A Cross-Sectional Investigation of the Public Health Consequences of Hepatitis B infection among Abattoir Workers in Port Harcourt Nigeria

Abstract

I**ntroduction:** Infection with Hepatitis B virus (HBV) is a public health threat accounting for an estimated nearly one million deaths annually largely due to cirrhosis and hepatocellular carcinoma. Abattoir workers are reported to be at high risk of contracting HBV infection. This study was conceived to ascertain the public health consequences of HBV infection among abattoir workers.

Materials and Methods: About 3 - 4 millilitres of venous blood samples were collected from each of 275 participants into pre-labelled EDTA vacutainer tubes and transported in a cold box to the Laboratory. They were analyzed with three different rapid diagnostic test strips and positive results were recorded only for specimens that were reactive to at least two test strips.

Results: The total prevalence of HBV for all the abattoirs was 6.2%. Tereama was dominant with 13.9% positive results, followed by Iloabuchi (12.5%) Wazobia (10.7%), Eagle Island 8.3% Mile three 6.5% and Oil mill 4.7%. Zero prevalence was recorded in six abattoirs. A chi-square test of independence to evaluate the relationship between the independent and dependent variables showed no significant relationship between them, as the p value of .742 is not less than 0.05, therefore the null hypothesis which states that the variables are independent is not rejected.

Conclusion: This study revealed an intermediate prevalence of HBV among abattoir workers in the same range with the general population. The abattoir workers appear, to be exposed to same risks as those faced by the general population in the study area,

Keywords: *Hepatitis B virus, Public Health, Meat Handlers, Abattoirs, Seroprevalence*

Introduction

Infection with Hepatitis B virus is an insidious global public health threat accounting for an estimated nearly 300 million persons currently living with the chronic condition, and about 30 million people being infected annually.[1] The estimated number of deaths due to hepatitis B infection is put at about one million persons with over eighty percent attributable to cirrhosis and hepatocellular carcinoma (HCC), making hepatitis B the 15th commonest cause of human mortality worldwide.[2,3] The high number of deaths associated to HBV is largely due to the large number of undiagnosed cases, with less than 10% of infected persons being diagnosed and less than 1%, receiving treatment The disease burden of hepatitis B is heavy on the African continent with over 60 million infected persons hepatitis B, which amounts to over 60,000 deaths each year.[3]

Nigeria is one of the African countries with high prevalence of HBV, defined as more than 8% with a vast majority of the infected persons being ignorant of their status and therefore not receiving treatment. It is thus not surprising that the country has one of the highest incidences of liver cancer caused by HBV, estimated at close to 5.1 cases per 100,000 person-years.[4]

Hepatitis B virus is a small enveloped DNA virus. It is hepatotropic and belongs to the family *hepadnaviridae*; and has a narrow host range, infecting only humans and a few related primate species.[5] It is transmitted through both vertical and horizontal routes, majorly, mother to child, sexual intercourse and parenterally through blood and blood products.[6] Vertical transmission through mother-to-child at birth, is recognized as the prevalent mode of transmission of the virus in areas of endemicity, like Sub-Saharan Africa and Asia-Pacific countries; and those

who become infected at infancy are more likely to become chronic carriers if not treated on time. On the other hand, horizontal transmission at adult ages is more likely to result in self-limiting acute forms of the infection.[5] It is a resilient virus, which is highly stable at 37 °C and can survive on environmental surfaces for more than 22 days; it is detectable in blood and body fluids such as saliva, tears, sweat, semen, and vaginal secretions. In areas of low prevalence, injection drug use and high-risk sexual exposures are the commonest modes of transmission.[6]

Hepatitis B virus infections may be acute or chronic forms. The post-infection incubation period of the acute infection ranges from one to four months. Symptoms in the acute stage may only be found in adult where about one third of infected persons manifest serum sickness type symptoms such as fever, arthralgias, and rash, which may occur in the prodromal period; followed by constitutional symptoms, anorexia, nausea, jaundice, and right upper quadrant discomfort. Liver function tests are marked with elevated serum alanine transaminase and mild elevation in bilirubin. The most notable complication of the acute infection acute liver failure[7]

The chronic infection is a resultant effect of interactions between the host and viral factors, and occurs when viral clearance In the acute stage is ineffective. It is characterized by persistence of serum HBsAg for at least 6 months[7] The induced immune response following the infection of human hepatocytes leads to the elimination of infected cells especially in immunocompetent persons. In cases of immature or compromised immunity the formation of chronic disease or their reactivation after remissions are the likely outcomes. In adults HBV infection results in acute infection in 90–95% of cases, while in the case of infants chronicity is the outcome in almost all cases.[8]

Although the infection of humans by hepatitis B virus is reported to have been in existence for 2000–3000 years, the virus was only discovered until 1966, and in 1970 the virus particle was identified by Dane *et al.,* by the use of electron microscopy. Consequently, antiviral therapies and vaccines has been produced in the bid to combat the viral menace. In spite of the efforts and breakthrough in the treatment and prevention of the infection, the mortality and morbidity remain high.[9]

Horizontal transmission of HBV through occupational, recreative and similar activities occasioning inadvertent contacts with human fluids particularly blood has received attention in recent times. Studies have considered slaughter house workers as high-risk groups for HBV infection, given that they are exposed to a number of risks such as knife cuts, close contacts with animal blood, exchange of knives in the course of their occupational activities.[10,11] It has also been reported that hepatitis virus has been detected in some animals like cattle, and the fact that a large proportion of pathogenic organisms are zoonotic organisims.[11]

This study was thus conceived to ascertain the prevalence of hepatitis B virus among persons involved in slaughtering animals and cutting up of meat for sale to the public in public abattoirs in Port Harcourt with the intent of determining the public health consequences.

Materials and Methods

Study Design

This is an observational, retrospective and cross-sectional research. It was commissioned by 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 coordinated by the staff of the department and the executives of the various abattoirs' unions. The study was conducted between October 2014 and February 2015.

Study Site

The area for the study is Port Harcourt, the capital and major city of Rivers. It is located on Latitude: 4°46′38″ N Longitude: 7°00′48″ E with an Elevation above sea level: 16m. Twelve abattoirs spread across the two local governments of Port Harcourt City and Obio Akpor were involved in the study. The abattoirs were located at Tereama, Mile 3, Eagle Island, Emenike, Wazobia, Iloabuchi, St Andrews, Nkpor, Rukpokwu, Shukura, Choba and Oil mill areas of the two local governments.

Subject Selection and Demographics

All the butchers and meat handlers including those involved in slaughtering, wholesaling and retailing the mostly cow and goat meat were involved in the study. Semi-structured interviewer-administered questionnaire and an observation checklist were used to obtain demographic data such as age, sex, length of stay on the job. Only persons above the age eighteen and who has been on the job for at least one year were included in the study. A total of 275 blood samples were collected from persons who freely gave their informed consents

Sample Collection

A total of 275 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 mililitres 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 Laboratory, 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 three different rapid diagnostic test strips (names not recorded) and positive results were recorded only for specimens that tested negative for all three test strips.

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 and viral infections was determined using Chi-Square test and Fisher exact test at significance level below 0.05.

Results

The descriptive statistics indicate that 275 participants were involved in the study. The youngest was 20 years while the eldest was 67 years old. The mean age was 38.35 years with standard deviation of 9.752; the median and modal ages were 37 and 40 years respectively. All the data as analyzed were complete. (Table 1)

Table 1: Descriptive Statistics of the Variables: Abattoirs, Age, Sex and Hepatitis B Results of Meat Handlers in Port Harcourt Nigeria

Statistics

		Abattoir	Age	Sex	Result
N	Valid	275	275	275	275
	Missing	0	0	0	0
Mean		6.02	38.35	1.01	1.94
Median		5.00	37.00	1.00	2.00
Mode		2	40	1	2
Std. Deviation		3.936	9.752	.120	.241
Minimum		1	20	1	1
Maximum		12	67	2	2

Crosstabulation of the abattoirs and the results of HBV screening

Crosstabulation of the abattoirs and the results of HBV screening Shows that Mile three abattoir had the highest percentage of participants with 16.7% in the study, followed by Oil mill 15.6%, Tereama 13.1%, Wazobia 10.2%., Iloabuchi 8.7%, Emenike 7.6%, Choba 6.5%, Rukpokwu 5.8%, Eagle Island, Nkpor and Shukura, 4.4%, apiece and St Andrew 2.5%

The total prevalence of HBV for all the abattoirs as shown in this study was 6.2%. Tereama had the largest prevalence (positive cases) of 13.9%, followed by Iloabuchi (12.5%) Wazobia (10.7%), Eagle Island 8.3% Mile three 6.5% and Oil mill 4.7%. Zero prevalence was found among participants from Six abattoirs namely, Emenike, St Andrews, Nkpor, Rukpokwu, Shukura and Choba.

In terms of total results, abattoirs and HBsAg results indicate that Tereama, abattoir accounted for 29.4% of all positive results. This is followed by Iloabuchi, Wazobia and Mile 3, abattoirs contributing 17.6% apiece, Oil mill constituted 11.8% of total result while Eagle Island abattoir contributed 5.9% of total result. The other six abattoirs recorded zero percent positive results. The total prevalence of 6.2%. consist of Tereama 1.8%, Mile three1.1% Wazobia 1.1%Iloabuchi1.1% Oil Mill 6.2% and Eagle Island 0.4%

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Table 2: Crosstabulation of the Variables (Abattoir and Hepatitis B Virus Results) of Meat Handlers in Port Harcourt Nigeria

Result * Abattoir Crosstabulation

			Abattoir												
			Tere-ama	Mile Three	Eagle Island	Eme-nike	Wazobia	Iloa-buchi	St Andrews	Nkpor	Rukp-okwu	Shukura	Choba	Oil Mill	Total
Result	Positive	Count	5	3	1	0	3	3	0	0	0	0	0	2	17
		% within Result	29.4%	17.6%	5.9%	0.0%	17.6%	17.6%	0.0%	0.0%	0.0%	0.0%	0.0%	11.8%	100.0%
		% within Abattoir	13.9%	6.5%	8.3%	0.0%	10.7%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	6.2%
		% of Total	1.8%	1.1%	0.4%	0.0%	1.1%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	6.2%
	Negative	Count	31	43	11	21	25	21	7	12	16	12	18	41	258
		% within Result	12.0%	16.7%	4.3%	8.1%	9.7%	8.1%	2.7%	4.7%	6.2%	4.7%	7.0%	15.9%	100.0%
		% within Abattoir	86.1%	93.5%	91.7%	100.0%	89.3%	87.5%	100.0%	100.0%	100.0%	100.0%	100.0%	95.3%	93.8%
		% of Total	11.3%	15.6%	4.0%	7.6%	9.1%	7.6%	2.5%	4.4%	5.8%	4.4%	6.5%	14.9%	93.8%
Total		Count	36	46	12	21	28	24	7	12	16	12	18	43	275
		% within Result	13.1%	16.7%	4.4%	7.6%	10.2%	8.7%	2.5%	4.4%	5.8%	4.4%	6.5%	15.6%	100.0%
		% within Abattoir	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	13.1%	16.7%	4.4%	7.6%	10.2%	8.7%	2.5%	4.4%	5.8%	4.4%	6.5%	15.6%	100.0%

Crosstabulation of the Variables Age Groups and Hepatitis B Virus Results

A crosstabulation of the HBV test results and the different age groups indicate that participants in the 30 – 39 age group were predominant with 112 (40.7%) participants and accounted for 8 (47.1%) of the positive results. This is followed by the 40 – 49 age group which accounted for 75 (27.3%) of the participants and 4 (23.5%) of positive outcomes. The 20 – 29 age group recorded 46 (16.7%) persons and 4 (23.5%) of positive outcomes. There are 31 (11.3%) participants from the 50 – 59 age group, with one of them having a positive result amounting to 5.9% of the results. The oldest group in the study was the smallest group having 11 (4.0%) participants and all tested negative to hepatitis B virus (Table 3)

Table 3: Crosstabulation of the Variables (Age Groups and Hepatitis B Virus Results) of Meat Handlers in Port Harcourt Nigeria

Crosstab

Count

		Result		
		POSITIVE	NEGATIVE	Total
AGEGROUPS	20 -29	4	42	46
	30 – 39	8	104	112
	40 – 49	4	71	75
	50 – 59	1	30	31
	60 – 69	0	11	11
Total		17	258	275

Table 4: Crosstabulation Of Sex and Results of HBsAg Screening

A crosstabulation Of Sex and Results of HBsAg Screening shows the distribution of the counts and test results among the different males and females show a preponderance of males over females. Among 275 participants, there were 271 (98.5%) males and 4 (1.5%) females. Also, out of 17 positive results, 16 (94.1%) were recorded from males and 1 (5.9%) was from the females.

Table 4: Crosstabulation Of Sex and Results of HBsAg Screening between Male and Female Meat Handlers in Abattoirs in Port Harcourt

Sex * Result Crosstabulation

			Result		
			POSITIVE	NEGATIVE	Total
Sex	MALES	Count	16	255	271
		% within Sex	5.9%	94.1%	100.0%
		% within Result	94.1%	98.8%	98.5%
		% of Total	5.8%	92.7%	98.5%
	FEMALES	Count	1	3	4
		% within Sex	25.0%	75.0%	100.0%
		% within Result	5.9%	1.2%	1.5%
		% of Total	0.4%	1.1%	1.5%
Total		Count	17	258	275
		% within Sex	6.2%	93.8%	100.0%
		% within Result	100.0%	100.0%	100.0%
		% of Total	6.2%	93.8%	100.0%

Chi-square test of independence of the variables

A chi-square test of independence was performed to evaluate the relationship between the independent variables and results of HBsAg tests (dependent variable). The relationship between these variables were found not be significant, given that the p value of .742 is not less than 0.05, we therefore fail to reject the null hypothesis which states that the variables are independent. In other words, there is no sufficient evidence to conclude that a significant association exists between the variable and the test results obtained for the hepatitis B screening.

Table 5: Chi-square test of independence of the variables

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.965[a]	4	.742	.754		
Likelihood Ratio	2.680	4	.613	.699		
Fisher's Exact Test	1.239			.858		
Linear-by-Linear Association	1.914[b]	1	.167	.181	.101	.039

N of Valid Cases	275					

a. 4 cells (40.0%) have expected count less than 5. The minimum expected count is .68.
b. The standardized statistic is 1.384.

Discussion

This study has been able to establish the prevalence of hepatitis B infection among meat handlers in twelve abattoirs across Port Harcourt metropolis in Nigeria. A number of previous studies had reported high prevalence of viral hepatitis, including Hepatitis B virus among meat handlers at abattoirs. A national survey on seroprevalence of hepatitis B put the national prevalence at 12. 2%[12] Other studies across the country has given the prevalence as 9.5%[4] ,12.6% and 15.2%[13], 2.23%[14], and13.1%[15]. These differences were shown not to be statistically significant and so does not pose much public health threat.

The prevalence of 6.2% found for HBV infection in this study in lower than most values reported elsewhere across the country. It is much lower than 13.7% reported for abattoirs in Port Harcourt.[18], but higher than an earlier 4.3% also in Port Harcourt among pregnant women.[12;] however, it is in alignment with a prevalence of 5.1% reported in Port Harcourt and 6.49% reported in a recent nationwide study of HBV prevalence in pregnant women[20]. It is apparent that the prevalence of HBV varies widely in time and space. This could be gleaned from the prevalence across the abattoirs which ranged from zero in 50% of the abattoirs to 13.9% in one of the abattoirs. The result from this study which is an intermediate prevalence does not differ much from the from the results for other populations in Port Harcourt such as pregnant women.[12] It is however higher than those obtained for abattoir workers and livestock merchants with a reported prevalence of 10.9%[16] in Ibadan, and 8.0% reported for donkey butchers in Ebonyi state[17] The hyper prevalence in those areas may align with the prevailing population prevalence while it may be said that abattoir workers in Port Harcourt have imbibed safety practices in the jobs, especially given there was a decline from a previous reported prevalence; and the fact that during the course of the screening and preceding ones, there were enlightenment lectures on saty practices in the abattoirs.

While there are several reports had focused on the prevalence of HBV among the general population and some high-risk groups across the country, there appear to have been not much work on the prevalence of the virus in the abattoirs. However, the factors the contribute to put abattoir workers in high risk as it pertains to HBV infection have been studies by a number of researchers. Personnel involved in meat processing for instance are known to be exposed to a lot of biological and physicochemical agents which may result in infectious and noninfectious diseases.[10]

Some of the factors that put abattoir personnel at risk of HBV include knife cuts, sharing of knives, cut from bones, injury by animals, close, long contacts with animals and animal products among others[18,18]. The risks associated working with animals is heightened by the fact that vast majority of emerging infections are zoonotic which makes animals potential carriers of unrecognized pathogens.

It is remarkable that over eighty percent of the participants and over ninety percent of those with positive results are in the age brackets below fifty years. The above sixty age bracket recorded

no positive results, while the 50 -59 group had only one positive case. Though the chi square test of independence did not reveal any significant association between HBV results and age groups, it can be seen that the most active age brackets are in the below fifty groups and any efforts at combating the HBV infection should be focused on the younger age brackets. The wide disparity among the genders as seen in this study is not surprising, given that abattoir workers are predominantly males.

Conclusion

This study has been able to show that though the prevalence of HBV among abattoir workers is at intermediate level, they are in the same range with the prevalence among the general population in the metropolis and the abattoir workers appear, not to be exposed to any higher levels of risks to the infection than those faced by the general population. The prevalence of 6.2% is not an acceptable one. Efforts should be intensified to eradicate HBV infection through mass vaccination and other safety practices.

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