Probing the Seroprevalence of Hepatis B and Hepatitis C Viral infections among Meat Handlers in a Mega Abattoir in Port Harcourt, Nigeria

ABSTRACT

Background

Hepatitis B and C viral infections are sexually transmitted and blood borne infections with vertical and horizontal transmission, constituting major global public health threats. While about 254 million people globally are living with hepatitis B and 50 million people are living with hepatitis C, and 6000 people are being infected daily with viral hepatitis; many infected persons remain undiagnosed in several countries.

Methodology

A total of 309 blood samples were collected from persons who freely gave their consents after the reasons and procedures have been well explained and their questions entertained to their apparent satisfaction. About 3 - 4 ml of venous blood samples were collected from each study participant and transferred into a pre-labelled EDTA vacutainer tubes and transported in a cold box to the Diagnostix and Scientifique Laboratories, a medical diagnostic and research laboratory offering services to public and private healthcare facilities in Port Harcourt for analysis.

Results

The overall prevalence of HBV / HCV as observed in this study was 12.3%. Age-wise, the highest prevalence of 13.3% was recorded with the 19-25 years age bracket, while the least was found within the >35 years age bracket at 8.3%. The males had a prevalence of 13.0% while the females had zero prevalence. Within abattoirs, the pig abattoirs were the highest with 25.0% prevalence. Meat handlers from the south had a prevalence of 12.5% and those from the north recorded 12.3%. The prevalence of HBV and HCV were 11.0% and 1.6%, respectively.

Conclusion

The very high prevalence rates of the pathogens among handlers of pork are worthy of note, particularly the statistically significant association between HCV infection and meat handlers in the different abattoirs.

Keyword: *Viral hepatitis, HBV, HCV, Abattoirs, Meat handlers*

INTRODUCTION

Data obtained by the World Health Organization from 187 countries indicate that viral hepatitis constitutes a foremost public health challenge with indications that about 1.3 million people died from chronic viral hepatitis B and C in 2022, translating to 3500 deaths per day. Also, about 254 million people globally are living with hepatitis B and 50 million people are living with hepatitis C, while 6000 people are being infected daily with viral hepatitis. Worse, many infected persons remain undiagnosed in several countries, while among those who were diagnosed of the infection, only very few persons are receiving treatment.[1] Viral hepatitis rank among the top five global killer infections; while hepatis B (HBV) and hepatitis C (HCV) viruses are the causative agents of chronic diseases, together being the commonest cause of liver cancer, cirrhosis, and viral hepatitis-related deaths.[2] Other types of viral hepatitis include hepatitis A virus, which is also common and hepatitis D and E viruses which are not very prevalent

HBV and HCV are Sexually transmitted and blood-borne infections, constituting major risks for various populations of persons, such as prisoners, people living with human immunodeficiency virus (HIV), recipients of blood transfusion and blood products, injectable drug abusers (PWIDs) amongst others. This is mainly due to risky behaviours like sharing of sharp objects such as needlestick injuries, tattooing, and body piercing; risky sexual conducts such as anal sex, oral sex, same gender sex; receipt of infected blood/blood products and compromised immunity.[2,3,4] HBV may be spread through vertical or horizontal routes; in areas where it is endemic, the commonest route is by perinatal or horizontal transmission. HCV is spread much the same way as HBV, but the perinatal route is less common.[4]

Hepatitis B infection is a vaccine-preventable disease, while hepatitis C is curable with the use of direct-acting antivirals.[5] The World Health Assembly had in 2016, endorsed the goal of eliminating viral hepatitis as a public health problem by 2030, which was defined as a 90% reduction in incidence of newly reported chronic infections (95% for hepatitis B and 80% for hepatitis C), and a 65% decrease in mortality compared with 2015 estimates.[6] The treatment for chronic HCV infection is aimed at eradicating hepatitis C virus, which leads to a cure of the infection, and known as a sustained virologic response (SVR). This is defined as the non-detection of the virus in the blood 12 weeks after receiving anti-HCV therapy.[7,8]

Advisedly, all infants should be vaccinated against HBV as part of the routine infant immunization schedule; while adults at high risk of the infection, are to be vaccinated, healthcare workers and caregivers at risk of exposure to blood and body fluids, persons living with HIV, sexual partners or family members of persons infected with HBV, dialysis patients, sexually active persons not in long-term monogamous relationships, men having sex with men, injectable drug abusers, persons being treated for sexually transmitted infections, person who receive frequent blood transfusions, persons at risk of injuries due to sharp objects such as tattoo artists and recipients of tattoo and similar procedures, etc.[7,8] HBV vaccine should also be offered to persons with chronic liver disease; neonates born to mothers infected with HBV should be vaccinate against HBV within 12 hours of birth. Plasma-derived or recombinant HBV vaccines are highly effective, with more than a 95% seroconversion rate.[7,8] Infants are initially vaccinated at birth, followed with subsequent vaccinations at 1 to 2 months and 6 to 18 months. Adults, after the initial vaccination, will have repeated doses at 1 month and 6 months. There are recommendations for booster dose at 5 to 10 years. Postexposure prophylaxis with hepatitis B immunoglobulin is also recommended. Patients requiring frequent transfusion of blood products or factor concentrates, such as patients with hemophilia, should also receive the vaccination.[7,8]

In order to achieve the goals of eradicating viral hepatitis, it is imperative to identify and have updated epidemiological data on vulnerable populations. A number of studies have been conducted on various population segments for this purpose. In recent times, the prevalence of HBV and HCV infections among various population segments have been studied in Nigeria, such as blood donors,[9] residents of an academic community,[10] livestock merchants and slaughterhouse workers,[11] residents of high-density group of urban communities,[12] healthcare workers,[13] patients and healthcare workers,[4] Pregnant Women[14] Sickle Cell Disease Patients,[15] and men who have sex with men and transgender women[16]

Meat handlers including butchers and other abattoir workers appear to be in a high-risk occupation considering the hazards of exposure to various pathogens, particularly blood-borne viruses like HBV and HCV. The hazards accidental exposure to percutaneous injury from cuts by butchers' knives, frequent contacts with human and animal body fluids through contaminated sharp objects such as sharing of cutlasses, knives and razors, improper wound dressing and working in very unhygienic conditions are enough reasons for suspicions of meat handlers as

high-risk population.[11] This study was thus aimed at determining the seroprevalence of HBV and HCV among meat handlers in a mega abattoir in Port Harcourt.

MATERIALS AND METHODS

Study Area

The study area was Trans-Amadi abattoir located in Oginigba Community within the 2,500-acre Trans-Amadi industrial layout; situated at 4°48'53" N latitude and 7°2'14" E longitude. the Port Harcourt metropolis. It is a multi-racial meat market with operators from across the country and beyond including hundreds of registered and unregistered operators including herdsmen, livestock merchants, slaughterhouse workers, butchers, retailers and wholesalers of meat etc. Ruminant animals are regularly supplied from across the country, particularly from northern states as well as neighboring countries like Niger, Chad and Cameroon, with about 1000 animals including cows, goats, sheep and pigs slaughtered daily. It served as the largest abattoir in Rivers State and catered for the protein needs of buyers from across the state and neighbouring states until it was closed down in 2021.

Study Design

This was a prospective, cross-sectional research, conducted under the auspices of the state environmental health department in Port Harcourt as part of routine screening and monitoring of meat handlers within the abattoirs in the metropolis. The screening exercise was authorized and coordinated by the staff of the department and the executives of the various abattoirs' unions. The study was conducted between January and February 2018.

Subject Selection and Demographics

All the butchers and meat handlers including those involved in slaughtering, wholesale and retail trade of the cows, goats and pigs were involved in the study. Semi-structured interviewer-administered questionnaire and an observation checklist were used to obtain demographic data such as age, sex, and region. Only persons who are eighteen years or above and who have been on the job for at least one year were included in the study. A total of 309 blood samples were collected from persons who freely gave their informed consents.

Sample Collection

A total of 309 blood samples were collected from persons who freely gave their consents after the reasons and procedures have been well explained and their questions entertained to their apparent satisfaction. About 3 - 4 ml of venous blood samples were collected from each study participant into a pre-labelled EDTA vacutainer tubes and transported in a cold box to the Diagnostix and Scientifique Laboratories, a medical diagnostic and research laboratory offering services for public and private healthcare facilities in Port Harcourt for analysis. The laboratory analyses were conducted with rapid diagnostic test strips (SD Bioline) were used to screen for HBsAg and anti-HCV antibodies.

Data Analysis Data were cleaned using Excel spreadsheet 2016, and analyzed using IBM SPSS Statistics version 25. Descriptive and inferential statistics were employed in results presentation and interpretation. Associations between possible risk factors namely abattoirs, gender, age and hepatitis B infections were determined using Pearson's Chi-Square test of independence and Fisher exact test at significance level below 0.05.

RESULTS

A total of 309 meat handlers comprising of 292 males and 17 females were screened for hepatitis B surface antigen (HBsAg) and anti-hepatitis C antibodies. The ages of the subjects ranged from 19 t0 69 years, the mean age was 39.03 ± 9.558 years, the median age was 38.00 ± 9.558 years and the mode was 40 years. (figure 1; Table 1)

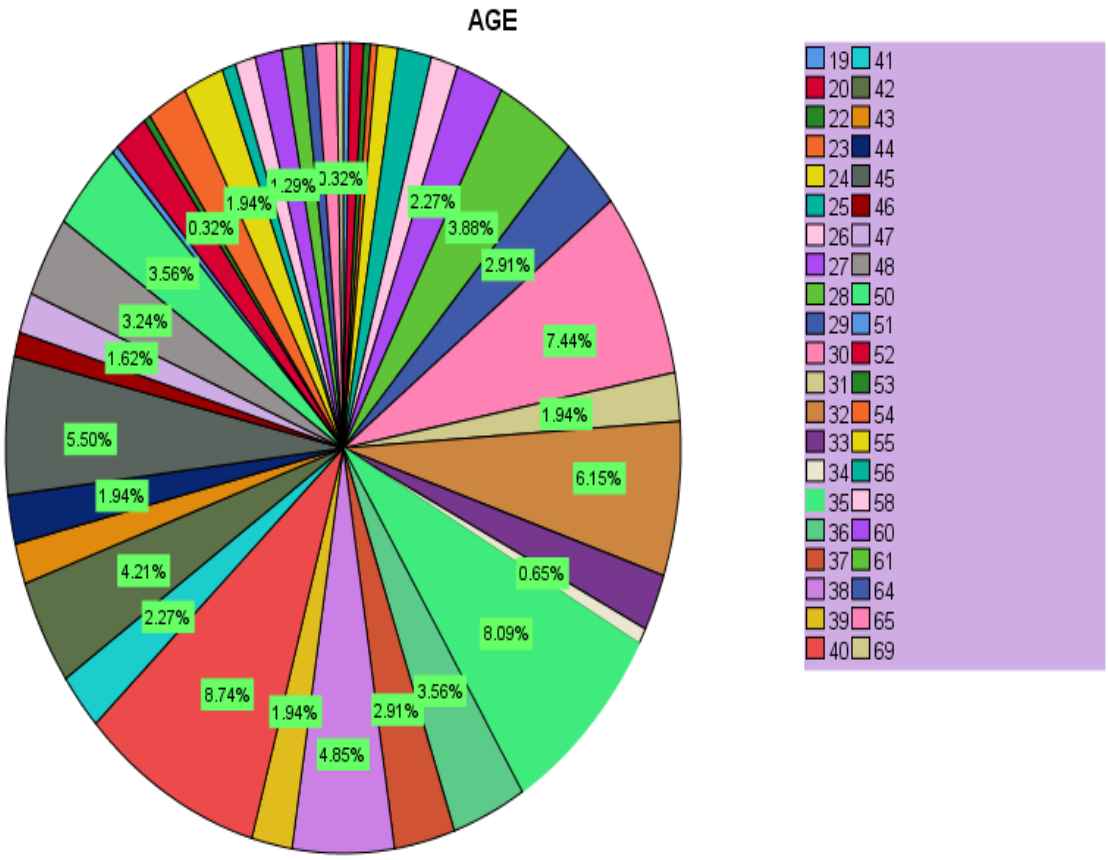

Figure 1: Distribution of Ages of Meat Handlers in a Mega Abattoir

Seroprevalence of Hepatitis B and C Viral Infections among Meat Handlers

The overall prevalence of HBV / HCV as observed in this study was 12.3%. Age-wise, the highest prevalence of 13.3% was recorded with the 19-25 years age bracket, while the least was found within the >35 years age bracket at 8.3%. The males had a prevalence of 13.0% while the females had zero prevalence. Within abattoirs, the pig abattoirs were the highest with 25.0% prevalence, followed by cow abattoirs (12.3%) and goat abattoirs (8.6%) meat handlers from the south had a prevalence of 12.5% and those from the north recorded 12.3%.

Table 1: Cumulative Seroprevalence of Hepatitis B and C Viral Infections among Meat Handlers

Characteristics	Number Tested	Positive	Prevalence %
Age Brackets			
19-25	45	6	13.3
26-30	123	16	13.0
31-35	93	12	12.9
>35	48	4	8.3
Gender			
Male	292	38	13.0
Female	17	0	0.0
Abattoir			
Cow Abattoir	204	25	12.3
Goat Abattoir	81	7	8.6
Pig Abattoir	24	6	25.0
Region			
North	197	24	12.2
South	112	14	12.5
Total	**309**	**38**	**12.3**

Seroprevalence of Hepatitis B Viral Infection among Meat Handlers

The prevalence of HBV as shown in this study was 11.0%. The highest prevalence with the age brackets was 13.3% was recorded with the 19-25 years age bracket, while the least was found within the >35 years age bracket at 2.1%. The males had a prevalence of 11.6% while the females had zero prevalence. Within abattoirs, the pig abattoirs logged the highest prevalence of 16.7% prevalence, followed by cow abattoirs (11.8%) and goat abattoirs (7.4%) meat handlers from the south had a prevalence of 11.7% and those from the north recorded 9.8%.

Table 2: Seroprevalence of Hepatitis B Viral Infection among Meat Handlers

Characteristics	Number Tested	Positive	Prevalence %
Age Brackets			
19-25	45	6	13.3
26-30	123	15	12.2
31-35	93	12	12.5
>35	48	1	2.1
Gender			
Male	292	34	11.6
Female	17	0	0.0
Abattoir			
Cow Abattoir	204	24	11.8
Goat Abattoir	81	6	7.4
Pig Abattoir	24	4	16.7
Region			
North	197	23	11.7
South	112	11	9.8
Total	**309**	**34**	**11.0**

Seroprevalence of Hepatitis C Viral Infection among Meat Handlers

HCV infection was found at a prevalence of 1.6% in this study. Within the age brackets, >35 years year olds recorded the highest prevalence of 6.3%, while the least was zero prevalence noted within the 19-15 years bracket. The prevalence for males was 1.7% while the females had zero prevalence. Within abattoirs, the pork handlers were noted with the highest prevalence of 8.3% prevalence, followed by chevon(goat-meat) handlers (2.5%) and beef handlers (0.5%), meat handlers from the south had a prevalence of 3.6% and those from the north recorded 0.5%%.

Table 3: Seroprevalence of Hepatitis C Viral Infection among Meat Handlers

Characteristics	Number Tested	Positive	Prevalence %
Age Brackets			
19-25	45	0	0.0
26-30	123	1	0.8

31-35	93	1	1.1
>35	48	3	6.3
Gender			
Male	292	5	1.7
Female	17	0	0.0
Abattoir			
Cow Abattoir	204	1	0.5
Goat Abattoir	81	2	2.5
Pig Abattoir	24	2	8.3
Region			
North	197	1	0.5
South	112	4	3.6
Total	**309**	**5**	**1.6**

Coinfection of Hepatitis B and C Viral Infections among Meat Handlers

Coinfection was observed between HBV HCV infections at a prevalence of 0.3%. Age-wise, the 31-35 years age bracket recorded a prevalence of 1.1%, while the other brackets had zero prevalence. The prevalence for males was 0.3% while the females had zero prevalence. Within abattoirs by chevon (goat-meat) handlers had a prevalence of 1.2%, beef and pork handlers had zero prevalence. Meat handlers from the south had a prevalence of 0.9% and those from the north recorded 0.5%%.

Table 4: Coinfection of Hepatitis B and C Viral Infections among Meat Handlers

Characteristics	Number Tested	Positive	Prevalence %
Age Brackets			
19-25	45	0	0.0
26-30	123	0	0.0
31-35	93	1	1.1
>35	48	0	0.0
Gender			
Male	292	1	0.3
Female	17	0	0.0
Abattoir			
Cow Abattoir	204	0	0.0
Goat Abattoir	81	1	1.2
Pig Abattoir	24	0	0.0

Region			
North	197	0	0.0
South	112	0	0.9
Total	**309**	**1**	**0.3**

DISCUSSION

This study has contributed in establishing the seroprevalence of hepatitis B and hepatitis C viral infections among meat handlers in a mega abattoir in Port Harcourt, Nigeria. The combined prevalence of 12.3%. obtained in this study for HBV/ HCV, and the prevalence of 11.0% for HBV are higher than some of the values obtained in some studies in Port Harcourt.[9,10,12] They however aligned closely with the 13.7% reported for abattoirs in Port Harcourt[17] and 12.2% obtained in a country-wide survey.[18] There are significant variations in research reports, but high results as obtained in this case indicate that the infections are still endemic in the country.

The prevalence of 1.6 % for HCV is consistent with a number of previous studies in the country which have reported low prevalence,[9,12,19,2] though higher prevalences have been reported in some other studies across the country. Such as 15.2% and 6.5% among patients and health workers in a hospital,[4] 4.4% among HIV patients,[21] 4.0% among patients in a north central state.[22] The co-infection prevalence rate of 1.6% was higher than the 0.4% coinfection rates reported among livestock merchants and slaughterhouse workers.[11]

The prevalence of HBV was higher than 7.8% reported for the WHO African region,[23] as well as WHO definition of settings with high Hepatitis B surface antigen (HBsAg) seroprevalence in the general population of ≥2% or ≥5% HBsAg seroprevalence.[24] However, the prevalence of HCV 2.25% general population in sub-Saharan Africa,[25] as well as WHO definition of settings with high Hepatitis B surface antigen (HBsAg) seroprevalence in the general population of ≥2% or ≥5% HBsAg seroprevalence [26] The outcomes of this study and other similar studies have reinforced the fact that viral hepatis due to HBV ana HCV has remained major public health threats.

There have been wide variations in prevalences across population segments, countries, regions, occupational and health status. It however remained certain that the public health challenge posed by HBV and HCV in the area of study is yet to abate. The WHO criteria grading the prevalence of HBV infection a prevalence of > 8% as high, between 2 and 8% as intermediate, and < 2% as being. Hepatitis C virus infection may be classified as: high, > 3.5, moderate 1.5–3.5%, or low < 0.1.5%.[27] it follows that the prevalence of HBV was high, and HCV was low in this study. The co-infection rates in this study were low and corroborates results obtained elsewhere in Ibadan (0.4%),[11] and Ethiopia (0.7%).[28]

The highest prevalence for HBV was found within the 19-25 age brackets, this aligned with findings in Ethiopia,[28,29] This may be due the youthful exuberance of the young adults, eager to experiment with behaviours pertaining to sexual activities; on the contrary, the highest prevalence for HCV was found among persons between >30-year-olds, and may be attributable to work-related activities. All the seropositivity in this study was found among males and none in females. Though this outcome was corroborated in some other studies,[27] in this study it is more likely due to the preponderance of male meat handlers over females.

Though viral hepatitis infections have been shown to be present in some animal species,[30] only the association between HCV infection and abattoir were found to be statistically significant with

p value less than 0.05. There was insufficient statistical evidence to link the higher prevalence of HBV and combined HBV / HCV observed among the meat handlers in pig abattoirs to contact with the animals. The seroprevalence of persons from the north and those from the south were similar, it thus appears that region is not linked with the infection. More investigations are thus required to unravel the role of pigs in the high prevalence of the viral pathogens in this study.

The major limitation of this study stem from its reliance on secondary data. There was inadequacy of sociodemographic variables and genomic analysis which would have added more value in characterization of the pathogen was not employed.

CONCLUSION

This study has been able to contribute to the data on the epidemiology of HBV and HCV in port Harcourt by determining their seroprevalence rates among meat handlers in a mega abattoir in Port Harcourt. This will go a long way in policy formulation and planning for prevention and control of the infections. The very high prevalence rates of the pathogens among handlers of pork are worthy of note, particularly the statistically significant association between HCV infection and meat handlers in the different abattoirs.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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