Trend Analysis of Hepatitis B and C Among Patients Visiting Health Facility of Tigrai, Ethiopia, 2014-2019

Haftom Legese (legesehaftom2@gmail.com)
Adigrat University https://orcid.org/0000-0002-6280-1116

Brhane Berhe
Adigrat University

Gebre Adhanom
Adigrat University

Tsega Kahsay
Adigrat University

Aderajew Gebrewahd
Adigrat University

Guesh Gebremariam
Adigrat University

Fitsum Mardu
Adigrat University

Kebede Tesfay
Adigrat University

Haftay Gebremedhin
Adigrat University

Hadush Negash
Adigrat University

Research

Keywords: Ethiopia, Hepatitis B, Hepatitis C virus, Tigrai, Trend

Posted Date: June 15th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-595940/v1

Abstract

Background: Hepatitis B and C viruses are the major public health concerns of the globe. The two hepatotropic viruses share common modes of transmission and their co-infection is common.

Despite the provision of an effective prevention mechanism, the infections caused by these viruses' remains a significant problem worldwide, particularly among the developing countries like Ethiopia.

Methods: Institutional based retrospective study design was conducted from January 2014 to December 2019 from documented serology laboratory logbooks and patient charts at the serology laboratory of Adigrat general hospital, Tigrai, Ethiopia. The collected data were checked for completeness on daily based, coded, entered and cleaned using Epinfo version 7.1 and exported and analyzed using SPSS version 23. Binary logistic regression analysis and Chi-square test (X^2) were used to assess the association between dependent and independent variables. The corresponding variables with P-value ($P < 0.05$) with a 95% confidence interval were considered as statistically significant.

Results: Out of 20935 clinically suspected specimens tested for hepatitis B and C viruses with total completeness of 20622 were included in this study with a total completeness 98.5%. The overall prevalence of hepatitis B and hepatitis C virus was found to be 3.57 % (689/19,273) and 2.13% (30/1,405) respectively. The positivity rate of hepatitis B virus was 8.0% (106/1317) and 3.24% (583/17,956) among males and females respectively. Additionally, 2.49 %(12/481) of males and 1.94% (18/924) females were positive for hepatitis C virus infection. The overall prevalence of co-infection for both hepatitis B and hepatitis C virus was 7.4% (4/54). Sex and age were significantly associated with hepatitis B and C virus infection.

Conclusions: The overall prevalence of hepatitis B and C is low intermediate according to the WHO criteria. Both hepatitis B and C share similar routes of transmission and affects all age and male sex. Therefore, awareness creation of the community about the methods of transmission, education about prevention, and control of hepatitis B and C virus infection, improving coverage of youth-friendly services in the health facilities should be strengthened.

Background

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are causing a serious health problem in the world. Globally, 257 and 10 million people were carrying HBV and HCV infection respectively. Of which, 80 million have active viraemic infections [1, 2], Without treatment, up to 30% of chronic HBV and 20% of chronic HCV cases develop liver cirrhosis and hepatocellular carcinoma, which are the sixth most common cancer and the third cause of cancer-associated deaths worldwide [3–6]. There are an estimated 1.4 million deaths annually [1].

Even though the burden of HBV and HCV infection has a worldwide distribution, the vast majority of infected persons reside in low- and middle-income countries, particularly in Asia and Africa [7]. Africa has one of the highest burdens of disease, it has been estimated that 60 million people infected with the prevalence of 6·1% for HBsAg with about 87,890 deaths annually. However, the Sero-prevalence differs depending on sex, ethnicity, and rural and residence [8–10].

The mode of transmission for HBV and HCV is through horizontal transmission, carrying out healthcare procedures using contaminated instruments using unsafe practices (unsafe sexual practices, reuse of needles and syringes), and mother to child transmission [11]. Co-infection with the two viruses is common [12].

The true public health magnitude and impact of hepatitis epidemics are poorly understood in African countries like Ethiopia. Because national and sub-national data are often insufficient, and HBV and HCV surveillance programs are weak making it difficult to plan for focused action and prioritize the allocation of resources in Ethiopia [13].

Even though patients who are clinically suspected of HBV and HCV have been shown to have a high prevalence of hepatitis infection, awareness about the magnitude of this condition is limited among the health care workers and caretakers [13]. Hence, thus this study was conducted to determine the extent of hepatitis infection among patients attending at Adigrat general Hospital.

Material And Methods

Study design, area and period

Institutional based retrospective study was conducted among clinically suspected hepatitis clients at Adigrat General Hospital from January 2014 to December 2019. The Hospital is found in Adigrat town eastern zone of Tigrai regional state located at 891 km from Addis Ababa(the capital city of Ethiopia) and 104 km from Mekelle city(capital of Tigrai regional state). The town is located at altitudinal ranges from 2000 - 3000 meters above sea level and geographically it is located at 014°16’34” N latitude and 039°27’51”E longitude. Adigrat town is a zonal administrative of Eastern Tigrai, Ethiopia with an estimated total population of 76,400 [14]. Adigrat General Hospital is one of the governmental Hospitals located established for catchments of 6 woredas. The Hospital is having about 120 beds with a total of 209 health care professionals and 132 administrative staff. Currently, it served as teaching and referral hospital. The Hospital is currently using as teaching and referral services for more than 1,000,000 populations with an average annual client flow of 131,125 people.

Study Population

The study populations were all patients who gave blood and tested for HBV and HCV at Adigrat Hospital from January 2014 to December 2019.

Sample Size

All of the 20622 HBV and HCV suspected individuals who were tested in Adigrat General Hospital laboratory from January 2014 to December 2019 that fit the inclusion criteria were the total sample size for this study.

Inclusion criteria

Data showed number of HBV and HCV status, years, age and sex were included in this study.

Exclusion criteria

Data with missed data in the inclusion criteria were excluded.

Data collection

Data were collected from HBV and HCV suspected clients attending at Adigrat General Hospital for the period of spanning 1 January 2014 through 31 December 2019 from the logbooks by trained six medical laboratory technologists. Relevant parameters (age, sex, year of screening and status HBV and HCV) were collected.

Handling and Tracking of Missing data

In case of missing data from the laboratory logbooks, client records (charts) were inspected and tracked to be included in the study. However, incomplete client records were excluded and consulted to the head department of the laboratory of Adigrat hospitals.

Quality control

To assure the quality of data, we first checked the completeness of the HBV and HCV serology laboratory logbooks. Properly designed data collection format sheet was prepared and used for HBV and HCV data recording. Then data were collected from laboratory logbooks and client charts and records which were stored from 2014 to 2019 in the laboratory of the Hospital. Data were extracted by trained data collectors and were adequately informed about the data collection process. Each day the collected data were reviewed for its completeness and consistency of the information. Furthermore, laboratory technologists of the hospital were well trained and had more than 6 year work experience. The hospital have strict follow on the use of standard operating producers and the professionals run positive and negative controls and checked for expired date before they process patients test.

Data Processing and Analysis

Data were cleaned, entered, and analyzed using statistical product and service solution (SPSS) version 23 database. Descriptive statistics like frequency, percentage, measures of central tendency, and measures of dispersion were carried out. Missing values were analyzed by using multiple imputation techniques. Then the data was presented using frequencies tables and figures. Binary logistic regression analysis and Chi-square test (X^2) were used to calculate the odds ratios (OR); Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR) to ascertain the degree of association between the dependent and independent variables. The multi co-linearity test was carried out to see the correlation between independent variables. The corresponding variables with P-value <0.05 with 95% confidence interval were considered as statistically significant.

Result

Socio-demographic characteristics of study subjects

During the six years study period (2014-2019), a total of 20935 were requested for laboratory diagnosis. About 20,622 (98.5%) data were complete and included in the study. Most of them, 18,862 (91.5%) were females. A higher frequency of study participants 8,954 (43.4%) was aged from 25-34 years with a mean and standard deviation 28 (9.54SD) **[Table 1]**.

Table 1: Socio-demographic characteristics of study participants at Adigrat General Hospital from January 2014 to December 2019

Variables	Frequency	Percentage (%)
Sex		
Male	1760	8.5
Female	18862	91.5
Age		
0-14	419	2.0
15-24	7468	36.2
25-34	8954	43.4
35-44	2705	13.1
45-54	421	2.0
55-64	234	1.1
≥65	421	2.0

Prevalence of HBV, HCV and HBV-HCV co-infection

Over the six years, 3.57% (689/19,273) and 2.13% (30/1,405) of study participants were seropositive for HBsAg and anti-HCV respectively. Among the study participants, the positivity rate of HBsAg was 106/1317 (8.0%) and 583/17956 (3.24%) among males and females respectively. Additionally, 12 (2.49%) of males were positive for hepatitis C and 18 (1.94%) females were positive for hepatitis C. The overall prevalence of co-infection for both HBV and HCV was 4/54 (7.4%). Hepatitis B virus was predominantly higher among individuals aged ≥65 years old (6.27%) followed by 45-54 years old (4.79%). On the other hand, the prevalence of hepatitis C virus was high frequency among the age group of 45-54 years old (7.52%) followed by 55 - 64 years old(3.84%). Moreover, a high percentage of HBV and HCV were seen in the year of 2014 [**Table 2**].

Table 2: Detection rates of HBV, HCV, and HBV-HCV co-infection among study participants at Adigrat General Hospital from January 2014 to December 2019

Year	HBV suspected N (%)	HBV Positive N (%)	HCV Suspected N (%)	HCV Positive N (%)	Both HBV and HCV suspected N (%)	Both HBV and HCV Positive N (%)
Sex						
Male	1317	106(8.0)	481	12(2.49)	38	1(2.63)
Female	17956	583(3.24)	924	18(1.94)	18	3(16.67)
Age						
0-14	364	8(2.19)	56	1(1.78)	1	1(100.0)
15-24	7085	220(3.1)	404	4(0.99)	21	1(4.76)
25-34	8526	317(3.71)	447	8(1.78)	19	1(5.26)
35-44	2474	103(4.16)	235	6(2.55)	4	0(0.0)
45-54	334	16(4.79)	93	7(7.52)	6	1(16.67)
55-64	187	6(3.2)	52	2(3.84)	5	0(0.0)
≥65	303	19(6.27)	118	2(1.69)	0	0(0.0)
Year						
2014	989	91(9.2)	125	7(5.6)	41	0(0.0)
2015	1845	66(3.57)	79	10(12.65)	10	3(30.0)
2016	936	27(2.88)	165	0(0.0)	2	0(0.0)
2017	3900	71(1.82)	284	7(2.46)	3	1(33.34)
2018	4351	148(3.4)	136	1(0.73)	0	0(0.0)
2019	7252	286(3.94)	616	5(0.81)	0	0(0.0)

Factors associated with hepatitis B virus infection

Bivariate and multivariate logistic regression analyses were performed to assess the association between dependent and independent study variables. According to the bivariate analysis, being female and age were showed association with hepatitis B virus infection and transported to multivariate analysis. Accordingly, in multivariate analysis, being female were negatively associated with hepatitis B virus infection (AOR =0.439, 95% CI: 0..348,0.553, p= 0.001) and age between 15-24 (AOR=2.320, 95%, CI: 1.125, 4.788,p =0.023), 25-34(AOR=2.877, 95% CI: 1.397, 5.924, p=0.004), 35-44 (AOR= 2.927, 95% CI:

1.401, 6.115, p=0.004) and 45-54 (AOR= 2.493, 95% CI: 1.051, 5.912, p=0.038) were significantly factors associated with hepatitis B virus infection **[Table 3]**.

Table 3: Factors associated with hepatitis B among study participants at Adigrat General Hospital from January 2014 to December 2019

Variables	Positive for HBV		COR[a] (95% CI)	p-value	AOR[b] (95% CI)	p-value
	Yes	No				
Sex						
Male	106	1211	1		1	
Female	583	17373	0.498(0.402,0.616)	0.001	0.439 (0.348,0.553)	0.001*
Age						
0-14	8	356	1		1	
15-24	220	6865	1.559(0.765, 3.179)	0.222	2.320(1.125, 4.788)	0.023*
25-34	317	8209	1.886(0.928, 3.830)	0.079	2.877(1.397, 5.924)	0.004*
35-44	103	2371	2.034(0.983, 4.207)	0.056	2.927(1.401, 6.115)	0.004*
45-54	16	318	2.030(0.859, 4.795)	0.107	2.493(1.051, 5.912)	0.038*
55-64	6	181	1.352(0.463, 3.945)	0.581	1.435(0.491, 4.196)	0.509
≥65	19	284	2.428(1.051, 5.610)	0.038	2.237(0.966, 5.177)	0.060

Key: [a](COR=Crude odds ratio); [b](CI=Confidence interval); [c](AOR=Adjusted odds ratio); 1(referent).

Factors associated with hepatitis C virus infection

Chi-square test (X^2) showed that gender (p<0.001), and age (p<0.001), were statistically significant with hepatitis C virus infection **[Table 4]**.

Table 4: Factors associated with hepatitis C among study participants at Adigrat General Hospital from January 2014 to December 2019

Variables	Positive for HCV		Chi-square test (X^2)	p-value
	Yes	No		
Sex				
Male	12	469	38.105	0.001*
Female	18	906		
Age				
0-14	1	55	85.587	0.001*
15-24	4	400		
25-34	8	439		
35-44	6	229		
45-54	7	86		
55-64	2	50		
≥65	2	116		

Trend prevalence of HBV and HCV infections

The prevalence of HBV and HCV was relatively fluctuating from year to year. The line trend analysis showed that the high prevalence of hepatitis B virus was observed in 2014, 9.2% but it was decreased from 2014 to 2017 from 9.2% to 1.82%. On the other hand, HBV was increased from the year 2018 (3.40%) to the year 2019 (3.94%). Furthermore, the trend prevalence of the hepatitis C virus was observed a considerable fluctuation from year to year. Prevalence was 5.60% in 2014, 12.65% in 2015, 0.0% in 2016, 2.46% in 2017, 0.73% in 2018 and 0.81% in 2019 **[Figure 1]**.

Discussion

According to the World Health Organization, viral hepatitis plays a significant role in the burden of chronic diseases. Infections with HBV and HCV causes liver cirrhosis and primary liver cancer worldwide [15].

In this study, the overall prevalence of HBV and HCV infections among suspected clients in Adigrat Hospital was 3.57% and 2.13% respectively. This study was lower compared with similar studies conducted in Ethiopia, Gondar 14.6% HBV and 12.4% HCV [13], Hawassa 9% HBV and 5.5% HCV [16], Ghana 6.94% HBV [17]and, Nigeria 13.60% and 16.6% for HBV and HCV respectively [18]. The possible explanation for this difference could be due to the hyperendemic in Ghana and Nigeria, variation in methodology, the difference in the population studied the level of awareness in the method of transmission. However, compared to our study low prevalence was reported in Iran 0.13% for HBV and 0.06% for HCV [19]. This might be attributed due to the study participants in Iran were blood donors that

they are a self-selected group at a lower risk of infectious diseases and exclusion of those individuals having sign and symptom of the disease.

A co-infection rate of 7.4% (4 /54) reported in this study. This finding is higher than with the study reported in Ethiopia, Gondar 2% [13], however, it was lower compared with the study done in Nigeria 8.3% [20]. This might be due to differences in the study period, increasing awareness of the population about the importance screening, and the sample size of the study participant.

Among the male participants, 106 (8.0%) were seropositive for HBsAg and 12 (2.49%) were positive for HCV antibody compared to the 583 (3.24%) and 18 (1.94%) positive HBsAg and HCV antibody respectively among the female study participants. This is consistent with the study conducted in Nigeria [18]. The higher prevalence in men might be due to the sharing of sharps materials such as nail cutters and barbing clippers and injectable drug usage is also more prevalent in males than in females.

In this study, sex was significantly associated with HBV infection. Female study participants were fourfold less likely to be infected by hepatitis B virus infection compared to male study participants. This finding is in line with previous studies conducted in Gondar [13], Brazil [21], Pakistan [22] [23] and, Ghana [24]. This may be due to drug use and occupational exposure compared to women. In contrast, a higher prevalence of hepatitis B virus (HBV) was observed among females compared to their male counterparts [17].

The present study showed that age was significantly associated with HBV. The study participant's age groups from 15–24, 25–34, and 35–44 were three times more likely to have HBV infection. This finding is consistent with the study reported from, Gondar, Ethiopia [13], and Nigeria [18]. This might be due to tattooing, drug use, those age groups are sexually active in nature, alcoholism, and occupational exposure. Hence, this may be an implication to take action such as increased resource mobilization for prevention and control of this infection, improve awareness of this group about the availability of vaccination, increase coverage of youth-friendly service in the health facilities, actions to prevent transmission of the virus, guidelines for screening, diagnosis. Moreover, age is thought to be strongly associated with hepatitis B infection those individuals aged 45–54 were also 2.4 more likely to acquire HBV infection. This finding was also supported by studies conducted in Brazil [21] and [18]. This might be due to increased practicing of dental extraction out of health institutions with unhygienic conditions and without proper sterilization[16].

In the current study, age and sex were statistically significant with hepatitis C infection. This is agreed with finding reported from Gondar, Ethiopia [13], and Nigeria [18].

In our study, the prevalence of hepatitis B virus infection was showed a significant upward in 2014. Even though a gradual decline was shown from 2015 to 2017, small peaks were observed from 2018 to 2019. The decrease in the prevalence of the hepatitis B virus may be attributed to the increasing awareness of the population about the method of transmission and prevention, and the control mechanism of the infection. Whereas, small peaks might be due to increasing awareness towards screening from 3897 in

2017, 4498 in 2018, and 7538 in 2019 and increase awareness of the hepatitis B virus which is already existing in the community.

Additionally, the prevalence of hepatitis C virus infection was varied noticeably in different years. In 2014, 5.6% then it was increased to 12.65% in 2015 and lowered to 0.0% 2016. On the other, small fluctuation was showed for HCV from 2017, 2.46%, 2018, 0.73%, and 2019, 0.81%.

Limitations

Since the study is secondary data from the logbook and patient charts, data incompleteness, lack of the associated risk factor, and poor document retention system were a limitation of this study.

Furthermore, for the future researcher detection and introduction of PCR based screenings are important.

Conclusions

The overall trend prevalence of hepatitis B and C viruses among patients suspected and referred to Adigrat Hospital serology laboratory were 3.57% and 2.13% respectively. Being male and age group 15–44 and age ≥ 65 were significantly associated with the chance of acquiring hepatitis B infection. Therefore, this can affect the more productive age at the household and zonal level. Hence, our recommendation is to improve awareness about a method of transmission, increase resource mobilization such as immunization to that group, increase coverage of youth-friendly service in the health facilities and guidelines for screening and diagnosis should be implemented. Furthermore, dental extraction should be practiced in health institutions with hygienic conditions and with sterilized materials.

Abbreviations

HBsAg: Hepatitis B surface antigen; **HBV**: Hepatitis B virus; **HCV**: Hepatitis C virus; **PCR**: Polymerase Chain Reaction; **RERC**: Research Ethics Review Committee; **TRHB**: Tigrai Regional Health Bureau; **WHO**: World health organization

Declarations

Ethics approval and consent to participate

This study was approved by the Research Ethics Review Committee (RERC) of the Tigrai regional research institution and ethical clearance (Consent Ref Number THRI/4031/0390/19 approval dated 25/11/2019). The official letter was obtained from Tigrai Regional Health Bureau (Consent Ref Number TRHB/RCSH 121/1418/2019 approval dated 30/11/2019 to Adigrat Hospital administration. A written consent letter was sought from the administration of Adigrat General Hospital before starting the data collection. Then Permission was obtained from the Head of the laboratory, Adigrat General Hospital.

Consent for publication

Not applicable

Availability of data and materials

All data collected and analyzed during this study were included in the manuscript. But if the full paper is needed, it will be shared upon request by the editor from the corresponding author.

Competing interests

The authors' declared that there were no competing interests

Funding

Not applicable

Authors' contributions

HL designed the study, collection, analysis, and interpretation of data, and drafted the manuscript. BB, GA, TK, and AG designed the study, supervised data collection both on-field and in the laboratory, and prepared the manuscript. GG, FM, KT, AD, HG and HN read and approved the final manuscript.

Acknowledgements

The authors gratefully acknowledge the Adigrat General Hospital for their support in the study. We also wish to extend our deep appreciation to Adigrat University, College of Medicine and Health Sciences and Tigrai Health research institute for providing us with the opportunity to do this research.

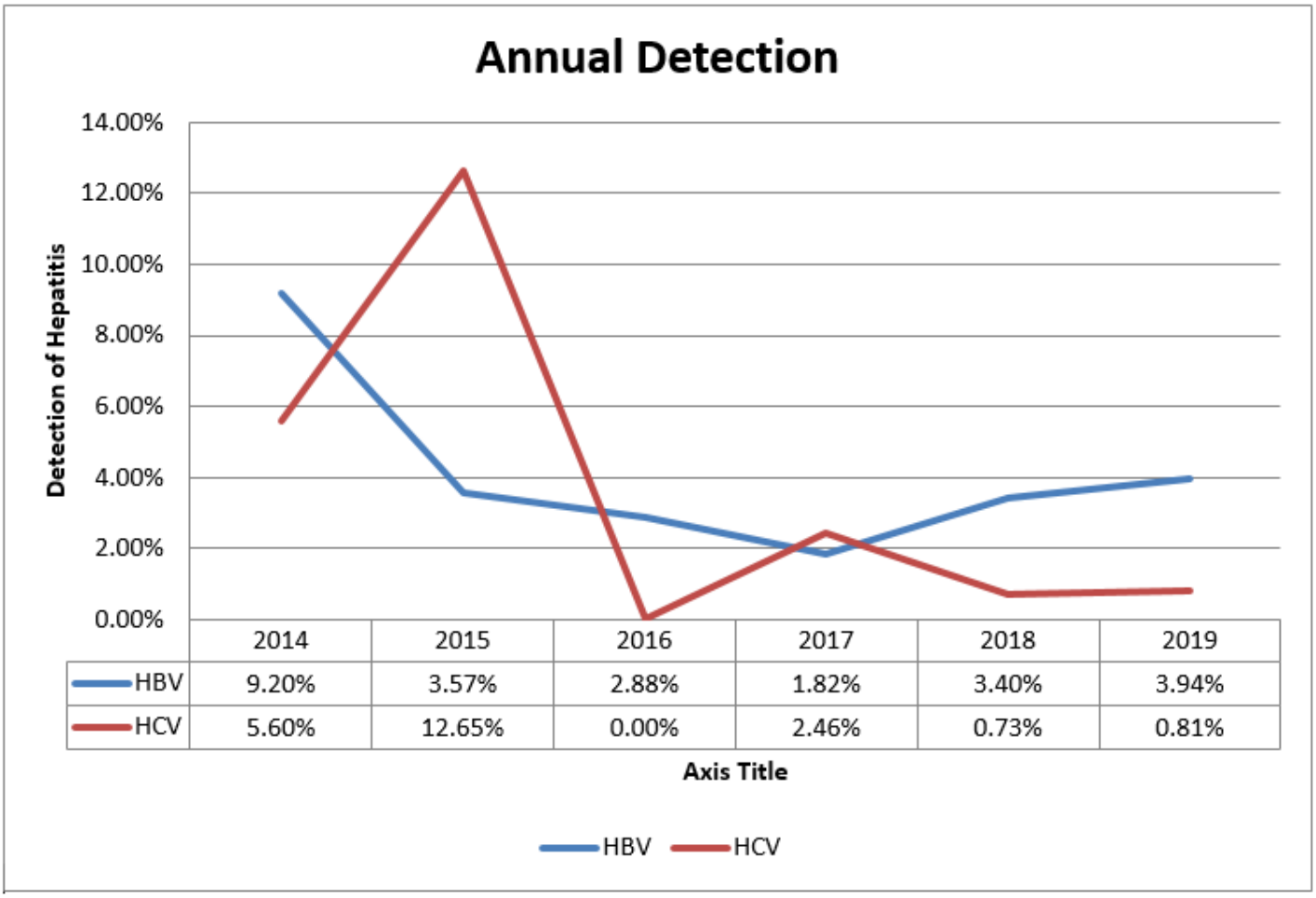
References

1. Global health, estimates, 2016., Geneva:: World Health Organization. (https://wwwwhoint/healthinfo/global_burden_disease/estimates/en 2016.
2. Global H. 2017. R: Geneva: World Health Organization; 2017. *Licence: CC BY-NC-SA 30 IGO*.
3. EASL. Clinical Practice Guidelines: Management of Chronic hepatitis B. J Hepatology. 2009;50(2):227–42.
4. Foster G. Pegylated interferons for the treatment of chronic hepatitis C: pharmacological and clinical differences between peginterferon-alpha-2a and peginterferon-alpha-2b. Drugs. 2010;70(2):147–65.
5. Turati F, Edefonti V, Talamini R, Ferraroni M, Malvezzi M, Bravi F, et al. Family history of liver cancer and hepatocellular carcinoma. Hepatology. 2012;55(5):1416–25.
6. Andre F. Hepatitis B epidemiology in Asia, the Middle East and Africa. *Vaccine* 2000, 18(1):S20-S22.
7. Organization WWH: Global hepatitis report,. Geneva: World Health Organization, April, 2017. 2017.

8. Riou J. Hepatitis C virus seroprevalence in adults in Africa: a systematic review and meta-analysis; Journal of Viral Hepatitis; October 2015. Philippa C. Matthews: Epidemiology and impact of HIV coinfection with Hepatitis B and Hepatitis C viruses in Sub-Saharan Africa. J of Clin Viro. 2014;61(1):20–33.
9. Zampino R, Boemio A, Sagnelli C. Hepatitis B virus burden in developing countries. World journal of gastroenterology. 2015;21:11941–53.
10. Lin X, Robinson N, Thursz M. Chronic hepatitis B virus infection in the Asia-Pacific region and Africa: review of disease progression. J Gastroenterol Hepatol. 2005;20:833–43.
11. Organization:. WH: Hepatitis B vaccines. Wkly Epidemiologic Re. 2004;79:255–63.
12. WHO Ua. Progress on Sanitation and Drinking Water- update and MDG assessment. *UNICEF and World Health Organization*; 2015.
13. Tesfa H, Biadgo B, Getachew F, Tegegne K, Yismaw Ga, Muluye D. Seroprevalence of hepatitis B and C virus infection among patients attending serology laboratory of Gondar University Hospital. BMC Res Notes. 2013;6:164.
14. Population.: City population Adigrat. *Adigrat City municipality* 2013.
15. Organization WH. Global policy on the prevention andcontrol of viral hepatitis [In Portuguese]. *Ministry of Health, Organization* 2014.
16. Taye M, Daka D, Amsalu Aa, Hussen S. Magnitude of hepatitis B and C virus infections and associated factors among patients scheduled for surgery at Hawassa University comprehensive specialized Hospital, Hawassa City, Southern Ethiopia. Res Notes 2019, 12(412):https://doi.org/10.1186/s13104-13019-14456-13100.
17. Lokpo SY, Osei-Yeboah J, Norgbe GK, Owiafe PK, Ayroe F, Ussher FA, et al: Viral Hepatitis Endemicity and Trends among an Asymptomatic Adult Population in Ho: A 5-Year Retrospective Study at the Ho Municipal Hospital, Ghana. *Hepatitis Research and Treatment* 2017:ID 6174743.
18. Omote V, Kashibu E, Ojumah I, Adda D, Etaghene J, Ukwamedua H. Serological screening of hepatitis B virus and hepatitis C virus among patients attending a tertiary hospital in Jalingo, Taraba state, Nigeria. Saudi J Health Sci. 2018;7:167–71.
19. SAJJADI SM, POURFATHOLLAH AA, MOHAMMADI S, NOURI B, HASSANZADEH R, RAD F: The Prevalence and Trends of Hepatitis B, Hepatitis C, and HIV among Voluntary Blood Donors in Kohgiluyeh and Boyer-Ahmad Transfusion Center, Southwestern Iran *Iranian journal of public health* 2018, 47(7):944–951.
20. Pennap GR, Aliyu Y, Odula O, Joseph F. Prevalence of hepatitis B and C virus infection among people of a local community in Keffi, Nigeria. Afr J Microbiol Resour Announc. 2010;4:274–8.
21. Marcon CEM, Schneider IJC, Schuelter-Trevisol F, Traebert J. Trends in the Burden of Hepatitis B in a Southern Brazilian State *Hepatitis monthly* 2015, 15(11):e31906.
22. Ahmed W, Qureshi H, Arif A, Ejaz Alam S: Changing trend of viral hepatitis -"A twenty one year report from Pakistan Medical Research Council Research Centre, Jinnah Postgraduate Medical Centre, Karachi *JPMA* 2010, 60(86).

23. Alomatu H: HIV, HBV, HCV and Syphilis Infections among Blood Donors in Koforidua, Ghana *University of Ghana* 2016, Ghana.
24. Walana W, Ahiaba S, Hokey P. Sero-prevalence of HIV, HBV and HCV among Blood Donors in the Kintampo Municipal Hospital, Ghana. British Microbiology Research Journal. 2014;4(12):1491–9.

Figures



	2014	2015	2016	2017	2018	2019
HBV	9.20%	3.57%	2.88%	1.82%	3.40%	3.94%
HCV	5.60%	12.65%	0.00%	2.46%	0.73%	0.81%

Figure 1

Trend prevalence of HBV, HCV among study participants at Adigrat General Hospital from January 2014 to December 2019