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Prevalence of Hepatitis B and C Viruses and Associated Risk Factors in Patients Suspected of Liver Diseases in Asmara, Eritrea

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Abstract: *Background*: Viral hepatitis is a critical global health challenge and acquiring adequate and recent epidemiological data on Hepatitis B and C infections is important in prevention and control of the disease. The aim of this study is to determine the prevalence and risk factors related with HBV and HCV infection and associated liver enzymes profile among patients suspected of liver diseases in Asmara, Eritrea. *Methods:* This was a cross-sectional study carried out among patients suspected of liver diseases. 411 participants were screened for serological markers of anti-HCV and HBsAg using rapid assays which were further confirmed using ELISA. A predesigned structured questionnaire was used to collect socio-demographic and risk factors data. Liver function tests were also performed using an automated spectrophotometer analyzer. Furthermore, for every HBV and HCV positive samples viral load was determined. Collected data were then analyzed using SPSS statistical tool. *Result:* The overall prevalence of HBV and HCV among study participants was 6.6% and 1.7% respectively. Hepatitis virus positive participants had substantially higher mean values of AST, ALT, ALP, total bilirubin and GGT. Viral load mean assay level was 10.6 x 10^6 IU/ml ranging from 20 IU/ml - 1.7 x 10^8 IU/ml. There was a significant association between HBsAg and sex (cOR= 4.18, 95% CI: 1.65-10.6), residence area (cOR=2.51, 95% CI: 1.10-5.69). Multivariate logistic analysis showed males were more prone to HBsAg infection (AOR= 3.9; 95% CI: 1.5-10.0). Moreover, prevalence of liver enzyme abnormality was 8.5% (95% CI: 6.1%-8.2%). Among these patients, 24 (5.8%) had cholestatic type, 4 (1%) had hepatocellular, and the rest 7 (1.7%) had mixed type of hepatotoxicity. *Conclusion:* Though the prevalence of HBV and HCV infection is comparatively low, regular surveillance should be conducted to prevent further spread of disease and achieve global goals of HBV and HCV elimination.

Keywords: Hepatotoxicity, Chronic Liver Disease, Cholestatic, ALT, AST, Viral Load

1. Introduction

Annually, liver diseases are responsible for over one and half million deaths and are marked by chronic inflammatory processes that expose to hepatic malignancy. The liver is in many ways the key anatomical and physiological reflection of the body and should play a principal role in global health policies [1]. Worldwide, HBV and HCV related liver diseases kill 1-2 million people yearly [2].

Chronic liver disease (CLD) is primarily caused from an inflammatory impairment in the liver, persisting for more than six months without complete recovery. CLD includes a spectrum of disorders comprising chronic hepatitis, alcohol-induced liver disease, non-alcoholic steatohepatitis, autoimmune liver disease, liver cirrhosis, drug-induced liver disease and hepatocellular carcinoma [3, 4]. Generally, global estimations indicate that CLD is present in 844 million people, in which 2 million deaths are recorded annually [1].

Viral hepatitis caused by HBV and HCV account for a substantial proportion of chronic liver diseases worldwide leading to cirrhosis, hepatic carcinoma, liver failure, and eventually death. The estimated hepatitis B surface antigen (HBs Ag) seroprevalence in different parts of the world ranges between 0.1%–20% [5]. 68% of all chronic hepatitis B infections is present in the African and western-Pacific countries [5]. Majority of the African countries (99%) are categorized in the higher-intermediate (5–7%) and higher-endemic zone (>8%) with regard to HBsAg seroprevalence. HBV carrier rate in Sub-Saharan Africa is over 8% [6].

HBV and HCV may exist as coinfection owing to the same mode of transmission mainly through exchange of body fluids such as blood, semen, breast milk and at the time of birth. Use of HBV/HCV contaminated injections during medical procedures or among drug users and transfusion of contaminated blood and blood products are also the main routes of spread. Sexual transmission is also possible. It is well documented that HBV and HCV coinfection increases the risk of hepatocellular carcinoma [7].

An estimated 95% of individuals with chronic HBV or HCV infection, or both, are unaware of their infection due to the slow and silent onset of the disease. Hence, they do not benefit from treatment, clinical care and interventions that are intended to decrease the onward spread [8]. Despite, Eritrea being located in a region highly endemic with viral hepatitis infections, there is only inadequate data on the assessment of HBV and HCV infections in the general population. Accurate estimates of the epidemiologic burden of HBV and HCV are crucial for effective health care strategies and for evaluating unfulfilled clinical needs.

By establishing a true burden, a clear path is created in identification of individuals infected with HBV and HCV, prevention of mother to child transmission, universal vaccination, appropriate linkage to care and eventual attaining of global goals of HBV and HCV elimination. Therefore, the aim of this study is to assess the prevalence and associated risk factors of hepatitis B and C infections among patients suspected of liver disease.

2. Methods

2.1. Study Area and Design

This was a cross sectional study conducted among patients suspected of liver diseases visiting Orotta and Halibet National Referral Hospitals in Asmara, Eritrea. They are the largest tertiary hospitals with catchment area of over 814,000 inhabitants and with simultaneously large number referral patients visiting from around the country. These hospitals serve a large volume of patients and have the accessible facilities for storing and processing blood samples.

2.2. Sampling Technique

The study was carried out with a sampling method of convenience in the sense that, participants were patients who turned up voluntarily in the two hospitals being suspected of liver disease. Patients suspected of liver diseases aged 16 and above with hepatitis B and C test order for the first time were included. Patients who know their HBV/HCV status and/or on antiviral therapy were excluded.

2.3. Data Collection

Sociodemographic characteristics (age, educational level, religion, area of residence) and history of risk exposure practices (blood transfusion, dental extraction, surgery) of subjects were collected using a structured questionnare. For participants aged 16-18 years, parental guidance was obtained when requesting information.

2.4. Sample Collection and Analysis

A total of 10ml of venous blood sample was obtained, after applying standard antiseptic technique, in a uniquely labelled chemistry tubes from each individual. Blood specimen were then allowed to clot and were centrifuged at 3500 rpm for 3 minutes to separate serum samples. The serum fractions were then stored at 6°C and were analyzed within 24 hours of collection. Each participant sample was screened for HBsAg (MEDIFF: One for All, France) and anti-HCV (MEDIFF: One for All, France) by one-step insert rapid chromatography test strips. HBV and HCV viral load was performed on positive samples with the help of the COBAS AmpliPrep and COBAS TaqMan48 analyzer instruments. Liver function parameters including ALT, AST, ALP, total bilirubin, albumin and GGT were evaluated by automated spectrophotometric analyzer technique using AU480 Chemistry Analyzer (Beckman Coulter AU480). For assessment of liver injury type, the upper limit of normal (ULN) > 30 IU/L was set as a reference level, cholestatic (ALP $\geq 2 \times$ ULN; $R \leq 2$), hepatocellular (ALT $\geq 3 \times$ ULN; $R \geq 5$), mixed (ALT $\geq 3 \times$ ULN, ALP $\geq 2 \times$ ULN; $R > 2$ to <5) where R value = (ALT/ULN)/(ALP/ULN).

2.5. Statistical Analysis

Data documented were subjected to statistical analysis using SPSS version 20 software (SPSS v. 20, SPSS Inc. Chicago, IL, USA). Responses in the questionnaires and laboratory results were tabulated, coded and processed. Cross tabulations were used to analyze relationship between dependent and independent variables. Frequency distribution tables and percentages were constructed to give clear picture of background variables. Depending of the nature of the variables, Pearson Chi square (χ^2) test/ or Fishers exact test was conducted to evaluate the relationship between independent and dependent variables. Multivariate and univariate logistic regression was fitted to establish the relationship between specific liver function profiles and associated risk factors. At 95% level of significance, observed differences was considered to be significant at $p<0.05$.

2.6. Quality Assurance

The completeness and validity of the questionnaire was

ascertained by experts in infectious disease and medical microbiology. Data and sample collectors were senior year clinical laboratory science students which were supervised for a common understanding using role play interviews and thorough discussion sessions. For laboratory chemical tests, all the chemistry analytical equipment's were periodically undergoing calibration and quality control according to laboratory protocols prior to sample processing. The performance of the rapid HBs Ag and anti-HCV test kits were evaluated using known positive and negative controls. At the same time, all the positive samples for both HBsAg and anti-HCV were further confirmed using ELISA. As per viral load testing, one replicate each of the COBAS TaqMan HCV High Positive Control, the HCV Low Positive Control and Negative Control were included in each test batch.

2.7. Ethical Consideration

Ethical consent was obtained from Orotta College Medicine and Health Sciences research ethical committee and Ministry of Health. Moreover, a written and verbal consent was obtained from study subjects upon the acquisition of the data. The questionnaire contained a code for patient identification which was also used to label the blood sample to match the questionnaires. A written consent was also obtained while collecting blood sample for chemical analysis. Participants were also informed about their right to leave the study any time with no resultant consequence. Standard respect and care was accorded to the respective participants regardless of their consent or decline to take part in the study.

3. Results

3.1. Sociodemographic Characteristics of Study Subjects

A total of 411 blood specimen were collected from patients suspected of liver diseases and referred to the laboratory for HBV and HCV seromarker testing. Of these, 215 (52.3%) were females and 196 (47.7%) were males. The mean ± standard deviation age of patients was 43.3 ± 17.3 years (ranging from 16–88 years). 328 (79.8%) participants were from urban areas while 83 (20.2%) participants were from rural areas. Majority of subjects were government employees (40.6%). Based on level of education, most of the respondents had at least primary level of education. Most of the participants belonged to the majority Tigrigna ethnic group (85.9%) and the rest (14.1%) belonging to the remaining 8 ethnic groups (Table 1).

Table 1. *Sociodemographic and risk factor characteristics of study participants and seroprevalence of HBsAg and anti-HCV.*

Characteristics		**Overall N (%)**	**HBsAg**	**Anti-HCV**
			N (%)	**N (%)**
Sex	Male	196 (47.7)	21 (10.7)	3 (1.5)
	Female	215 (52.3)	6 (2.8)	4 (1.5)
Age	16-24	65 (15.8)	4 (6.2)	0 (0)
	25-34	80 (19.5)	6 (7.5)	1 (1.2)
	35-44	77 (18.7)	4 (5.2)	0 (0)
	>45	189 (46)	13 (6.9)	6 (3.2)
Religion	Christian	340 (82.7)	20 (5.9)	5 (1.5)
	Muslim	71 (17.3)	7 (9.9)	2 (2.8)
Ethnicity	Tigrigna	353 (85.9)	21 (5.9)	5 (1.4)
	Tigre	32 (7.8)	3 (9.4)	1 (3.1)
	Others	26 (6.3)	3 (11.5)	1 (3.8)
Residence	Urban	328 (79.8)	17 (5.2)	7 (2.1)
	Rural	83 (20.2)	10 (12.0)	0 (0)
Occupation	Housewife	91 (22.1)	3 (3.3)	4 (4.4)
	Governmental	167 (40.6)	16 (9.6)	2 (1.2)
	Private/ Self-employed	109 (26.5)	7 (6.4)	1 (0.9)
	Unemployed	44 (10.7)	1 (2.3)	0 (0)
Educational Level	Illiterate	55 (13.4)	3 (5.5)	2 (3.6)
	Primary	127 (30.9)	10 (7.9)	1 (0.8)
	Secondary	137 (33.3)	5 (3.6)	3 (2.2)
	College & Higher	92 (22.4)	9 (9.8)	1 (1.1)
Marital Status	Married	249 (60.6)	21 (8.4)	6 (2.4)
	Single	100 (24.3)	5 (5.0)	0 (0)
	Widow/ divorced	62 (15.1)	1 (1.6)	1 (1.6)
Prior knowledge of hepatitis	Yes	82 (20.0)	7 (8.5)	3 (3.7)
	No	329 (80)	20 (6.1)	4 (1.2)
History of transfusion	Yes	36 (8.8)	1 (2.8)	1 (2.8)
	No	375 (91.2)	26 (6.9)	6 (1.6)
History of surgery	Yes	80 (19.5)	1 (1.2)	2 (2.5)
	No	331 (80.5)	26 (7.9)	5 (1.5)
History of dental extraction	Yes	229 (24.3)	10 (4.4)	6 (2.6)
	No	182 (15.1)	17 (9.3)	1 (0.5)
Sharing of sharp materials	Yes	73 (17.8)	7 (9.6)	2 (2.7)
	No	338 (82.2)	20 (5.9)	5 (1.5)

Characteristics		Overall N (%)	HBsAg	Anti-HCV
			N (%)	N (%)
Traditional practice	Yes	253 (61.6)	18 (7.1)	5 (2.0)
	No	158 (38.4)	9 (5.7)	2 (1.3)
Unprotected sexual practice	Yes	40 (9.7)	1 (2.5)	0 (0)
	No	371 (90.3)	26 (7)	7 (1.9)

3.2. Seroprevalence of HBsAg and Anti-HCV Markers

Out of the total samples, 27 were found to be positive for HBsAg giving an overall prevalence of 6.6% (95% CI: 4.4%-9%) and 7 samples were positive for anti-HCV antibody giving an overall prevalence of 1.7% (95% CI: 0.5%-3.2%). Co-infection with HBV and HCV was not seen in any of the subjects.

Moreover, of the 27 HBsAg positive samples, viral load quantification was performed for all except for one which was found to have insufficient quantity. Similarly, 2 out of the 7 positive anti-HCV samples were not sufficient for viral load test. All participants found seropositive were not under any antiviral therapy. Mean assay level was 10.6 x 10^6 IU/ml with the range of 20IU/ml -1.7 x 10^8 IU/ml. One sample was present with undetectable viral DNA (< 9IU/ml). 14 seropositive samples had viral load below 2000 IU/ml, 7 in the range 2000-20,000 IU/ml and 10 had viral load >20,000 IU/ml.

3.3. Socio-demographic and Risk Factor Characteristics of Study Participants in Relation to HBsAg and Anti-HCV Prevalence

The study tried to establish association of positivity between HBsAg seromarker, socio demographic and risk factor characteristics of study participants. Association studies was not done for anti-HCV seromarker as the number of positive cases was too low.

According to univariate logistic analysis results, a significant association was recorded between HBsAg and sex, residence. HBV infection was highly prevalent among male participants (cOR = 4.18, 95% CI: 1.65-10.586) while females had increased rate of HCV infection (1.9%). The highest prevalence of HBsAg (7.5%) and HCV (3.2%) was seen among participants aged 25-34 and greater than 45, respectively.

Participants from rural areas had higher odds of having Hepatitis B antigen (cOR=2.506, 95% CI: 1.10-5.69) compared with those from urban areas (Table 2). However, the seroprevalence of anti-HCV was greater in urban areas (2.1%). Moreover, the highest seroprevalence of HBsAg was observed in participants with higher level of education (9.8%). In contrast, anti-HCV seroprevalence decreased with increasing level of education. Married participants were found to be more exposed to both HBsAg and anti HCV with seropositivity 8.4% and 2.4% respectively. Governmental employees exhibited higher prevalence of HBsAg seromarker (9.6%) whereas housewives showed greater seroprevalence of anti-HCV (4.4%).

Minority ethnic groups were present with higher prevalence of HBsAg (11.5%). Participants with transfusion and surgical history depicted lower prevalence for HBsAg. Moreover, higher positivity of HBsAg seromarker was observed in those who had no dental extraction history (9.3%) while the reverse was true for anti-HCV seromarker (2.6%). Elevated seroprevalence of HBV infections was recorded in those who performed traditional practices (7.1%) and in those who have one or more family member infected with HBV (10.7%). Further analysis using multivariate logistic analysis for significant variables demonstrated a substantial relation between HBsAg infection and sex (aOR= 4.97, 95% CI: 1.212-20.374).

Table 2. *Association of socio-demographic characteristics in relation to HBsAg.*

Variables		Laboratory results for Positive HBsAg test		
		Pos (%)	cOR (95% CI)	aOR (95%CI)
Sex	Female	21 (10.7)	1	1
	Male	6 (2.8)	4.18 (1.65-10.6)*	3.9 (1.5-10.0)*
Age	16-24	4 (6.2)	1.31 (0.41-4.16)	0.93 (0.28-3.13)
	25-34	6 (7.5)	0.83 (0.217-3.23)	0.78 (0.19-3.18)
	35-44	4 (5.2)	1.64 (0.42-6.42)	1.12 (0.27-4.66)
	>45	13 (6.9)	1	1
Residence	Urban	17 (5.2)	1	1
	Rural	10 (12.0)	2.51 (1.10-5.69)*	1.55 (0.65-3.69)
Surgical History	No	1 (1.2)	6.73 (0.9-50.4)	5.39 (0.69-41.8)
	Yes	26 (7.9)	1	1
Dental Extraction	No	10 (4.4)	2.25 (0.99-5.06)	1.97 (0.84-4.63)
	Yes	17 (9.3)	1	1

*Significant at p-value= 0.05.

3.4. Assessment of Liver Enzyme Function Tests

Table 3 summarized the mean levels of liver enzymes between HCV and HBV positive and negative individuals and 95% CI for mean. Generally, hepatitis virus positive participants had significantly higher mean values of AST, ALT, ALP, GGT and total bilirubin in comparison with the

negative individuals.

Table 4 demonstrates the pattern and distribution of liver injury in the registered subjects. The analysis showed the frequency of hepatotoxicity was 8.5% (95% CI: 6.1%- 8.2%). Among these patients 24 (5.8%) had cholestatic type, 4 (1%) had hepatocellular type, the rest 7 (1.7%) had mixed type of liver disorder. Cholestatic type of liver injury was predominant in self-employed/unemployed patients. Statistics also revealed a considerable association between hepatitis infection, gender, residence and the pattern of liver injury ($p<0.05$).

Table 3. *Descriptive comparison of Liver enzymes test outcomes among study participants.*

Parameters	HBsAg		Anti-HCV	
	Positive	Negative	Positive	Negative
	Mean±SD	Mean±SD	Mean+SD	Mean±SD
AST	52.04±44.6	30.6±38.1	37.86±23.2	31.9±38.9
ALT	40.22±34.2	21.3±26.9	28.9±14.7	22.6±27.8
ALP	160.1±67	91.3±76.3	97.8±27.4	95.9±89.3
Bilirubin	1.25±1.08	0.88±1.59	1.3±0.5	0.94±1.91
GGT	74.4±139.1	25.3±34.8	68.4±61.3	28.6±50.2

Table 4. *Patients characteristics and pattern of liver toxicity according to liver function tests.*

	Category	Cholestatic	Hepatocellular	Mixed	Normal	Total	P (X^2)
		N (%)	*N (%)*	*N (%)*	*N (%)*	*N (%)*	
Gender	Male	20 (10.2)	3 (1.5)	3 (1.5)	170 (86.7)	196 (47.7)	0.002*
	Female	4 (1.9)	1 (0.5)	4 (1.9)	206 (95.8)	215 (52.3)	
Age	16-24	6 (9.2)	1 (1.5)	0 (0)	58 (89.2)	65 (15.8)	0.603
	25-34	3 (3.8)	0 (0)	1 (1.2)	76 (95)	80 (19.5)	
	35-44	4 (5.2)	2 (2.6)	2 (2.6)	69 (89.6)	77 (18.7)	
	>45	11 (5.8)	1 (0.5)	4 (2.1)	173 (91.5)	189 (46)	
Education	Illiterate	6 (10.9)	0 (0)	2 (3.6)	47 (85.5)	55 (13.4)	0.203
	Primary	7 (5.5)	0 (0)	4 (3.1)	116 (91.3)	127 (30.9)	
	Secondary	9 (6.6)	3 (2.2)	1 (0.7)	124 (90.5)	137 (33.3)	
	College	2 (2.2)	1 (1.1)	0 (0)	89 (96.7)	92 (22.4)	
Residence	Urban	15 (4.6)	4 (1.2)	2 (0.6)	307 (93.6)	328 (79.8)	0.001*
	Rural	9 (10.8)	0 (0)	5 (6.0)	69 (83.1)	83 (20.2)	
Occupation	Housewife	2 (2.2)	0 (0)	2 (2.2)	87 (95.6)	91 (22.1)	0.06
	Governmental	6 (3.6)	3 (1.8)	4 (2.4)	154 (92.2)	91 (22.1)	
	Private/ Self-employed	10 (9.2)	0 (0)	1 (0.9)	98 (89.9)	109 (26.5)	
	Unemployed	6 (13.6)	1 (2.3)	0 (0)	37 (84.1)	44 (10.7)	
Hepatitis virus	Negative	20 (5.3)	4 (1.1)	4 (1.1)	349 (92.6)	377 (91.7)	0.003*
	Positive	4 (11.8)	0 (0)	3 (8.8)	27 (79.4)	34 (8.3)	
Viral Load	Low	2 (14.3)	0 (0)	1 (7.1)	11 (78.6)	14 (45.2)	0.688
	Moderate	1 (14.3)	0 (0)	1 (14.3)	5 (71.4)	7 (22.6)	
	High	1 (10)	0 (0)	1 (10)	8 (80)	10 (32.3)	

*Significant at p-value= 0.05.

4. Discussion

This is the first study determining the prevalence of hepatitis B and C viruses among patients suspected of liver disease in Eritrea. In this study, the overall prevalence of HBsAg and anti-HCV antibody markers was found to be 6.6% and 1.7% respectively. Generally, there is a lack of comprehensive data on the prevalence of HBV and HCV infections in Eritrea especially among liver diseases patients. Nevertheless, the reported prevalence is much higher compared to studies conducted among blood donors (2.6%) and antenatal care attendees (3.2%) in the same study setting [9, 10]. However, this finding is consistent with other similar studies conducted in Sub-Saharan Africa [4, 11, 12] and Asia [13].

Similarly, the anti-HCV prevalence of the present study is higher than what is reported among blood donors (0.18%) in Eritrea [10] but consistent with other studies worldwide [14-17]. This comparison only helps to highlight the extent of HBV and HCV infection among liver diseases suspected patients. But the interpretations of these prevalence magnitudes need caution as the characteristics of participants in the current study are entirely different than characteristics of healthy blood donors and antenatal attendees. The presence of HBV DNA/HCV RNA in peripheral blood is a reliable indicator of active HBV/HCV replication [18]. Among the HBsAg positive, 10 participants (32.3%) had high level of viral load that indicate a higher level of infectiousness with actively replicating viruses. Low levels were recorded in 14 patients (45.2%) with viral load <2000IU/ml which are considered to have an inactive infection with low viremia thus a decreased level infectiousness [19, 20].

The high presence of HBsAg among age group 25-34 is comparable to the finding of a study conducted in southeast Ethiopia and Pakistan which reported an increased seroprevalence among the age group 16-30 years [7].

However, a contrary outcome was obtained in case of HCV infection in agreement with other studies [21]. This might be explained by the fact that the probability of progressing into carrier and chronic infection is very high among patients infected with HCV compared to HBV. Moreover, cumulative risk of HCV exposure increases with age.

Male participants showed a significantly higher frequency of HBV infection (10.7%) unlike females showing higher results in HCV infection (1.9%) comparable to studies elsewhere [6, 7, 22]. The low infection rate of HBsAg in females may be due to natural disappearance of acute infection which is attributed to the presence of key genetic factors such as IL28B genetic variant in females [21]. Moreover, the increased prevalence of HBsAg in males might be due to the likelihood of men to have multiple sex partners and might be involved in unprotected sex [13].

Increased prevalence of HBsAg (5.9%) and anti-HCV (3.8%) markers was reported among the minority ethnic groups compared to Tigrigna. Similar findings were reported for HBsAg in the current study area among a research in pregnant women [9]. This calls for further investigation to understand mechanisms of variation in exposure to HBV among the different ethnic group's by taking behavioral and cultural practices into account. Frequent traditional practices like marking/scarring of the face and traditional circumcision processes done in those societies might become the source of increased hepatitis infections.

In concordance with other studies [13, 23], HBsAg was highly prevalent among participants from rural areas (12%). Several reports including the 2014 millennium development goal and the 2010 population and health survey indicated that poverty levels are predominantly higher in rural areas compared to urban areas [24, 25]. The finding of increased HBsAg prevalence in rural settings can be related to poverty, poor hygiene, less health services and also lack of knowledge about the disease. In addition, unsafe traditional practices prevailing in the vast rural areas can be the key mode of transmission.

Married participants were found to be more exposed to both HBsAg and anti-HCV with seropositivity of 8.4% and 2.4% respectively. This is consistent to a study done among CLD patients in India and Ethiopia in which HBsAg and anti-HCV was higher among married participants [6, 13].

There was lower prevalence of HBsAg (1.3%) and higher anti-HCV (2.5%) seromarker in participants with history of surgery and transfusion in this study. This finding is coherent to studies conducted in Uganda [26] and Nigeria [27] in which the obtained lower rates of infection might be justified by the presently implemented screening protocols for potential blood borne pathogen [28, 29]. Similarly, an increased HCV infection of 2.6% and decreased HBsAg seroprevalence of 4.4% was observed among participants who had dental extraction in coherence with other studies [6]. The use of unsterile materials or interchangeable use from one patient to another may have contributed to the increased rate of HCV infection.

Consistent with several studies, participants who exercised traditional practices showed higher prevalence of HBsAg (7.1%) than those who do not (5.7%) [21, 27, 30]. Having one or more family member infected with viral hepatitis increases the likelihood of horizontal transmission. Accordingly, an increased prevalence of HBsAg (10.7%) was recorded in those participants who had a family member infected with HBV.

Liver enzymes play a crucial role in the assessment of liver function because of liver injury resulting in cytolysis or necrosis that causes release of enzymes into circulation. They are crucial in differentiating hepatocellular (functional) from obstructive (mechanical) liver disease. It can be observed that those seropositive participants had an elevation in mean values for almost all the tested parameters for liver function test.

In this study, cholestatic type of liver injury 61 (42.36%) was the frequent type. Hepatocellular carcinoma is widespread in some parts of the globe in which the key carcinogenic agents such as alcohol, HBV and aflatoxin are the cause [31, 32]. Moreover, characteristic of the patients enrolled in the study may be responsible for the wide varied patterns. Advanced studies in larger population are required to explore the pattern of hepatotoxicity and its risk factors.

5. Conclusion

A total of 411 samples were processed and the overall prevalence of HBsAg and anti-HCV seromarker was found to be 6.6% and 1.7% respectively. Even though Eritrea is located in the sub-Saharan region which has the record of high prevalence of both seromarkers, it has relatively lower seroprevalence when compared to the neighboring countries. Hepatitis infection was significantly associated with sex and residence of participants. Multivariate logistic analysis showed males were more prone to HBsAg infection. Participants seropositive for HBV and HCV infection showed an overall increase in almost all the measured liver enzyme parameters indicating injury to the liver.

Prevalence of hepatitis infections acquired from this study provides clearer understanding of HBV and HCV epidemiology. In spite of the relatively low prevalence of HBV and HCV infections, further surveillance should be carried out in the general population for a more representative picture of the pattern and distribution of HBV and HCV. Emphasis on eradication of health risky traditional practices should also be highlighted. The increased cost of treatment for these disease can be evaded through effective prevention measures.

Abbreviation

ANC: Antenatal Care *ALT:* Alanine Aminotransferase *ALP:* Alkaline Phosphatase *AST:* Aspartate Aminotransferase *CLD:* Chronic Liver Disease *HBV:* Hepatitis B Virus *HCV:* Hepatitis C Virus IU: International Unit *WHO:* World Health Organization.

Data Availability

The dataset supporting the conclusions of this article is available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no conflict of interest to declare on this study.

Authors' Contributions

FM, LW, HM, NM, LL, SH, YB, YK conceived of the study, participated in the design, and performed the laboratory experiments. NF and YK performed the statistical analysis, participated in the design, and reviewed/edited the manuscript. All authors read and approved the final manuscript.

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