Sero-prevalence of Hepatitis B virus infection and associated factors among pregnant women attending antenatal care service in health institutions in Gedeo Zone, Southern Ethiopia

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Abstract

Background: Hepatitis B virus infection is a major public health problem worldwide which is a major cause of morbidity and mortality. This study aimed to assess the prevalence of hepatitis B virus infection and associated factors among pregnant mothers in Gedio Zone, southern Ethiopia.

Methods: Institutional based cross-sectional study was conducted in governmental and private health facilities in Gedeo zone from January to April 2019. The study participants were selected using stratified random sampling techniques. Eugene strip test was used to determine hepatitis B virus infection among pregnant mothers. The status of HIV was collected from the records. Other variables were collected from the mothers using interviewer administered questionnaires. Logistic regression was used for the analysis. Adjusted Odds Ratios and their 95% Confidence Interval were calculated to determine association between HBsAg Sero-positivity and various factors. A p-value less than 0.05 were considered as significant. The data was analyzed using the SPSS version 25 statistical software.

Results: Prevalence of hepatitis B virus among pregnant mothers was 9.2% in Gedio Zone. Previous birth at health institution [AOR=4.4, 95% CI: 1.7, 11.2], blood transfusions [AOR=4.4, 95% CI: 1.8, 10.5], previous history of Hospital admission [AOR=3.3, 95% CI: 1.5, 7.5], ear piercing practice [AOR=5.7, 95% CI: 1.1, 29.0], current Gestational age [AOR=3.6, 95% CI: 1.2, 11.2], and HIV status of the mother [AOR=6.1, 95% CI: 1.3, 30.0] had statistical significant association with HBsAg Sero-positivity.

Conclusions: Hepatitis B virus infection was found to have higher endemicity (9.2%) in the Gedio Zone. History of blood transfusion, hospital admissions, ear piercing, being HIV positive, gestational age and institutional delivery were significant predictors for HBsAg sero-positivity. Early initiation of antenatal care service that integrate awareness creation about the risks of hepatitis B infection and mother to child transmission of the disease must be implemented by the health facilities in Gedio Zone.

Introduction

Hepatitis B virus (HBV) is a hepatotropic deoxyribonucleic acid (DNA) virus which occurs through immune-mediated killing of infected liver cells [1]. It is a major blood-borne and sexually transmitted infectious agent, and poses a serious global public health problem which is approximately 100 times more contagious than human immunodeficiency virus (HIV) and is found in diverse populations and subpopulations [2-3]. HBV is transmitted mainly through parenteral or mucosal exposure to infected blood and body fluids, such as secretions or saliva, unsafe sexual intercourse; transfusion of HBV infected blood and blood products, usually either by a vertical or horizontal route early in life in highly endemic areas, resulting in a high rate of chronic infections [4.6].

Mother-to child transmission (MTCT) is one of the main transmission pathway and is responsible for approximately one-half of chronic hepatitis B (CHB) infection worldwide [7]. It is also associated with a high risk of maternal complications and has effects on both the mother (such as preeclampsia, placenta praevia, preterm delivery, placental separation, ante partum hemorrhage, preterm labor, increased

incidence of intra-ventricular hemorrhage, gestational diabetes mellitus) and child (leads to fetal and neonatal hepatitis and higher risk of developing chronic liver disease and cancer) [8-10].

Pregnant mothers who have been tested positive for both hepatitis B surface antigen (HBsAg) and hepatitis B e antigen (HBeAg) have 70–90% risk of transmitting infection to their newborn infants and about 10–40% risk if they test positive for only HBsAg. In endemic areas, where carrier rates are greater than 5%, perinatal transmission is common; especially when HBV infected mothers is also HBeAg positive [11-13]. Globally, 350 million people are chronic carriers. Of these, one million of them are expected to suffer serious illness and death from cirrhosis and hepatocellular carcinoma (HCC) and about 600,000 people die annually from acute or chronic complications of hepatitis B infection [14-16].

Africa has the second largest number of chronic carriers after Asia, and is considered a region of high endemicity ($\geq 8\%$) [16]. Although it is difficult to assess the exact burden of HBV in Africa, the Sero-prevalence of hepatitis B surface antigen (HBsAg) has been estimated to be in the range from 6% to 20% [17-18]. A higher prevalence 9.7%-16.6% was observed in other developing countries [19-22], while the prevalence of HBV in Ethiopia among pregnant women, have shown moderate endemicity, with the prevalence of HBsAg positivity ranging from 2.3%-7.9% [23-29]. Different factors such as having a history of blood transfusion, history of use of sharp materials, having multiple sexual partners, ear pricking, history of abortion, Place of delivery, practice of female Genital mutilation, history of tooth extraction cesarean section and tattooing were some of the major risk factors associated with HBVs Ag sero-positivity in previous studies in similar settings [23-34].

Since HBV infected pregnant women are at risk of infecting their babies, knowing magnitude of HBV status and its risk factors in the area is very important in preventing mother-to-child transmission and reducing the burden of the disease. However, in resource constrained settings such as in Ethiopia, laboratory diagnosis of HBV infection is not part of routine care in ANC of all health facilities which makes the detection of pregnant mothers with HBV difficult, which intern also make the intervention very difficult [35]. Observational community studies of serological markers of HBV infection have an important role in identifying population endemicity, and possible routes of transmission which could help in the development of appropriate control measures. Therefore this study intends to fill the limited information gap regarding the prevalence and associated factors of HBV among pregnant women in the southern part of Ethiopia specifically in Gedio Zone.

Methods

Design and study sites

This study was institutional based cross-sectional study conducted in selected health facilities in Gedio Zone Southern Nations and nationalities regional state, Ethiopia. The Zone has 1 referral hospital, 3 primary hospitals (Bule, Gedeb and Yerga Chefe), 38 health centres, 146 health posts, 4 NGO clinics and 17 reported privet health facilities.

Sample size determination and procedure

The sample size was determined using single population proportion formula. The sample size was calculated based on the following assumptions: 95% confidence interval (CI), Hepatitis B virus prevalence rate 3.5% [28], degree of precision of 1.75% and none-response rate of 10%. Finally, the calculated sample size was 479. The study participants were recruited using Stratified random sampling method from selected health institutions as indicated in (Figure 1).

Data collection

Data was collected from January to March 2019. The socio demographic characteristics, such as age, residence, employment status, level of education, and marital status were collected using interviewer administered questionnaire by trained health professionals. HBV infection was determined using Eugene strip test.

Laboratory analysis

Three milliliters of venous blood sample was collected using was collected with ethylene diamine tetra acetate (EDTA) anti-coagulated tube following standard operating procedure (SOP) by trained laboratory professional. Two supervisors controlled data collection process. The tubes were labelled and processed at the time of collection at Dilla University Teaching Hospital central Medical laboratory. Serum was separated by centrifugation at 3000 rpm for 10 min. Each serum was subjected to HBsAg antibody rapid test. (Manufacturer: Shanghai Eugene Biotech co., Ltd. Shanghai. China. Email: info@eugenebio.com.)

Data quality assurance

To ensure quality of data, the questionnaire was prepared in English language, translated to Amharic and Gediofa and translated back to English by other person who can speak all the three languages. Further the questionnaire was pre-tested and field editing was done to ensure completeness and correctness of data. Pre-test was conducted on 5% of total sample size in Bule primary hospital which was not included in this study. Collected data was checked daily for consistency and accuracy. Standardized procedures were strictly followed during blood sample collection, storage.⁴⁰ Two supervisors controlled data collection process. Testing for surface antigen was performed by senior laboratory technologist. Known positive and negative samples were run to control the quality of HBsAg kit as external quality assurance.

Data processing and analysis

Data was entered into Epi-Data version 3.1 and transferred to SPSS version 25 for analysis. Binary and multivariable logistic regression analyses were used to determine the association between explanatory variables and the outcome variable using odds ratio at 95% CI. Predictor variables with P-value <0.25 in the bivariate analysis were candidates for the multivariable logistic regression model. Adjusted Odds Ratios and their 95% Confidence Interval were calculated to determine association between HBsAg Sero-

positivity and various factors. A p-value less than 0.05 were considered as significant. The Hosmer-Lemeshow test was used to check the overall model fitness.

Results

Socio-demographic characteristics

As shown in (Table 1), majority of the mothers interviewed 411(85.8%) were married and more than two third of the respondents 185(38.6%) have primary education. More than half of the participants 245(51.1%) were housewives while 265(55.3%) of the mothers were rural residents. Age between 26 and 30 years was the dominant maternal age group with 151(31.5%) while mothers older than 35 were only 23(4.8%).

Obstetric factors

Regarding the obstetrics history of the mothers, 121(25.3%) had no previous birth history, while the rest 358(74.7%) reported that they have multiple pregnancies. Out of 479 pregnant women those who are on the first trimester were 99(20.7), and almost half of the pregnant women 245(50.5%) are on the second trimester while the rest are on the third trimester. It was assessed that 32(6.7%) of the pregnant women had a history of abortion in the past. Among 479 respondents those mothers history of home delivery was 103(21.5%) and history of institutional delivery had 255(52.2%).

Prevalence of Hepatitis B virus among ANC following pregnant mothers

The prevalence of HBV among pregnant mothers, who are on ANC follow-up in Gedio Zone, was 9.2% during study period.

Bivariate and Multivariable Analysis

During the bivariate analysis history of blood transfusion, previous history of Hospital Admission, previous history of abortion, Gestational age, previous place of birth, age of the pregnant Women, and HIV status of the pregnant women have a significant association with HBV status of the pregnant women. As indicated candidate in (table 1) variables with P value <0.25 were candidates for the multivariate logistic regression analysis. In the final analysis women with previous history of blood transfusion, previous history of hospital admission, previous place of birth, ear piercing practice, Current gestational age and HIV status of the pregnant women were significant factors that determine, Sero-prevalence of Hepatitis B virus of pregnant women in Gedeo zone in the multivariable logistic regression.

Table 1. Bivariate and Multivariable logistic analysis of HBV among pregnant women in Gedeo Zone, Southern, Ethiopia

Variable	HBV		COR	P value	AOR	P value
	Positive	Negative				
Blood transfusion						
No	31	398	1			
Yes	13	37	4.5 (2.2-9.4)	<0.001	4.4(1.8-10.5)**	0.001
Hospital Admission						
No	27	373	1		1	
Yes	17	62	3.8(2.0-7.4)***	<0.001	3.3 (1.5-7.5)*8	0.004
Body tattooing						
No	37	332	1		1	
yes	7	103	0.6 (0.3-1.4)	0.247	0.6 (0.2-1.6)	0.307
History of ear piercing						
No	2	60	1			
Yes	42	375	3.4 (0.8-14.2)	0.1	5.7 (1.1-29.5)*	0.038
History of abortion						
No	37	410	1		1	
Yes	7	25	3.1 (1.3-7.7)	.014	2.3 (0.8-6.6)	0.124
Residence						
Rural	29	236	1		1.5 (0.7-3.1)	0.312
Urban	15	199	0.6 (0.3-1.2)	.141	1	
Gestational age						
First trimester	15	84	1	1	3.6 (1.2-11.2)*	0.025
Second trimester	22	220	3.3 (1.3-8.5)	0.012	1.9 (0.7-5.3)	0.224
Third trimester	7	131	1.9 (0.8-4.5)	0.162	1	
Place of birth						
No Birth	9	112	1	1	1	
Health Institution	22	81	3.4 (1.5-7.7)	0.004	4.4 (1.7-11.2)**	0.002
Home	13	242	0.7 (0.3-1.6)	0.369	0.7 (0.3-1.8)	0.408
HIV status						

Negative	39	427	1			
Positive	5	8	6.8 (2.1-21.9)	0.001	6.1 (1.3-30.0)*	0.025

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In the multivariable logistic analysis after controlling for the cofounders, previous history of blood transfusion [AOR=4.4, 95% CI: 1.8, 10.5], previous history of Hospital admission [AOR=3.3, 95% CI: 1.5, 7.5], ear piercing practice [AOR=5.7, 95% CI: 1.1, 29.0], current Gestational age [AOR=3.6, 95% CI: 1.2, 11.2], and HIV status of the mother [AOR=6.1, 95% CI: 1.3, 30.0] were significant factors associated with HBV infection among pregnant women in Gedio Zone. The multivariable logistic analysis also showed that, pregnant mothers who previously delivered in Health Institutions were, 4.4 [AOR=4.4, 95% CI: 1.7, 11.2] times more likely to develop HBV, than mothers who never previously gave birth.

Discussion

To indicate the prevalence and endemicity of HBV active infection in the general population, surface antigen (HBsAg) is used as the main marker in a particular geographical area ⁴³. In this study area, the overall Sero-prevalence of HBsAg among pregnant women was 9.2 % which is considered as high endemicity area, (with sero-positivity $\geq 8\%$ sero positive), based on WHO classification criteria of endemicity of HBV infection [16].

The prevalence was highest across the country to the researchers' knowledge. Previous studies in different regions of Ethiopia reported lower proportions, from the lowest prevalence (3.7 %) in Jimma town to the highest (8.4%) in Dire Dawa [23-29]. Yet, the finding was lower than findings reported by other developing countries, with 8% in Mali [19], 9.7% in Cameroon [20], 10.8% in Yemen [21], 11.8 % in Uganda [22], and 16.6% in Nigeria [23]. The observed discrepancies in the magnitude of HBV prevalence across different geographical location might be due to variation in socio-demographic characteristics of the study population such as socio-cultural, environmental and tribal practices. Moreover, the variation in diagnosis methodologies, level of awareness, and the quality and access to antenatal care service provision might add to the difference.

Blood transfusion is a well-established risk factor for HBsAg. Pregnant women in Gedio Zone, with previous history of blood transfusion were 3.3 [AOR=3.3, 95% CI: 1.5, 7.5] times more likely to be infected with HBV than women who had no history of blood transfusion. The result is in accordance with the previous studies [28, 30-31].

In this study, previous History of hospital admission [AOR=3.3, 95% CI: 1.5, 7.5] and previous delivery in Health Institutions [AOR=4.4, 95% CI: 1.7, 11.2] were associated with HBV among pregnant women. This might be due to poor infection prevention practices among the health facilities during Hospital admission and delivery. previously hospital admissions was one of the predictor in other previous findings [32-33]

but the result of the place where previous delivery taken place which was different from the finding in Atat Hospital in Wolkite [32] where previous history of home delivery was a risk factor. The difference might be associated with variations in poor practices of infection prevention at health facilities, in sample size and study period

HIV status of the pregnant women was another determinant of HBV infection in this study. Pregnant women with HIV infection were 6.1 [AOR=6.1, 95% CI: 1.3, 30.0] more likely acquire HBV infection than women who had no HIV infection. This result is consistent with other studies [21, 30]. Since Ethiopia is categorized as a country with high HIV burden [39] and high HBV endemic area [39] the possibility HBV/HIV co-infection is very much anticipated. Moreover, it was reported that co-infection of HIV/HBV could greatly facilitates HBV replication and reactivation leading to higher HBV-DNA levels and a reduced spontaneous clearance of the virus [40].

Compared to women in the third trimester, pregnant women in the first trimester were more likely to be infected with HBV. This finding may have an implication on the early initiation of ANC service for pregnant mothers. Since, community transmission is possible through different routes such as ear piercing practice another prognostic factor which apparent in this study, early initiation of ANC service is critical to identifying the risk of HBV infection to the mother as well as to the baby to prevent mother to child transmission and to manage complications earlier [36]. Earlier screening of pregnant mothers during their antenatal care visits to health facilities for HBV has a significant relevance for identifying the risk of HBV infection.

Conclusions

Higher prevalence (9.2%) of HBV infection was detected in the study area. Our study illustrated that Sero-prevalence of HBV infection was significantly associated with HIV positive status, having a history of blood transfusion, previous institutional delivery, hospital admission, being in the first trimester and ear piercing practice were independent predictor of HBV infection in ANC following pregnant women in Gedeo Zone southern Ethiopia.

To reduce the Sero-prevalence of HBV infection in Gedio Zone, health education on the risk of HIV, home delivery, unsafe ear piercing practices and safety issues during admission to hospitals is needed at Zonal level and health facility level. At national level, screening all pregnant women for hepatitis B virus should be made as part of routine antenatal care service.

Declarations

Acknowledgement

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Disclosure

The authors declare that they have no competing interests.

Ethical consideration

Ethical approval of this study was approved after review by the “Dilla University Institutional Research and Ethical review board” and the research was carried out only after ethical letter was obtained with Protocol Unique number **009/19-01**. Consent form, was provided to all participants and the purpose and importance of the study was explained to each study participants. To ensure confidentiality of participant’s information, codes were used instead of names of the participant. Participant were interviewed alone to keep the privacy. All participants did not pay for the test. Voluntary Participation was clearly stated explained to all the participants that they can choose to participate or not before the study.

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Figures

Figure 1

Procedure for selecting study participants from the health institutions