Research Article
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Epidemiological dynamics of syphilis, Hepatitis B, and C co-infection among pregnant women in some communities in Okarika LGA of Rivers State, Niger Delta

Abstract

The increase in the spread of sexually transmitted infections among pregnant women is a public health concern, even as it puts the mother and foetus at high risk. The study aimed to determine the sero-prevalence of syphilis, hepatitis B, and C among pregnant women visiting antenatal clinics and the Okrika General Hospital facility. A cross-sectional and convenience sample research design was explored to recruit a total of 119 subjects. Their blood samples were aseptically obtained with a 5 ml sterile needle and syringe after oral and written consent was obtained from the subjects, even as their demographic data were obtained using structured questionnaire. Using rapid test kits, the collected blood samples were tested in accordance with the manufacturer's instructions and the results were analysed statistically using SPSS, version 23. The study recorded no co-infection, but a prevalence of 9.2% and 8.4% were observed for hepatitis B and hepatitis C. Based on maternal age, it was recorded that the age bracket with the highest HBsAg prevalence was between 15 and 25 years, with a 5.0% prevalence rate. It was followed by the age bracket 26-35 years with a prevalence rate of 2.5%. The gestational age with the highest prevalence rate was second trimester with 6 (5.0%). In terms of parity, the highest prevalence was found among women who had two children with a percentage of 4.2%, followed by women with three children (3.4%) There is need for public awareness and continuous monitoring should be underpinned in our communities to reduce the trend.

Keywords: pregnancy, HIV, syphilis, hepatitis, risk factor, sero-prevalence - dynamics

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Introduction

In most developing countries such as Nigeria, and the world at large, sexually transmitted infections (STIs) such as Hepatitis B virus, Human Immunodeficiency virus, *Trichomonas vaginalis, Neisseria Gonorrhoeae,* Syphilis and Genital herpes remain an issue of public health concern.[1–3] An estimated 1.3 billion persons are said to have contracted STI worldwide.[4] According to the World Health Organization (WHO), about 18 million women are infected with syphilis worldwide, out of which 305,000 pregnant women account for neonatal and foetal deaths yearly, which leaves approximately 215,000 children at risk of death resulting from congenital diseases, prematurity, and low birth weight.[4,5] Syphilis is an STI caused by *Treponema pallidum,* a mobile, gram-negative bacterium.[6] Hepatitis B infection is caused by the Hepatitis B virus (HBV) and this could lead to death as a result of cirrhosis, non-liver and liver cancers.[7,8] The risks of infection also include tattooing, dental and surgical procedures, having sexual intercourse with multiple and unvaccinated sex partners, and exposure to infected body fluids such as seminal fluid, saliva and blood.[9–11] Mother-to-child transmission of this virus occurs either during delivery (perinatally) or through exposure to infected blood (horizontally). The World Health Organization (WHO) and the Federal Ministry of Health reported a prevalence of 11.2% in Nigeria. According to the WHO, there is a higher prevalence of HBV in Africa and the Western Pacific Regions with 6.1% and 6.2% infected among the adult population, respectively.[9]

Hepatitis C virus (HCV) is less common in comparison with other STIs.[12] Its transmission is often through transfusion of unscreened blood, sharp objects such as needles, sexual practices resulting in exposure to blood and mother-to-child transmission. Nevertheless, most persons infected with HCV are asymptomatic and often do not know they have been infected.[12,13] Worldwide, the prevalence rate of HCV ranges from 0.5% to 1.0% in the areas with less infection and 1.5% to 2.3% in the areas most affected.[12] However, in Nigeria, the prevalence rate of this virus is 2.0%.[14]

Due to the similar modes of transmission of HBV, HCV, and syphilis, most individuals including pregnant women are exposed to them in different combination mix. Research on pregnant women showed a prevalence rate of 12.4%, 3.4%, 2.6%, and 0.08% for HIV, HBV, HCV, and syphilis, respectively. While there were co-infection cases for HIV-HBV and HIV-HCV, none was recorded for HBV-HCV.[15] Co-infections have been linked with drug resistance, sub-optimal response, cross-resistance, and hepatoxicity related to drugs.[16] Previous studies reported the presence of HBV and HCV among military personnel and residents of an Orashi community in the Niger Delta region of Nigeria.[17,18] These infections cause complications in pregnant women; as such, this study aims at reporting the sero-prevalence of hepatitis B, hepatitis C, and syphilis co-infection among pregnant women in Okirika Local Government Area, Rivers State, Nigeria, which has huge scarcity of reported and published literature. Nevertheless, given the paucity of research data on the above research focus, in the remote communities of the Niger Delta region, it is firmly expected that data generated would help to fast-track policy formulation and implementation of health policies by the relevant government health agencies, for the protection and management of these vulnerable groups among us in our communities.

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Materials and methods

Study area

The study is a cross-sectional research design carried out among pregnant women in Okrika, Rivers State. However, Okrika Local Government Area is an island located in Rivers State, Nigeria. It is in the southern part of Port Harcourt, the capital of Rivers State and also the headquarter of all Niger Delta oil producing states. It is also worthy of note, to mention very clearly that Okirika is an integral part of Niger Delta communities. The area has rich natural gas and crude oil deposits. The major occupations of its occupants are fishing and petty trading; however, crop farming of oil palm, plantain, and cassava is also done in a small scale. Subjects for this study were drawn from different health facilities in the area of study figure 1.

Figure 1 Map of Rivers State Showing different Local Govt. Area that makes up the State and Okirika LGA (Study Location).

Study population

Subjects for this study were women who were ≥15 years attending the antenatal clinics of different health facilities in the study location. One hundred and nineteen (119) self-administered questionnaires were used to obtain subjects 'demographic data. The questionnaires were filled out by those who could read and write, while they were read out to those who could not, and their responses were documented accordingly with the help of a local language interpreter.

Sample collection and preparation

Whole venous blood (5 ml) from the antecubital vein collected from each subject was dispensed in plain serum bottles and left to clot. At 1500 rpm, the sample was spun for 5 minutes, after which the serum was recovered and tested for HBsAg, HCV and syphilis respectively.

Exclusion criteria: Women who were ≥15 years but did not give their consent were excluded from the study. Also, those who were visitors to the community or were presently being treated for hepatitis B or any other viral infection were excluded.

Inclusion criteria: Pregnant women who were ≥15 years, occupants of the community and accepted to be part of the study having understood the nature and purpose of the study were included in the study.

Ethical advocacy: Oral and written consent was obtained from the subjects before their blood samples were collected. This was actualized by explaining to the subjects what the study was all about, and the step-by-step systematic approach that would be involved in the project. Thus, after the much-needed explanation, the subjects who gave their consent were enrolled in the study and the subjects who said no were not included in the study.

Laboratory experimental

HBsAg, HCV and syphilis assay: They were carried out by using rapid test kits (SWE-care diagnostics) and this is based on the principle of sandwich immunoassay where the strip's membrane is coated with HBsAg antibodies. The strips were dipped into the serum for 8-10 sec and thereafter laid flat on a dry, clean non-absorbent surface. After 10 minutes, the result was read. A negative result is indicated by one colour band on the control region while a positive result is indicated by colour bands on the control and test region. A colour band on the test region only or no colour band at all is reported as invalid and should be repeated.

Administration of well-structured questionnaire: A well-structured questionnaire was used to collect some critical demographic characteristics and possible potential risk factors that could promote the trend of infection in our communities.

Statistical analysis: The data obtained were analysed using SPSS 23 and the results generated were presented in percentages, graphs and tables as seen in the results session of the article.

Results

This study involved the analysis of sero-prevalence and co-infection of Hepatitis B and C and Syphilis in pregnant women attending antenatal clinic in Okrika General Hospital, of whom 9.2% were sero-positive for HBsAg, 8.4% for Syphilis, and 0% for HCV; no co-infections were recorded. The result showed that HBsAg had the highest prevalence rate followed by syphilis (Table 1).

Table 1 General sero-prevalence of HBsAg, HCV and syphilis among the subjects

Variable	Number examined	Sero-positive	Sero-negative	Sero-prevalence (%)
HBsAg	119	11	108	9.20%
HCV	119	0	119	0%
VDRL	119	10	109	8.40%
Degree of sero-prevalence	**HBsAg > VDRL ≠ HCV**			

> Means Greater Than, ≠ means Not (Zero)

Based on maternal age, it was recorded that the age bracket with the highest HBsAg prevalence was between 15 and 25 years, having a 5.0% prevalence rate in the study population. This was followed by the age bracket of 26–35 years, with a prevalence rate of 2.5%. Based on Trimester, the gestational age with the highest prevalence rate was second trimester with 6 (5.0%), followed by first trimester with 1 (3.4%). The least prevalence was found in women already in their third trimester. In terms of occupation, entrepreneurs or self-employed women had the highest prevalence of 4.2%, followed by

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students (3.4%), with none found in housewives and unemployed women. Educationally, women who had only secondary education had the highest prevalence rate of 6.7%, which was followed by women who had only primary education with 2.5% and none for individuals who had OND and tertiary education. In terms of parity, the highest prevalence was found among women who had two children with a percentage of 4.2%, followed by women with three children (3.4%). No infection was found among women who had one child (Table 2).

Table 2 Specific prevalence of HBsAg according to socio-demographic data

Socio-demographics	Classification	Sero-negative	Sero-positive	Sero-prevalence (%)
Age group (Years)	15 – 25	45	6	5.00%
	26 – 35	42	3	2.50%
	36 – 45	19	2	1.70%
	≥46	2	0	0%
	Total			9.20%
Trimester	First Trimester	35	4	3.40%
(Gestational age)	Second Trimester	60	6	5.00%
	Third Trimester	13	1	0.80%
	Total		11	9.20%
	Entrepreneur/ Self Employed	18	5	4.20%
	Civil Servant	3	0	0%
Occupation	House Wife	4	0	0%
	Unemployed	11	0	0%
	Public Servant	16	2	1.70%
	Student	56	4	3.40%
	Total	108	11	9.20%
	Primary	32	3	2.50%
Educational level	Secondary	56	8	6.70%
	OND	18	0	0%’
	Tertiary	2	0	0%
	Total	108	11	9.20%
	One Child	1	0	0%
	Two Children	48	5	4.20%
Parity	Three Children	23	4	3.40%
	Four Children	8	1	0.80%
	Five Children	28	1	0.80%
	Total	108	11	9.20%

In terms of maternal age bracket, the age bracket that recorded the highest prevalence was between 15-25 years with 6.7%, followed by 26-35 years with 1.7%. No positive results were recorded for ≥46yrs. A high prevalence was recorded among women in their second trimester at 5.0% and closely followed by women in their third trimester at 3.4%. Based on occupation, self-employed or entrepreneurial women had the highest prevalence of 5.0%; none was found among housewives and unemployed women. Based on educational status, women who had only secondary education, had the highest prevalence rate with 7.6%. This is followed by women who had only primary education with 0.8%. None was found among women with tertiary education. A high prevalence was found among women who had two children with a prevalence of 4.2%, while those with three children recorded a prevalence of 2.5% (Table 3).

Table 3 Distribution of specific Sero-prevalence of VDRL according to socio-demographic data

Socio-demographics	Classification	Sero-negative	Sero-positive	Sero-prevalence (%)
	15 – 25	43	8	6.70%
	26 – 35	19	2	1.70%
Age Group (Years)	36 – 45	45	0	0%
	≥46	2	0	0%
	Total			8.40%
Trimester	First Trimester	35	4	3.40%
(Gestational age)	Second Trimester	60	6	5.00%
	Third Trimester	14	0	0%
	Total	108	10	8.40%
	Entrepreneur/ Self Employed	54	6	5.00%
	Civil Servant	2	1	0.80%
Occupation	House Wife	4	0	0%
	Unemployed	11	0	0%
	Public Servant	16	1	0.80%
	Student	22	2	1.70%
	Total	109	10	8.40%
	Primary	34	1	0.80%
Educational level	Secondary	55	9	7.60%
	OND	18	0	0%
	Tertiary	2	0	0%
		109	10	8.40%
	One Child	1	0	0%
	Two Children	48	5	4.20%
Parity	Three Children	26	3	2.50%
	Four Children	8	1	0.80%
	Five Children	26	1	0.80%
	Total	109	10	8.40%

Discussion

Okrika and its environ have experienced a high level of health promotion advocacy in recent years which has probably increased the knowledge of its indigenes, with regard to health issues of public health importance. Although no co-infection was recorded, the prevalence of HBsAg and syphilis was 9.2% and 8.4%, respectively; none of the samples tested positive for HCV. However, no matter how low this prevalence may look or be, it is strongly believed that these pregnant women and their foetuses are at risk, as about 90% of babies born by HBsAg-positive mothers are infected with the virus if not prevented in good time.[19] This is a huge public health concern if adequate plans and measures are not put in place to mitigate the situation, and sustained progress made in this direction.

In similar studies carried out in two separate locations in Osogbo, Nigeria, a prevalence of 3% and 18.6% was recorded for HBsAg while there were no positive patients for syphilis.[20,21] Nonetheless, a study in Congo recorded a syphilis prevalence of 3.92% among pregnant women.[22] In a related study carried out among 4657 pregnant women in a health facility in Ebonyi State, a prevalence of 4.1% was reported for both HCV and HBV, respectively while that of syphilis was 1.8%.[23] The HBV prevalence reported in this study is also higher than the 1.0%, 2.2%, and 3.4% reported in Kogi, Edo and Enugu States, respectively.[15,23–25] It is also different from studies carried out outside Nigeria where 3.07%, 2.5%, 2.0%, 1.02%, 1.6% and 0.4% were reported in similar studies carried out in India, Haiti, USA, China, Egypt and Bangladesh.[26–31] Higher prevalence was however recorded in Nasarawa (19.8%) and Uganda (11.8%)[32,33] respectively.

Nonetheless, the zero-prevalence reported for HCV was in disparity with a previous study by Umoke et al.,[23] who reported an HCV prevalence of 4.1%.[23] Prevalence of 8.1%, 18%, 0.8%, 1.1%, 0.5%, 0.8% and 2.6% were recorded in studies carried out in Southern Ethiopia, Cameroon, Okada in Edo State, Niger Delta region of Nigeria, Edo State and Enugu, respectively.[15,24,34–38] According to the World Health Organization and Nigeria's Federal Ministry of Health, the country has an HCV burden of 2.0% which was referred to as high.[14] This could be a result of the low rate of infection in the area. Also, HCV is known as an STI that is not common.[39]

This study recorded a higher sero-prevalence among persons aged 15-25 years which is similar to the report by Umoke et al.,[23] who recorded a higher prevalence among those aged <20 years (4.6%).[23] Also, those in their second trimester had higher HBV and syphilis prevalence with 5.0% for each. This is in contrast with the study by Umoke et al.,[23] who recorded a higher prevalence of HBV among women in their third trimester (4.6%).[23]

In this study, a higher prevalence of HBV and syphilis among women who were multiparous (9.2% and 8.4, respectively) and with secondary education (6.7% and 7.6%, respectively) was reported. This is in consonance with the study by Umoke et al.,[23] whose study had higher HBV prevalence among those with secondary education (4.8%) and multiparous (4.1%).[23] However, syphilis recorded a higher prevalence among women who were primiparous (2.4%) and in their first trimester (2.0%).[23]

The prevalence of syphilis recorded in this study (8.4%) is higher than that reported in Ebonyi (1.8%) by Umoke et al.[23] Similar studies were also carried out in Niger State (5.0%), Ethiopia (1%), Cameroon (1.7%), Abakiliki, Nigeria (0.33%) and Enugu where lower prevalence was reported (0.08%).[15,34,40–42] The difference in results between this study and previous ones could probably be associated with the varied sample sizes, awareness and knowledge of individuals on the risk factors and consequences of these STIs, and practising preventive measures. Reducing mother-to-child transmission of HBV could be achieved by administering antiviral treatments to pregnant women with an increased risk of transmission.[43]

Conclusion

Syphilis, Hepatitis B and C are sexually transmitted diseases regarded as problems of global health requiring a high level of prevention and control. This study recorded HBsAg and syphilis at 9.2% and 8.4%, respectively which is higher than most of the studies carried out in Nigeria. Sequel to the risks associated with pregnant women being infected with these diseases, there is an urgent need for continuous monitoring and evaluation of the high-risk indices that are associated with it. However, it is strongly suggested that large-scale studies and public awareness of these and other STDs should be intensified and sustained in our communities.

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Author's contribution

Azuonwu, O; Abam, J.G., were strongly involved in the conceptualization of the study, research design and literature search, assemblage and write-up of the literature review. Abam, J.G, and Azuonwu, O; were involved in laboratory assay analysis and the Statistical analysis of the laboratory-data generated were handled by Abam, J.G. and Adebayo-Olajide T,C Furthermore, the prepared first draft and double checking of spellings and English language tenses were done by Azuonwu, O; Abam, J.G., and Adebayo-Olajide T, C. However, Azuonwu, O completed the last draft of the article and double checked the suitability of the references used. All the authors read and approve the final draft for publication. There was no conflict of interest reported among authors.

Ethical Approval

The study was approved by the Central Committee on Research and Ethics of Rivers State Research and Development unit Port Harcourt, Nigeria with the Registration Number: -R/S/CCR/RDU/359/2018/04

Conflict of interest

The authors declare there is no conflict of interest.

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