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Low Seroprevalence of Hepatitis E Virus (HEV) antibodies among pregnant women in Ogbomoso Nigeria

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Abstract

Background: Hepatitis E virus (HEV)is referred to as an emerging infectious agent, it is well-established as a major cause of acute viral hepatitis (AVH) worldwide. The mortality rate is significantly higher for pregnant women, particularly in cases where the infection progresses to fulminant hepatitis, especially in the second and third trimesters, putting pregnant women at increased risk of acute liver failure, fetal loss, and most times death This study focused on the prevalence of Hepatitis E Virus among pregnant women in Ogbomoso.

Methods: A cross-sectional study was conducted in two Primary Health Centers in Ogbomoso, Ogbomoso North Local Government and Ogbomoso South Local Government between January 2024 to July 2024. A total of 208 consenting pregnant women were enrolled in the study. HEV IgG and IgM antibodies were detected using ELISA, inferential statistics, such as chi-square were used. Risk factors and the prevalence of HEV were analysed using SPSS version 25.

Results: The HEV IgG antibodies positivity rate was 3.8% (8/208) 96.2% tested negative, all 208 participants tested negative for HEV IgM antibodies. The distribution across gestational periods shows that 35.1% are in the first trimester, 44.7% in the second trimester, and 20.2% in the third trimester.

Conclusion: The study reveals a low seroprevalence of HEV among the pregnant women is the study area. However, few of the women had evidence of past exposure to HEV indicating the need for continuous surveillance and more efficacy on personal hygiene among this cohort. There is therefore the need for awareness campaign on the prevention and control of HEV among pregnant women in Ogbomoso.

Keywords: Hepatitis E virus (HEV); Pregnancy; Prevalence; Antibodies; Ogbomoso

1. Introduction

Hepatitis E virus (HEV) is a small non-enveloped, positive-sense single-stranded RNA virus (1). Although hepatitis E virus (HEV) is sometimes referred to as an emerging infectious agent, it is well-established as a major cause of acute viral hepatitis (AVH) worldwide. An estimated one-third of the world's population has been infected with HEV. Of the more than 20 million infections estimated to occur globally each year, ~70,000 infections result in death. The vast majority of these deaths occur in resource-poor countries in Asia, Africa, and Latin America (2). HEV primarily spreads

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through the faecal-oral route, often via contaminated water sources. While the infection typically resolves within 2–6 weeks and is self-limiting, it can lead to severe hepatic manifestations and, in some cases, extrahepatic complications such as pancreatitis, neurological symptoms, hematological disorders, glomerulonephritis, and mixed cryoglobulinemia (3). Pregnancy appears to be a potential risk factor for viral replication and leads to extremely low immune status among African, Indian, and Asian pregnant women (4). This study aims to determine the prevalence of HEV among pregnant women attending antenatal in selected healthcare centers in Ogbomoso, Oyo State, Nigeria. To determine the prevalence of HEV seroprevalence (IgM and IgG) among pregnant women attending antenatal in selected healthcare centers in Ogbomoso, Oyo State. To identify risk factors associated with HEV infection among pregnant women in the study population in Ogbomoso, Oyo State. To evaluate the knowledge and awareness of HEV among pregnant women in Ogbomoso, including knowledge of transmission routes, symptoms, and preventive measures.

2. Material and methods

2.1. Study Design

This descriptive cross-sectional study, was carried out in two Primary Health Centers in Ogbomoso, Ogbomoso North Local Government and Ogbomoso South Local Government. Ethical approval was obtained from the ethical committee of Oyo State Ministry of Health, the ethical approval was issued with NREC ASSIGNED NUMBER: NHREC/OYOSHRIEC/10/11/22. To ensure that the research adheres to established ethical guidelines and safeguards the rights, confidentiality and well-being of participants in compliance with the Helsinki ethical principles and declarations concerning research that involve human participations. Informed consent was also obtained from each of the subjects after carefully explaining the concept of the study to them and questionnaires were self-administered.

2.2. Participant Inclusion criteria and Exclusion criteria

All consenting pregnant women between 10 to 36 weeks of gestation who was attending the antenatal clinic at the selected health centers during the study and excluded all non- consenting pregnant women.

2.3. Sample collection and HEV antibody testing

Blood samples were collected from 208 consenting pregnant women using syringe and needle into plain sterile bottles. Serum samples were separated and stored at -80C until used for analysis. Serological testing for HEV IgG and IgM was performed using commercial ELISA kits manufactured by Diagnostics Automation/Cortez (Diagnostics, Inc.23961 Craftsman Road, Suite E/F, Calabasas, California 91302 USA). All laboratory analysis was carried out at Center for Emerging and Reemerging Infectious Diseases(CERID) Laboratory, Ladoke Akintola University Ogbomoso.

2.4. Data analysis

Statistical analysis: All the data were analysed using the Statistical Test Package for Social Sciences (SPSS) version 25. The seroprevalence for HEV was expressed as a percentage for the entire study group, with the P-value set at ($P<0.05$) for significance at the 95% confidence interval

3. Results

3.1. Socio demographic of the Pregnant women

Table 1 presents the socio-demographic profile of the participants in the study, the majority of the participants, 63.9%, are aged between 21 and 30 years, while 26.4% are aged 31 years and above, and 9.6% are 20 years or younger. All participants are female. Regarding educational qualifications, most participants hold a School Certificate (63.5%), followed by 21.2% with an NCE, 9.1% with a B.Sc., 4.3% with an OND, and 1.9% with an HND. In terms of occupation, 47.6% are traders, 40.4% are artisans, 8.2% are skilled workers, 3.4% are unemployed, and 0.5% are students. All participants are married. Ethnically, the majority are Yoruba (95.7%), with smaller representations from the Fulani (0.5%), Hausa (1.4%), Igbo (1.4%), and Tapa (1.0%) ethnic groups. Religiously, 78.4% of the participants identify as Christian, 21.2% as Muslim, and 0.5% adhere to traditional beliefs.

Table 1 Socio demographic of the pregnant women

Variable	Categories	Frequency	Percent
Age	≤ 20 years	20	9.6
	21-30 years	133	63.9
	31 years and above	55	26.4
Education qualification	B.Sc.	19	9.1
	HND	4	1.9
	NCE	44	21.2
	OND	9	4.3
	School certificate	132	63.5
Occupation	Artisan	84	40.4
	Skilled workers	17	8.2
	Student	1	0.5
	Trader	99	47.6
	Unemployed	7	3.4
Marital status	Married	208	100.0
Ethnicity	Fulani	1	0.5
	Hausa	3	1.4
	Igbo	3	1.4
	Tapa	2	1.0
	Yoruba	199	95.7
Religion	Christian	163	78.4
	Islam	44	21.2
	Traditional	1	0.5

Table 3.2. Risk factors associated with occurrence of hepatitis E virus among pregnant women

Table 2 outlines the risk factors associated with the occurrence of Hepatitis E Virus (HEV) among pregnant women. Among the respondents, 36.5% rear animals, while 67.3% do not wash their hands after handling animals. Regarding dietary habits, 27.4% eat pork, and none report experiencing symptoms or jaundice. The distribution across gestational periods shows that 35.1% are in the first trimester, 44.7% in the second trimester, and 20.2% in the third trimester. In terms of pregnancy number, 36.5% are pregnant for the first time, 35.6% for the second time, and smaller percentages for subsequent pregnancies, with 10.6% of respondents having an unspecified number of pregnancies. All respondents have given consent.

Table 2 Risk factors associated with occurrence of hepatitis E virus among pregnant women

Variable	Categories	Frequency	Percent
Rear animal	No	132	63.5
	Yes	76	36.5
Wash hand after feeding animal	No	140	67.3
	Yes	68	32.7
Eating pork	No	151	72.6
	Yes	57	27.4
Having any HEV symptom	No	208	100.0
Jaundice	No	208	100.0
Gestational period	First trimester	73	35.1
	Second trimester	93	44.7
	Third trimester	42	20.2
	Total	208	100.0
Number of pregnancy	1	76	36.5
	2	74	35.6
	3	25	12.0
	4	7	3.4
	5	4	1.9
	1st	22	10.6

3.2. Prevalence of HEV IgM and IgG among Pregnant women

Table 3 shows the prevalence of IgM and IgG antibodies among the study participants. All 208 participants tested negative for IgM antibodies. For IgG antibodies, 96.2% tested negative, while 3.8% tested positive.

Table 3 Prevalence of HEV IgM and IgG among Pregnant women

Variable	Categories	Frequency	Percent
IgM	Negative	208	100.0
IgG	Negative	200	96.2
	Positive	8	3.8

3.3. Association between socio demographic and Awareness of HEV

Table 4 analyzes the relationship between socio-demographic factors and awareness of Hepatitis E Virus (HEV) among respondents. The age group 21-30 years constitutes the majority (63.9%), with only 0.5% aware of HEV, while those aged ≤20 years (9.6%) and 31 years and above (26.4%) also show low awareness (0% and 1% respectively), with age not significantly associated with HEV awareness (χ^2=2.601, p=0.272). In terms of educational qualification, respondents with a school certificate make up 63.5% and show no awareness of HEV, whereas those with B.Sc education exhibited slightly higher awareness (10.5%). This indicates a statistically significant association between education level and HEV awareness (χ^2=13.365, p=0.010). Among occupations, artisans (40.4%) and traders (47.6%) were predominant but display low awareness (0% and 1% respectively), with no significant link between occupation and HEV awareness (χ^2=3.937, p=0.415). Ethnicity reveals a highly significant association, with Yoruba making up 95.7% of respondents and only 1% aware of HEV, while other ethnic groups (Fulani, Hausa, Igbo, Tapa) show very low awareness (χ^2=21.819, p=0.000). Finally, in terms of religion, the majority are Christians (78.4%) with 1.4% awareness, while Muslims (21.2%)

and traditional worshippers (0.5%) show no significant awareness, and the association between religion and HEV awareness is not statistically significant (χ^2=0.840, p=0.657).

Table 4 Association between socio demographic and Awareness of HEV

Variable	**Categories**	**No**	**Yes**	**Total**	**Pearson Chi-Square (χ^2)**	**Df**	**P-value**
Age	≤ 20 years	20(9.6%)	0(0.0%)	20(9.6%)	2.601	2	0.272
	21-30 years	132(63.5%)	1(0.5%)	133(63.9%)			
	31 years and above	53(25.5%)	2(1.0%)	55(26.4%)			
Education qualification	B.Sc.	17(8.2%)	2(1.0%)	19(9.1%)	13.365	4	0.010
	HND	4(1.9%)	0(0.0%)	4(1.9%)			
	NCE	43(20.7%)	1(0.5%)	44(21.2%)			
	OND	9(4.3%)	0(0.0%)	9(4.3%)			
	School certificate	132(63.5%)	0(0.0%)	132(63.5%)			
Occupation	Artisan	84(40.4%)	0(0.0%)	84(40.4%)	3.937	4	0.415
	Skilled workers	16(7.7%)	1(0.5%)	17(8.2%)			
	Student	1(0.5%)	0(0.0%)	1(0.5%)			
	Trader	97(46.6%)	2(1.0%)	99(47.6%)			
	Unemployed	7(3.4%)	0(0.0%)	7(3.4%)			
Ethnicity	Fulani	1(0.5%)	0(0.0%)	1(0.5%)	21.819	4	0.000
	Hausa	2(1.0%)	1(0.5%)	3(1.4%)			
	Igbo	3(1.4%)	0(0.0%)	3(1.4%)			
	Tapa	2(1.0%)	0(0.0%)	2(1.0%)			
	Yoruba	197(94.7%)	2(1.0%)	199(95.7%)			
Religion	Christian	160(76.9%)	3(1.4%)	163(78.4%)	.840[a]	2	0.657
	Islam	44(21.2%)	0(0.0%)	44(21.2%)			
	Traditional	1(0.5%)	0(0.0%)	1(0.5%)			

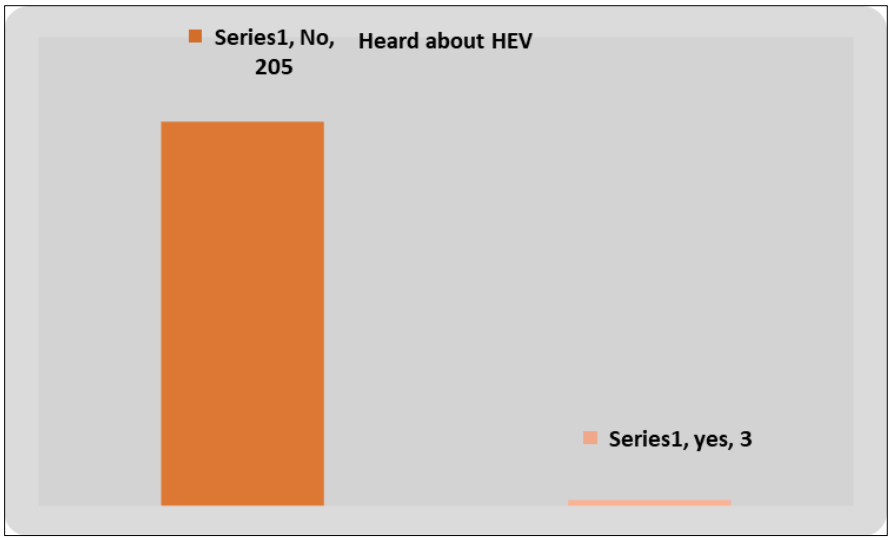

Figure 1 Awareness of HEV

4. Discussion

Hepatitis E Virus (HEV) is a significant public health concern, especially among pregnant women in Nigeria. The prevalence of HEV among pregnant women can vary based on several factors, including geographical location, access to clean water, and overall healthcare infrastructure. Studies have shown that HEV infection can lead to severe complications in pregnant women, including fulminant hepatitis, which can be fatal.

A total of 208 serum samples from pregnant women attending ANC at The Ibraheem Taiwo Primary Health Care in Oja Igbo, representing Ogbomoso North LGA and Adebayo Alata PHC, Ibapon Ward, representing Ogbomoso South LGA, prevalence of IgM and IgG antibodies among the study participants all 208 participants tested negative for IgM antibodies. Majority of the participants, 63.9%, are aged between 21 and 30 years, while 26.4% are aged 31 years and above, and 9.6% are 20 years or younger. Regarding educational qualifications, most participants hold a School Certificate (63.5%), followed by 21.2% with an NCE, 9.1% with a B.Sc., 4.3% with an OND, and 1.9% with an HND, there were none without school certificate. In terms of occupation, 47.6% are traders, 40.4% are artisans, 8.2% are skilled workers, 3.4% are unemployed, and 0.5% are students. All participants are married. Ethnically, the majority are Yoruba (95.7%), with smaller representations from the Fulani (0.5%), Hausa (1.4%), Igbo (1.4%), and Tapa (1.0%) ethnic groups. Religiously, 78.4% of the participants identify as Christian, 21.2% as Muslim, and 0.5% adhere to traditional for IgG antibodies, 96.2% tested negative, while 3.8% tested positive.

This study found no prevalence of anti-HEV IgM seropositivity among pregnant women in the study group, which is indicative of emerging and non-active HEV infection. The overall prevalence of hepatitis infections among pregnant women attending antenatal clinic in selected primary health care in Ogbomoso is below WHO cut of level of endemicity of 8%, and low when compared with 11.6% reported in Nigeria, 7.7% in Cameroon among antenatal clinic attenders. High prevalence between 8 and 20% have been reported in many parts of Africa (5)however the prevalence in this study are consistent when compared the investigation done on pregnant women in Lebanon, Turkey, and India which had prevalence of 2.9%, 4.3%, and 4.6%, respectively (5)

Low Seroprevalence of Hepatitis E virus in Pregnant Women in an Urban Area near Pretoria, South Africa which reported 3.13%(6)HEV IgM/IgG seroprevalence of (1.9%/2.9%) which were recorded respectively in Seroprevalence and related risk factors of Hepatitis E virus infection among pregnant women attendees at Adeoyo Hospital, Ibadan, Nigeria (7) .It was reported in Seroprevalence of hepatitis E virus infection in pregnant women: a systematic review and meta-analysis (8)that HEV IgG antibody seroprevalence ranged from 3.41% to 61.29% depending on geographical location and study population.

In this study, 3.8% of those who had not heard about HEV tested positive for IgG, while none of those who were aware of HEV did. This association is not statistically significant (χ^2=0.122, p=0.727). Regarding animal rearing such as goat, chicken dog and cat 2.9% of those who do not rear animals tested positive for IgG, compared to 1.0% of those who do. This association is also not statistically significant (χ^2=0.478, p=0.489). When considering handwashing after feeding

animals, 2.9% of those who do not wash their hands tested positive for IgG, compared to 1.0% of those who do wash their hands. This association is not significant (χ^2=0.224, p=0.636). For dietary habits, 2.9% of those who do not eat pork tested positive for IgG, while 1.0% of those who do eat pork tested positive, but this difference is not statistically significant (χ^2=0.024, p=0.876). The gestational period does not show a significant association with IgG positivity: 1.4% in the first trimester, 1.9% in the second trimester, and 0.5% in the third trimester, with no statistically significant differences (χ^2=0.310, p=0.857). The number of pregnancies also does not significantly influence IgG occurrence, with positivity ranging from 0% to 1.4% across different pregnancy numbers and no significant association found (χ^2=2.517, p=0.774). Overall, none of the risk factors significantly affect the occurrence of IgG antibodies. An overwhelming 98.6% (205 out of 208) of the respondents have never heard about HEV, indicating a near-total absence of knowledge about HEV virus. Only a small fraction, 1.4% (3 out of 208), reported being aware of HEV.

However, the prevalence in this study is lower than that in some primary studies conducted in different countries among pregnant women, such as in Tunisia of 5.1%, Mexico of 5.7%, France of 7.7%, Pakistan of 8.86%, Sudan of 10.3%, and in Serbian blood donors of 15.0%. On the other hand, a higher prevalence of HEV was reported among pregnant women in Egypt of 83.4%,68 and India of 60.0%. In addition, some other studies reported a high prevalence of HEV IgG antibody in Iran, with 46.1% in the adult population.(8)

5. Conclusion

In this study Seroprevalence was only discovered for the anti-HEV IgG antibody, which mostly indicates past infection and there is significantly low prevalence of anti-HEV IgG antibody among pregnant women in Ogbomoso in which none of the risk factors significantly affect the occurrence of IgG antibodies in this study.

The data indicate the need for prevention and control of HEV among pregnant women in Ogbomoso. A careful and continue research that provide epidemiological and molecular information is important to limit the risk of infection and spread of HEV. The result of this study shows the need for further studies with larger samples that are needed to detect the circulating genotypes of HEV among pregnant women in Ogbomoso.

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Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Ethical approval was obtained from the ethical committee of Oyo State Ministry of Health, the ethical approval was issued with NREC ASSIGNED NUMBER: NHREC/OYOSHRIEC/10/11/22. To ensure that the research adheres to established ethical guidelines and safeguards the rights, confidentiality and well-being of participants in compliance with the Helsinki ethical principles and declarations concerning research that involve human participations.

Statement of informed consent

Informed consent was also obtained from each of the subjects after carefully explaining the concept of the study to them and questionnaires were self-administered.

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