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Prevalence of Hepatitis B Virus and Related Risk Factors: A Case Study at Assela Referral Hospital, Oromia, Ethiopia

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Authors' contributions

This work was carried out in collaboration between all authors. Author BB designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author FK managed the analyses of the study and literature searches. Author DN edited the study. All authors read and approved the final manuscript.

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ABSTRACT

Background: Hepatitis B virus (HBV) is hepatotropic virus whose primary replication occurs in the liver. Hepatitis is an infection of the liver caused by several viruses, the most common of which are hepatitis A, B and C. Hepatitis B virus (HBV) is spread mainly through contaminated blood and blood products, sexual contact and contaminated needles.
Objective: The study assesses the prevalence of hepatitis B virus and identify related risk factors for this viral infection among patients.
Methods: Simple random sampling method applied to this study. Bayesian Logistic Regression Model has been employed to predict the probability of prevalence of hepatitis virus (dependent variable), on the base of a set of predictor variables.
Results: The prevalence of hepatitis B virus was 10.9%. History of sexually transmitted disease, multiple sexual partner, frequent intake of alcohol, chat/smoking cigarette/ or any other drugs, and abortion had shown statistically significant association with prevalence.

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Conclusions: Related risk factors associated with hepatitis B virus are history of sexually transmitted disease, multiple sexual partner, frequent intake of alcohol, chat/smoking cigarette/ or any other drugs, and abortion.

Keywords: HBV; patients, Assela Referral Hospital.

1. INTRODUCTION

Hepatitis is an infection of the liver caused by several viruses, the most common of which are hepatitis A, B and C. Hepatitis B virus (HBV) is spread mainly through contaminated blood and blood products, sexual contact and contaminated needles [1].

Hepatitis B virus (HBV) is hepatotropic virus whose primary replication occurs in the liver [2]. Chronic infection by this virus leads to slow progressive liver disease that over a period of up to 30 years may result in cirrhosis, chronic liver failure and hepatocellular carcinoma (HCC) [3]. HBV belongs to the family of hepadnaviridae, a group of hepatotropic mammalian and avian DNA viruses, which replicate via reverse transcription of a genomic RNA intermediate. It contains a partially double stranded genomic DNA [4].

In Ethiopia, the prevalence of liver disease is high with 12% of the hospital admissions and 31% of the mortality in medical wards of Ethiopian hospitals [5].

WHO estimates that there are 350 million people with chronic HBV infection worldwide with about 563,000 deaths annually [4]. Hepatitis B Virus (HBV) infection is an important global health problem. About 60,000 deaths occur globally every year. Chronic Hepatitis is leading causes of cirrhosis and hepatocellular carcinoma (HCC) which is considered as the third cancer associated cause of deaths worldwide. WHO estimated that the prevalence of infection in Africa is on average more than 10%. However, a study conduct on Addis Ababa showed that the mean prevalence of HBsAg was 6.1 percent [6].

2. DATA AND METHODOLOGY

2.1 Study Design and Area

A cross-sectional study was conducted into Assela town referral hospital from May 2016 to January 2017. The study participants were recruited from government health institutions found in Asella town which are located in East part of Ethiopia about 143 km far from the capital city; Addis Ababa.

2.2 Sampling Design

Simple random sampling method adopted as an appropriate sampling design for selecting a representative sample (1343 patients).

2.3 Data Collection

After obtaining informed written consent from each participant, primary data would be collected by interview using a structured self administered questionnaire, that is, the questionnaire was prepared first in English and then translated into Amharic. The Amharic version of the questionnaire was pre tested for clarity and acceptability. Then based on the finding from pre testing, some of the questions were modified and the corrected questionnaire was used to collect the data from these HBV suspected patients since May 2016 to January 2017 which is collected by a trained public health specialist.

2.4 Sample Size Determination

The study includes all 1343 patients who were suspected for hepatitis B virus infection at Assela hospital.

2.5 Variables Considered under the Study

The response variable in this study prevalence categorised as HBV reactive and HBV non reactive. Independent variables including Socio demographic characteristics includes: age (in year), sex (male, female), marital status (single, married, divorced, widowed), religion (orthodox, catholic, protestant, muslim, other), accommodation (alone, not alone), educational level (elementary and less, high school, higher education), and occupational status. Risk factors for HBV and/or HCV includes respondents frequent intake of alcohol, chat/smoking cigarette/ or any other drugs, history of sexually transmitted disease, multiple sexual partner, blood transfusion, abortion, dental extraction at health facility, circumcision, hospital admission, surgical procedure, venous or body piercing for treatment, ear/ nose piercing, tattooing on body/gum, contact with jaundiced patient.

2.6 Laboratory Testing

About 5 mL of venous blood was collected from all study participants according to the standard blood collection procedure. Separated sera were taken to the laboratory of Assela Referral Hospital using a cold box and stored at -20°C until tested. All serum samples from respondents were screened for HBsAg, hepatitis B core antibody (total anti-HBc), and hepatitis B surface antibody (anti-HBs) using rapid diagnostic kits.

2.7 Ethical Considerations

The study was approved by the institutional review board (IRB) of the Adama Science and Technology University Department of Applied Natural Science (Ref.No ASTU/02/057/08). Participation in the study was fully voluntary and informed written consent was confirmed by the IRB. Participants were assured that information obtained in the course of the study would be kept confidential. All laboratory testing was performed free of charge and individuals positive for HBsAg or anti-HCV were managed by physicians.

2.8 Method of Data Analysis

To meet the objective set up on this study Bayesian logistic regression model and tests related are employed as a general methodology.

Bayesian logistic regression was used to make inference about the parameters of a logistic regression model. Bayesian inference for logistic regression analyses follows the usual pattern for all Bayesian analysis.

Likelihood contribution from the i^{th} subject is

$$L(\beta / data) = \prod_{i}^{n} \left(\frac{\exp(\beta_0 + \beta_1 X_{i1} + ,..., + \beta_p X_{iP})}{1 + \exp(\beta_0 + \beta_1 X_{iP} + ,..., + \beta_P X_{iP})} \right)^{y_i} \left(1 - \frac{\exp(\beta_0 + \beta_1 X_{iP} + ,..., + \beta_P X_{iP})}{1 + \exp(\beta_0 + \beta_1 X_{iP} + ,..., + \beta_P X_{iP})} \right)^{(1-y_i)} \quad (1)$$

A critical feature of any Bayesian analysis is the choice of a prior. If the posterior is highly dependent on the prior, then the data (likelihood function) may not contain sufficient information. However, if the posterior is relatively stable over a choice of prior, then the data indeed contains significant information. The most common priors for logistic regression parameters have the form $\beta_j \sim N(\mu_j, \sigma_j^2)$. Hence the normal distribution with mean μ_j and variance $\sigma^2{}_j$ is written as:

$$f(\beta_j) = \frac{1}{\sqrt{2\pi_j \sigma^2{}_j}} \exp\left(-\frac{1}{2} \left(\frac{\beta_j - \mu_j}{\sigma_j^2} \right)^2 \right) \quad (2)$$

Posterior distribution is:

$$f(\beta / y) = \prod_{i=1}^{n} \left[\left(\frac{\exp(\beta_0 + \beta_1 X_{i1} +, \ldots, + \beta_p X_{ip})}{1 + \exp(\beta_0 + \beta_1 X_{i1} + ,\ldots, \beta_p X_{ip})} \right)^{y_i} \right] \left[\left(1 - \frac{\exp(\beta_0 + \beta_1 X_{i1} + \ldots + \beta_p X_{ip})}{1 + \exp(\beta_0 + \ldots + \beta_p X_{ip})} \right)^{1-y_i} \right] \prod_{j=0}^{p} \frac{1}{\sqrt{2\pi\delta_j^2}} \exp\left\{ \frac{-1}{2} \left(\frac{\beta_j - \mu_j}{\sigma_j^2} \right)^2 \right\} \quad (3)$$

MCMC methods are attempted to simulate direct draws from some complex distribution of interest. Markov Chain Monte Carol (MCMC) methods [7,8] enable the drawing of samples from the joint posterior distribution of the model parameter. The Gibbs sampler is implemented by using WinBUGS to solve approximate properties of the marginal posterior distributions for each parameter used.

3. RESULTS

The analysis has been performed for 1343 patients who were suspected for hepatitis B virus infection at Assela hospital with 10.9% reactive for HBV.

The Gibbs sampler algorithm was implemented with 30,000 iterations in three different chains, 10,000 Burn in terms were discarded, as to obtain 60003 samples from the full posterior distribution. The Bayesian approach of logistic regression shows that four predictor variables are statistically significant.

Table 1. Summary of the posterior distribution of the model parameter

Node	Estimated parameter (βˆ)	SE(β)	MC error	95% CI(βˆ)	
				Lower	Upper
b[1]. Frequent intake of alcohol chat/smoking cigarette/ or any other drugs	0.4135	0.1293	0.001008	0.1605	0.6661
b[2]. History of sexually transmitted disease	-0.2442	0.1708	9.537E-4	0.5783	0.08928
b[3]. Multiple sexual partner	-08981	0.1363	0.001021	-1.167	-0.6336
b[4]. Blood transfusion	0.1262	0.1121	7.087E-4	-0.09434	0.3885
b[5]. Abortion	-0.728	0.1393	7.846E-4	-1.002	-0.4544
b[6]. Dental extraction at health facility	0.1211	0.1986	0.001736	-0.2698	0.5097
b[7]. Circumcision	0.0674	0.1627	0.00155	-0.2496	0.3885
b[8]. Hospital admission	0.06372	0.1883	0.001352	-0.3073	0.4324
b[9] Surgical procedure	0.4135	0.1293	0.001008	-0.1605	0.6661
b[10] Venous or body piercing for treatment	0.3063	0.1147	0.00104	-0.08411	0.5329
b[11] Ear/ Nose piercing	0.0032	0.1993	0.001402	-0.1093	0.2024
b[12] Tattooing on body	-0.0412	0.1828	9.527E-4	-0.4703	0.08523
b[13] Tattooing on body/gum	0.0021	0.1883	0.00122	-0.1053	0.1024
b[14] Contact with jaundiced patient	0.00221	0.1753	0.00133	-0.1583	0.1254

Gibbs sampler algorithm with three simultaneous chain running provided time series plots and autocorrelation of each it in different colours to check convergence. The convergence of chain can be initially checked visually using trace plots and Monte Carol (MC) error in comparison to its posterior standard deviation.

The posterior summary estimated by the MCMC algorithm, epically by Gibbs sampler, like posterior mean, standard deviation, MC error, and 95% confidence intervals were estimated using Win-BUGE software are summarised in Table 1. The convergence especially, to have accurate posterior estimates the simulation should be run until the MC error for each parameter of interest is less than about 5% of its posterior standard deviation and hence evidence for accuracy of the posterior estimates in Bayesian logistic regression is accomplished. If MC error value is low in comparison to its posterior standard error, then the posterior density is considered to be estimated with accuracy.

In Table 1, MC error for each significant predictor is less than 5% of its posterior standard deviations. This implies convergence and accuracy of posterior estimates are attained and the model is appropriate to estimate posterior statistic.

The predictor variables given in Table 1 frequent intake of alcohol chat/smoking cigarette/ or any other drugs, history of sexually transmitted disease , multiple sexual partner, and abortion were statistically risk factors associated with prevalence of hepatitis B.

4. DISCUSSION

The study tried to provide the prevalence of HBV and related risk factors in suspected patients. This study has found that the prevalence were 10.9%. It was found that the frequent intake of alcohol chat/smoking cigarette/ or any other drugs, history of sexually transmitted disease, multiple sexual prater, and abortion had a significant effect on the status of HBV infection. Higher prevalence rates were found as compared to related study in different part of the world. For example, Lower prevalence found in Hawaii, United State of America with reported prevalence rate of 3.6% HBV [9]. Awareness level of communities about hepatitis B virus in the study area was low (44.9%) and this may result for high prevalence rate. In the present study conducted for 1343 patients who were suspected for hepatitis B virus infection, 10.9% were positive for HBsAg (hepatitis B surface antigen) which is lower when compared with HBsAg (hepatitis B surface antigen) seropositivity (35.8%) which was reported

previously from Ethiopia may 2011 [10]. This study found among the risk factors associated with Hepatitis B included frequent intake of alcohol chat/smoking cigarette/ or any other drugs, history of sexually transmitted disease, multiple sexual prater, abortion, and these results are in line with research conducted by Lavanchy D [11] which suggested that younger age of sexual initiation and multiple sex partners are significant risk factors for the acquisition of Hepatitis B Virus. Sexual transmission has also been suggested to play a role in East Africa as demonstrated in the Ugandan study [12].

5. CONCLUSIONS

This study showed that HBV prevalence among 1343 patients who were suspected for hepatitis B virus infection was 10.9%. This showed high prevalence of hepatitis B surface antigen was obtained as compared with other studies and this may indicate the study area is exposed to the epidemic and it needs more attention. It is recommended that community based education should be conducted to raise the level of awareness of hepatitis B infection, together with transmission and prevention method. Awareness campaigns should be enhanced to increases the knowledge of the public on Hepatitis B infection with emphasis on its mode of transition and measures to reduce the risk of controlling the viruses (practicing safe sex and avoiding of sharing infection needles, tooth brushes, or shaving razors). The most effective means of preventing Hepatitis B infection is through vaccination, thus educational interventions are need to promote Hepatitis B screening and increase vaccination coverage.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rikabi A, Bener A, Al-Marri A, Al-Thani S. Hepatitis B and C viral infections in chronic liver disease: A population based study in Qatar. Eastern Mediterranean Health J. 2009;15(4):22-29.
2. Gregory A, Poland, Robert NJ. Prevention of hepatitis B with the hepatitis B vaccine. N Engl J Med. 2004;351(27):2832-2838.
3. Igor R, Evropi T, Harish N, Ana M, Harry C. Reducing the burden of maternal and neonatal infections in low-income settings. J Global. 2011;1(2):1211-1218.
4. Abel G. Sero-prevalence of HBV and HCV among chronic liver disease patients visiting OPD in public hospitals in Addis Ababa. ISRN 2012. 2013;563821:1-7.
5. Tsega E. Epidemiology, prevention and treatment of viral hepatitis with emphasis on new developments. Ethiop Med J. 2000;38:131-141.
6. Abebe A, Messel T, Dejene A, Enquselass F, Cutts F. Seroepidemiological study of hepatitis B virus in Addis Ababa, Ethiopia. Transmission Patterns and Vaccine Control. 2003;131:757-770.
7. Gelfand A, Smith A. Sampling based approach to calculating marginal densities. Journals of the American Statistical Association. 1990;85:389-409.
8. Geman S, Geman D. Stochastic relaxation, Gibbs distribution and the Bayestion restoration of images. IEEE Trans. Pattern. Anal. Mach. Intell. 1984;6:721-741.
9. Naoky CS, Peter SH, Linda LW, Aldrich AR. Seroepidemiology of hepatitis B virus infection: Analysis of mass sreening in Hawaii. Hepatol Int. 2008;2:478-485.
10. Abel G. Sero-prevalence of HBV and HCV among chronic liver disease patients visiting OPD in public hospitals in Addis Ababa. ISRN 2012. 2013;563821:1-7.
11. Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. J Viral Hepatitis. 2004;11:97–107.
12. FLok A, McMahon B. Chronic hepatitis B. Hepatol. 2007;45(2):507-539.

QUESTIONNAIRE

Dear Respondent,

This questionnaire is designed to investigate the Prevalence of Hepatitis B Virus and Related Risk Factors: A case Study at Assela Referral Hospital, Oromia, Ethiopia.

Participation in this survey is on a voluntary basis. Your information is very important for this study. Any information that you provide us will be kept strictly confidential.

Instruction for data collectors: For each question please write your answer or put a cross clearly inside one box, if you make a mistake; simply cross out the mistake and put a cross in the correct box.

Code: _____

PART ONE: CHARACTERISTICS OF THE RESPONDENTS

1. Age _____years old
2. Sex □ male □ female
3. Educational level □ elementary and less □ high School □ higher Education
4. Marital status □ single □ married □ divorced □ widowed
5. Religion □ orthodox □ catholic □ protestant □ muslim □ other
6. Accommodation □ living Alone □ not alone
7. Occupational status □ self employed □ student □farmer □ other(Specify)_____

PART TWO: RISK FACTORS ASSOCIATED WITH HBV

Have you have or ever practiced the following?

1. History of sexually transmitted disease □ Yes □ No
2. Multiple sexual prater □ yes □ No
3. Blood transfusion □Yes □ No
4. Abortion □ Yes □ No
5. Dental extraction at health facility □ Yes □ No
6. Circumcision □ Yes □ No
7. Hospital admission □ Yes □ No
8. Surgical procedure □ Yes □ No
9. Venous or body piercing for treatment □ Yes □ No
10. Ear/ Nose piercing □ Yes □ No

11. Tattooing on body/ gum □ Yes □ No

12. Contact with jaundiced patient □ Yes □ No

13. Frequent intake of alcohol, chat/smoking cigarette/or any other drugs □ Yes □ No

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