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Seroprevalence of hepatitis B, C, and its associated risk factors among clinically suspected patients attending poly and Maraki Health Centers, Gondar City, North West Ethiopia

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Abstract

Background: Hepatitis B and C viruses are major global health problems with a high mortality rate, mostly due to serious liver diseases such as liver cirrhosis, liver failure, and hepatocellular carcinoma. The objective of this study was to determine the prevalence of the hepatitis B and C viruses and associated risk factors among clinically suspected patients attending Poly and Maraki Health Centers in Gondar City.

Methods: An institution-based cross-sectional study was conducted to recruit 422 clinically suspected patients attending Poly and Maraki Health Centers between June and August 2020. The blood sample was tested for hepatitis B surface antigen and anti-Hepatitis C virus antibodies using commercially available rapid test kits. We used logistic regression and chi-square analysis to assess factors associated with Hepatitis B virus and Hepatitis C virus infections.

Results: The overall prevalence of hepatitis B surface antigen and anti-Hepatitis C virus antibodies was 29 (6.9%) and 5 (1.2%), respectively. The prevalence of Hepatitis B virus and Hepatitis C virus was found to be significantly higher at Maraki Health Center. Multiple sexual partners (adjusted odd ratio (AOR = 12.299; 95% CI = 2.515–60.142), history of delivery by traditional birth attendants (AOR = 6.284; 95% CI = 2.373–16.637), surgical history (AOR = 3.679; 95% CI = 1.009–13.417), previous hepatitis infections (AOR = 10.374; 95% CI = 1.128–95.444), and upper abdominal pain (AOR = 3.382; 95% CI = 1.215–9.414) were significantly associated with an increased risk of Hepatitis B virus infections. On the other hand, a history of blood transfusion (AOR = 43.132; 95% CI = 1.385–1343.176) and a history of kidney dialysis (AOR = 71.199; 95% CI = 2.074–2444.646) were significantly associated with Hepatitis C virus infection.

Conclusions: According to the WHO endemicity classification, the prevalence of the hepatitis B virus was intermediate, while that of the hepatitis C virus was low. Therefore, it is necessary to strengthen the efforts to control and prevent Hepatitis B virus and Hepatitis C virus infections.

Keywords
HBV, HCV, seroprevalence, risk factor, Ethiopia, Gondar

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Introduction

The term 'hepatitis' describes an inflammation of the liver. It happens as a result of a number of factors and pathogen infection, mostly from hepatitis viruses. Hepatitis B and C virus (HBV and HCV) infections are major global health concerns among the five hepatitis viruses (A–E). For instance, worldwide, the estimated number of individuals with chronic HBV and HCV infections was around 296 million and 58 million, respectively. Furthermore, it is reported that HBV and HCV cause 820,000 and 290,000 deaths, respectively, with cirrhosis and hepatocellular carcinoma accounting for the majority of these deaths.[1,2]

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There are differences in the prevalence of hepatitis B and C infections throughout the world. The Western Pacific and African regions have the highest prevalence of hepatitis B infections, while HCV infections are more prevalent in the Eastern Mediterranean and Europe.[1,2] HBV and HCV are vertically transmitted from the mother to the fetus during childbirth or intrauterine transmission.[3] On the other hand, horizontal transmission of the virus happens when unscreened blood or blood products are transfused, through sexual contact with an infected partner, or from the reuse of contaminated needles, syringes, or sharp objects in a medical setting, the community, or among drug users.[1–4]

In Ethiopia, the prevalence of HBV ranges from 2.5%[4] to 11.5%[5] among medical professionals, 3.57%[6] to 21.16%[7] among clinically suspected individuals, 5.7%[8] to 9.0%[9] among the general public, 3.8%[10] to 10.9%[11] among pregnant women, 2.1%[12] to 10.9%[13] among healthy blood donors, and 2.1%[14] to 11.7%[15] among HIV-positive individuals. According to a systematic review and meta-analysis study, the pooled prevalence of HBV in different groups in Ethiopia is 7.4%.[16] Similarly, the prevalence of HCV varies among different studies in Ethiopia. The ranges of the prevalence reports were 3.0%[17] to 11.7%[18] in patients with HIV infection, 0.4%[13] to 8.5%[19] among blood donors, 1.0%[20] to 1.9%[21] in the general population, and 2.13%[6] to 12.4%[22] in clinically suspected individuals.

There are few data on the prevalence and risk factors of HBV and HCV in hepatitis-suspected patients and in the general population in Ethiopia. The lack of meaningful policy action may be due to the paucity of integrated epidemiological data on the prevalence of viral hepatitis in Ethiopia. To effectively plan preventative programs, it is crucial to obtain an accurate estimate of the incidence of these viruses and the risk factors associated with them in both the general population and hepatitis-suspect patients. Therefore, this study was conducted to investigate the prevalence and associated risk factors contributing to HCV and HBV among suspected hepatitis patients attending Poly and Maraki Health Centers in Gondar City.

Methods

Description of the study area

The study was carried out in Gondar, in the Amhara regional state of Ethiopia. It is located 180 km from Bahir Dar, the regional capital, and 748 km from Addis Ababa, the national capital. According to the Central Statistical Agency's 2019 population projection, the population of Gondar city was 400,555, with 196,225 men and 204,330 women in 2019.[23] The city is situated between latitude and longitude of 12°36′27″N and 37°27′33″ E and at an elevation of 1966 m above sea level. The city's average monthly temperature is 19.70°C, and its annual precipitation is 1772 mm. These values fall into the mid-highland climate zone (Figure 1).

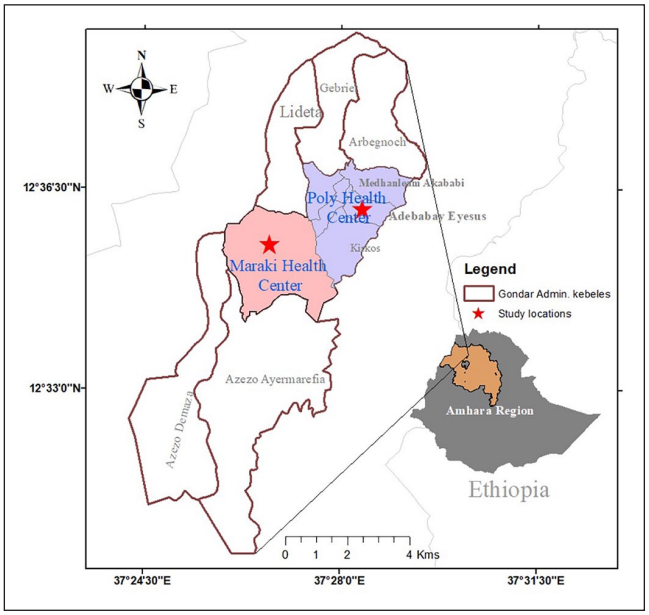

Figure 1. Map of the study Area.

The population of Gondar is served by eight health centers (Poly, Maraki, Azezo, Bilageg, Gebrael, Tseda, Woleka, and Mentiwab), two hospitals (the University of Gondar Teaching Hospital and Ayra General Hospital), and numerous private clinics and hospitals. Acute upper respiratory infections, pneumonia, general medical examination, helminthiasis, medical care, dyspepsia, urinary system disorders, fevers of unknown origin, amoebiasis, and malaria are the top 10 diseases recorded in these health facilities in the city (Gondar City Health Administration personal communication).

Poly and Maraki Health Centers offer outpatient care, including basic laboratory and pharmacy services, and inpatient service with a 10-bed capacity for emergency and delivery services, as well as preventive, health promotion, and rehabilitative care.

Inclusion and exclusion criteria

The study included individuals who showed symptoms of hepatitis, such as jaundice, dark urine, extreme fatigue, nausea, vomiting, and upper right abdominal pain, or had a history of hepatitis either personally or in their family and were willing to participate in the study. Participants who were seriously ill and unable to provide an adequate amount of blood samples were not included in the study.

Study population

The study population comprised patients at Poly and Maraki Health Centers suspected of hepatitis in outpatient and inpatient services (including mothers giving birth) during the study period.

The study design and period

An institution-based cross-sectional study was conducted on patients suspected of having hepatitis who visited Poly and Maraki Health Centers from June to August 2020.

Sample size determination and sampling techniques

The sample size estimation for the study was based on the previous HBV prevalence study.[22] Employing assumptions of expected prevalence = 14.2%, the margin of error = 5%, $\alpha = 5\%$ (95% confidence level), design effect = 2, and 15% nonresponse rate, a sample size of 430 hepatitis-suspected patients were included in the study by using the formula for estimating single proportion.[24] Using a simple random sampling method, the study participants were randomly selected from hepatitis-suspected patients attending Poly and Maraki Health Centers from June 2020 to August 2020.

Data collection

The data were collected using semistructured questionnaires via face-to-face interviews and laboratory diagnosis based on rapid diagnostic tests.

Data collection by questionnaire

A pretested, structured questionnaire was used to collect data on sociodemographic characteristics and risk factors associated with the transmission of HBV and HCV.

Specimen collection and assay procedure

Five milliliters (ml) of venous blood were drawn under aseptic conditions from selected study participants by experienced laboratory personnel and immediately poured into vacutainer tubes containing a clot activator. According to Ethiopian Ministry of Health guidelines, venous blood collection is preferred over finger pricking for the diagnosis of HBV and HCV. The need to collect enough blood samples for HBV and HCV diagnosis is the other justification for venous blood sample collection in this study. The blood samples taken from the individuals were centrifuged at 3000 revolutions per minute for at least 20 min at room temperature, and the serum was separated and placed in Eppendorf tubes. The sample was then stored at room temperature and confirmed by the HBsAg rapid kit (Zhejiang Orient Gene Biotech Co., Ltd., China) and HCV antibody test strip (Xiamen Boson Biotech Co., Ltd., China) according to manufacturer instructions. The kit's performance ability was sensitivity 99.4%, specificity 99.5%, for HBV, and sensitivity 99.1%, specificity 99.2%, for HCV.

Clinical data collection

Data on HIV status, kidney dialysis, diabetes, history of hepatitis, and symptoms of hepatitis were gathered by clinical examinations and patient histories acquired during the enrollment of patients in the research period.

Data quality control

To ensure data quality, standard operating procedures were strictly followed for specimen collection and laboratory analysis. The quality of test results was maintained using the internal quality control of the test kits by using known negative and positive controls. Moreover, the questionnaire was prepared in English, translated into the local language (Amharic), and pretested on 5% of the study participants who were not included in the actual study. During the actual study, the collected data were sorted and checked for errors and completeness on-site daily. Overall data collection activities were supervised by the principal investigator.

Statistical analysis

After the data were checked for completeness and consistency, it was entered and analyzed using the Statistical Package for Social Science (SPSS) version 22 (SPSS Inc., Chicago, IL, USA). The overall prevalence of HCV and HBV markers was expressed as the percentage of seropositive samples. A chi-square test and binary logistic regression analysis were done to determine the association between sociodemographic and other potential risk factors and the dependent variable. Variables with $p < .25$ in bivariate logistic regression were selected for subsequent analysis in multivariate logistic regression analysis.[22] $p < .05$ was considered statistically significant.

Ethical consideration

The ethical committee of the College of Natural and Computational Sciences at the University of Gondar approved the study (CNCS/10/639-25-5-2020). The study participants were informed about the purpose of the study, and written informed consent was obtained from each participant. Each participant was informed that they had the right to withdraw from the study at any point in time. A code was applied to each test tube and questionnaire to guarantee participant data confidentiality. The patients who tested positive for HCV/HBV were sent to the Gondar Referral Hospital for additional testing and free treatment.

Operational definitions

Abortion: The deliberate or spontaneous termination of a pregnancy before the fetus is expected to survive.

Female circumcision: This is a traditional harmful practice that involves removing a woman's external genitalia completely or partially for nonmedical reasons.

Body or ear Piercing: A body or ear piercing involves puncturing the skin with a sharp object to insert jewelry, such as in the nose or the ear.

Table 1. Sociodemographic characteristics of study participants in Poly and Maraki Health Centers in Gondar city, North West Ethiopia, June to August, 2020.

Variables	Categories	Poly Health Center (*N* = 255) *n* (%)	Maraki Health Center (*N* = 167) *n* (%)	Total (*N* = 422) *n* (%)
Sex	Male	11 (4.3)	55 (32.9)	66 (15.6)
	Female	244 (95.7)	112 (67.1)	356 (84.4)
Age groups	18–24	89 (34.9)	10 (6.0)	99 (23.5)
	25–34	142 (55.7)	72 (43.1)	214 (50.7)
	35–44	24 (9.4)	47 (28.1)	71 (16.8)
	>45	0 (0.0)	38 (22.8)	38 (9.0)
Marital status	Married	221 (86.7)	107 (64.1)	328 (77.7)
	Single	30 (11.8)	25 (14.9)	55 (13.0)
	Divorced	1 (0.3)	28 (16.8)	29 (6.9)
	Widow	3 (1.2)	7 (4.2)	10 (2.4)
Residence	Urban	229 (89.8)	156 (93.4)	385 (91.2)
	Rural	26 (10.2)	11 (6.6)	37 (8.8)
Occupation	Unemployed	17 (6.7)	23 (13.8)	40 (9.5)
	Daily laborer	21 (8.2)	31 (18.6)	52 (12.3)
	Merchant	41 (16.1)	31 (18.6)	72(17.0)
	Student	35 (13.7)	5 (2.9)	40 (9.5)
	Government employed	55 (21.6)	31 (18.6)	86 (20.4)
	Farmer	86 (33.7)	46 (27.5)	132 (31.3)

Tattoo: A tattoo is a form of body art where ink is inserted into the dermis layer of the skin using a needle or other sharp materials.

Multiple sexual partners: This is the measure and incidence of engaging in sexual activities with two or more people within a specific time period.

Results

Sociodemographic characteristics of study participants

A total of 430 hepatitis suspected patients were enrolled in this study, but 422 participants were interviewed, yielding a response rate of 98.1%. Of the 422 study participants involved in this study, 255 (60.4%) and 167 (39.6%) were from Poly and Maraki Health Centers, respectively. Of the total study participants, 84.4% ($n = 356$) were females. Poly Health Center had a higher percentage of female patients suspected of having hepatitis (95.7%) compared to Maraki Health Center (67.1%). Most of the participants were aged between 25 and 34 years ($n = 214$, 50.7%). The age group 35–44 (28.1%) and those above 45 years old (22.8%) were higher in Maraki Health Center. On the other hand, the age group between 25 and 34 was higher in Poly Health Center (55.7%) (Table 1).

Of the total participants, 77.7% ($n = 328$) were married, but this varied across the health centers. Married hepatitis suspects were higher in Poly Health Center (86.7%) than in Maraki Health Center (64.1%). In contrast, divorced participants were higher in Maraki Health Center (16.8%) than in Poly Health Center (0.3%). Almost all of the study participants (91.2%) were urban residents, and 31.3% were farmers. The Poly Health Center had a higher percentage of student participants (13.7%), while the Maraki Health Center had a higher percentage of unemployed (13.6%) and daily laborers (18.6%) (Table 1).

Seroprevalence of HBV and HCV infections

The overall prevalence of HBV infection in this study was 6.9% (29/422). A statistically significant higher prevalence of HBV was observed in Maraki Health Center at 10.8% (18/167, $p = 0.005$) compared to Poly Health Center at 4.3% (11/255). However, a slightly higher prevalence was detected in males at 7.6% (5/66), in age categories greater than 45 at 10.5% (4/38), in divorced study participants at 13.8% (4/29), and in daily laborers at 11.5% (6/52) compared to their counterparts. All 29 HBV cases were detected in urban residents, or 7.5% (29/385). On the other hand, the overall prevalence of HCV infection in this study was 1.2% (5/422). A statistically significant higher prevalence was observed in Maraki Health Center: 3% (5/167, p value = 0.005), in males; 6.1% (4/66, $p = 0.000$), in age categories greater than 45:7.9% (3/38, $p = 0.001$), and in unemployed study participants: 7.5% (3/40, $p = 0.005$). However, a statistically insignificantly higher prevalence was observed in single 1.8% (1/55) study participants compared to its counterparts. Like HBV, all of the HCV cases were identified in urban residents at a rate of 1.3% (5/385). There was no co-infection between HBV and HCV in this study (Table 2).

Table 2. Prevalence of HBV and HCV among different sociodemographic characteristics at Poly and Maraki Health Center, Gondar City, June to August, 2020.

Variables	HBsAg			HCAb		
	Positive *n* (%)	Negative *n* (%)	χ^2 (*p* Value)	Positive *n* (%)	Negative *n* (%)	χ^2 (*p* Value)
Health center						
Poly Health center	11(4.3)	244(95.7)	**6.590 (0.010)**	0(0.0)	255(100.0)	**7.726(0.005)**
Maraki Health Center	18 (10.8)	149(89.2)		5(3.0)	162(97.0)	
Total	29(6.9)	405(96)		5(1.2)	412(98.8)	
Sex						
Male	5(7.6)	61(92.4)	0.054(0.816)	4(6.1)	62(93.9)	**15.886(0.000)**
Female	24(6.7)	332(93.3)		1(0.3)	355(99.7)	
Age groups						
18–24	4(4.0)	95(96.0)	3.060(0.383)	1(1.0)	98(99.0)	**16.431(0.001)**
25–34	14(6.5)	200(93.5)		1(0.5)	213(95.5)	
35–44	7(9.9)	64(90.1)		0(0.0)	71(100.0)	
>45	4(10.5)	34(89.5)		3(7.9)	35(92.1)	
Marital status						
Married	20(6.1)	308(93.9)	3.639(0.303)	4(1.2)	324(98.8)	0.659(0.883)
Single	5(9.1)	50(90.9)		1(1.8)	54(98.2)	
Divorced	4(13.8)	25(86.2)		0(0.0)	29(100.0)	
Widow	0(0.0)	10(100.0)		0(0.0)	10(100.0)	
Residence						
Urban	29(7.5)	356(92.5)	2.993(0.084)	5(1.3)	380(98.7)	0.486(0.486)
Rural	0	37(100)		0(0.0)	37(100.0)	
Occupation						
Unemployed	1(2.5)	39(97.5)	4.448(0.487)	3(7.5)	37(92.5)	**16.793(0.005)**
Daily laborer	6(11.5)	46(88.5)		1(1.9)	51(98.1)	
Merchant	3(4.2)	69(95.2)		0(0.0)	72(100.0)	
Student	2(5.0)	38(95.0)		0(0.0)	40(100.00	
Government employed	6(7.0)	80(93.0)		1(1.2)	85(98.8)	
Farmer	11(8.3)	121(91.7)		0(0.0)	132(100.0)	

HBSAg: Hepatitis B Virus Antigen; HCAb: Hepatitis C Antibody.
The bold values indicate variables statistically significant at $p < .05$.

Associated risk factors for HBV infection

Bivariate and multivariate analyses of different risk factors and the prevalence of HBV are presented in Table 3. According to the bivariate logistic regression analysis, history of unsafe injection, multiple sexual partners, history of delivery by traditional birth attendants, diabetes mellitus, previous history of hepatitis, having HIV, upper right abdominal pain, the presence of jaundice, and the presence of dark urine were significantly associated with the prevalence of HBV in the present study. However, in multivariate analysis, multiple sexual partners, history of delivery by traditional birth attendants, history of surgery, previous history of hepatitis, and upper abdominal pain remained independent predictors of HBV infection.

For instance, study participants who had a history of multiple sexual practices were almost 12 times more infected compared to those who had no history (AOR=12.299; 95% CI=2.515–60.142). Similarly, study participants who were delivered at home by traditional birth attendants were 6.2 times more likely to be infected by HBV compared to those who were not delivered at home (AOR=6.284; 95% CI: 2.373–16.637). The risk of HBV infection was 3.6 times (AOR=3.679; 95% CI=1.009–13.417) higher in study participants who had a history of surgery compared to their counterparts. Study participants who were previously infected by hepatitis were almost 10 times more likely to be infected by HBV than those who did not have hepatitis (AOR=10.374; 95% CI: 1.128–95.444). Likewise, study participants who showed symptoms of upper abdominal pain were 3.3 times more likely to be at risk of HBV than those who did not have upper abdominal pain (AOR:3.382; 95% CI=1.215–9.414).

Associated risk factors for HCV infection

In bivariate logistic regression, history of unsafe injection, history of dental procedure, history of blood transfusion, history of incarceration, history of circumcision at home, and surgical history were associated with increased seroprevalence of HCV. However, a history of blood transfusion and a history of kidney dialysis were the independent predictors of

Table 3. Univariate and multivariate analysis of HBV among different risk factors in Poly and Maraki health center, Gondar city, June to August, 2020.

Variables	Positives *n* (%)	Negatives *n* (%)	COR (95% CI)	*p* Value	AOR (95% CI)	*p* Value
History of unsafe injection						
No	21 (5.5)	362 (94.5)	1	0.001	1	0.150
Yes	8 (20.5)	31 (79.5)	4.547 (1.512, 13.670)		2.325 (0.737, 7.333)	
Tattooing						
No	21 (6.7)	292 (93.3)	1	0.823	NA	
Yes	8 (7.3)	102 (93.6)	1.101 (0.473, 2.564)			
History of dental procedure						
No	19 (6.2)	289 (93.8)	1	0.350	NA	
Yes	10 (8.8)	104 (91.2)	1.463 (0.659, 3.248)			
Share tooth brush						
No	26 (6.4)	380 (93.6)	1	0.070	1	0.422
Yes	3 (18.8)	13 (81.2)	3.373 (0.904, 12.585)		2.060 (0.353, 12.029)	
Multiple sexual partner						
No	25 (6.1)	385 (93.9)	1	0.002	1	**0.002**
Yes	4 (33.3)	8 (66.7)	7.700 (2.170, 27.325)		12.299 (2.515, 60.142)	
Consume more alcohol						
No	19 (6.1)	294 (93.9)	1	0.273	NA	
Yes	10 (9.2)	99 (90.8)	1.563 (0.703, 3.475)			
History of delivery by traditional birth attendants						
No	16 (4.5)	338 (95.5)	1	0.000	1	**0.000**
Yes	13 (19.1)	55 (80.9)	4.993 (2.227, 10.951)		6.284 (2.373, 16.637)	
History of abortion						
No	24 (6.8)	329 (93.2)	1	0.893	NA	
Yes	5 (7.2)	64 (92.8)	1.071 (0.394, 2.911)			
History of kidney dialysis						
No	27 (6.6)	383 (93.4)	1		1	
Yes	2 (16.7)	10 (83.3)	2.837 (0.592, 13.603)	0.192	2.348 (0.265, 20.826)	0.443
Had DM						
No	25 (6.2)	380 (93.8)	1	0.011	1	0.078
Yes	4 (23.5)	13 (76.5)	4.677 (1.421, 15.396)		3.933 (0.857, 18.049)	
Surgical history						
No	24 (6.2)	366 (93.8)	1	0.050	1	**0.048**
Yes	5 (15.6)	27 (84.4)	2.824 (0.998, 7.988)		3.679 (1.009, 13.417)	
Family having liver disease						
No	23 (6.2)	350 (93.8)	1	0.121	1	0.291
Yes	6 (12,2)	43 (87.8)	2.123 (0.819, 5.505)		0.486 (0.127, 1.857)	
Previous history of hepatitis						
No	26 (6.2)	390 (93.8)	1	0.001	1	**0.039**
Yes	3 (50.0)	3 (50.0)	15.000 (2.884, 78.012)		10.374 (1.128, 95.444)	
HIV status						
No	27 (6.5)	390 (93.5)	1	0.015	1	0.130
Yes	2 (40.0)	3 (60.0)	9.630 (1.543, 60.103)		5.930 (0.590, 59.585)	
Upper abdominal pain						
No	18 (4.9)	357 (97.8)	1		1	
Yes	11 (19.3)	48 (84.2)	4.610 (2.049, 10.370)	0.000	3.382 (1.215, 9.414)	**0.030**
Presence of jaundice						
No	19 (5.5)	327 (94.5)	1		1	
Yes	10 (13.2)	66 (86.8)	2.608 (1.160, 5.862)	0.020	1.477 (0.514, 4.244)	0.469
Weakness and fatigue						
No	20 (5.8)	322 (94.2)	1		1	
Yes	9 (11.2)	71 (88.8)	2.041 (0.892, 4.669)	0.091	1.666 (0.595, 4.664)	0.331
Presence of dark urine						
No	14 (3.5)	384 (96.5)	1		1	
Yes	3 (12.5)	21 (87.5)	3.918 (1.045, 14.6.98)	0.043	1.727 (0.445, 6.700)	0.430

NA: Not applicable; COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; 1: Reference.
The bold values shows variables statistically significant at $p < .05$.

Table 4. Univariate and multivariate analysis of HCV among risk factors in Poly and Maraki health center in Gondar city, North West Ethiopia from June to August, 2020.

Variables	Positives *n* (%)	Negatives *n* (%)	COR (95% CI)	*p* Value	AOR (95% CI)	*p* Value
History of unsafe injection				0.038	1	0.855
No	3 (0.8)	380 (99.2)	1		1.284 (0.087, 18.999)	
Yes	2 (5.1)	37 (94.9)	6.847 (1.109, 42.290)			
Tattooing						
No	4 (1.3)	309 (98.7)	1	0.766	NA	
Yes	1 (0.9)	108 (99.1)	0.715 (0.079, 6.470)			
Share tooth brush						
No	4 (1.0)	402 (99.0)	1		1	0.092
Yes	1 (6.2)	15 (93.8)	6.700 (0.705, 63.638)	0.098	22.363 (0.602, 831.072)	
History of dental procedure						
No	1 (0.3)	307 (99.7)	1	0.032	1	0.138
Yes	4 (3.5)	4 (3.5)	11.164 (1.234, 100.964)		9.942 (0.478, 206.649)	
History of blood transfusion						
No	3 (0.7)	409 (99.3)	1	0.000	1	**0.032**
Yes	2 (18.2)	8 (80.0)	34.083 (4.991, 232.747)		43.132 (1.385, 1343.176)	
Consume more alcohol						
No	2 (0.6)	313 (98.4)	1	0.101	1	0.095
Yes	3 (2.8)	104 (97.2)	4.514 (0.774, 27.390)		15.425 (0.621, 383.094)	
History of ear or body piercing						
No	4 (1.0)	398 (99.0)	1	0.147	1	0.663
Yes	1 (5.0)	19 (95.0)	5.237 (0.558, 49.148)		2.337 (0.051, 106.422)	
History of incarceration						
No	4 (1.0)	408 (99.0)	1	0.046	1	0.626
Yes	1 (10.0)	9 (10.0)	10.175 (1.041, 99.412)		2.728 (0.048, 154.210)	
History of circumcision at home						
No	3 (0.8)	387 (99.2)	1	0.021	1	0.613
Yes	2 (6.2)	30 (93.8)	8.600 (1.383, 53.469)		2.205 (0.103, 47.307)	
History of kidney dialysis						
No	4 (1.0)	406 (99.0)	1		1	**0.018**
Yes	1 (8.3)	11 (91.7)	9.227 (0.952, 879.464)	0.055	71.199 (2.074, 2444.646)	
Surgical history						
No	3 (0.8)	387 (99.2)	1	0.021	1	0.082
Yes	2 (6.2)	30 (93.8)	8.600 (1.383, 53.469)		10.999 (0.735, 164.525)	

NA: Not applicable; COR: Crude odds ratio; AOR: Adjusted odds ratio; CI: Confidence interval; 1: Reference.
The bold values shows variables statistically significant at $p < .05$.

HCV infection in this study. Study participants who received blood were infected more than 43 times (AOR = 43.132; 95% CI = 1.385–2343.176) than those who did not receive blood at least once in their lifetimes. The risk of HCV infection was more than 71 times more likely in those study participants who had kidney dialysis (AOR = 71.199; 95% CI: 2.074–2444.646) than in those who did not have kidney dialysis (Table 4).

Discussion

The prevalence of HBsAg was 6.9% in this study, which is an intermediate level of transmission (2–8%) according to WHO criteria of endemicity.[1] This is in agreement with studies conducted in the south Omo zone in the general population (7.2%),[21] among pregnant women in Hawassa city and Wolaita Zone, southern Ethiopia (6.6%, 7.3%),[25,26] and pregnant women in Nigeria (6.78%).[27] However, this prevalence was lower compared to studies conducted in Sekota town and Gondar city in the Amhara region in clinically suspected patients (21.16%, 14.4%),[7,22] in medical students in eastern Ethiopia (11.5%),[5] in chronic liver disease patients in Addis Ababa and Southern Ethiopia (35.8%, 22.3%),[28,29] in community-based studies in southern Ethiopia (9%, 8%),[9,21] in street dwellers in Gondar city (10.9%),[30] and in clinically suspected patients in Nigeria (16.7%).[31] This difference might be due to methodological differences, geographical variations, the type of study participants, and the type of study design used. The differences in HBV prevalence rates observed in various regions may also be due to variations in viral endemicity and knowledge of the mode of transmission. For instance, in highly endemic areas like Africa, HBV is often transmitted from mother to child during childbirth (perinatal transmission) or through contact with contaminated blood transfusion.

Additionally, HBV can also be spread through needlestick injuries or exposure to body fluids such as saliva, menstrual fluids, vaginal fluids, and semen.[1] As a result, differences in awareness of the mode of transmission of HBV are among the primary factors contributing to the variation in prevalence rates observed in this study and in previous studies conducted both within and outside Ethiopia.

In contrast, the HBsAg prevalence in this study is relatively higher than in studies done in clinically suspected patients in the Tigray region (3.57%),[6] health professionals at Gondar University Teaching Hospital (4.52%),[32] HIV-infected patients in northwest Ethiopia (2.0%),[14] healthcare workers at Jimma University (2.5%),[4] and clinically suspected patients in Rabat, Morocco (2.47%).[33] This difference might be due to differences in the study populations, in which health workers in previous studies were expected to be more aware of the transmission of the HBV virus than the general population groups in this study. Differences in the geographical location and the effect of some HIV drugs like lamivudine to eliminate HBV might be a possible explanation for the lower prevalence of HBV in HIV patients in an earlier study.[34]

According to this study, there was a higher prevalence of HBV than HCV, which is consistent with research from other studies done in Ethiopia[21,35] and Nigeria.[31] This is because HBV is 50%–100% more contagious than HCV.[36] Another explanation could be that of the use of HBsAg as a serologic marker, which can identify recent viral transmission, may have boosted prevalence, while the use of anti-HCV antibodies, which have the potential to diminish with time, may have underestimated prevalence in the case of HCV. However, the prevalence of HCV was higher in HIV-infected individuals in northwest Ethiopia[20] and hemodialysis patients in Addis Ababa.[37]

The overall seroprevalence of anti-HCV antibodies in this study was found to be 1.2%. This finding is in agreement with the WHO's low criteria.[2] This prevalence was similar to the previous studies conducted in HIV-infected patients in Debre Tabor Hospital (1.3%),[35] among antenatal clinics at Gonder Health Center (1.3%)[38] and among medical waste handlers in Gondar (1%).[39] On the other hand, higher prevalences were reported in Adawa among voluntary counseling testing and anti-retroviral treatment clinic attendants (4.3%),[40] among blood donors in Gondar city (5.8%),[41] among prison inmates (11.3%),[42] and at the HIV testing center in Hawassa (10.5%).[43] However, the prevalence was higher compared to studies conducted among the blood donors in Gondar and Jijiga in the northwest and eastern Ethiopia (0.7%, 0.4%)[44,45] and in India, (0.16%).[46] These variations might be due to differences in sample size, sociodemographic and economic characteristics, the behaviors of study participants, geographic locations, and study design.

According to the study, Maraki Health Center had a higher prevalence of HBV and HCV than Poly Health Center. Lower HBV and HCV rates at Poly Health Center might be a sign of better health-seeking habits in the city's core, where the facility is situated. A significant number of people living in the Maraki area either possess farms or work as laborers in the Setit Humera and Wolkait lowlands, where sesame and cotton are commonly cultivated and harvested. The elevated prevalence of Hepatitis B and C could be linked to unhygienic lifestyles and unsafe sexual practices during the harvest season.

Our study showed that the prevalence of HCV was higher in study participants over 45 years old, which is similar to studies conducted in Ethiopia, Rwanda, and Morocco.[21,47,48] The higher prevalence of HCV infection in older study participants may be due to either acquiring a new infection at an older age or having been infected for a longer period. Older adults with weakened immune systems due to complex comorbidities, such as diabetes, and hypertension are at a higher risk of developing cirrhosis and hepatocellular carcinoma due to the progression of HCV infection. Conversely, direct-acting antiviral agents have decreased the chances of HCV infection among young people, as well as screening for HCV in blood banks, and limited access to recreational drugs such as opioids.

In this study, the prevalence of HCV was higher in males, which is similar to studies conducted in Mekele[48] and Morocco.[49] This higher HCV prevalence in males might be due to frequent exposure and due to their higher-risk behaviors in comparison to females.

In this study, multiple sexual partners increased the risk of having an HBV infection by almost 12 times (AOR = 12.299, $p = 0.002$). This is in line with studies conducted in different parts of Ethiopia.[35,48,50] This study confirms that those who engage in multiple sexual partners are at an increased risk of contracting HBV. An increased risk of HBV infection was seen in research participants (mothers) who had previously given birth to traditional birth attendants. Study results from Atat hospitals in central Ethiopia[12] and Nigeria[51] also found similar findings. This may be due to the nonsterile instruments used by traditional birth attendants or the lack of adequate sanitation.

A previous history of hepatitis was also an independent risk factor significantly associated with HBV infection (AOR = 10.374, $p = 0.039$). This is in line with study conducted in Romania.[45] This might be due to the exacerbation of the virus from the chronic hepatitis B virus, which is accompanied by reactivation and conversion of nonreplicative HBV infection to replicative infection. Such spontaneous reactivations are accompanied by re-expression of HBeAg and HBV DNA, as well as by exacerbations of liver injury.[52]

The current study also showed that surgical history increased the risk of having an HBV infection by 3.6 times (AOR = 3.679, $p = 0.048$). This is in line with studies conducted in Ethiopia and Rwanda.[26,52] The lack of HBV screening for HBV before surgery and the re-usage of contaminated surgical instruments without proper sterilization of these instruments might be the possible explanations for the increased risk of HBV in those undergoing surgery in this study.

In this study, blood transfusion was found to be a statistically significant risk factor for HCV infection (AOR = 43.132, $p = 0.032$). This finding was similar to studies conducted in Ethiopia.[35,53] and Iran.[54] It might be due to blood transfusions with inadequate screening that can transmit HCV. The other reason might be that the diagnostic methods used in the diagnosis of HCV in Ethiopia (ELISA and rapid diagnostic kits) may not detect the virus in the window period.

The other risk factor associated with HCV infection in this study was a history of kidney dialysis (AOR = 71.199, $p = 0.018$). Similar to this study, kidney dialysis was associated with an increased risk of HCV in Ethiopia[37] and Iran.[55] Due to prolonged vascular access during kidney dialysis, patients might be exposed to a hepatitis C infection. Furthermore, kidney dialysis patients are immunesuppressed, so they might be exposed to different infections, like HCV.[56] The higher odds ratio and wider confidence intervals in statistically significant variables in HCV infection in this study might be due to the small number of HCV-positive cases ($n = 5$).

It should be noted that this study has a few limitations that need to be taken into consideration. First, only two out of the ten health centers were included in the study, which limits the generalization of the findings. Additionally, the diagnostic methods used in the study did not include ELISA or molecular approaches, which may have led to an underestimation of the prevalence of HBV and HCV among the study participants area.

Conclusions and recommendations

This study examined the prevalence of HBV and HCV among clinically suspected hepatitis patients attending Poly and Maraki Health Centers and found an intermediate endemicity of HBV infection and a lower prevalence of HCV according to the World Health Organization endemicity classification. The major risk factors for HBV include having multiple sexual partners, a history of delivery by traditional birth attendants, a surgical history, a previous history of hepatitis, and upper abdominal pain. On the other hand, HCV infection is significantly associated with blood transfusion and kidney dialysis. To prevent the transmission of HBV and HCV in the community, health education should be given about the means of transmission and associated risk factors of the hepatitis B and C viruses. Additionally, screening policies should be implemented and integrated with other health services as the higher intermediate level of transmission of HBV infection indicates the need for it.

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Authors' contributions

ST: Identified the research problem, collected and analyzed the data, and participated in the draft and final write-up of the manuscript. AA: Identified the research problem, collected and analyzed the data, and participated in the draft and final write-up of the manuscript. EB: Collected and analyzed the data, and participated in the draft and final write-up of the Manuscript. DM: Analyzed the data, participated in the draft and final write-up of the manuscript. AA: Analyzed the data, participated in the draft and final write-up of the manuscript.

Data availability

The corresponding authors can share data when reasonable requests emerge.

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Ethical approval for this study was obtained from College of Natural and Computational Sciences ethical committee (CNCS/10/639-25-5-2020).

Informed consent

Written informed consent was obtained from all subjects before the study.

Trial registration

Not applicable.

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Supplemental material

Supplemental material for this article is available online.

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