International Journal Dental and Medical Sciences Research (IJDMSR)
ISSN: 2393-073X Volume 4, Issue 9 (September - 2020), PP 07-14
www.ijdmsr.com

Liver Disease in HIV Infected Patients

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ABSTRACT:- Liver disease is the single greatest cause of non-AIDS related death in patients with HIV disease accounting for a greater proportion of deaths than cardiovascular disease or non AIDS related cancers. Nearly half of deaths among hospitalized HIV infected patients in the HAART era have been attributed to liver disease. This hospital based cross-sectional study was conducted in a diagnosed cases of HIV infected patient admitted in the Department of Medicine and Centre of Excellence (CoE) ART Centre, Regional Institute of Medical Sciences (RIMS), Imphal for a period of 2 years. Our aim of the study is to find out the prevalence of liver disorder(s) in association with HIV infection and its associations with HBV and HCV co–infection. The study revealed that 93(87.73%) patients had abnormal liver function test of which 37(34.9%) patients had hepatocellular liver injury, 14(13.2%) had cholestatic jaundice and 42(39.6%) had mixed injury type. Majority of the patients 81(76.4%) were taking TLE regimen. Co-infection was seen in 24(22.6%) and 4(3.8%) with hepatitis C and hepatitis B respectively and one (0.94%) had co–infection with both hepatitis C and hepatitis B. Oral candidiasis was the most common opportunistic infection seen in 30(28.3%).

I. INTRODUCTION

Prior to HAART (highly active antiretroviral therapy), the most common causes of liver dysfunction in HIV-infected patients were opportunistic infections, including cytomegalovirus (CMV) and mycobacterium infections, and AIDS-related neoplasms such as lymphoma and Kaposi's sarcoma.[1-2] Managing liver disease is an increasingly important component to the care of individuals infected with human immunodeficiency virus-1 (HIV). Since the advent of effective antiretroviral therapy (ART) in 1996 for HIV, there has been a substantial decrease in deaths related to acquired immunodeficiency syndrome (AIDS).[3] Liver disease is the single greatest cause of non–AIDS-related death in patients with HIV disease accounting for a greater proportion of deaths than cardiovascular disease or non AIDS related cancers. Liver disease has become apparent as the most common non-AIDS related cause of death among HIV-infected patients, accounting for 14-18% of all deaths. Nearly half of deaths among hospitalized HIV infected patients in the HAART era have been attributed to liver disease.[4-7] Liver cirrhosis is a more serious consequence with an estimate overall prevalence of 8.3% in HIV infected persons.[8] Liver disease is often reflected by biochemical abnormalities of the liver function test.[9-13] Laboratory liver test abnormalities are attributed to chronic viral hepatitis (hepatitis B and hepatitis C virus) co-infections due to shared routes of transmission.[14-15] Manipur is one of the high prevalence states for HIV infection in India.[16]

AIMS AND OBJECTS

1. To determine the prevalence of liver disorder(s) in HIV infected patients and its correlation with CD4 count.
2. To identify liver disease in HIV infected patients and its co-infection with HBV and HCV.

II. MATERIALS AND METHODS

Study design: Hospital based cross-sectional study.

Study setting: The study was conducted in a diagnosed cases of HIV infected patient admitted in the Department of Medicine and Centre of Excellence (CoE) ART Centre, Regional Institute of Medical Sciences (RIMS), Imphal.

Study population: HIV seropositive cases.

Study duration: Duration of the study was 2 years, starting from September 2017 to August 2019.

Inclusion criteria:

1. Patient with HIV infection whose age is 18 years and above (both sexes included)
2. Diagnosed cases of HIV positive patients with or without ART.
3. Those who have consented for the study.

Exclusion criteria:

1. Liver disorder unrelated to HIV infection.
2. Those who are not willing to participate in the study.
3.

Sample size: A sample size of 106 was arrived by using the formula n = $\frac{P(100-P)}{e^2}$ where, P is prevalence = 51.82% (taken from a study from Pathania MS et al[17]), assumption: a) 95% degree of precision b) allowable error "L"=10%, therefore standard error "e" =L/1.96 and non-response rate: 10%

Sampling: Consecutive sampling.

Working definition: This study was conducted to find the prevalence of liver disorder(s) like hepatitis to the advanced liver disease like cirrhosis and carcinoma in HIV infected patient(s) and its co-infection with HBV and HCV.

Data collection:

Procedures-

1. The study was carried out after getting clearance from the Research Ethical Board of Regional Institute of medical sciences, Imphal, Manipur.
2. Cases included patients with HIV seropositivitye admitted to Medicine ward and those attending Centre of Excellence (CoE) ART centre at RIMS, Imphal and fulfilling the inclusion criteria.
3. The patients were provided with written and informed consent.
4. Relevant investigations like complete blood count (CBC), liver function test (LFT), kidney function test (KFT), prothrombin time (PT) and international normalized ratio (INR), HbsAg and HCV Antibody, etc. were carried out.
5. Patients were classified into Grade 1, 2, 3 and 4 (based on NIH – NIAI[18]).
7. Liver dysfunction was graded according to the levels of ALT, AST, ALP, and Bilirubin.
8. The study population was divided into three groups based on CD4 count.

Group 1 – CD4 count <200

Group 2 – CD4 count of 201 – 350

Group 3 – CD4 count >350

Statistical analysis: The categorical data was presented as number or proportion and continuous data as mean and median and standard deviation (SD). p value less than 0.05 was taken as a level of significance. x^2 Test was applied in case of categorical data. Data was analyzed through IBM SPSS Statistics 21 developer (Statistical Package for the Social Sciences software).

Conflict of interest: none.

III. RESULTS AND OBSERVATION

The age varied from 18 years to 76 years with a mean of 42.79 $\pm$ 11.04 years. Male: female ratio in the study population was nearly 1:1. Out of 106 patients, 32(30.2%) were alcohol users and 74(69.8%) were non-alcohol users. The study population of 106 numbers of patients were divided into three groups based on their CD4 count with maximum numbers of patient were in Group 1-45(42.5%), followed by Group 3-36(34%) and Group 2-25(23.6%).

Jaundice was the major complaint seen in 55(51.90%) of patients followed by fever in 37(34.90%) patients (Figure 1).

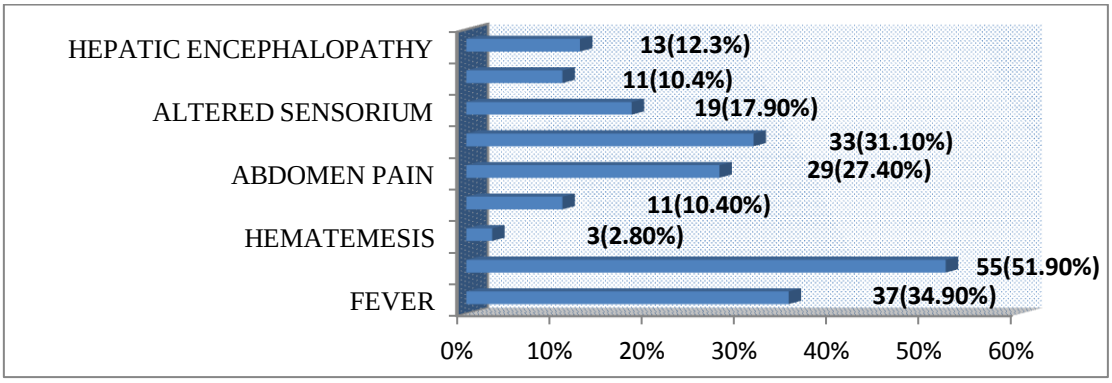

Figure 1: Symptoms in the study population of HIV infected patients (n=106)

Icterus was the major finding seen in 56(52.80%) patients followed by hepatomegaly in 41(38.7%) patients (Figure 2).

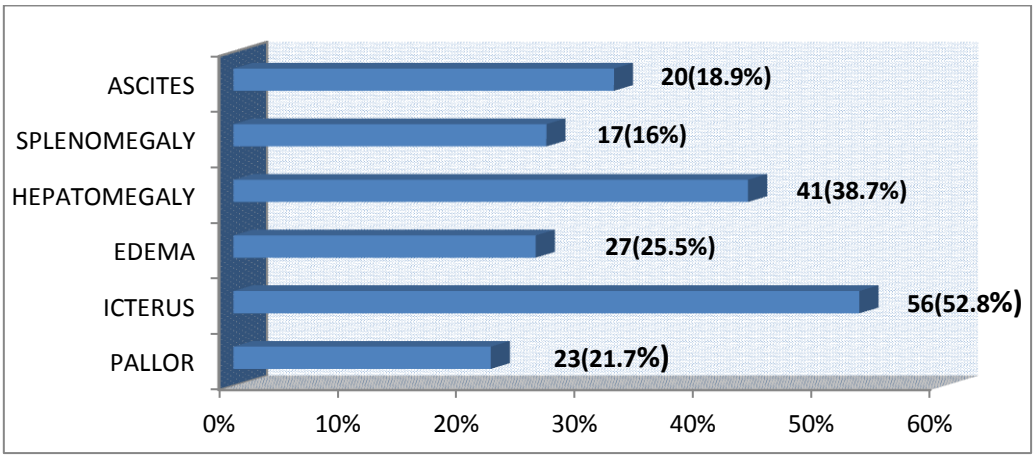

Figure 2: Signs in the HIV infected patients (n=06)

Total bilirubin varied from between 0.2 and 42.0 mg/dl with a mean of 5.62 ± 8.13 mg /dl (Figure 3).

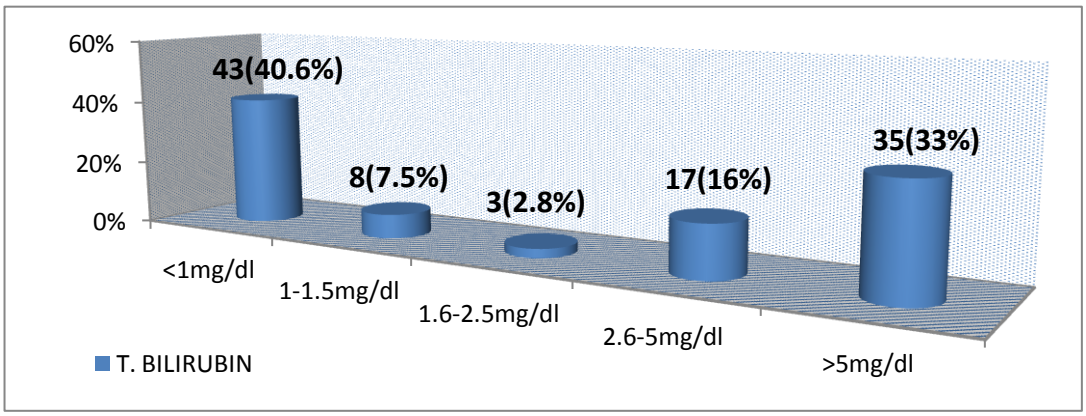

Figure 3: Serum total bilirubin of HIV infected patients (n=106)

In patients with serum total bilirubin < 1mg/dl majority of patients 25(55.6%) were having CD4 count <200 and in patients with serum total bilirubin >1 mg/dl, majority of patients 25(69.4%) had CD4 count >350 (Figure 4). A statistical significance was noted between CD4 count subgroups and serum total bilirubin <1mg/dl and >1mg/dl (p value =0.026).

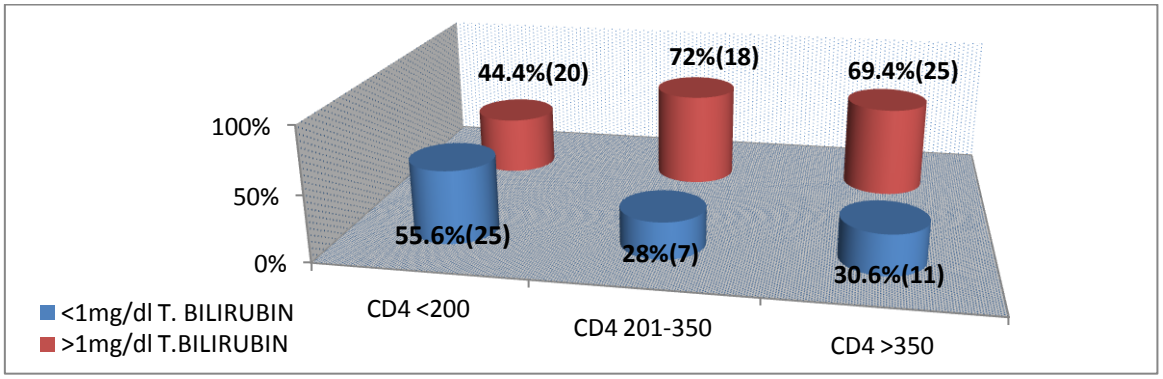

Figure 4: Serum total bilirubin according to their CD4 count subgroup in HIV infected patients (n=106)

AST varied between 12 IU/L and 731 IU/L with a mean of 136.19 ± 126.68 IU/L. ALT varied between 10 IU/L and 645 IU/L with a mean of 94.91 ± 99.79 IU/L. In AST, 30(28.3%) patients were in grade 1 and 32(30.2%) patients were in grade 2. In grade 3 and grade 4, 12(11.32%) and 6(5.7%) patients were present respectively. In ALT, 39(36.8%) patients were in grade 1 which is the majority and 18(17%) patients in grade 2. In grade 3 and grade 4, 8(7.5%) and 2(1.9%) patients were present respectively (Figure 5).

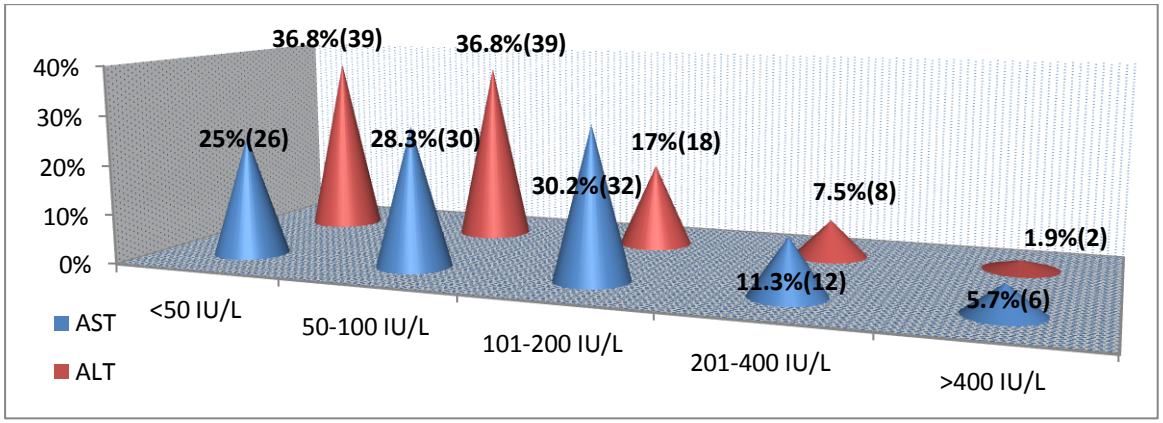

Figure 5: Serum AST and ALT level in HIV infected patients (n=106)

In patients with CD4 count <200, 13(28.9%) patients had AST level <50 IU/L and 32(71.1%) patients had AST level >50 IU/L. In those with CD4 count 201-350, 4(16%) patients had AST level <50IU/L and 21(84%) patients had AST level >50 IU/L. Again in those patients with CD4 count >350, 9(25%) patients had AST level <50IU/L and 27(75%) patients had AST level >50 IU/L. No statistical significance was noted between CD4 count subgroups and serum AST level <50 IU/L and >50 IU/L (p value =0.485). In patients with CD4 count <200, 16(35.6%) patients had ALT level <50 IU/L and 29(64.4%) patients had ALT level >50 IU/L. In those with CD4 count 201-350, 8(32%) patients had ALT level <50IU/L and 17(68%) patients had ALT level >50 IU/L. Again in those with CD4 count >350, 15(44.4%) patients had ALT level <50IU/L and 21(55.6%) patients had AST level >50 IU/L. No statistical significance was noted between CD4 count subgroups and serum ALT level <50 IU/L and >50 IU/L (p value =0.725).

ALP varied between 37 U/L and 1794 U/L with a mean of 358.19 ± 328.19 U/L.

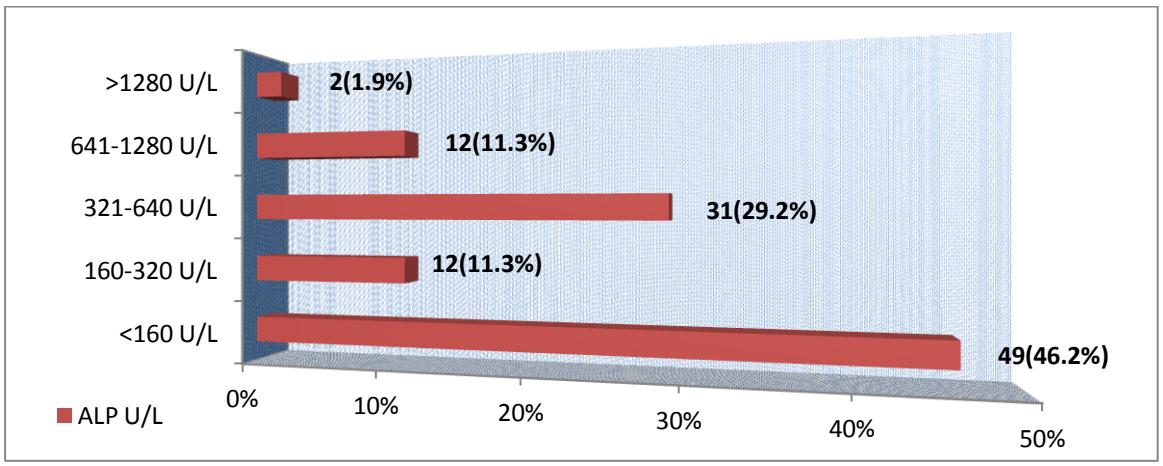

Figure 6: Serum alkaline phosphatase grading in HIV infected patients (n=106)

In patients with CD4 count <200, 22(48.9%) patients had ALP level <160 U/L and 23(51.1%) patients had ALT level >160 U/L. In those with CD4 count 201-350, 11(44%) patients had ALP level <160 U/L and 14(56%) patients had ALP level >160 U/L. Again in those with CD4 count >350, 16(44.9%) patients had ALP level <160 U/L and 20(55.6%) patients had ALP level >160 U/L. No statistical significance was noted between CD4 count subgroups and serum alkaline phosphatase level <160 IU/L and >160 IU/L (p value =0.894).

Serum albumin varied between 1.0 mg/dl and 5.7 gm/dl with a mean of 2.92 $\pm$ 0.85. Out of 106 studied population, majority of patients 82(77.4%) had serum albumin <3.5 gm and 24(22.6%) patients had serum albumin >3.5 gm/dl. In patients with CD4 count <200, 38(84.4%) patients had serum albumin of <3.5gm/dl and 7(15.6%) patients had serum albumin of >3.5 gm/dl. In those with CD4 count 201-350, 20(80%) patients had serum albumin of <3.5 gm/dl and 5(20%) patients had serum albumin of >3.5gm/dl and in those patients with CD4 count >350, 24(66.7%) patients had serum albumin of <3.5gm/dl and 12(33.3%) patients had serum albumin of >3.5gm/dl. No statistical significance was noted between CD4 count subgroups and serum albumin level <3.5gm/dl and >3.5gm/dl (p value =0.154).

INR varied between 0.8 and 4.3 with a mean of 1.49 $\pm$ 0.57. Maximum number of patients with 80(75.5%) patients had INR >1.1 and 26(24.5%) patients had INR <1.1. In patients with CD4 count <200, 13(28.9%) patients had INR of <1.1 and 32(71.1%) patients had INR of >1.1. In those patients with CD4 count 201-350, 6(24%) patients had INR of <1.1 and 19(76%) patients had INR of >1.1 and patients with CD4 count >350, 7(19.4%) patients had INR of <1.1 and 29(80.6%) patients had INR of >1.1. No statistical significance was noted between CD4 count subgroups and serum INR level <1.1 and >1.1 (p value =0.616).

Out of 106 patients, USG W/A showed fatty liver in 38(35.8%) patients and features of liver parenchymal disease with ascites and hepatomegaly/splenomegaly were seen in 24(22.6%) patients (Figure 7).

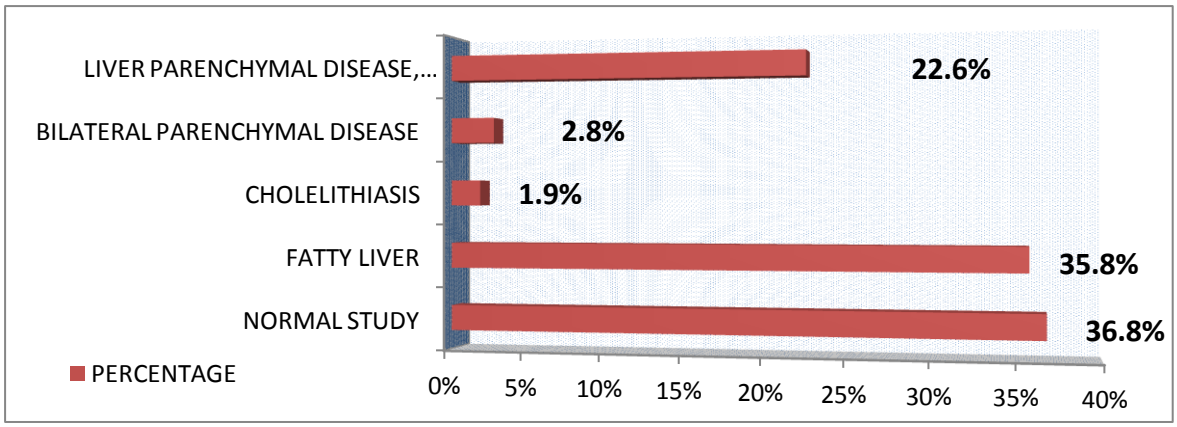

Figure 7: USG W/A finding in HIV infected patients (n=106)

Oral candidiasis was the major opportunistic infection seen in 30(28.3%) patients, followed by cryptococcal meningitis in 5(4.7%) patients, pulmonary tuberculosis in 4(3.8%) patients, tubercular meningitis in 3(2.8%)

patients and intestinal mucormycosis in 1(0.9%) patients. 63(59.4%) patients of the studied populations had no opportunistic infection (Figure 8).

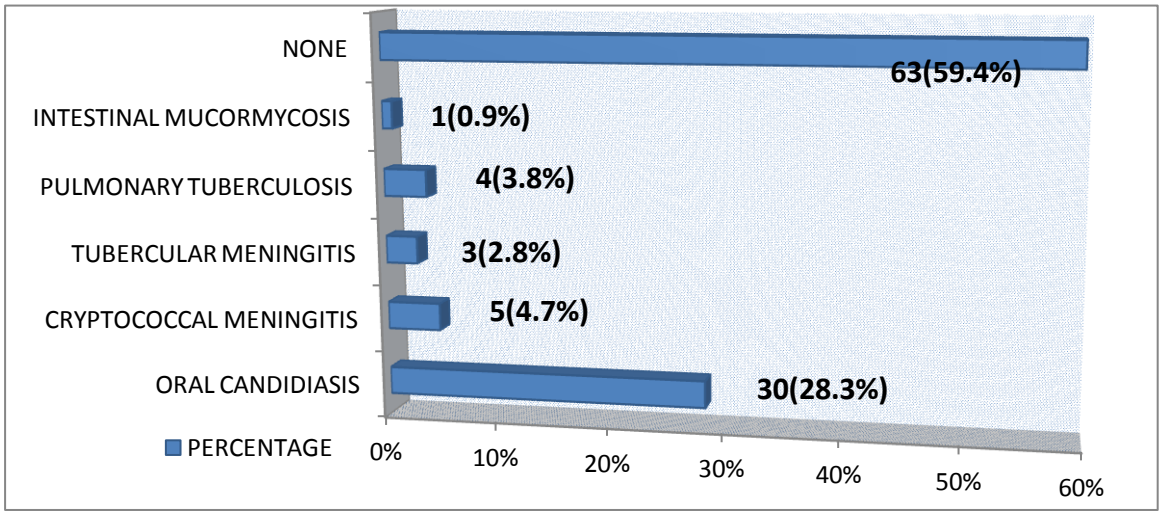

Figure 8: Opportunistic infections in HIV infected patients (n=106)

In the study population of 106 patients, co-infection was seen in 24(22.6%) and 3(2.8%) with hepatitis C and hepatitis B respectively and one (0.94%) patients had co–infected with both hepatitis B and hepatitis C.

IV. DISCUSSION

In this study a total of 106 patients HIV patients were considered. In the study done by Savita M et al[19] fever was the most common symptom 63(63%) followed by abdominal pain 22 (22%s) and pallor was the most common general examination finding in 34 (34%) followed by pedal oedema and icterus in 6(6 %) and 5(5%) numbers of patients respectively. In our study, jaundice was the most common symptom seen in 55(51.90%) patients, followed by fever 37(34.90%) and abdominal distension in 33 (33.10%). Icterus was the major finding seen in 56(52.80%) patients followed by pallor 23(21.7%) and oedema 27(25.5%). Peripheral signs of liver failure were present with ascites seen in 20(18.9%) and splenomegaly in 17(16%) and hepatomegaly in 41(38.7%) patients. In the study done by Ocama P et al[20] patients were categorised into three groups (group 1: <200, group 2: 201-350 and group 3: >350) according to CD4 count. In our study, similar categories of the patients were done, in which patient's liver function test results were correlates with their CD4 counts and its significance. In the study by Ejilemele AA et al[21] out of 129 patients, 113 patients (87.6%) had LFT abnormality, out of which 94 patients (85.5%) had hepatocellular injury, 16 patients (14.5%) had cholestatic liver injury. In our study, 93(87.73%) patients had abnormal liver function test, out of which 37(34.9%) patients had hepatocellular liver injury, 14(13.2%) had cholestatic jaundice and 42(39.6%) had mixed injury type. 13(12.27%) patients had normal liver function test. Thus, our study results showed similarity with the study done by others. In the study conducted by Pathania MS et al[17] hyperbilirubinemia was noticed in 27/247 (10.93%) patients and only 8 patients were icteric (grade 3 in 6 patients and grade 4 in 2 patients). In our study, most of the patients, 63(59.4%) had serum total bilirubin >1 mg/dl with 35(33%) patients had serum total bilirubin >5 mg/dl. In our study, in relation to CD4 count, 25(55.6%) patients had serum total bilirubin <1mg/dl in group 1, 7(28%) and 11(30.6%) in group 2 and 3 respectively (p=0.026), thereby indicating a strong correlation between serum total bilirubin and CD4 count. In the study by Sterling RK et al[22], the prevalence of elevated LFTs were AST (20%), ALT (15%) and ALP (43%). In this study, elevated AST, ALT and ALP were observed in 80(75%), 67(63.23%) and 57(53.8%) patients respectively. In the study done by Pathania MS et al[17] in relation with severity of transaminases, 92/128 (71.87%) patients were in grade 1, 29/128 (22.65%) patients were in grade 2; while significant rise was seen in only 7 patients (grade 3 in 6/128 (4.68%) patients, grade 4 in only one patient (0.78%). In our study majority of the patients had mild to moderate elevation of transaminases, with AST in 30(28.3%) patients were in grade 1, 32(30.2%) patients were in grade 2 which is the majority and 12(11.32%) and 6(5.7%) patients in grade 3 and grade 4 respectively and with ALT, 39(36.8%), 18(17%), 8(7.5%) and 2(1.9%) patients were in grade 1, grade 2, grade 3, grade 4 respectively. In the study by Savita M et al[18] in relation to CD4 count, 40(80%), 18(64.28%) and 9(40.9%) patients in the group 1, group 2 and group 3 respectively had elevated AST and 38(76%), 17(60.71%) and 5(22.72%) patients had elevated ALT in the group 1, group 2 and group 3 respectively. In our study, in CD4 count <200, 32(71.1%) patients and 29(64.4%) patients had AST level and ALT level >50 IU/L respectively. In CD4 count 201-350, 21(84%) patients and 17

(68%) patients had AST and ALT level >50 IU/L respectively. In CD4 count >350, 27(75%) patients and 21(55.6%) patients had AST and ALT level >50 IU/L respectively. No statistical significance correlation (p >0.05) between AST/ALT with CD4 count in our study. In the Joshi KS et al[23] study, serum ALP was abnormal in 86 (84.31%) patients and normal in 16 (15.68%) patients. In our study, out of 106 patients, most of them, 57(53.8%) had ALP level >160 U/L and in relation to severity, majority of them were in grade 2 which was 31(29.2%) and 12(11.3%) were both in grade 1 and grade 3 respectively and only 2(1.9%) had ALP in grade 4. In our present study, in CD4 count <200, 23(51.1) patients had ALP level >160 U/L. In CD4 count 201-350, 14(56%) had ALP level >160 U/L. In CD4 count >350, 20(55.6%) had ALP level >160 U/L. No statistical significance (p>0.05) between ALP and CD4 count. In our study, majority of patients 82(77.4%) had serum albumin <3.5 gm/dl. In a study done by Savita M et al[18] in relation to CD4 count, 20(60%), 16(57.14%), 15(68.18%) patients had serum albumin <3.5gm/dl in CD4<200, CD4–201-350, CD4 >350 respectively. In our study, in relation to CD4 count, 38(84.4%) patient had serum albumin of <3.5gm/dl in CD4 <200. In CD4 count 201-350, 20(80%) patients had serum albumin of <3.5 gm/dl. In CD4 count >350, 24(66.7%)) patient had serum albumin of <3.5gm/dl. No statistical significance (p>0.05) between serum albumin and CD4 count. In this study, patients taking TLE regimen showed majority of liver function tests abnormality in which out of 81 patients taking TLE regimen, 31(38.3%) patients showed mixed type injury followed by hepatocellular injury seen in 30(37%) patients and 10(12.3%) patients had cholestatic hepatitis. 10(12.3%) out of 106 patients showed no liver function tests abnormality. In patients taking other regimen, 11/25 (44%) patients showed mixed type of hepatic injury and 7/25 (28%) and 4/25 (16%) patients had hepatocellular and cholestatic type injury respectively. 3(12%) patients shows no liver function abnormality. There is statistical significance (p<0.02) correlation between serum bilirubin and HAART. In our study, the most common opportunistic infection was oral candidiasis seen in 30(28.3%) of patients, followed by cryptococcal meningitis in 5(4.7%), pulmonary tuberculosis in 4(3.8%) tubercular meningitis in 3(2.8%) and intestinal mucormycosis in 1(0.9%). 63(59.4%) patients of the patients have no opportunistic infection. Majority of opportunistic infections were seen when CD4 <200 with 35(33.02%) patients out of 106 total patients with oral candidiasis being the commonest seen in 25(55.6) patients and cryptococcal meningitis were seen in 4(8.9%) in CD4 <200.

V. CONCLUSION

106 HIV seropositive patients were subjected to detailed clinical examination and investigation. Liver profiles were studied in great detail along with ultrasound of whole abdomen. 93(87.73%) patients had abnormal liver function test of which 37(34.9%) patients had hepatocellular liver injury, 14(13.2%) had cholestatic jaundice and 42(39.6%) had mixed injury type. Majority of the patients 81(76.4%) were taking TLE regimen. Patients taking TLE regimen showed majority of liver function abnormality in which out of 81 patients taking TLE regimen, 31(38.3%) patients showed mixed type injury followed by hepatocellular injury type seen in 30(37%) patients. 10(12.3%) patients had cholestatic jaundice. Co-infection was seen in 24(22.6%) and 4(3.8%) with hepatitis C and hepatitis B respectively and one (0.94%) had co-infection with both hepatitis C and hepatitis B and only one (0.94%) patient was found to have HCC. Liver parenchymal diseases (cirrhosis) were mainly seen in patients with hepatitis B and hepatitis C co-infection. Oral candidiasis was the most common opportunistic infection seen in 30(28.3%) of patients, followed by cryptococcal meningitis in 5(4.7%), pulmonary tuberculosis in 4(2.8%) tubercular meningitis in 3(2.8%).To summarize, liver function abnormalities were common in patients living with HIV and in patient taking HAART, however majority of them had mild to moderate form of severity. Severe or life threatening were commonly seen in patients co-infection with HBV or HCV or alcohol user. The finding indicates that HIV patients undergoing ART are at high risk of liver injury, and there is a need for a regular clinical follow-up of the patients. Screening of hepatitis B and hepatitis C virus is another important step in the management of HIV patients since HBV or HCV shared the same route of transmission of infection with HIV and co-infection with HBV/HCV complicates the clinical course of HIV in infected patients, thus adversely affecting treatment of HIV patients. Screening of the HIV patients for the opportunistic infection especially in patients with low CD4 count and alcohol de-addiction counselling is also an another important step in the management of HIV patients.

ACKNOWLEDGEMENT

The authors would like to thank Medical Superintendent, RIMS Imphal for the kind permission to undertake the study. We also extend our heartiest thanks and gratitude to Programme Director, CoE ART Centre, RIMS Imphal and Research Ethics Board, RIMS Imphal for allowing us to conduct the study. We are also thankful to all the patients for their valuable cooperation.

REFERENCES

[1]. Cappell MS. Hepatobiliary manifestations of the acquired immune deficiency syndrome. Am J Gastroenterol 1991 Jan;86(1):1-15.

[2]. Lefkowitch JH. Pathology of AIDS-related liver disease. Dig Dis 1994 Nov-Dec;12(6):321-30.

[3]. Palella FJJ, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. HIV Outpatient Study Investigators. N Eng J Med 1998 Mar;338(13):853-60.

[4]. Weber R, Sabin CA, Friis-Moller N, Reiss P, El-Sadr WM, Kirk O, et al. Liver-related deaths in persons infected with the human immunodeficiency virus: the D:A:D study.Arch Intern Med 2006 Aug;166(15):1632-41.

[5]. Palella Jr FJ, Baker RK, Moorman AC. Mortality in the highly active antiretroviral therapy era: changing causes of death and disease in the HIV outpatient study. J Acquir Immune Defic Syndr 2006 Sep;43(1):27-34.

[6]. Smith C, Sabin CA, Lundgren JD. Factors associated with specific causes of death amongst HIV-positive individuals in the D: A: D Study. AIDS 2010 Jun;24(10):1537–48.

[7]. Bica I, McGovern B, Dhar R, Stone D, McGowan K, Scheib R, Snydman DR. Increasing mortality due to end-stage liver disease in patients with human immunodeficiency virus infection. Clin Infect Dis 2001 Feb;32(3):492-7.

[8]. Castellares C, Barreiro P, Martín-Carbonero L, Labarga P, Vispo ME, Casado R, et al. Liver cirrhosis in HIV-infected patients: prevalence, aetiology and clinical outcome. J Viral Hepat 2008 Mar;15(3):165-72.

[9]. Richardson J, Melester D. Treatment AIDS. Clin Liver Dis 2003;7:475-99.

[10]. Ogedegbe AO, Sulkowski MS. Antiretroviral-associated liver injury. Clin Liver Dis 2003 May;7(2):475-99.

[11]. Nunez M, Lana R, Mendoza JL, Martın-Carbonero, Soriano V. Risk factors for severe hepatic injury after introduction of highly active antiretroviral therapy. J Acquir Immune Defic Syndr 2001 Aug;27(5):426-31.

[12]. Dieterich DT, Robinson PA, Love J, Stern JO. Drug-induced liver injury associated with the use of nonnucleoside reverse-transcriptase inhibitors. Clin Infect Dis 2004 Mar;38(suppl2):S80-9.

[13]. Wnuk AM. Liver damage in HIV-infected patients. Med Sci Monit 2001 Aug;7(4):729-36.

[14]. Pol S, Lebray P, Vallet-Pichard A. HIV infection and hepatic enzyme abnormalities: intricacies of the pathogenic mechanisms. Clin Infect Dis 2004 Mar;38(suppl2):S65-72.

[15]. Bonacini M. Hepatobiliary complications in patients with human immunodeficiency virus infection. Am J Med 1992 Apr;92(4):404-11.

[16]. India, UNGASS country report, 2010 [Internet]. Available from: http://data.unaids.org/pub/report/2010/india_2010_country_progress_report_en.pdf. Accessed 30 July, 2017.

[17]. Pathania MS, Kaur N, Kumar S, Sashindran VK, Puri P. A cross-sectional study of liver function tests in HIV-infected persons in Western India. Med J Armed Forces Ind 2017 Jan;73(1):23-8.

[18]. Division of AIDS (DAIDS). Table for Grading the Severity of Adult and Pediatric Adverse Events Version 2.0 November 2014.

[19]. Savita M, Singh RB, Vengadakrishnan K, Damodharan J. Liver function abnormalities in human immunodeficiency virus positive individuals and its correlation with disease severity. Int J Sci Stud 2015 Nov;3(8):15-18.

[20]. Ocama P, Katwere M, Piloya T, Feld J, Opio KC, Kambugu A, et al. The spectrum of liver diseases in HIV infected individuals at an HIV treatment clinic in Kampala, Uganda. Afr Health Sci 2008 Mar;8(1):8-12.

[21]. Ejilemele AA, Nwauche CA, Ejele OA. Pattern of abnormal liver enzymes in HIV patients presenting at a Nigerian Tertiary Hospital. Niger Postgrad Med J 2007 Dec;14(4):306-9.

[22]. Sterling RK, Chiu S, Snider K, Nixon D. The prevalence and risk factors for abnormal liver enzymes in HIV positive patients without hepatitis B or C coinfections. Dig Dis Sci 2008 May;53(5):1375-82.

[23]. Joshi KS, Shriwastav RR. Highly active antiretroviral therapy and changing spectrum of liver diseases in HIV infected patients. Int J Res Med Sci 2016 Aug;4(8):3125-9.

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