International Journal of Emerging Research in Applied Medical Sciences (IJERAMS)

Seroprevalence and Risk Factors of Hepatitis B and C Virus Infections among Pregnant Women in Kaduna State, Nigeria

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ABSTRACT

Background: Hepatitis is caused by Viruses that are all contagious and the infection can be transmitted from one person to another. Estimating the prevalence of hepatitis B and C viral infections among pregnant women will help reduce mortality and morbidity rates in these subjects. Methodology: A total of three hundred (300) blood samples were collected from three Hospitals in Saminaka, Lere and Gure based on the availability of samples. The sera samples were assayed using in-vitro diagnostic kit (dipsticks/strips) to detect the hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C virus (anti-HCV). Results: Test strip revealed that 18/330 (6.00%) of pregnant women tested positive for HBV and 15/300 (5.00%) were infected with HCV. The Enzyme Linked Immunosorbent Assay (ELISA) kit confirmed 25/300 (8.33%) of HBV and 21/300 (7.00%) of HCV in the study population.. Conclusion: There is need for proper screening of blood before transfusion as most women that had blood transfusion once were found to be infected also there is need for proper sensitization about the disease as many participants were not aware of its capacity to spread and cause life threatening infection.

Keywords: ***Hepatitis, HBV, HCV and Pregnant women***

DOI: https://doi.org/10.65477/ijerams.v1.i4.01

1. Introduction

All viruses that cause hepatitis are infectious and spread from person to person. Types A, B, C, D, E, and G are the six primary hepatitis viruses (Kibet, 2023). Hepatitis B and C are the most prevalent causes of cancer and liver cirrhosis, and they cause chronic illness in hundreds of millions of individuals (Cortesi et al., 2023). Other viruses that impact the liver include cytomegalovirus, Epstein-Barr virus, Herpes Simplex virus, rubella, and yellow fever virus (Dike-Ndudim et al., 2022).

The hepatitis B virus, which is prevalent worldwide, is a serious public health concern (Alberts et al., 2022). An estimated 2 billion persons globally are thought to have contracted HBV at some point in their life by contaminated blood or bodily fluids; of these, 350 million are thought to be chronically infected and develop into virus carriers (Tan et al., 2021). Over 4 million acute clinical instances of HBV occur each year, and approximately one million individuals pass away from primary liver cancer, cirrhosis, or chronic hepatitis (Alsulaimany, 2023). According to a Nigerian survey, 36.2% of people received all three doses of the Hepatitis B vaccine, whereas 64.5% had received at least one dose (Osagiede et al., 2022).

According to Seid et al. (2014), the hepatitis C virus typically causes severe symptoms. Approximately 85% of acute infections result in chronic liver disease, and some develop cirrhosis, which can progress to end-stage liver disease that may require a liver transplant. HCV is a chronic virus that affects about 170 million individuals globally. Because the infection can remain undiagnosed for ten to thirty years, it is frequently referred to as "silent." The virus damages the liver in a gradual but ultimately catastrophic way (Mezgebo et al., 2014). In rare cases, the hepatitis B virus can be passed from an infected woman to her unborn child during pregnancy. It is less frequent for HCV to be passed from mother to kid at birth (Dabsu and Ejeta, 2018).

Different prevalence rates have been found in studies conducted among specific demographics. While (Omosigho et al., 2022a) observed an intermediate prevalence of 4.3% for HBV infection among pregnant women in Port Harcourt, Oguche (2021) showed a 3% prevalence of Hepatitis C virus infection among blood donors in Benin City. According to (Innocent et al., 2022), the prevalence of hepatitis B and hepatitis C in Jos was 15.1% and 4.3%, respectively. According to (Dausayi et al., 2022), 8.3% of pregnant women in Zaria had hepatitis B. Pregnant women in Minna had a prevalence of 12.3% for hepatitis B and 0.4% for hepatitis C, according to (Omosigho et al., 2022b). According to Jatau and Yabaya (2014), 14.7% of blood donors in the Kaduna senatorial district have hepatitis B. Due to the potential for perinatal transmission—the passage of the virus from mother to child—pregnant women must be made aware of the condition.

Thus, the study's goal is to determine how common viral hepatitis B and C infection is among pregnant mothers who frequent prenatal clinics in certain hospitals in the Lere Local Government Area of Kaduna State.

Materials and Methods

Study Area

This study was carried out in Lere Local Government Area located between latitude 10°0.00′07″N to 10°30.00′07″N and longitude 8°20.00′06″E to 8°50′.00 07″E with a population of 331, 161 in three Hospitals located at Saminaka, Maigamo and Binawa (Figure 1). These hospitals were selected based on those that run antenatal and postnatal clinics

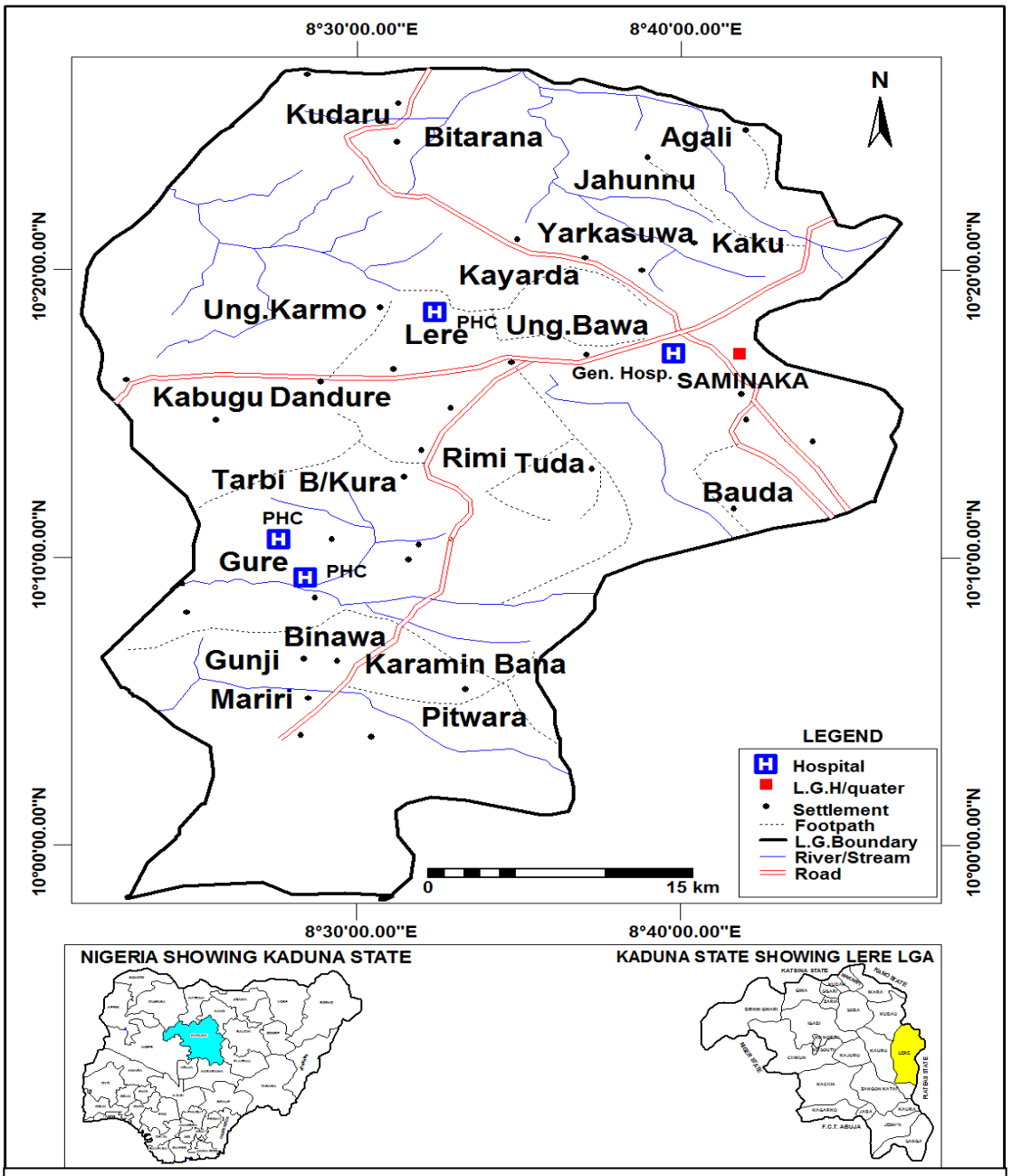

Figure 1: Lere Local Government Area Showing Sampled Hospitals Source: Adapted from Administrative Map of Kaduna State

Study Design

This study was a hospital based cross-sectional study. On every antenatal day, during the study, the pregnant women were given health talk on HBV and HCV viral infection and informed on the importance of knowing their status. Ethical approval was obtained from the Ethical Committee of the selected General Hospitals and the State Ministry of Health. Consenting attendees were recruited and included for the study.

Sample Size

Due to the unavailability of data on hepatitis viral infection among pregnant women in Lere Local Government Area, a projected prevalence rate of 15% based on the previous study by Okonko & Nwagwu, (2023) was used to determine the sample size. Based on which a minimum of 196 samples will be used. However, a total of three hundred (300) samples were collected from the three Hospitals visited based on the availability of samples.

Blood Sample Collection and Examinations

Blood samples were collected aseptically by venepuncture using 5ml sterile disposable hypodermic syringes and needles into pre-labelled specimen EDTA bottles. In the laboratory, sera samples were assayed to detect

both the hepatitis B surface antigen (HBsAg) and antibodies to hepatitis C virus (anti-HCV) respectively. Assays were done using invitro diagnostic kit (dipsticks/strips) following the manufacturer's instructions (Murayama et al., 2019). Positive samples were confirmed using ELISA kit (Diagnostic Automation Cortez USA).

Statistical Analysis

Prevalence of HBV and HCV were expressed in percentages. Chi-square was used to determine the association of HBV and HCV viruses with the pregnant women in Lere LGA. Odds ratio (OR) was used to establish the risk factors associated with the infections. Statically Significant difference was evaluated at $p \leq 0.05$ using SPSS version 20.0.

1: Prevalence of HBV and HCV in pregnant women attending some selected hospitals in Lere Local Government Area (n=300)

The study on prevalence of HBV and HCV in pregnant women attending antenatal clinic in Saminaka, Lere and Gure general hospital revealed overall higher prevalence of 18(6.0%) for HBV, 15(5.0%) HCV using test strips and 25(8.33%) HBV and 21(7.0%) HCV using ELISA.. Using test strips, highest prevalence of HBV (6.6%) was recorded among pregnant women attending antenatal at Saminaka General hospital while the least prevalence of 4.55% was recorded in Lere general hospital. There was no statistically significant difference ($p>0.05$) in prevalence of HBV among women attending the three selected hospitals. On the other hand, using same test, highest titre (9.09%) of HCV antigen was recorded in Lere while the least (3.05%) was among women that attend saminaka general hospital. There was no statistically significant difference ($p>0.05$) in prevalence of HCV among women attending the three selected hospitals. ELISA test revealed highest prevalence of HBV (9.09%) and least prevalence (6.78%) in Lere and Gure. There was no statistically significant difference ($p>0.05$) in prevalence of HBV among women attending the three selected hospitals. HCV was detected in more women (13.56%) in Gure general hospitals and least (4.04%) in saminaka. There was statistically significant difference ($p<0.05$) in the prevalence of HCV among women attending the three selected hospitals (Table 1).

Table 1: Prevalence of HBV and HCV in pregnant women attending some selected hospitals in Lere Local Government Area (n=300)

		Positive with test strip			**Positive with ELISA kit**		
Hospitals	**No. Examined**	**TNPHV (%)**	**HBV (%)**	**HCV (%)**	**TNPHV (%)**	**HBV (%)**	**HCV (%)**
Saminaka	197	19 (9.65)	13 (6.60)	6 (3.05)	25 (12.69)	17 (8.63)	8 (4.06)
Lere	44	6 (13.64)	2 (4.55)	4 (9.09)	9 (20.46)	4 (9.09)	5 (11.36)
Gure	59	8 (13.56)	3 (5.09)	5 (8.48)	12 (20.34)	4 (6.78)	8 (13.56)
Total	**300**	**33 (11.00)**	**18 (6.00)**	**15 (5.00)**	**46 (15.33)**	**25 (8.33)**	**21 (7.00)**
	$\chi 2$	1.077	0.378	4.634	3.088	0.242	7.800
	Df	2	2	2	2	2	2
	P-value	0.584	0.828	0.099	0.214	0.886	0.020

Key: TNHV = Total Number of Hepatitis Viruses TNPHV? HBV = Hepatitis B Virus using, HCV = Hepatitis C Virus using, df = Degree of freedom and $\chi 2$ = Chi squared

2: Prevalence of HBV and HCV of pregnant women according to their age distribution Of some selected hospitals in Lere Local Government Authority (LGA)

Age group 15-19years 7 (19.44%) had the highest prevalence of HBV and HCV viruses, while age group 20-24years 3 (4.76%) had the least (Table 2). Hepatitis B was more prevalent among Age group 15-19years (%) while age group 20-24 years had the lowest prevalence of 1 (1.59%). Hepatitis C was more prevalent in age group > 40years 2 (10.00%) and low prevalence in age group 20-24years 2 (3.18%). HBV and HCV viruses were not significantly associated with age of the pregnant women in the selected hospitals in Lere LGA.

Table 2: Prevalence of HBV and HCV of pregnant women according to their age distribution

		Positive with test strip			Positive with ELISA kit		
Age group	**No. examined**	**TNHV (%)**	**HBV (%)**	**HCV (%)**	**TNPHV**	**HBV (%)**	**HCV (%)**
15-19	36	7 (19.44)	5 (13.89)	2 (5.56)	9 (25.00)	6 (16.67)	3 (8.33)
20-24	63	3 (4.76)	1 (1.59)	2 (3.18)	5 (6.35)	3 (4.76)	2 (3.17)
25-29	54	6 (9.26)	4 (7.41)	2 (3.70)	9 (16.67)	5 (9.26)	4 (7.41)
30-34	86	10 (11.62)	5 (5.81)	5 (5.81)	13 (15.12)	6 (6.98)	7 (8.14)
35-39	41	4 (9.76)	2 (4.88)	2 (4.88)	6 (14.63)	3 (7.32)	3 (7.32)
≥ 40	20	3 (15.00)	1 (5.00)	2 (10.00)	4 (20.00)	2 (10.00)	2 (10.00)
Total	**300**	**33 (11.00)**	**18 (6.00)**	**15 (5.00)**	**46 (15.33)**	**25 (8.33)**	**21 (7.00)**
	$\chi 2$	5.553	6.469	1.830	5.674	4.721	1.983
	Df	5	5	5	5	5	5
	P-value	0.352	0.263	0.872	0.339	0.451	0.852

Key: TNHV = Total Number of Hepatitis Viruses TNPHV? HBV = Hepatitis B Virus using, HCV = Hepatitis C Virus using, df = Degree of freedom and $\chi 2$ = Chisquared

3.The Prevalence of HBV and HCV based on occupation of pregnant women attending selected hospitals in Lere LGA

Occupation of the women was evaluated as factor of distribution of HBV and HCV viruses in pregnant women (Table 3) with housewives having higher prevalence of the infection when tested with test strip 21 (18.26%) and ELISA kit 25 (21.74%). House wife had 11 (9.57%) each of HBV and HCV as revealed by test strip, while confirmation test using ELISA indicated 13 (11.30%) and 12 (10.44%) respectively for HBV and HCV.

Table 3: The Prevalence of HBV and HCV based on the occupation of pregnant women

		Positive with test strip			Positive with ELISA kit		
Occupation	**No. examined**	**TNHV**	**HBV (%)**	**HCV (%)**	**TNHV**	**HBV (%)**	**HCV (%)**
C/Servant	30	2 (6.67)	2 (6.67)	0 (0.00)	4 (13.33)	2 (6.67)	2 (6.67)
S/Emp.	46	1 (2.17)	1 (2.17)	0 (0.00)	5 (8.70)	3 (6.52)	2 (4.35)
Farmer	93	7 (7.53)	4 (4.30)	3 (3.23)	11 (10.75)	6 (6.45)	5 (5.37)
H/Wife	115	22 (18.26)	11 (9.57)	11 (9.57)	25 (21.74)	13 (11.30)	12 (10.44)
Student	4	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Others	12	1 (8.33)	0 (0.00)	1 (8.33)	1 (8.33)	0 (0.00)	1 (8.33)

Total	**300**	**33 (11.00)**	**18 (6.00)**	**15 (5.00)**	**46 (15.33)**	**25 (8.33)**	**21 (7.00)**
	$\chi 2$	12.454	5.307	10.153	5.196	2.857	2.375
	Df	5	5	5	5	5	5
	P-value	0.029	0.380	0.071	0.392	0.722	0.795

Key: TNHV = Total Number of Hepatitis Viruses TNPHV? HBV = Hepatitis B Virus using, HCV = Hepatitis C Virus using, df = Degree of freedom and $\chi 2$ = Chi-squared

4: The Prevalence of HBV and HCV viruses in relation to level of education of pregnant women attending antenatal clinic in selected hospitals in Lere LGA

Educational status was not significantly associated ($p>0.05$) with HBV and HCV in pregnant women in the selected hospitals. Those with tertiary level of education had 3 (25.00%) and 4 (33.33%) infection when tested using test strip and ELISA kit respectively (Table 4). However, those that are illiterate had corresponding 6 (6.12%) and 8 (6.16%) prevalence tested using test strip and ELISA kit for HCV.

Table 4: Prevalence of HBV and HCV viruses in relation to educational status of pregnant women.

		Positive with test strip			**Positive with ELISA kit**		
Educ. Status	**No. examined**	**TNHV (%)**	**HBV (%)**	**HCV (%)**	**TNHV (%)**	**HBV (%)**	**HCV (%)**
Illiterate	98	9 (9.18)	3 (3.06)	6 (6.12)	13 (13.27)	5 (5.10)	8 (8.16)
Primary	129	14 (10.85)	9 (6.98)	5 (3.88)	18 (13.95)	11 (8.53)	7 (5.43)
Secondary	61	7 (11.48)	4 (6.56)	3 (4.92)	11 (18.03)	6 (9.84)	5 (8.20)
Tertiary	12	3 (25.00)	2 (16.67)	1 (8.33)	4 (33.33)	3 (25.00)	1 (8.33)
Total	**300**	**33 (11.00)**	**18 (6.00)**	**15 (5.00)**	**46 (15.33)**	**25 (8.33)**	**21 (7.00)**
	$\chi 2$	2.750	4.173	0.885	3.849	5.890	0.861
	Df	3	3	3	3	3	3
	P-value	0.432	0.243	0.829	0.278	0.117	0.835

Key: TNHV = Total Number of Hepatitis Viruses TNPHV? HBV = Hepatitis B Virus using, HCV = Hepatitis C Virus using, df = Degree of freedom and $\chi 2$ = Chi-squared

5: The prevalence of hepatitis B and C viruses using ELISA test according to their trimesters in some selected hospitals in Gure, Lere and Saminaka

The hepatitis infections with regards to the stages of pregnancy were examined in this study as shown in Table 5. Women in their third level of trimester had highest prevalence of 13 (28.89%), followed by second trimester 26 (13.40%), while first trimester 7 (11.48%) had the least. Third trimester was significantly associated ($\chi 2 = 6.315$, $p = 0.012$; odds ratio = 2.733, confidence interval = 1.303-5.735) with HBV and HCV infections in this study.

Table 5: Prevalence of hepatitis B and C viruses using ELISA test according to their Trimesters

Trimester	**No. examined**	**No. posit. (%)**	χ^2	**P-value**	**Odds ratio**	**Class interval**
First	61	7 (11.48)	0.544	0.461	0.665	0.282-1.569
Second	194	26 (13.40)	1.185	0.277	0.666	0.352-1.260

Third	45	13 (28.89)	6.315	0.012	2.733	1.303-5.735
Total	**300**	**46 (15.33)**				

Key: Trim. = Trimester, No. =Number, Posit. = Positive, $\chi 2$ = Chisquared

6: The Risk factors associated with HBV and HCV in pregnant women attending selected hospitals in Lere LGA (which test did you use (ELISA or test strips)?

Some risk factors responsible for the transmission of hepatitis in pregnant women in selected hospitals in Lere LGA were also assessed and presented in Table 6. Types of marriage was a factor of hepatitis infections but not significantly associated (OR = 1.110, CI = 0.588-2.092) with polygamy 20 (16.13%). Those that married once 34 (16.11%) had higher insignificant exposure (OR = 1.233, CI = 0.606-2.508) than those who married twice 12 (13.95%) or more. History of hepatitis was not significantly associated (OR = 2.593, CI = 0.764-8.803) with those who had history 4 (30.77%) than those without history of hepatitis 42 (15.50%). History of jaundice was a factor but not significantly associated (OR = 1.112, CI = 0.309-4.003) with the infections of hepatitis in pregnant women in this study. Pregnant women that had blood transfusion once 10 (37.04%) in their lives were significantly exposed (OR = 3.873, CI = 1.645-9.117) to hepatitis than those who had never 36 (13.19%) had blood transfusion. Sharing of objects was not an insignificant (OR = 1.246, CI = 0.617-2.519) factor of exposure to hepatitis infections in pregnant women in Lere LGA hospitals.

Table 6: Risk factors associated with HBV and HCV in pregnant women using ELISA test kit

Risk factors	No. examined	Positive (%)	Chi-square	P-value	Odds Ratio	Class Interval
Types of marriage						
Monogamy	176	26 (14.77)	0.025	0.874	0.901	0.478-1.700
Polygamy	124	20 (16.13)		0.874	1.110	0.588-2.092
Single	0	0 (0.00)				
Subtotal	**300**	**46 (15.33)**				
No. of marriages.						
Once	211	34 (16.11)	0.162	0.688	1.233	0.606-2.508
Twice	86	12 (13.95)			0.811	0.399-1.651
More	3	0 (0.00)				
Subtotal	**300**	**46 (15.33)**				
Knowledge of hepatitis						
Yes	49	8 (16.33)	0.045	0.833	1.094	0.476-2.515
No	251	38 (15.14)			0.914	0.398-2.102
Subtotal	**300**	**46 (15.33)**				
History of jaundice						
Yes	18	3 (16.67)	0.026	0.871	1.112	0.309-4.003
No	282	43 (15.25)			0.900	0.250-3.240
Subtotal	**300**	**46 (15.33)**				
Blood transfusion						
Never	273	36 (13.19)	9.007	0.003	0.258	0.110-0.608
Once	27	10 (37.04)			3.873	1.645-9.117
Subtotal	**300**	**46 (15.33)**				
Sharing of sharp objects						
Yes	74	13 (17.57)	0.184	0.668	1.246	0.617-2.519
No	226	33 (14.60)			0.620	0.319-1.206

Subtotal	**300**	**46 (15.33)**				

Discussion

Hepatitis B and Hepatitis C virus infections (HBV, HCV) are serious health issues worldwide. Hepatic impairment during pregnancy is most frequently caused by viral hepatitis worldwide. Using ELISA kits for HBV and HCV, respectively, the frequency of Hepatitis B and C infections among prenatal patients visiting the Gure, Lere, and Saminaka was verified in this study. According to Godwin et al. (2017), HBsAg and HCsAg levels greater than 7.00% in an adult population are considered high endemicity for HBV and HCV infection. The population of the research area is endemic to hepatitis B and C infections, as evidenced by the overall HBsAg and HCsAg seropositivity of 11.00% and 15.33% among pregnant women utilising test strip and ELISA.

In contrast to this study, reports of prevalence among pregnant women in Zaria and Kano, Nigeria, were 18.2% and 17.6%, respectively, according to Mohammed et al. (2015) and Cookey et al. (2022). The fact that some of the studies did not come from the same risk category may be related to these discrepancies. This outcome is consistent with previous research by Park et al. (2025) and Bittaye et al. (2019), which found that the HBV and HCV carrier rates in sub-Saharan Africa ranged from 9.00% to 12.00%.

With an infection incidence of 19.44%, the younger age group (15–19) had a higher prevalence of HBV and HCV. This could be the result of quick changes in lifestyle brought on by watching television, using smart cell phones to watch movies, and using the internet extensively as a form of entertainment for young people, all of which could cause them to contract the disease if they attempt to apply what they see. The study's findings are consistent with those of Ugochukwu et al. (2014), who found that among the 100 respondents, the age range of 15 to 20 years had the highest prevalence of HBsAg, with an infection rate of 20.01%.They blamed the high infection rate on a number of variables, including educational attainment and ignorance of the infectiousness of HBV and HCV. In the same development, those between the ages of 15 and 19 had the highest rate of HBV infection (25.00%), while those over 40 had the highest rate of HCV infection (10.00%). The higher incidence of HCV in elderly adults is most likely caused by a decline in immunity, which may have increased the viral load.

This study supports the findings of Belete et al. (2024), who found that the prevalence of the hepatitis C virus was 1.2% and that it gradually rose after the age of thirty.

There was a substantial ($p<0.05$) correlation between the pregnant women's occupation and HBV and HCV infection. While pregnant students did not have any HBV or HCV infections, housewives had the highest rate of infection (18.26%).

Due to sociocultural behaviours that promote sharing household items that could spread hepatitis viruses among family members, housewives may have greater infection rates. However, Odenwald & Paul (2022) state that exposure to contaminated blood products, sexual activity, or perinatal transmission can all result in the acquisition of hepatitis B and C. The pregnant students in this study may not have been infected since they were aware of how contagious the hepatitis virus is, which may have kept them from getting sick.

This group of expectant mothers who did not report this infection may be related to their line of employment, which may reduce their risk of contracting the illness. In comparison to the infection rate found in this study, Roiji et al. (2024) reported a 12.00% in South-Western Nigeria and a 2.50% in Maiduguri by Anka et al. (2024).

In this study, there was no significant ($p>0.05$) correlation between the participant's educational level and HBV and HCV infection.

The highest infection rate (25.00%) was found in women who pursued higher education. Pregnant women who attended tertiary levels had the greatest rates of HBV and HCV, even when taken separately. Since the study was conducted in rural areas, it is possible that the low level of education in the three study locations contributed to the low number of tertiary-stage pregnant women who visited the three hospitals, increasing the likelihood of a high prevalence. This study contrasts with (Olokoba et al., 2022) research where the largest incidence of 119 (51.50%) pregnant women evaluated had a tertiary educational level. They explained the high frequency by pointing to the research area's hospital-based metropolitan setting.

Hepatitis B and C are more common in this kind of marriage, which may be due to an infection from one partner that is easily transferred to the other partners through sexual activity. According to Shahriar et al. (2022), the hepatitis C virus is transmitted by direct contact with infected blood, whereas the hepatitis B virus is transmitted by contact with an infected person's blood or other bodily fluids. Rarely, it can also spread through other bodily fluids.

Compared to those who married twice or more,

those who married once had a higher infection rate of 11.85%. This could be explained by contracting the infection from an infected spouse. According to the responses of pregnant women surveyed for this study, hepatitis B and C virus infection was significantly ($p<0.05$) linked to those who were unaware of the infection. Since most persons who are unaware of the infection are at risk of contracting it, the higher prevalence of the infection in this group may be related to the virus's infectious nature.

With a prevalence incidence of 23.08%, pregnant women with a history of hepatitis infection were more likely to be infected than the general population. This might be the outcome of contracting an illness from a parent if pregnancy, childbirth, and sharing household items are poorly managed, which can accelerate the disease's transmission. This result is consistent with the study by Oluremi et al. (2021), which found that the prevalence in Ibadan was 21.3%. According to Busayo & Phiri (2022), the hepatitis virus spreads from person to person and is present in bodily fluids like blood.

The infection rate was higher among respondents who had a hepatitis test than among those who did not. Among the studied pregnant women respondents, those with a history of jaundice (11.11%) were substantially ($p<0.05$) linked to hepatitis infection. The increased prevalence of 25.93% in women who received blood once may have been caused by the fact that blood transfusions are known to spread hepatitis of any kind, as this study showed. Similarly, the increased prevalence of 12.16% among respondents may have been partially caused by sharing sharp items like razor blades and needle cutters, among others. Hepatitis B and C infections were shown to be more common during the third trimester of pregnancy. Pregnancy-related viral hepatitis is linked to an increased risk of maternal problems. However, there is a high rate of vertical transmission that results in foetal and neonatal hepatitis, which can have detrimental effects that could impair mental and physical health later in life. According to Gyimah et al. (2021), it is also the most common cause of jaundice during pregnancy (Al Beloushi et al., 2024).

Conclusion

It was determined that the overall frequency of combined HBV and HCV infection was 15.335. HBV had an individual prevalence of 8.33%, whereas HCV had a prevalence of 7.00%. It is advised that all infected individuals have a database, free screening, and public education.

Since the majority of women who had previously received blood transfusions were discovered to be infected, it is necessary to properly screen blood before transfusion. Additionally, since many participants were unaware of the disease's potential to spread and cause life-threatening infections, it is necessary to properly raise awareness of the disease.

Author statement

All authors made substantial contributions to the conception and design of the study, data acquisition, analysis, and interpretation. Each author was involved in drafting the manuscript and critically revising it for important intellectual content. All authors have read and approved the final version of the manuscript and accept responsibility for the integrity and accuracy of the work.

Declarations

Ethics approval and consent to participate

This research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki for research involving human participants.

Ethical approval for the study was obtained from the Health Research Ethics Committee of the participating institution(s) in Kaduna State, Nigeria. Permission to conduct the study was also obtained from the management of the healthcare facilities where participant recruitment and sample collection were carried out.

All eligible participants were adequately informed about the objectives, procedures, potential risks, and benefits of the study in a language they clearly understood. Participation was entirely voluntary, and written informed consent was obtained from each participant prior to enrolment. Participants were assured of the confidentiality and anonymity of their personal and clinical information, and data were coded to prevent identification of individual participants.

Participants were informed of their right to decline participation or withdraw from the study at any stage without any consequences to their medical care. Biological samples collected were used strictly for the purpose of this study, and no additional analyses were conducted without prior consent.

Consent for Publication

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in the main article .

Competing Interests

The authors declare that they have no competing interests.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions: Sarah Kase: Writing – original draft. Jonah Danladi: Methodology. Christy Chinyere Fredrick: Supervision. Amaechi Dennis: Writing – review & editing. Esther Luka Abdulkarim: Conceptualization. Garba Ninani: Data curation. Jonah Danladi: Data curation. Magdaline Joseph Kwaji and Haruna Danlami Sambo : Formal analysis. Jamilah Ibrahim Suleiman: Project administration. Theophilus I. Ojemudia: Methodology. Mercy Kure : Project administration. All authors have read and agreed to the published version of the manuscript

Acknowledgements

The authors acknowledge the contributions of researchers whose work formed the basis of this research.

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