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Awareness, Risk Factors and Prevalence of Viral Hepatitis B and C among Antenatal Attendees in South-southern Nigeria: A Cross-sectional and Hospital-based Study

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Abstract **Background:** Viral hepatitis was responsible for 1.34 million deaths globally in 2015, a number comparable to deaths caused by tuberculosis and higher than those caused by HIV. Although hepatitis B and C viral infections are major causes of liver cirrhosis or/and hepatocellular carcinoma, knowledge is limited and prevalence underestimated because of poor surveillance programs in most developing countries. **Objectives:** The aim of this study was to evaluate the level of awareness/knowledge, risk factors and prevalence of viral hepatitis B and C amongst antenatal attendees in a secondary health-care facility. **Study design:** The study was cross-sectional, descriptive and hospital-based. **Methods:** A total of 218 pregnant women were recruited from the antenatal clinic of Central Hospital Warri using simple random technique after approval from the institutional review board and consent from the participants. They were screened for Hepatitis B and C viral infections using a rapid immune-chromatographic test strip. Samples positive for HBsAg were screened for other HBV biomarkers using a 5 in one test cassette. **Result:** Of the 218 women screened, 3 (1.4%) were positive for HBsAg while 4 (1.8%) reacted for HCV antibodies. All positive cases for HBsAg were negative for HBeAg and HBsAb, but positive for HBeAb and HBcAb. Age-grade 31-40 gave the highest age-based prevalence 1.92% for HBsAg while participants younger than 20 years had the highest age-based prevalence of 20% (2/10) for HCV. Multiparous women had 2.8% for HBsAg while nulliparous/primiparous participants have the highest HCV antibody prevalence of 3.1%. For other variables measured, self-employed, Secondary school education, lack of HBV vaccination, women who share sharps and participants that engaged the services of quacks for invasive procedures gave the highest prevalence in their respective categories. **Conclusion:** The prevalence of 1.4% and 1.8% reported by this study for HBV and HCV respectively is relatively low when compared to a previous report for the study region and other Nigerian studies. However, the poor level of awareness/knowledge and high level of exposure to predisposing risk factors among the study population calls for urgent intervention if vision 2030 will be a reality for the study region.

Keywords: *Hepatitis B and C, pregnant women, awareness, risk Factors, prevalence, Nigeria*

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1. Introduction

Globally, viral hepatitis was responsible for 1.34 million deaths in 2015, a number comparable to deaths caused by tuberculosis and higher than those caused by HIV [1]. While infections caused by viral hepatitis A-E viruses can result in mortality, 96% of deaths results from liver cirrhosis or/and hepatocellular carcinoma due to chronic viral hepatitis caused by hepatitis B and C viruses [1]. Hepatitis B infection is a disease of public health significance. Although it is preventable with safe and effective vaccines, it is currently responsible for about 2 billion infections globally amongst whom 350 million are chronic (lifelong) infections [2]. On the other hand, Hepatitis C virus is responsible for about 150 million infections globally [3] with 71 million of these cases

becoming chronic [1]. There are varying degrees of prevalence for both viral infections. HBV is more prevalent in Africa and the western pacific regions whereas Eastern Mediterranean and European regions accounts for the greater bulk of HCV infections [1]. Both viruses are transmitted via the peri-cuteanous route (blood and body fluids contact) and share similar risk factors. These risk factors include but not limited to sharing sharps, undertaking invasive procedures, recycling of used needles, unscreened blood transfusion, multiple sexual partners and vertical transmission (Mother to child).

The availability of safe and effective vaccines for HBV and chemotherapy with cure rates of 70-90% for HCV has resulted in gradual decline in the prevalence of chronic viral hepatitis. However, Mother-to-Child-Transmission (MTCT) of both viruses remains the most important mechanism of chronic viral hepatitis in Africa [4]. According to a study carried out at the University Hospital Yalgado in Burkina Faso, the vertical transmission rate for HBV is 37.1% [5]. In Nigeria, Sani et al. [28] reported a prevalence of 15.3% for MTCT for Northern Nigeria. Aside serving as a persistent source of infection, 25% of vertically infected children are at greater risk of death from hepatocellular carcinoma or cirrhosis in adulthood [6].

The prevalence of MTCT of chronic viral hepatitis varies depending on several maternal factors (HBeAg positivity, HBV and HCV viral load, knowledge and awareness as well as some socio-cultural practices). Bulk of the gains made so far with regards to viral hepatitis is largely attributed to increase in awareness/knowledge of associated risk factors. In most African settings, screening for viral hepatitis has not been made compulsory for antenatal attendees. Thus, vertical transmission of both viruses is believed to be promoted and encouraged.

Morbidity and morbidity associated with chronic viral hepatitis is dependent on two key factors; a persistent infection source and age of infection acquisition. Vertical transmission ensures efficient provision of both factors. Thus, prevention of MTCT of both viruses is vital to vision 2030 (eradication of viral hepatitis). There is paucity of data for the study region on the awareness, risk factors and prevalence of chronic viral hepatitis among antenatal attendees. This study seeks to address this issue, make a case for the integration of HBV and HCV screening into antenatal care and create a template for further research on the subject matter.

2. Materials and Methods

2.1. Study Region, Design and Population

This study was conducted at Central Hospital Warri which is located in the oil-rich city of Warri, Delta State Nigeria. Central Hospital Warri is a 350-bed-secondary health-care facility that serves as a referral center for some parts of Delta, Edo and Bayelsa State. Warri is the most populated city in Delta state and serves as home to all most all ethnic nationalities in Nigeria. The study was hospital-based, descriptive and cross-sectional in design and it included 218 pregnant women who attended antenatal clinic of Central Hospital Warri, From May to August 2019.

2.2. Sampling Technique

All pregnant women visiting the study site during the study duration that were not critically ill were eligible for the study. A total of 218 pregnant women were recruited using simple random sampling (the first twenty women to be enrolled on each of the clinic days until sample size was obtained) technique based on the calculated sample size using the formula as proposed by Araoye 2004 [29].

$$N = Z^2 x\ P\ x\ q / d^2$$

Where Z is the critical value and in a two-tailed test, Z = 1.96. P is the estimated national prevalence of viral hepatitis (15%) [3], q is the probability which is 1-P, while d is the absolute sampling error that can be tolerated. In this study, it will be 5%. Thus,

$$N = (1.96)^2 x\ 0.15\ x\ (1-0.15) /\ (0.05)^2$$
$$N = 3.8416\ x\ 0.15\ x\ 0.85 /\ 0.0025$$
$$N = 0.4898 / 0.0025$$
$$N = 196.$$

Assuming a non-response rate of 20%, 196 x 0.2 = 39.239.2 + 196 = 235.2.

However, we had a response rate of 92.7 as only 218 participants willingly responded.

2.3. Ethical Clearance

The study design and methodology was reviewed by the ethical committee of Central Hospital Warri and approval was granted. Written consent was obtained from consenting participants after the consent form was properly explained to them.

2.4. Data Collection and Laboratory Analysis

A pre-tested structured interviewer's questionnaire was used to collect data on demographics, socio-economic status, awareness and knowledge as well as associated risk factors by trained research assistants. HIV status was extracted from their case records. Knowledge of viral hepatitis was assayed for using three different questions (Have you heard of viral hepatitis, do you know what it is and which organ of the body is affected). A participant is termed to be knowledgeable if he or she scores two and above.

About three milliliters (3 mL) of venous blood was collected from each consenting participants following standard aseptic procedures. Blood sample was placed into labeled plain container and allowed to clot. Serum was extracted after centrifugation at 3000 rpm for five (5) minutes. Samples were either analyzed immediately or stored at -20^{0}C until they were analyzed.

Samples were screened for HBsAg and HCV antibodies using Global strips (Lot No. HBSG19070062) and (Lot No. HCV18070021) for HBsAg and HCV respectively (Alltest Biotech Co. Limited, China). Both kits have a specificity and sensitivity of 99.4% and 99.7% respectively. HbsAg positive samples were screened for HBsAg, HBsAb, HBeAg, HBeAb and HBcAb using a 5 in 1 HBV TEST CASSETTE (Lot No. SKY201810TEC) (SKYTEC). All test strips and cassette used were quality

controlled using known samples. Screening was done strictly according to manufacturer's instruction.

2.5. Data Management and Analysis

Data was collected and entered into the database on a weekly basis after cleaning. Confidentiality of data collected was ensured as identifiers were not included and data access was strictly restricted to research team. At the end of the study, data was subjected to descriptive and inferential statistical analysis using Statistical Package for Social Science (SPSS) (Version 22.0) statistical (IBM) software. Continuous variables were expressed in mean and standard deviation while categorical variables were summarized as percentages. Chi-square and Fisher's exact test were used to assess for the association between study variables. P-values of ≤ 0.05 were considered to be statistically significant.

3. Results

A total of 218 participants with a mean age of 30.7 ± 5.5 years were involved in the study. The youngest was 12 years old while the oldest was 47 years old. All most half of the participants 104(47.7%) were within the 21-30 years. Multiparous participants were 106 (48.6%) while self-employed respondents were 148 (67.9%). Women with tertiary education were 104 (47.7%) while urban residents and average annual income below 150 thousand naira (less than a dollar a day) accounted for 194 (89.0%) and 192 (88.1%) respectively. Respondents in a monogamous relationship were 207 (95.0%). Characteristics of the studied population are detailed in Table 1.

Extracts from their case record revealed that all participants were HIV negative. HBsAg was detected in 3 (1.4%) while 4 (1.8%) reacted for HCV antibodies (Table 2).

The three samples that reacted positively for HBsAg also gave the same serological profile for the other HBV biomarkers (Table 3).

There were varying prevalence and p-value for HBV and HCV among the different categories of variables measured. Age-grade was the only variable that a significant p<0.001for HCV infection (Table 4).

All participants positive for HBsAg and HCV antibody had no knowledge of viral hepatitis, its route of transmission and the presence of safe and effective vaccines for HBV (Table 5).

Viral hepatitis B and C distribution based on exposure to risk factors gave varying degree of prevalence and all lacked significant p-values (Table 6).

Table 1. Characteristics of the studied population

Characteristics	Frequency	Percentage
Age(years)		
11-20	10	**4.6**
21-30	98	**45.0**
31-40	104	**47.7**
Above 40	6	**2.8**
Parity		
Nulliparous or Primiparous	98	**45.0**
Multiparous	106	**48.6**
Grand multiparous	14	**6.4**
Employment status		
Student	11	**5.0**
Professionals	45	**20.6**
Self-employed	148	**67.9**
Non-employed	14	**6.4**
Educational status		
None	2	**0.9**
Primary	12	**5.5**
Secondary	100	**45.9**
Tertiary	104	**47.7**
Average annual income		
Below 150K	192	**88.1**
150-300k	12	**5.5**
300-500k	3	**1.4**
Above 500k	11	**5.0**
Location of residence		
Urban	194	**89.0**
Semi-urban	21	**11.0**
Rural	0	**0.0**
Marriage status		
Monogamous	207	**95.0**
Polygamous	11	**5.0**

Table 2. Sero-prevalence of HBsAg and HCV antibodies

Biomarker	Participants screened	Positive cases (n)	Positive cases (%)
HBsAg	218	3	**1.4**
HCV antibodies	218	4	**1.8**

Table 3. Serological profile of HBsAb positive cases (n = 3)

Biomarker	Results	Frequency (n)	Percentages (%)
HBsAg	Positive	3	**100**
HBsAb	Negative	3	**0**
HBeAg	Negative	3	**0**
HBsAb	Positive	3	**100**
HBcAb	Positive	3	**100**

Table 4. Sero-prevalence of HBV and HCV across studied variables

Variables	Frequency	HBsAg		HCV antibodies	
		Positive (%)	p-value	Positive (%)	**p-value**
Age (years)			0.909		**0.001**
11-20	10	0 (0.00)		2 (20.00)	
21-30	98	1 (1.02)		0 (0.00)	
31-40	104	2 (1.92)		2 (1.92)	
Above 41	6	0 (0.00)		0 (0.00)	
Parity			0.200		**0.461**
Null/primiparous	98	0 (0.00)		3 (3.10)	
Multiparous	106	3 (2.80)		1 (0.90)	
Grand multiparous	14	0 (0.00)		0 (0.00)	
Occupation			0.696		**0.911**
Student	11	0 (0.00)		0 (0.00)	
Professionals	45	0 (0.00)		1 (2.20)	
Self-employed	148	3 (2.00)		3 (2.00)	
Non-employed	14	0 (0.00)		0 (0.00)	
Educational status			0.309		**0.693**
None	2	0 (0.00)		0 (0.00)	
Primary	12	0 (0.00)		0 (0.00)	
Secondary	100	3 (3.00)		3 (3.00)	
Tertiary	104	0 (0.00)		1 (1.00)	
Average annual income			0.981		**0.968**
Below 150k	192	3 (1.60)		4 (2.10)	
150-300K	12	0 (0.00)		0 (0.00)	
300-500k	3	0 (0.00)		0 (0.00)	
Above 500k	11	0 (0.00)		0 (0.00)	
Location of residence			1.000		**0.375**
Urban	194	3 (1.50)		3 (1.50)	
Semi-urban	24	0 (0.00		1 (4.20)	
Rural	0	0 (0.00)		0 (0.00)	
Marriage type			0.915		**0.888**
Monogamous	217	3 (1.40)		4 (1.80)	
Polygamous	11	0 (0.00)		0 (0.00)	

Table 5. HBV and HCV infection rates based on knowledge and awareness of viral hepatitis

Variable	Frequency (%)	HBsAg		HCV antibodies	
		Positive (%)	p-value	Positive (%)	**p-value**
Knowledge of viral hepatitis			1.000		**1.000**
Yes	40 (18.3)	0 (0.0)		0 (0.0)	
No	178 (81.7)	3 (1.7)		4 (2.2)	
Awareness of transmission route			1.000		**1.000**
Yes	16 (7.3)	0 (0.0)		0 (0.0)	
NO	202 (92.7)	3 (1.5)		4 (2.0)	
Knowledge of HBV vaccine			1.000		**1.000**
Yes	26 (11.9)	0 (0.0)		0 (0.0)	
No	192 (88.1)	3 (1.6)		4 (2.1)	

Table 6. Viral infection distribution based on exposure to risk factors

Variables	Number (%)	HBsAg		HCV antibodies	
		Positive (%)	p-value	Positive (%)	**p-value**
Vaccinated for HBV			0.879		
Yes	16 (7.3)	0 (0.0)		0 (0.0)	
No	202 (92.7)	3 (1.5)		4 (2.0)	
Blood Transfusion			0.681		
Yes	44 (20.2)	0 (0.0)		1 (2.3)	
No	174 (79.8)	3 (1.7)		3 (1.7)	
Personal kit for manicure and Pedicure			0.200		**0.53**
I don't do M&P	25 (11.5)	0 (0.0)		0 (0.0)	
Yes	87 (39.9)	0 (0.0)		1 (1.1)	
No	106 (48.6)	3 (2.8)		3 (2.8)	
Given birth at a tradition home			1.000		**1.000**
Yes	19 (8.7)	0 (0.0)		0 (0.0)	
No	199 (91.3)	3 (1.5)		4 (2.0)	
Consulted quacks for invasive procedure			0.397		**0.958**
Yes	67 (30.7)	2 (3.0)		1 (1.5)	
No	151 (69.3)	1 (0.7)		3 (2.0)	

4. Discussion

This study conducted among antenatal attendees at Central Hospital Warri in Warri city, Delta state, Nigeria was aimed at assessing the level of awareness, risk factors and prevalence of hepatitis B and C. An overall prevalence of 1.4% (3 out of 218) and 1.8% (4 out of 218) was reported for hepatitis B and C, respectively. The 1.4% reported for HBsAg is similar to the 1.9% obtained for pregnant women in Bali, Indonesia [7] and 2.1% recorded for women at the point of delivery of University of Benin Teaching Hospital, Benin city Nigeria [8]. In contrast, Ophori et al., reported a higher prevalence of 12% for the study site in 2004 [9]. Several Nigerian studies have recorded higher values of 3.5%, 3.9%, 4.3% and 9.3% [10,11,12,13]. The reduction of HBV prevalence form 12% [9] to the 1.4% reported by this study may be attributed to the gains made along the four-prong strategy developed by the WHO which has ensured the registration of hepatitis-related cancer cases, creating of national guidelines for the prevention of infection in health-care workers, adopting universal vaccination, public awareness creation and screening all donated blood [3].

This study reported a prevalence of 1.8% for HCV which is similar to 1.5% and 1.1% reported for Lagos and Edo states respectively [15] [16]. However, our values are lower than 3.6% for Benin city [2], 6.0% for Keffi [17], 14.9% for Enugu [18] and 11.9% for Kaduna [19].

The variation in prevalence reported by the above mentioned studies may be attributed to variation in diagnostic methodology, strip or kit sensitivity and predisposing socio-cultural factors. Another reason for the low prevalence may be linked to HIV non-availability among the study population. In a study among rural Cameroonian women, Noubiap et al. [20] reported that HIV infection increases HBV acquisition by 22 times.

All three positive cases for HBsAg gave the same serological profile. They reacted for HBeAb and HBcAb while they were non-reactive for HbeAg and HBsAb. The presence of both antibodies (HBeAb and HBcAb) signifies HBV infection with decreased infectivity (chronic) and progress towards resolution [21]. The absence of HBsAb indicates non-resolution and absence of immunity while absence of HBeAg denotes no viral replication thus, infectivity is decreased. HBeAg is very important in vertical transmission. Our report of zero HBeAg cases is in contrast to the report of Aba and Aminu [11] and Amsalu et al [21] who reported 6.5% and 38.8% respectively for Kaduna, Nigeria and Yirgalem, Ethiopia. The few HBsAg positive cases in our study may be responsible for the difference observed with regards to prevalence of HBeAg.

Women within the ages of 31-40 years had the highest age-based prevalence of 1.92%. The report is in consonance with the findings of Anaedobe et al. [22] and Ugbebor et al. [2] who reported higher HBV prevalence among women older than 30 years of age. However, our report is in disagreement with the findings of Oti et al. [17] and Aba and Aminu [11] who gave higher values of HBV for ages younger than 30 years of age. All three women positive for HBV were multiparous. This finding agrees with Ugbebor et al. [2] and Ali and Memon [23]. Women older than 30 years would most likely account for the bulk of the multiparous group. Increase risk of HBV exposure from previous pregnancy, the cumulative years of sexual exposure and risky sexual behavior may be responsible for our age-based and parity-based findings.

Participants who were self-employed and those with secondary school education accounted for all three HBV infection and 75% of HCV infection. It is no surprise that 86% (data not shown) of women with secondary school education are self-employed. This finding is in agreement with Bittaye et al. [24] who reported traders to account for the highest burden of HBV infection. However, Onwuakor et al. gave a contrasting report for Abia state, Nigeria where students and civil servants had the highest prevalence [25]. Self-employed participants mostly traders are a vulnerable group of people who undertake travels and spend the night on the road. Thus, they are more likely to have multiple sexual partners.

The study site is located in an urban city thus; most of the participants (204 out of 218) had either secondary or tertiary education. Our study reported an inverse relationship between formal education and HBV and HCV prevalence. This finding is similar to other reports [17,22,26] but in contrast to an Ethiopian and Nigerian

report [11,21]. The effect of education and awareness on the prevalence of diseases (infectious or non-infectious) is an established fact. The reduced prevalence of both hepatitis infections among our study population may be attributed to the high percentage of literate participants.

Age-based HCV prevalence was the only variable that gave a significant p-value at <0.001. Women younger than 20 years had a prevalence of 20.0%. This is in contrast to the report of Oti et al. [17] who recorded age 21-30 and 31- 40 years as the highest age-based prevalence. About 95% of HCV infections are transmitted via contaminated sharps [1]. This may be responsible for the pattern of our findings as women within this age-grade 0-20 years are more involved in intra-venous drug usage, tattooing and body piercing.

All the cases of HBV and HCV were recorded for those without (i) Knowledge of viral hepatitis (ii) its route of transmission (iii) availability of safe and effective HBV vaccine. Although there was no significant association between awareness/knowledge and prevalence (because there were few positive cases), analysis for association between awareness/knowledge against formal education revealed significant association between educational status and awareness/knowledge of viral hepatitis, its transmission routs and HBV vaccine availability. There was a direct relationship between awareness/knowledge and formal education (data not shown). This highlights the importance of education on awareness/knowledge which invariably translates into reduction in viral hepatitis prevalence.

Only 7.3% of the study population reported vaccination for HBV and all were HBsAg negative. Our finding is not in agreement with Bittaye et al. [24] who reported 2.3% prevalence for those previously vaccinated. Quality, storage and dosage of HBV vaccines affect its functionality. This may have accounted for the HBV cases recorded among vaccinated participants. HBV vaccine is known to be very effective (95%) against chronic infections and not acute (84%) [27].

Blood transfusion history gave contrasting results for HBV and HCV. While there was no case of HBV among participants with history of blood transfusion, they accounted for 2.3% of HCV prevalence as against 1.7% for those without blood transfusion history. Our report is similar to the report of Anaedobe et al. [22] but in contrast to [11,17]. Our report validates the gains made toward ensuring safe blood transfusion services in the study site.

The highest prevalence of 2.8% was recorded for HBV and HCV among women who shared sharps used for manicure and pedicure. Similar findings are contained in some Nigerian studies [11,17,22]. Sharing of sharps is an established risk factor for most diseases transmitted via blood or body fluid contact (per-cutaneous route). This surely explains our findings. Although there was no significant association between women who consulted quacks for invasive procedures and those that didn't, those that consulted quacks had higher HBV prevalence and lesser HCV prevalence. Our report agrees with [11,17].

5. Conclusion

The prevalence of 1.4% and 1.8% reported by this study for HBV and HCV respectively is relatively low when compared to a previous report for the study site and other Nigerian studies. However, the poor level of awareness/knowledge and high level of exposure to predisposing risk factors among the study population calls for urgent intervention if vision 2030 will be a reality for the study region. The high occurrence of predisposing factors and poor awareness/knowledge may not have translated to high prevalence because of insufficiency of infection sources (a known fact associated with the epidemiology of infectious diseases).

Age above 30 years, multiparity, been self-employed, non-tertiary education, poor awareness/knowledge, lack of vaccination, sharing sharps and consulting quacks for invasive procedures have been highlighted to be associated with HBV prevalence. However, younger age (lesser than 20 years) had significant association with HCV prevalence.

6. Strength and Limitation

The study was cross-sectional and assayed lots of variables that measured most socio-demographics and risk factors associated with the epidemiology of chronic viral hepatitis. However, screening for both viral hepatitis (B and C) was done using just serology and HBV biomarker were only assayed for participants that reacted to HBsAg.

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