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Occurrence of Hepatitis B and C Viral Infections among Pregnant Women in Calabar, Cross River State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author PCIE designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RUA and TUA managed the analyses of the study. Author UOO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine the prevalence of HBV and HCV among pregnant women in Calabar, and the possible predisposing factors of the disease.
Study Design: This was a cross sectional study.
Place and Duration of Study: This study was carried out in Calabar, the capital city of Cross River State, Nigeria between May, 2014 and February, 2015.
Methodology: Ethical approval was obtained, consent forms were signed by the patients, questionnaires were also administered to capture socio demographic information followed by

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collection and processing of specimens. Five millitre (5 ml) of blood was collected from 300 pregnant (test) and 100 non pregnant (control) subjects and their sera tested for HBV and HCV using One step HBsAg strip and One step Anti-HCV strip. Both manufactured by ACON Laboratories incorporated, USA. Questionnaires were also administered.

Results: Of the 300 pregnant women examined, infection with HBsAg was observed in only 14(4.7%). There was no infection with Hepatitis C virus and no mixed infection with both viruses. Among the 100 control (non-pregnant) women examined, infection with HBV was observed in only 6(6%) with no infection with Hepatitis 'C' virus and no mixed infection with both viruses. Respondents in the age group 36-40 years had the highest rate of HBV infection 8(57.1%), but this was not statistically significant (P= 0.052). In the nature of marriage category, respondents who were separated from their spouse had the highest rate of HBV infection 2(33.3%). In terms of occupation, respondents in the category of business women had the highest rate of HBV 4(6.1%) while traders had the lowest rate of HBV infection 0(0%). Respondents who were not educated in the educational status category had the highest rate of HBV infection 2(33.3%), while respondents with the secondary level of education had the lowest rate of HBV infection 4(3.2%). Respondent in their first trimester of pregnancy had the highest level of HBV infection 6(3.7%) while those in their second trimester had the lowest rate of HBV infection 2(2.1%).

Conclusion: This study has revealed HBV among pregnant women in Calabar and therefore recommends that a routine screening of this category of patients be made mandatory during their antenatal clinic in order to achieve their proper clinical management and reduction of vertical transmission of the disease.

Keywords: Hepatitis B and C viral infections; pregnant women; co-infection; Calabar.

1. INTRODUCTION

Viral hepatitis during pregnancy is associated with high risk of maternal complications. This infection has a high rate of vertical transmission causing fetal and neonatal hepatitis which can have serious effects on the neonate, leading to impaired mental and physical health later [1,2]. Peri-natal transmission of this disease occurs if the mother has had acute Hepatitis B virus (HBV) infection during late pregnancy or if the mother is a chronic HBV carrier [3]. Hepatitis C virus (HCV) transmission occurs predominantly around time of delivery and pregnancy [4]. Chronic infection with HBV and HCV are often asymptomatic and could lead to coagulation defects, postpartum haemmorrhage, organ failure and high mortality and devastating effects such as still birth, neonatal death, liver disease [2].

Worldwide, the prevalence of HBV and HCV infections in pregnant women is estimated to be 1–8% and 0.05–5% respectively [5]. The vertical transmission rate has been estimated to be 3–5% and there is a high rate of spontaneous clearance (25–50%) in the children. Higher rates have been reported for both vertical transmissions; 18%, 6–36% and 41% [6,7]. El Sheik et al. [8] reported a prevalence of 5.6% of HBV in pregnant women and a low prevalence of HCV in Sudanese women. In Nigeria, Buseri et al. [9] reported HBV and HCV prevalence rate of 5.0% and 0.5% among pregnant women in Yenagoa, Bayelsa State, Yakasai et al. [10] reported 7.9% and 7.6% HBV among pregnant women and non pregnant women respectively in Kano, while, Oladeinde et al. [11] reported 2.2% and 0.8% of HBV and HCV infections among pregnant women in Benin City. In Calabar, a prevalence rate of 0.4% of HCV infection in pregnant women has been reported [12]. Treatment of viral co-infection of Hepatitis B virus (HBV) and Hepatitis C virus (HCV) represent a great health challenge [13]. Successful interventions to prevent vertical transmission linked to prenatal and intrapartum testing have been demonstrated in a variety of limited resource setting [4]. Control strategies for Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infection is based mainly on reducing the risk of contracting the viral infections and includes; Screening and testing of blood, plasma, tissue and semen donors, counseling of persons with high–risk of drug use and sexual practices, implementation of infections control practices in health care and other settings, public health education and immunization in case of hepatitis B virus (HBV) infection [14]. This study was to determine the prevalence of HBV and HCV among pregnant women in Calabar and their possible predisposing factors.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out at the General Hospital and a few private Clinics in Calabar, Cross River State that offer Obstetric and Gynaecological care to patients. Cross State is a coastal State in Southeastern Nigeria, named after Cross River which passes through the State. Its capital is Calabar, alias People's Paradise. Located in the Niger Delta, Cross river state occupies 20,156 sqkm and shares an extensive boundary with Cameroon Republic to the East, with Benue state to the North, Enugu and Abia States to the West, and to the South by Akwa-Ibom and the Atlantic Ocean. Calabar has a land mass of 299.10 sqKm and an estimated population of 375, 196 as at 2006 Nigeria population Census [15].

2.2 Study Subjects

The subjects included 300 randomly selected pregnant women attending antenatal clinics at the General Hospital and a few privately owned hospitals in Calabar and 100 non- pregnant women (control subjects) from the same environment. The age range of study was 15-50 years and above. A pilot survey carried out in the study revealed a prevalence of 5% for HBV and 1% for HCV. The minimum sample size was therefore calculated assuming a 95% level at $P<0.05$.

2.3 Ethical Clearance

Ethical clearance was sought and obtained from the ethical Committee of General Hospital Calabar. Pregnant women were educated on the purpose of conducting the research and they also signed consent forms before investigation commenced.

2.4 Questionnaire Administration

A structured questionnaire was administered to all participating pregnant women to obtain demographic and other vital information of the subjects by the researcher. Verbal informed consent was obtained from all participating subjects prior to specimen collection.

2.5 Collection of Specimen

Five ml (5 ml) of blood was collected from each subject and dispensed into a plain container and allowed to clot. The serum obtained was used for serological diagnosis of Hepatitis B and C viruses.

2.6 Processing of Specimen

The serum from refrigerator was allowed to room temperature before testing. The sera was tested for HBV and HCV using One step HBsAg strip by ACON Laboratories incorporated, USA and One step Anti-HCV strip by ACON Laboratories incorporated, USA.

A drop of patient's sera was transferred to test strips and then 2 drops of buffer was added and observed for the emergence of line bands on the strips. Positive and negative control sera were run alongside test. Interpretation of result was equally done according to manufacturer's instruction. A positive result means the person is currently infected. Hepatitis C testing typically begins with blood testing to detect the presence of antibodies to the HCV, using an enzyme immunoassay. If this test is positive, a confirmatory test is then performed to verify the immunoassay and to determine the viral load [16]. A recombinant immunoblot assay is used to verify the immunoassay and the viral load is determined by a HCV RNA polymerase chain reaction [16]. If there is no RNA and the immunoblot is positive, it means that the person tested had a previous infection but cleared it either with treatment or spontaneously; if the immunoblot is negative, it means that the immunoassay was wrong. It takes about 6–8 weeks following infection before the immunoassay will test positive [17].

A positive test result means the person has been infected with HCV and might be chronically infected; it does not always mean the person is still infected. Diagnostic tests are needed.

A negative test result means either the person has not been infected or the person was infected recently and antibodies have not yet appeared. Another test might be needed in 6 months [18].

2.7 Statistical Analysis

The chi-square test (x^2) was employed to analyse the data obtained. The determination of the relationships between age and the presence of risk factors with Hepatitis B and C viruses was set at a statistical significance level of $P<0.05$.

3. RESULTS

Three hundred (300) pregnant women aged 15 – 50 years attending ante natal clinics of General Hospital Calabar, and some private clinics in both Calabar Municipality and Calabar South Local Government Areas, of Cross River State, were screened for HBV and HCV antibodies and 100 apparently healthy non-pregnant women within the same age brackets were used as control. Table 1 shows the prevalence of Hepatitis B and Hepatitis C Viral infections according to age group of respondents`. A total of 14(4.7%) were infected with Hepatitis B Virus (HBV) while there was no infection with Hepatitis C Virus (HCV) and none with both infection. Among the control group, only 6(6%) had Hepatitis B Viral infection while there was no Hepatitis C Viral infection and none with both Hepatitis B and Hepatitis C mixed Viral infection. Subjects aged 36 – 40 years had the highest rate of infection 8(57.1%) while those aged 31 – 35 and 41 and above had the lowest rate of Hepatitis B infection 0(0%). There was no statistically significant difference in the prevalence rate of infection according to age group of subjects examined (X^2 = 7.714 df (6) P = 0.052).

Prevalence of Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) infection among subjects according to nature of marriage is shown in Table 2. Subjects who were "separated" from their spouse had the highest rate of HBV infection 2(33.3%) while those in the widow and co-habitation category had the lowest level of infection 0(0%). There was a statistically significant difference in the presence of infection according to nature of marriage (X^2 = 9.143 df (4) P = 0.010). Table 3 shows the prevalence of Hepatitis B and Hepatitis C Viral infections among subjects examined according to occupation. Respondents in the category of business women had the highest prevalence rate of 4(6.1%), while those in the category of traders had the lowest rate of infection 0(0%). There was no statistically significant difference in the presence of infection according to occupation of subjects examined (X^2 = 3.143, df (5) P = 0.370). The prevalence of Hepatitis B and Hepatitis C Viral infection among respondents according to educational status of subjects examined is shown on Table 4. Respondents with no formal education had the highest prevalence of 2(33.3%), while those at the secondary level had the lowest rate of Hepatitis B Virus infection 4(3.2%). No prevalence of Hepatitis C Virus and mixed infection among subjects examined were recorded. There was no statistically significant difference in the prevalence of infection among subjects examined according to educational status (X^2 = 4.000, df (3) P = 0.135). Table 5

Table 1. Prevalence of HBV and HCV according to age group of respondents

Age group (year)	Test subjects				Control subjects			
	No. examined	No. (%) with HBV infection	No. (%) with HCV infection	No (%) with both HBV & HCV infection	No. examined	No. (%) with HBV infection	No. (%) with HCV infection	No. (%) with both HBV & HCV infection
15-20	30	2 (6.6)	0 (0)	0 (0)	18	0 (0)	0 (0)	0 (0)
21-25	62	2 (3.2)	0 (0)	0 (0)	10	2 (20)	0 (0)	0 (0)
26-30	106	8 (7.5)	0 (0)	0 (0)	24	4 (16.7)	0 (0)	0 (0)
31-35	54	0 (0)	0 (0)	0 (0)	26	0 (0)	0 (0)	0 (0)
36-40	22	2 (9.1)	0 (0)	0 (0)	12	0 (0)	0 (0)	0 (0)
41-45	14	0 (0)	0 (0)	0 (0)	8	0 (0)	0 (0)	0 (0)
46-50	12	0 (0)	0 (0)	0 (0)	2	0 (0)	0 (0)	0 (0)
Total	**300**	**14 (4.7)**	**0 (0)**	**0 (0)**	**100**	**6 (6)**	**0 (0)**	**0 (0)**

Table 2. Prevalence of HBV and HCV infection among respondents according to nature of marriage

Nature of marriage	No. examined	No. (%) with HBV infection	No. (%) with HCV infection	No. (%) with both HBV & HCV infection
Married	238	10 (4.2)	0 (0)	0 (0)
Separated	6	2 (33.3)	0 (0)	0 (0)
Widow	0	0 (0)	0 (0)	0 (0)
Co-Habitation	14	0 (0)	0 (0)	0 (0)
Single	42	2 (4.8)	0 (0)	0 (0)
Total	**300**	**14 (4.7)**	**0 (0)**	**0 (0)**

Table 3. Frequency of HBV and HCV among respondents according to occupation

Occupation	No. Examined	No. (%) with HBV infection	No. (%) with HCV infection	No. (%) with both HBV & HCV infection
Student	48	2 (4.2)	0 (0)	0 (0)
Civil servant	142	6 (4.2)	0 (0)	0 (0)
Business	66	4 (6.1)	0 (0)	0 (0)
Farmer	0	0 (0)	0 (0)	0 (0)
Fulltime housewife	38	2 (5.3)	0 (0)	0 (0)
Trader	6	0 (0)	0 (0)	0 (0)
Total	**300**	**14 (4.7)**	**0 (0)**	**0 (0)**

Table 4. Prevalence of HBV and HCV among respondents according to educational status

Educational status	No. examined	No. (%) with HBV infection	No. (%) with HCV infection	No. (%) with both HBV & HCV infection
Primary	0	0 (0)	0 (0)	0 (0)
Secondary	124	4 (3.2)	0 (0)	0 (0)
Tertiary	170	8 (4.7)	0 (0)	0 (0)
Not educated	6	2 (33.3)	0 (0)	0 (0)
Total	**300**	**14 (4.7)**	**0 (0)**	**0 (0)**

Table 5. Distribution of HBV and HCV among respondents according to trimester of pregnancy

Trimester of pregnancy	No. examined	No. (%) with HBV infection	No. (%) with HCV infection	No. (%) with both HBV & HCV infection
First	78	6 (7.7)	0 (0)	0 (0)
Second	94	2 (2.1)	0 (0)	0 (0)
Third	128	6 (4.7)	0 (0)	0 (0)
Total	**300**	**14 (4.7)**	**0 (0)**	**0 (0)**

shows the prevalence of Hepatitis B and Hepatitis C Viral infections among subjects examined by trimester of pregnancy. Subjects in the first trimester had the highest rate of Hepatitis B Virus infection 6(7.7%) while those in their second trimester had the lowest prevalence of 4(2.1%). There was no statistically significant difference in the prevalence of infection among subjects examined according to trimester of pregnancy (X^2 = 2.286, df (2) P = 0.319).

4. DISCUSSION

This study observed the prevalence of HBV and HCV to be 4.7% and 0% respectively among pregnant women in Calabar. There was no mixed information with both viral infections, which is in agreement with that reported by Collenberg et al. [19] in rural and urban Burkinafaso and WHO, [4]. The prevalence of HBV (4.7%) as seen in this study is lower than the 8.3% reported by Luka et al. [20] among pregnant women at Ahmadu Bello University Teaching Hospital, Zaria and the 11.0% reported by Mbaawuaga et al. [21] among pregnant women at Makurdi, Benue State, North Central Nigeria. It is also lower than the 11.6% reported by Hary et al. [22], the 12.6% reported by Jombo et al. [23] among pregnant women in Maiduguri, North-Eastern Nigeria and a rural community in North Central, Nigeria respectively. It is rather lower than the 13.8% observed by Roingeared et al. [24] among pregnant Senegalese women in Dakar, and 63.3% reported by Imade et al. [25] among pregnant women in Jos, North-Central Nigeria.

The prevalence of 4.7% is however higher than the 2.2% observed among pregnant women by Onakewhor et al. [26] in Benin City, Edo State. It is also higher than the 4.3% reported by Akani et al. [27] in Port Harcourt and the 4.4%, the 4.6% observed by Obi et al. [28] in Lagos and Enugu respectively. It is higher than the 2.9% reported by Obi et al. [29] among pregnant women in Port Harcourt, the 2.5% reported by Schaefer et al. [30] in pregnant Iranian women and the 1.53% observed by Todd et al. [31] among pregnant Afghan women attending Government Maternity Hospitals in Kabul but lower than the 6.2% observed by Wurie et al. [32] in Sierra Leone by Wurie et al. [32]. The variations in the previous studies when compared with the results of this work may be connected with the difference in demographic characteristics of the study group such as socio-cultural practices, sexual lifestyle and practices medical exposure, predominant

routes of transmission and test methods employed to detect HBV and HCV infections.

The findings in this study did not agree with that of Habiba and Memon, [33] of which majority of those that tested positive to HBsAg were in the age group of 25-35 years. In this study, most of the subjects examined were in the age group 26-30 years but with a prevalence of 8(7.5%), while those in the age group of 36-40 years had a prevalence rate of 2(9.1%). This could be as a result of multiparity which put them at a greater risk because of their past pregnancies, blood transmission or surgical operation. These results were similar to the studies by Awan et al. [34] and Ali et al. [35]. This is also similar to other works done by various authors in the same study area; Okpokam et al. [36] and Okpokam et al. [37] who had the highest prevalence amongst age group 26-35 years but differ from that of Inyang-Etoh et al. [38] observed 51 60 years amongst patients on antiretroviral drug therapy.

Although, the number of married women examined in this study were significantly high (238) with a prevalence rate of 10(4.2%), the highest prevalence of HBsAg was recorded among those separated from their spouses (33.3%) followed by single women (4.8%). These findings could be attributed to the rate of promiscuity among separated women as they may be involved in unprotected sexual activities having multiple sexual partners as reported by Etuk et al. [39].

Occupation of the subjects is a known predisposing factor for HBV infection [40]. Business pregnant women had a prevalence of 4(6.1%) for HBV as shown in Table 3. The high prevalence of 6.1% of HBV among business women depicts the low level of attention given to their health, ignorance and possibly sexual behaviours of the subjects examined, while the low rate of 4.2% among students and civil servants respectively reflected the awareness level of respondents about modes of transmission of HBV and HCV and thus, protect themselves from getting infected. Civil servants which comprised of both health care and non-health care workers had a prevalence of 4.2%. It may be thought that the health care givers in high risk health departments like blood transfusion services or theatres are more predisposed to acquiring these infections, but this study has shown that health workers were significantly more likely to have the knowledge about screening for HBV and HCV, compared to their non-health care counterparts. This is in consonance with other studies by Ajayi et al. [40], Nwokediuko, [41] and Eke et al. [42].

Another important factor studied was the relationship between the level of education of the respondents and the acquisition of HBV. This study showed that 33.3% of the subjects had no formal education (Table 4). This figure is not unconnected with inability to read and/or appreciate English language efficiently resulting in impaired understanding of preventive measures for HBV and HCV infections. Low level of education or no formal education is associated with low socioeconomic status, ignorance and a poor health seeking attitude [43,39].

Ninety eight percent (98%) of the women studied had formal education. This finding was in keeping with the study in Mexico, which showed that the educational status of the women was high [44]. Trimester of the study population had a link with the prevalence of HBV infection. The highest prevalence was recorded among the subjects examined in their first trimester 6(7.7%) as shown in Table 5. This could be because it is the period in which women become pregnant and are likely to present for the first time for antenatal care. Hence, those positive to HBsAg are likely to be picked up when screened as noted from this study. There were no prevalence of HCV and co-infection of HBV and HCV infection among pregnant women in the study popular in Calabar. This was in disagreement with other studies which had reported a low prevalence of HCV and co-infection of HBV and HCV in their studies [9-12]. The non-prevalence of HCV and co-infection of HBV and HCV infections may be attributed to increased awareness of the viral infection by the general population and the small sample size of pregnant women in this study.

5. CONCLUSION

This study has revealed high prevalence of HBV infection (4.7%) amongst pregnant women in Calabar, but HCV and co-infection of HBV and HCV were not observed in the study population. It is therefore advocated that pregnant women be properly educated on the various routes of transmission of these viruses. The need for screening and re-screening of these infections in pregnancy is also necessary to reduce vertical transmission.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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