Rapid Detection of Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV) among Pregnant Women attending Private Hospitals in Port Harcourt, Nigeria

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Abstract: The present study was aimed at determining the prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) antibodies in pregnant women serum samples during antenatal care (ANC) in a private hospital in Port Harcourt, Rivers State, Nigeria. The study involved experimental design, administration of structured questionnaire and analysis of data. The analysis was carried out in the Medical Microbiology laboratory of the University of Port Harcourt, Rivers State, Nigeria for the periods of 6 months from March 2018 to August 2018. Blood samples were collected aseptically from ninety-five (95) subjects. These samples were stored and screened for hepatitis B, using ACON HBsAg ultra-rapid test strip, Hepatitis C using Swe-life HCV and human immune deficiency virus using HIV1/2 test strip. The study was a retrospective study that reviewed all clinical case records of HIV, HBV and HCV patients (pregnant women) seen in private hospitals. Information such as age, sex, marital status, educational status, number of sexual partners, sharing of sharp objects, transmission of the virus to the foetus, human immune deficiency virus, hepatitis B and hepatitis C status, treatment status, knowledge of the viruses were retrieved using a structured questionnaire. Data were analysed and presented in simple percentage. Findings from the study showed that 100% of the patients were females and 19 pregnant women (20%) were in the age group of 15-25 years, 71 pregnant women (74.7%) were in the age group of 26-36 years and 5 pregnant women (5.3%) were in the age group of 36-45 years. The prevalence of human immune deficiency virus (HIV) was 15.79%, hepatitis B virus was 11.58% while hepatitis C virus was 0%. In addition, human immunodeficiency virus and hepatitis B were significant found among pregnant women compared to hepatitis C. The study showed the prevalence of hepatitis B and human immune deficiency virus among pregnant women attending private hospitals. Therefore, routine screening for HBV and HIV should be carried out regularly.
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Key words: Hepatitis B Virus, Hepatitis C Virus, Human Immunodeficiency Virus, Pregnant Women

Introduction

Viral hepatitis is a systemic disease primarily affecting the liver (Alter, 1994). It is a major factor in the eventual development of liver disease and hepatocellular carcinoma (HCC). Currently nine viruses are recognized as causing hepatitis. It is estimated that about 325 million of people, in 2015, were chronic carriers of hepatitis B virus (HBV) or hepatitis C virus (HCV) worldwide (WHO, 2011, 2017). HBV HCV and HIV are worldwide problem especially in pregnant women in Sub-Saharan Africa because the disease can infect their foetus or new born during delivery (Elsheikh *et al*., 2007; Wright, 2006; *Eke et al*., 2011; Zhang *et al*., 2014). Pregnant women make up a significant proportion of the population and horizontal and perinatal transmission in HBV transmission is possible (Thumbiran *et al*., 2014). HBV has the same similarities with HIV and HCV but their mode of transmission varies. They are both transmitted through exposure to infected blood. According to WHO, HBV seems to be more infectious because of its high concentration in the acute phase in body fluids of infected individuals, it can be transmitted by body fluids and not breastfeeding, thus child to child transmission is common but not applicable in HIV (WHO, 2011). Infants that are born to HBV/HIV co-infected women are more likely to be infected perinatally, with an increased risk of chronic hepatitis, than those that are born to HBV or HIV infected women alone (Thumbiran *et al*., 2014).

Materials And Methods

Study Population/ Location: The study was carried out among 95 pregnant women attending antenatal in a private hospital in Rivers State Nigeria. They were between the ages of 15-25, 26-35 and 36-45. They were grouped in relation to age, number of pregnancies, marital status, and educational status.

Ethical approval: Participants were sought and the reason for the research was explained to the officer in charge of the laboratory section and study was

approved and permission was obtained from the hospital to carry out the study.

Sample Collection: Blood was drawn aseptically by vein puncture into sterile ethylene-diamine tetra acetate (EDTA) bottles then centrifuged at 300rpm for 10 minutes. Serum was separated from the red blood cells using sterile droppers. Samples were clearly identified with names or codes in order to avoid miss interpretation of results. Serum and plasma were stored at +2°-8°C.

Detection of HBV, HCV and HIV in blood samples: Serum samples were screened for HBsAg using an in vitro diagnostic kit (ACON laboratory INC) stored at 2-30°C, anti-HCV antibodies at room temperature (25-28°C) using an in vitro diagnostic kit Swe-life HCV ultra-rapid strip and screen for HIV-1/2 using an in vitro diagnostic kit stored at (2-30°C) a qualitative, solid phase two site sandwich immunoassay. One to two millimetres of serum were applied to the pads of the test strips. The serum migrates upwards through capillary movement and formed a complex with the anti-HBsAg, anti-HCV and anti-HIV antibody conjugated particles. The mixture reacts, producing a coloured line in the test region of the strips. The coloured line on the control region of the strip is the internal procedural control. It confirms sufficient specimen volume and correct procedure technique.

Results

Demography of total study population: All of the subjects approximately (100%) were pregnant women which were all female. From the bio-data of the subjects been tested on, the ages of the pregnant women ranged from 15-45 years which were grouped into 15-25 years, 26-35 years and 36-45 years.

Socio-Demographic Information of the Subjects: The socio-demographic details of the subjects tested are represented in Table 1. Results obtained showed that more of the pregnant women were between the ages of 26-35 years (74.7%). Majority of the women were married (97.9%), while 2.1 % were unmarried. A greater percentage of the population were females 100% (95) while 0% (0) of the population is male. In relation to educational status 15 of these pregnant women stopped at the senior secondary level of education while majority of these women stopped at the tertiary level of education. The study also showed that a higher percentage of the women were having their first pregnancy (53.7%) followed by those having their second pregnancy. The least were those having their fourth pregnancy (5.3%). All subjects practised Christianity as illustrated in Table 1.

Table 1: Analysis Based on Socio-Demographic Information of the Subjects

Socio-demographic characteristics	Groups	No tested	Percentage (%)
Age (years)	15-25	19	20.0
	26-35	71	74.7
	36-45	5	5.3
Gender	Male	0	0
	Female	95	100
Marital status	Single	2	2.1
	Married	93	97.9
Educational status	Senior school	15	15.8
	Tertiary	80	84.2
1st pregnancy	Women	51	53.7
2nd pregnancy	Women	30	31.6
3rd pregnancy	Women	9	9.5
4th pregnancy	Women	5	5.3
Religion	Christianity	95	100.0

Risk Factors Associated with the Disease: Results obtained on the risk factors associated with the disease which includes; number of sexual partners, blood transfusion, and unprotected sex, sharing of sharp objects, dental procedure, and mother to foetus transmission. The percentage analysed were as follows as represented in Table 2. Of all 95.8% had just one sexual partner, 3.15% (3 pregnant women) had two sexual partners. Only one subject had more than 2 sexual partners. The women had knowledge of unprotected sex (89.5%) while a 20% indulged in unprotected sex. A significant percent of the women has not transfused blood while 10.5% have transfused blood. Sixty-four pregnant women do not share sharp objects while 3 pregnant women shared sharp objects. Results also showed that 86.3% (82 pregnant women)

have not undergone dental procedure while 13.7% (13 pregnant women have undergone dental procedure, 84.2% (80 pregnant women) have not transmitted virus to foetus during pregnancy while 15.8% (15 pregnant women) have transmitted virus to foetus during pregnancy.

Table 2: Analysis Based on Risk Factors

Risk factors	Groups	No tested	Percentage (%)
Sexual partners	One	91	95.8
	Two	3	3.15
	Above 2	1	1.05
Unprotected sex	Yes	19	20.0
	No	76	80.0
Blood transfusion	Yes	10	10.5
	No	85	89.5
Sharing sharp objects	Yes	31	32.6
	No	64	67.4
Dental procedure	Yes	13	13.7
	No	82	86.3
Mother to foetus	Yes	15	15.8
	No	80	84.2

Based on their knowledge about HIV, HBV and HCV their status, vaccination and attitude towards the viruses as shown in table 3.3 74.7% (71 pregnant women) have heard about HIV, HBV and HCV while 25.3% (24 pregnant women) have not heard about HIV. HBV and HCV, 80.0% (76 pregnant women) know their HIV, HBV and HCV status while 20.0% (19 pregnant women) don't know their status but 26.7% each of pregnant women know their HIV and HBV status while 26.7% know their HCV status. 70.5% (67 pregnant women) have not treated any of the viruses while 29.5% (28 pregnant women) have not treated any of the viruses. Based on their attitude towards the virus (i.e. willingness to receive treatment if infected), 80.0% (12 pregnant women) of women who are HIV positive are willing to receive treatment, 20.0% (3 pregnant women) of women who are HIV positive and are not willing to receive treatment, 12.6% (12 pregnant women) of women who are HIV positive and are willing to receive treatment in the total sample tested, 3.16% (3 pregnant women) of women who are HIV positive and are not willing to receive treatment in the total sample tested, 72.7 (8 pregnant women) who are HBV positive and are willing to receive treatment, 27.3% (3 pregnant women) of women who are HBV positive and are not willing to receive treatment, 8.42% (8 pregnant women) who are HBV positive and are willing to receive treatment in the total sample tested, 3.15% (3 pregnant women) are HBV positive and were not willing to receive treatment in the total sample tested.

Overall Prevalence of Hepatitis B surface Antigen (HBsAg), HIV and HCV: From the total of 95 pregnant women been tested, 11.6% (11 pregnant women) were positive to the hepatitis B surface antigen (HBsAg), 15.8% (15 pregnant women) were positive to HIV, 0% (0 pregnant women) were positive to the hepatitis C virus while a larger population of 88.4% (84 pregnant women) were negative to the HBV. Those that were negative to HIV were 84.2% while 100% (95 pregnant women) were negative to HCV.

Prevalence in Relation to Risk Factors: From the data gathered from the pregnant women tested, risk factors that were analysed based on the number of sexual partners, unprotected sex, blood transfusion, sharing of sharp objects, dental procedure and transmission from mother to foetus. Results obtained showed that 95.8% had one sexual partner while the prevalence in persons with two (2) sexual partners was 3.15%. Those with more than two sexual partners had a prevalence rate of 1.05% as shown in Table 2. For unprotected sex, the highest prevalence 80.0% was observed in those that do not indulge in unprotected sex whereas 20.0% prevalence was observed in those that indulge in unprotected sex. For blood transfusion, total prevalence 89.5% was found in the population that has no transfused blood while 10.5% prevalence was observed in those that received transfused blood in the study. For sharing of sharp objects, the prevalence 67.4% was found in the population who do not share sharp objects whereas 32.6% prevalence was observed in those that shared sharp objects in this study. For dental procedure, the prevalence 86.3% was found in pregnant women who have not undergone any dental procedure while 13.7% prevalence was found in those who have undergone dental procedure. In respect to transmission from mother to foetus the

prevalence 84.2% was found in pregnant women who have not transmitted to their foetus whereas 15.8% prevalence was found in those that have transmitted from mother to foetus.

Prevalence Based on Knowledge, Awareness, Status and Attitude towards the HIV, HBV and HCV: Based on the knowledge of HIV, HBV and HCV, the population studied (95 pregnant women) who had knowledge about the virus had a prevalence of 74.7% whereas 25.3% do not have knowledge about the virus. The study showed that 70.5% has been tested for the virus studied whereas 29.5% have not been tested for any of the virus before. With regards to knowing their status for any of the virus, population who knew their status have a prevalence of 80.0% whereas 20.0% were found in the population of those who did not know their status.

Table 3: Analysis Based on Their Knowledge, Vaccination and Attitude towards the Viruses (HIV, HBV and HCV)

HIV, HBV and HCV Awareness	Groups	No tested	Percentage (%)
Heard of HIV, HBV and HCV	Yes	71	74.7
	No	24	25.3
	Yes	76	80.0
Know their status	No	10	20.0
	I don't know	0	0
		28	29.5
Treated any form of the virus	Yes	67	70.5
	No	0	0
	I don't know	12	80.0
Attitude knowledge	Yes		
HIV positive who are willing to receive treatment	No	3	20.0
	I don't know	0	0
		12	12.6
HIV positive who are willing to receive treatment in total sample tested	Yes		
	No	3	3.16
	I don't know	0	0
		8	72.7
HBV positive who are willing to receive treatment	Yes		
	No	3	27.3
	I don't know	0	0
		8	8.42
HBV positive who are willing to receive treatment in total sample tested	Yes		
	No	3	3.15
	I don't know	0	0

Based on their attitude toward the viruses. For HIV, population of pregnant women who were HIV positive and willing to receive treatment had prevalence of 80.0% while population of pregnant women who were HIV positive and are not willing to receive treatment had prevalence of 20.0%. For HBV, the population of pregnant women who were HBV positive and are willing to receive treatment had prevalence of 72.7% whereas 27.3% were population of pregnant women who were HBV positive and were not willing to receive treatment. In the case of HCV, the population of pregnant women who were HCV positive and willing to receive treatment also the population who were not willing to receive treatment had equal prevalence of 0%.

The prevalence of 12.6% was found in the population who were HIV positive and willing and willing to receive treatment in the total sample tested while population who are HIV positive and are not willing to receive treatment in the total sample tested had prevalence of 8.16% For HBV, population who were HBV positive and are willing to receive treatment in the total sample tested had prevalence of 8.42% while prevalence of 3.15% was found in the

population who are HBV positive and are not willing to receive treatment in the total sample tested. In the case of HCV, the population who were HCV positive and willing to receive treatment and population who were not willing to receive treatment in the total sample tested had equal prevalence of 0%.

Discussion

The result of this study showed the prevalence or frequency of hepatitis B virus, hepatitis C virus and human immunodeficiency virus among pregnant women attending private hospitals was 11.58% for HBV, 15.79% for HIV, which HIV had the highest prevalence in this study. Infections due to hepatitis B virus, HIV and hepatitis C virus (HBV, HIV and HCV) are significant health problems around the globe. Worldwide, viral hepatitis is the commonest cause of hepatic dysfunction in pregnancy. With a general population infection rate of nearly 10.00% while 69 (72.6%) was recorded for HBV, HIV and HCV, the prevalence of chronic HBV is particularly serious in China. Chronic HBV and chronic HCV infection are strongly associated with liver failure, liver cirrhosis and cancer (Razawi, 2014). WHO defines low prevalence to be <2%, moderate prevalence as 2-8% and high prevalence as >8% for HBsAg, HIV and HCV positivity (WHO, 2010). This report shows that 84 (88.4%), 80 (84.2%) and 95 (100%) were found to be sero-negative to serum antibodies to hepatitis B (HBsAg), HIV and HCV respectively in this study. To some extend the number of pregnancy a woman has can affect the co-infection directly or indirectly. A study reported by Mutagoma (2017) recorded in their study in Rwanda observed that women with more than 2 or more pregnancies tend to have more of the co-infection of HBV and HIV compared with those of 2 or less pregnancies.

In comparison with earlier studies carried out in Nigeria, the prevalence of this result is higher than the 4.9% and 10.3% reported in Port Harcourt and Jos (Inyama *et al*., 2002). In contrast, it was less than the 21.3% recorded in Ibadan (Otegbayo *et al*., 2003), 18.2% and 7.3% reported prevalence among pregnant women in Zaria and Kano (Dawaki *et al*., 2006) and in two studies in Jos (Banwat *et al*., 2007) also compared to 17.3% reported in Tanzania (Nagu *et al*., 2008). The anti-HIV antibody prevalence of 15.79% in this study was found to be higher when compared to 8.2% reported in Abuja, Nigeria (Agwale *et al*., 2004). Studies also showed 14.7% in Lagos by Balogun *et al*. (2012) with no case of HIV/HCV prevalence reported among pregnant women attending antenatal care. The prevalence of HIV and HBV study was higher than with HCV, a recurring finding in pregnant women in Nigeria. This confirms that the fact that the prevalence of prevalence for both viruses is still considerably high. The frequency of HBsAg, HIV and HCV was more in age group ranging between 26-35 years in the present study, which also fell within the range of the findings of Mutagoma (2017) that reported HBV-HIV co-infection was higher between the ages of 15 -24 years and 25- 49 years. This shows that the virus is significantly associated with younger patients are sexually active and are more likely exposed to risky behaviours than older ones. This result is contrary to the findings of Isa *et al*. (2015) who found higher prevalence in those above 40 years old. The rate of HBV infection was significantly higher in females, that of HIV is normally higher in male but in this study the female gender only was worked on which has a prevalence of 15.78% in female that were sampled in this study and in that of HCV is low in female, this may be due to the number of females to male. This report agrees with that of (Mustapha and Jibrin, 2004) in which prevalence of HBV infection was higher in female than male, this result however contrasts with that of Kouassi *et al*. (2001) and Pennap *et al*. (2011) which showed higher prevalence of HBV and HCV infection in male than in female. However, conflicting reports regarding male or female predominant for prevalence with either of these viruses. The reason for this is not obvious but may be due to the epidemiological differences in the different study populations and variations in methodology.

As it relates to marital status, highest prevalence (16.12%) was seen among pregnant women who were married while highest was seen among pregnant women who were singles, HCV had a prevalence of 0%. This result is similar to that of (Ejele *et al*., 2004) who reported that single/unmarried patients constituted the highest proportion of those with HBV infection. This may be explained by the fact that promiscuity and unprotected sexual behaviours among singles/unmarried pregnant women might be higher than among the unmarried therefore increasing the risk of acquiring the viruses due to their instability to stick to only one sexual partner. Infection of HBV, HIV and HCV was more prevalent among those who do not share sharp objects. This study contrast that of Edet *et al*. (2012) who found higher prevalence among students who shared unsterilized sharp objects in the University of Uyo also Ndoko *et al*. (2011) reported history of practicing high behaviours such as sharing of sharp objects. This supports the study of Dawaski and Kawo (2006) that these risk factors are poorly associated with the infection.

This study reported that the higher prevalence of HIV, HBV and HCV infection was with persons with one sexual partner. This is similar to the finding of Adekunle *et al*. (2010) who reported higher prevalence in those without multiple sexual partners. The findings of the present study is contrary to some studies that

reported higher prevalence of HIV/HBV infection among patients with multiple sexual partners may be due to the fact that the pregnant women might have taken necessary precaution when negotiating new sexual partners or already been affected when they had one (1) sexual partner before re-marrying (Pennap *et al*., 2011). In addition, those infected could have gotten the viral infection through any other route. In relation to protected sex, the viruses were detected with high prevalence in those that use condom but in couples who resist the partner which may lead to acrimony (Otori *et al*., 2013). Pregnant women that have not transfused blood, pregnant women that have not undergone dental procedure and women that have no mother to foetus transmission of the viruses had a greater prevalence; this could be due to the fact that few pregnant women with contrasting behaviours were sampled in this study. It cannot be understood in totality what is responsible for the increase of these co-infections in pregnant women. It can suggested based on the study by Benhammou *et al*. (2018) that HBV/HCV are more frequent in individuals that are infected with HIV maybe due to lower response to ART and other factors discussed in this study for those that are not HIV positive. It is also possible other factors such poor immune virological response to ART. Complications could be associated with HCV infection.

Conclusion

This study found the prevalence of HBV, HIV and HCV infection among pregnant women attending private hospitals Port Harcourt, Rivers state, Nigeria to be 11.58%, 15.78% and 0% which implies that the infection is endemic among pregnant women. These women can therefore serve as potential reservoir for transmission of the viruses. Thus, awareness should be intensified especially in rural areas, routine antenatal screening for these viral diseases will aid early detection. More studies should be carried out in large scale to get more accurate prevalence in private hospitals in the community.

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