



# Sero-Prevalence of Hepatitis B Virus Infection Among Patients Attending at Addis Alem Primary Hospital, Bahir Dar, Northwest Ethiopia

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## Abstract

**Background:** Hepatitis B Virus (HBV) causes severe liver disease, such as Hepatocellular Carcinoma (HCC) and life-threatening liver disease. Hepatitis B virus infection is one of the most dominant public health problems these days. Therefore, this study aimed to determine the seroprevalence of HBV infection among patients attending Addis Alem Hospital, Bahir Dar, Northwest Ethiopia.

**Methods:** A retrospective study was conducted from January to February 2019 on HBV registered from January 2016 to December 2018. The presence of HBsAg in serum was detected using the One Step Cassette Style HBsAg test kit. Data were analyzed using SPSS version 20. Descriptive statistics were used to describe the characteristics of participants with HBV infection. Statistical association of the determinants with HBV infection was determined by the X<sup>2</sup> test.

**Results:** In this study, a total of 2010 participants of HBsAg rapid test records in the laboratory logbook were included. The median age of women was 25 years. The overall seroprevalence of HBsAg was 78 (3.9%). There was a general increment of HBV infection from 2016 to 2018, X<sup>2</sup>=7.52; P=0.023. Age (X<sup>2</sup>=8.19; P=0.042) and sex (X<sup>2</sup>=37.77; P<0.001) were associated with HBsAg positivity.

**Conclusion and recommendations:** An intermediate seroprevalence of HBV infection was detected among participants in our study area. This figure raises significant public health concerns. Therefore, implementing strategies for routine screening of women for HBV and hospital attendants would be critical.

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**Keywords:** HBV; HBsAg; Addis alem; Bahir dar.

**Abbreviation:** DNA: Deoxyribonucleic Acid; ELISA: Enzyme Linked Immunosorbent Assay; HBV: Hepatitis B Virus; HCC: Hepatocellular carcinoma; NAAT: Nucleic Acid Amplification Technique; STI: Sexually Transmitted Infection; VCT: Voluntary Counselling and Testing.

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## Background

Hepatotropic viruses cause most cases of hepatitis worldwide. Hepatitis B Virus (HBV), a Hepadnaviridae [1], is one of these viruses which causes severe liver disease, such as Hepatocellular Carcinoma (HCC) and life-threatening liver disease. Hepatitis remains one of the most dominant public health problems these days. Hepatitis B virus infection is the critical cause of diseases and death worldwide [2,3].

Hepatitis B virus infection is limited to the liver cells of humans and causes cirrhosis and HCC. This infection is still accounting for a significant proportion of morbidity and mortality.

Globally, 2 billion people are infected with HBV, 350 million people are estimated to be chronically infected [4,5], and 50 million people are newly infected with hepatitis B every year [6]. The prevalence of chronic HBV infection is variable throughout the world, ranging from < 1% in areas of low endemicity to over 30% in highly endemic areas. Africa has the second largest number of chronic carriers of HBsAg (>8%) next to Asia, which is considered a region of high endemicity [5,7,8]. Ethiopia, being part of this region, is ranked as an area with medium to high endemicity for HBV infection [9-10]. Worldwide, HBV infection is estimated to be the cause of 50% of reported cases of cirrhosis and 30% of liver cancer, and over 500,000 people die from them each year [11]. Cirrhosis, liver failure, and hepatocellular carcinoma develop in 15–40% of chronically HBV infected individuals [2,12].

In highly endemic settings, perinatal, and horizontal (Exposure to chronically infected household members) routes are responsible for most disease transmission [13]. But in low prevalence countries, the Hepatitis B virus is transmitted parenterally [14]. Adults infected with HBV usually develop acute hepatitis and recover. Infected children rarely develop the acute disease, but 25 to 90% become chronic carriers [15]. Infection with HBV is highest among developing countries. Ethiopia is among the high burden countries for HBV infection [16], 7.4% in the general population [17]. Therefore, this study aimed to determine the seroprevalence of HBV for the last three years using laboratory recorded data (log book) to fill the existing epidemiologic gap in the area.

## Methods

### Study area, period and design

From January to February 2019, a retrospective cross-sectional study was conducted on HBsAg registered from January 2016 to December 2018. The research was done in Northwest Ethiopia, in Bahir Dar. Bahir Dar is situated 556 kilometers from Addis Ababa, Ethiopia's capital city. It is one of the tourist destinations places in Ethiopia, which contains the largest lake in Ethiopia: Lake Tana, which gives birth to the Blue Nile. Some twenty of these shelter churches and monasteries of immense historical and cultural interest, decorated with beautiful paintings and housing innumerable treasures. The study was conducted at Addis Alem Primary Hospital found in this town.

## Population

The study population consisted of all clients who gave blood, were screened for HBV, and reported in the laboratory logbook at the Addis Alem Hospital from January 2016 to December 2018.

### Data collection tool

The checklist was used to obtain information on HBV status, gender, age, and the department that requested the exam. Further data on different factors associated with HBV infection was problematic because the logbook contained small variables.

### Laboratory investigation

The hepatitis B surface antigen (HBsAg) was requested as part of the antenatal care panel and for clinical suspicion of liver disease. The presence of HBsAg in serum was detected using a One Step Cassette Style HBsAg test kit (Nantog genes Biotech Co. Ltd, China) by following the Manufacturer's instructions.

### Quality control

To ensure the consistency of the data, the necessary data were obtained from the laboratory logbook and reviewed thoroughly every day for completeness and accuracy. Software data has been tested carefully for errors, implausible values, and discrepancies that may be due to encoding, input, typing, and other errors. HBsAg positive clients' serum was double-checked using ELISA in the referral laboratory located in the city.

### Data processing, analysis and interpretation

Data were entered and analyzed using version 20 of the Statistical Package for Social Sciences (SPSS). Descriptive statistics (frequency, median, percentage) were used to define the characteristics of HBV participants. The Pearson Chi-square ( $X^2$ ) test was used to determine the relationship between categorical variables. The Chi-square trend test was used to analyze year-by-year changes in patterns.

### Ethical consideration

Ethical approval was received from the Ethical Committee of the University of Gondar, College of Medicine and Health Science, Biomedical School and Laboratory Sciences Research. The study used data previously obtained from patients. The Addis Alem Hospital Administration and clinical management committee have waived the requirement to seek approval from customers.

## Results

Among 2010 screened patients, 616 (30.6%), 1151 (57.3%) and 243 (12.1%) patients were screened for HBV in 2016, 2017 and 2018 respectively. Among the screened patients, 1893 (94.2%) were females, and 117 (5.8%) were males with a median age of 25 years (Table 1). Within the year 2016, 2017, and 2018 screened patients, 591 (95.9%), 1068 (92.8%), and 234 (96.3%) were females, respectively. The majority of participants 427 (69.3%), 735 (63.9), and 168 (69.1%) patients were in the age group of 21-30 years screened in 2016, 2017, and 2018 respectively. Most of the participants (95%) in this study were from urban residency (Table 2).

**Table 1:** Socio-demographic characteristics of study participants screened for HBV from 2016-2018, (n=2010), Northwest Ethiopia, 2019.

		Frequency (n)	Percentage (%)
Sex	Male	117	5.8
	Female	1893	94.2
Age in Years	1-20	380	18.9
	21-30	1330	66.2
	31-40	246	12.2
	>40	54	2.7
Residence	Urban	1912	95.1
	Rural	98	4.9
Examination Departments	EOPD	120	6.0
	ANC	1576	78.4
	OPD	151	7.5
	Inpatient	163	8.1
Year of Examination	2016	616	30.6
	2017	1151	57.3
	2018	243	12.1

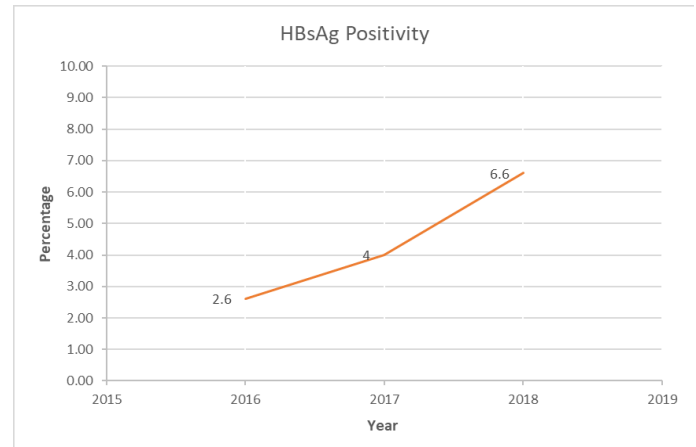
**Table 2:** The distribution of participants characteristics within consecutive three years, (n = 2010), Northwest Ethiopia, 2019.

		Year of Screening		
		2016 (n=616)	2017 (n=1151)	2018 (n=243)
Sex	Male	25 (4.1%)	83 (7.2%)	9 (3.7%)
	Female	591 (95.9%)	1068 (92.8%)	234 (96.3%)
Age in years	1-20	102 (16.6%)	233 (20.2%)	45 (18.5%)
	21-30	427 (69.3%)	735 (63.9%)	168 (69.1%)
	31-40	76 (12.3%)	143 (12.4%)	27 (11.1%)
	>40	11 (1.8%)	40 (3.5%)	3 (1.2%)
Residence	Urban	589 (95.6%)	1093 (95.0%)	230 (94.7%)
	Rural	27 (4.4%)	58 (5.0%)	13 (5.3%)
Examination departments	EOPD	31 (5.0%)	72 (6.3%)	17 (7.0%)
	ANC	502 (81.5%)	869 (75.5%)	205 (84.4%)
	OPD	60 (9.7%)	91 (7.9%)	0 (0.0%)
	Inpatient	23 (3.7%)	119 (10.3%)	21 (8.6%)

EOPD- Emergency outpatient department, ANC- Antenatal care unit, OPD-Outpatient department

From all patients screened, the total prevalence of HBsAg in this study was 78/2010 (3.9% with 95% CI 3.1, 4.8). The seroprevalence of HBV infection in each consecutive year was 16/616 (2.6%), 46/1151 (4.0%), and 16/243 (6.6%), respectively (Figure 1). The trend of HBV infection was increasing and statistically significant change in seropositivity from the year 2016 to 2018

(Table 3). The positivity rate was higher in females 61/2010 (3.0%) than males 17/2010 (0.8%). This difference was statistically significant with HBV infection,  $\chi^2=37.7$ ;  $P < 0.001$ .



**Figure 1:** Trends of HBsAg positivity from 2016-2018 at Addis Alem Hospital, Northwest Ethiopia, 2019.

From the total patients requested for HBV screening in the hospital, 76 (3.8%) were positive for HBsAg in urban patients, whereas 2 (0.1%) were positive in rural patients. The seroprevalence of HBV infection was higher in the age group of 21-30 years, 48/2010 (2.4%) than their counterparts. This was statistically significant with HBsAg seropositivity,  $\chi^2 = 8.2$ ;  $P=0.042$ . Among the requested patients from different examination departments, the highest prevalence reported from the antenatal care unit 44/2010 (2.2%) followed by the emergency outpatient department accounts for 22/2010 (1.1%). This was statistically significant with  $\chi^2 =73.9$ ;  $P < 0.001$  (Table 3).

**Table 3:** Sero-prevalence of HBV infection with respect to socio-demographic characteristics and different years of screening (n=2010), Northwest Ethiopia, 2019.

		HBsAg Status		$\chi^2$	P-value
		Positive (%)	Negative (%)		
Age of Participants	1-20	10 (0.5)	370 (18.4)	8.19	0.042
	21-30	48 (2.4)	1282 (63.8)		
	31-40	16 (0.8)	230 (11.4)		
	>40	4 (0.2)	50 (2.5)		
Sex	Male	17 (0.8)	100 (5.0)	37.77	<0.001
	Female	61 (3.0)	1832 (91.1)		
Residence	Urban	76 (3.8)	1836 (91.3)		
	Rural	2 (0.1)	96 (4.8)		
Examination room	EOPD	22 (1.1)	98 (4.9)	73.91	<0.001
	ANC	44 (2.2)	1532 (76.2)		
	OPD	8 (0.4)	143 (7.1)		
	Inpatient	4 (0.2)	159 (7.9)		
Examination Years	2016	16 (2.6)	600 (97.4)	7.52	0.023
	2017	46 (4.0)	1105 (96.0)		
	2018	16 (6.6)	227 (93.4)		

$\chi^2$ - Pearson chi square

## Discussion

The cases selected for our study were all patients who seek screening for HBV infection. The lab tests employed were all standard and reliable. It is easy to compare our findings with other hospital-based similar studies where the cases selected are the clinically suspected ones coming to the hospital seeking treatment.

Sexually transmitted infections (STIs) including HBV are widespread in developing countries and constitute a major public health problem in sub-Saharan Africa [18]. Hepatitis B surface antigen (HBsAg) is the main marker indicating endemicity of HBV infection in the general population of a particular geographical area [19]. The classification of low, intermediate, and high endemicity for HBV infection has been defined as HBsAg less than 2%, 2 to 7%, and greater than 7% in an adult population respectively [20].

In the present study, we found 3.9% (95% CI, 3.0-4.7%) of the overall seroprevalence of HBsAg among patients screened for HBV infection in Addis Alem primary Hospital. Based on the WHO classification, the prevalence of HBV infection in this study was classified as "Intermediate". This figure is still high if we compute the general population of Ethiopia as these days it is close to 100, million. In addition, it is assumed that the rate might be increased more if this study is done in different geographical areas. Therefore, HBV infection was a particular problem might be due to the possibility of all the population infected with HBV.

In our study, the prevalence rate of HBsAg was comparable with a study conducted in Gondar University Teaching Hospital on blood donors 4.7% [21] and Addis Ababa 3.0% [22]. However, our study finding was lower than when compared to study done in Gondar, Ethiopia among street dwellers 10.9% [23] and among medical waste handlers 6% [24], on donors at Bahir Dar, Ethiopia 25% [25], among blood donors in Amhara and Tigray regional states, Ethiopia 6.2% [26], among patients with chronic hepatitis, southeast Ethiopia 22.3% [27], among VCT clients, southern Ethiopia 5.7% [28], in Addis Ababa, Ethiopia among medical waste handlers 6.3% [29] and among general population higher than 7% [9], and Jigjiga, Ethiopia (10.9) [30], in Nigeria among blood donors 10.9% [31] and 18.6% [32]. In contrast, our study was higher than a study conducted in Eretria on blood donors 2.6% [33] and 2.0% [34], and the study reported Japan 0.8% [5].

These differences might be suggested to sample size difference, geographical variation, method of detection, cultural practice difference, and behavioural divergences for the risk factors, and the degree of HBV endemicity often correlates with the predominant mode of transmission. Furthermore, the variation might be also due to different study designs and methods for the assay of HBV infection used.

In this study, the highest prevalence was recorded among the age group between 21-30 years 48/2010 (2.4%), which was higher than all other age groups 1.5%. The infectivity of HBV seems to be skewed towards persons younger than 30 years of age as the majority of the clients in this age group were HBsAg positive. In our opinion, the reason behind the high rate of HBV in this age group is most probably the high infectivity potential of the virus, immunization status, cultural practices which could expose to HBV infection like circumcisions, tattooing, bloodletting exercises to treat different diseases. But a study conducted

in Ghana on blood donors, revealed that the highest seroprevalence was among the 30–39 years age group 8.9% [35] which was not in agreement with our study. Sixty-one (3.0%) females were tested positive as compared to 17 (0.8%) males. This was supported by another study done by Walana W et al. (14.3%) of females as compared to (6.7%) males [35]. Almost all, 76/78 (97.4) of all HBsAg positives were from urban.

The trend analysis performed showed that HBV infection significantly increased from 16 (2.6%), 46(4.0%), and 16 (6.6%) for the last three consecutive years. This might be due to an increased focus and frequent HBV screening for all suspected attendants in the hospital. The limitation of our study is the method that we employed. HBsAg detection method can also be questioned because it used a rapid chromatographic immunoassay for the first 3 years. Another limitation is that laboratory tests have been limited to the detection of HBsAg, without checking the markers of viral replication, as HBeAg or HBV DNA, for economic reasons. So, our results would have been more genuine if we had been able to perform ELISA and Nucleic Acid Amplification Technique (NAAT).

## Conclusions

An intermediate prevalence of HBV infection was detected among study participants in our study area. Because hospital attendant clients are among vulnerable population groups, the figure raises serious public health concerns. Therefore, implementing strategies for routine screening of all patients attending Hospitals for HBV would be critical.

## Declarations

### Ethical considerations

Ethical clearance was first obtained from the ethical review committee of school of Biomedical and Laboratory Sciences, University of Gondar.

### Availability of data and materials

The original data used for this study are available at the corresponding author, so that interested reader can get the data from the corresponding author with reasonable request.

### Competing interests

The authors declared that we have no competing interests regarding the publication of this article.

### Authors' contributions

MG: Primary researcher conceived the idea for this study. MG, TG, ZG, and EY participated in data collection, conducted data analysis, drafted and finalized the manuscript for publication. All authors read and approved the final manuscript.

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