

Hepatitis E Infection in Nigeria: A Systematic Review

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Abstract

Citation: Okagbue HI, Adamu MO, Bishop SA, Oguntunde PE, Odetunmbi OA, Opanuga AA. Hepatitis E Infection in Nigeria: A Systematic Review. Open Access Maced J Med Sci. 2019 May 31; 7(10):1719-1722. https://doi.org/10.3889/oamjms.2019.143

Keywords: Hepatitis E; Hepatitis B; Odd ratio; Logistic regression; Prevalence; Statistics

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Received: 25-Feb-2019; **Revised:** 07-May-2019; **Accepted:** 08-May-2019; **Online first:** 29-May-2019

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Funding: This research was financially supported by Covenant University, Nigeria

Competing Interests: The authors have declared that no competing interests exist

BACKGROUND: Research done globally on hepatitis E virus (HEV) infection is far fewer compared with other types of hepatitis virus infection. Little is known on the prevalence of HEV in Nigeria.

AIM: The present study presents the prevalence of HEV infection in Nigeria from a few available research papers on HEV. The detailed statistical analysis was used to analyse the prevalence of HEV in humans and animals.

MATERIAL AND METHODS: A literature search in Web of Science, Scopus and PubMed databases was done, and a final 7 articles were selected. Minitab 17.0 was used to perform the correlational and binary logistic analyses.

RESULTS: Serum and faecal analysis of blood and stool samples of 1178 humans and 210 pigs (animals) were done, and the presence of anti-HEV IgG or HEV RNA in the study samples were 127 and 138 respectively. Further analysis showed the prevalence of HEV are 10.8% and 65.7% in humans and animals, respectively. Weak positive non-significant association ($r = 0.327$, $p\text{-value} = 0.474$) was obtained between the target (humans and animal) and the HEV infection (positive) groups. The application of binary logistic regression yielded an equation that can be used to predict the target group from the HEV positive humans or animals. Generally, the logistic model was not statistically significant ($p\text{-value} = 0.376$), and the model was able to explain 9.3% of the deviation or variability of the model. The odds ratio is $OR = 1.0344$ with 0.9550, 1.204 95% Confidence Interval (CI). Thus, in Nigeria, the odds of prevalence of HEV in animals are 1.0344 higher than humans.

CONCLUSION: The risk factors obtained from the few available articles are consistent with the global epidemiology of HEV infection. Food and animal handlers and those that consume unsafe water are the key people at risk of HEV infection in Nigeria.

Introduction

Hepatitis E is an inflammatory liver disease caused by a non-enveloped positive-sense [1] and single-stranded ribonucleic (RNA) genome called the hepatitis E virus (HEV). The virus is in four different types identified as genotypes 1, 2, 3 and 4. Genotypes 1 and 2 have been isolated in humans while 3 and 4 are found in animals. HEV is transmitted mainly through faecal contamination of drinking water and uncooked foods. Generally, the risk factors of the disease include lack of access to cheap, safe and

potable drinking water, unhygienic living conditions and indiscriminate disposal of human wastes, poverty, the insecurity that results to a strain on access to basic life amenities and limited access to quality health services [2]. Symptoms of the disease include mild fever, anorexia, nausea, jaundice, dark urine, pale stools and slight liver inflammation, although, rare cases have been reported to result to fulminant hepatitis in pregnant women [3], [4]. Diagnosis of HEV infection includes detection of the HEV in stool or serum samples and serological tests for identification of anti-HEV Ig G and Ig M [1]. Measures to be taken to eliminate the risk factors are consistent supply of

clean and safe water, improving personal hygiene and ensuring proper disposal of human wastes.

Hepatitis E is one of five known human hepatitis viruses. Others are A [5], B [6], [7], C [8], [9], [10] and D [11]. The prevalence of HEV is very low compared with the others, especially hepatitis B virus (HBV). Numerous articles that investigated different aspects of HBV infections in Nigeria [12], [13], [14] and few papers are available for HEV infection.

This paper aims to present a statistical analysis of a few articles published on the prevalence of HEV infection in Nigeria. The few papers are traceable to the low prevalence of the disease in the world of which the studied country is a particular case. A similar investigation has been done and can be found in [15], [16], [17], [18], [19], [20], [21].

Material and Methods

Study Design

The study design is Web of Science, Scopus and PubMed databases. The keywords "Hepatitis E" OR "HEV" AND "Nigeria" were queried in Scopus, PubMed and Web of Science databases. PubMed, Scopus and Web of Science (WOS) returned 301, 66 and 11 articles respectively. Further evaluation showed that the articles in WOS are also contained in Scopus and are littered with hepatitis B and studies on areas not related to Nigeria. A final seven (7) articles were sieved out after all the unrelated articles were removed.

Eligibility Criteria

The papers that contained the prevalence of HEV in their abstracts were included. Risk of bias was almost nonexistent since the sample size is small.

Ethics Statement

No ethical rules were violated. All the sources of information were duly acknowledged.

Statistical Analysis

The absence of numerous studies places undue restrictions on the use of different statistical techniques. The statistical techniques are needed to reveal hidden patterns as long as the sample size is appreciably high [22], [23], [24], [25], [26], [27], [28]. The 7 articles were analysed using Minitab version 17.0, binary logistic regression was used for the analysis, and this was as a result of splitting of the target groups into two distinct and non-overlapping

classes. P-value of 0.05 was considered significant.

Results

The summary of the data presentation of the 7 articles [29], [30], [31], [32], [33], [34], [35] are presented in Table 1. The publication span 10 years. It can be seen that (6/7) of both the methodology and diagnostics (tool for analysing serum and faecal samples) used in the articles are cross-sectional studies and enzyme-linked immunosorbent assay (ELISA) technique respectively.

Table 1: Studies on hepatitis E virus infection in Nigeria

Author	Publication Year	Methodology	Target Group	Diagnos tics	Sample size	HEV positive
[29]	2008	Observation	Hospitalized	Therapy	1	1
[30]	2013	Cross sectional	Non-hospitalized	ELISA	132	36
[31]	2014	Cross sectional	Pigs	ELISA	90	69
[32]	2014	Cross sectional	Non-hospitalized	ELISA	462	43
[33]	2015	Cross sectional	Non-hospitalized	ELISA	406	31
[34]	2018	Cross sectional	Pigs	ELISA	120	69
[35]	2018	Cross sectional	Non-hospitalized	ELISA	177	16

Prevalence of HEV in the samples

HEV positive means the presence of anti-HEV IgG or HEV RNA in the study samples. The prevalence for each case is obtained using the dataset of Table 1, by dividing the total number of HEV positive and the total number investigated and multiplying by 100. This is presented in Table 2.

Table 2: Prevalence of the two types of HEV infection in Nigeria

	Humans	Animals
Total investigated	1178	210
HEV positive	127	138
Prevalence	10.8%	65.7%

Correlation Analysis

Correlation coefficient was obtained between the target group (humans = 0, animal = 1) and the HEV positive and it was computed to be ($r = 0.327$, $p = 0.474$).

Binary Logistic Regression

Binary logistic regression was performed to determine the association between the target group y (humans = 0, animal = 1) and the HEV positive (x).

Table 3: Deviance table

Source	DF	Adj Dev	Adj Mean	Chi-Square	P-Value
Regression	1	0.7842	0.7842	0.78	0.376
Error	5	7.5915	1.5183		
Total	6	8.3758			

This is to determine if the prevalence of HEV can predict whether the target group is animal or human.

Table 4: Model Summary

Deviance	Deviance	R-Sq	R-Sq(adj)	AIC
9.36%	0.00%	11.59		

The details are presented in Tables 3 to 7, and the logistic regression equation is $\text{Exp}(y) = -2.33 + 0.338x$.

Table 5: Coefficient of the model

Term	Coef	SE	Coef	VIF
Constant	-2.33	2.04		
x	0.0338	0.0407	1.00	

Discussion

The few available studies on HEV infection in Nigeria is due to the less severe nature of the disease when compared with Hepatitis B infection. The low research activities on HEV can also be as a result of the low incidence of the disease, self-medication, the use of traditional or alternative medicine and non-hospitalization. Hospital records about the HEV infection will encourage cross-sectional and retrospective studies.

Table 6: Odds Ratios for Continuous Predictors

Odds Ratio	95% CI
x	1.0344 (0.9550, 1.1204)

The risk factors available from the few articles are consistent with the global epidemiology of HEV infection. The risk factors are faecal contamination of water and food, improper disposal of human and animal wastes, poverty, unhygienic environment and inadequate access to quality healthcare services.

Table 7: Goodness-of-Fit Tests

Test	DF	Chi-Square	P-Value
Deviance	5	7.59	0.180
Pearson	5	6.61	0.252
Hosmer-Lemeshow	4	4.60	0.330

Serum and faecal analysis of blood and stool samples of 1178 humans and 210 pigs (animals) were done, and the presence of anti-HEV IgG or HEV RNA in the study samples were 127 and 138 respectively. Further analysis showed the prevalence of HEV are 10.8% and 65.7% in human and animals, respectively. The high level of the prevalence in animals calls for urgent action to avoid infections to human via faecal oral transmission.

There is a weak positive non-significant

association between the target groups (humans and animals) and the HEV infection (positive). This is the outcome of the prevalence that showed that the prevalence of both groups is different; that is, high for animals and low for humans.

The application of binary logistic regression yielded an equation that can be used to predict the target group from the HEV positive humans or animals. Generally, the logistic model was not statistically significant (p -value = 0.376), and the model was able to explain only 9.3% of the deviation or variability of the dependent variable. The odds ratio was gotten to be; OR = 1.0344 (0.9550, 1.204) 95% CI. Thus, in Nigeria, the odds of prevalence of HEV in animals are 1.0344 higher than humans.

Acknowledgement

The authors appreciate the efforts of the anonymous reviewers toward this publication. The support from Covenant University, Nigeria, is also deeply appreciated.

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