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ORIGINAL RESEARCH

Seroprevalence of Hepatitis B and C Viruses and Their Associated Factors Among Military Personnel at Military Camps in Central Gondar, Ethiopia: A Cross-Sectional Study

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Background: Globally, viral hepatitis is a leading cause of death and is highly prevalent in Ethiopia. Military personnel are more vulnerable to hepatitis B virus (HBV) and hepatitis C virus (HCV) infections, and there are no data on such populations in the study area. Therefore, this study aimed to determine the seroprevalence of HBV and HCV infections and their associated factors among military personnel in military camps in Central Gondar, Ethiopia.

Materials and Methods: This institutional-based cross-sectional study was conducted with 277 military personnel from April to August 2022 at military camps in Central Gondar, Ethiopia. A systematic random sampling technique was used to select the study participants. Sociodemographic and other relevant data were collected using a structured questionnaire. Five milliliters of venous blood were collected using a vacutainer tube and tested for hepatitis B surface antigens and anti-hepatitis C virus antibodies using an enzyme-linked immunosorbent assay. Data were analyzed using STATA version 14 software and logistic regression models were used to determine the association between HBV/HCV infection and risk factors.

Results: Out of 277 participants, the overall seroprevalence of HBV and HCV infections was 19 (6.9%) and 9 (3.3%), respectively. The rate of HBV and HCV co-infection was 2 (0.7%). Having multiple sexual partners ($p = 0.048$), frequent alcohol use ($p = 0.034$), hospitalization ($p = 0.014$), and history of receiving injections from traditional practitioners ($p = 0.040$) were significant predictors of HBV infection. In contrast, a history of blood transfusion ($p = 0.048$) and sexually transmitted infections ($p = 0.039$) were significant risk factors for HCV infection.

Conclusion and Recommendations: An intermediate prevalence of HBV and HCV infections was observed among the military personnel. Continuous screening, adherence to healthcare service guidelines, and strengthening of vaccination are crucial for preventing HBV and HCV infections.

Keywords: hepatitis B virus, hepatitis C virus, military personnel, Ethiopia

Background

Hepatitis is an inflammation of the liver caused by an infectious agent and is a leading public health problem. Common viral agents of hepatitis are hepatitis B virus (HBV) and hepatitis C virus (HCV), which can cause acute and chronic forms of liver disease.[1] Globally, HBV and HCV infections are major causes of chronic liver disease, eventually leading to cirrhosis, hepatocellular carcinoma (HCC), and even death.[2,3] Hepatitis B and C viruses share significant similarities, including high global prevalence, modes of transmission, hepatotropism, and capacity to induce chronic infection.[4,5]

The World Health Organization (WHO) estimates that 354 million people live with HBV and HCV.[6] Worldwide, approximately 296 million people are currently living with HBV, and the burden disproportionately affects sub-Saharan Africa and East Asia.[7] Indeed, preliminary statistics indicate that if the current state of underdiagnosis and under-treatment persists, it is predicted that global HBV-related mortality will rise by 39%, from 850,300 deaths in 2015 to

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1,109,500 deaths in 2030.[8] More than 60% of chronic liver disease and 80% of HCC are caused by chronic HBV and HCV infections.[9] The economic impact of HBV and HCV infections is vast because HCC has a high fatality rate in Africa, including Ethiopia, and usually affects economically productive age groups.[9]

Moreover, the WHO report also described Ethiopia as a country with a lack of diagnostic facilities and appropriate national surveillance strategies, poor prevention and control, and a lack of a coordinated and systematic national response to chronic viral hepatitis, even though the country is classified under geographical regions with intermediate to hyper-endemic viral hepatitis infections.[10,11] A meta-analysis study in Ethiopia reported 7.4% and 3.1% pooled prevalence rates of HBV and HCV infections, respectively.[12]

Although the potential for transmission varies, intravenous drug use, tooth extraction, tattooing, sharing of utensils with infected persons, age, and unsafe sexual practices were found to be common risk factors for HBV and HCV infections.[13–15] Military personnel are at a higher risk because they share items such as hairbrushes, combs, razors, and toothbrushes that increase exposure and facilitate virus transmission.[14] Furthermore, the military is frequently mobile from place to place for different professional reasons and stays longer without their family, which may cause them to have multiple sex partners and increase their exposure to different sexually transmitted infections (STIs).[16]

Several studies have reported the prevalence of HBV and HCV infections among different segments of the population in the study area[17–24] and there is a single report of armed forces in Bahir Dar, Amhara Regional State of Ethiopia.[16] No data were described the prevalence of viral hepatitis among military personnel in the study area. Therefore, this study aimed to determine the seroprevalence and associated risk factors of HBV and HCV infections among military personnel at the Central Gondar military camps, Ethiopia.

Materials and Methods

Study Design, Period, and Setting

This institutional-based cross-sectional study was conducted from April to August 2022 at the Azezo and Seraba military camps. Military camps are located in the Central Gondar Administrative Zone, Amhara National Regional State, approximately 750 km northwest of Addis Ababa, the capital city of Ethiopia.

Study Population

Military personnel found in military camps during the data collection period and those who consented to participate and provided blood samples were included. However, military personnel who were mentally or physically ill and unable to participate in the interviews were excluded from this study.

Sample Size and Sampling Technique

The sample size was determined by considering the 95% confidence interval (CI), 80% power from a previous study,[16] and 5% margin of error. A total of 277 participants were selected using systematic random sampling. Based on the information obtained from Central Gondar Zone military camps an estimated 3500 militaries were found in the two camps (Azezo and Seraba) each consisting of 1500 and 2000 militaries, respectively. The sampling interval value was determined as follows:

$$\frac{\text{Total military personnel who live in camp}\,(3500)}{\text{Total estimated sample size}\,(277)} = 12.6{\sim}13$$

Based on the order in which the military personnel were present at camp, the study participants were selected every 13 person patterns after determining the starting unit, which was three. To avoid recycling, special marks were used on the thumb and supported by verbal confirmation of whether to participate or not in the previous time during sample collection. The number of samples to be collected from each of the two camps was determined by using the proportional allocation formula: $ni = n * Ni/N$, where N = Total population, Ni = the total population of the subgroup, n = the total sample size, and ni = the total sample size in the subgroup.

Azezo camp; $ni = 277 * 1500/3500 = 119$

Seraba camp; $ni = 277 * 2000/3500 = 158$

Thus, 119 and 158 samples were collected from Azezo and Seraba, respectively, giving a total of 277 participants in our study.

Study Variables

The dependent variable was seroprevalence of HBV and HCV infections. The independent variables were sex, age, marital status, residence, educational status, work experience, family history of liver disease, previous hospitalization, history of HBV or HCV infection, war-related injury, dental extraction, surgical history, history of blood transfusion, history of body fluid contact, STI, cigarette smoking, alcohol use, tattooing, number of sexual partners, nose piercing, ear piercing, sharing sharp materials, history of drug use, receiving an injection from a traditional practitioner, and use of a condom.

Data Collection

Data on sociodemographic characteristics and risk factors for HBV and HCV infections were collected by trained health officers and senior nurses using a structured questionnaire after obtaining written informed consent. A pre-tested structured questionnaire was used for data collection.

Blood Sample Collection and Transportation

Five milliliters of venous blood was collected from each study participant by a trained laboratory technologist using vacutainer tubes. Whole blood samples were centrifuged at 3000 rpm for 10 minutes to separate the serum. Serum samples were transported to the Gondar Blood Bank Services laboratory using a cold box and stored at −20°C until use in an enzyme-linked immunosorbent assay (ELISA).

Laboratory Method

Hepatitis B surface antigen (HBsAg) and anti-HCV antibodies from the serum of each military personnel were determined using commercially available ELISA kits according to the manufacturer's instructions (Beijing Wantai Biological Pharmacy Enterprise Co., Ltd., Beijing, China).[25] We used HBsAg ELISA kit, with a sensitivity of 100% and a specificity of 99.92%, and anti-HCV ELISA kit, with a sensitivity of 100% and a specificity of 99.55%.

Data Management and Quality Control

Data were collected using a pretested questionnaire before the study period among 5% of military personnel at the Weleka submilitary camp in Gondar Town. One day of training was provided for data collectors on the aim of the study and the content of the questionnaire and regular supervision. Standard operating procedures were strictly followed during the blood sample collection, storage, and analytical processes. The storage conditions and expiration dates of the reagents were checked. The quality of the ELISA test was ensured by known positive and negative controls

Data Analysis and Interpretation

Data were checked for completeness and consistency, and coded manually. The data were entered into Epi Data version 3.1 and exported to the STATA software package (version 14) for analysis. Descriptive statistics such as percentages, means, and standard deviations were calculated. The data output is summarized and presented in tables. Logistic regression models were used to determine the association between outcome variables (HBV and HCV) and explanatory variables (risk factors). All variables in the bivariate logistic regression model whose P-value < 0.2 were passed into the multivariable analysis. Finally, the degree of association was assessed using an adjusted odds ratio (AOR), precision with a 95% confidence interval, and a p-value ≤ 0.05 was considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the School of Biomedical and Laboratory Sciences, College of Medicine and Health Science, University of Gondar, Ethical Review Committee (Ref. No. SBMLS/243; March 18, 2022). Official permission was obtained from the Central Gondar Zone military camp higher management. Written informed consent was obtained from each study participant, and confidentiality was maintained at each level of the study using code numbers for identification. The study participants who tested positive for HBsAg and anti-HCV antibodies were linked to a physician for clinical management. All laboratory procedures in this study were conducted following the amended Declaration of Helsinki.[26]

Results

Sociodemographic Characteristics of the Study Participants

A total of 277 military personnel participated in this study. Out of these participants, 203 (73.3%) were males. The mean age of the study participants was 27.39 ± 8 years. More than half (67.2%) of participants were below the age of 29 years, followed by 57 (20.6%) were 30 to 39 years and 34 (12.3%) were over 40 years old. About 119 (43.0%) of the study participants were single. Most of the participants, 156 (56.3%) were recruited from urban areas. Half of the study participants (139) attained 1 to 8 grade, 106 (38.3%) were secondary school students, and only 22 (7.9%) had a college diploma and above. A large proportion of military personnel 246 (88.8%) had less than 10 years of work experience (Table 1).

Table 1 Socio-Demographic and Related Variables of Military Personnel with HBV and HCV Infections at Military Camps in Central Gondar, Ethiopia (n = 277)

Variables		Frequency N (%)	HBV (+) N (%)	HCV (+) N (%)
Sex	Male	203 (73.3)	14 (6.9)	8 (3.9)
	Female	74 (26.7)	5 (6.8)	1 (1.4)
Age in years	≤ 29	186 (67.2)	11 (5.9)	5 (2.7)
	30–39	57 (20.6)	4 (7.0)	2 (3.5)
	≥ 40	34 (12.3)	4 (11.8)	2 (5.9)
Marital status	Single	119 (43.0)	7 (5.9)	2 (1.7)
	Married	99 (35.7)	7 (7.1)	4 (4.0)
	Divorced	45 (16.3)	4 (8.9)	2 (4.4)
	Widowed	14 (5.1)	1 (7.2)	1 (7.1)
Residence	Urban	156 (56.3)	12 (7.7)	7 (4.5)
	Rural	121 (43.7)	7 (5.8)	2 (1.7)
Educational status	Unable to read and write	10 (3.6)	1 (10)	1 (10.0)
	Primary school	139 (50.5)	9 (6.5)	3 (2.2)
	Secondary school	106 (38.3)	7 (6.6)	4 (3.8)
	College and above	22 (7.9)	2 (9.1)	1 (4.5)
Work experience (years)	<10	246 (88.8)	13 (5.3)	8 (3.3)
	≥10	31 (11.2)	6 (19.4)	1 (3.2)
Family history of liver disease	No	221 (79.8)	15 (6.8)	6 (2.7)
	Yes	56 (20.2)	4 (7.4)	3 (5.4)

(*Continued*)

Table 1 (Continued).

Variables		**Frequency N (%)**	**HBV (+) N (%)**	**HCV (+) N (%)**
Hospitalization	No	225 (81.2)	9 (4.0)	6 (2.7)
	Yes	52 (18.8)	10 (19.2)	3 (5.8)
History of HBV infection	No	252 (91.0)	16 (6.3)	
	Yes	25 (9.0)	3 (12.0)	
History of HCV infection	No	254 (91.7)		5 (2.0)
	Yes	23 (8.3)		4 (17.4)
War related injury	No	230 (83.0)	15 (6.5)	6 (2.6)
	Yes	47 (17.0)	4 (8.5)	3 (6.4)
Dental extraction	No	192 (69.3)	12 (6.3)	3 (1.6)
	Yes	85 (30.7)	7 (8.2)	6 (7.1)
Surgical history	No	219 (79.1)	14 (6.4)	6 (2.7)
	Yes	58 (20.9)	5 (8.6)	3 (5.2)
History of blood transfusion	No	199 (71.8)	11 (5.5)	2 (1.0)
	Yes	78 (28.2)	8 (10.3)	7 (9.0)
History of body fluid contact	No	204 (73.7)	13 (6.4)	6 (2.9)
	Yes	73 (26.4)	6 (8.2)	3 (4.1)
STI	No	216 (78.0)	12 (5.6)	2 (0.9)
	Yes	61 (22.0)	7 (11.5)	7 (11.5)
Cigarette smoking	Past smoker	25 (9.0)	3 (12.0)	2 (8.0)
	Never smoker	173 (62.5)	10 (5.8)	5 (2.9)
	Current smoker	79 (28.5)	6 (7.6)	2 (2.5)
History of drug user	No	264 (95.3)	18 (6.5)	8 (2.9)
	Yes	13 (4.69)	1 (7.7)	1 (7.7)
Alcohol use	No	129 (46.6)	2 (1.6)	3 (2.3)
	Yes	148 (53.4)	17 (11.5)	6 (4.1)
Tattooing	No	167 (60.3)	12 (7.2)	5 (3.0)
	Yes	110 (39.7)	7 (6.4)	4 (3.6)
Number of sexual partner	1	88 (31.8)	2 (2.3)	4 (4.5)
	≥ 2	133 (48.0)	16 (12.0)	4 (3.0)
	0	56 (20.2)	1 (1.8)	1 (1.8)
Nose piercing	No	258 (93.1)	18 (7.0)	8 (3.1)
	Yes	19 (6.9)	1 (5.3)	1 (5.3)

(*Continued*)

Table 1 (Continued).

Variables		Frequency N (%)	HBV (+) N (%)	HCV (+) N (%)
Ear piercing	No	203 (73.3)	14 (6.9)	8 (3.9)
	Yes	74 (26.7)	5 (6.8)	1 (1.4)
Sharing sharp materials in camps	No	184 (66.4)	13 (7.1)	7 (3.8)
	Yes	93 (33.6)	6 (6.5)	2 (2.2)
Received injection from traditional practitioner	No	254 (91.7)	15 (5.9)	8 (3.1)
	Yes	23 (8.3)	4 (17.4)	1 (4.3)
Consist use of condom	No	115 (41.5)	10 (8.7)	4 (3.5)
	Yes	162 (58.5)	9 (5.6)	5 (3.1)

Abbreviations: HBV, Hepatitis B Virus; HCV, Hepatitis C Virus; STI, Sexually Transmitted Infection; N, Number.

Seroprevalence of HBV and HCV Infections

Out of 277 study participants, the overall seroprevalence of HBV and HCV was 19 (6.9%) (95% CI: 4.1–10.5%) and 9 (3.3%) (95% CI: 1.5–6.1%), respectively. The co-infection rates of HBV and HCV were 2 (0.7%) (95% CI: 0.09–2.6%). The prevalence of HBV was almost similar in male and female military with 6.9% and 6.8%, respectively. However, HCV was higher in males (3.9%). The proportion of both HBV and HCV infection was higher in older study participants, with 11.8% and 5.9%, respectively. Hepatitis C virus infection was high in military personnel unable to read and write (10.0%), those having a history of blood transfusion (9.0%), and past smokers (8.0%). The highest prevalence of both viruses was found in participants from urban residences (7.7% of HBV) and (4.5% of HCV).

The proportion of HBV infection was higher in military personnel who had work experience of greater than or equal to 10 years (19.4%), and a history of hospitalization (19.2%). The presence of HBV and HCV history responded during interview increased their prevalence, which was 12.0% and 17.4%, respectively. Both HBV and HCV were higher in participants having a history of STIs (11.5% each). Additionally, the highest seroprevalence of HBV was also observed in military personnel receiving injections from a traditional practitioner (17.4%), having multiple sexual partners (12.0%), having a history of frequent alcohol use (11.7%), and not using condoms (8.7%) (Table 1).

Factors Associated with HBV and HCV Infections Among Military Personnel

Multiple logistic regression models showed that HBV infection was significantly associated with hospitalization (AOR: 3.78, 95% CI: 1.31–10.9, p = 0.014), frequent alcohol consumption history (AOR: 5.35, 95% CI: 1.13–2.35, p = 0.034), multiple numbers of sexual partners (AOR: 5.55, 95% CI: 1.01–28.3, p = 0.048), and receiving an injection from a traditional practitioner (AOR: 4.34, 95% CI: 1.1–17.76, p = 0.040) (Table 2). Similarly, history of blood transfusion

Table 2 Bivariate and Multivariable Analysis of Factors Associated with HBV Infection Among Military Personnel at Military Camps in Central Gondar, Ethiopia (n = 277)

Variables		HBV (+) N (%)	HBV (-) N (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
Work experience in years	< 10	13 (5.3)	233 (94.7)	1		1	
	≥ 10	6 (19.4)	25 (80.6)	4.3 (1.5–12.3)	0.007	3.11 (0.91–0.8)	0.072
Hospitalization	No	9 (4.0)	216 (96.0)	1		1	
	Yes	10 (19.)	42 (80.8)	5.71 (2.18–14.9)	0.000	3.78 (1.31–10.9)	0.014*

(*Continued*)

Table 2 (Continued).

Variables		HBV (+) N (%)	HBV (-) N (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
History of blood transfusion	No	11 (5.5)	188 (94.5)	1		1	
	Yes	8 (10.3)	70 (89.7)	1.95 (0.75–5.1)	0.168	1.43 (0.44–4.7)	0.549
History of STI	No	12 (63.2)	204 (79.1)	1		1	
	Yes	7 (36.8)	54 (20.9)	2.2 (0.83–5.9)	0.114	0.94 (0.28–3.2)	0.925
Alcohol use	No	2 (1.6)	127 (98.4)	1		1	
	Yes	17 (11.5)	131 (88.5)	8.24 (1.86–36.4)	0.005	5.35 (1.13–25.4)	0.034*
Number of sexual partner	1	2 (2.3)	86 (97.7)	1.28 (0.11–14.4)	0.842	1	
	≥ 2	16 (12.0)	117 (88.0)	7.52 (0.97–58.2)	0.053	5.55 (1.01–28.3)	0.048*
	0	1 (1.8)	55 (98.2)	1			
Received injection from traditional practitioner	No	15 (5.9)	239 (94.1)	1		1	
	Yes	4 (17.4)	19 (82.6)	3.35 (1.01–11.1)	0.048	4.34 (1.1–17.8)	0.040*

Note: *Statistically Significant.
Abbreviations: COR, Crude Odds Ratio; AOR, Adjusted Odds Ratio; CI, Confidence Interval; HBV, Hepatitis B Virus; STI, Sexually Transmitted Infection; N, Number.

Table 3 Bivariate and Multivariable Analysis of Factors Associated with HCV Infection Among Military Personnel at Military Camps in Central Gondar, Ethiopia (n = 277)

Variables		HCV (+) N (%)	HCV (-) N (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
Past history of HCV Infection	No	5 (2.0)	249 (98.0)	1		1	
	Yes	4 (17.4)	19 (82.6)	10.5 (2.6–42.3)	0.001	4.9 (0.99–24.2)	0.052
War related injury	No	6 (2.6)	224 (97.4)	1		1	
	Yes	3 (6.4)	44 (93.6)	2.55 (0.6–10.7)	0.198	0.28 (0.05–1.6)	0.158
Dental extraction	No	3 (1.6)	189 (98.4)	1		1	
	Yes	6 (7.1)	79 (92.9)	4.78 (1.2–19.6)	0.030	3.3 (0.69–16.2)	0.134
History of blood transfusion	No	2 (1.0)	197 (99.0)	1		1	
	Yes	7 (9.0)	71 (91.0)	9.7 (1.97–47.8)	0.005	5.9 (1.02–33.8)	0.048*
Past history of STI	No	2 (0.9)	214 (99.1)	1			
	Yes	7 (11.5)	54 (88.5)	13.87 (2.868.7)	0.001	6.6 (1.1–39.9)	0.039*

Note: *Statistically Significant.
Abbreviations: AOR, Adjusted Odds Ratio; CI, Confidence Interval; COR, Crude Odds Ratio; HCV, Hepatitis C Virus; STI, Sexually Transmitted Infection; N, Number.

(AOR: 5.9, 95% CI: 1.02–33.8, p = 0.048) and STI (AOR: 6.6, 95% CI: 1.1–39.9, p = 0.039) were statistically significant with HCV infection (Table 3).

Discussion

Ninety-six percent of all viral hepatitis-related deaths are caused by hepatocyte-specific hepatitis B and C virus infections.[16] According to the WHO classification of countries, HBV prevalence >8% can be graded as high, 2–8% is intermediate, and <2% is considered as low.[27] Ethiopia is grouped under geographic regions with an intermediate prevalence of viral hepatitis infections.[28] In this study, the seroprevalence of HBV among military personnel was intermediate (6.9%). This finding is comparable to previous studies conducted in Bahir Dar, Ethiopia (4.2%)[16] and Iran (4.8%).[29] However, a higher prevalence of HBV was reported in Senegalese military personnel on mission to Darfur (Sudan) (14.2%),[30] Senegal (10.8%),[31] and Northern Ethiopia (13.0%).[32] Our finding is higher than reports in Lithuania (1.97%),[33] Pakistan (3.24%;[34] 2.8%[35]), China (0.44%),[36] Greece (0.32%),[37] Caribbean country (4.0%),[38] Brazil (0.22%),[39] UK (0.37%),[40] and India (1.25%).[41] The discrepancy between our findings and the studies conducted elsewhere might be due to variations in sample size, sampling technique, socioeconomic status, availability of medical services, study period, vaccination status, type of risk exposure to HBV infection, and diagnostic techniques.

The overall seroprevalence of HCV infection in this study was 3.3%. This finding is consistent with studies conducted in Pakistan (3.4%)[35] and India (1.5%).[42] The lower prevalence of HCV was reported in Bahir Dar, Ethiopia (0.2%),[16] Brazil (0.7%;[43] 0.28%[39]), Iran (0.7%),[29] Afghanistan (0.82%),[44] UK (0.06%),[40] and Turkey (0.46%). In contrast, our finding is lower than studies conducted in Pakistan (3.69%),[35] Rwanda (16.0%),[45] and Caribbean countries (36.7%).[38] The difference might be due to the potential variability of the diagnostic test kit employed, sample size, geographic location, awareness of transmission methods of HCV, and exposure to risk factors.

In this study, the co-infection of HBV and HCV was 0.7%. This implies that HBV and HCV could share a similar route of transmission and risk factors. This is supported by some studies, in which HBV and HCV co-infection is common due to the sharing of transmission routes, especially in endemic areas and among subjects at risk of parenteral transmissible infections such as blood transfusion and injection drug use.[46,47] In contrast, no co-infection of these viruses was detected in studies conducted in Ethiopia and elsewhere.[16,38,41] The absence and/or low prevalence of HBV and HCV co-infection is related to the replication inhibition mechanism of both viruses. A mutual inhibition of viral replication occurs in HBV and HCV co-infection, with HCV exerting a negative effect on HBV replication and HBsAg carriers with concurrent HCV infection having low-level HBV viremia, low titers of HBsAg in serum, and low-levels of intracellular HBsAg.[48] Although the detailed mechanism remains unclear, viral interference involves complex integration between virus replication properties and the host immune system. The HBV interference with HCV replication results in a lower HCV RNA titer in patients with concurrent HBV infection.[49]

Regarding factors for HBV infection, having a history of multiple sexual partners was significantly associated with acquiring HBV infection, which is supported by certain studies.[39,44,45] This is due to experiencing multiple contacts with HBV carriers through unprotected sex. The HBV infection was higher in study participants who consumed alcohol. This finding is consistent with a study conducted in Afghanistan.[44] Behavioral factors like alcohol consumption can increase sexual desire and put people at increased risk of HBV transmission.[50] A study reported that more frequent episodes of alcohol intoxication were associated in a dose-dependent manner with an increased risk of having more sexual partners.[51] Besides, alcohol increases HBV replication and oxidative stress, suppresses the immune response, promotes liver damage, and increases the likelihood of developing cirrhosis. There is also an increased risk of HCC in HBV-infected patients who consume a lot of alcohol.[52,53]

Hepatitis B virus is highly contagious, a hundred times more infectious than human immunodeficiency virus (HIV), and stays outside the bloodstream longer than HIV.[54] In this study, a history of receiving injections from a traditional practitioner was associated with the acquisition of HBV infection. This finding is consistent with a study conducted in India.[55] This is due to unsafe injection practices, such as the use of one syringe for more than one individual, injections prepared in an unclean area, and re-use of single-use disposable needles and syringes.[56] Low awareness of HBV and the sharing of needles in the study participants may also increase its transmission. Moreover, military personnel with a history of hospitalization were significantly associated with HBV infection similar to a study in Iran.[14] This could be due to poor infection control practices in health facilities, improper sterilization of medical equipment, absence of protective equipment, and low awareness of the hospital population. Since HBV is stable on environmental surfaces for at least one week, indirect inoculation of HBV can also occur via inanimate objects.[57]

In our study, risk factors such as previous history of blood transfusion and STI were significantly associated with HCV infection. In our setting, HCV testing from blood and blood products using ELISA may not be able to accurately detect the virus in the window period and occult hepatitis, which requires advanced laboratory techniques. In other studies, a history of STI was a possible risk factor for HCV infection.[16,39] Sexually transmitted infections present a continuing challenge to the efforts to prevent diseases in the military.[31] The risk of acquiring HCV infection increased among heterosexual persons with pre-existing HIV, particularly among those engaging in high-risk sexual behaviors and having unprotected sex with multiple sexual partners.[58] Additionally, HCV RNA can be present in the menstruation of a female, increasing the possibility of blood-to-blood contact and the transmission of the virus.[59]

The study has the following limitations: there is a lack of information about the type of infection, such as acute, chronic, or recovery/immunity. We only performed HBsAg and anti-HCV antibody tests for detecting current HBV and HCV infections. Because of resource limitations, molecular analysis and serotyping of HBV and HCV were not performed. Despite its drawbacks, this study added new information regarding HBV and HCV infections among military personnel for the first time in the study area.

Conclusion and Recommendations

This study demonstrated an intermediate prevalence of both HBV and HCV infections among military personnel. The previous history of hospitalization, frequent alcohol consumption, multiple sexual partners, and receiving injections from traditional practitioners were significantly associated with HBV infection. However, a history of blood transfusion and STI were significant risk factors for HCV infection. Continuous screening of military personnel, improving adherence to healthcare service guidelines, and strengthening vaccination of those high-risk individuals are key strategies to prevent HBV and HCV infections and decrease the hepatitis virus spread in the community.

Abbreviations

AOR, Adjusted Odds Ratio; COR, Crude Odds Ratio; ELISA, Enzyme-Linked Immune Sorbent Assay; HBsAg, Hepatitis B surface Antigen; HBV, Hepatitis B Virus; HCC, Hepatocellular Carcinoma; HCV, Hepatitis C Virus; HIV, Human Immunodeficiency Virus; HRP, Horse Radish Peroxidase; STI, Sexually Transmitted Infections; WHO, World Health Organization.

Data Sharing Statement

All relevant information is included in the manuscript and will be provided upon reasonable request to the corresponding author.

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Author Contributions

All authors made a significant contribution to this manuscript; took part in the conception, drafting, revising, or critically reviewing the article; have agreed on the journal to which the article has been submitted; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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