making it suitable for the study.

Ethical Clearanceand Consent of the participants

Ethical approval wassought and obtained from theBingham University Teaching Hospital, Jos Plateau State before commencement of the study. Informed consent of the subjects was individually sought and obtained beforethe commencement of the study.

Study Population

The study population consisted of all consenting pregnant women (age 18 years and above) attending the antenatal clinic of the hospital. A total of 100 pregnant women were randomly selected and enrolled for the study and their identity was handled with confidentiality.

Data collection

Data was collected using a semi-structured interviewer administered questionnaire. It consisted of the following: socio-demographic,(age, marital status, employment status and educational status) information on the participants' knowledge of the infection, and information on the predisposing factors of the infection (intravenous drug use, tattooing, use of sharp objects, blood transfusion, multiple sexual partners and history of vaccination)

Sample Collection

Five milliliters (5ml) of the blood was collected from each the participants through venipuncture and emptied into labeledsterile tubes without anticoagulant,allowed to clot and centrifuged at 1000-1500g for 10 minutes to obtain the serum.The serum aliquots were transferred to plain sterile sample bottles, labeled appropriately and stored at -20^{0}C until ready for use.

Screening for Hepatitis B and C

One step HBsAg strip and One step HCV antigen strip. (DiaSpotDiagnostics,UK),a rapid chromatographic immunoassay for the qualitative detection of Hepatitis B surface antigen and HCV in serum/plasma were usedseperately to screen the participant's serum sample. The analysis was carried out following the manufacturer's instruction.

HBV and HCV screening Procedure

The test was carried out at room temperature (18 - 26^{0}C). The test strips for HBV and HCV were removed from the foil pouch by tearing at the notch. The strips were separatelyimmersed into the specimens with the arrow pointing towards the specimens and were removed after 10 seconds and placed on a flat clean, dry and non = absorbent surface. The results were read after 15 minutes and the procedure was repeated for all the specimens.

Visible rose = pink bands in both the control and the appropriate test region indicated a positive result for HBsAgand HCV in the specimen and visible rose = pink band only in the control region indicated a negative result.

Data analysis

Data obtained were entered in Statistical package for social Sciences version 20 to test for significant difference between variables using chi-square test. Statisticalsignificance was determined at ($P< 0.05$) at 95% Confidence interval and results were recorded and tabulated.

RESULTS

Out of the 100 women recruited in this study, 12(12.0%) were positive for HBV and 3(3.0%) were positive for HCV, but, co-infection was not detected (Table 1). Table 2 depicts the sero-prevalence of HBV and HCV in relation to age among the pregnant women. It shows that HBV infection was more prevalent (20%) each among individuals within the age group 16-20 years and 21-25 years respectively. The least prevalence was found within the age group 31-35 years. Similarly, HCVsero-positivity was 11.1% among individuals aged 36-40 years followed by individual aged 31-35 years with prevalence of 3.3%. Zero (0%) prevalence was recorded among other age groups. Statistically, there was no significant difference between age and prevalence of HBV and HCV ($P> 0.05$).

Table 3 shows the prevalence of hepatitis in relation to associated risk factors among the pregnant women. Of the 100 pregnant women recruited in this study, 22 admitted they had surgery of which 1(4.5%) each was positive for HBV and HCV respectively. The remaining 78 participant who had no history of surgery had 11(14.1%) and 2(2.6%) prevalence of HBV and HCV respectively. Also,of the 100 pregnant women recruited in this study, four (4) had previous history of blood transfusion out of which 1(25.0%) was positive for HBV. No

seropositivity was obtained for HCV. The remaining 96 who had no history of blood transfusion showed a prevalence of 11(11.5%) and 3(3.1%) for HBV and HCV respectively. The result also shows that none of the four (4) subjects who admitted to having more than one sexual partner were positive for HBVand HCV. Statistical analysis revealed no association (p>0.05) between prevalence and any of the associated risk factors.

Table 4 shows the sero-prevalence of HBV and HCV with respect to the level of education. The infections were more prevalent among those with SSCE(22.7%) and Posgraduate level of education (20.0%)for HBV and HCV respectively. However, HBV was notdetected among those with pre-degree and postgraduate levels of education, while, HCV was equally not detected among those with degree.

The prevalenceof HBV and HCV in relation to occupational status revealed that, those with non-formal occupation had the highest prevalence 50% for HBV while,no case was detected among housewives, applicants and students respectively.Onlycivil servants werepositive for HCV with 5.7%.There is however no statistical association (P>0.05) between prevalence of the two infections and occupation (Table 5).

Table 6 shows the prevalence of HBV and HCV with respect to marital status. Seroprevalence was higher among the married with 12.4% and 3.1% for HBV and HCV respectively compared with 0.0% for the unmarried (single and widow).Statistically,there is no significant difference (P>0.05).

Seroprevalence of HBV in relation to age of pregnancy revealed that, those in the first and second trimester had the highest prevalence of 12.5%, while, the least prevalence was obtained among those in the third trimester (11.1%). For HCV, those in the third trimester had the highest prevalence 5.6%, while the infection was not detected among those in the first trimester. There was no statistical association (p>0.05) Table 7.

Table 1: Sero-prevalence of HBV, HCV and Co-infection among Pregnant Women

Variables	No. screened	No. positive	Percentage (%)
Hepatitis B	100	12	12.0
Hepatitis C	100	3	3.0
HBV/HCV co-infection	100	0	0.0

Key: HBV = Hepatitis B virus. HCV = Hepatitis C virus.

DISCUSSION

The prevalence of hepatitis B and C infections varies in different parts of the world from country to country (Ephrain*et al.*, 2015). The overall prevalence of HBV among pregnant women in this study was 12% and HCV had a prevalence of 3.0% and there was no co-infection. The 12.0% prevalence of HBV recorded in this study is relatively high according to WHO criteria (WHO, 1999). The result is similar with the 12.5% and 3.6% prevalence for hepatitis B and C respectively among pregnant women in some part of Nigeria (Ugbebor, *etal.*,(2011). There were higher prevalence rates of 15.8% for HBV in Maiduguri (Baba *et al.*, 1999), 21.8% in Ibadan (Otegbayo, *et al*, 2003), 14.1% in Kano (*Musa, et. al.*, 2015). A high prevalence of 17.3% was also reported inBurkino Faso (Collenberg*et al.*, 2006). However lower prevalence of 11% was recorded in Markurdi (Mbaawuga *et. al.*, 2008), 2.19 % in Benin City (Onakewhorand Okonofua, 2008) and 8.3% in Zaria (Luka *et al.*, 2008). For HCV, a low prevalence of 3.0% was reported in this research when compared with the 14.9% reported in Kaduna (WHO, 2007). These variations may be related to socio-cultural practices, environmental factors, difference in the sensitivity of the test methods and sample size.

Table 2: Sero-prevalence of HBV and HCV Infection in Relation to Age among Pregnant Women

		HBV			HCV		
Age group (years)	No. screened	No.Positive (%)	χ^2	p-value	No. Positive (%)	χ^2	p-value
16-20	5	1(20.0)	1.824	0.873	0(0.0)	5.689	0.338
21-25	15	3(20.0)			0(0.0)		
26-30	29	3(10.3)			0(0.0)		
31-35	30	3(10.0)			1(3.3)		
36-40	18	2(11.1)			2(11.1)		
41-45	3	0(0.0)			0(0.0)		
Total	100	12(12.0)			3(3.0)		

Key: HBV = Hepatitis B virus, HCV = Hepatitis C virus.

Table 3: Sero-prevalence of HBV and HCV in Relation to Associated Risk Factors among Pregnant Women

		HBV			HCV		
Risk factors	**No. screened**	**(%)Positivity**	**χ^2**	**p-value**	**% Positivity**	**χ^2**	**p-value**
History of surgery							
Yes	22	1(4.5)	1.484	0.223	1(4.5)	0.231	0.630
No	78	11(14.1)			2(2.6)		
Blood transfusion							
Yes	04	1(25.0)	0.667	0.414	0(0.0)	0.129	0.720
No	96	11(11.5)			3(3.1)		
Sex partner							
One	96	12(12.5)	0.568	0.451	3(3.1)	0.129	0.720
Multiple	04	0(0.0)			0(0.0)		
History of vaccination							
Yes	27	2(7.4)	0.739	0.390	1(3.7)	0.063	0.802
No	73	10(13.7)			2(2.7)		
Tattoo mark							

Yes	14	1(7.1)	0.364	0.546	1(7.1)	0.960	0.327
No	86	11(12.8)			2(2.3)		
Tribal mark							
Yes	14	1(7.1)	0.364	0.546	0(0.0)	0.503	0.478
No	86	11(12.8)			3(3.5)		

Key: HBV = Hepatitis B virus. HCV = Hepatitis C virus.

Table 4: Sero-prevalence of HBV and HCV Infection in relation to Educational Status among Pregnant Women

		HBV			HCV		
Education	**No. screened**	**No. Positive (%)**	**χ^2**	**p-value**	**No Positive (%)**	**χ^2**	**p-value**
No Formal	5	1(16.7)	5.259	0.262	0(0.0)	7.633	0.106
SSCE	6	5(22.7)			1(4.5)		
Pre-degree	22	0(0.0)			1(6.7)		
Degree	15	6(11.5)			0(0.0)		
Postgraduate	52	0(0.0)			1(20.0)		
Total	100	12(12.0)			3(3.0)		

Key: HBV = Hepatitis B virus, HCV = Hepatitis C virus.

Table 5: Sero-prevalence of HBV and HCV Infection in Relation to Occupation among Pregnant Women

		HBV			HCV		
Occupation	**No. screened**	**No. Positive (%)**	**χ^2**	**p-value**	**No Positive (%)**	**χ^2**	**p-value**
Civil servant	53	5(9.4)	8.192	0.146	3(5.7)	2.743	0.740
Business	30	5(16.7)			0(0.0)		
House wife	6	0(0.0)			0(0.0)		
Applicant	2	0(0.0)			0(0.0)		
Student	5	0(0.0)			0(0.0)		

Artisans	4	2(50.0)		0(0.0)
Total	100	12(12.0)		3(3.0)

Key: HBV = Hepatitis B virus. HCV = Hepatitis C virus

Table 6: Sero-prevalence of HBV and HCV Infection in Relation to Marital Status among Pregnant Women

		HBV			HCV		
Marital status	**No. screened**	**No. Positive (%)**	**χ2**	**p-value**	**No Positive (%)**	**χ2**	**p-value**
Married	97	12(12.4)	0.422	0.810	3(3.1)	0.096	0.953
Single	02	0(0.0)			0(0.0)		
Widow	01	0(0.0)			0(0.0)		
Total	100	12(12.0)			3(3.0)		

Key: HBV = Hepatitis B virus, HCV = Hepatitis C virus.

Table 7: Sero-prevalence of HBV and HCV Infection in Relation to Trimester among Pregnant Women

		HBV			HCV		
Marital status	**No. screened**	**No. Positive (%)**	**χ2**	**p-value**	**No. Positive (%)**	**χ2**	**p-value**
1st Trimester	32	4(12.5)	0.042	0.979	0(0.0)	1.799	0.407
2nd Trimester	32	4(12.5)			1(3.1)		
3rd Trimester	36	4(11.1)			2(5.6)		
Total	100	12(12.0)			3(3.0)		

Key: HBV = Hepatitis B virus, HCV = Hepatitis C virus

A higher prevalence of HBV was found in the age groups 16-20 years and 21-25 years. The reason for the high prevalence among this age groups could be as a result of their frequency of exposure to risk factors associated with the virus, as subjects within this age groups are still in their active sexual stage. In the present study, there was slightlydecline in HBV seropositivity

with increasing age.Several studies have shown that HBV infection in pregnant women increases with age (Bertolini*et al*.. 2006. Papaevangelou*et al*_ 2008).

Reports in literature indicate that. the chances of getting infection to infants are 10% when mother had an acute infection in firsttrimester. the prevalence increases to 90% if infection occurs in the third trimester (Onakewhor and Okonofua_2008_Maheswari*et al*.. 2005). In this study. higher HBV positivity was found during the first and second trimester (12.5%) but association of trimesters with HBV positivity in this study was not statistically significant (P>0.05). Lower prevalence of HBV was observed among those with higher educational attainment in the study population. This might be due to their socio-economic status and probably more knowledgeable on the preventive methods of the infection. We expected the singles and the widow to be more infected than the married because of the possibility of having more than one sexual partners as suggested by Onwuakor*et al*..(2014). but we had a contrary outcome. This difference could be adduced to the sample size and probably the married were more exposed to contaminated transfusion blood. instruments and surfaces in labour rooms.

The 3% prevalence of HCV in the tested population was higher compared with the report of Oluboyo*et al*., (2014) who reported 1% prevalence of HCV among pregnant women. Olaitan and Zamani (2010) had also reported 1% prevalence of Hepatitis C virus in ante-natal patients in Gwagwalada-Abuja. Nigeria and 2.5% was found in Maiduguri (Baba *et al*.. 1999). Sample size. screening methods as well as quality of the studies might be the reason for this variation

Risk factors to hepatitis B and Cconsidered in the study were majorly history of blood transfusion multiple sex partners.History of vaccination and tattoo mark. even though. there was no statistical association (p>0.05). This is in contrast with the work of Ephrain*et al*.. (2015) who stated that there exist a significant association between HCV and the associatedrisk factors. The result is also in contrast to the report of Bala*et al*.. (2012) who revealed a significant association between HCV and blood transfusion. sharing of syringe and needles as well as consumption of alcohol as risk factors. The difference could be attributed to the geographical differences and possibly due to sample size.

CONCLUSION AND RECOMMENDATION

The study has shown that hepatitis B and C infections are still prevalent among pregnant women in the study area but hepatitis C recorded a low prevalence of 3.0% as compared to 12.0% recorded for HBV. However, it is recommended that, routine testing for HBV and HCV should be incorporated for pregnant women at first prenatal and postnatal visit so that HBV and HCV positive mothers can receive prompt intervention.National surveillance and enlightenment should be carried out to inform the public and especially the pregnant women about epidemiologic factors andpossible risk factors necessitating the spread of the infections.

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