ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES,

SCHOOL OF PUBLIC HEALTH

Prevalence of Hepatitis B and Hepatitis C and associated risk factors among HIV positive individuals at Voluntary Counseling and Testing (VCT) centers in Jimma zone, South West Ethiopia, 2016.

BY:

ASHEBIR GEBRE (BSc)

SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH

May, 2016

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY,

COLLEGE HEALTH SCIENCES,

SCHOOL OF PUBLIC HEALTH

MASTERS DEGREE IN PUBLIC HEALTH

Prevalence of Hepatitis B and Hepatitis C and associated risk factors among HIV positive individuals at Voluntary Counseling and Testing (VCT) centers in Jimma zone, southwest Ethiopia. 2016.

BY:

ASHEBIR GEBRE (BSc)

SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTERS OF PUBLIC HEALTH

ADVISORS:

1. **DR MESFIN ADDISSE**
2. **MR ROBEL YIRGU**

May, 2016

ADDIS ABABA, ETHIOPIA

ADDIS ABABA UNIVERSITY,

COLLEGE HEALTH SCIENCES,

SCHOOL OF PUBLIC HEALTH

MASTERS DEGREE IN PUBLIC HEALTH

BY:

ASHEBIR GEBRE (BSc)

JUNE, 2016

MASTERS DEGREE IN PUBLIC HEALTH PROGRAM

SCHOOL OF PUBLIC HEALTH

COLLEGE HEALTH SCIENCES,

ADDIS ABABA UNIVERSITY,

Approved by examining

_____ _____

Chairman, School Graduate Committee

DR Mesfin Addise _____

Advisor

_____ _____

Examiner

_____ _____

Examiner

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in this or any other university, and all sources of materials used for this thesis have been fully acknowledged.

Name : Ashebir Gebre

Signature : _____

Place : Addis Ababa

Date of submission: June 2, 2016

Address **+251911391164, ashebir_12@yahoo.com**

Acknowledgments:

I am grateful to Addis Ababa University, school of public health for various helps in ensuring the successful completion of this research programs.

I wish to express appreciation to Dr Mesfin Addisse and Mr Robel Yirgu for there contributions to the conduct of this research, there intellectual guidance, support and leadership.

I would like to acknowledge Mr.Germay Medhin from institute of Pathobiology, Addis Ababa University for his expert assistance with this project, reviewing the manuscript, statistical analysis and valuable contribution with the studies.

Table of Contents **Pages**

List of Tables: **Pages**

List of Figures: **Pages**

Liss of Annexes: **Pages**

List of Abbreviations/ Acronyms:

AIDS : Acquired Immuno-Deficiency Syndrome

Anti-HBc: Antibody to Hepatitis B core Antigen

Anti-HCV: Antibody to Hepatitis C Virus

ART: Anti-Retro Viral Treatment.

CI: Confidence Interval

DLD: Decompensated Liver Disease

ELISA: Enzyme-Linked Immuno Sorbent Assay

HBV: Hepatitis B Virus

HBsAg: Hepatitis B surface Antigen

HCV: Hepatitis C Virus

HCC: Hepatocellular Carcinoma

HIV: Human Immunodeficiency Virus

IDU: Injecting Drug User

MSEM: Modified Social Ecological Model

MSP: Multiple Sexual Partners

NNTTI: Non- Nucleoside Reverse Transcriptase Inhibitor

OR: Odds Ratio

STI: Sexually Transmitted Infection

VCT: Voluntary Counseling and Testing

WHO: World Health Organization

Abstract

Background: Shared modes of transmission of infection with HIV and hepatitis B and/or C virus, have made them important causes of morbidity and mortality in HIV infected persons receiving antiretroviral drugs. The magnitude of HBV and HCV co and triple infection among HIV patients has not been known in Jimma zone.

Objective: To determine the prevalence of hepatitis B and C; and associated risk factors among HIV positive individuals in Jimma zone, Ethiopia, 2016.

Methods: A facility based cross sectional study based on secondary data were conducted on an anonymous samples collected for VCT at Jimma specialized hospital from January, 2015 to May, 2016. A questionnaire adapted for this study was used to collect data on demographic characteristics, associated risk factors, and serological status of HBV/HCV among HIV positive individuals.

Results: A history of four hundred eleven HIV positive individuals were included in the study, Majority of participants were female65.5%. Age (28.8±11.2) year were enrolled. Thirty three (8.0%)[95% CI, 5.2–10.3] were HBV positive, twenty (4.9%) [95% CI, 2.8–6.9] were HCV positive and four (1.0%) [95% CI, 0.2–2.3] were HBV/HCV/HIV triple infected. Rural residency shown to be independent predictor for HCV [AOR = 2.81; 95% CI 1.03–7.68].

Conclusions: These findings suggest that co-infection and triple co-infection is similar with the general population in the study setting. Therefore, it is important to implement a screening program for HIV positive individuals for active infection of HBV and HCV is therefore necessary.

1. Introduction

1.1 . Background

Viral hepatitis has been a major human disease for at least 2000 years [1]. In 1963 a major breakthrough identified serum hepatitis and its cause, hepatitis B virus (HBV) [2]. In 1989 hepatitis C virus (HCV) was isolated [3].

Hepatitis B and hepatitis C viruses are the most common causes of chronic liver disease worldwide. Approximately 350 million people are infected with HBV world wide, and the world health organization (WHO) estimates that approximately 170 million people are infected with HCV [4].

It is estimated that there are 50 million HBV chronic carriers in Africa, and 12.5 million deaths will occur from liver disease as a result [5]. Prevalence of HCV in Sub-Saharan Africa is 3.0 % and in East Africa 1.6% [6].

A nation wide sero-epidemiological study for hepatitis B markers conducted in Ethiopia from serum showed prevalence rates of 10.8% for HBsAg and 73.3% positive at least for one marker [7]. Community based study done in Ethiopia reported that the prevalence of HCV antibody ranged from 1.5%-2.0% [8].

Hepatitis B, hepatitis C and HIV share at least one common route of infection, blood-to-blood contact through the shared use of contaminated needles [9]. As a result there is a high rates of concomitant HCV and HBV in HIV-infected subjects [10]. Although the advent of HAART has resulted in a considerable reduction in mortality and morbidity associated with HIV infection, advances in the management of HBV and HCV in co-infected patient continue to somewhat lag behind. This is particularly true for those co-infected with HIV and HBV or HCV, despite the high incidence of co infection worldwide [4]. Therefore liver disease remains a major cause of mortality and morbidity among HIV-infected individuals with access to highly active antiretro-viral therapy (HAART) [11].

A recent prospective study done in Spain on 226 HIV-HCV co infected patients to determine HAART related hepatotoxicity showed that nearly one third of HIV/HCV co infected patients with cirrhosis could develop liver toxicity during HAART [12]. In another study, the incidence of severe hepatotoxicity was prospectively studied among 568 HIV infected patients who received non- nucleoside reverse transcriptase inhibitor (NNRTI) – based HAART, The greatest risk of

NNRTI-associated severe hepatotoxicity was observed in 32% of patients with hepatitis B or C co infection [13].

Similarly in a Spanish cohort studied 110 HIV infected patients who developed Decompensated Liver Disease (DLD), comparison between (pre-HAART, on HAART) groups revealed that death secondary to liver disease was common in HAART era (81.8% compared to 60% pre-HAART) [14]. A study of 472 patients compared the survival of HIV patient's co- infected with hepatitis B and/ or C with those infected with HIV alone. Liver mortality was noted in 12% of the cohort and 41% of the total mortality and liver deaths were more common in patients with hepatitis (28%), HIV/HBV (15%) [15].

Recognizing the devastating effect of HIV/AIDS on its population and the positive impact of antiretroviral therapy (ART) the Ethiopian government has responded to the epidemic as a national emergency scaled up the ART program. However the high rate of HIV co-infection with HBV and/or HCV has implications for treatment programs designs and patient care. This study aimed to estimate the prevalence of HBV and HCV infection among HIV-infected individuals and to investigate factors associated with co-infection in the Jimma. These results may contribute to assessing the burden of viral hepatitis in people living with HIV and to guiding preventive measures for more vulnerable groups.

1.2 .Statement of the problem

The HIV epidemic has been one of the worst global epidemics in decades. It has been described as heterogenic, varying from country to country and population to population [16]. Similarly, the HIV epidemic remains a huge global challenge, and in 2012, an estimated 35.3 million people were living with the virus, whereas 1.6 million died [17]. Sub-Saharan Africa still bears the brunt of the HIV epidemic, with 68% of the global total by the end of 2009. A total of 22.5 million people in the region are living with the infection, and more women than men are infected. In 2009, of the 1.8 million HIV-related deaths globally, 72% occurred in sub-Saharan Africa, despite efforts to scale up ART [16].

The rate of HIV infection has also remained persistently high among young people age 15-24. In 2006, this group constituted 40% of the population age 15 and older living with HIV population [16]. Sexual risk behavior such as having unprotected sexual intercourse and multiple sexual partnerships has been described as the cornerstone for HIV transmission, and changes in these behaviors have been associated with reduction in the transmission rate of HIV infection [18].

Hepatitis is an inflammation of the liver, most commonly caused by a viral infection. Of these viruses, hepatitis B virus and hepatitis C virus infections account for a substantial proportion of liver diseases worldwide [19]. Of the 2 billion people or one-third of the world's population that has been infected with HBV, it is estimated that 360 million people are chronic carriers [20]. Hepatitis B virus infection is estimated to be the cause of 30% of cirrhosis and 53% of liver cancer in the world [21]. Approximately 15-40% of patients with chronic HBV will develop cirrhosis, end-stage liver failure or hepatocellular carcinoma (HCC) in their lifetime [22]. The prevalence of HBV infection in Africa is on average more than 10% [23].

In Ethiopia, Study conducted in Addis Ababa showed that the mean prevalence of HBsAg was 7% [24], at Shashamane General Hospital about 5.7% [25]. At Addis Ababa hospital employees; the overall HBsAg prevalence rate was 9.02%, Marker positivity as well as HBsAg carrier rate was higher for males than for females [26].

Hepatitis B is usually spread when blood, semen, or other body fluids from a person infected with the Hepatitis B virus enter the body of someone who is not infected. This can happen through having sex with an infected partner; sharing needles, syringes, or other injection drug equipment; or from direct contact with the blood or open sores of an infected person. Hepatitis B can also be passed from an infected mother to her baby at birth [27, 28].

World health organization (WHO) estimated that approximately 170 million people are infected with hepatitis C virus and about 130 million are carriers and three to four million persons are newly infected each year and more than 350,000 people estimated to die from hepatitis C-related liver diseases each year worldwide [29]. Africa has the highest WHO estimated regional HCV prevalence (5.3%) [30]. In Ethiopia, a previous population-based survey had reported a moderate prevalence (2%) of HCV infection [31].

HCV is mostly also transmitted through exposure to infective blood through transfusions of HCV-contaminated blood and blood products, contaminated injections during medical procedures, and through injection drug use. Sexual transmission is also possible [27].

An estimated 34 million people are currently infected with HIV worldwide, and of these, three million are chronically infected with HBV and seven million are coinfected with HCV due to the similarity in the transmission routes [32]. However, many factors can influence and modify these estimates, such as geographical region, risk groups, age of infection, modes of transmission efficacy or efficiency of exposure.

The survival of HIV infected patients has markedly improved since the introduction of HAART and deaths from AIDS-related causes have declined. However, multiple studies have shown that liver disease, caused by hepatitis B virus and hepatitis C virus coinfections, chronic alcoholism, hepatictuberculosis or hepatotoxicity associated with antiretrovi-ral therapy has emerged as the leading cause of mortality [33]. Chronic HCV infection is now the leading cause of death, after AIDS-related complications, among HIV-infected individuals in areas where highly active antiretroviral therapy is available [34].

HIV-positive individuals, particularly those with suppressed immune systems, are less likely to respond to vaccination against HBV, are at higher risk for antiretroviral therapy failure and are more likely to develop chronic disease after being exposed to HBV [35, 36]. Moreover, individuals coinfected with HBV and HIV more frequently present persistent serological markers, have higher HBV-DNA levels, and experience more severe liver disease as a result of chronic infection [36]. Growing problems of HIV/AIDS pandemic in sub Saharan Africa; where the transmission is predominantly through sexual route and most of the people in these region are already been exposed to HBV by the time they become sexually active to acquire HIV infection, with minority being exposed to both viruses more or less simultaneously [37,38].

Although some antiretroviral (ARTs) used to manage HIV are also effective against hepatitis virus, some ARTs may also be toxic to the liver. Treatment with these agents may produce viral resistance by the HIV, hepatitis virus or both. Finally, adding more drugs to treat associated infections adds to the expense and complexity of patient care. The investigation of the presence of HBV and HCV in HIV infected patients is important from the public health perspective to measure the resources required for prevention and treatment. Currently, HIV infected patients have greater longevity due to effective antiretroviral regimens as well as more effective drugs to treat hepatitis B and C[39].

As shown by several studies, estimates of co-infection prevalence may vary depending on the risk groups and geographical area. Thus current study is therefore designed to estimate the prevalence of co-infection of HBV and/or HCV in people infected by HIV in Jimma Zone. Therefore, reliable epidemiological data is important in planning dedicated preventive health services aimed at this group of people.

1.3 . Rational / Significance of the study

HBV, HCV, and HIV share the same routes of transmission. HIV co-infection with HBV or HCV presents a complicated treatment challenge. HBV and HCV are disease-causing viruses that attack the liver. The viruses can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. However, most that are infected have no symptoms and are unaware that they carry the virus and can pass it on to others [40].

The prevalence of HIV-HBV or HIV-HCV co-infection presents great variation and reflects differences in the socio demographic profile, lifestyle, and hepatitis B immunization coverage in different population groups. Thus, estimating the magnitude and associated risk factors of co-infection in different populations is relevant. With all these paradoxes, no study has been done to indicate the magnitude and associated risk factors of dual triple infections found in the study area

The finding from this study will provide quantitative (magnitude) data on related associated risk factors of HBV/HCV co infection in HIV positive patients found in Jimma zone, based on the study finding clinician and patients by being vigilant about monitoring potential symptoms of liver disease and /or drug related effects on the liver, clinicians to be a ware of those possible co existences and to reinforce the need of prevention programmes like immunization for risk groups.

2. Literature Review

Viral hepatitis and HIV infections have recently become epidemic in many areas of the world, especially in countries with high rate of HIV infection, and are commonly transmitted by high risk sexual behavior, blood transfusion and/or injection drug use (IDU) [41]. The prevalence of antibodies to HBV and HCV in HIV infected patients varies according to the risk factor involved for the acquisition of these infections [42].

Persons at risk for infection with HIV, through high risk sexual and drug using behaviors, are at higher risk for acute and chronic hepatitis virus infections[11].Persons with HIV infection are at higher risk for hepatitis related cirrhosis than are hepatitis infected persons without HIV infection [43].

Several epidemiological studies highlighted the high rates of concomitant HCV and HBV in HIV infected subjects. One third of HIV positive individuals world-wide (10 million people) are co-infected with HCV, there are approximately 400 million chronic carriers of hepatitis B, of which an unknown number are co infected with HIV [44]. Over 95% of HIV infected individuals have evidence of infection with HBV and 5-40% of patients are co-infected with HCV [45].

A study conducted in Nigeria of 155 HIV-infected children; the prevalence of HIV/HBV co-infection was 7.7%, while that of HIV/HCV co-infection was 5.2%. No child was co-infected with all three viruses. Children who were co-infected with HCV were more likely to be older than 5 years and there was no significant association between co-infection with either of the hepatitis viruses and socio-economic status, gender, number of persons living in the household [46]. A study done in 9,170 participants from Tripoli (Libya); the average prevalence of Co-infection of HBV/HIV 3 (0.03%), HCV/HIV 12 (0.13%) and HBV/HCV/HIV 2 (0.02%). Anti-HCV and anti-HIV were more prevalent among those aged 20–40 years likewise Intravenous drug use and blood transfusion were the main risk factors for HCV and HIV infection[47].

A Study attempted to estimate the seroprevalence and identify risk factors associated with hepatitis B and/or C co-infections in HIV-infected individuals in Cameroon; of 531 participants, 68% were females and 32% males. Mean CD4 count was 400 cells/µl. Seroprevalence rates for HBsAg and HCV-Ab were 23.7%, and 7.2%, respectively. Associations assessed that HBsAg but not HCV-Ab positivity was linked to age, lower CD4 count and residing in an urban rather than in a rural setting [48]. Study in done in Nigeria; of the 2391 studied subjects, 101(4.2%) and 37(1.5%) respectively were seropositive for Hepatitis B and C Virus infection. Two women (0. 08%) had triple infections. blood transfusion, (cOR: 2.3; 95% CI:1.1 - 4.6), history of induced abortion (cOR:2. 2;95% CI:1.3 - 3.6), and elevated baseline ALT (cOR:2. 2; 95%CI:2. 2;4.2) were significantly associated with HBV. History of induced abortion was the only factor found to be associated with HIV/ HCV (cOR: 1.9;95%CI:1. 3-3.9)[49].

Likewise of the 324 HIV-infected patients screened in Nigeria , 53 (15.5%) were positive for HBsAg, 24 (7.0%) positive for hepatitis C virus antibodies (HCV-Ab), while 2 (0.6%) were positive for both viruses. Seroprevalence of HBsAg was higher in male (17.8%) than in female (14.7%) ($\chi^2 = 0.49$, $P = 0.49$), while the reverse is the case for HCV-Ab; 7.1% for female and 6.7% for male ($\chi^2 = 0.02$, $P = 0.88$) [50]. In another similar study done in Nigeria ; of 1535 serum samples from volunteered participants n Nigeria 42 (2.7%) had both HBV and HIV infections and the HBV and HIV co infected individuals were strongly associated with being a divorcee, having a separated marriage, Alcoholism smoking, blood transfusion or surgery[51].

Similarly a study on 512 individuals in St.Petersburg detected co-infection with HIV and either HCV or HBV in 38.6%, out of 1,411 patients tested for both HBV and HCV, 1.8% were positive for both viruses [52]. Another study in Brazil (Santacatarina) determined the sero-prevalence of HBV and HCV in 93 HIV positive patients (34 intravenous drug users) HBV and HCV were 85.3% and 88.2% respectively [53]. Similarly afore mentioned study showed nearly 40% had at least one marker of HBV infection and 13.53% were positive for HBV surface antigen [54].

In an Argentinean cohort study of 250 HIV patients between 1997 and 2004, 48% were co infected with HCV, 87.5% of who had evidence of active disease [55]. An Armenian study for the eligibility of ART therapy of 74 HIV positive patients showed 29/74 were positive for HCV [56].

Evidence suggests a higher rate of infectious carriage of HBV in HIV positive individuals in the Democratic republic of Congo and Zambia [5]. In a recent retrospective survey done in Abidjan

and Cote d'Ivoire from serum collected in different African countries from HIV positive pregnant women for estimating the prevalence of hepatitis B and C viruses, HBsAg was found in similar proportion among HIV positive (9%) and HIV negative (8%) women diagnosis of chronic hepatitis B was more frequent in HIV positive women (26.7%) compared to HIV negative women (9.4%). In cases of hepatitis co infection a prevalence rate of about 1% was found, both in HIV positive (1.2%) and HIV negative (0.8%) women [57]. In contrast a study done in a Nigerian clinic, reported the rate of HBV infection were (14.8%) among HIV cohort [58].

According to a study done on Ethiopian immigrant in Israel, HIV positive migrants were more likely to have markers for hepatitis B surface antigen than HIV negative migrants (20% *Vs* 8.6%) [59]. A few available community based studies report that HCV antibodies have a prevalence of 5% in HIV infected individuals in Ethiopia [8].Serum samples collected from 4,593 house holds from Addis Ababa were tested for HCV antibodies the prevalence of HCV antibodies was higher among HIV positive samples compared to HIV negative individuals (4.5% *Vs* 0.8%) respectively [9]. An Addis Ababa, study at Tikur Anbesa Hospital showed an over all prevalence rates of 7.5% [8].

HIV infection/ AIDS is a pandemic, with cases reported from virtually every country. At least 1.5 million people in Ethiopia are currently living with HIV, according to UN estimates and some 245,000 people across the country were in need of ART .There are aims to reach 100,000 people by the end of the year [60].

Conceptual Framework

To gain a better understanding of the context and interactions between multiple proximal and distal risk factors that influence sexual risk behaviours and HIV, hepatitis B and C infections. There are numerous adaptations of the health beliefs and behaviour change conceptual frameworks; however, the modified socio-ecologic model provides the best framework for this study [61]. The modified social ecological model (MSEM) is composed of five layers of risk for HIV/HBV/HCV infections: individual, network, community, policy, and stage of the HIV epidemic. The MSEM modifies the social ecological model by modifying the levels of risk as well as adding the stage or level of the HIV epidemic to the social ecological model, and is based on the premise that while individual level risks are necessary for the spread of disease,

The modified social-ecologic model is a flexible model that allows the examination of individual risk factors within the context of sexual network, community, and the wider public policy environment. This study examined the interplay of individual, social and sexual network, community and structural level risk factors/ policy associated with sexual behaviours that predispose individuals to HBV/HCV infection among HIV positive individual. For this study, risk factors at different levels. Individual level factors included age, socioeconomic factors, marital status, Educational, surgery, substance use (injecting and non-injecting), and history of

reported STIs. At the social and sexual network levels, number of sex partners, partner characteristics, will be examined

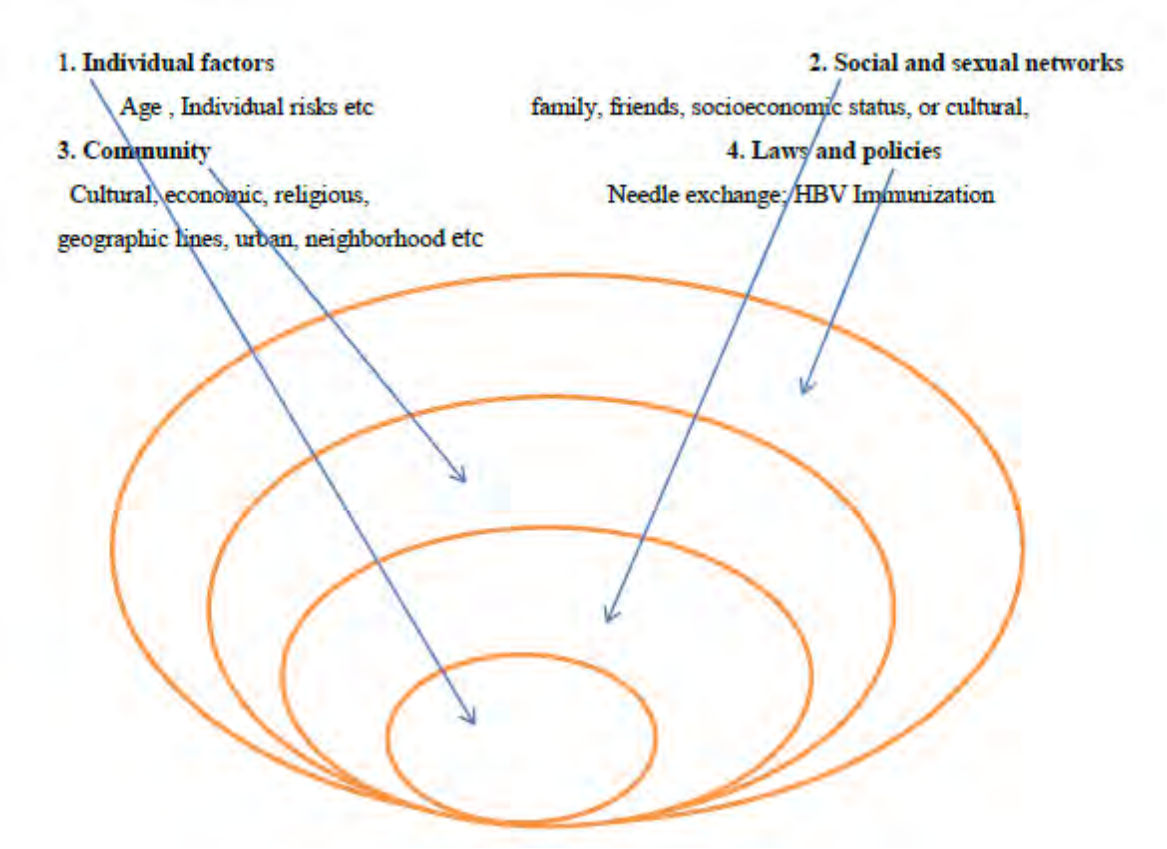

Figure 1: Modified social ecological model for HBV, HCV risk in HIV positive individuals.

.

3. Objectives

3.1. **General objective**

- To determine the prevalence of hepatitis B and C viruses among HIV positives individuals and associated risk factors in Jimma zone South West, Ethiopia 2016.

3.2. **Specific objectives**

- To determine the magnitude of HBV and HIV co infection.
- To determine the magnitude of HCV and HIV co infection.
- To determine the magnitude of HBV, HCV, and HIV triple infection.
- To identify the potential/ associated risk factors for co infected individuals.

4. Methodology

4.1.Study area:

Jimma is the largest city in southwestern Ethiopia. It is a special zone of the Oromia Region and is surrounded by Jimma Zone. Jimma was reorganized administratively as a special Zone. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia, this Zone has a total population of 120,960, of whom 60,824 are men and 60,136 women. With an area of 50.52 square kilometers, Jimma has a population density of 2,394.30 all are urban inhabitants. A total of 32,191 households were counted in this Zone, which results in an average of 3.76 persons to a household, and 30,016 housing units [62].

The Jimma zone consists of 1 Specialized Hospital, and 9 voluntary counseling centers and more than 15 private clinics.

The study was conducted on secondary data collected from VCT center of Jimma University Specialized Hospital voluntary counseling center, found in Jimma zone, southwest Ethiopia.

4.2. Study design and period

A quantitative cross sectional study design was conducted from January 2015 to February 2016.

4.3. Source population

All individuals who reside in the Jimma Zone conceded to be a source population.

4.4. Study population

All individuals who reside in the Jimma Zone and come to Jimma specialized hospital for HIV counseling and testing service.

4.5. **Study Unit**

All individuals who come to VCT centers during the study period and undertake serological test and participate in the questioner were included after matching with the inclusion and exclusion criteria.

4.6. Inclusion and exclusion criteria

4.6.1. Inclusion criteria

Inclusion criteria were all subjects who undergo counseling, HIV testing, HBV, HCV test and complete the questionnaire.

4.6.2. Exclusion criteria

All individuals who refuse to test for serological test and questionnaire.

4.7. Study Variables

4.7.1. Outcome variables/ Dependent variables

Serological status for HBV; Positive or Negative result

Serological status for HCV; Positive or Negative result

4.7.2. Exposure variables/ Independent variables:

Socio-demographic (age, sex, religion, ethnicity, residence occupation, education and marital status).

Regular sexual partner, multiple sexual partner, history of abortion, history of blood transfusion, had surgery, history of STI, history of chronic infections, contact with infected person, and hospital admission, alcohol , Injection drug users are people (IDUs) etc

4.8. Sample size and Sampling technique for study subjects.

4.8.1. Sample size:

Calculation of the sample size was based on the following assumptions; since there were no previous studies done in Ethiopia to take its prevalence for the calculation HBV/HCV among HIV positive individuals thus we used 50% for the calculation of minimum sample size, 95% confidence level, marginal error (desired precision) of 5%, and non response rate of 10%.

The formula to calculate the sample size:

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

Where

n = Minimum Sample size

d = The desired precision of the estimate

p =The proportion of HBV/HCV among HIV positive

$n = \frac{1.96^2 . 0.5 (1-0.5)}{0.05^2}$ $Z_{1-\alpha/2}$ = Normal distribution (=1.960)

N = Final sample size

n = 384

Final sample size =384 + 10 %(384)

N = 422

Based on the formula a sample size of 422 was calculated.

4.8.2. **Sampling technique**

A total of **422 individuals** were included to the study.

4.9. Operational Definitions:

Abortion: A women who had a history of any type(Induced and spontaneous) of abortion in the last two years.

Alcohol: Who took 4 beers or related alcohol types per day for the last two years.

Blood transfusion: History of any blood transfusion during the last two years.

Chronic infections: History of any chronic infection during the last two years. Like liver disease

HBV infected: Detection of Hepatitis surface Antigen in a blood.

HCV infected: Detection of Hepatitis C virus antibody in the blood.

Household contact: An individual who have contact with chronically ill persons at home for the last two years.

Hospital Admission: An individual who had admitted at least ones in the last two years.

HIV/HBV Co-infection: Detection of HIV and Hepatitis surface Antigen in a blood

HIV/HCV Co-infection: Detection of HIV and Hepatitis C virus antibody in a blood.

HIV positive: Detection of HIV antibody in a blood.

Injection drug users :(IDUs): People, who inject (usually illicit) drugs such as heroin, cocaine, speed or steroids into a vein, muscle, or under their skin.

Multiple Sexual Partners (MSP): A person having sexual partner more than one in the last two years.

Regular sexual partners: A person having regular sexual partner in the last two years.

Sexual Transmitted Infection: History of any STI during the last two years.

Surgical Procedure: Includes; dental procedure, tattooing, unsafe injection, caesarian section, ear piercing, bloodletting, abortion, others similar techniques.

Tuberculosis: Had a Tuberculosis infection last two years

Triple infection: Detection of HIV, HBV and HCV in the blood.

4.10. Data collection

A secondary data was collected using questionnaire adapted for this study. It has four different sub- sections, namely socio-demographic characteristics, associated risk factors, serological status and other related variables of interest. (Annex 2)

All anonymous and unlinked secondary data's were coded and entered in to the excel sheet by a trained nurse on the study topic. Data in the Excel sheet was imported to the SPSS 15.0.

Data Quality Assurance

A continues supervision were undertaking during collection of secondary data for its completeness and perfect feet for the study purpose. One day training also provided for two nurses on secondary data collection and filling on excel spread sheet.

4.11. Data analysis

Pre coded and checked data were entered in to statistical software SPSS 15.0. Descriptive statistics, univariate, bivariate and multi variate analyses were used as appropriate. Statistical analysis such, as chi-square and logistic regression were calculated at 95% of confidence interval. The Odds Ratios (ORs) and their respective 95% CI were calculated. All Factors were entered to logistic regression were used to control the effect of confounding variables and adjusted OR was calculated. Univariate results were presented in the forms of proportions, percentages, tables and graphs.

4.12. Ethical considerations

Ethical clearance was obtained from Addis Ababa University, School of Public Health research ethical committee after the study protocol has been submitted. Since data's are secondary, thus the results obtained from this study will be maintained its confidentiality. The study was commenced after getting approval from ethics committee.

4.13. Dissemination of the study

The finding of this research will be provided to all participated health institutions in the zone and other responsible bodies' thorough Addis Ababa University, School of Public Health. Results will also be presented on local and national scientific conferences and publication.

5. RESULTS:

5.1 Description of study participants

A total of four hundred twenty two HIV positive subjects were selected for the enrollment and only four hundred eleven were included for the study. Eleven were excluded as a result of incomplete data. Female participants were two hundred sixty nine (65.5.7%). Ages ranged from 15 to 70 years (mean = 28.8 years; SD± 11.2).The mean age for women was lower than that for men (26.9 Vs 30.28 years, p<0.008). The majority of participants (82.5%) were residents of Jimma town. Seventy two (17.5 %) from rural areas. Two hundred sixty four (64.2%) study participants were unemployed. Two hundred forty five (59.6%) followers of Orthodox Christians. One hundred eighty seven (45.5%) were ethnically Oromo. The majority 226 (55%) of subjects completed a primary and junior school education level. One hundred sixty two (39.4%) were married and one hundred seventy one (41.6%) were singles (Table 1)**.**

Table 1: Socio-demographic characteristics of the study participants, Jimma University specialized hospital; Jimma, 2016.

Socio-demographic Characteristics	Total (%)
Sex	
Male	142(34.5)
Female	269(65.5)
Age, in years	
15-19	78(19.1)
20-29	138(33.6)
30-39	132(32.1)
≥40	63(15.3)
Residence	
Urban	339(82.5)
Rural	72(17.5)
Occupational status	
Priv employed	51(12.4)
Gov.employed	42(10.2)
Unemployed	264(64.2)
Student	41(10)
Others	13(3.2)

Religion	
Muslim	138(33.6)
Orthodox	245(59.6)
Others	28(6.8)
Ethnicity	
Oromo	187(45.5)
Amhara	134(32.6)
others	90(21.9)
Educational status	
Can't write and read	101(24.6)
Primer & junior	226(55)
Secondary &above	84(20.4)
Marital status	
Single	171(41.6)
Married	162(39.4)
*Others	78(19.0)

** includes separated, divorced widowed etc*

5.2. Prevalence of HBV and/or HCV.

The overall prevalence rate of HBV positive was Thirty three (8.0%) [95% CI, 5.2–10.3]. Twenty (4.9%) [95% CI, 2.8–6.9] was positive for HCV. Four (1.0%) [95% CI, 0.2–2.3] of the study participant were positive for both HBV and HCV markers (Figure 1).

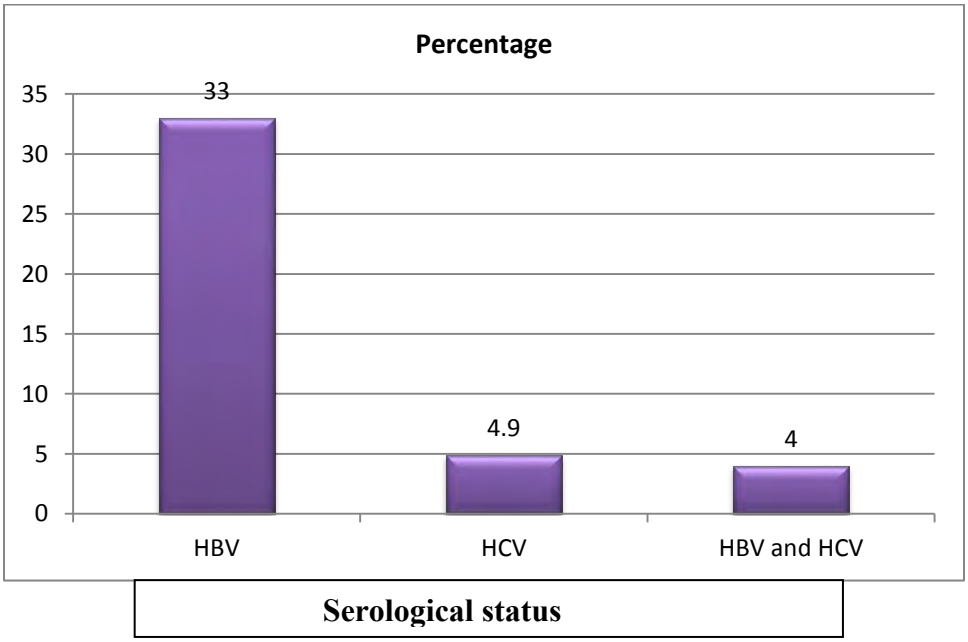

Figure 2, Frequency of HBV and HCV Serological markers among HIV positive individuals at Jimma University specialized hospital; Jimma, 2016.

5.3. Associated risk factors for study participants:

One hundred sixty seven (40.6%) of study subjects had a regular sexual partner. one hundred thirty (31.6%) had multiple sexual partner. History of sexually transmitted infections (STI) were reported by 19 (4.6%) of study participants. History of abortion was reported among 18(4.4%). Thirty eight (8.8%) of study subjects had history of previous hospital admission. Fifty two (12.7%) participants had history of Tuberculosis. One hundred twenty three (30%) had history of liver disease and additionally 233(56.4%) individuals were responded as they had felling (self diagnosis) of liver related diseases and we excluded from the analysis. Only seven (1.7%) subjects had immunization for HBV. A total of 93(22.6%) study participants were taking antiretroviral therapy. (Table 2).

Table 2: Associated risk factors of the study participants at Jimma University specialized hospital; Jimma, 2016.

Risk factors	**Total (%)**
Regular sexual partner	
No	244(59.4)
Yes	167(40.6)
Multiple sexual partner	
No	281(68.4)
Yes	130(316)
STIs	
No	392(95.4)
Yes	19(4.6)
Abortion	
No	393(95.6)
Yes	18(4.4)
Blood Transfusion	
No	403(98.1)
Yes	8(1.9)
Dental procedure	
No	405(98.5)
Yes	6(1.5)
Alcohol	
No	393(95.6)
Yes	18(4.4)
IVDs	
No	409(95.5)
Yes	2(0.5)
History of Hospital admission :	
No	378(91.2)
Yes	36(8.8)
House hold contact	
No	400(99)
Yes	4(1)
History of TB	
No	359(87.3)
Yes	52(12.7)
History of Liver disease	
No	288(70)
Yes	123(30)
HBV Immunization	
No	404(98.3)
Yes	7(1.7)

STI; Sexual Transmitted Infections, IVD; Intra venues drug, TB; Tuberculosis, Household contact: an individual who had contact with chronically ill persons at home.

5.3.1. Risk factor for HBV/HIV Co-infection:

There was no difference in the prevalence of detectable HBV in men and women (3.8% Vs 4.13%, P = 0.07) nor between residence; urban and rural (7.0% Vs 0.97%, P = 0.849) respectively (Table 3).

Table 3: Socio-demographic characteristics, bivariate and multivariate analysis of HBV/HIV co-infection of the study subjects, Jimma University specialized hospital; Jimma, 2016.

Characteristics	Total (%)	Number(%) positive	CrudeOR (95% CI)	P-value	Adjusted OR	P-value
Sex						
Male	142(34.5)	16(48.5)	1	0.083	1	0.060
Female	269(65.5)	17(51.5)	0.53(0.26,1.08)		0.45(0.20,1.03)	
Age						
15-19	78(19.1)	5(6.4)	1		1	
20-29	138(33.6)	12(8.7)	1.39(0.47,4.10)	0.551	1.44(0.45,4.57)	0.476
30-39	132(32.1)	12(9.1)	1.46(0.49,4.31)	0.493	1.25(0.41,3.86)	0.688
≥40	63(15.3)	4 (6.3)	0.99(0.25,3.85)	0.988	0.90(0.22,3.68)	0.935
Residence						
Urban	339(82.5)	29(87.8)	1	0.399	1	0.275
Rural	72(17.5)	4 (12.2)	0.62(0.21,1.84)		1.89(0.60,5.94)	
Occupational status						
Priv employed	51(12.4)	5(15.2)	1			
Gov.employed	42(10.2)	6(18.1)	0.65(0.18,2.30)	0.293	—	—
Unemployed	264(64.2)	16(48.5)	1.68(0.58,4.82)			
Student	41(10)	4 (12..2)	1.00(0.25,4.01)			
Others	13(3.2)	2 (6)	0.59(0.10,3.49)			
Religion						
Muslim	138(33.6)	15(45.4)	1	0.092	1	0.444
Orthodox	245(59.6)	14(42.4)	2.01(0.94,4.30)		1.18(0.45-3.09)	
Others	28(6.8)	4 (12.2)	0.73(0.22,2.39)		0.50(0.14,1.81)	
Ethnicity						
Oromo	187(45.5)	23(69.7)	1	0.004	1	0.074
Amhara	134(32.6)	3 (9)	0.16(0.048,0.55)		4.94(1.23-19.71)	
others	90(21.9)	7 (21.3)	0.26(0.24,1.45)		1.71(0.60,4.85)	

Educational status						
Can't write and read	101(24.6)	6(18.2)	1	0.639		
Primer & junior	226(55)	19(57.6)	0.68(0.26,1.77)		—	—
Secondary &above	84(20.4)	8(24.2)	0.60(0.20,1.80)			
Marital status						
Single	171(41.6)	14(42.4)	1	0.991	—	—
Married	162(39.4)	13(39.4)	1.02(0.46,2.24)			
* Others	78(19.0)	6 (18.2)	1.67(0.39,2.89)			

** includes separated, divorced widowed etc*

Although, statistically not significant age-specific prevalence of HBsAg increase with the age ,where the highest prevalence appeared to age grouped 30-39 years, 9.1% (Figure 2).

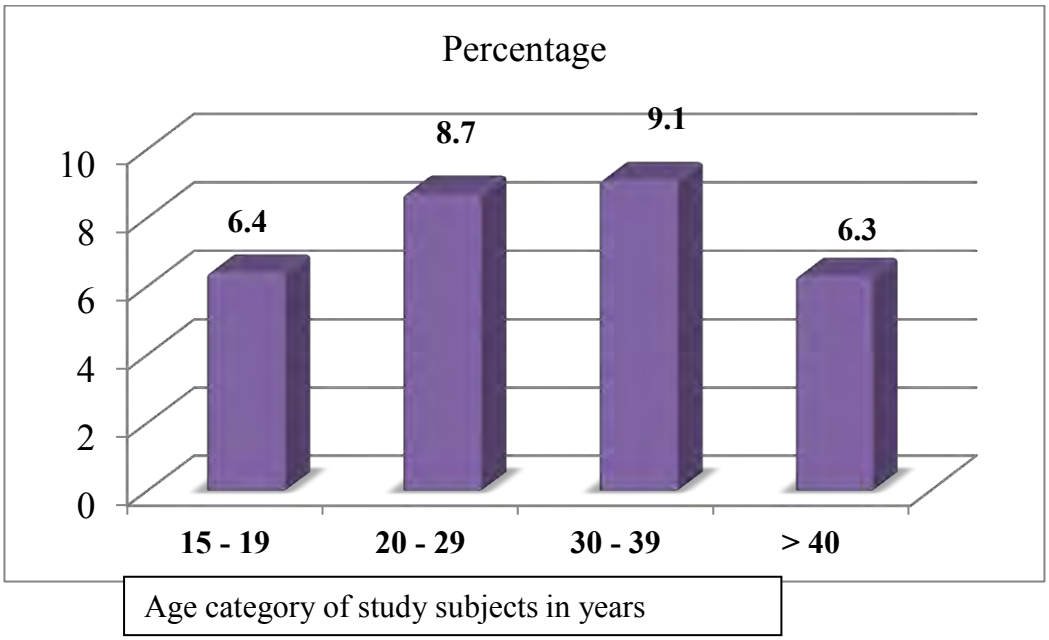

Figure 3. Frequency of HBV among HIV positive individuals with their corresponding age categories at Jimma specialized hospital Jimma Ethiopia, 2016.

Subjects with history of hospital admission had two times more likely to test positive for HBV than those had not [OR=2.58; 95% CI 0.98–6.73; p=0.053], although marginally significant, Subjects with

the history of Tuberculosis (n=9) had three times more likely to test positive for HBV than those had not [OR=2.92; 95% CI 1.27–6.69; p<0.011]. Subjects with history of abortion had six times more likely to test positive for HBV than no history of abortion [OR = 6.03; 95% CI 1.06–34.2; p=0.043], and alcohol consumption; more than once a week had three times more likely to test positive for HBV than those had not [OR = 3.58; 95% CI 1.10–11.5; p=0.033]. However, after adjusted for socio-demographics characteristics and risk factors none of them were found to predictor for HBV (Table 4).

Table 4: Associated risk factors, bivariate and multivariate analysis of HBV/HIV co-infection of the study subjects, Jimma University specialized hospital; Jimma, 2016.

Characteristics	**Total (%)**	**Number(%) positive.**	**Crude OR (95% CI)**	**P-value**	**Adjusted OR**	**P-value**
Regular sexual partner: Yes	167(40.6)	13(39.4)	0.94(0.457,1.95)	0.880	---	--
Multiple sexual partner Yes	130(316)	9(27.3)	0.79(0.359,1.776)	0.575	---	--
STIs Yes	19(4.6)	2(6)	1.37(0.30,6.20)	0.682	---	--
Abortion Yes	18(4.4)	2 (6)	6.03(1.06,34.2)	0.043	3.39(0.48,23.7)	0.218
Blood Transfusion Yes	8(1.9)	1(3)	1.65(0.19,13.8)	0.638	--	---
Dental procedure Yes	6(1.5)	0 (0)	-	_	--	--
Alcohol Yes	18(4.4)	4(12.1)	3.586(1.10,11.5)	0.033	1.55(0.42,5.71)	0.508
IVDs Yes	2(0.5)	0 (0)	-	-	-	-
History of Hospital admit ion : Yes	36(8.8)	6(18.1)	2.57(0.98,6.73)	0.053	1.68(0.53-5.28)	0.374
House hold contact Yes	4(1)	0 (0)	-	_	---	--
HCV infection Yes	20(4.9)	1 (3)	0.59(0.077,4.55	0.609	0.46(0.53-4.12)	0.491
History of TB Yes	52(12.7)	9 (27.3)	2.92(1.27,6.69)	0.011	1.90(0.75,4.79)	0.170
History of Liver						

disease				0.021	---	--
Yes	123(30)	2 4(72.7)	0.87(0.16,0.86)			
HBV Immunization						
Yes	7(1.7)	0 (0)	_	_	---	--

5.3.2. Associated risk factors for HCV/HIV Co-infection:

Although marginally significant, age-specific prevalence of HCV decreases with the age, where the highest age specific prevalence were among age between 15-19 years and the least were among age group 30-39 years (7.7% Vs 3.0%, p<0.05). In Univariate analysis, age between 15-19 years had 63 and 36 percent excess risk to test positive for HCV compared to age between 30-39 years and 20-29 years [OR = 0.37; 95% CI 0.10–1.37; p=0.528] and [OR = 0.64; 95% CI 0.20–1.98; p=0.031] respectively(Figure 3).

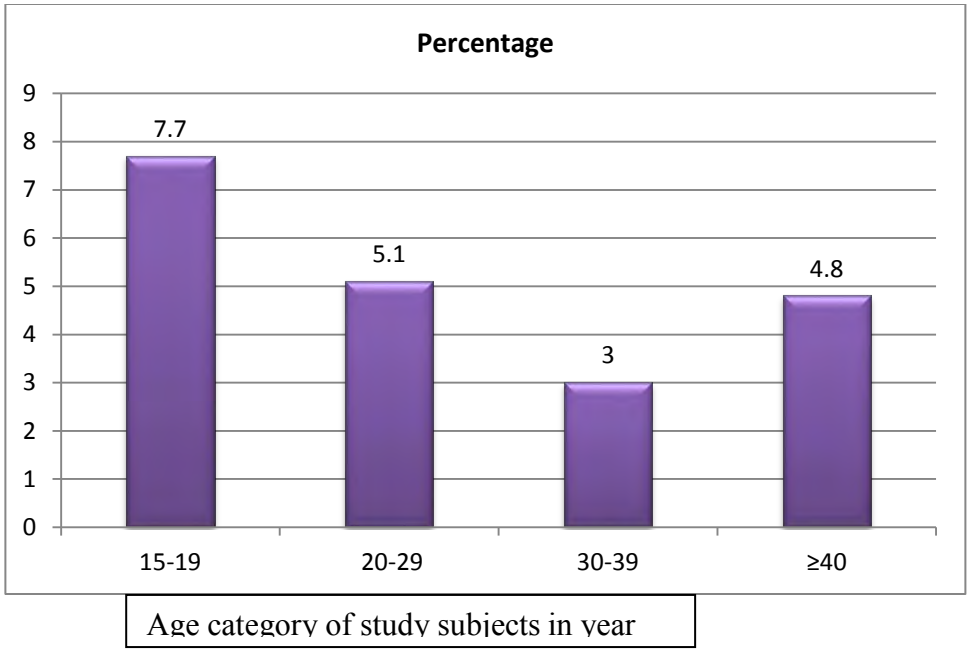

Figure 4. Frequency of HCV among HIV positive individuals with their corresponding age categories at Jimma specialized hospital Jimma Ethiopia, 2016.

Subjects from rural residences had higher prevalence compared to that of urban (9.2% Vs 3.8%, P=0.035) and two times more likely to test positive for HCV compared to urban residences [OR = 2.71; 95% CI 1.03–7.02; p=0.035]. Moreover, after adjusted, rural residence of the study subjects were

shown to be independent predictor to test positive for HCV with an adjusted odds ratio [AOR = 2.81; 95% CI 1.03–7.68; p=0.042 .

Table 5: Socio-demographic characteristics, bivariate and multivariate analysis of HCV/HIV co-infection of the study subjects, Jimma University specialized hospital; Jimma, 2016.

Characteristics	Total (%)	Number(%) positive	Crude OR (95% CI)	P-value	Adjusted OR	P-value
Sex						
Male	142(34.5)	6 (30)	1	0.661	1	0.902
Female	269(65.5)	14(70)	1.24(0.46,3.31)		0.93(0.32,2.67)	
Age in years						
15-19	78(19.1)	6 (7.7)	1		1	
20-29	138(33.6)	7 (5.1)	0.64(0.20,1.98)	0.440	0.64(0.19,2.14)	0.690
30-39	132(32.1)	4 (3.0)	0.37(0.10,1.37)	0.138	0.39(0.10,1.54)	0.180
≥40	63(15.3)	3 (4.8)	0.60(0.14,2.50)	0.483	0.74(0.17,3.21)	0.828
Residence						
Urban	339(82.5)	13 (65)	1	0.042	1	0.042
Rural	72(17.5)	7 (35)	2.71(1.03,7.02)		2.81(1.03,7.65)	
Occupational status						
Priv employed	51(12.4)	2 (10)	1	0.548		
Gov.employed	42(10.2)	1 (5)	1.67(1.14,19.12)		---	--
Unemployed	264(64.2)	12 (60)	0.85(0.18,3.97)			
Student	41(10)	4 (20)	0.37(0.06,2.17)			
Others	13(3.2)	1 (5)	0.49(0.04,5.86)			
Religion						
Muslim	138(33.6)	8 (40)	1	0.047	1	0.014
Orthodox	245(59.6)	8 (40)	0.54(0.20,1.49)		0.36(0.087,1.48)	
Others	28(6.8)	4 (20)	2.70(0.75,9.71)		3.15(0.72,13.66)	
Ethnicity						
Oromo	187(45.5)	10(50)	1	0.405	1	
Amhara	134(32.6)	8 (40)	0.89(0.34,2.37)		2.20(0.51,9.39)	0.317
others	90(21.9)	2 (10)	2.48(0.53,11.59)		0.63(0.10,3.97)	
Educational status						
Can't write and read	101(24.6)	7 (35)	1	0.367		
Primer & junior	226(55)	8 (40)	2.02(0.71,5.75)		---	--
Secondary &above	84(20.4)	5 (25)	1.17(0.35,3.85)			

Marital status						
Single	171(41.6)	9 (45)	1	0.627	---	--
Married	162(39.4)	6 (30)	1.44(0.51,4.15)			
Others	78(19.0)	5 (25)	0.81(0.26,2.50)			

Subjects with history STI had four times more likely to test positive for HCV compared to those had not [OR=4.13; 95% CI1.09–15.5;p=0.036], further after adjusted, for risk factors subjects with history of STI were not found to be independent predictor to test positive for HCV [AOR = 3.76, 95% CI 0.93-15.1; p= 0.062] (Table 6).

Table 6: Associated risk factors, bivariate and multivariate analysis of HCV/HIV co-infection of the study subjects, Jimma University specialized hospital; Jimma, 2016.

Characteristics	**Total (%)**	**Number(%) positive**	**CrudeOR (95%CI)**	**P-value**	**Adjusted OR**	**P-value**
Regular sexual partner						
Yes	167(40.6)	7 (15)	0.77(0.30,1.99)	0.599	---	--
Multiple sexual partner						
Yes	130(316)	4 (20)	0.52(0.17,1.6)	0.252	---	--
STIs						
Yes	19(4.6)	3 (15)	4.13(1.09,15.5)	0.036	3.76(0.93,15.14)	0.062
Abortion						
Yes	18(4.4)	1 (5)	4.06(0.45,36.5)	0.176	3.76(0.93,15.14)	0.062
Blood Transfusion						
Yes	8(1.9)	1 (5)	2.88(0.33,24.6)	0.311	---	--
Dental procedure						
Yes	6(1.5)	1 (5)	4.0(0.45,36.5)	0.176	---	--
Alcohol						
Yes	18(4.4)	1 (5)	1.15(0.14,9.1)	0.886	2.23(0.13-36.35)	0.572
IVDs						
Yes	2(0.5)	0 (0)	---	--	---	--
History of hospital admiss-ion :						
Yes	36(8.8)	3 (15)	1.91(0.53,6.8)	0.311	1.36(0.27-6.86)	0.702
House hold contact						
Yes	4(1)	1 (5)	6.80(0.67,68.5)	0.104	0.29(0.17-4.98)	0.395

HBV infection						0.180
Yes	161(39.2)	4 (20)	2.68(0.88,8.17)	0.082	2.21(0.69-7.08)	
History of TB						
Yes	52(12.7)	4 (20)	1.78(0.57,5.56)	0.311	---	--
History of Liver disease						
Yes	123(30)	16 (80)	0.66(0.19,1.9)	0.494	---	--
HBV Immunization						
Yes	7(1.7)	0 (0)	-	-	---	--

5.3.2 Risk factors for triple infection:

Triple infection with HIV, HCV and HBV was present in 1%. All of them were from urban , with a mean age of 24 years. Although the absolute number (n = 4) was relatively small for analysis. Thus, Studies enrolling a larger number of subjects are needed to elucidate these potential associations further.

6. Discussion:

There are limitations to our study that should be considered in relation to the findings. First, it is facility based study and VCT centers self- selected and have access (Geographic, Financial and other) the study may not represent the general public. Therefore, our findings may not represent to all HIV positives. Additionally, this is a cross-sectional study unable to adequately establish a casual relationship between the time of exposure and subsequent infection. However, the results can be implied to approximate and prepare for clinical care for HIV-positive individuals.

In Ethiopia, according to UNAIDS/WHO report on 2007, prevalence of HIV higher in females than males (1.5% Vs 0.5%) respectively [63]. In this study, of 411 HIV positive subjects, females were larger in number compared to males (65.5% Vs 34.5%). Moreover, in the age group 15-29 years, there were more women living with HIV/AIDS than men [64]. Which support the similar distributions observed in this study, where women were younger's than that for men (26.9 Vs 30.28 years, $p<0.008$). Apparently due to a combination of the earlier commencement of sexual activity of females, the older age of their partners, gender-based biological factors [65], and prenatal and obstetric care/delivery exposures. Despite the fact that, it was facility based study and VCT centers, the similarity of age and sex distributions of our study participants to that of the general HIV positive

individual in the country, justifies representativeness of our study group and its finding to the general HIV positive individuals in the country. Additionally since the study was a cross-sectional, the findings will not adequately establish a casual relationship between the time of exposure and subsequent infection.

In this study, the Seroprevalence for HBV/HIV found to be 8.0%. Which is comparable to recent study done in Addis Ababa St Paul's hospital HIV positive individuals with a prevalence of HBV3.9% (12/305) [66] Similarly, blood sample collected from five different regions of Ethiopia (unknown serological statues for HIV), the mean carrier rate of HBV was 6.2%(31/500) [67]. In another community-based sero epidemiological survey done in Addis Ababa, HBsAg 7%(332/4736) [68]. Study conducted on Ethiopian immigrant study in Israel, HIV positive migrants were more likely to have markers for hepatitis B surface antigen than HIV negative migrants (20% *Vs* 8.6%) [29] This finding indicates that HBV is distributed equally both in HIV positive and the general population and confirms the prevalence of HBV is endemic among HIV positive individuals. Where; the classification of endemicity for prevalence of HBV has been defined as HBV greater than 8% in an adult population [69, 70].

In the present study, prevalence of HCV/HIV co-infection found to be 4.9%, comparable to study to household community survey of the population of Addis Ababa; HCV prevalence was 4.5% (207/4593) and among HIV-positive antenatal care attenders 2.9%(50/1725)[71]. Another recent study done on HIV positive individuals at Addis Ababa Black Lion Hospital, prevalence of HCV was 7.5% [72]. Like HBV, HCV also distributed similarly between HIV positive individuals as well as the general population. Similarly, earlier study also confirms no difference was observed among HIV positive and HIV negative individuals [71].This finding confirms that HCV is found at the intermediate level among HIV positive individuals. Where; the classification of intermediate endemicity for HCV has been defined as a prevalence of HCV between 1.1 % - 5% in an adult population [73].

The prevalence of HBV/HCV/HIV was found to be 1%(4/411) there is, at present, limited information on the prevalence of HBV, HCV, HIV triple infection in Africa and virtually no information found in Ethiopia to compare for trend. However, it is consistent with a recent retrospective study conducted on treatment-naive HIV patients in Nigeria with a prevalence of 1 %(18/1779)[74] and a recent study done in pregnant Nigerian women, 2 (0. 08%) had triple infections[49]. It is much lower than that reported previously in another similar Nigerian study, with a prevalence of

7.2 %(13/180) [75]. Likewise of the 324 HIV-infected patients screened in Nigeria 2 (0.6%) were positive for both viruses [50]. Another study in Tripoli (Libya), 2 (0.02%) of study participate had triple infection [47].Similarly a study on 512 individuals in St.Petersburg detected co-infection with HIV and either HCV or HBV in 38.6%, out of 1,411 patients tested for both HBV and HCV, 1.8% were positive for both viruses [21].

In all epidemiological studies, age has always proved to be the most important factor and the age of acquiring infection is the major determinant of the incidence and prevalence rates [76]. In this study, the difference in prevalence of HIV/HBV co-infection in various age groups indicate that this factor plays an important role in the prevalence rates. The age groups 30-39 years showed the higher prevalence for HBV/HIV co-infection, which is a well-known and widely observed fact, due to the increasing risk of exposure with time. Similarly, the high prevalence of HIV/HBV co-infection among these age groups is in line with the report that persons within the ages 15 to 34 years are mostly affected with HIV/AIDS in Ethiopia [66]. This is because of the high sexual activity within these age brackets. Since HBV has similar routes of transmission and risk factors as HIV, increased prevalence of HIV will explain to increase in HBV prevalence. Although statistically not significant.

HBV infection is predominantly acquired at an early age in developing countries, which includes vertical transmission from mother to child, perinatal transmission, and horizontal transmission from child to child. However, HBV can also be transmitted sexually and sexual transmission both heterosexual and homosexual, accounts for a majority of the transmission occurring in adult life [77]. Study on pregnant women who experience abortion at Jimma university specialized hospital; twofold more likely to be positive for HBsAg compared to others [78]. As it is known, abortion is related to sexually active women, and exposure to a heterosexual partner is also one of the most important mode of transmission for HBV [79]. Although statistically not significant after adjusted, our finding links that abortion is a risk factor for HIV positive individuals for acquisition HBV as a result of sexual transmission where female participants with history of abortion had six times more likely to test positive for HBV compared to those who had not. Similarly a study conducted in Nigeria; history of induced abortion (cOR: 2.2; 95% CI: 1.3 - 3.6) were significantly associated with HBV [49].

Survey conducted in selected health facilities in Ethiopia, three fourth of patients had spontaneous abortion and one fourth of them had induced abortion [80]. In similar study done, 75% women had

history of spontaneous abortion [81]. Although, in this study all had responded as they had a history of spontaneous abortion, previous study had documented that induced abortions common in Jimma and 95% of the women had used either rubber tubes or roots of plants to induce abortion. Therefore, the impacts of unsafe surgical instruments negligible in this study [81].

It is assumed that age-specific prevalence reflects the cumulative risk of acquiring infection, where the prevalence of infection increases steadily with age, However, the greatest variations in prevalence occur among persons with different risk factors for infection[82]. In this study the HCV/HIV co-infection prevalence was inversely related to age, with a consistent gradient of risk when comparing each age group to that above it; age between 15-19 years was far more likely to test positive for HCV when compared with any of the higher age categories. Although, there is limited information to compare with similar studies in Africa, Study in India; predominantly young pregnant women, the prevalence was found to increase up to the age of 25 but decrease after that [83]. An Australian study done on HIV positive individuals, reveled the highest odds ratio observed among age lass than 20 years [84].

HIV/AIDS seriously affects adolescents throughout the world. One-third of all currently infected individuals are youth, ages 15 to 24, and half of all new infections occur in youth the same age [85] Indeed, In Ethiopia, HIV infection mainly affects young persons, especially young women had the highest prevalence [65, 86] This finding could supports the similar epidemiologic patterns of the two infections; Where, HCV prevalence were more frequent in younger age between 15-19 persons of both sexes in our finding too.

Subjects from rural residences had higher prevalence compared to that of urban (9.2% Vs 3.8%, P=0.035) and two times more likely to test positive for HCV compared to urban residences [OR = 2.71; 95% CI 1.03–7.02; p=0.035]. Moreover, after adjusted, rural residence of the study subjects were shown to be independent predictor to test positive for HCV with an adjusted odds ratio [AOR = 2.81; 95% CI 1.03–7.68; p=0.042. In developing countries, unsterile medicinal and other injection practices account for many HCV infections.

6. Conclusions:

Our data provide facility-based determine the prevalence of HBV and HCV and associated risk factors among HIV positive individuals, at Jimma. Therefore, it is possible to conclude that; significant numbers of HIV positive individuals are co-infected and triple infected with HBV and HCV. HBV and HCV distributed similarly in HIV positive and the general population. Participant from rural residency had more likely to acquire HCV than urban residents

8. Recommendations:

In Ethiopia; Because of the well-established infrastructure for HIV counseling and testing in public health programs, expanding these services to include prevention of HCV and HBV infection should be considered and Health-care providers in HIV should be trained to screen actively for risk factors for HIV, HBV, and HCV and to offer prevention education, counseling, and hepatitis B vaccine to clients with risk factors.

Annex's

Annex 1. Reference

1. Bonacin M.. Survival in patients with HIV infection and viral hepatitis B or C: a cohort study. *AIDS* 2004; 18(15): 2039-2045.
2. Viral Hepatitis History. http://www.stanford.edu/group/virus/1999/tchang/history.htm
3. Sulkowski H. Hepatitis C and progression of HIV disease.*JAMA* 2002; 288:199-206.
4. Seth D and Emmet B. Natural history and treatment of hepatitis B virus and hepatitis C virus co infection. *Ann clinMicrobiolAtnimicrob* 2005; 4:13.

5. Burnett RJ et al. Hepatitis B virus and human immunodeficiency virus co-infection in sub-Saharan Africa: a call for further investigation. Liver International 25: 201-213, 2005.
6. Madhava V, Burgess C, Drucker E. . Epidemiology of chronic hepatitis infection in sub Saharan Africa. *Lancet Infect Dis.* 2002; 2(5):293-302.
7. Kefene H, Rapicatta M, Rassi G, etal. Ethiopian national hepatitis B study. *J Med virol* 1988; 24(1): 75-84.
8. Kibru G. Monga D, Fekade D et al. Hepatitis C virus and human immunodeficiency virus co infection among attendants of voluntary counseling and testing center, and HIV follow up clinics at Tikur anbessa hospital. Addis Ababa (Accepted abstract for poster presentation at 16th annual Ethiopian public health association conference, Addis Ababa, 2006.
9. Fasola CG, Netto GJ, Christensen LL, et al.Evolution of hepatitis C recurrence (HCVR) post liver transplantation (OLT) in the last ten years: more aggressive recurrence in recent years? *American Journal of Transplantation*. 2002;2(Suppl 3):54. Abstract 6.
10. Carr A, Cooper DA. Restoration of immunity to chronic hepatitis B infection in HIV-infected patient on protease inhibitor. The Lancet 1997; 349:995-996
11. Kellermon SE . Prevalence of chronic hepatitis B and incidence of acute hepatitis B infection in human immono deficiency virus infected subjects. J Infec Dis 2003; 188:571-577.
12. Anfredi R. HIV infection, antiretroviral therapy, and hepatic function. Emerging epidemiological, pathogenetic, and clinical issues, and their consequences on disease management (editorial). AIDS2003;17(15): 2253-2256..

13. Senahr R A cohort study done in HIV infected patients who develop decompensated liver disease between 1990 and 2003. TUPE 1.

14. Moore M . A survival analysis on HIV mono infected and HIV/HCV co infected patients initiating HAART. abstract of the 3rdintenatinal Aids society conference on HIV pathogenesis and treatment. July 24-27,2005.Rio de Janerio,Brazil:Tupe 1.1 cls

15. Tedaldi E. Influence of co-infection with hepatitis C virus and morbidity and mortality due to human immunodeficiency virus infection in the era of highly active antiretroviral therapy.*Clinical Infectious Diseases* 2003;36:363-367.

16. UNAIDS, and WHO. 2010. *AIDS Epidemic Update.* Washington D.C., USA: USAID.

17. UNAIDS (2013). Global report: UNAIDS report on the Global AIDS epidemic. Geneva: UNAIDS.

18. Seth C Kalichman, Dolly Ntseane, Keitseope Nthomang,et al. Recent multiple sexual partners and HIV transmission risks among people living with HIV/AIDS in Botswana. Sex Transm Infect. 2007 Aug; 83(5): 371–375

19. Gunn RA, Murray PJ, Ackers ML, Hardison WG, Margolis HS. Screening for chronic hepatitis B and C virus infections in an urban sexually transmitted disease clinic: rationale for integrating services. Sex Transm Dis. 2001;28(3):166–70.

20. World Health Organization. Hepatitis B vaccines. Weekly Epidemiological Record. 2009; 40:405-420.

21. Perz JF, Armstrong GL, Farrington LA, et al. The contributions of hepatitis B virus and hepatitis C virus infections to cirrhosis and primary liver cancer worldwide. J Hepatology. 2006; 45(4):529-538.

22. Lok AS. Chronic Hepatitis B. N Engl J Med. 2002; 346(22): 1682-1683.

23. Bwogi J, Braka F, Makumbi I, Mishra V, Bakamutumaho B, Nanyunja M, Opio A, Downing R, Biryahwaho B, Lewis RF: Hepatitis B infection is highly endemic in Uganda: findings from a national serosurvey. Afr Health Sci 2009, 9:98–108.
24. Abebe A, Messele T, Dejene A, Enquselassie F, Messele T, Cutts F:Sero epidemiological study of hepatitis B virus in Addis Ababa, Ethiopia: transmission patterns and vaccine control. Epidemiol Infect 2003,131:757–770.
25. Negero A, Sisay Z, Medhin G: Prevalence of hepatitis B surface antigen (HBsAg) among visitors of shashemene general hospital voluntary counselling and testing center. BMC Res Notes 2011, 4:35.
26. Kefenie H , Desta B, Abebe A, Conti S, Pasquini P. Prevalence of hepatitis B infection among hospital personnel in Addis Ababa (Ethiopia). Eur J Epidemiol. 1989 Dec;5(4):462-7.
27. S. C. Smelzer and B. Bare, Brunner and Suddarth's Textbook of Medical Surgical Nursing, Lippincott Williams & Wilkins, Philadelphia, Pa, USA, 2003.
28. CDC..Centers for Disease Control and Prevention. Department of health & human services Division of Viral Hepatitis. 2010. Publication No. 21-1074
29. Georg, M. and D. Bruce, 2001. Hepatitis C virus infection. National England Journal of Medicine,. 345: 41-52.
30. Mercy Jelagat Karoney and Abraham Mogisi Siika .Hepatitis C virus (HCV) infection in Africa: a review. Pan Afr Med J. 2013; 14: 44.
31. Frommel D, Tekle-Haimanot R, Berhe N, Aussel L, Verdier M, Preux P, Denis F: A survey of antibodies to hepatitis C virus in Ethiopia. Am J Trop Hyg 1993, 49:435-439.

32. Joint United Nations Program on HIV/AIDS. HIV andco-infections in people who inject drugs; 2012.
33. Thio CL. Hepatitis B human immunodeficiency viruscoinfection. Hepatology. 2009;49:S138–45.
34. Weber R, Sabin CA, Friis-Moller N, et al. Liver-related deaths inpersons infected with the human immunodeficiency virus: the D:A:D study. Arch Intern Med 2006; 166:1632–41.
35. 4. Ockenga J., Tillmann H.L., Trautwein C., et al. Hepatitis B and C in HIV-infected patients. Prevalence and prognostic value. J Hepatol **1997**;27(1):18-24.
36. 5. Nunez M., Soriano V. Management of patients co-infected with hepatitis B virus and HIV. Lancet Infect Dis **2005**;5(6):374-82.
37. Davis LG, Werer DL, Lemon SM. Horizontal transmission of HBV. Lancet 1989; 1 (8643): 889-93.
38. Burnett RJ, François *G*, Kew MC, *et al.* HBV and HIV co-infection in sub –Saharan Africa "a call for further investigation". *Liver international,* 2005; 25: 201 -213.
39. Kuehlkampa VM, Schuelter-Trevisol F. Prevalence of humanimmunodeficiency virus/hepatitis C virus co-infection in Brazil and associated factors: a review. Braz J Infect Dis.2013;17:455–63.5.
40. The Co-infection of HIV/AIDS and Hepatitis B and C: The Socio-Economic Impact on the State of Florida. The Center for Public Policy Research and Ethics The AIDS Institute
41. Sulkowskis M. Hepatotoxicity associated with Neuiirapine or efavirenzcontainting Antiretroviral therapy: role of hepatitis C and B infections. Hepatology 2002; 35:182-189.

42. Gilson RJ, Hawkins AE, Beecham MR, et al. Interactions between HIV and hepatitis B virus in homosexual men: Effects on the natural history of infection. AIDS 1997;11:597-606.

43. Sanchez-somolino S. A retrospective review of hospital admissions patients between 1996 and 2004. TVPe(32).

44. Ronald B. A review of new study data presented on treatments and management of HIV_HCV and HIV-HBV co-infection .45th annual interscience conference on Antimicrobials and chemotherapy .2006.Washingiton.DC.

45. Lutwick L. Clinical interactions between human immunodeficiency virus and human hepatitis viruses. Infect Dis ClinPrac 1999;8:9-20.

46. A E Sadoh, W E Sadoh, N J Iduoriyekemwen, P. HIV co-infection hepatitis B and C viruses among Nigerian children in an antiretroviral treatment programme. SA Journal of Child Health. 2011;5(1).

47. Mohamed A. Daw , Amira Shabash , Abdallah El-Bouzedi et al .Seroprevalence of HBV, HCV & HIV Co-Infection and Risk Factors Analysis in Tripoli-Libya. PLoS ONE 9(6): e98793. doi:10.1371/journal.pone.0098793

48. Jean Jacques N. Noubiap, Peter V. Akan, Aubin J. Nanfack. Et al. Hepatitis B and C Co-Infections in Some HIV Positive Populations in Cameroon, West Central Africa: Analysis of Samples Collected Over More Than a Decade. PLoS One. 2015; 10(1371):

49. Oliver Chukwujekwu Ezechi1, &, Olufunto Olufela Kalejaiye1, Chidinma Vivian Gab-Okafor et al . Sero-prevalence and factors associated with Hepatitis B and C co-infection in pregnant Nigerian women living with HIV Infection. Pan African Medical Journal. 2014; 17:197

50. Ojide C K, Kalu E I, Ogbaini-Emevon E, Nwadike V U. Co-infections of hepatitis B and C with human immunodeficiency virus among adult patients attending human immunodeficiency virus outpatients clinic in Benin City, Nigeria. Niger J Clin Pract 2015;18:516-21
51. Emmanuel, Msugh, Mbaawuaga et al.: Studies on Prevalence, Co-Infection and Associated Risk Factors of Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV) in Benue State, Nigeria. Sjph.2014; 2(6): 569-576.
52. Maria J, Mendes C, Antonio B. et al. Prevalence of hepatitis B and C in the sera of patients with HIV infection in S'paulo, Brazil . Presented at the 38thInterscience conference on Antimicrobial and chemotherapy, 1998.California, USA.
53. Schiavini M. Fibrosis progression in HIV/HCV co-infected patients with paired liver biopsies: evaluation of risk factors. Second International Workshop on HIV and Hepatitis Co-infection., January 12th-14th, 2006 Amsterdam ,The Netherlands [Abstract 9]
54. Bonnard P. Assessment of fibrosis progression in patients dually infected by HIV and HCV. Second International Workshop on HIV and Hepatitis Co-infection. January 12th-14th, 2006.Amsterdam,The Netherlands .
55. Prestini K. Liver related mortality in the HAART era in a cohort of HIV infected patients: incidence, risk factors and impact of highly active antiretroviral therapy. Second International Workshop on HIV and Hepatitis Co-infection.. January 12th-14th, 2006Amsterdam;The Netherlands.
56. Prestini K. Liver related mortality in the HAART era in a cohort of HIV infected patients: incidence, risk factors and impact of highly active antiretroviral therapy. Second

International Workshop on HIV and Hepatitis Co-infection. January 12th-14th, 2006Amsterdam;The Netherlands.

57. Ruet F .HBV and HCV prevalence and viraemia in HIV positive and HIV negative pregnant women in Abjaja, cot'divoire.. *J med virol* 2004:74(1):34-40.

58. Alkan M, Meayan S, Belmaker I, et al. Serological markers for hepatitis B and treponomal infection among HIV carriers from Ethiopia. *Isr J Med Sci* 1993; 29(6-7): 390-2.

59. Cicconi P. Risk factors for decompensated cirrhosis and associated morbidity and mortality in I.Co.N.A. Second International Workshop on HIV and Hepatitis Co-infection. January 12th-14th, 2006Amsterdam, The Netherlands.

60. Rouard B. A review of new study data presented on treatment and management HIV-HIV and HIV-HBV co-infection 45th annual intersciance conference on Antimicrobials and Chemotherapy 2006, Washington, DC.

61. Poundstone KE, Strathdee SA, Celentano DD: The social epidemiology of human immunodeficiency virus/acquired immunodeficiency syndrome. [Meta-Analysis Research Support, U.S. Gov't, P.H.S.]. *Epidemiol Rev* 2004, 26:22–35. doi:10.1093/epirev/mxh005.

62. Population and Housing Census of Ethiopia: Results for Oromia Region,2007 Vol. 1

63. World Health Organization, Hepatitis C. WHO/CDS/CSR/LYO/2003.?. 2002.

64. MOH. AIDS in Ethiopia. 6th edition. Disease Prevention and Control Department. Addis Ababa: Ministry of Health, 2005.

65. Quinn, T.C., J. Overbaugh. HIV/AIDS in women: an expanding epidemic. Science2005; 308:1582-1583.

66. T Shimelis, W Torben, G Medhin, et al. Hepatitis B virus infection among people attending the voluntary counseling and testing centre and anti-retroviral therapy clinic of St Paul's General Specialized Hospital, Addis Ababa, Ethiopia. Sex. Transm. Inf.2008; 84; 37-41.

67. Tesga E, Mengesha B, Hanson BG, et al. Hepatitis A, B, and Delta infection in Ethiopia: a serologic survey with demographic data. Am J Epidemiol 1986; 123:345–51.

68. Abebe A, Nokes DJ, Dejene A, et al. Sero-epidemiology of hepatitis B in Addis Ababa, Ethiopia: transmission patterns and vaccine control. Epidemiol Infect 2003; 131:757–70.

69. World Health Organization. Introduction of hepatitis B vaccine into childhood immuniatation services,2001,Geneva,WHO,WHO/V&B/01.31.

70. Madhava V, Burgess C, Drucker E. Epidemiology of chronic HCV infection in sub-Saharan Africa. Lancet Infect Dis 2002;2:293-302.

71. Ayele W, D.Jemes Nokes, Ababe A et al. Higher prevalence of Anti-HCV antibodies among HIV-positive compared to HIV-negative inhabitants of Addis Ababa, Ethiopia. J Med Virol 2002;68:12-17.

72. Kibru G, Monga D, Fekade D et al. Hepatitis C virus and human immunodeficiency virus co infection among attendants of voluntary counseling and testing center, and HIV follow up clinics at Tikur Anbessa hospital. Addis Ababa (Accepted abstract for poster presentation at 16th annual Ethiopian public health association conference, Addis Ababa, 2006).

73. Richard lG, David VW, and Peter FW. Viral Hepatitis. In: Martin T, Stanley ML and Eugener RS(eds). Tropical Infectious disease. Principles, Pathogens, Practices. 2nd edn. New York. Elsevier Inc.2006 p 709-710.
74. Dimitrakopoulos A, Takou A, Haida A, et al. The prevalence of hepatitis B and C in HIV-positive Greek patients: relationship to survival of deceased AIDS patients. J Infect 2000; 40: 127-31.
75. JC Forbi, S Gabadi,R Alabi,HO et al. The role of triple with hepatitis B virus, hepatitis C virus, human immunodeficiency virus(HIV) tayp-1 on CD4-lyphocytes in highly HIV infected population of north-Nigeria. Men Inst oswalodo Cruz2007; 102(4):535-537.
76. Christy N; Denis E; Gilbert O; et al. The seroprivalence of hepatitis B surface antigen and Human immunodeficncy virus among pregnant women in Anamber stste, Nigeria. Shiraz E-medical journal 2004; 5:2.
77. A Resbud; S Mehendale; S Basu. Prevalence and incidence of Hepatitis B Virus infection in STD clinic attendees in Pune, India. Sex Transm Inft 2002;78:169-173.
78. Awole M, Gebre-Selassie S. Seroprevalence of HBsAg and its risk factors among pregnant women in Jimma, Southwest Ethiopia. Ethiop J Health Dev.2005; 19:45–50.
79. Duncan ME, Tibaus G, Pelger A, et al. Prevalence and significance of sexually transmitted diseases among women attending clinics in Addis Ababa. Ethiop J Health Dev.1995; 9:31-40.
80. Ethiopians Society of obstetricians and gynecologists. Report Survey of Unsafe Abortion in Selected Health Facilities in Ethiopia. May 2000 (unpublished report).
81. Elias S. , Getu Degu A. , Nuru A. et al. Prevalence and associated risk factors of Induced Abortion in northwest Ethiopia. Ethiop.J.Health Dev. 2005;19(1) 37-44.

82. Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol 2007; 13(17): 2436-2441
83. Ashok Kumar, K. Aparna Sharma, R.K. Gupta, et al. Prevalence & risk factors for hepatitis C virus among pregnant Women. Indian J Med Res 2007;126: 211-215.
84. D Lincoln, K Petoumenos, GJ Dore. HIV/HBV and HIV/HCV Coinfection, and Outcomes Following Highly Active Antiretroviral Therapy. HIV Med 2003;4(3):241-249.
85. UNAIDS. Listen, Learn, Live! World AIDS Campaign with Children and Young People: Facts and Figures. Geneva: UNAIDS, 1999.
86. Kane M, Clements J, Hu D. Hepatitis B. In: Jamison DT, Mosley WH, Measham AR, et al, eds. Disease control priorities in developing countries. Oxford: World Bank, Oxford University Press, 1993:321–30.

Annex 2 . Questionnaire

Direction

The purpose of this Questionnaire is for a research paper is to determine the prevalence and associated risk factors of hepatitis B and C virus in HIV positive individuals .

For data collectors: please circle on the answer choice or write on the space provided.

1. **Identification**

1.1. Code _____

1.2. Sex A. Male B. Female

1.3. Age _____

2. Back ground information

2.1. Residence A. Urban B. Rural

2.2. Current occupational status

A Driver B. Commercial C. Government employee

D. Job less E. Student F. Farmer

G. Other specify _____

2.3 Religion A. Muslim B. Orthodox C. Protestant

D. Catholic E. Does not have

F. Others (Specify) _____

2.4 Ethnicity A. Oromo B. Amhara C. Keffa

D. Gurage E. Dawro

F. Others (specify) _____

2.5 Educational status

A. Can't write and read B. No formal education

C. Grade 1-4 D. Grade 5-8

E. Grade 9-10 F. Grade 11-12

G. 12+

2.6. Marital status A. Single B. Married Widowed

D .Divorced E. Separated F. Other_____

2.7 Estimated monthly income (in birr) _____

3. Questions related to associated risk factors

3.1 Do you have regular sexual partner last two years?

A. Yes B. No

3.2 Have you experienced sexual contact other than your regular partner last two years?

A. Yes B. No

3.3 Have you ever had blood transfusion last two years?

A. Yes B. No

If yes for how many so far----------

3.4 Have you ever had surgery for last two years?

A. Yes B. No

If yes how many so far ----------

3.5 If for equation 3.4 is **yes** which surgical procedure you had among listed?

A. Dental procedure D. Caesarian section

B. Tattooing E. Ear piercing

C. Unsafe injection G .Abortion

F .Blood letting H. Catheterization

I. Scarification J. Organ transplantation.

K. Hemodialsis l. Other_____

3.6 Have you ever-encountered sexually transmitted infection last two years STIs?

A. Yes B. No

C, Do not know

3.7. Have you ever had history of chronic infections among listed last two years?

A. TB B .Leprosy

C. Haemophiilia D .Liver disease

E. Thalassemia F, Others G. Never

3.8. Have you ever had immunization against hepatitis B?

A Yes B, No C I don't know

3.9 Do you have habits among the listed last two years?

A, Alcohol B, Intra Venus drug C, Never

4 Have you ever had history hospital admission last two years?

A, Yes B. No C, I do not know

5 Do you have household contact with infected person last two years ?

A, Yes B. No C. I do not know

II . Laboratory Format

No	Code	HBV Positive/Negative	HCV Positive/Negative	HBV and HCV Positive/Negative	Remark

1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					