Akhtar A, et al., J AIDS Clin Res Sex Transm Dis 2019, 6: 023
DOI: 10.24966/ACRS-7370/100023

HSOA Journal of AIDS Clinical Research and STDs

Research Article

Prevalence and Correlates of HBV and HCV among HIV Positive Patients: A Facility based Cross-Sectional Retrospective Study from Malaysia

Ali Akhtar[1]*, Amer Hayat Khan[1], Samreen Fatima[2], Syed Azhar Syed Sulaiman[1] and Chow Ting Soo[3]

[1]*Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Palau Pinang, Malaysia*

[2]*College of Pharmacy, University of the Punjab, Lahore, Pakistan*

[3]*Infectious disease unit, Hospital Palau Pinang, Pinang, Malaysia*

Abstract

Background: HBV and HCV become severe cause of chronic liver diseases and immunological impairment among the HIV positive individuals. The aim of this study is to evaluate the prevalence of HBV and HCV among the HIV infected patients receiving HAART treatment and their correlation with CD4 cell count and liver enzymes.

Methods: A retrospective, cross-sectional study was conducted from September 2013 to April 2014 at Hospital Palau Pinang, Pinang, Malaysia. Socio-demographic data as well as clinical data was collected with the help of data collection form from the patient's records. Then the data was entered and analyzed by using statistical software SPSS version 20.0 and $p<0.05$ was considered as significant.

Results: The overall prevalence of viral hepatitis among 808 HIV infected study population was 230 (28.4%). The prevalence of HIV-HBV, HIV-HCV and HIV-HBV-HCV co-infected patients was 86 (13%), 130 (18.4%) and 14 (2.4%) respectively. Individuals with HIV-HBV, HIV-HCV and HIV-HBV-HCV showed raised levels of liver enzymes than the HIV mono-infected patients. Study participants who had HIV-HBV, HIV-HCV and HIV-HBV-HCV co-infections also had a slight increase in the level of CD4 count than the HIV mono-infected study population. The mean CD4 value observed in this study was higher in females than males.

Conclusion: The prevalence of HBV and HCV was slightly higher in this study than some other reports from the world. Raised levels of CD4 count and liver enzymes were also observed in HIV-HBV, HIV-HCV and HIV-HBV-HCV co-infected patients than HIV mono-infected patients. These findings suggest the importance of screening for all HIV positive individuals before the initiation of the HAART treatment.

Keywords: Co-infection; HAART; HBV; HCV; HIV

Introduction

Globally, Hepatitis B Virus (HBV) and Hepatitis C virus (HCV) are the common causes of chronic liver diseases. Usually the infection is asymptomatic and has a severe and invasive impact on the health of millions of people throughout the world [1,2]. Co-infection of HIV with HBV and HCV is common due to similar routes of transmission [3]. It is estimated that 10% of all HIV infected population has HBV co-infection and around a third estimated to have HCV co-infection throughout the world [2,3]. Many studies reported that the rates of HBV and HCV co-infection in HIV infected population may vary region to region, study population and risk factors involved [4-7]. The prevalence of HBV and HCV co-infection among HIV individuals ranged from 3.9-7.3% and 6.9 respectively reported in a systemic review of 18 Sub Saharan African countries [8].

After the initiation of Highly Active Antiretroviral Therapy (HAART) there is a decline in the mortality and morbidity of HIV individuals however, liver diseases due to HBV and HCV become a main cause of death. In many reports the impact of HCV on HIV disease progression remains controversial [6,9-13]. HIV causes increased rate of persistent HBV infection, increased risk of hepatocellular carcinoma at lower CD4T cell counts and liver related mortality in HIV-HBV co-infected patients [14]. Similarly, there is a more rapid progress to hepatocellular carcinoma, Cirrhosis and end-stage liver disease in HIV-HCV co-infected population [15].

There is a risk of liver hepatotoxicity results in failure to improve the immunological recovery in HIV positive patients co-infected either with HBV or HCV. This shows in a study conducted in Tanzania which reported that after the initiation of HAART treatment there is a slow rate of immunological recovery and greater risk of hepatotoxicity among co-infected patients of HIV and HBV/HCV [16]. In some countries before initiation of anti-viral treatment it is highly recommended to screen the HIV patients for HBV and HCV [17]. The management of HBV and HCV in HIV infection becomes complicated as a result HIV, HBV and HCV become the major public health concerns worldwide [18,19].

***Corresponding author:** Ali Akhtar, Discipline of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Palau Pinang, Malaysia, Tel: +60 0060104231157; E-mail: pharmacist_pu2006@yahoo.com

Citation: Akhtar A, Khan AH, Fatima S, Sulaiman SAS, Soo CT (2019) Prevalence and Correlates of HBV and HCV among HIV Positive Patients: A Facility based Cross-Sectional Retrospective Study from Malaysia. J AIDS Clin Res Sex Transm Dis 6: 023.

Received: February 04, 2019; **Accepted:** February 19, 2019; **Published:** March 05, 2019

In Malaysia, the prevalence of HBV and HCV among HIV individuals is not reported. In addition, there is no report present which shows the liver enzymes and CD4 count determination in HIV-HBV and HIV-HCV co-infected patients. Therefore, the main objective of this study was to assess the prevalence of HIV-HBV, HIV-HCV co-infected patients and CD4 cells as well as liver enzyme levels among these co-infected individuals at Hospital Palau Pinang, Pinang, Malaysia.

Materials and Methods

Ethics statement

This study was conducted after the approval from National Institute of Health and Medical Research and Ethics Committee, Malaysia. This study was conducted according to the principles expressed in the approval.

Study design, area and period

A retrospective, cross-sectional study was conducted from Aug 2013 to March 2014 at Hospital Palau Pinang, Pinang, Malaysia.

Inclusion and exclusion criteria

All HIV patients receiving HAART under treatment from 2007 to 2012 and with confirmed diagnosis of HBV and HCV which were older than 18 years of age were included. Diagnosed with other co-morbidities and which were not in the specified time period was excluded from the study.

Source population and study participants

The source population was all HIV positive individuals who were under treatment in the infectious unit at Hospital Palau Pinang. The study participants were all treated with HAART HIV positive individuals. A convenient, non-probability sampling technique was employed and no scientific methods were used to calculate the sample size, instead, we enrolled all the patients which were eligible according to inclusion criteria.

Data abstraction and collection

Socio-demographic, clinical information and other relevant possible risk factors of the study participants were collected with the help of comprehensive data collection form from the medical records of the patients.

Data analysis

The data was entered and analyzed using SPSS Version 20.0 statistical software and the differences in proportions was evaluated by Pearson's Chi-square test and p value less than 0.05 was considered as statistically significant. Mean plus standard deviation with 95% Confidence Interval (CI) was also used for continuous variables and the difference in means was compared with independent-sample t-test.

Results

Socio-demographic characteristics

Among 808 study participants, 627 (77.6%) were males (mean age: 41±9 years) and 181 (22.4%) were females (mean age: 39±10 years). The lowest and highest age of the study population was 21 and 73 years respectively. The median age of 39 years was observed in the study participants. The majority of the participants was Chinese 500 (61.9%), married 380 (47.0%) and had primary education 328 (40.6%). The main route of transmission of HIV in the study population was observed in heterosexual contact 572 (70.8%). Most of them were smokers 457 (56.6%) and non-alcoholic 499 (61.8%) (Table 1).

Variables	Frequency (%) N= 808
Gender	
Male	627(77.6)
Female	181 (22.4)
Race	
Malay	161(19.9)
Chinese	500 (61.9)
Indian	104 (12.9)
Others	43 (5.3)
Age groups (year)	
≤40	407 (50.4)
>40	401 (49.6)
Marital status	
Single	342 (42.3)
Married	380 (47.0)
Divorced	48 (5.9)
Widow	38 (4.7)
Education status	
No formal	223 (27.6)
Primary	328 (40.6)
Secondary	196 (24.3)
Graduation	61 (7.5)
Smoking	
Smoker	457 (56.6)
Non-smoker	351 (43.4)
Alcohol use	
Alcoholic	309 (38.2)
Non-alcoholic	499 (61.8)
IVDU	
Yes	128 (15.8)
No	680 (84.2)
Risk factors	
Heterosexual	572 (70.8)
Homosexual	53 (6.6)
Unknown	183 (22.6)

Table 1: Socio-demographic characteristics of HIV positive study population at Hospital Palau Pinang, Malaysia.

Prevalence of HBV and HCV among HIV study population

The overall prevalence of Viral Hepatitis (HBV and HCV) was 230 (28.4%). The prevalence of HBV and HCV were 86 (13%) and 130 (18.4%) respectively. Only 14 (2.4%) of HIV positive study participants showed triple (HIV-HBV-HCV) infections.

Association between HIV-HBV and HIV-HCV co-infection and their demographic characteristics

Higher prevalence of HIV-HBV co-infection was observed significantly in males 76 (11.4%) as compared to females 10 (1.5%) (p=0.001). Although non-significant higher prevalence of HIV-HBV

co-infection was seen in Chinese race 64 (9.6) (p = 0.091) and in the age group of >40 years 48 (7.2%) (p=0.165). Those who were single 42 (6.3%) (p=0.254) and had primary level of education 32 (4.8) (p=0.581) showed non-significant higher prevalence in HIV-HBV positive individuals. A significant higher prevalence of smokers 56 (8.4%) (p=0.004) and non-alcoholic 46 (6.9) (p=0.055) were also observed in the HIV-HBV positive individuals.

Significant higher prevalence of HIV-HCV co-infection was observed in males 122 (17.2%) (p=<0.001), those who were categorized in Malay race group 76 (10.7%) (p=<0.001), single 70 (9.9%) (p=0.001) and had primary educational status 60 (8.5%) (p=0.050). Those who were smokers 112 (15.8%) (p=<0.001) and intravenous drug users 76 (10.7%) (p=<0.001) also showed high prevalence of HIV-HCV co-infection which was statistical significant. The co-existence of both HBV and HCV in males and females were 10 (1.7) and 4 (0.7) (p=0.930). The significantly higher prevalence of this triple infection was observed in the non-intravenous drug users group 10 (1.7%) (p=0.002) (Table 2).

Mean CD4 count and liver enzyme levels in HIV-HBV, HIV-HCV and HIV-HBV-HCV co-infections

In HIV mono infected participants the mean CD4 count was 243 cells/mm^3. While the mean CD4 counts were 283 cells/mm^3, 243 cells/mm^3 and 313 cells/mm^3 observed in HIV-HBV, HIV-HCV and HIV-HBV-HCV respectively. The statistical significant difference was seen in HIV-HBV and HIV-HBV-HCV co-infections (Table 3). The CD4 count is higher in females as compared to males (268±79 vs 243±113). Females infected with triple infection (HIV-HBV-HCV) shows the lowest CD4 mean count. The highest and lowest mean CD4 count was observed in ≤40 year's age group (Table 4).

Variables	HIV-HBV		p value	HIV-HCV		p value	HIV-HBV-HCV		p value
	Negative N (%)	Positive N (%)		Negative N (%)	Positive N (%)		Negative N (%)	Positive N (%)	
Gender									
Male	419 (63.1)	76 (11.4)	0.001	419 (59.2)	122 (17.2)	<0.001	419 (70.8)	10 (1.7)	0.930
Female	159 (23.9)	10 (1.5)		159 (22.5)	8 (1.1)		159 (26.9)	4 (0.7)	
Race									
Malay	75 (11.3)	8 (1.2)		75 (10.6)	76 (10.7)		75 (12.7)	2 (0.3)	
Chinese	391 (58.9)	64 (9.6)	0.091	391 (55.2)	36 (5.1)	<0.001	391 (66.0)	9 (1.5)	0.987
Indian	82 (12.3)	6 (0.9)		82 (11.6)	14 (2.0)		82 (13.9)	2 (0.3)	
Others	30 (4.5)	8 (1.2)		30 (4.2)	4 (0.6)		30 (5.1)	1 (0.2)	
Age groups (year)									
≤40	304 (45.8)	38 (5.7)	0.165	304 (42.9)	60 (8.5)	0.109	304 (51.4)	5 (0.8)	0.212
>40	274 (41.3)	48 (7.2)		274 (38.7)	70 (9.9)		274 (46.3)	9 (1.5)	
Marital Status									
Single	223 (33.6)	42 (6.3)		223 (31.5)	70 (9.9)		223 (37.7)	7 (1.2)	
Married	294 (44.3)	38 (5.7)	0.254	294 (41.5)	44 (6.2)	0.001	294 (49.7)	4 (0.7)	0.3
Divorced	30 (4.5)	4 (0.6)		30 (4.2)	12 (1.7)		30 (5.1)	2 (0.3)	
Widow	31 (4.7)	2 (0.3)		31 (4.4)	4 (0.6)		31 (5.2)	1 (0.2)	
Education Status									
No formal	157 (23.6)	26 (3.9)		157 (22.2)	36 (5.1)		157 (26.5)	4 (0.7)	
Primary	229 (34.5)	32 (4.8)	0.581	229 (32.3)	60 (8.5)	0.05	229 (38.7)	7 (1.2)	0.425
Secondary	145 (21.8)	18 (2.7)		145 (20.5)	32 (4.5)		145 (24.5)	1 (0.2)	
Graduation	47 (7.1)	10 (1.5)		47 (6.6)	2 (0.3)		47 (7.9)	2 (0.3)	
Smoking									
Smoker	279 (42.0)	56 (8.4)	0.004	279 (39.4)	112 (15.8)	<0.001	279 (47.1)	10 (1.7)	0.087
Non-smoker	299 (45.0)	30 (4.5)		299 (42.2)	18 (2.5)		299 (50.5)	4 (0.7)	
Alcohol Use									
Alcoholic	207 (31.2)	40 (6.0)	0.055	207 (29.2)	56 (7.9)	0.074	207 (35.0)	6 (1.0)	0.587
Non- alcoholic	371 (55.9)	46 (6.9)		371 (52.4)	74 (10.5)		371 (62.7)	8 (1.4)	
IVDU									
Yes	38 (5.7)	10 (1.5)	0.091	38 (5.4)	76 (10.7)	<0.001	38 (6.4)	4 (0.7)	0.002
No	540 (81.3)	76 (11.4)		540 (76.3)	54 (7.6)		540 (91.2)	10 (1.7)	
Risk Factors									
Heterosexual	408 (61.4)	56 (8.4)		408 (57.6)	98 (13.8)		408 (68.9)	10 (1.7)	
Homosexual	43 (6.5)	4 (0.6)	0.186	43 (6.1)	4 (0.4)	0.183	43 (7.3)	2 (0.3)	0.545
Unknown	127 (19.1)	26 (3.9)		127 (17.9)	28 (4.0)		127 (21.5)	2 (0.3)	

Table 2: HIV-HBV and HIV-HCV co-infection and their association with demographic characteristics.

Immunological and liver biomarkers	HIV alone	HIV-HBV	p value	HIV alone	HIV-HCV	p value	HIV alone	HIV-HBV-HCV	p value
CD4 mean ± SD	243±88	283±136		243±88	230±141		243±88	313±170	
Normal value	410-1590 cells/uL	410-1590 cells/uL	<0.001	410-1590 cells/uL	410-1590 cells/uL	0.957	410-1590 cells/uL	410-1590 cells/uL	0.004
ALT mean ± SD	32±40	56±54		32±40	59±45		32±40	65±33	
Normal Value	0-55 u/L	0-55 u/L	<0.001	0-55 u/L	0-55 u/L	<0.001	0-55 u/L	0-55 u/L	0.002
ALP mean ± SD	100±40	105±37		100±40	126±51		100±40	98±27	
Normal value	40-150 u/L	40-150 u/L	<0.001	40-150 u/L	40-150 u/L	<0.001	40-150 u/L	40-150 u/L	0.887

Table 3: Liver enzymes level and mean CD4 count and their association with HBV and HCV co-infection.

Variables	Mean CD4 Count				
	HIV alone	HIV-HBV	HIV-HCV	HIV-HBV-HCV	Over all
Gender					
Male	235±92	271±137	245±144	328±192	243±113
Female	264±73	373±82	213±79	109±52	268±79
Age groups (year)					
≤40	252±83	294±122	215±125	388±186	252±98
>40	232±92	274±147	268±150	273±155	244±114

Table 4: Mean CD4 count associated with gender and different age groups.

In HIV mono-infected patients the mean ALT and ALP levels are 32μ/L and 100μ/L respectively. However, in the group of HIV-HBV co-infected patients there is a significant increase in the levels of ALT and ALP was observed (56μ/L and 105μ/L respectively). Similarly, in HIV-HCV co-infected patients the mean ALT and ALP levels are significantly increased (59μ/L and 126μ/L respectively) (Table 3).

Discussion

The main objective of this study is to investigate the prevalence of HBV and HCV among the HIV positive individuals which were under the treatment of highly active antiretroviral therapy and tried to assess the levels of CD4 count and liver enzymes among HIV-HBV and HIV-HCV co-infected, HIV-HBV-HCV triple infected and HIV mono infected study population. The prevalence of hepatitis (both HBV and HCV) was 28.4% among the study participants. In the current study the prevalence of HIV-HBV was 10.6% which is comparable with a prevalence of 10.9% and 9.2 % reported in Ethiopia and Nigeria respectively [20,21]. A study reported in Malawi reported 20.4% prevalence of HIV-HBV co-infected individuals which was higher than the present study [22]. The prevalence of HIV-HBV co-infected individuals in present study was higher in males as compared with females (11.4% vs 1.5%) which are in line with some other reports [23-25]. The difference in the prevalence of such co-infections may be due to differences in exposures, geographic regions and types of risk groups involved [21,26-30].

The prevalence of HIV-HCV co-infection in the current study was 16.1% which is higher than the studies which were done in Nigeria (5.8%), Malawi (5.0%), Burkina Faso (4.8%) and Senegal (8.0%) [21,22,31,32]. But HIV-HCV co-infection ranges from 3.6-13.3% in some recent studies [33-38]. The reasons behind the variation of HCV prevalence among HIV individuals could share the same factors in variation in HBV prevalence discussed above. HIV-HBV-HCV triple infection observed in this study was 1.7% which is less or more comparable to some studies from Senegal (0.5%), Kenya (0.26%), Nigeria (1.5%) and Egypt (0.44%) [32,39,40]. However, in Argentina and Iran the prevalence of HIV-HBV-HCV triple infection was higher to (9.5%) and (9.2%) respectively [41,42]. Risk factors associated in the variation of HIV-HBV prevalence might work for the triple infection.

The statistical significant difference was observed in the means levels of liver enzymes between the HIV mono-infected and HIV-viral hepatitis co-infected individuals in the present study. There was a raised level of ALT and ALP was found in the HIV-HBV, HIV-HCV and HIV-HBV-HCV co-infected patients comparable with a study conducted in South Africa that reported the raised level of ALT and ALP in HIV-HBV and HIV-HCV co-infected individuals [30]. Similarly, significantly elevated ALT levels also reported in HIV-HBV and HIV-HCV co-infected patients in India [43]. The differences in the liver enzyme levels in many other reports might be due to the difference in the study design, duration of viral hepatitis as well as the patient's condition like drug induced hepatotoxicity or having chronic alcoholism.

In the present study, there is statistical significant CD4 count mean was observed in HIV-HBV and HIV-HBV-HCV co-infected patients and non-significant CD4 mean was found in HIV-HCV co-infected individuals. The mean CD4 count in HIV-HBV individuals was 283 cells/mm^3 which was not comparable with the mean CD4 of 141.6 cells/mm^3 and 121 cells/mm^3 reported in studies conducted in South Africa and Nigeria respectively [30,39]. The differences in the results may be due to high HIV and HBV viral replication that may contribute in the impairment of the immune system of the patients in HIV-HBV co-infected individuals. In addition, may be due to the differences in the immune system of the study participants or due to viral hepatitis.

In this study the mean CD4 count in HIV-HCV co-infected individuals was 243 cells/mm^3 which is comparable with the mean CD4 counts of 260 cells/mm^3 and 288.6 cells/mm^3 reported in the studies

conducted in Nigeria and India respectively [39,43]. Such low levels of CD4 mean count in HIV-HCV individuals than HIV-HBV co-infected patients was still unclear. The CD4 count in HIV mono-infected patients was relatively higher than the HIV-HCV co-infected individuals. This lower CD4 count in HIV-HCV co-infected reflecting the immunosuppressed state of patients due to increased replication of HIV and HCV.

In the current study, the difference was observed on the mean CD4 values in relation to the gender. The mean CD4 value in the males was lower than the females (235 cells/mm^3 vs 264 cells/mm^3). Some studies conducted in Nigeria and Uganda also showed same findings [44,45]. Males who had Triple Infection (HIV-HBV-HCV) had highest CD4 count. This increase of CD4 count in males may be linked with their daily life activities. Moreover, mostly males have muscular body and they do not take the mental stress to accept the HIV-HBV-HCV disease status that contribute in the recovery of the immune system or improves CD4 count. We also analyzed the CD4 mean values in different age groups and the lowest CD4 mean value was observed in the ≤40 year's group co-infected with HIV-HCV (215 cells/mm^3). As this disease is almost asymptomatic so that younger people cannot be tested regularly so that their CD4 count was lowered than the older one because they were more conscious about their health due to many diseases in older age than in young age.

In conclusion, the prevalence of HBV and HCV among HIV positive individuals was very high so, screening of HBV and HCV in HIV population before the initiation of antiretroviral treatment is mandatory and strict monitoring of liver enzymes and CD4 count status to minimize the complication of the liver and effective HIV treatment.

Acknowledgement

We will highly grateful for Universiti Sains Malaysia for giving the funding for this study under USM Fellowship Scheme.

References

1. Chen SL, Morgan TR (2006) The Natural History of Hepatitis C Virus (HCV) Infection. Int J med sci 3: 47-52.
2. Fenton K (2007) The changing global epidemiology of HBV and HCV. Frontiers in Drug Development for Viral Hepatitis 3: 3-4.
3. Soriano V, Barreiro P, Nuñez M (2006) Management of chronic hepatitis B and C in HIV-coinfected patients. Journal of Antimicrobial Chemotherapy 57: 815-818.
4. Sharifi-Mood B, Metanat M (2006) Co-infection HIV/AIDS and hepatitis C. Int J Virol 2: 63-66.
5. Koziel MJ, Peters MG (2007) Viral hepatitis in HIV infection. N Engl J Med 356: 1445-1454.
6. Konopnicki D, Mocroft A, De Wit S, Antunes F, Ledergerber B, et al. (2005) Hepatitis B and HIV: Prevalence, AIDS progression, response to highly active antiretroviral therapy and increased mortality in the EuroSIDA cohort. AIDS 19: 593-601.
7. Amin J, Kaye M, Skidmore S, Pillay D, Cooper D, et al. (2004) HIV and hepatitis C coinfection within the CAESAR study. HIV Medicine 5: 174-179.
8. Barth RE, Huijgen Q, Taljaard J, Hoepelman AI (2010) Hepatitis B/C and HIV in sub-Saharan Africa: An association between highly prevalent infectious diseases. A systematic review and meta-analysis. International Journal of Infectious Diseases 14: 1024-1031.
9. Sulkowski MS (2008) Viral hepatitis and HIV coinfection. Journal of Hepatology 48: 353-367.
10. Petrovic LM (2007) HIV/HCV co-infection: Histopathologic findings, natural history, fibrosis, and impact of antiretroviral treatment: A review article. Liver International 27: 598-606.
11. Lincoln D, Petoumenos K, Dore GJ (2003) HIV/HBV and HIV/HCV coinfection, and outcomes following highly active antiretroviral therapy. HIV medicine 4: 241-249.
12. Sullivan PS, Hanson DL, Teshale EH, Wotring LL, Brooks JT (2006) Effect of hepatitis C infection on progression of HIV disease and early response to initial antiretroviral therapy. AIDS 20: 1171-1179.
13. Sulkowski MS, Moore RD, Mehta SH, Chaisson RE, Thomas DL (2002) Hepatitis C and progression of HIV disease. JAMA 288: 199-206.
14. Thio CL (2009) Hepatitis B and human immunodeficiency virus coinfection. Hepatology 49: 138-145.
15. Romeo R, Rumi M, Donato M, Cargnel M, Vigano P, et al. (2000) Hepatitis C is more severe in drug users with human immunodeficiency virus infection. Journal of Viral Hepatitis 7: 297-301.
16. Christian B, Okuma J, Hawkins C, Chalamilla G, Spiegelman D, Nagu T, et al. (2010) Prevalence of hepatitis B and C Co-infection and response to antiretroviral therapy among HIV-infected patients in an urban setting in Tanzania. Proceedings of the 17th Conference on Retroviruses and Opportunistic Infections, San Francisco, USA.
17. Chung RT (2006) Hepatitis C and B viruses: The new opportunists in HIV infection. Top HIV med 14: 78-83.
18. Leeratanapetch N, Suseangrut W (2010) Hepatitis B Virus and Hepatitis C Virus Co-Infection with HIV Patients at khon kaen Hospital. Khon Kaen Medical Journal 32: 229-238.
19. Modi AA, Feld JJ (2007) Viral hepatitis and HIV in Africa. Aids Rev 9: 25-39.
20. Moges F, Kebede Y, Kassu A, Mulu A, Tirunch M, et al. (2006) Seroprevalence of HIV, hepatitis B infections and syphilis among street dwellers in Gondar city, Northwest Ethiopia. Ethiopian Journal of Health Development 20.
21. Lesi OA, Kehinde MO, Oguh DN, Amira CO (2007) Hepatitis B and C virus infection in Nigerian patients with HIV/AIDS. Niger Postgrad Med J 14: 129-133.
22. Nyirenda M, Beadsworth MB, Stephany P, Hart CA, Hart IJ, et al. (2008) Prevalence of infection with hepatitis B and C virus and coinfection with HIV in medical inpatients in Malawi. J Infect 57: 72-77.
23. Hussain T, Kulshreshtha KK, Sinha S, Yadav VS, Katoch VM (2006) HIV, HBV, HCV, and syphilis co-infections among patients attending the STD clinics of district hospitals in Northern India. Int J Infect Dis 10: 358-363.
24. Otegbayo JA, Taiwo BO, Akingbola TS, Odaibo GN, Adedapo KS, et al. (2008) Prevalence of hepatitis B and C seropositivity in a Nigerian cohort of HIV-infected patients. Ann Hepatol 7: 152-156.
25. Omosigho OP, Inyinbor HE, Emumwen EG, Mohammed SK, Ledogo G, et al. (2010) Hepatitis C Virus Co-Infection In Human Immuno Deficiency Virus Positive Population In Bida, North Central Nigeria. The Internet Journal of Infectious Diseases 9: 1-4.
26. Kloos H, Mariam DH (2000) HIV/AIDS in Ethiopia: An overview. Northeast African Studies 7: 13-40.
27. Alter MJ (2006) Epidemiology of viral hepatitis and HIV co-infection. J Hepatol 44: 6-9.
28. Sherman KE, Rouster SD, Chung RT, Rajicic N (2002) Hepatitis C virus prevalence among patients infected with human immunodeficiency virus: a cross-sectional analysis of the US adult AIDS Clinical Trials Group. Clin Infect Dis 34: 831-837.

29. Rockstroh JK, Mocroft A, Soriano V, Tural C, Losso MH, et al. (2005) Influence of hepatitis C virus infection on HIV-1 disease progression and response to highly active antiretroviral therapy. J Infect Dis 192: 992-1002.

30. Lodenyo H, Schoub B, Ally R, Kairu S, Segal I (2000) Hepatitis B and C virus infections and liver function in AIDS patients at Chris Hani Baragwanath Hospital, Johannesburg. East Afr Med J 77: 13-15.

31. Simpore J, Savadogo A, Ilboudo D, Nadambega MC, Esposito M, et al. (2006) Toxoplasma gondii, HCV, and HBV seroprevalence and co-infection among HIV-positive and -negative pregnant women in Burkina Faso. J Med Virol 78: 730-733.

32. Diop-Ndiaye H, Touré-Kane C, Etard JF, Lô G, Diaw P, et al. (2008) Hepatitis B, C seroprevalence and delta viruses in HIV-1 Senegalese patients at HAART initiation (retrospective study). J Med Virol 80: 1332-1336.

33. Tessema B, Yismaw G, Kassu A, Amsalu A, Mulu A, et al. (2010) Seroprevalence of HIV, HBV, HCV and syphilis infections among blood donors at Gondar University Teaching Hospital, Northwest Ethiopia: declining trends over a period of five years. BMC Infect Dis 10: 111.

34. Diro E, Alemu S, G/Yohannes A (2008) Blood safety & prevalence of transfussion transmissible viral infections among donors at the Red Cross Blood Bank in Gondar University Hospital. Ethiop Med J 46: 7-13.

35. Ayele W, Nokes DJ, Abebe A, Messele T, Dejene A, et al. (2002) Higher prevalence of anti-HCV antibodies among HIV-positive compared to HIV-negative inhabitants of Addis Ababa, Ethiopia. J Med Virol 68: 12-17.

36. Dessie A, Abera B, Wale F (2007) Seroprevalence of major blood-borne infections among blood donars at Felege Hiwot referral hospital, Northwest Ethiopia. Ethiop J Health Dev 21: 68-69.

37. Abreha T, Woldeamanuel Y, Pietsch C, Maier M, Asrat D, et al. (2011) Genotypes and viral load of hepatitis C virus among persons attending a voluntary counseling and testing center in Ethiopia. J Med Virol 83: 776-782.

38. Alemayehu A, Tassachew Y, Sisay Z, Shimelis T (2011) Prevalence and risk factors of Hepatitis C among individuals presenting to HIV testing centers, Hawassa city, Southern Ethiopia. BMC Res Notes 4: 193.

39. Adewole OO, Anteyi E, Ajuwon Z, Wada I, Elegba F, et al. (2009) Hepatitis B and C virus co-infection in Nigerian patients with HIV infection. J Infect Dev Ctries 3: 369-375.

40. Asl SKH, Avijgan M, Mohamadnejad M (2004) High prevalence of HBV, HCV, and HIV infections in Gypsy population residing in Shahr-E-Kord. Arch Iranian Med 7: 20-22.

41. Fuse V, Cornelio C, Meraldi N (2004) Prevalence of HCV and HBV in HIV-positive patients attending a general hospital in Buenos Aires, Argentina. Int Conf AIDS.

42. Ataei B, Tayeri K, Kassaian N, Farajzadegan Z, Babak A (2010) Hepatitis B and C among patients infected with human immunodeficiency virus in Isfahan, Iran: Seroprevalence and associated factors. Hepat Mon 10: 188-192.

43. Tripathi AK1, Khanna M, Gupta N, Chandra M (2007) Low prevalence of hepatitis B virus and hepatitis C virus co-infection in patients with human immunodeficiency virus in Northern India. J Assoc Physicians India 55: 429-431.

44. Akinbami A, Dosunmu A, Adediran A, Ajibola S, Oshinaike O, et al. (2012) CD4 Count Pattern and Demographic Distribution of Treatment-Naïve HIV Patients in Lagos, Nigeria. AIDS Res Treat 2012: 352753.

45. Tugume SB, Piwowar EM, Lutalo T, Mugyenyi PN, Grant RM, et al. (1995) Hematological reference ranges among healthy Ugandans. Clin Diagn Lab Immunol 2: 233-235.

Journal of Anesthesia & Clinical Care

Journal of Addiction & Addictive Disorders

Advances in Microbiology Research

Advances in Industrial Biotechnology

Journal of Agronomy & Agricultural Science

Journal of AIDS Clinical Research & STDs

Journal of Alcoholism, Drug Abuse & Substance Dependence

Journal of Allergy Disorders & Therapy

Journal of Alternative, Complementary & Integrative Medicine

Journal of Alzheimer's & Neurodegenerative Diseases

Journal of Angiology & Vascular Surgery

Journal of Animal Research & Veterinary Science

Archives of Zoological Studies

Archives of Urology

Journal of Atmospheric & Earth-Sciences

Journal of Aquaculture & Fisheries

Journal of Biotech Research & Biochemistry

Journal of Brain & Neuroscience Research

Journal of Cancer Biology & Treatment

Journal of Cardiology: Study & Research

Journal of Cell Biology & Cell Metabolism

Journal of Clinical Dermatology & Therapy

Journal of Clinical Immunology & Immunotherapy

Journal of Clinical Studies & Medical Case Reports

Journal of Community Medicine & Public Health Care

Current Trends: Medical & Biological Engineering

Journal of Cytology & Tissue Biology

Journal of Dentistry: Oral Health & Cosmesis

Journal of Diabetes & Metabolic Disorders

Journal of Dairy Research & Technology

Journal of Emergency Medicine Trauma & Surgical Care

Journal of Environmental Science: Current Research

Journal of Food Science & Nutrition

Journal of Forensic, Legal & Investigative Sciences

Journal of Gastroenterology & Hepatology Research

Journal of Gerontology & Geriatric Medicine

Journal of Genetics & Genomic Sciences

Journal of Hematology, Blood Transfusion & Disorders

Journal of Human Endocrinology

Journal of Hospice & Palliative Medical Care

Journal of Internal Medicine & Primary Healthcare

Journal of Infectious & Non Infectious Diseases

Journal of Light & Laser: Current Trends

Journal of Modern Chemical Sciences

Journal of Medicine: Study & Research

Journal of Nanotechnology: Nanomedicine & Nanobiotechnology

Journal of Neonatology & Clinical Pediatrics

Journal of Nephrology & Renal Therapy

Journal of Non Invasive Vascular Investigation

Journal of Nuclear Medicine, Radiology & Radiation Therapy

Journal of Obesity & Weight Loss

Journal of Orthopedic Research & Physiotherapy

Journal of Otolaryngology, Head & Neck Surgery

Journal of Protein Research & Bioinformatics

Journal of Pathology Clinical & Medical Research

Journal of Pharmacology, Pharmaceutics & Pharmacovigilance

Journal of Physical Medicine, Rehabilitation & Disabilities

Journal of Plant Science: Current Research

Journal of Psychiatry, Depression & Anxiety

Journal of Pulmonary Medicine & Respiratory Research

Journal of Practical & Professional Nursing

Journal of Reproductive Medicine, Gynaecology & Obstetrics

Journal of Stem Cells Research, Development & Therapy

Journal of Surgery: Current Trends & Innovations

Journal of Toxicology: Current Research

Journal of Translational Science and Research

Trends in Anatomy & Physiology

Journal of Vaccines Research & Vaccination

Journal of Virology & Antivirals