ECRONICON OPEN ACCESS

EC MICROBIOLOGY
Research Article

Risk Factors and Sero-Prevalence of HBV Infection among Crime Preventing Federal Police in Addis Ababa, Ethiopia

Tekilu Israel[1], Temesgen Tantu[2] and Admasu Haile[2]*

[1]*College of Health Science, Addis Ababa University, Addis Ababa, Ethiopia*

[2]*College of Health Sciences, Wolkite University, Wolkite, Ethiopia*

***Corresponding Author:** Admasu Haile, College of Health Sciences, Wolkite University, Wolkite, Ethiopia.

Received: May 27, 2022; **Published:** July 27, 2022

Abstract

Viral hepatitis is one of international public health problem affecting many individuals each year, causing disability and death. Military personnel are particularly vulnerable to parenteral and sexually transmitted diseases like hepatitis B virus (HBV).There are no data on the prevalence and associated factors of HBV among federal police staff in Ethiopia. So, this study was aimed at assessing the prevalence and associated factors of HBV among federal police staff in Addis Ababa, Ethiopia.

An institutional-based cross-sectional study was conducted in Addis Ababa, Ethiopia from December 2020 to June 2021. A structured questionnaire was used to collect data on socio-demographic characteristics. Blood samples were tested using a one-step test strip for HBsAg and positive samples were retested by using Murex HBsAg version 3 UK ELISA kits. Data analysis was done using SPSS version 21 computer software. Binary and multiple regressions were done to assess the strength of the association between dependent and independent variables.

The overall prevalence of HBV in this study was 4.6% (n = 23/500). The prevalence was higher in males (20/500) than in females (3/500). 97% and 99.6% of study participants, respectively, were not screened and were not vaccinated. In multiple regression, only residence (AOR = 2.4211 CI [1.015, 5.778]) was the independent predictor of HBV infection.

The prevalence of the hepatitis B virus was intermediate in this study. HBV infection was found to be more common in men, as well as those who had a history of blood transfusions and tooth extraction.

Keywords: *Hepatitis B Virus Prevalence; Federal Police; Addis Ababa; Ethiopia*

Introduction

Viral hepatitis affects many individuals each year causing disability and death, and is a major topic of discussion in international health platforms [1]. Hepatitis B virus (HBV) is one of the major causes of acute and chronic liver disease worldwide. Chronic infection with this virus often leads to chronic liver disease, including cirrhosis or primary hepatocellular carcinoma. HBV is transmitted efficiently by both percutaneous and mucosal exposures [2]. 80% of virus-associated hepatocellular carcinoma (HCC) cases are due to HBV in Africa and East Asia, the areas with the highest incidence of HCC globally [3]. Worldwide, hepatitis B virus infection is a major public health problem; approximately 30% of the world's population shows serological evidence of current or past infection. HBV is majorly transmitted through infected blood or other body fluids, so its well-known transmission modes include vertical transmission (mother-to-child), sexual transmission, unsafe injections, blood transfusions, or dialysis [4,5]. The infection can cause acute and chronic liver

disease, including cirrhosis and HCC [6]. Chronic infection with the hepatitis B virus (HBV) is a major cause of chronic liver disease and remains endemic in many countries despite the worldwide implementation of vaccination. By 2030, the viral hepatitis elimination goal has been adopted by the World Health Organization as a major public health threat, calling for a 90% reduction in new infections and a 65% reduction in mortality [7,8]. In Ethiopia, different studies were conducted on the prevalence of HBV among different non-police study populations [9-14] and a few were done in Ethiopia and across the world in this area [15-21]. To the best of our knowledge, there is no study conducted on the sero-prevalence and risk factors of HBV infection among federal police staffs involving in crime prevention in Ethiopia in this area. So, this study was aimed at detecting the prevalence and risk factors of HBV among federal police staff.

Materials and Methods

Study area

The study was conducted in Addis Ababa, the capital city of Ethiopia. A population of 3,384,569 according to the 2007 population census, with an annual growth rate of 3.8%. This Ethiopian capital city covers 527 square kilometers and has a population density of 5,165.1/km^2; the entire population lives in cities. All Ethiopian ethnic groups are represented in the city. There are around 30,000 federal police staff in Ethiopia, and of those, approximately 13,500 is in Addis Ababa. The investigation focused on the federal police staff selected from four sub-cities (Lideta, Bole, Arada and Kolfe) out of ten sub-cities of Addis Ababa.

Study design and period

Institutional based cross-sectional study was conducted from December 2020 to June 2021 at Addis Ababa, Ethiopia.

Source population

The source population was all federal police staffs in Addis Ababa, Ethiopia.

Study population

The study population was federal police crime prevention staffs around study area who meet the inclusion criteria and selected for the study.

Inclusion criteria

All federal police crime prevention staffs those present in the work area during data collection day.

Exclusion criteria

- Those who are unable to communicate for different reasons
- Those who knew their status of HBV and HCV
- Those who have critical health problems.

Study variables

Dependent variables

- Prevalence of HBV.

Independent variables

- Socio demographic characteristics (Age, sex, marital status, position, educational status, residence
- Risk factors of HBV infection (history blood transfusion, sharing of sharp materials, vaccination status, history of ear piercing, history of tooth extraction, history of tattooing, history of multiple sex, and history of surgery).

Sample size calculation and sampling method

The sample size was calculated using a single population proportion formula considering the following assumptions.

Confidence interval = 95%, Zα/2 = 1.96, Degree of precision d = 0.05. The proportion (p) = 50% since there was no research done in the same setting.

$$n = \frac{(Z\,\alpha/2)2p(1-p)}{d^2}$$

$$n = \frac{(1.96)2(0.5(1-0.5))}{(0.05)^2}$$

n = 384.

With non-response rate of 10%, final sample size = 422. However, intentionally data was collected from 500 participants.

From total of seven directorates of Federal police, two directorates participating in crime prevention duties were included for this study. The study participants were selected systematically using each division found in selected directorates after proportional allocation of calculated sample size.

Data collection

Socio-demographic data collection

After obtaining written consent from the study groups, socio-demographic data and risk factors of HBV infection were collected using a pre-tested questionnaire.

Blood specimen collection and processing

Five milliliters of venous blood were collected from each participant using gel and clot activator tubes. The tubes were labeled, processed at the time of collection and transported to the laboratory. The serum was allowed to clot and the serum was separated by centrifugation at room temperature at 10,000 rpm for ten minutes. After separation, all serum samples were tested for HBsAg with the Wondfo (Guangzhou Wondfo Biotech Co., Ltd., China) one-step HBsAg serum/plasma test method for detection of hepatitis B surface antigen (HBsAg). The remaining sera were stored in a freezer at -20 degrees Celsius. All rapid positive tests were confirmed using ELISA at the national blood bank.

Data quality assurance

Prior to the beginning of any data collection, all data collectors were trained on the overview of the assessment and its objectives. All specimens were collected according to the standard operating procedure for specimen collection. The quality of test results was maintained by using the internal quality control of the test kits and by using a known negative and positive sample as an external quality control.

Data analysis and interpretation

Data entry and analysis were done using SPSS version 21.0. The data was summarized and presented in descriptive measures such as tables and percentages. To determine the association between HBV infection and risk factors, odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were calculated.

Ethical considerations

The study was carried out after approval by Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Ethical Review Committee and Institutional Review Board (IRB). It was also approved by the federal police crime prevention health center's Ethical Review Committee, and a support letter was obtained from Addis Ababa Health Bureau. The purpose of the study was explained to each participant, and a sample was obtained only after each participant gave his/her written consent. All information obtained is held securely and stored on paper and computer files with a unique identification number. No one except the interviewers knew the participant took part in the study and the answers were given by the participant marked with a study number only and not their name.

Results

Socio-demographic characteristics

Of a total of 500 study participants, 81.4% were males and 64% belonged to the age group of 18 to 25 years old. Regarding marital status, 59.4% were single and 42.6% of total participants had a college or above educational level. The majority, 75%, of total study participants was from rural areas (Table 1).

Variables		Frequency (n = 500)	Percentage (%)
Sex	Male	407	81.4
	Female	93	18.6
Age category	18 - 25	320	64
	26 - 35	137	27.4
	> 36	43	8.6
Educational background	1 - 8	8	1.6
	9 - 12	279	55.8
	Collage and above	213	42.6
Marital status	Married	196	39.2
	Single	297	59.4
	Divorced	7	1.4
	Widowed	0	0

Position	Constable	274	54.8
	Sergeant	168	33.6
	Inspector	49	9.8
	Commander	9	1.8
Ethnicity	Oromo	106	21.2
	Amhara	124	24.8
	Tigray	60	12
	Wolaita	40	8
	Others	170	34
Religion	Orthodox	298	59.6
	Muslim	51	10.2
	Protestant	143	28.6
	Catholic	7	1.4
	Others	1	0.2
Residence background	Rural	375	75
	Urban	125	25

Table 1: *Socio-demographic characteristics among federal police staff in Addis Ababa Ethiopia, (n = 500), 2021.*

Clinical and risk factors

From a total of 500 study participants, 6.8%, 31.0%, 19.0%, 18.1%, 28.5%, and 58.8% had a history of surgery, multiple sex, tattooing, tooth extraction, ear piercing and sharing sharp materials with others, respectively. Almost all of the study participants (99.5%) were not vaccinated for HBV infection and the majority (98.9%) had no history of blood transfusion (Table 2).

Risk factors	Frequency	Percent (%)
Sharing sharp materials		
Yes	294	58.8
No	206	41.2
History of blood transfusion		
Yes	5	1
No	495	99
History of vaccination		
Yes	2	0.4
No	498	99.6
History of ear piercing		
Yes	142	28.4
No	358	71.6
History of tooth extraction		
Yes	91	18.2
No	409	81.8
History of tattooing		
Yes	94	18.8
No	406	81.2
History of multiple sex		
Yes	148	29.6
No	352	70.4
History of surgery		
Yes	58	11.6
No	442	88.4

Table 2: *Distribution of risk factors among Federal police, Addis Ababa, Ethiopia 2021.*

Prevalence of HBsAg

Figure 1 shows that the overall prevalence of HBsAg was 4.6 percent (n = 23/500) in both rapid and ELISA tests.

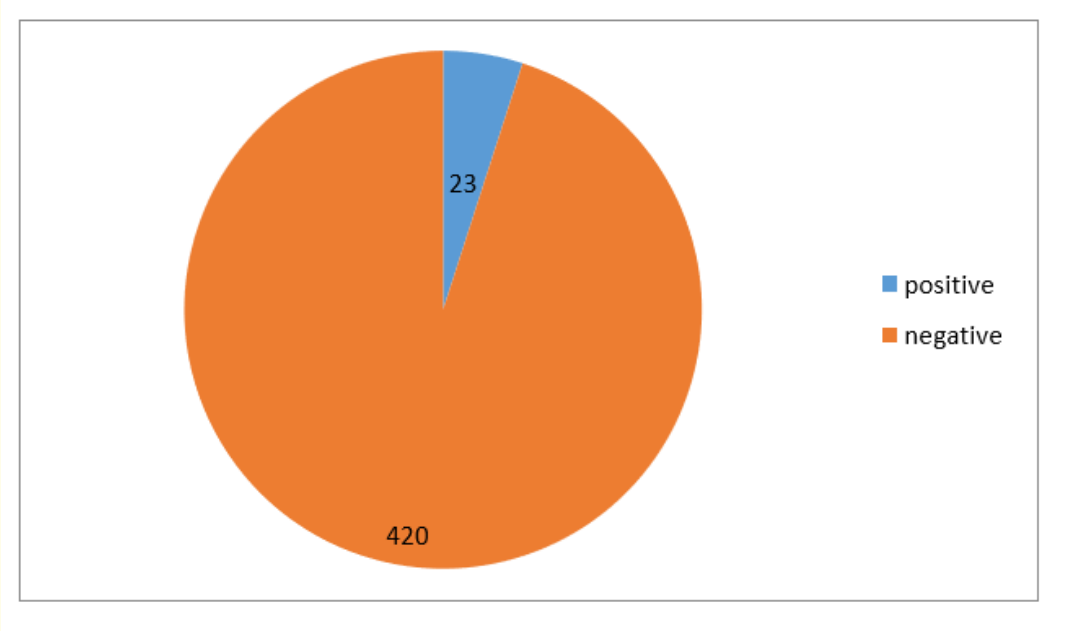

Figure 1: *The Prevalence of HBV infection among federal police in Addis Ababa, Ethiopia 2020.*

HBV infection prevalence with socio-demographics characteristics

Eighty-seven percent (20/23) of the 23 positive cases were of the male sex. In terms of age group, 6.0% (n =18/284) of HBsAg was found in people aged 18 - 25 years old. 4.7% and 4.6% of HBsAg were detected in single and married people, respectively (Table 3).

Variables		Total	HBsAg		Total
		Pos (%)	Neg (%)		
Sex	Male	407 (81.4)	20 (4.9)	387 (95.1)	407
	Female	93 (18.6)	3 (3.2)	90 (96.8)	93
Age category	18 - 25	320 (64)	18 (5.6)	302 (94.4)	320
	26 - 35	137 (27.4)	4 (3)	133 (97)	137
	> 36	43 (8.6)	1 (2.3)	42 (97.7)	43
Educational background	1-8	8 (1.6)	0 (0)	8 (100)	8
	9-12	279 (55.8)	12 (4)	267 (96)	279
	Collage and above	213 (42.6)	11 (5.2)	202 (94.8)	213

Marital status	Married	196 (39.2)	9 (4.6)	187 (95.4)	196
	Single	297 (59.4)	14 (4.7)	283 (95.3)	297
	Divorced	7 (1.4)	0 (0)	7 (100)	7
	Widowed	0 (0)	0 (0)	0 (0)	0
Position	Constable	274 (54.8)	14 (5.1)	260 (94.9)	274
	Sergeant	168 (33.6)	7 (4.2)	161 (95.8)	168
	Inspector	49 (9.8)	2 (4.1)	47 (95.9)	49
	Commander	9 (1.8)	0 (0)	9 (100)	9
Residence	Rural	375 (75)	13 (3.5)	362 (96.5)	375
	Urban	125 (25)	10 (8)	115 (92)	125

Table 3: *Prevalence of HBsAg with socio-demographic characteristics among federal police crime prevention staffs Addis Ababa, Ethiopia 2020 (n = 500).*

HBV infection with risk factors

Of the total 23 infected participants, 65.5% shared sharp materials with others and 43.5% had a history of ear piercing. Participants with a history of tattooing, surgery, or multiple sex practice had a 17.4%, 21.7% and 26.1% prevalence of HBsAg, respectively (Table 4).

Risk factors	**HBsAg by ELISA rest**	
	Positive (%)	**Negative (%)**
Sharing sharp materials with other		
Yes	15 (65.5)	279 (58.5)
No	8 (34.8)	198 (41.5)
History of blood transfusion		
Yes	1 (4.3)	4 (0.8)
No	22 (95.7)	473 (99.2)
History of vaccination		
Yes	0 (0)	2 (0.4)
No	23 (100)	475 (99.6)
History of ear piercing		
Yes	10 (43.5)	132 (27.7)
No	13 (56.5)	345 (72.3)
History of tooth extraction		
Yes	3 (13.0)	88 (18.4)
No	20 (87.0)	389 (81.6)
History of tattooing		
Yes	4 (17.4)	90 (18.9)
No	19 (82.6)	406 (81.2)
History of multiple sex		
Yes	6 (26.1)	142 (29.8)
No	17 (73.9)	335 (70.2)
History of surgery		
Yes	5 (21.7)	53 (11.1)
No	18 (78.7)	424 (88.9)

Table 4: *Prevalence of HBsAg with risk factors among Federal police, Addis Ababa, Ethiopia 2020.*

Associated factors of HBsAG

Both binary and multiple regressions were done to assess the strength of the association between the dependent variable and explanatory variables. In both regressions, the residence background of the respondents was found to be significantly associated with the prevalence of HBsAg (p value < 0.05). The likelihood of developing HBV infection is 1.550 times higher among females than males. Participants with no ear piercing history had a 0.543 lower risk of developing HBV than their counter parts, AOR (0.543 (0.230 - 1.283). Individuals with a history of surgery were 2.222 times more likely to acquire HBV than those without a history of surgery. AOR 95%CI (2.222 (0.792 - 6.23) (Table 5).

Variables		Total	HBsAg positive	COR (95%CI)	P value	AOR (95% CI)	P value
Sex	Male	407	20	1			
	Female	93	3	1.550 (0.451-5.331)	0.486		
Age	18-25	320		1		1	
	26-35	137		0.399 (0.52-3.070)	0.378	0.288 (0.034-2.436)	0.253
	>36	43		0.792 (0.86-7.279)	0.836	0.543 (0.058-5.731)	0.639
Education level	1-8	8	0	1			
	9-12	279	12	-			
	College and above	213	13	1.212 (0.524-2.802)	0.654		
Residence	Rural	375	13	1		1	
	Urban	125	10	0.413 (0.167-0.967)	0.042*	2.421 (1.015-5.778)	0.046*
Sharing sharp materials	Yes	294	15	1			
	No	206	8	1.331 (0.553-3.199)	0.523		
History of blood transfusion	Yes	5	1	1		1	
	No	495	22	5.375 (0.576-50.118)	0.140	4.859 (0.419-56.305)	0.206
History of ear piercing	Yes	142	10	1			
	No	358	13	2.010 (0.861-4.697)	0.107	0.543 (0.230-1.283)	0.164
Tooth extraction	Yes	91	3	1			
	No	409	20	0.668 (0.193-2.281)	0.518		
History of tattooing	Yes	94	4	1			
	No	406	19	0.905 (0.301-2.726)	0.860		
History of multiple sex	Yes	148	6	1			
	No	352	17	0.833 (0.322-2.156)	0.706		
History of surgery	Yes	58	5	1		1	
	No	442	18	2.222 (0.792-6.232)	0.129	0.435 (0.141-1.340)	0.147

Table 5: *Binary and multiple regression of HBSAg among federal police, Addis Ababa, Ethiopia 2020.*

Discussion

HBV infection is a significant health problem around the globe. The current study was conducted to determine the sero-prevalence and associated factors of HBV among Federal police crime prevention staff in Addis Ababa, Ethiopia. The overall prevalence of HBsAg among federal police crime prevention staff in this study was 23 (4.6%). This finding is in agreement with previous studies conducted in different parts of Ethiopia, including military personnel, which reported the prevalence of HBsAg at 4.2% - 7.1% [11,15,22-24]. This finding was also corroborated by studies conducted in Morocco (3.16%) [25], Egypt (4.2%) [26]. However, this finding revealed a higher prevalence of HBsAg than other studies done among military groups in Brazil (0%) [16], India (0.93%) [27] and Greece (0.32%) [17]. In contrast, this study indicated a lower prevalence of HBsAg than other studies in the general population of the southern parts of Ethiopia (8.0%) [28], Addis Ababa (9.02%) [29], Addis Ababa (35.8%) [30]. Variation in prevalence of HBsAg across studies could be multifactorial, including geographical distribution, study population differences in terms of lifestyle, awareness, socio-cultural environment, traditional practices, and sexual practices, medical exposure, the difference in hepatitis epidemiology, study subjects, and sample size might also be the cause of such differences.

In the current study, a higher prevalence of HBsAg (5.6%, 18/320) was detected among age groups of 18 - 25. This finding was in good agreement with the study conducted in Greece, where all positives were found in the age group of 19 - 22 [17]. The observed high prevalence of HBsAg positivity among the younger age group could be defined as the high probability of exposure to high risk health behaviors. In terms of gender, a higher prevalence of HBsAg was detected among male staff at 4.9% (20/407) than female staff at 3.2%. However, the difference was not statistically significant (COR = 1.6, CI 95% = 0.245 - 5.37, P = 0.486). This finding was comparable with that of a study conducted in Bahirdar military personnel study that showed a 4.2% prevalence in males [15]. However, this finding contradicts the study conducted in Addis Ababa that revealed a higher prevalence among females [31]. This difference may be due to differences in the sample size and study population of participants. Regarding marital status, the prevalence of HBsAg was higher among single participants, which was 4.7%, and the detection rate of HBsAg was higher among those with an education status of college or above, 5.2%; this contradicted the finding in Bahirdar military personnel, which showed a high prevalence of 6% at the high school educational level and a lower prevalence of 3.1% at the college level and above [15]. In relation to residence background, the prevalence of HBsAg was higher among urban residence background participants (8%) than rural (3.5%) and statistically significant with an AOR 95%CI of 2.421 (1.015-5.778, p-value = 0.046) significantly associated with HBsAg prevalence. This finding was comparable with a study conducted in Bahirdar among military personnel, urban 3.8% and rural 6% [15].

In the current study, the screening and vaccination status of HBsAg were assessed, and 485 (97.3%) and 498 (99.6%) were not screened and vaccinated, respectively. This finding showed agreement with the study conducted in Ethiopia among medical and health science students, 85.7% and 95.3%, respectively [32].

Conclusion

The present study showed an intermediate prevalence of HBV infection among apparently healthy federal police staffs in Addis Ababa that needs for timely intervention strategies to alleviate the burden of HBV infection in the federal police staffs and community. This prevalence rate also calls for additional efforts regarding active screening and vaccination for all federal police staffs and public health education campaigns in the media to promote better awareness of risk factors.

Bibliography

1. Stanaway JD., *et al*. "The global burden of viral hepatitis from 1990 to 2013: findings from the Global Burden of Disease Study 2013". *The Lancet* 388.10049 (2016): 1081-1088.

2. Mast EE., *et al*. "Strategies to prevent and control hepatitis B and C virus infections: a global perspective". *Vaccine* 17.13-14 (1999): 1730-1733.

3. Petruzziello A. "Suppl-1, M3: epidemiology of hepatitis B virus (HBV) and hepatitis C virus (HCV) related hepatocellular carcinoma". *The Open Virology Journal* 12 (2018): 26.

4. Trépo C., *et al*. "Hepatitis B virus infection". *The Lancet* 384.9959 (2014): 2053-2063.

5. Yang S., *et al*. "Transmission of hepatitis B and C virus infection through body piercing: a systematic review and meta-analysis". *Medicine* 94.47 (2015): 1893.

6. Kao JH and DS Chen. "Global control of hepatitis B virus infection". *The Lancet Infectious Diseases* 2.7 (2002): 395-403.

7. Schmit N., *et al*. "The global burden of chronic hepatitis B virus infection: comparison of country-level prevalence estimates from four research groups". *International Journal of Epidemiology* 50.2 (2021): 560-569.

8. Karimi-Sari H., *et al*. "Knowledge, attitude, and practice of Iranian health sciences students regarding hepatitis B and C virus infections: A national survey". *American Journal of Infection Control* 45.11 (2017): e135-e141.

9. Tanga AT., *et al*. "Sero-prevalence of hepatitis B virus and associated factors among pregnant women in Gambella hospital, South Western Ethiopia: facility based cross-sectional study". *BMC Infectious Diseases* 19.1 (2019): 1-7.

10. Umare A., *et al*. "Hepatitis B virus infections and associated factors among pregnant women attending antenatal care clinic at Deder Hospital, Eastern Ethiopia". *PLoS One* 11.11 (2016): e0166936.

11. Demsiss W., *et al*. "Hepatitis B and C: Seroprevalence, knowledge, practice and associated factors among medicine and health science students in Northeast Ethiopia". *PLoS One* 13.5 (2018): e0196539.

12. Melku M., *et al*. "Sero-epidemiology and associated factors of HIV, HBV, HCV and syphilis among blood donors in Ethiopia: a systematic review and meta-analysis". *BMC Infectious Diseases* 21.1 (2021): 1-21.

13. Mekonnen D., *et al*. "Prevalence of hepatitis B virus in patients with diabetes mellitus: a comparative cross sectional study at Woldiya General Hospital, Ethiopia". *Pan African Medical Journal* 17.1 (2014).

14. Geta M and G Ayalew. Seroprevalence of hepatitis B virus infection and associated factors among mothers in Gondar, North-west Ethiopia: a population based study (2021).

15. Birku T., *et al*. "Prevalence of hepatitis B and C viruses infection among military personnel at Bahir Dar Armed Forces General Hospital, Ethiopia". *BMC Research Notes* 8.1 (2015): 1-6.

16. Villar LM., *et al*. "Prevalence of hepatitis B and C virus infections among military personnel". *Brazilian Journal of Infectious Diseases* 19 (2015): 285-290.

17. GermanV., *et al*. "Serologic indices of hepatitis B virus infection in military recruits in Greece (2004–2005)". *BMC Infectious Diseases* 6.1 (2006): 1-6.

18. Li YY., *et al*. "A survey of knowledge about hepatitis B among new military recruits in China". *Military Medical Research* 4.1 (2017): 1-6.

19. Mirza IA., *et al*. "Seroprevalence of hepatitis B and C in young adults seeking recruitment in armed forces". *PAFMJ* 56.2 (2006): 192-197.

20. Taberner J., *et al*. "Seroepidemiologlcal survey of hepatitis B infection in a cohort of military recruits in Barcelona, Spain". *European Journal of Epidemiology* 8.1 (1992): 117-119.

21. Kupcinskas L., *et al*. "Prevalence of hepatitis B virus chronic carriers and risk factors for hepatitis B virus infection among Lithuanian army soldiers". *Military Medicine* 172.6 (2007): 625-627.

22. Belyhun Y., *et al*. "Hepatitis viruses in Ethiopia: a systematic review and meta-analysis". *BMC Infectious Diseases* 16.1 (2016): 1-14.

23. Negero A., *et al*. "Prevalence of Hepatitis B surface antigen (HBsAg) among visitors of Shashemene General Hospital voluntary counseling and testing center". *BMC Research Notes* 4.1 (2011): 1-5.

24. Argaw B., *et al*. "Sero-prevalence of hepatitis B virus markers and associated factors among children in Hawassa City, southern Ethiopia". *BMC Infectious Diseases* 20.1 (2020): 1-7.

25. Souly K., *et al*. "Prevalence of hepatitis B and C virus in health care personnel in Ibn Sina Hospital, Rabat, Morocco". *Open Journal of Medical Microbiology* 6.01 (2016): 17.

26. IA K. Hepatitis B and C viral infection: prevalence, knowledge, attitude and practice among barbers and clients in Gharbia governorate, Egypt (2010).

27. Puri P., *et al*. "Viral hepatitis in India: Armed forces perspective". *Medical Journal, Armed Forces India* 72.3 (2016): 201.

28. Woldegiorgis AE., *et al*. "Community-based sero-prevalence of hepatitis B and C infections in South Omo Zone, Southern Ethiopia". *PloS one* 14.12 (2019): e0226890.

29. Kefenie H., *et al*. "Prevalence of hepatitis B infection among hospital personnel in Addis Ababa (Ethiopia)". *European Journal of Epidemiology* 5.4 (1989): 462-467.

30. Ayele AG and S Gebre-Selassie. "Prevalence and risk factors of hepatitis B and hepatitis C virus infections among patients with chronic liver diseases in public hospitals in Addis Ababa, Ethiopia". *International Scholarly Research Notices* (2013).

31. Mekonnen A., *et al*. "Prevalence of HBV, HCV and associated risk factors among cleaners at selected public health centers in Addis Ababa, Ethiopia". *International Journal of Basic and Applied Virology* 4.1 (2015): 35-40.

32. Mesfin YM and KT Kibret. "Assessment of knowledge and practice towards hepatitis B among medical and health science students in Haramaya University, Ethiopia". *PloS one* 8.11 (2013): e79642.

Volume 18 Issue 8 August 2022