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Prevalence and Associated Risk Factors of Hepatitis C Infection among Pregnant Women in Ilorin, Kwara State, Nigeria

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Abstract

Hepatitis C virus (HCV) poses a significant risk to the well-being of pregnant women and their offspring with about 1.5 million new infections occurring annually. The data on the prevalence and associated risk factors among pregnant women in Nigeria remains limited. This study therefore aimed to determine the prevalence and associated risk factors of hepatitis C infection among pregnant women in Ilorin, Kwara State, Nigeria. This cross-sectional study enrolled 180 eligible pregnant women who visited and received antenatal care at Cottage and Civil Service Hospitals in Ilorin, Nigeria between November 2021 and January 2022. Demographic and clinical data were collected using a structured questionnaire while the antibody screening was via Enzyme-Linked Immunosorbent Assay (ELISA). The data were analyzed with IBM SPSS version 26 at $p<0.05$ significant level. Of the 180 pregnant women, 8 (4.4%) were positive for HCV. The highest proportion of HCV positivity was recorded among women aged 20-30 years (75%), those with tertiary education (100%), Civil Servants (100%), married women (100%), and those in the second trimester gestational age (100%). Furthermore, 87.5% of HCV-positive patients had a history of blood transfusion and 62.5% reported scarification. However, no significant statistical association was recorded between demographic characteristics, risk factors, and HCV seropositivity ($p > 0.05$). Although the prevalence of active HCV infection among pregnant women in Ilorin was low, the outcome underscores the importance of routine screening of pregnant women for HCV to prevent maternal and neonatal complications. These findings support the need for more comprehensive research on HCV prevalence among pregnant women across Nigeria. Public health strategies should include regular screening, counselling, follow-up and awareness programs to mitigate the risks of HCV transmission, in alignment with Sustainable Development Goal 3 on good health and well-being.

Keywords: *Hepatitis; Epidemiology; Pregnant women; Antibody; SDG*

INTRODUCTION

Hepatitis C (HCV) is a highly prevalent viral infection that affects people across the globe, with sub-Saharan Africa being one of the regions with the highest incidence rate (Madhava *et al*., 2002; Shepard *et al*., 2005). The consequences of contracting HCV infection can be severe and long-lasting, including the development of hepatocellular carcinoma, liver cirrhosis, and, ultimately, the death of infected individuals. The World Health Organization (WHO) estimated that about 58 million people are chronically infected with HCV, with 1.5 million/annum new infections and 3.2 million cases in children and adolescents (WHO, 2023). The annual number of deaths due to HCV-related cirrhosis and liver cancer has risen above 350,000 (WHO, 2021). The virus is transmitted through surgical procedures, blood transfusions, high-risk sexual activities, direct contact with blood or blood products, and vertical transmission from mother to child during pregnancy, at the time of delivery, or during the first 28 days after birth (Zenebe *et al*., 2022).

Globally, an estimated 1 to 8 percent of pregnant women are affected by HCV infection (Zenebe *et al*., 2015; Nartey *et al*., 2023). When pregnant women contract HCV, they are at risk of experiencing various complications, such as premature birth, vaginal bleeding, placental abruption, and in severe cases, even death (Safir *et al*., 2010; Reddick *et al*., 2011; Ragusa *et al.,* 2020). Maternal-child transmission is one factor contributing to the spread of the viral infection among the next generation (Brunel *et al*., 2019). Vertical transmission is estimated to be 0.2-0.4% in the United States and Europe but can be as high as 12-14% in some areas of Africa (Muñoz-Gámez, *et al*., 2016).

In Africa, hepatitis C is a common viral infection with an incidence of antibodies ranging from 5% to 17.5% (Ndjomou *et al*., 2002). A review of the prevalence report ranged from 3.2% to 14.6% throughout the Congo Republic (Boumba *et al*., 2012), 17.5% in Egypt, 13.8% in Cameroon, 11.3% in Burundi and 3.0% in Ghana and 2.1% for Nigeria as at 2013 (Nartey *et al*., 2023). There is not much information on the pathophysiology of HCV infection during pregnancy. Maintaining active immunity against HCV to protect the foetus from infection and building tolerance to paternal alloantigens form the basis of the maternal immune system (Campion *et al*., 2021).

In Sub-Saharan Africa, identification and documentation of HCV/HCV-related cases is still challenging (Ugwu *et al*., 2023). Inconsistent reporting and lack of up-to-date data on the occurrence of the virus has further complicated its understanding. The existing record of prevalence is unpredictable in Nigeria because of factors such as variations in hospital policies and facilities and the presence of distinct risk groups with varying levels of HCV antibodies (Zenebe *et al*., 2015; Oti *et al*., 2021). Thus, to address this gap, this study sought to determine the seroprevalence and associated risk factors of Hepatitis C viral infection among pregnant women within the Ilorin metropolis.

MATERIALS AND METHODS

Ethical consideration

The Kwara State Ministry of Health, Fate-Ilorin, granted ethical approval before the commencement of the study (Ethical Number: MOH/KS/EU/777/584). Throughout the study, pertinent confidentiality was upheld. Informed consent was also sorted from consenting participants.

Study design and population

This cross-sectional study was conducted between November 2021 and January 2022 at the Cottage and Civil Service Hospital, Ilorin, Nigeria, amongst 180 consenting pregnant women. A structured questionnaire was used to obtain information on their sociodemographic characteristics, medical history, and any risk factors predisposing the participants to HCV acquisition.

Sample Collection

Samples from about 5mL of venipuncture were collected and taken to the University of Ilorin Microbiology laboratory for analysis. After serum separation, samples were kept at -20°C until needed for the serological assay for HCV antibody.

Serological Screening

The commercial fourth-generation enzyme-linked immunosorbent assay (ELISA) method was used to screen the blood samples for the presence of HCV by the manufacturer's instructions (DIAGNOSTIC AUTOMATION INC.). The assay's results were represented quantitatively as the ratio (R) of the test sample's optical density to the calculated cutoff absorbance because the calculated cutoff absorbance was 0.201, sera with ratios more than 0.201 were regarded as positive. In contrast, those with R values less than 0.201 were considered negative.

Data Processing and Analysis

IBM SPSS Statistical tool was used to compute and analyze data. To ascertain association, the chi-square test was employed, and P-values less than 0.05 were regarded as significant.

RESULTS

The total seroprevalence of hepatitis C was found to be 4.44%, i.e. 8 of 180 (Figure 1). The age distribution was 19–42 years, with a mean of 29.18 years and a standard deviation of ±5.42 (SD). Ages 20 to 30 years accounted for the most significant proportion of participants in this study (64.4%; 116/180), with 66.67% having completed tertiary education. The pregnancy age distribution was higher within the second-trimester group (90/180 (50%)) compared to others, while marital status revealed 10 (5.56%), 2 (1.11%), and 168(93.33%) as single, divorced, and married respectively (Table 1).

Table 1 also showed that the highest HCV antibodies (5.17%; 6/116) were recorded in the age group 20-30 years. The result shows no significant association between age group and HCV infection (P= 0.982). Analysis of the data with respect to the educational level of the enrollee showed that HCV prevalence was highest among pregnant women who attained tertiary level of education 6.67% (8/120) but those with lower education levels had no positive result (0.00%). The highest anti-HCV antibody prevalence was obtained among married women (8/168; 4.76%) while single and divorced pregnant test subjects recorded no prevalence. The highest seropositivity was observed among urban residents at 4.65% (8/172) but despite the prevalence of HCV observed in socio-demographic variables, there was no significant statistical association ($P > 0.05$).

Based on risk factor analysis, 38.89% (70/180) of the participants reported having had blood transfusions out of which 7/70 (10.00%) tested positive for HCV antibodies, indicating Hepatitis C Virus infection. Of the study population, 154/180 (85.55%) test participants reported not having lost pregnancy in the past, whereas 14.4% (26/180) of pregnant women had a history of abortion or miscarriages. These subgroups had seroprevalences of 6/154(3.89%) and 2/26(7.69%) for HCV infection, respectively. Table 2 indicates that statistical analysis did not have a significant correlation ($P > 0.05$) despite the reported incidence of HCV in groups linked with possible risk factors.

There was an observed relationship between tiredness and HCV seropositivity (p=0.020). Subjects with symptoms of tiredness had the highest rate of HCV seropositivity, with 8/80 (10.00%). The highest prevalence of HCV infection was reported among those who had no symptoms of nausea (6/64; 9.38%), while the lowest prevalence was recorded among those with nausea symptoms (2/116; 1.72%). No statistical association was recorded with a P value=0.092 (Table 3).

Most respondents did not have sickle cell disease, and 8 out of 178 (4.49%) tested positive for HCV antibodies. Pregnant women without joint pain (144/180) had the highest seropositive rate for HCV infection (8/144; 5.56%). Tested subjects who did not exhibit yellow eye symptoms had the highest seropositivity (8/168; 4.76%). Most study participants did not have fever symptoms (110/180; 61.11%), and 6/110 (5.45%) tested positive for HCV infection. The test subjects with a history of jaundice (90/180; 50.00%) had the highest proportion of HCV seropositivity 8/90 (8.89%) and a statistical association was recorded(P=0.041) (Table 3).

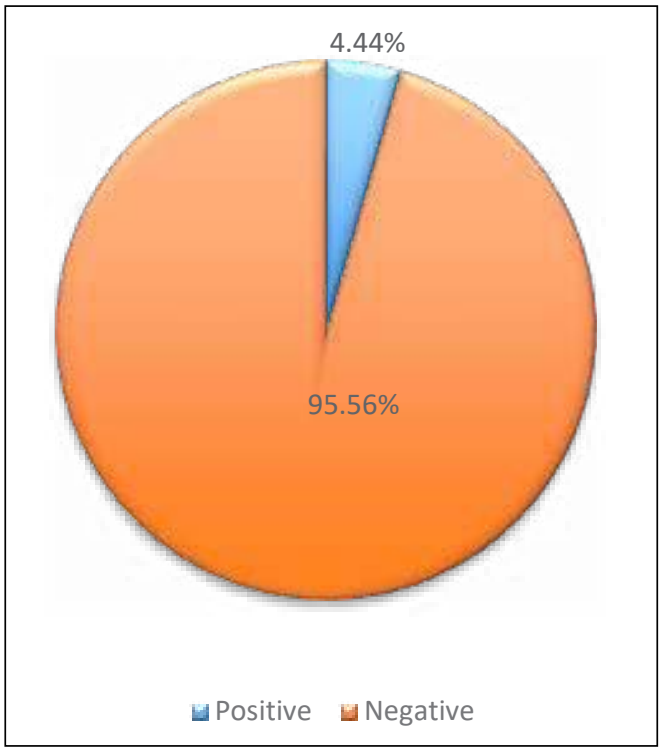

Figure 1: Prevalence of HCV infection among pregnant women in Ilorin

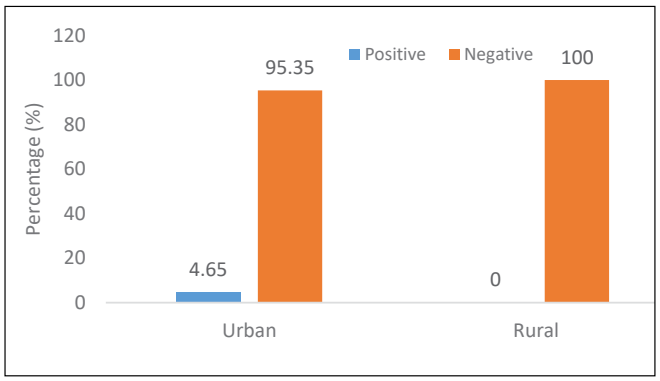

Figure 2: Prevalence of anti-HCV antibodies among pregnant women based on residential area

Table 1: Prevalence of anti-HCV antibodies among pregnant women in relation to some socio-demographic factors

Variables	**No. tested**	**No (%) of positive HCV Antibody**	χ^2	**P value**
Age in years				
<20	2(1.11)	0(0.00)	8.438	0.982
20-30	116(64.44)	6(5.17)		
31-40	58(32.22)	2(3.45)		
41-50	4(2.22)	0(0.00)		
Educational status				
Primary	8(4.44%)	0(0.00)	2.093	0.351
Secondary	52(28.89)	0(0.00)		
Tertiary	120(66.67)	8 (6.67)		
Marital Status				
Single	10(5.56)	0(0.00)	0.299	0.861
Married	168(93.33)	8 (4.76)		
Divorced	2(1.11)	0(0.00)		
Stage of gestation				
First trimester	48(26.67)	0(0.00)	4.186	0.123
Second trimester	90(50.00)	8 (6.67)		
Third trimester	42(23.33)	0(0.00)		

HCV: Hepatitis C virus. Values are given as numbers (percentage). *- statistically significant

Table 2: Seroprevalence of HCV infection among pregnant women in relation to some possible risk factors for vertical transmission

Variables	**No. tested**	**No (%) of positive HCV Antibody**	χ^2	**P value**
Any lost pregnancy				
Yes	26(14.44)	2(7.69)	0.377	0.539
No	154(85.56)	6(3.89)		
History of blood transfusion				
Yes	70(38.89)	7(10.00)	0.217	0.641
No	110(61.11)	1(0.91)		

HCV: Hepatitis C virus. Values are given as numbers (percentage). *- statistically significant

Table 3: Prevalence of HCV infection among pregnant women according to some symptoms exhibited

Variables	**No. tested**	**No (%) of positive HCV Antibody**	χ^2	**P value**
Yellow eyes				
Yes	12(6.67)	0(0.00)	0.299	0.585
No	168(93.33)	8(4.76)		
Nausea				
Yes	116(64.44)	2(1.72)	2.842	0.092*
No	64(35.55)	6 (9.38)		
Joint pain				
Yes	36(20.00)	0(0.00)	0.989	0.320
No	144(80.00)	8(5.55)		
Tiredness				
Yes	80(44.44)	8(10.00)	5.370	0.020*
No	100(55.56)	0(0.00)		
Sickle cell				
Yes	2(1.11)	0(0.00)	0.095	0.828
No	178(98.89)	8 (4.49)		
Fever				
Yes	70(38.89)	2(2.86)	0.309	0.578
No	110(61.11)	6 (5.45)		
History of jaundice				
Yes	90(50.00)	8(8.89%)	4.186	0.041*
No	90(50.00)	0(0.00)		

HCV: Hepatitis C virus. Values are given as numbers (percentage). *- statistically significant

DISCUSSION

Hepatitis C viral infection has become the leading cause of acute hepatitis and jaundice during pregnancy (Owolabi *et al*., 2015; Asafo-Agyei *et al*., 2023). Therefore, this disease can cause serious public health problems, most especially among pregnant women. This study recorded a 4.44% seroprevalence of HCV infection among pregnant women within the Ilorin metropolis. The prevalence recorded in this study is higher than the 2.1% HCV prevalence quoted for Nigeria, published in 2010 (Lavanchy, 2011). When compared with earlier reported prevalence of HCV in Nigeria, the prevalence recorded in this study is higher than the prevalence of 0.5% reported in Ilorin by Omosigho *et al*. (2021), 1.86% found among pregnant women in University of Benin Teaching Hospital (Onakewhor and Okonofua, 2009), 0.5% found in Gwagwalada, Abuja (Agarry and Lekwot, 2010), 0.4% reported in Calabar (Davies *et al*., 2013), 1.3% reported by Eleje *et al*.(2021) and 1.5% prevalence reported in Lagos by Anayochukwu-Ugwu *et al*. (2023). However, the prevalence recorded in this study is comparable to the 3.6% recorded in Edo State, Nigeria (Ugbebor *et al*., 2021). Furhtermore, the HCV prevalence observed this study is lower than 9.2% earlier reported in Osun State (Ogunro *et al*., 2001), Comparing with reported prevalence from other countries, the prevalence observed in this study is higher than the prevalence of 1.8% reported for the obstetric population in Cameroon a western African neighboring country (Njouom *et al*., 2005),1.03% observed in India (Kumar *et al*., 2007), 0.1% in Turkey (Altinbas *et al*., 2010), 0.3% in Sudan (Elsheihk *et al*., 2007) and 2.1% in Gabon (Ndong-Atome *et al*., 2008). While it is lower than the 6.2% prevalence in Pakistan (Kanaani et al., 2018) and the 8.5% prevalence reported in Sana'a, Yemen (Murad et al., 2010), the prevalence of this study falls within the 1.0–8.0% global prevalence of HCV in pregnancy (Arshad et al., 2011; He *et al*., 2023).

The observed differences might be due to variations in the studied risk groups, socioeconomic statuses, and testing methods, where some studies combined hepatitis C virus RNA and anti-HCV antibody tests. Our study focused only on the detection of anti-HCV antibodies. Acute HCV infection must have been lost before the production of antibodies. The high HCV prevalence of 6.4% reported by Zahran *et al*. (2010) in Egypt must have been possible due to combined HCV antibody and antigen testing methods.

Based on age distribution, most HCV-positive patients belonged to the age group of 20- 30 years (3.33%) and this result corresponds to the result obtained by Owolabi *et al*. (2015). This age group correlates with the age at which women get pregnant, which makes them susceptible to variables that increase their risk of contracting HCV from high-risk sexual behaviors and receiving blood transfusions from issues related to pregnancy, such as postpartum hemorrhage. The age group and HCV seropositivity did not have a statistically significant association (P=0.982).

Concerning marital status, anti-HCV seroprevalence was found only among married pregnant women (4.44%) at p>0.05. This could be because of this region's generally low seroprevalence rate of HCV infection. Since single women are thought to be more likely to participate in high-risk sexual activities, it could also imply that there are other ways to spread or contract the virus outside of sexual contact.

Pregnant women with tertiary education showed a higher incidence of seropositivity, and the seroprevalence rate in this research rose proportionately with educational level. The rise in seroprevalence conflicts with a prior study that found that pregnant women's illiteracy increased their chance of contracting HCV because of inadequate

enlightenment brought on by a lack of education (Obinna *et al*., 2012).

In this study, although the majority of pregnant females reside in urban areas (95.56%, 172/180) as compared to those from rural areas (4.44%,8/180), the highest number of reactive patients belonged to urban areas (4.44%, 8/8). A study conducted in Faridkot, Punjab, however, found that pregnant women from rural regions had greater seropositivity (72.5%, 29/40) than those from urban areas (27.5%, 11/40) (Goyal *et al*., 2014). This is understandable given that the study was carried out in an urban region and that many expectant mothers would rather get care close to home.

All the positive results observed in this study were related to the 50% (90;50.00%) of pregnant women in their second trimester. The present outcome is consistent with the research undertaken by Mboto *et al*. (2010), which indicated that all positive cases were attributed to pregnant women in their second trimester.

In the group of pregnant women with HCV seropositive results, 3.89% had previously received blood transfusions. Research among pregnant women in Pakistan found that blood transfusion is one of the significant risk factors that lead to the acquisition of HCV (Bibi *et al*., 2013). However, blood transfusion and HCV seropositivity did not significantly correlate (P=0.641). This might be because the Hepatitis C virus can spread through a variety of channels, including sharing sanitary products, misusing needles, and getting tattooed without sterile conditions. No statistically significant correlation was found between HCV infection in the general population and the risk factors (previous history of blood transfusion and any lost pregnancy). This is consistent with the study conducted by Olive Obienu *et al.* (2011), which found little about the predisposing variables for HCV in Nigerian patients (Obienu *et al*., 2011). Layden *et al.* (2011) claim that although the best routes for HCV virus transmission are established, the hazards associated with exposure in Africa, particularly Nigeria, are poorly understood (Layden *et al*., 2014).

Symptoms/signs presented by the pregnant women, such as yellow eyes, asthma, sickle cell, fever, and joint pain, showed various levels of association but were not statistically significant ($p > 0.05$). There was a significant association between the pregnant women's history of jaundice ($p = 0.041$), symptoms of tiredness ($p = 0.020$), and nausea (0.092). These symptoms are common attributes of infection with viral Hepatitis C. Pregnant women with a history of jaundice may have encountered situations where their liver function was compromised, making them susceptible to HCV infection. Screening blood and blood products does not seem to be enough to reduce the incidence of HCV infection in expecting moms anymore. Technology has assisted in reducing the viral burden on blood and blood products, even though blood transfusions were historically a common route for children to get the disease. However, vertical or perinatal transmission is the most prevalent route for humans to contract this virus. The spread of HCV can be halted by taking several steps, including educating the public and medical professionals about safe medical practices and raising awareness of the condition and its mode of transmission. The prevalence can also be decreased by screening for sickle cell disease and providing premarital prenatal counselling.

CONCLUSION

This study reveals a relatively high prevalence of HCV infection among pregnant women in Ilorin, yet lower than studies conducted in other parts of Nigeria. This variation underscores the imperative need for a nationwide research study involving a substantial number of pregnant women from all regions of Nigeria to establish updated, comprehensive, and accurate prevalence data.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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