HIV infection and hepatic enzymes abnormalities: A hospital based study among the HIV infected women of India

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Abstract

Introduction: Globally HIV infection has become a serious public health problems as it is responsible for millions of deaths every year and the women are the most vulnerable to HIV infection in the developing and underdeveloped countries. The liver enzymes alteration is a useful indicator of the HIV severity of the body. This study was designed to find the effect of CD_4 count and nutritional status on liver enzymes among HIV^+ and HIV^- women living in West Bengal.

Materials and Methods: This hospital based cross sectional study was performed among 97 women at Midnapore Medical College and Hospital, Midnapore, India. Blood samples were collected from the participants to determine CD_4 count, Serum glutamate oxaloacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT), and alkaline phosphates (ALP). Anthropometric measurements were taken using the standard techniques

Results: HIV^- women (20.42±1.763 kg/m^2) were significantly heavier (t=4.172; P<0.001) than the HIV^+ one (18.52±2.63 kg/m^2). Similarly the HIV^- women (995.92±100.24 cells/µl) had higher level of CD_4 than the HIV^+ women (374.22±185.66 cells/µl) at significant level (t=20.459; P<0.001). The Odd ratio indicated that the elevated SGPT, SGOT and ALP were 1.250, 1.520 and 14.400 times higher among the HIV^+ than HIV^- women.

Discussion: HIV-infected women are at a greater risk of abnormal liver function and this abnormality increases with the severity of the disease condition.

Keywords: CD4 count, Antiretroviral therapy, Human immunodeficiency virus infection, Liver function.

Introduction

HIV/AIDS (Human immunodeficiency virus/ acquired immunodeficiency syndrome) is responsible for 35 million deaths so far.[1] Recent reports revealed that nearly 36.7 million people were living with HIV infection and nearly 1.8 million people have been newly infected in 2016 throughout the globe.[1] Another report stated that 17.8 million women were living with HIV infection which is 51 percent of the total adult people with HIV infection throughout the world.[2] However, in 1985, only 35% of the infected people were women.[3] The drastically increasing rate of HIV infection among the women are varied from region to region such as in sub-Saharan Africa it was 60% while in Caribbean it was 45–50%. The low increasing rate was seen in Asia and Latin America (30–40%), and Eastern Europe and Central Asia (30%).[4] It is also estimated that the 2.5 million people living with HIV/AIDS in India, of which nearly 40% were women.[5] The dramatic increase of the HIV infection among the women is due to the biological vulnerabilities, poor socioeconomic states, and dominant sexual practice of males. The other cause of the HIV infection among the women is transmission of HIV infection from the male partners having risky sexual behavior during occupational migration.[5]

HIV^+ women faced many social, psychological problems. HIV infection causes systemic disease with many complications.[6] In HIV infection, liver enzymes are elevated due to altered liver functioning in response to pathogenic invasion.[7-8] HIV-infected persons may reproduce hepatitis B (HBV) or hepatitis C (HCV) infection due to opportunistic infection in them and induce liver enzyme abnormalities, which are very common among HIV^+ than those of HIV^- individuals.[9-10] In HIV-HBV co-infections, HIV infection causes increased rates of persistent HBV infection, increased cirrhosis and liver related mortality and increased risk of hepatocellular carcinoma at lower CD4+ counts.[11] Similarly in HIV-HCV co-infections, there is a more rapid progress to cirrhosis, end-stage liver disease and hepatocellular carcinoma.[12] The liver fibrosis pathogenesis, nonalcoholic fatty liver disease and nonalcoholic steatohepatitis may have a direct impact on the further progression of liver disease.[13-14] Several studies suggest that mortality was higher in HIV-infected patient's with elevated liver enzymes than that of HIV-uninfected patients with liver function abnormalities.[15-16] It is well known that undernutrition is predominant among the HIV^+ individuals and it is also related with the liver enzyme abnormalities among HIV^- individuals. So, this study examines the effect of CD_4 count and nutritional status on liver enzymes among HIV^+ and HIV^- women living in West Bengal.

Materials and Methods

This hospital based cross sectional study was performed at Midnapore Medical College and Hospital, Midnapore, India. The suspected individuals came for medical treatment in this hospital as a first point of

contact. The women participants were randomly selected and the study group was consisting of 97 women of which 49 were HIV^+.

Prior to the study Institutional ethical permission was obtained. The objective of the study was explained to the probable participants and those who consented were included in the study.

Anthropometric measurements were taken using the standard techniques.[17] Height was measured to the nearest 0.1 cm using Martin's anthropometer. Body weight of the lightly-clothed participants was recorded in the nearest 0.1 kg on a digital weighing scale. Body mass index (BMI) was computed using the standard equations and nutritional status was assessed by internationally accepted BMI guidelines.[18]

Blood samples were collected from the participants in Dept. of Biochemistry, Midnapore Medical College and Hospital. A 5 ml of blood sample was collected from each participant of which, 3 ml of blood was collected in a sterile test tube and allowed to clot and centrifuged at 3,000 rpm for 10 minutes to separate the serum for estimation of liver enzymes. Serum glutamate oxaloacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT), and alkaline phosphates (ALP) were estimated by semi auto analyzer (Biochemistry Analyzer-ErbaChem 5 Plus). The remaining 2ml of blood was used for CD4 lymphocyte count, which was estimated by Fluorescence Activated Cell Sorter (FACS) count system. Blood glucose of the participants was measured by glucose assay kit employing the glucose oxidase and peroxidase method.

The data were analyzed using Statistical Package (SPSS, version 17), data were presented as number (percentage) or mean±SD as appropriate. The Student's t test was done to compare the mean differences in BMI, CD_4 count among the HIV^+ and HIV^- women. The differences in means of the liver enzymes in HIV^- and different categories of HIV^+ based on CD4 count were compared using One-Way Analysis of Variance (ANOVA) and Dunnett test. The χ^2 test was also performed to study the elevation of liver enzymes in various categories. The level of significance was determined at 5 percent ($p<0.05$).

Results

In the present study, the mean age of female participants was 29.80±7.78 years and the BMI was 19.46±2.43 kg/m^2. While comparing the BMI of the HIV^+ and HIV^- women, it was observed that HIV^- women (20.42±1.763 kg/m^2) were significantly heavier ($t=4.172$; $P<0.001$) than the HIV^+ one (18.52±2.63 kg/m^2). Similar finding was observed in case of CD4 count, the HIV^- women (995.92±100.24 cells/µl) had higher level of CD_4 than the HIV^+ women (374.22±185.66 cells/µl) at significant level ($t=20.459$; $P<0.001$). The overall prevalence of undernutrition among the females were 26.80% while in case of HIV^+ and HIV^- women these were 40.82% and 12.50% respectively. The liver enzymes studied in this investigation were SGPT, SGOT and ALP. Table 1 indicates that ALP was negatively correlated with CD_4 in the HIV^- women while blood glucose level was positively correlated with SGPT and SGOT but no such association was observed in HIV^+ women. It was found that BMI and ALP was significantly different in various categories of CD_4 (Fig 1). The lower prevalence of undernutrition and elevated ALP was observed among HIV^- women than those of HIV^+ women while HIV^+ women with CD_4 300-500 showed the highest prevalence of these abnormalities (Fig 2). In figure 3 the liver enzymes showed the different distribution pattern with respect to BMI and CD_4.

Table 1: Correlation between liver enzymes and nutritional status among HIV positive and negative female

HIV status	Indices	SGPT	SGOT	ALP
HIV^+	BMI	0.108	0.109	-0.022
	CD4	-0.052	0.228	0.121
	Blood glucose	0.185	0.055	0.055
HIV^-	BMI	0.182	0.135	0.052
	CD4	-0.166	-0.226	-0.329*
	Blood glucose	0.322*	0.390**	0.116
Total	BMI	0.064	0.047	-0.190
	CD4	-0.154	-0.09	-0.403***
	Blood glucose	0.201*	0.161	-0.011
Significant level *P<0.05; **P<0.01; ***P<0.001.				

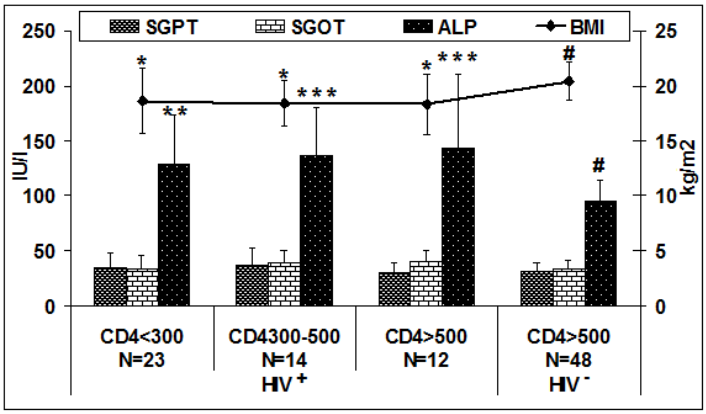

Fig. 1: Mean and standard deviation of the SGPT, SGOT, ALP and BMI with varied CD4 level. # indicates the significant difference in the variables with CD4 levels (ANOVA test) and Post hoc test indicates the level of significance at *P<0.05, **P<0.01, ***P<0.001 while compared to the HIV⁻ group

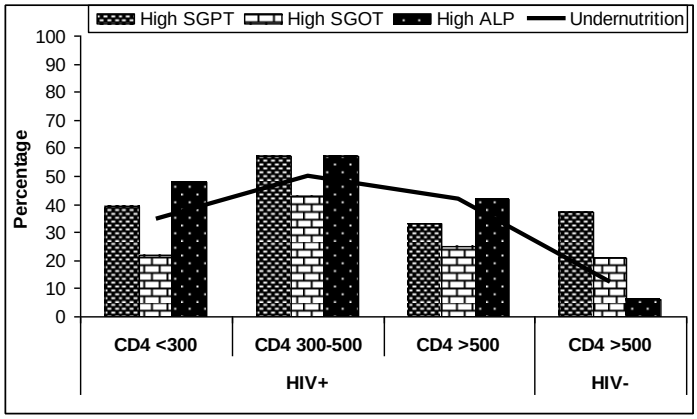

Fig. 2: Impact of CD4 count on the liver enzymes and nutritional status among HIV⁺ and HIV⁻ female. Prevalence of high ALP (χ^2=22.839; P<0.001) and undernutrition (χ^2=10.943; P<0.05) was associated with CD4 level in HIV⁺ and HIV⁻ female

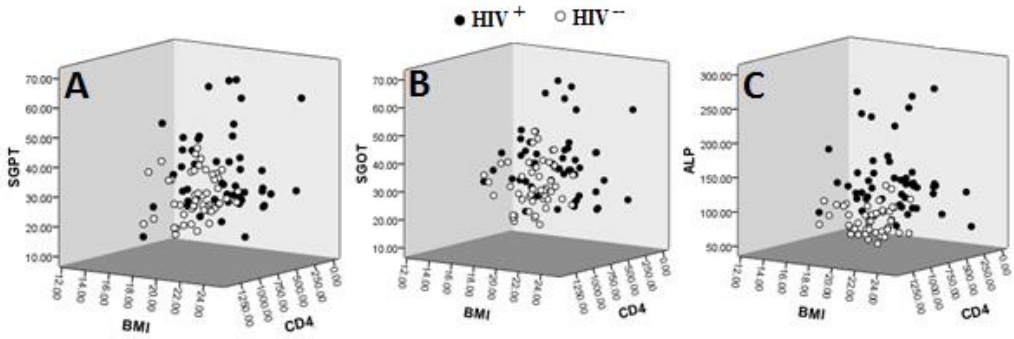

Fig. 3: Scatter plot explore the distribution of SGPT, SGOT, ALP on varied CD4, BMI among HIV⁺ and HIV⁻ female

Discussion

In this study, the high prevalence of undernutrition (40.82%) among the HIV⁺ women was noted. This may be due to the HIV infection induced malabsorption[19] and lower food intake[19] while increasing nutrients demands during HIV infection (10% more energy in asymptomatic and 20-30% more energy in symptomatic condition).[20] The elevation of the hormones glucagon, insulin, epinephrine, and cortisol is associated with altered metabolism of carbohydrates, proteins, and fat during HIV infection and thereby promotes rapid weight loss.[21]

It was also noticed that liver enzymes (mainly ALP) significantly increased in HIV⁺ women compared with the HIV⁻ women. The SGOT (34.51±13.24 vs 31.63±7.52) and SGPT (36.78±12.12 vs 33.65±8.14) were higher among the HIV⁺ women than the HIV⁻

women though the change is insignificant. While studying this elevation level, it was noted that prevalence of elevated SGPT among the HIV^+ and HIV^- women was 42.86% and 37.50% respectively and in case of ALP (48.98% and 6.25%) and SGOT (28.57% and 20.83%) similar higher prevalence was noted in HIV+ women than those of HIV− women. The Odd ratio indicated that the elevated SGPT, SGOT and ALP were 1.250, 1.520 and 14.400 times higher among the HIV^+ than HIV^- women. It may be suggested that the HIV infection is associated with the abnormalities of liver enzymes. HIV infects a wide range of non-hematopoietic cells, including cells in the liver.[22] HIV infection directly attacks host cells and operate the infected cells. These infected cells release cellular contents into the surrounding medium of which enzymes constitute 20% and this may also one of the most importance causes of elevation of liver enzymes.[23] The other probable mechanism of the pathogenesis of liver damage is that the whole body protein increases which is related to the progression of the HIV infection in the body and the downfall of CD4 count. Some studies suggest that HIV can alter the permeability of the gastrointestinal tract, leading to increased levels of circulating lipopolysaccharide that may affect liver function parameters,[24] and in advanced HIV infection, there is an elevated rate of protein turnover.[25] The other studies suggested that circulating cytokines including tumor necrosis factor (TNF), interleukin (IL)-6, and interferon (IFN)-α etc. are increased during HIV infection and these have a direct effect on protein metabolism.[25,26] Other probable causes of this increased serum enzymes are hepatitis, drug toxicity, extra-hepatic cholestasis, cirrhosis, hepatobiliary disease, and genetic abnormalities.[23]

Conclusion

It can be concluded from this study that HIV infection might be responsible for elevation of liver enzymes in HIV^+ women and the ALP showed the higher level of alteration of all the liver enzymes. This elevation of liver enzymes abnormalities is associated with CD4 counts before the initiation of ART treatment.

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