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COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS

PREVALENCE, TREND AND ASSOCIATED FACTORS OF HEPATITIS B VIRUS AMONG PREGNANT WOMEN, ATTENDING GOHALA PRIMARY HOSPITAL ANC CLINIC, NORTH EAST ETHIOPIA, 2023

BY MASTEWAL WOGAYEHU YIMAM

A THESIS REPORT TO BE SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS, SCHOOL OF PUBLIC HEALTH, COLLEGE OF MEDICINE AND HEALTH SCIENCES FOR PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH IN EPIDEMIOLOGY

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FULL TITLE OF THE PROPOSAL	PREVALENCE,TREND AND ASSOCIATED FACTORS OF HEPATITIS B VIRUS AMONG PREGNANT WOMEN, AT GOHALA PRIMARY HOSPITAL ANC CLINIC, NORTH EAST ETHIOPIA

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ABSTRACT

BACKGROUND: Hepatitis B virus is Deoxyribo Nucleic Acid virus causing hepatitis in human. Hepatitis B virus is highly prevalent disease in the world. The pregnant women are very vital group to end transmission while intervening over them by preventing further spread of hepatitis B virus infections. Hepatitis b virus has not been emphasised well and didn't studied in this study area, East Bellessa Woreda, Gohalla primary hospital so far.

OBJECTIVES: To assess the prevalence, trend and associated factors of hepatitis B virus infection among pregnant women at Gohala Primary Hospital, north east, Ethiopia, 2022.

METHODS: Institutional based cross-sectional study design was conducted among pregnant women at Gohala primary hospital, North East Ethiopia. The sample size was 431 which was determined by single population proportion. Data on socio demographic and other risk factors were collected by prepared checklist from randomly selected individual charts of the participant. The collected data was checked for completeness, coded, entered and cleaned using Epi data version 3.1 and exported to SPSS version 23 for analysis. Simple count and simple proportion were used for trend over years. Simple and multiple binary Logistic regression analysis were used to identify candidate variables and the association between dependent and independent variables; Hosmer-Lemeshow goodness of fit used.

RESULTS: The prevalence Hepatitis B Virus was 15.8% with 95% CI (12.5-19.4); trend showed an increase from 13.5% in 2017 to 21.5% in 2018 and decreased to 19.5% in 2019, 15% in 2020 and 8% in the 2021. After the model fitted the data at p-value 0.358 and multivariate logistic regression analysis, the associated risk factors for Hepatitis B virus infection were Blood transfusion[AOR = 4.16; 95% CI 1.48–11.65], Abortion[AOR = 8.23; 95%CI 3.34-20.31], HIV [AOR = 3.27; 95% CI 1.25-8.55], cervical lesion screening [AOR = 0.24; 95% CI 0.06-0.98], marital status [AOR = 0.33; 95% CI 0.135 - 0.795].

CONCLUSIONS AND RECOMENDATION: According to WHO criteria, prevalence of hepatitis B virus in this study was highly endemic. The trend showed an increase from 2017 to 2018 and a decrease from 2018 to 2021; though decrement, still the prevalence was higher. Risk factors of HBV among pregnant women were blood transfusion, abortion, and HIV infection, cervical lesion screening and marital status. So that, prevention of abortion, taking great care in sterility during blood transfusion and early testing of HIV and counselling to limit sexual partner are necessary steps to reduce Hepatitis B Virus infection.

KEY WORD: HBV, pregnant women, Prevalence, trend, Gohalla primary hospital, Ethiopia

ABBREVIATIONS AND ACRONYMS

ANC	Ante Natal Care
AOR	Adjusted Odd Ratio
APHI	Amhara Public Health Institution
ARHB	Amhara Regional Health Bureau
C I	Confidence Interval
CLD	Chronic Liver Disease
COR	Crude Odd Ratio
DNA	Deoxyribonucleic Acid
ELISA	Enzyme Linked Immune sorbent Assay
HBcAg	Hepatitis B Core Antigen
HbeAg	Hepatitis B envelope Antigen
HbsAg	Hepatitis B Surface Antigen
HBV	Hepatitis B Virus
HCC	Hepato Cellular Carcinoma
IDU	Injection Drug Use
IgM	Immunoglobulin M
MSP	Multiple Sexual Partner
PV	P Value
PMTCT	Prevention of Mother to Child Transmission
SBCC	Social Behavioural Change and Communication
UTI	Urinary Tract Infection

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1. INTRODUCTION

1.1 Background

Hepatitis B virus (HBV) is Deoxyribo Nucleic Acid (DNA) virus which causes inflammation of liver in human (1).HBV infection may lead to either transient or chronic infections of the liver. Transient infections may produce serious illness; approximately 0.5% of cases end up with fatal and fulminate hepatitis. Similarly, chronic infections also have serious consequences; nearly 25% terminate in untreatable liver cancer (4).

HBV has several genotypes (A-J), which might influence the emergence of mutations, the response to antiviral treatment, and possibly vaccination, against the virus (2, 3).

The natural history of chronic HBV infection can be schematically divided into phases, which are not necessarily sequential. The "immune tolerant" phase is characterised by Hepatitis B envelope antigen(HBeAg) positivity, high levels of HBV replication because of high levels of viremia, these patients are highly contagious. The "immune reactive HBeAg-positive'' phase is characterised by HBeAg positivity, relatively lower level of replication compared to the immune tolerant phase (as reflected by lower serum HBV DNA levels) and may last for several weeks to several years as well as rate of spontaneous HBeAg loss is enhanced. This phase ends with sero conversion to anti-HBe antibody. The "inactive HBV carrier state" may follow sero conversion from HBeAg to anti-HBe antibody (4).

Even though The prevalence of HBV infection and mode of transmission is not similar in different parts of the world (5), HBV infection during pregnancy is associated with a high risk of maternal complications and high rate of vertical transmission causing foetal and neonatal hepatitis with higher maternal mortality and also most of the burden of HBV-related diseases results from infections acquired in infancy through perinatal or early childhood exposure to HBV (6, 7).

HBV infection is a global public health problem affecting a significant portion of the world, about 2 billion people worldwide have been infected with HBV and an estimated one million people die each year from acute and chronic complication secondary to HBV infection, including cirrhosis, fulminate hepatic failure, hepatocellular carcinoma (4, 8, 9).

In Sub Saharan Africa it is estimated that around 240 million people arechronically infected with HBV and overall, about 650,000 deaths occur annually from the complications of chronic hepatitis B (10).

In 2016, the World Health Organization (WHO) endorsed a global strategy to eliminate viral hepatitis as a public threat by 2030, including reducing the prevalence of hepatitis B surface antigen (HBsAg) among children to 0.1%. (9) In addition to the scale-up of HBV vaccination as part of the Expanded Program on Immunization (EPI), birth-dose vaccination has been recommended since 2004 to protect infants from vertical and horizontal transmission (11).

1.2 Statement of the problem

Globally, HBV infection is just about 100 times more contagious than HIV and comes as the 9th cause of death (12).

Several ways of HBV transmission are registered including contaminated blood transfusion, sexual intercourse, and streak with contaminated sharp materials.

In sub Saharan Africa and East Asian countries HBV usually is predominantly transmitted via perinatal or horizontal route. However, in developed countries most infections occur to young adults through injecting drug use (5).

Mother-to child transmission (MTCT), by which HBV is transmitted from infected mothers to their infants, prenatal transmission (in utero), natal transmission (during delivery), or postnatal transmission (during child care or through breast milk), is the main route of infection in infants (4, 13). In the presence of an acute maternal HBV infection, up to 90% of new born infants and 30% of children under the age of 5 years develop chronic HBV infection, compared with only 1–5% of adults with an intact immune system (14).

After HBV infection, many people with HBV may not show any symptoms and the clinical manifestations vary in acute and chronic cases from non-specific symptoms to organ failure and most of the time the diseases is becoming silent killer due to its characteristics (13, 15).

An effective HBV vaccine by WHO, which has 90% potential in preventing blood-borne transmission from an infected mother to her new born (1), has been available for nearly 20 years and attempts at universal vaccination are now under way in developed countries, including areas of endemic infection such as China, which has about 120 million carriers (16). However the high cost of the vaccine has impeded introduction in many poorer countries where HBV infections are prevalent, afflicting 5 to 20% of the population (1).

A national observational study of HBV among pregnant women in china showed that, even though there is disparities among provinces and country level, the prevalence of HBV infection among pregnant women declined by 25.44%, from 7.30% in 2015 to 5.44% in 2020(p for trend <0.001)(16).

In Ethiopia, 12.1% prevalence of HBV among pregnant women was observed in 2005 and relatively decreased to 6.9 % by 2014 (18).

A study from Ethiopia indicated that 75% of new-borns born from HBV infected mother were positive for HBsAg (22) and more than 95% of prenatally acquired infection results in Chronic Hepatitis B virus infection because of induction of an immune tolerant state of variable duration and have a 15 to 25% risk of dying in adulthood from cirrhosis or liver cancer (23).

A study conducted in health facilities of Ethiopia revealed the burden of HBV among pregnant women ranged from 3% to 8% (18-21). Though patients who are clinically suspected of HBV have been shown to have a high prevalence of hepatitis infection, evidence of studies about the trend, magnitude and associated factors among the pregnant mothers of this condition have many gaps (15).

The most feared characteristics of HBV infection is the transmission from mother to child and its effects on both the mother and child. Even though, most health facilities started screening of all pregnant women attending the facility (3), there is limitation to show scientific evidence on the overall burden and associated factors of hepatitis B among pregnant women in all Ethiopian health professionals and policymakers (20, 24).

Currently there are plenty of rumours about HBV infection in the study area who go for traditional healers for diagnosis and treatment. Supposed that this rumour might be scientifically prevalent infection and was acquired from mother to child accordingly (19), this study was intended to know the current prevalence, trend and associated factors of hepatitis B virus infection among pregnant women in the study area (Gohala primary Hospital) in order to disseminate results to different responsible bodies for this issue.

1.3 Significance of the study

This study was intended to confirm different paradoxical results from literature review and to show the prevalence, trend and associated factors of HBV infection in this study area.

This study benefits relevant stakeholders including health care providers, health policy designers, future researchers, and pregnant women. It will be used as an evidence for Governmental and Non-Governmental organizations to consider effective measures based on the study finding to reduce HBV infection among pregnant women by focusing more on early screening and prevention.

In this study the information on this prevalence of HBV infection among pregnant women and its risk factors for health care providers will help to give emphasis on those exposed pregnant women and give effective health care service by early screening and treating before it reached the advanced stages as well as to prevent transmission from one to another.

In addition, showing the overall prevalence and trend of HBV among pregnant women over years as well as identifying its associated factors will be important for health policy makers to redesign strategies to reduce HBV morbidity and its transmission with in the community.

Finally, the finding of this study will be used as input for future researchers who are interested to undertake further research in this area.

2 LITERATURE REVIEW

2.1 Prevalence ofHBV infection

The global prevalence of HBV infection varies widely; Regions are divided into areas of low, intermediate, and high prevalence and about 45% of the world's population lives in regions of high prevalence where at least 8% of the population is currently infected (5);and also 20% of sub-Saharan Africa is highly endemic to HBV (2).

It is estimated that sub-Saharan Africa pregnant women are exposed to HBV with Hepatitis B Surface Antigen (HBsAg) sero prevalence rates of 6–20% (2, 3, 10, 17).

A community based cross sectional study conducted among pregnant women in Libumbashi city of Democratic Republic of Congo, in Ningo pram pram district of Ghana, Youn province of China and Harare city of Ethiopia showed that the prevalence of HBV infection or sero prevalence of HBsAg is from 4.4% to7.9% (16, 25-27).

Whereas institutional based cross sectional study conducted among pregnant women who attended ANC clinic of Dei-Dei General hospital in Nigeia, Korle Bu Teaching Hospital in Ghana, University hospital in Rio Dejenerio of Brazil and University Hospital in Antioch of Turkey HBV prevalence found to be 4.3%,7.7%,1.9% and 2.1% respectively (10, 28-30).

An institutional based cross-sectional study which was conducted among pregnant women in regional and town health facilities of Ethiopia in Amhara region health facilities ,in Oromo region public hospitals, in Tigre region health facilities, in Nekemete town and in Hawasa city health facilities showed that the prevalence of HBV is 4.6%,6.1%,5.5%,5.8%and 7.1% respectively (31-34). Prevalence of HBV among pregnant women attending ANC clinics of Felegehiwot referral hospital and Addis Alem hospital in Bahirdar, Siant Pauli's Hospital in Addis Ababa, Yirgalem hospital and Shone hospital of Ethiopia resulted with prevalence rate of 3.9%-7.2% (20, 22-24, 35).

Over all In Ethiopia, the HBsAg prevalence rate among pregnant women was between 3% and 7.8% (22, 32, 33, 35).

Despite its prevalence, there is a paucity of data regarding on HBeAg status among pregnant women which helps to understand the frequency of highly infective HBV carriers in the given region which in turn helps to design and implement preventive and control measures and awareness of transmission route of HBV infection (15).

2.2 Trends of HBV infection

Every year 780,000 HBV-related deaths are documented around the globe (5).On the other hand population based linkage study in New South Wales ,Australia during 2002-2012 showed that annual HBV-related liver death numbers were slightly increasing (53 to 68), though Age-standardized HBV-related liver mortality rates declined from 0.2 to 0.1 per 100 person-years (PY) ($P< 0.001$)(8). In United States by using Data taken from the 2003–2014 National Health and Nutrition Examination surveys revealed that the prevalence of HBV was 23.4%. Prevalence increased from 2003–2006 (16.3%) to 2007–2010 (27.3%), but no change occurred from 2007–2010 (27.3%) to 2011–2014 (28.1%) (36).

A ten year trend of HBV study among pregnant women conducted in Ethiopia showed a decline from 12.6% to 6.7% (37). Similarly a five year trend (2014 to 2019), Institutional based retrospective study conducted in Tigre region showed that the prevalence of HBV was relatively fluctuating from year to year. In that line trend analysis, the higher prevalence of HBV was 9.2 % in 2014. However,it was droppedto 1.82 in 2017 from 9.2 %. On the other hand, HBV was increased from the year 2018 (3.40%) to the year 2019 (3.94%) (37). but I want to study more recent data which will include additional two years after that study.

2.3 Factor that affect the prevalence of HBV infection

The prevalence of HBV have different predictive factors ,Even though the burden of HBV infection has a worldwide distribution, the vast majority of infected persons reside in low- and middle- income countries, particularly in Asia and Africa. And theSero-prevalence differs depending on sex, ethnicity, and residence (38).

Socio-demographic factors

Institutional based study of all pregnant women in River State university teaching hospital of Nigeria and in Nekemte hospital of Ethiopia observed that there was statistically significant relationship between their ages and HBsAgsero positivity (17, 32). Whereas, in addition to age the place of residence had showed significant association with hepatitis B virus infection on Study conducted Nekemte hospital of Ethiopia (32).However A cross sectional study conducted in korle-Bu Teaching Hospital of Ghana, saint Pauli's Hospital of Ethiopia showed that socio demographic factors age, marital status and place of residence are not statistically significant with prevalence of HBV (22, 29).

Behavioral factors

A behavioural factor like heavy alcohol drinking among pregnant women is not studied yet; however a related cross sectional study among alcohol consumers in cheka, konso zone, south western Ethiopia revealed that from a total of 511 participants, 18.2% (95% CI, 15.1–21.5) were found to be positive for hepatitis B infection using the ELISA test (45).

Clinical factors

A cross sectional study conducted among pregnant women's showed that institution related factors like traditional mal practice, history of blood transfusion, history of major surgical procedures and hospital admission show strong positive association with the prevalence of HBV (24, 32, 35)

A studyof HBV infection and its associated risk factors among pregnant women in Northern Ethiopia in 2017 by using a cross sectional study design showed that those who hadsurgicalprocedures and history of abortion were positively associated (34). Another cross sectional study in Oromia region of Ethiopia in 2018 resulted with the risk factors such as History of abortion, traditional tonsillectomy (tonsillectomy conducted by untrained practitioner),history of admission to a health facility and history of familial liver disease were positively associated with hepatitis B virus infection among pregnant women (31).

However study in Antioch, Turkey showed that History of blood transfusion, history of hepatitis and history of household/close contact were found statistically significant positively for HBV infection. But the other risk factors (ever been operated, abortion) were not significantly associated with HBV infection (10).

Therefore the above study have shown many controversies and used different study design and data collection method as well as they did not incorporate additional predictive factors.

This study incorporatedadditional variables like heavy alcohol drinking and mother HIV status, mother syphilis screening result, presence of jaundice, and presence of other chronic medical conditions.

3 CONCEPTUAL FRAMEWORK

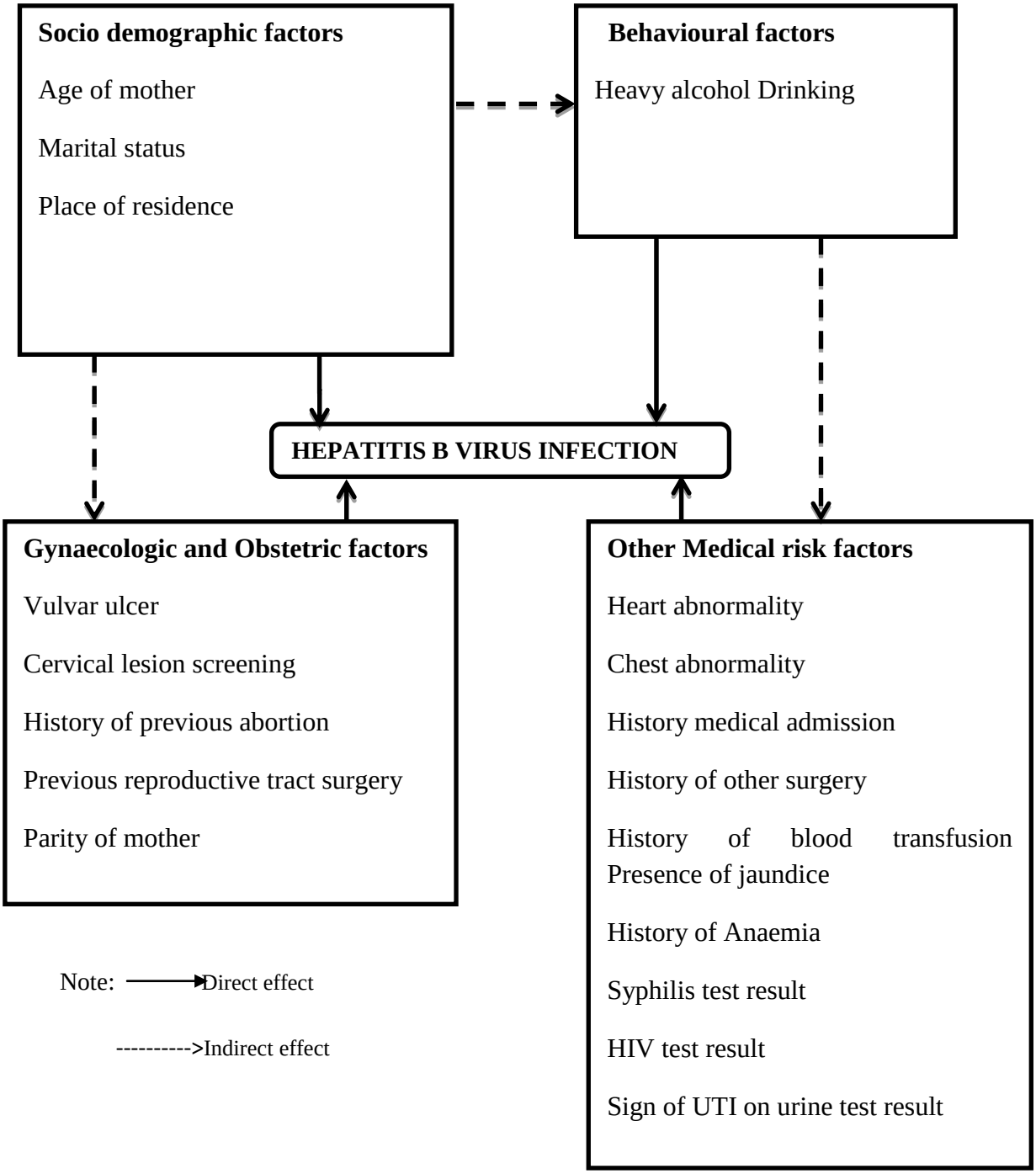

Figure 1 conceptual framework of prevalence of hepatitis b virus and its associated factor adapted (39)

4 OBJECTIVE

4.1 General objective

- To assess the prevalence, trend and associated factors of hepatitis B virus infection among pregnant women attending ANC at Gohalla Primary Hospital, North East Ethiopia, from January 01, 2017 GC to December 31, 2021 GC.

4.1 Specific objectives

- To determine the prevalence of hepatitis B virus infection among pregnant women attending ANC
- To describe the trend of hepatitis B virus infection among pregnant women attending ANC clinic from 2017 to 2021
- To identify factors associated with prevalence of hepatitis B virus infection among pregnant women attending ANC

5 METHODS AND MATERIALS

5.1 Study area

This study were conducted at Gohala primary hospital which is found in East BellesaWoreda ,Central Gondar zone in Amhara region Gohala which is the Capital town of East Belesaworeda, located in north from Bahirdar (capital city of Amhara region),which 184 km far and north west from Addis Abeba which far 718 km. The town has a latitude and longitude of $11^{o}51^{'}N38^{o}1E$ and $11.850^{o}N$ $38.017^{o}E$ with an elevation of 1500-2300 meters above sea level. East BelesaWoreda has estimated total population of 148,758 whom 75,732 are males and 73,026 are females. The composition of health professionals being 2 health officers, 2 pharmacists, 4 pharmacy technicians, 18 nurses, 2 lab technologist, and 4 lab technicians and 10 medical doctors and 2 IESO.The hospital provides laboratory services, like detection of infectious diseases, including Hepatitis B virus, whenever the health professionals suspect cases and routine screening of all pregnant women visiting ANC clinic for HBV,HIV, syphilis. In addition to gohala Primary hospital theworeda has 5 health Centers, 30 health posts and four private health facilities. Thisprimary Hospital is serving in providing comprehensive health services for total catchments of population about 148, 758 in the woreda and other neighbouring woredas.

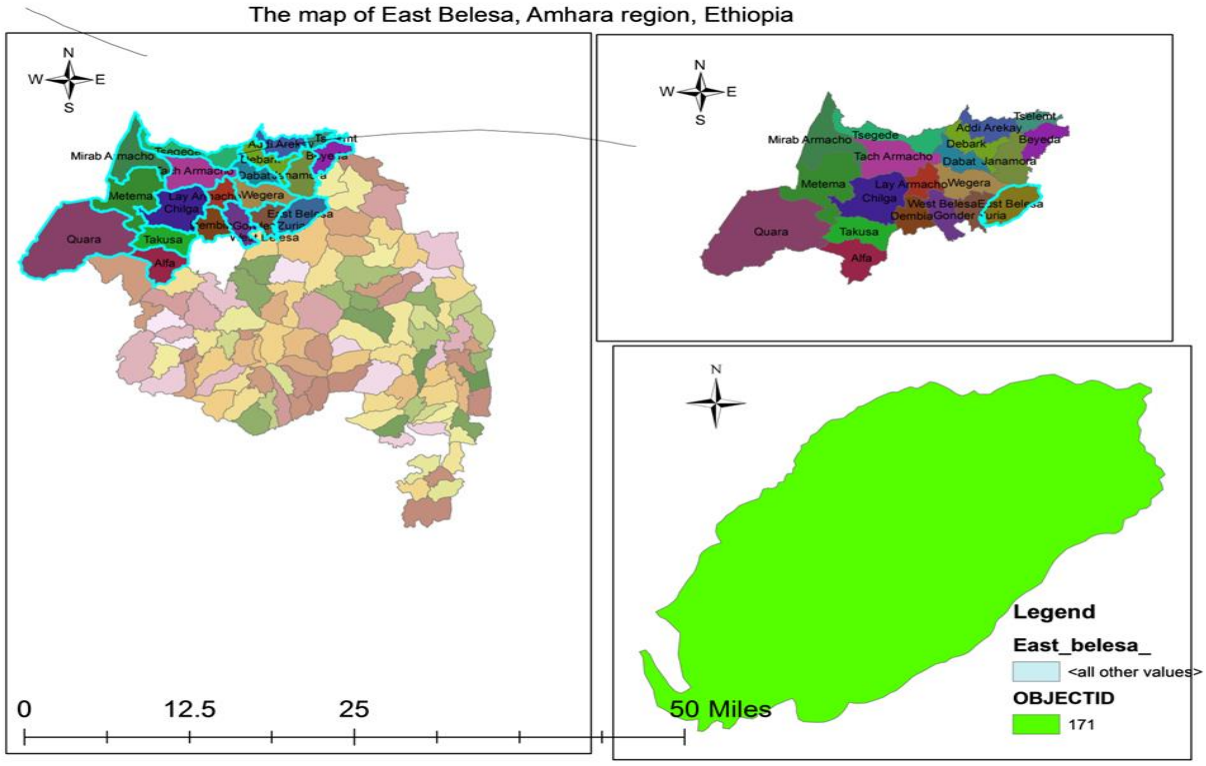

Figure 2 map of the study area North East Ethiopia Amhara region, Central Gondar zone, East BellesaWoreda 2023(44)

5.2 Study design and period

Institution based cross-sectional study was conducted by chart review fromJanuary 01, 2017 GC to December 31, 2021 and data collection period was from November 1, 2022 to December 29, 2022.

5.3 Source population

The source population of this study was all pregnant women who visited ANC OPD of Gohalla primary hospital from January 1, 2017 to December 31, 2021

5.4 Study population

The study population was all pregnant women who visit ANC clinics at Gohala Primary hospital that are serologically tested for Hepatitis B virus and registered in laboratory log book from January 1, 2017 to December 31, 2021.

Inclusion and exclusion criteria

All pregnant women who visited ANC clinics and underwentroutine serological screening of HBV, syphilis, HIV as well ashaving results registered in the laboratory logbookfrom January 1, 2017 to December 31 and had medical informationon participants chart was included in this study; however pregnant women who have never been serologically tested in the study period were excluded.

5.5 Sample size and sampling procedures

Sample size determination

The first objective sample size determined by using one population proportion formula by considering the following assumptions: the recent cross-sectional study conducted on pregnant mothers in felegehiwot referral hospital was p= 4.7% (24), Confidence interval 95% and the margin of error (d=0.02 i.e. When the prevalence of the disease is below 10% or more than 90%, the degree of precision is taken as half).

$$N=\frac{\left(\frac{Za}{2}\right)2*p(1-p)}{d2}$$

Where N= minimum sample size required for the study

Z= standard normal distribution at two tailed (Z=1.96) with 95% CL

P=population proportion

And d=0.02(margin of error) therefore P=0.047 and q=1-P= 0.954

$$N=\frac{(1.96)2*\ 0.047(0.953)}{(0.02)2}=431$$

The second objective Sample size determined using double population proportion formula usingepi info by considering the following assumptions taking significant factors from study conducted in felegehiwothospital Amhara Regional State, Ethiopia (24).

Table 1shows comparing significant associated factors for sample size calculation for trend, prevalence and associated factors of HBV infection among pregnant women who attend Gohalla primary Hospital, North East Ethiopia, 2023.

Sn	Predictor variable	Proportion of exposed	Proportion of un-exposed	CI %	Odds ratio	Power	Sample size
1.	Blood transfusion	15%	4.1%	95	4.13	80	262
2.	Multiple Sexual Partner	14%	4.1%	95	3.81	80	302
3.	Traditional tonsillectomy	10%	2.5%	95	4.33	80	378

The final sample size was 431 which were higher than the sample size obtained from the second objective.

Sampling techniques and procedures

In Gohallaprimary hospital there were 3448 pregnant women who were screened for HBV from January 01 2017 –December 31 2021including routine screening of HIV and syphilis.

A systematic random sampling procedure was applied to select the study participants since it is better for relatively large sample size. Complete list of the pregnant women was extracted from the pregnant women screening registration log book in laboratory room fromJanuary 01, 2017 GC to December 31, 2021which served as a sampling frame.

Sampling interval (K) calculated based on our sample sizek=3448/431which is 8 and the starting point was selected randomly chosen within the first to the *8*th element in the list, where every 8th element from the starting point was followed to select the remaining sample elements from January 01 2017 –December 31 2021GC until the overall sample size reached 431.

5.6 Variable

Dependent variable

- HBV test result of the pregnant women(positive or negative)

Independent variables

- ***Socio-demographic factors***: Age of the mother, marital status and place of residence
- ***Gynecologic and Obstetric factors:*** Abortion history, cervical lesion screening,history of vulvar ulcer, pelvic mass history, previous reproductive tract surgery and Parity.
- ***Behavioral risk factors:*** Heavy alcohol drinking
- ***Other Medical risk factors:*** Heart abnormality, chest abnormality, Hospital medical admission, History major surgery other than reproductive tract surgery ,Blood transfusion ,jaundice, Anemia ,Syphilis, HIV , sign of Urinary tract infection on urine test.

Terms and operational definitions

- **Hepatitis B Surface Antigen (HBsAg)**- is an antigen on the surface of the virus. Its presence in serum of mother indicates HBV infection or sero positive.
- **Parity of mother**– the number of births that the mother gave after 28 weeks of gestation. Null-porous→ not at all, Multipara →two to five Grand multipara →greater than six.
- **Cervical lesion screening** -positive result in cervical cancer screening typically refers to the presence of high-risk human papillomavirus (HPV) or abnormal cervical cells.
- **History of medical admission** –participants who were admitted in health facility for medical problems only i.e. Not a surgical admission.
- **Heart abnormality**: any derangement in the normal function of heart during visit
- **Chest abnormality**: any derangement in the normal function of lung during visit
- **Heavy alcohol drinking**–mothers who addicted to drink alcohol more than two bottle
- **HBV status of the mother:-**

  Positive: if the diagnostic kit called HBsAg Test cassette produced in china with proper effective date with relative specificity 99.6%, relative sensitivity 99.9% and overall accuracy 99.7% show two distinct colors on both control region(C) and test region(T).

  Negative: if the diagnostic kit called HBsAg Test cassette produced in china with proper effective date with relative specificity 99.6%, relative sensitivity 99.9% and overall accuracy 99.7% show one distinct colors on control region(C) but not in test region (T).The intensity of the color on the test region may vary depend on the concentration of HBsAg concentration present in the specimen.

5.7 Data collection

The data collection method was record review, socio-demographic characteristics and possible risk factors for HBV infection were collected on pregnant women's Integrated Antenatal, Labour, Delivery, New born, and postnatal card containing a checklist for every pregnant woman to screen by health care provider in every visit.

5.8 Data quality control

To assure the quality of data, we first checked the completeness of the HBV and other serology tests in laboratory logbooks. Properly designed data collection check list was prepared. Then data was collected from laboratory logbooks and participant charts from records which were availed from January 2017 to December 2021 GC in the laboratory room of the Hospital.

Data was extracted by trained data collectors about the data collection process. Each day the collected data was reviewed for its completeness and consistency of the information by assigned supervisor. The hospital have the standard which is strictly to be followed on the use of standard operating producers and the professionals run positive and negative controls and checked for expired date before they process test.

One MPH in RH as a supervisor, two-Health officers, one BSC nurse and two laboratory technologists were recruited for data collection. Training focusing on understanding the check list, sampling technique, data handling, ethical conduct and quality of data collection were given for one day for data collectors and for the supervisor with intensive understanding on the tool step by step.

The tool was pre-tested from 5% out of my study participant prior to data collection to reduce ambiguity and increase the clarity of the tool and coherency and consistency proble of the checklist was corrected after pre-test.

The collected data was reviewed daily by the supervisors and the principal investigator to check for its completeness.

5.9 Data analysis and management

The collected data was entered, edited and cleaned using EPI data version 3.1, then exported to SPSS version 23 for analysis. Descriptive statistics like frequency, percentage was carried out and interpreted in the form of text, figures, and tables. Before entering all variables to multiple binary logistic regression, simple binary logistic regression was used to see if there are variables with $p<0.25$ to be candidate for multiple binary logistic regression analysis.

Multiple binary logistic regression analysis was executed for those candidate variables selected by simple binary logistic regression to see the association between independent and dependent variables and finally the significance of the association and the strength was identified based on P-value, $p<0.05$ and according to odds ratio with 95% CI. The final model was checked using the Hosmer-Lemeshow Goodness of Fit test.

5.10 Ethical consideration

Ethical clearances was obtain from the Institutional Review Board (IRB) of Bahir Dar University College of Medicine and Health Sciences and permitted and approved by Amhara public health institute and further approval was gained from Gohalla primary hospital board committee and the aim of the research has been briefly explained for necessary bodies. During data collection the study participants information collected would have been kept anonymous and confidential. Finally verbal consent with working health professionals in the room was taken.

6 RESULTS

6.1 Socio-demographic characteristics

A total of 431pregnant women's chart was reviewed. In this study among participants, 261 (60%) were urban in residence where as 332(77%) of them were married. (Table 2)

Table 2 Socio demographic characteristics of pregnant women attending antenatal clinic at Gohala primary Hospital from January 2017 to December 2021 (n = 431)

Characteristics		Frequency (%)	HBV status of pregnant mother	
			Positive (%)	Negative (%)
Age of mother(years)	15-24	178(41.3)	28(15.7)	150(84.3)
	25-34	198(45.9)	34(17.2)	164(82.8)
	35-45	55(12.8)	6(10.9)	49(89.1)
Place of residence	Urban	261(60.6)	36(13.8)	225(86.2)
	Rural	170(39.4)	32(18.8)	138(81.2)
Marital status	Married	336(78)	32(9.5)	304(90.5)
	Unmarried	95(22)	30(31.6)	65(68.4)

6.2 Behavioural and clinical related factors

In this study A total of 61 (14.2%) participants had been history of blood transfusion, while 103 (23.9%) had been hospitalized at some time during their lives. Among respondents 171(39.7%) had a history of UTI and 86 (20%) had a syphilis test positive. Among participants again 82(19%) was HIV positive and among the study participants those who had history of episodes of abortion were 109(25.3) and those who had anemia 50(11.6%). Detail is provided in table 3.

Table 3 Behavioral and clinical related factors related to HBV infection among pregnant women attending antenatal care clinic at Gohala primary Hospital from January 2017 to December 2021

Characteristics	HBV status of pregnant mother		
	Count (%)	Positive(%)	Negative(%)
History of abortion			
Yes	109(25.3)	55(50.5)	54(49.5)
No	322(74.7)	13(4.3)	308(95.7)
Parity of mother			
Nulliparous	82(19)	17(20.7)	65(79.3)
Multipara	314(72.9)	58(14.3)	347(85.7)
Grand multipara	35(8.1)	6(17.1)	29(82.9)

Cervical lesion screening			
Positive	**26(6)**	**10(38.5)**	**16(61.5)**
Negative	**405(94)**	**58(14.3)**	**347(85.7)**
History of reproductive tract surgery			
Yes	**44(10.2)**	**11(25)**	**33(75)**
No	**387(89.8)**	**57(14.7)**	**330(85.3)**
History of blood transfusion			
Yes	**61(14.2)**	**41(67.2)**	**20(32.8)**
No	**370(85.8)**	**27(7.3)**	**343(92.7)**
History of jaundice			
Yes	**35(8.1)**	**20(57.1)**	**15(42.9)**
No	**396(91.9)**	**48(12.1)**	**348(87.9)**
History of chest abnormality			
Yes	**24(5.6)**	**9(37.5)**	**15(62.5)**
No	**407(94.7)**	**59(14.5)**	**348(85.5)**
History of heart abnormality			
Yes	**34(7.9)**	**18(52.9)**	**16(47.1)**
No	**397(92.1)**	**50(12.6)**	**347(87.4)**
History of anemia			
Yes	**50(11.6)**	**18(36)**	**32(84)**
No	**381(88.4)**	**50(13.1)**	**331(86.9)**
HIV test result			
Positive	**82(19)**	**50(70)**	**32(30)**
Negative	**349(81)**	**18(5.2)**	**331(94.8)**
Syphilis test result			
Positive	**86(20)**	**49(57)**	**37(43)**
Negative	**345(80)**	**19(5.5)**	**326(94.5)**
Sign of Urinary tract infection			
Positive	**171(39.7)**	**51(29.8)**	**120(70.2)**
Negative	**260(60.3)**	**17(6.5)**	**243(93.5)**
History of hospital medical admission			
Yes	**103(23.9)**	**44(42.7)**	**59(57.3)**
No	**328(76.1)**	**24(7.3)**	**304(92.7)**
History of heavy alcohol drinking			
Yes	**59(13.7)**	**20(33.9)**	**39(66.1)**
No	**372(86.3)**	**48(12.9)**	**324(87.1)**

6.3 Prevalence of HBV infection

The prevalence of HBV infection was 15.8% with 95% CI (12.5-19.4). A majority of positive count 62 (91.2%) was observed in the age group of (15–34) years. Among unmarried respondents 30 (31.6%) were reported as positive for HBV infection. (Table 2)

6.4 Trends of HBV prevalence among pregnant women over five year

The trend of HBV among pregnant women attending Gohala primary Hospital from January 1, 2017 to December 2021, showed an increase from baseline year (2017) by 8% in 2018, by 6% in 2019 and also by1.5% in 2020; however, it was decreased by 3.8% in the year 2021 as compared to baseline year. (Table 4)

Table 4 Proportion of Hepatitis B Virus Infection among pregnant women attending antenatal clinic, by year of detection, at gohala primary hospital, North east Ethiopia, from January 2017 to December 2021 (n = 431)

Year of detection	Count	Number of positives	Proportion %	95% CL
2017	**89**	**12**	**13.5**	**13.5±7.1**
2018	**79**	**17**	**21.5**	**21.5 ±9.1**
2019	**87**	**17**	**19.5**	**19.5±18.8**
2020	**107**	**16**	**15**	**15±6.8**
2021	**69**	**6**	**8.7**	**8.7± 6.6**
Total	**431**	**68**	**15.8**	**15.8±3.6**

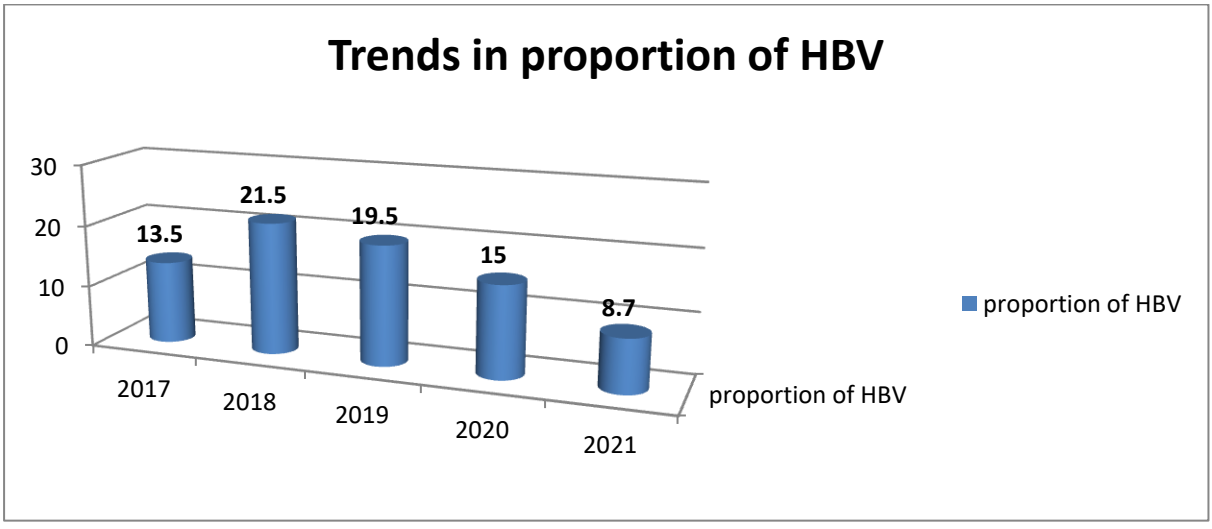

Figure 3 Trend in proportion of Hepatitis B Virus Infection among pregnant women attending antenatal clinic, by year of detection, at gohala primary hospital, North east Ethiopia, from January 2017 to December 2021 (n = 431)

6.5 Associated factors of HBV

For factors associated with hepatitis B virus infection both simple and multiple logistic regression analyses were done and assessed socio demographic, behavioural and clinical predictor variables in relation to hepatitis B infection of the pregnant women.

In simple binary logistic regression analysis age, marital status, maternal parity, heavy alcohol drinking, anaemia, abortion, previous medical admission, History of blood transfusion, UTI, HIV, syphilis and cervical lesion screening were significantly associated. However, multiple binary logistic regression analysis showed that five predictor variables had had significantly associated with HBV infections.

Pregnant women who had history of blood transfusion were 4.16 times likely to be infected by HBV than pregnant women who had no history of blood transfusion [AOR = 4.16; 95% CI 1.48–11.65 p value 0.007].

Having history of abortion were 8.23 times likely to be infected by HBV [AOR = 8.23; 95%CI 3.34-20.31 p value 0.0001] than women who had no history of abortion.

Unmarried pregnant women were 3.1 times likely to be infected by HBV than married pregnant women [AOR = 3.058; 95%CI 1.258-7.432 p value 0.014].

A pregnant women who had ever been screened for cervical cancer were 75.7 % less likely to be infected with HBV than never been screened for cervical cancer [AOR = 0.24; 95% CI 0.06-0.98 p value 0.047].

Pregnant women who had HIV positive test were about 3.27 times likely to be infected by HBV than those who had negative test to HIV [AOR = 3.27; 95% CI 1.25-8.55, p-value = 0.016](Table 5).

Table 5 Bivariate and Multivariate analysis to identify factors associated with HBV infection among pregnant women attending antenatal clinic at Gohala primary hospital, North east Ethiopia, from January 2017 to December 2021 (n = 431)

Variable	Category	HBV status of pregnant women			
		Positive%	Negative %	COR(95%CI)	AOR (95%CI)
Age in yrs.	15-24	28(15.7)	150(84.3)	2.44(0.7-8.5)	1.03(0.23-4.69)
	25-34	34(17.2)	164(82.8)	3.98(1.18-13.46)	1.73(0.41-7.26)
	35-45	6(10.9)	49(89.1)		1
Marital status	Married	32(9.5)	304(90.5)		1
	Unmarried	30(31.6)	65(68.4)	4.385(2.491-7.719)	3.058(1.258-7.432)*
Maternal Parity	Nulliparous	17(20.7)	65(79.3)	1.534(0.557-4.225)	3.34(0.59-19.03)
	Multipara	58(14.3)	347(85.7)	0.628(0.244-1.616)	1.84(0.38-8.82)
	Grand multipara	6(17.1)	29(82.9)		1
Heavy alcohol drinking	Yes	20(33.9)	39(66.1)	0.234(0.124-0.44)	0.92(0.34-2.56)
	No	48(12.9)	324(87.1)		1
Medical admission	Yes	44(42.7)	59(57.3)	13.38(7.221-24.793)	1.48(0.57-3.85)
	No	24(7.3)	304(92.7)		1
Blood transfusion	Yes	41(67.2)	20(32.8)	30.65(15.17-61.9)	4.157(1.48-11.65)*
	No	27(7.3)	343(92.7)		1
UTI	Pos	51(29.8)	120(70.2)	3.167(1.818-5.516)	1.45(0.61-3.42)
	Neg	17(6.5)	243(93.5)		1
Syphilis	Pos	49(57)	37(43)	9.93(5.325-18.517)	2.14(0.81-5.65)
	Neg	19(5.5)	326(94.5)		1
HIV	Pos	50(70)	32(30)	18.63(9.72-35.72)	3.27(1.25-8.55)*
	Neg	18(5.2)	331(94.8)		1
Anaemia	Yes	18(36)	32(84)	8.691(4.525-16.692)	1.96(0.67-5.7)
	No	50(13.1)	331(86.9)		1
Abortion	Yes	55(50.5)	54(49.5)	18.78(9.87-35.73)	8.23(3.34-20.31)*
	No	13(4.05)	308(95.95)		1
Cervical lesion Screening	Pos	11 (42.3)	15 (57.7)	5.1(2.22-11.69)	0.24(0.06-0.98)*
	Neg	51 (12.6)	354 (87.4)		1

***p value < 0.05**

1 reference category

7 DISCUSSION

Hepatitis B virus infection is a public health problem and a major cause of morbidity and mortality, particularly in developing countries (10).In this study found to be that the prevalence of HBsAg among study participants were 68 (15.8%) 95% CI (12.5-19.4). According to the WHO classification, the prevalence of HBV infection in this study area can be categorized as a higher endemicity (>7%) (2).

The prevalence of this study is almost similar to the findings of the study conducted in Nigeria 12% (40) and Mozambique 14.1 (11). In contrary, the prevalence of this study is higher than a study conductedin Felegehiwot referral hospital, Behar Dar Ethiopia with a proportion of 4.7% (24), 5.5% in Tigre (34), 3% in St. Paul's millennium medical college (22). This might be due to methods used were different from this area.

Whereas, very low prevalence 0.9%, 1%,1.5%, 1.6% and 2.1% were reported in USA (36), Brazil (41), china (16), Ghana (42), and Turkey (10), respectively. This variation may be due to national health system improvement, where regular screening and vaccination for HBV were performed (12).

Generally, the variations in sero prevalence in this study area and somewhere else might be because of differences in geographical regions, socioeconomic status, cultural and behavioural practices towards the risk of HBV infection, and health-related factors. Another reason for the difference might be due to the difference in awareness of the routes of transmission among the population, the difference in methodology of 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.

In this study pregnant women with history of abortion had 8.23 times more chance of being infected by HBV. It is supported with the study in public health hospitals of nekemte town (32), west hararghe public health hospitals of Oromia region (31) and shone hospital in northern Ethiopia (35). So during abortion blood contact from infected one and external entries of the virus to susceptible one will be common.

On the other hand those pregnant women who had history of blood transfusion had 4.16 times higher chance of infected with HBV than never transfused pregnant women and was supported with the study done in felegehiwot hospital bahirdar(16) ,in turkey(12),shone hospital(28). Therefore, the virus is easily transmitted through blood contact from the infected one to the healthy mother.

This study revealed that unmarried pregnant mothers were 3.1 times likely infected with HBV than married pregnant women and was supported with the study conducted in korle-bu teaching hospital Ghana (29), Nekemit hospital in Ethiopia (32).

Furthermore pregnant women having been screened for cervical cancer routinely were by 75.7 % less likely of being infected than those never screened. This might be due to strong awareness creation towards HBV infection prevention by health care providers during cervical cancer screening time. HIV positivity was an independent risk factor for hepatitis B virus infection. This may be, HBV as one of viral diseases has got favourable conditions to be easily entered and replicated in the body with compromised immune system.

The national strategic plans of Ethiopia have aimed to reduce HBV&HCV new infection by 90% in 2025GC (37). According to the finding trend showed an increase from 13.5% in 2017 to 21.5% in 2018 and decreased to 19.5% in 2019 and also 15% & 8% in the years 2020 & 2021. This trend is nearly similar to the related study conducted in united states of America (36).This was due to Access to diagnostic, treatment and care services as planned by WHO as strategic objective to eliminate hepatitis virus by 2030 (43).

On the other hand this study is not consistent with a related study conducted in Tigre region (37).This implies poor Advocacy, communication and social mobilization in that study area which one of the five main strategies to be undertaken under national strategic plan 2021-2025 (43).

8 LIMITATION OF THE STUDY

Since it is a secondary data missing some important variables and poor document retention system were limitations of this study.

9 CONCLUSION

According to WHO classification, prevalence of hepatitis B virus in this study was very high.

The trend showed an increase in 2018 from 2017 and then slightly decreased from 2018 to 2021, however still the prevalence was very high.

In this study the associated risk factors of HBV infection among pregnant women were blood transfusion, abortion, and HIV infection, cervical lesion screening and marital status.

10 RECOMMENDATION

For Gohala primary Hospital**:** Based on this finding, Special emphasis should be given to screening pregnant women who have risk factors having history of blood transfusion, having history of abortion and having HIV positive test. so that, ensuring sterility while taking blood for transfusion, prevention of abortion as well as early screening of HIV for early management and counselling to limit sexual partner or marriage is necessary to reduce Hepatitis BVirus infection and cervical screening positive pregnant women are high risk groups for HBV infection so that all pregnant women having cervical lesion screen positive should be given special emphasis to prevent HBV infection by proper follow up.

Considering that HBV is a high trouble in the study area, enhancing antenatal health education programs on HBV transmission and prevention, adhering to infection prevention principles throughout procedures, and testing every pregnant woman for HBV during an ANC visit are all critical steps in limiting the spread of the illness.

For East BelesaWoreda Health Office**:-**According to the study, higher endemicity of HBV infection among pregnant women based on WHO classification, this woreda health office need to implement key interventions like Advocating and incorporating key viral hepatitis SBCC and prevention elements in the health extension program to promote and strengthen viral hepatitis awareness among the community and the general public.

for Amhara Regional Health Bureau(ARHB)**:-**ARHB need to coordinate zonal health departments in wag himra zone, central Gondar zone, north Gondar zone as well as south Gondar zone, in which neighbouring woredas of this study area are incorporated, to strengthen screening of HBV for all pregnant women and give special emphasis to exposed pregnant women by allocating budget for treatment HBV positive pregnant women community mobilization to prevent further transmission with continuous monitoring and evaluation.The health authorities and health service providers in the study area in particular should increase HBsAg screening uptake for all pregnant women.

Moreover, further large-scale studies should be done to ensure the independent forecasting of HBV infection.

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ANEXIES

INFORMATION SHEET

የምርምር ፕሮጀክቱ ርዕስ፡- በነፍሰጡር እናቶች የጉበት ቫይረስ የስርጭት መጠንና መንስዓዎችን ለማወቅ የሚደረግ ጥናት ነዉ፡፡

ይህ ጥናት ከባህር ዳር ዩኒቨርስቲ በሚገኘዉ የጥናት ኮሚቴ ታይቶ ፈቃድ ማግኘቱ ማረጋገጫ ይኖራል፡፡

የአጥኝው ስም፡-ማስተዋል ወጋየሁ (ጤና መኮንን)

የጥናቱ አማካሪዎች ስም፡-1.አበባው ገድፍ በባ/ዳርዩኒቨርስቲረ/ ፕሮፌሰር

2.ዘላለም መሃሪ በባ/ዳርዩኒቨርስቲረ/ ፕሮፌሰር

የምርምር ፕሮጀክቱ ዓላማ:-በነፍሰ ጡር እናቶች የጉበት ቫይረስ የስርጭት መጠንና ከመንስዓዎቹ ጋር የተያያዙ ጉዳዮች ለመፈተሽ የሚደረግ ጥናት ሲሆን እንዲሁም የህክምና አቅድ ለማውጣት እና በተግባር ለማዋል ይረዳል፡፡

ሊከሰቱ የሚችሉ ስጋቶችና ምችትመጓደል

በዚህ ጥናት ምናልባት የጤና መረጃን ሚስጥራዊነት በተመለከተ የክፍሉ ሰራተኞች ስጋት ሊኖርባቸው ይችላል ነገር ግን የጥናቱ ውጤት ከሚሰጠው ጥቅም አንፃር ይህን ያህል አይደለም፡፡ ይህ የጤና መረጃ ለማንም አይነገርም በሚስጥር ይቀመጣል ስምም አይመዘገብም፡፡እንዲሁም ይህ ጥናት የጥናቱ ተሳታፊዎች ከጉዳት መጠበቃቸውን ለማረጋገጥ ከባህር ዳር ዩኒቨርሲቲ በሚገኘው ኮሚቴ ታይቶ ድጋፍ ያገኛል፡፡

ማስተዋል ወጋየሁ

በባህር ዳር ዩኒቨርሲቲ የፓብሊክ ሄልዝ ኢፒዲሞሎጂ 3ኛ አመት ተማሪ

ስልክ ቁጥር 0918255013

CHECKLIST

Section A: socio demographic variables

s.no	Questions	Coding categories	Skip
101	What is the Age of the pregnant mother in years		
102	Where is her Place of Residence?	1.Rural 2.Urban	
103	How is her Marital status?	1.mrried 2.unmarried	

Section B:Gyneacologic and Obstetric variables

s.no	Questions	coding	Skip
201	Had she history of vulvar ulcer?	1.Yes 2.No	
202	Cervical lesion screening?	1.positive 2.Negative	
203	Had she history of pelvic mass?	1.Yes 2.No	
204	Had she history of major surgery on reproductive tract?	1.Yes 2.No	If no skip to Q 301
205	If yes to q no 204 which type of reproductive tract surgery she underwent?	1.Tubal ligation 2.ceserian section 3.repaired rupture	

Section C: Behavioural variables

s.no	Questions	Coding	Skip
301	Had she History of heavy alcohol drinking?	0.No 1.Yes	

Section D: Other clinical and laboratory variables format

s.no	Questions	Coding categories	Skip
401	Had she History of hospital admission?	1.Yes 2.No	
402	Had she History of any type of surgery other site to reproductive tract?	1.Yes 2.No	
403	Had she history of chest abnormality?	1.Yes 2.No	
404	Had she history of heart abnormality	1.Yes 2.No	
405	Had she History of blood transfusion?	1.Yes 2.No	
406	Had she history of jaundice?	1.Yes 2.No	
407	Had she history of anaemia?	1.Yes 2.No	
408	What is her HIV test result?	1.positive 2.negative	
409	What is her Syphilis test result?	1.positive 2.negative	
410	Is there Sign of UTI on urine test?	1.yes 2.no	
411	What is her Hepatitis b virus sero status/HBSAg test result?	0.No 1.Yes	
412	In which Year was she diagnosed?	_____G.C	

Declaration form

I the under signed declared that this is my original work that has been never presented in this or any other University and that all the resources and materials used for the research have been fully acknowledged.

Investigator Name: _____

Signature: _____

Date: _____

Advisors Name: _____

Signature: _____

Date: _____

Advisors Name: _____

Signature: _____

Date: _____