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Research Article

Seroprevalence of Hepatitis B Virus and Associated Factors among Pregnant Women Attending Ante Natal Care services at Nekemte Town Public Health Facilities, Ethiopia

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ABSTRACT

Background: Viral hepatitis is an emerging global health problem. A pregnant woman infected with the Hepatitis B virus has a high rate of vertical transmission, causing adverse fetal and neonatal outcomes. Understanding the magnitude of the problem and associated factors has paramount importance to avert such adverse fetal and neonatal outcomes. So, the main aim of this study was to assess the Sero-prevalence of hepatitis B virus and associated factors among pregnant women attending antenatal care clinics at Nekemte town public health facilities.

Methods: Institutional based cross-sectional study was conducted among 277 pregnant women attending Antenatal Care at Nekemte town public health facilities from June 1 to July 30, 2020. All public health institutions in Nekemte town (two hospitals and one health center were taken and the study participants were selected by using a systematic sampling technique. The data were collected using pretested and structured questionnaires using a face-to-face interview and a blood sample was collected to test for hepatitis B surface antigen. Logistic regression analysis was employed to identify factors significantly associated with hepatitis B virus infection. Variables with a p-value <0.05 were considered statistically significant predictors of the outcome variable.

Results: The overall Sero-prevalence of Hepatitis B Virus infection was 16 (5.8%) [95% CI: 3.2-8.7] which indicates intermediate endemicity. History of abortion (AOR=6.155; 95% CI: 1.780, 21.291), history of contact with hepatitis patient (AOR=7.178; 95%CI: 1.702, 30.279), and having multiple sexual partners (AOR=6.788; 95%CI: (1.701, 27.086) had a statistically significant association with hepatitis B surface antigen Sero-positivity. **Conclusion:** Hepatitis B Virus Seroprevalence among pregnant women in this study shows intermediate endemicity. Therefore, health education on the risk of having multiple sexual partners, unprotected contact with hepatitis patients, and abortion should be given.

Keywords: Hepatitis B virus, Pregnant women, Seroprevalence, Antenatal care, Hepatitis

ABBREVIATIONS

ANC: Antenatal Care; ELISA: Enzyme-Linked immune-sorbent Assay; HBsAg: Hepatitis B surface Antigen; HBV: Hepatitis B Virus; HIV: Human Immune Virus; STI: Sexually Transmitted Infections.

BACKGROUND

Hepatitis is an inflammation of the liver that is affecting millions of people per year. The most common and serious form of viral hepatitis is Hepatitis B virus (HBV) [1] causing acute and chronic infection of the liver [2,3]. Being a major cause of chronic hepatitis, the hepatitis B virus can lead to cirrhosis and hepatocellular carcinoma. Due to largely its asymptomatic nature, most people are unaware of their infections. Hepatitis B surface antigen (HBsAg) is the serologic hallmark of HBV infection, and the presence of this antigen establishes the diagnosis of hepatitis from HBV [4]. However, it is one of the vaccine-preventable diseases and it has a safe and effective vaccine [2].

Hepatitis B virus is extremely infectious (about 100 times as infectious as HIV). HBV infection can progress into a chronic

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infection in about 80-90% of infants infected during the first year of life and 30-50% of children infected before the age of 6 years. Moreover, 15-25% of adults who become chronically infected during childhood go on to develop hepatitis B-related liver cancer/cirrhosis. Hence, chronicity is much more to be expected to develop in individuals infected as infants and young children when compared to individuals infected during adulthood [5] while all patients with chronic hepatitis are at increased risk of progression to cirrhosis and hepatocellular carcinoma [6].

More than 300 million people have chronic liver infections and about 600,000 people die each year from acute or chronic complications of hepatitis B infection globally [7]. The prevalence of chronic HBV infection among the adult population is highest in Sub-Saharan Africa and East Asia which was 5 and 10 percent respectively [3], whereas, in the other African region and Western Pacific, it was 6 percent [8]. In Ethiopia, the study shows that chronic HBV infection is 7.4 percent among the population and 4.7 percent among pregnant women [9].

Reproductive age women can potentially transmit hepatitis B infection to their babies [10] most commonly during childbirth [3,9]. The vertical transmission also remains the most frequent route of transmission, particularly in endemic areas where up to 20% of women of childbearing age may have HBV and approximately one-third of these are responsible for chronic HBV infection [11]. Exposure to contaminated blood or body fluids, unprotected sexual intercourse, blood transfusion, use of contaminated sharp materials [12] and body tattooing are associated with HBV infection as well [10].

World Health Organization (WHO) recommends routine screening of pregnant women attending antenatal care (ANC) for HBV and administration of immunoglobulin and vaccine within 12 hours of birth for infants born to HBV positive mothers. Even though, the program is crucial in minimizing the risk of HBV among newborns, the major part of HBV spread is also left with contact networks of the infected mothers [13].

In Ethiopia, a screening program for pregnant mothers is being implemented in public health facilities at Antenatal care points. However, the program is fragmented, not running regularly, and post-exposure prophylaxis is lacking. The absence of a regular HBV screening program could be partly explained by a lack of awareness of the overall burden and associated factors of hepatitis B among pregnant women in Ethiopia by health professionals and policymakers. Determining the seroprevalence and associated factors of hepatitis B infection in different geographical settings becomes most important to design and implement appropriate preventive measures. So, the main aim of this study was to assess the seroprevalence of the hepatitis B virus and associated factors among pregnant women attending antenatal care clinics at Nekemte town public health facilities.

METHODS

Study Area and Period

An institution-based quantitative cross-sectional study was conducted in Nekemte town public health facilities from June to July 2020. Nekemte town is found at East Wollega Zone, Oromia regional state, West of Ethiopia at a distance of 328 kilometers from Addis Ababa. Total catchment area population who are getting service from Nekemte town health facilities are about 1,902,380 (Male 998,333 and female 904,047). Nekemte public health facilities include Nekemte specialized hospital, Wollega University referral and teaching hospital, and Nekemte health center. Both hospitals are tertiary level hospitals, and have different departments that provide specialized services in outpatient, inpatient, and operation theatre departments. All health facilities provide care for pregnant mothers widely in ANC, intrapartum and postpartum periods. Being one of the most important routine investigations, HBV screening is expected to be done for all pregnant mothers attending antenatal care, but free vaccination is not started yet in the study area.

Population

All pregnant women visiting ANC clinic at public health facilities in Nekemte town were the source population while all pregnant women who visited ANC at public health facilities of Nekemte town during the study period were the study population for the study.

Eligibility criteria

Women who were having antenatal care follow-up at public health facilities in Nekemte town during the study period were included in the study. Pregnant women who required urgent intervention and/or pregnant women who were vaccinated for HBV were excluded from the study.

Sample Size Determination and Sampling Procedure

The sample size was calculated based on the single population proportion formula considering the 6.3% seroprevalence of hepatitis B infection from the study conducted in Harar city, Ethiopia [2], 95% CI, and the 3% precision which is half of the HBV infection prevalence because the prevalence is going to be less than 10% [14]. From this, the sample size was calculated as below;

$n= (Z\alpha/_2)^2 p (1-p)$ d2

n= (1.96)2 * 0.063(1-0.063)

0.0009

n = 3.8416 * 0.059031 = 252

0.0009

By adding a 10% non –response rate, the final sample size became 277.

In order to select the study participants, first, all the three public health facilities in Nekemte town (two hospitals and one health center) were considered to be included in the study. Depending on the past two months average of ANC follow-ups registered on the ANC registration book, the calculated sample size was proportionally allocated to each health facility. Then, the sampling interval (K) was calculated and made equal since the sample size was proportionally allocated to all public health facilities. After all, the final study participants were selected by using a systematic random sampling technique following the random selection of the first pregnant mother by lottery method.

Measurements

In this study, seroprevalence is defined as the proportion of pregnant women with hepatitis B surface antigen-positive status attending ANC at Nekemte public health institution during the study period. Seropositive is defined as the presence of hepatitis B surface antigen in the serum among pregnant women attending ANC at Nekemte public health institution during the study period.

Sero-negative is defined as, the absence of the hepatitis B surface antigen in the serum among pregnant women attending ANC at Nekemte public health facility during the study period. Household contact with hepatitis patients is defined as, the presence of unprotected contact with positive HBsAg in the family among pregnant women attending ANC during the study period.

Data Collection Tools and Procedures

To collect the data, the questionnaire was adopted from WHO guidelines and similar literature. Data collection was implemented through a face-to-face interview by using pretested structured questionnaire consists of socio-demographic and economic characteristics, health care delivery system-related factors, traditional practices, and behavioral related factors. A blood sample test was designed to collect the result of HBsAg from study participants by requesting a laboratory investigation paper. One day of training was given for four BSc midwifery nurses for data collection, four laboratory technicians for sample collection and testing the blood for HBV, and two BSc nurse supervisors for both hospitals and health centers.

Specimen Collection and Processing

Five milliliters of venous blood were drawn under aseptic conditions in disposable vacutainer tubes by trained laboratory personnel. These tubes were labeled with the participant's code. The blood was centrifuged at 3000 revolutions per minute (RPM) for at least 10 minutes at room temperature. Then serum was separated by a pasture pipette carefully not to include cell parts. The rapid test was performed to deliver the result of the pregnant women at the time of screening. The leftover serum was separated and collected in Eppendorf tubes, stored at -20°C [10].

Data Quality Assurance

To ensure the quality of data, the questionnaires that developed in English were translated into the local language (Afan Oromo) and again translated back to English by a bilingual expert. To make sure that the questionnaire is appropriate and understandable; it was pre-tested on 5% of pregnant women at Sire primary hospital before the actual data collection was conducted. The collected data were checked daily for consistency and accuracy. The training was given to supervisors and data collectors about data collection techniques. Standardized operational procedures were strictly followed during pre-analytical, analytical, and post-analysis. Finally, the positive result by rapid test kit was rechecked by ELISA in Nekemte blood bank.

Data Processing and Analysis

The collected data were checked for completeness and consistency. It was also coded and entered into Epi data version 3.1, and then exported to SPSS version 24.0 for data cleaning and analysis. Frequencies and summary statistics were used to describe the study population about relevant variables. Binary logistic regression was done to identify candidate variables for multivariate logistic regression. All variables that have an association on bivariate analysis at a liberal P-value of < 0.2 were considered for inclusion in the multivariate logistic regression model. Then, the multivariate logistic regression was done to control the confounding effect of other variables and to identify independent factors influencing the hepatitis B infection among pregnant women. The magnitude and direction of the relationship between the variables were expressed as odds ratios (OR) with 95%CI and P-value < 0.05 was used to declare the statistical significance. Model fitness was checked by using Hosmer-Lemeshow's test at a P-value of >0.05 and multicollinearity check was also carried out.

RESULTS

Socio-Demographic Characteristics

A total of 277 pregnant women attending ANC services in Nekemte town public health facilities were involved in the study, making a response rate of 100%. The age of the respondents ranged from 18 to 40 years with a mean of 25.88 years ± 4.782 standard deviations (SD). One hundred nineteen (43%) of the respondents were within the age group of 18-24 years. The majority of 237 (85.6%) of the respondents were urban dwellers. Regarding the ethnicity of the respondents, 228 (82.3%) were Oromo. Two-third of the respondents, 181 (65.3%) were followers of the Protestant religion, followed by orthodox 64 (23.1%) and Muslim 32 (11.6%). About two-fifths 106 (38.6%) of the respondents were not employed. The majority of the respondents were married 270 (97.5%). Only ten (3.6%) respondents have no formal education, and 121 (44%) of them had completed education at college or University. More than half of the respondents 154 (55.6%) have a monthly income of greater than 1500 Ethiopian Birr (ETB) (Table 1).

Obstetric and Other Health Services Related Factors

Almost all, 265 (95.7%) of the respondents have no history of blood transfusion. Similarly, about three out of four, 213 (76.9%) respondents have no history of hospital admission in their lifetime. More than three forth, 215 (77.6%) of the study participants have no history of abortion while the majority of them had first pregnancy 114 (41.2%), followed by second pregnancy 93 (33.6%). One hundred twenty (43.3%) of the study participants were attending antenatal care in the second trimester whereas half of the participants had a history of previous delivery at the health institutions (Table 2).

Traditional Practice and Behavioral Related Factors

Of the total of 277 study participants, 62 (22.4%), 205 (74%), 260 (93.9%), 20 (7.2%), and 21 (7.6%) of them have a history of body tattooing, history of female genital mutilation, history of ear piercing, history of having multiple sexual partners, and contact with HBV patient respectively (Table 3).

Prevalence of HBV infection

From the 277 study participants, the prevalence of HBsAg was 16 (5.8%) [95% CI: 3.2-8.7]. Positive samples were repeated by ELISA and all of them were positive again confirming no discordant result and no false positive in the rapid test kit (Figure 1).

Associated Factors for Hepatitis B Virus Infection

In the binary logistic regression, age, educational status, place of residence, income level, history of contact with hepatitis B virus patient in the family, abortion, and history of multiple sexual partners had a significant association with the hepatitis B infection. However, only the three variables meaning the previous history of contact with hepatitis B virus patient in the family, abortion, and having a history of multiple sexual partners were significantly associated with the hepatitis B virus infection in both bivariate and multivariate logistic regression.

Pregnant women having a history of contact with hepatitis B virus patients in a household were 7.2 times (AOR=7.178; 95%CI: 1.702,

Table 1: Socio-demographic characteristics of the pregnant women attending antenatal care at Nekemte town public health facilities, Ethiopia 2020 (n=277).

Variables	Categories	Frequencies	Percentage
Age in years	18-24	119	43
	25-30	112	40.4
	>=31	46	16.6
Marital status	Single	7	2.5
	Married	270	97.5
Residence	Urban	237	85.6
	Rural	40	14.4
Ethnicity	Oromo	228	82.3
	Amhara	27	9.7
	Guraghe	22	7.9
Religion	Protestant	181	65.3
	Orthodox	64	23.1
	Muslim	32	11.6
Average monthly income in Ethiopian Birr	<500	14	5.1
	500-1500	109	39.4
	>1500	154	55.6
Occupation	Self employed	83	30
	Government employed	58	20.9
	Private employed	30	10.8
	Not employed	106	38.6
Educational status	No formal education at all	10	3.6
	Primary education	58	20.9
	Secondary education	88	31.8
	College and above	121	43.7

Table 2: Obstetric and other health service related factors among pregnant women attending antenatal care in Nekemte town public health facilities, Ethiopia, 2020 (n=277).

Variables	Categories	Frequencies	%
Number of pregnancy/gravidity	First	114	41.2
	Second	93	33.6
	Three and above	70	25.3
Gestational age	1st Trimester	67	24.2
	2nd Trimester	120	43.3
	3rd Trimester	90	32.5
Place of delivery	Home	22	7.9
	Health Institution	142	51.3
History of abortion	No	215	77.6
	Yes	62	22.4
History of blood transfusion	No	265	95.7
	Yes	12	4.3 4
History of hospital admission	No	213	76.9 4
	Yes	64	23.1
History of surgical procedure	No	244	88.1
	Yes	33	11.69
History of tooth extraction	No	183	66.1
	Yes	94	33.9

Table 3: Traditional and behavioral related factors of HBV among pregnant women attending antenatal care in Nekemte town public health facilities, Ethiopia, 2020 (n=277).

Variables	Categories	Frequencies	Percentage
Body tattooing	No	215	77.6
	Yes	62	22.4
History of female genital mutilation	No	72	26
	Yes	205	74
History of ear piercing	No	17	6.1
	Yes	260	93.9
History of traditional tonsillectomy	No	249	89.9
	Yes	28	10.1
History of multi-sexual partner	No	257	92.8
	Yes	20	7.2
History of contact with HBV patient	No	256	92.4
	Yes	21	7.6

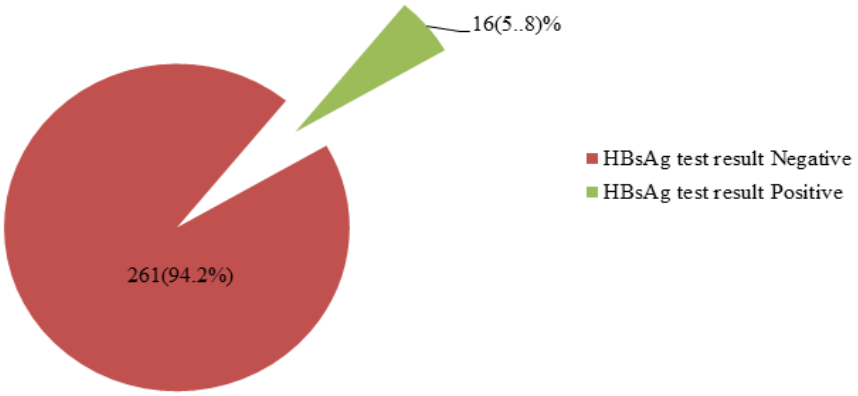

Figure 1: Prevalence of Hepatitis B virus among pregnant women attending Antenatal care at Nekemte town public health facilities, Ethiopia, 2020 (n=277).

Table 4: Multi-variable logistic regression of factors associated with the HBV infection among pregnant women attending antenatal care at Nekemte town public health facilities, Ethiopia, 2020 (n=277).

Variables	Category	HBs Ag test result		COR with 95% CI	AOR with 95%CI
		Negative (N, %)	Positive (N, %)		
Age in years	18-24	111 (93.3)	8(6.7)	0.757 (0.216, 2.646)	1.000 (0.211,4.737)
	25-30	108 (96.4)	4 (3.6)	0.389 (0.093,1.627)	0.286 (0.048,1.724)
	>=31	42 (91.3)	4 (8.7)	1	1
Level of Education	No formal education	8 (80.0)	2 (20.0)	5.800 (0.969,34.722)	1.498 (0.166,13.504)
	Primary school	53 (91.4)	5 (8.6)	2.189 (0.608,7.884)	2.211(0.402,12.147)
	Secondary school	84 (95.5)	4 (4.5)	1.105 (0.288,4.238)	1.272 (0.245,6.589)
	College and above	116 (95.9)	5 (4.1)	1	1
Residence	Urban	226 (95.4)	11 (4.6)	1	1
	Rural	35 (87.5)	5 (12.5)	2.935 (0.962,8.955)	2.022 (0.504,8.122)
Income	<500	13(92.9)	1 (7.1)	1.897 (0.212,16.981)	1.040 (0.060,18.174)
	500-1500	100(91.7)	9(8.3)	2.220 (0.766,6.431)	1.605(0.431,5.974)
	>=1500	148(96.1)	6(3.9)	1	1
History of contact with HBV patient	No	245 (95.7)	11(4.3)	1	1
	Yes	16 (76.2)	5 (23.8)	6.96 (2.156, 22.468)	7.178 (1.702,30.27)*
History of abortion	No	208 (96.7)	7 (3.3)	1	1
	Yes	53 (85.5)	9 (14.5)	5.046 (1.796-14.172)	6.155 (1.78,21.291)*
Multiple	No	247 (96.1)	10 (3.9)	1	1
sexual partner	No	247(96.1)	10(3.9)		
	Yes	14 (70.0)	6 (30.0)	10.586 (3.364,33.313)	6.788(1.701,27.086)*

AOR: Adjusted Odds Ratio, CI: Confidence Interval, COR: Crude Odds Ratio

30.279) more likely infected by HBV than their counterparts. The study also showed that the pregnant women who had a previous history of abortion were 6 (AOR=6.155; 95% CI: 1.780, 21.291) times more likely to develop HBV infection than those who had no history of abortion. The study revealed that pregnant women who have a history of multiple sexual partners were about seven (AOR=6.788; 95%CI: (1.701, 27.086) times more likely to acquire HBV compared to those pregnant women with no history of multiple sexual partners (Table 4).

DISCUSSION

In this study, the overall Seroprevalence of HBV positivity among pregnant mothers attending ANC services in Nekemte town public health facilities was 16 (5.8%) [95%CI: 3.2-8.7]. According to the WHO classification, the prevalence of HBV infection in this study area can be categorized as an intermediate endemicity (2%-7%) [10]. the prevalence found in this study was almost similar to the findings of the study conducted in Jimma (3.7%) [15], in Debra-Tabor Hospital (5.3%) [16], in Bahir Dar, northwest Ethiopia (4.7%) [17], Harar city (6.3%) [2], and the study conducted in Deder town, Eastern, Ethiopia (6.9%).

In contrary to the current study, the high prevalence was reported from a study conducted in Gambella (7.9%) [7], a study conducted in Hawassa ((7.8%) [18], a study conducted in Nigeria (19.5%) [19], and the study conducted in the Gambia (9.2%) [20]. The present study is higher than the study conducted in developed nations like; the USA (<2%) (13), Germany (0.48%) [21], Norway (0.1%) [22], and Switzerland (1.2%) [23]. The low prevalence might be because of the good screening of pregnant women for HBsAg and the availability of vaccines in the aforementioned developed countries.

The variations in seroprevalence in Ethiopia and somewhere else might also be attributed to the differences in the geographical locations, socioeconomic status, cultural and behavioral practices toward the risk of HBV infection, and health-related factors. Other reasons for the differences observed might be due to the differences in the level of awareness of the routes of transmission among the population, methodological differences among the studies, and sampling variability. It might also be due to the potential variability in sensitivity and specificity of the commercially available test kits used in each study.

The current study revealed that pregnant mothers who have a history of multiple sexual partners were seven times more likely to be infected with HBV compared to their counterparts. Although this finding is inconsistent with the study conducted in Bishoftu General Hospital which stated that sexual intercourse would have less probability of the transmission of HBV infection [24], it is supported by previous studies evidencing that acquisition of HBV infection is significantly higher among pregnant women who involved in multiple sexual practices [2,7,25]. This is because that having multiple sexual partners and unprotected sexual intercourse are closely related to STI leading to the HBV infection easily. In this regard, sexual contacts serve as a mode of transmission as blood, semen, and other body fluids are a common source of hepatitis B Virus infection.

In this study, pregnant mothers who experienced a previous history of abortion were 6 times more likely to be positive for HBsAg than their counterparts. Similar results were reported from a study conducted in Jimma [15], Arba Minch [26], Deder hospital [4], and Dessie, Ethiopia [27]. Poor practices of infection prevention control during an abortion, contaminated instruments used during the procedure, and related activities are the possible reasons that might increase the probability of acquiring HBV infection.

In this study, the odds of having hepatitis B virus infection among the pregnant women who had a history of contact with hepatitis patients in the family were 7.2 times higher than their counterparts. This finding is consistent with other reports indicating that the risk of HBV transmission is higher among people in contact with chronically infected HBV subjects [16,19,28]. This might be due to unprotected contact during care for individuals, and a lack of awareness in the mode of prevention. The risk of infection is increased among unvaccinated children living with a chronic HBV infected person in a household or an extended family.

In this study, the educational status of the pregnant women showed no significant association with HBV infection in contrast to the study reports from Nigeria and southern Ethiopia [10,29]. Also, no statistically significant difference was observed across various age groups in this study. However, this one agrees with the research finding from the study conducted in Bahir Dar [17], and Debretabor [16].

Contrasting the previous reports that showed the previous history of tooth extraction, blood transfusion, body tattooing, and surgical application as the risk factors for HBV transmission [2,16,17], those expected risk factors (tooth extraction, blood transfusion, surgical procedures, history of admission and body tattooing) have no statistically significant association with seropositivity for HBsAg in this study. The result is in agreement with previous studies conducted in other parts of Ethiopia [4,7,10,30]. Nevertheless, contradicted results were reflected from a study conducted in Harar city and Bahirdar [2,17]. A possible reason for this discrepancy might be due to differences in sample size, variation in the study period, or substandard infection prevention control measures.

Limitation of the Study

The study doesn't include private health facilities and a small sample size due to resource constraints and laboratory setup. There may be some biases to give accurate information when the interviewer asks about past exposures. There were also social undesirability concerns due to some sensitive questions such as a report on sex partners.

CONCLUSION

The findings of this study showed that the magnitude of HBsAg seropositivity is 16 (5.8%) [95%CI: 3.2-8.7]. This shows almost medium endemicity of HBV infection according to WHO criteria. Having a history of family contact with hepatitis patients, having a history of multiple sexual partners, and a previous history of abortion had a statistically significant association with the outcome variable.

As a result, screening pregnant women for HBV regardless of the basis of risk factors and developing a strong prevention strategy targeting this group may reduce mother-to-child transmission of HBV infection. Special emphasis should be given to screening pregnant women who have risk factors like; having contact with hepatitis patients, those having multiple sexual partners, and those having a history of abortion. Also, further large-scale studies should be done to ensure the independent forecaster of HBV infection.

DECLARATIONS

Ethical Considerations

Ethical approval of the study was obtained from the Wollega University, institute of health sciences, ethical review board. The cooperation letter was obtained from the hospital and health center administration. Written consent was obtained from the study respondents after informing the purpose and importance of the study to participants. To ensure confidentiality of participant's information, codes were used whereby the names and any identifier of the participants were not written on the questionnaire. All participants were not paid for the test. Voluntary Participation clearly stated that they can choose to participate or not, and they can still receive all the services they usually do if they choose not to participate. Test results were given to the clinicians who were working in the ANC clinic for further diagnosis and management. For the HBV positive results found during the investigation, management opportunities were arranged.

AVAILABILITY OF DATA AND MATERIALS

The data sets used and analyzed for the current study are available from the corresponding author on reasonable request.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTEREST

The authors declare that they have no competing interests

FUNDING

There was no funding obtained for this study.

AUTHORS' CONTRIBUTIONS

SE, GK, and AT were involved in all components of this research, including conception, design, and supervision of data collection, data analysis and write-up of the manuscript. SE was involved in designing the methodology part. AT prepared and revised the manuscript. All authors read and approved the final manuscript.

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