International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 9, September 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.9.2024.19

**ORIGINAL RESEARCH**

# The spectrum of hepatic abnormalities including sero-prevalence of hepatitis B and hepatitis c co-infection in HIV infected individuals and their correlation with CD4 count

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Received Date: 18 July, 2024 Acceptance Date: 16 August, 2024

## ABSTRACT

**Background:**To studythe spectrum of hepatic abnormalities including sero-prevalence of hepatitis b and hepatitis c coinfection in HIV infected individuals and their correlation with cd4 count.There had been little work done on liver function tests in HIV patients without pre-existing liver disease. **Method:** An observational study was conducted on 200 HIV patients above 18 years of age andexcluded those who were already diagnosed with Hep B or Hep C, co-existing malignancy, obstructive biliary disease and those with heavy alcohol consumption. **Result:** In our study Sero-prevalence of Hepatitis B co-infection among HIV Individuals was 4% (n=8). In our study Sero-prevalence of Hepatitis C co-infection among HIV Individuals was 15% (n=30). In our study Sero-prevalence of Hepatitis B and Hepatitis C co-infection among HIV Individuals was 1.5% (n=3). Overall, 34% (n=68) patients had abnormal Liver Function Tests.Out of 200 patients studied, 13 patients (6.5%) had serum bilirubin of more than 1 mg/dl and 187 patients (93.5%) had serum bilirubin in normal range.137 patients (68.5%) had AST level up to 40 IU/L and 63 patients (31.5%) had AST level of more than 40 IU/L. Out of these 63 patients, 61 patients (96.8%) were on TLE regimen and 2 patients (3.2%) were on ZLN regimen. Probable etiologies for deranged AST level in 63 patients were HIV/HBV co-infection in 7.9% patients (n=5), HIV/HCV co-infection in 28.6% patients (n=18), NAFLD in 9.6% patients (n=6) and HIV infection itself or cART or unknown causes in the remaining 53.9% patients (n=34). **Conclusion:** Elevated liver transaminases are now a common finding in HIV-infected patients. The main etiologies for hepatic morbidities in HIV-infected patients includes viral hepatitis coinfection, NAFLD, ARTrelated liver injury and infection-related factors. Thus, regular liver function tests along with non-invasive methods of investigation of hepatobiliary system needs to be done in every individual infected with HIV.



## INTRODUCTION

Hepatobiliary diseases occur commonly in patients with human immunodeficiency virus (HIV) infection and are now the commonest causes of death in HIV positive patients on antiretroviral therapy (ART) in western countries. [1,2] Liver enzyme abnormalities have been reported in 20 – 93% of HIV-infected populations. [3,4]

Human immunodeficiency virus (HIV) infection of liver cells contributes to liver disease progression by both direct and indirect mechanisms. Gp120 binding to CXCR4 may induce hepatocyte apoptosis and activation of HSCs, both contributing to fibrosis. HIV infection of the gastrointestinal tract produces pro-inflammatory cytokines and chemokines which attract activated lymphocytes and monocytes to the liver

DOI: 10.69605/ijlbpr_13.9.2024.19

which may further drive fibrosis.[5]

Most liver disease among HIV-infected individuals is secondary to coinfection with HCV and/or HBV [7] due to both common modes of transmission and geographic patterns of disease. HIV infection alters the natural history of HCV in several ways. Coinfected individuals also have higher HCV RNA levels, accelerated progression to hepatic fibrosis, an increased risk of developing cirrhosis, and a higher risk of decompensated liver disease once cirrhotic. [8-10] Individuals with HIV-HBV co-infection are 3-6 times more likely to develop chronic HBV after an acute exposure than individuals without HIV infection and lower rate of spontaneous clearance of HBeAg, increased HBV replication, and a higher rate of loss of anti-HBs and reactivation of HBV.[11]

Liver toxicity is one of the most common serious adverse events associated with ART. [12] due to direct drug toxicity and/or drug metabolism, hypersensitivity reactions, mitochondrial toxicity, and immune reconstitution inflammatory syndrome [IRIS]. [12-14] Common ART Agents Associated with Liver Injury in HIV infected patients [6]- NNRTI- Nevirapine, Efavirenz, NRTI- Abacavir, Protease Inhibitor- Ritonavir, Tipranavir, CCR5 Inhibitor- Maraviroc.Other prevalent factors affecting liver function are alcohol abuse and Non-alcoholic fatty liver disease (NAFLD)

## MATERIALS AND METHODS

A hospital based observational study was conducted in the department of Medicine at Rajindra Hospital, Patiala on 200 patients (20 in-hospital and 180 OPD/ART) above 18 years of age, after obtaining informed consent and ethical clearance. HIV patients on treatment as per NACO guidelines were included in this study. Patients who were already diagnosed with Hep B or Hep C, co-existing malignancy, obstructive biliary disease and those with heavy alcohol consumption were excluded from the study population.

Each participant was subject to detailed clinical history and examination and blood investigations including liver function tests were done. Imaging studies including Ultrasound and Fibroscan were performed. Liver function was also assessed using various scores such as APRI and FIB-4.

All indoor patients were managed as per symptoms and associated co-morbidities.

All statistical analysis was done on SPSS version18, Pearson Chi square test was used for studying correlation of different variables. p-value less than 0.05 was considered significant and less than 0.001 was considered highly significant.

## RESULTS

**Table 1: Baseline characteristics of study population**

| | Mean | Std. Deviation |
|---|---|---|
| Age | 37.85 | 12.105 |
| CD4 count | 493.43 | 297.502 |
| Duration of ART | 4.14 | 2.391 |
| S Bilirubin | .558600 | .3147561 |
| AST | 39.18 | 30.472 |
| ALT | 39.06 | 33.154 |
| Total serum protein | 6.599500 | .3853469 |
| Albumin | 3.628500 | .4752548 |
| Globulin | 2.986000 | .3816178 |
| INR | 1.031050 | .0861773 |
| Fibroscan | 6.425500 | 6.2142000 |
| APRI | .566800 | .8941899 |
| FIB-4 | 1.379250 | 1.7227960 |
| | | |

The above table shows the baseline characteristics of study population. Mean age 37.85±12.105 yrs (range 18-70 yrs). Mean CD4 cell count 493.43±297.502 cells/$mm^3$ (range 22-1857 cells/$mm^3$). Mean duration of treatment with ART 4.14±2.25 years (range1-11years). Mean Hemoglobin level 11.32±2.25 gm% (range 4-17.6 gm%). Mean Platelet count 225835±90305 /ul (range 29000-564000 /ul). Mean Bilirubin level was 0.55±0.31 mg/dl (range 0.2-2.1 mg/dl). Mean AST level 39.18±30.42 IU/L (range 13-243 IU/l). Mean ALT level 39.06±33.15 IU/L (range 11-295 IU/L). Mean total serum protein level 6.59+.38 gm/dl (range 5.1-7.8 gm/dl). Mean albumin level 3.62±0.47 gm/dl (range 2-4.4 gm/dl). Mean globulin level 2.98±0.38 gm/dl (range 2.3-4.8 gm/dl). Mean INR was 1.03±.08 (range 0.9-1.5). Mean Fibroscan value 6.42±6.21 KPa (range 3.1-41.0 KPa). Mean APRI score 0.56±0.89 (range 0.07-10.43). Mean FIB 4 score 1.37±1.72 (range 0.21-16.53).

DOI: 10.69605/ijlbpr_13.9.2024.19

**Table 2: Liver parameters in Study Population**

| Parameters | | Frequency | Percent |
|---|---|---|---|
| Serum bilirubin | ≤1 | 187 | 93.5 |
| | >1 | 13 | 6.5 |
| AST | Up to 40 | 137 | 68.5 |
| | >40-120 | 56 | 28 |
| | >120 | 7 | 3.5 |
| ALT | Up to 40 | 132 | 66.0 |
| | >40-120 | 62 | 31.0 |
| | >120 | 6 | 3.0 |
| USG Whole Abdomen | WNL | 165 | 82.5 |
| | Cholelithiasis | 5 | 2.5 |
| | Hepatomegaly | 3 | 1.5 |
| | Hepatosplenomegaly | 4 | 2.0 |
| | Fatty liver | 13 | 6.5 |
| | Cirrhosis liver | 10 | 5.0 |
| Fibroscan | <7.1KPa | 157 | 78.5 |
| | 7.1-12.5KPa | 31 | 15.5 |
| | >12.5KPa | 12 | 6.0 |
| APRI Score | <0.5 | 140 | 70.0 |
| | 0.5-1.5 | 49 | 24.5 |
| | >1.5 | 11 | 5.5 |
| FIB-4 Score | <1.45 | 146 | 73.0 |
| | 1.45-≤3.25 | 44 | 22.0 |
| | >3.25 | 10 | 5.0 |

Out of 200 patients, 6.5% (n=13) population had serum bilirubin of more than 1 mg/dl and 93.5% (n=187) had serum bilirubin in normal range.

Out of 200 patients, 68.5% (n=137) patients had AST level up to 40 IU/L and 31.5% (n=63) had AST level of more than40 IU/L. 7 patients had AST level of >3 times upper normal limit of AST.

Out of 200 patients, 66% (n=132) patients had ALT level up to 40 IU/L and 34% (n=68) had ALT level of more than 40 IU/L. 6 patients had ALT level of >3 times upper normal limit of ALT.

Out of 200 patients, 5.0%(n=10) had features of cirrhosis of liver, 6.5% (n=13) had features of fatty liver, 2%(n=4) had hepatosplenomegaly, 2.5%(n=5) had Cholelithiasis, 1.5%(n=3) had hepatomegaly (liver span >15 cm) and rest 82.5%(n=165) had ultrasound findings with in normal limit.

Liver Stiffness values >7.1 kPa (equivalent to Metavir F ≥ 2) were considered abnormal. In this study population 21.5% had LSM>7.1KPa. On the basis of liver stiffness values, F2-F3 and F4 Metavirstages were evidenced in 15.5% (n=31) and 6.0% (n=12) of patients.

In this study, 24.5% (n=49) patients had an APRI score of 0.5-1.5 and 5.5% (n=11) patients had an APRI score of >1.5.

In this study, 22% (n=44) patients had FIB-4 score of 1.45-<=3.25 and 5% (n=10) patients had FIB-4 score of >3.25.

**Table 3: Association of CD4 Count with Duration of cART**

| CD4 Count | | | Duration of ART | | | Total |
|---|---|---|---|---|---|---|
| | | | <2 | 2-5 | >5 | |
| | ≤200 | Count | 6 | 10 | 7 | 23 |
| | | % | 26.1% | 43.5% | 30.4% | 100.0% |
| | 201-500 | Count | 17 | 48 | 25 | 90 |
| | | % | 18.9% | 53.3% | 27.8% | 100.0% |
| | >500 | Count | 10 | 51 | 26 | 87 |
| | | % | 11.5% | 58.6% | 29.9% | 100.0% |
| Total | | Count | 33 | 109 | 58 | 200 |
| | | | | | | |

As shown in table 3, 23 patients who had CD4 count <=200 cells/ $mm^3$, 6 patients had duration of cART<2 years, 10 patients had duration of cART 2-5 years and 7 had duration of cART more than 5 years. Of 90 patients who had CD4 count in the range of 201-500 cells/$mm^3$, 17 patients had duration of cART<2 years, 48 patients had duration of cART 2-5 years and 25 had duration of cART more than 5 years. Of 87 patients who had CD4 count >500 cells/$mm^3$, 10 patients had duration of cART<2 years, 51 patients

DOI: 10.69605/ijlbpr_13.9.2024.19

had duration of cART 2-5 years and 26 had duration of cART more than 5 years. On Statistical analysis, the difference in CD4 count with duration of ART was not significant (p value 0.43).

**Table 4: Association of AST and ALT with type of cART regimen**

| ART drugs | | AST level | | Total | ALT | | Total |
|---|---|---|---|---|---|---|---|
| | | ≤40 | >40 | | ≤40 | >40 | |
| TLE | Count | 120 | 61 | 181 | 116 | 65 | 181 |
| | % within cART regimen | 66.3% | 33.7% | 100.0% | 64.1% | 35.9% | 100.0% |
| ZLN | Count | 17 | 2 | 19 | 16 | 3 | 19 |
| | % within cART regimen | 89.5% | 10.5% | 100.0% | 84.2% | 15.8% | 100.0% |
| Total | Count | 137 | 63 | 200 | 132 | 68 | 200 |
| | % within total pts on cART drugs | 68.5% | 31.5% | 100.0% | 66.0% | 34.0% | 100.0% |

As shown in table 4, 23 patients who had CD4 count <=200 cells/ $mm^3$, 6 patients had duration of cART<2 years, 10 patients had duration of cART 2-5 years and 7 had duration of cART more than 5 years. Of 90 patients who had CD4 count in the range of 201-500 cells/$mm^3$, 17 patients had duration of cART<2 years, 48 patients had duration of cART 2-5 years and 25 had duration of cART more than 5 years. Of 87 patients who had CD4 count >500 cells/$mm^3$, 10 patients had duration of cART<2 years, 51 patients had duration of cART 2-5 years and 26 had duration of cART more than 5 years. On Statistical analysis, the difference in CD4 count with duration of ART was not significant (p value 0.43).

**Table 5: Association of AST and ALT with patients of HIV/HBV coinfection, HIV/HCV coinfection and fatty liver**

| | | | HBsAg | | | Anti-HCV antibody | | | Fatty Liver | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Non-reactive | Reactive | Total | Non-reactive | Reactive | Total | No fatty liver | Fatty liver | Total |
| AST Level | ≤40 | N | 134 | 3 | 135 | 125 | 12 | 137 | 130 | 7 | 137 |
| | | % | 69.8 | 37.5 | 68.5 | 73.5 | 40 | 68.5 | 69.5 | 53.8 | 68.5 |
| | >40 | N | 58 | 5 | 63 | 45 | 18 | 63 | 57 | 6 | 63 |
| | | % | 30.2 | 62.5 | 31.5 | 26.5 | 60 | 31.5 | 30.5 | 46.2 | 31.5 |
| Total | | | 192 | 8 | 200 | 170 | 30 | 200 | 187 | 13 | 200 |
| P value | | | 0.054 | | | <0.001 | | | 0.434 | | |
| ALT Level | ≤40 | N | 129 | 3 | 132 | 118 | 14 | 132 | 126 | 6 | 132 |
| | | % | 67.2 | 37.5 | 66 | 69.4 | 46.7 | 66 | 67.4 | 46.1 | 66 |
| | >40 | N | 63 | 5 | 68 | 52 | 16 | 68 | 61 | 7 | 68 |
| | | % | 32.8 | 62.5 | 34 | 30.6 | 53.3 | 34 | 32.6 | 53.9 | 34 |
| Total | | | 192 | 8 | 200 | 170 | 30 | 200 | 187 | 13 | 200 |
| P value | | | 0.082 | | | 0.015 | | | 0.228 | | |

As shown in table 5, 31.5% (n=63) patients had AST level above upper limit. Out of 181 patients in the TLE group, 61 (33.7%) patients had deranged AST levels. Out of 19 patients in the ZLN group, 2 (10.5%) patients had deranged AST levels. This association was significant on statistical analysis (p value 0.03).

As shown in table 5, 34% (n=68) patients had ALT level above upper limit. Out of 181 patients in the TLE group, 65 (35.9%) patients had deranged ALT levels. Out of 19 patients in the ZLN group, 3 (15.8%) patients had deranged ALT levels. This association was significant on statistical analysis (p value 0.03).

**Table 6: Association of AST and ALT with patients of HIV/HBV/HCV coinfection**

| No of patients with HIV/HBV/HCV coinfection | No of patients with AST Level>40 IU/L | No of patients with ALT Level>40 IU/L |
|---|---|---|
| 3 | 3 | 3 |

As shown in table 6, 8 patients had HIV/HBV coinfection. Out of 8 patients with coinfection 5 (62.5%) patients had deranged AST level and 3 (37.5%) patients had AST level in normal range. This association was insignificant on statistical analysis (p value 0.054).

30 patients had HIV/HCV coinfection. 18 (60.0%) patients with coinfection had deranged AST level and

DOI: 10.69605/ijlbpr_13.9.2024.19

12 (40%) patients had AST level in normal range. This association was highly significant on statistical analysis (p value <0.001).
13 patients had fatty liver. 6 patients (46.2%) had deranged AST level and 7 patients (53.8%) had AST level in normal range. This association was insignificant on statistical analysis (p value 0.434).

**Table 7: Association of CD4 Count with AST and ALT levels**

| CD4 Count | | AST group | | Total | ALT group | | Total |
|---|---|---|---|---|---|---|---|
| | | ≤40 | >40 | | ≤40 | >40 | |
| ≤200 | Count | 13 | 10 | 23 | 14 | 9 | 23 |
| | % within CD4 grp | 56.5% | 43.5% | 100.0% | 60.9% | 39.1% | 100.0% |
| 201-500 | Count | 69 | 21 | 90 | 65 | 25 | 90 |
| | % within CD4 grp | 76.7% | 23.3% | 100.0% | 72.2% | 27.8% | 100.0% |
| >500 | Count | 55 | 32 | 87 | 53 | 34 | 87 |
| | % within CD4 grp | 63.2% | 36.8% | 100.0% | 60.9% | 39.1% | 100.0% |
| Total | Count | 137 | 63 | 200 | 132 | 68 | 200 |
| | % within CD4 grp | 68.5% | 31.5% | 100.0% | 66.0% | 34.0% | 100.0% |

As shown in table, above 10 patients had cirrhosis. 8 patients (80.0%) had deranged AST level and 2 patients (20%) had AST level in normal range. This association was significant on statistical analysis (p value 0.001).
As shown in table above, 7 patients (70.0%) had deranged ALT level and 3 patients (30%) had ALT level in normal range. This association was significant on statistical analysis (p value 0.014)

## DISCUSSION

The present study was conducted to study the spectrum of hepatic abnormalities and Sero-prevalence of Hepatitis-B and Hepatitis-C coinfection in HIV infected individuals and their correlation with CD4 count. In the present study mean age was found to be 37.85±12.1 which was comparable to studies conducted by Ocama P et al, Pathania MS et al and Bajpai S et al. In the present study, mean of CD4 cells was found to be 493.43±297.5 cells/$mm^3$ which was comparable to study conducted by Pathania MS et al. Mean CD4 count was 493.43±297.5 cells/$mm^3$ (range 22-1857 cells/$mm^3$). In our study Sero-prevalence of Hepatitis B co-infection among HIV Individuals was 4% (n=8). In our study Sero-prevalence of Hepatitis C co-infection among HIV Individuals was 15% (n=30). In our study Sero-prevalence of Hepatitis B and Hepatitis C co-infection among HIV Individuals was 1.5% (n=3).
Overall, 34% (n=68) patients had abnormal Liver Function Tests. Out of 200 patients studied, 13 patients (6.5%) had serum bilirubin of more than 1 mg/dl and 187 patients (93.5%) had serum bilirubin in normal range.137 patients (68.5%) had AST level up to 40 IU/L and 63 patients (31.5%) had AST level of more than 40 IU/L. Out of these 63 patients, 61 patients (96.8%) were on TLE regimen and 2 patients (3.2%) were on ZLN regimen. Probable etiologies for deranged AST level in 63 patients were HIV/HBV co-infection in 7.9% patients (n=5), HIV/HCV co-infection in 28.6% patients (n=18), NAFLD in 9.6% patients (n=6) and HIV infection itself or cART or unknown causes in the remaining 53.9% patients (n=34).132 patients (66%) had ALT level up to 40 IU/L and 68 patients (34%) had ALT level of more than 40 IU/L. Out of these 68 patients, 65 patients (95.6%) were on TLE regimen and 3 patients (4.4%) were on ZLN regimen. Probable etiologies for deranged ALT level in 68 patients were HIV/HBV co-infection in 7.4% patients (n=5), HIV/HCV co-infection in 23.5% patients (n=16), NAFLD in 10.3% patients (n=7) and HIV infection itself or cART or unknown causes in the remaining 58.8% (n=40) patients. Mean Total serum protein was 6.59±.38 gm/dl (range 5.1-7.8 gm/dl). Mean INR value 1.03±.08 (range 0.9-1.5).
In our study, 5.0% (n=10) patients had features of cirrhosis of liver, 6.5% (n=13) had features of fatty liver, 2% (n=4) had hepatosplenomegaly, 2.5% (n=5) had Cholelithiasis, 1.5% (n=3) had hepatomegaly and rest 82.5% (n=165) had ultrasound findings with in normal limit. Out of 10 patients who had cirrhosis, 9 patients had HCV/HIV coinfection and 1 patient had HBV/HIV co-infection. In this study population 21.5% had LSM>7.1KPa on fibroscan. 5.5% (n=11) patients had advanced fibrosis as per APRI score >1.5. 5% (n=10) patients had advanced fibrosis as per FIB-4 score >3.25. No statistically significant association was found in CD4 count with AST levels, CD4 count with ALT levels
In the present study, 4% of patients had both HIV/HBV coinfection. The discordance with other studies as conducted by Rathi PM et al(1997) [16] ,Ocama P et al(2008)[17] ,Luma HN et al(2016)[18] can be explained as in India, chronic hepatitis B affects around 2- 8 % of PLHIV, though there are wide variations in different parts of the country.[59]
In the present study, 15% of patients had both HIV/HCV coinfection. Hepatitis C virus (HCV) affects 5- 15% of PLHIV, rising to 90% among people who inject drugs.Because of shared routes of transmission, certain groups, particularly persons who inject drugs (PWID) have high rates of co-infection with HIV and HCV. Globally around 67% of PWID are infected with HCV. Other high-risk groups are those who have a high frequency of injections and a

DOI: 10.69605/ijlbpr_13.9.2024.19

low level of infection control, transmission from HCV infected mothers and people with HCV infected sexual partners. Persons with HIV infection, in particular MSM, are at increased risk of HCV infection through unprotected sex. Tattoo recipients have higher prevalence of HCV compared with persons without tattoos.[59]

In present study, 10 (43.5%) out of 23 patients with CD4 counts <= 200 cells/$mm^3$ and 53 (29.94%) out of 177 patients with CD4 counts >200 cells/ $mm^3$ had deranged AST level. 9 (39.1%) out of 23 patients with CD4 counts <= 200 cells/ $mm^3$ and 59 (33.33%) out of 177 patients with CD4 counts >200 cells/$mm^3$ had deranged ALT level. While in study conducted by Pathania MS et al [15] in 2016, 49 out of 97 patients (50.5%) with CD4 counts <200 cells/$mm^3$ and 79 out of 150 patients (52.7%) with CD4 >200 cells/$mm^3$ had abnormal LFTs. This difference in the results of our study and previous study could be attributed to fact that our study had excluded patients with heavy alcohol intake, chronic hepatotoxic drug, any obstructive biliary pathology, co-existent malignant disease.

In the present study, 5% patients had cirrhosis, 6.5% had fatty liver, 1.5% had hepatomegaly and 2% had hepatosplenomegaly on Ultrasound abdomen. In study conducted by Savita M et al [19] 24% had fatty liver whereas in present study fatty liver was found in 6.5% of patients as patients with significant amount of alcohol consumption (more than 1 drinks per day in women and more than 2 drinks per day in men, 1 drink was defined as 10gm of ethanol) were excluded from our study. 2.5% had cholelithiasis which was an incidental finding.

The difference in fibroscan findings in present study as compared with previous study could be attributable to the fact that the number of HCV/HIV co-infected patients were 30 out of 200 and HBV/HIV co-infected patients were 8 out of 200. While, the number of HCV/HIV co-infected patients in previous study by Maggi P et al [20] were 148 out of 228 and remaining were HIV mono-infected.

In the present study, 10 out of 12 patients with LSM > 12.5 KPa were noted to have cirrhosis on USG whole abdomen, of whom 9 patients were HIV/HCV co-infected and 1 was HIV/HBV co-infected.

The assessment of asymptomatic liver damage using LSM in patients mono-infected with HIV receiving long-term antiretroviral therapy has been rarely addressed.Even if liver biopsy is still considered the gold-standard method for assessment of liver fibrosis, Fibroscan is presently the main non-invasive method for diagnosis, staging, and follow-up of both viral and non-viral hepatopathies due to optimum accuracy standards, operator independency, absence of complications, and ease of use. Nevertheless, experience in the literature is still lacking regarding the use of this method for patients mono-infected with HIV.

In the present study, APRI scores of < 0.5, 0.5-1.5 and >1.5 were noted in 70%, 24.5% and 5.5% of patients respectively. Of 5.5% of these, 5% were noted to have cirrhosis on ultrasound of the whole abdomen.

In the present study, FIB-4 scores of <1.45, 1.45-3.25 and >3.25 were noted in 73%, 22% and 5% of patients respectively. All the patients with FIB-4 scoring of >3.25 were noted to have cirrhosis on ultrasound of the whole abdomen.

There is increased seroprevalence of HBV and HCV coinfection in HIV/AIDS patients due to common mode of transmission. Overall, 34% patients had abnormal liver function tests which can be attributed to HIV infection itself, co-infection with HBV, HCV, cART and NAFLD. These findings confirm hepatic involvement to be a feature of HIV infection.

Alcohol abuse and Anti-tubercular drugs are also one of the common causes of liver injury but they were excluded from our study.

Ours is a small study, larger studies are needed to confirm the presence of hepatic morbidities in HIV infection.

## CONCLUSION

Elevated liver transaminases are now a common finding in HIV-infected patients. The main etiologies for hepatic morbidities in HIV-infected patients include viral hepatitis coinfection, NAFLD, ARTrelated liver injury and infection-related factors. Several simple fibrosis biomarkers based on liver transaminases like APRI, FIB-4 score and non-invasive investigations like ultrasonography whole abdomen and fibroscan can help in the management of the individual patient. Thus, regular liver function tests along with non-invasive methods of investigation of the hepatobiliary system needs to be done in every individual infected with HIV.

Alcohol abuse and Anti-tubercular drugs are also one of the common causes of liver injury but they were excluded from our study.

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