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BIOCHEMICAL ASSESSMENT OF LIVER ENZYMES IN IMMUNOCOMPROMISED SUBJECTS – HIV/AIDS

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ABSTRACT

Aim: This study aims at the estimation of serum alkaline phosphatase (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma glutmyl transferase (GGT) in Human immunodeficiency virus (HIV) and/or Acquired immune deficiency syndrome (AIDS) patients in parts of Edo State, Nigeria.

Methods: A total of 50 HIV/AIDS positive patients and 50 HIV/AIDS negative subjects as control were studied from January to September, 2014. The enzymes were assayed using standard biochemical methods.

Results: The mean ±SD of alkaline phosphatise for HIV/AIDS patients was significantly increased ($p<0.005$) when compared with the control subjects. There was no significant increase ($p>0.05$) in the mean ±SD of ALP, AST, GGT and CD4 of female HIV/AIDS positive patients when compared with male subjects. Also, there was no significant increase ($p>0.05$) in the mean ±SD of ALT, AST and GGT of male HIV/AIDS positive patients when compared with male control subjects. There was a significant increase ($P<0.05$) in the mean ±SD of ALP of male HIV/AIDS positive when compared to male control subjects. There was a significant increase ($p<0.05$) in the mean ±SD of ALP and ALT of female HIV/AIDS positive when compared with female control subjects.

Conclusion: This study has suggested that specific estimation of ALP and ALT should be carried out on HIV/AIDS patients before any kind of treatment.

Key: Assessment, Liver, Enzymes, HIV/AIDS.

INTRODUCTION

Acquired immune deficiency syndrome (AIDS) has become the focus of much global concern and is reaching epidemic proportion in some parts of the world (Benjamin and Leskowitz, 1993). It is a fatal illness caused by retrovirus known as the Human immune deficiency virus (HIV) which breaks down the body immune system, leaving the patient vulnerable to host of life threatening opportunistic infections (Khiangte et al., 2007). Human immune deficiency virus patients are often associated with aberration of biochemical parameters in liver disease (Kumar and Sathian, 2011). Raised alanine amino transferase (ALT) has been studied in HIV and tuberculosis infected individuals, particularly in high income settings (Kovari et al., 2010). Previous studies have shown a link among others the body mass index (BMI), high cholesterol levels, diabetes mellitus and liver disease in HIV mono-infection in high income countries (Dallapiazza et al., 2010). It indicates that lifestyle may play a significant role in the development of liver disease amongst HIV infected individuals. The HIV-positive individuals are prone to malnutrition due to inadequate dietary intake, nutritional losses, metabolic changes, and increased requirement for both macro and micro nutrients (Macallan, 1999 and WHO, 2003). The critical role of nutritional support and highly active antiretroviral therapy (HAART) in the survival

of HIV infected individuals is imperative (Knox et al., 2003 and Tang et al., 2002). High-income countries of the world recommend nutritional support as a part of the care provided to HIV-positive individuals (PADA 1990). In Africa and other low-income countries including Nigeria, there is lack of support for HIV-positive individuals as a result of stigmatization and discrimination (FMOH, 2006), ultimately contributing to reduced food availability and inadequate dietary intake for these patients. Previous studies have shown that hepatic cells, Kupffer cells, differentiated tissue macrophages that reside in the liver, can be infected by HIV in vivo (Cao et al., 1992 and Hufert et al., 1993). Also, in vitro studies have shown that HIV infection of primary Kupffer cells leads to productive infection (Gendrault et al., 1991 and Schmitt et al., 1990). Therefore keeping in view of the biochemical abnormalities associated with HIV, this study is inclined to assess liver enzymes in HIV-positive patients in a bid to further enhance proper management and treatment of HIV/AIDS especially in low income countries.

MATERIALS AND METHODS

Area of Study

This study was carried out in the Department of Human Virology, Irrua specialist Teaching Hospital, Irrua (ISTH) in Edo state, Nigeria. A total of 50 HIV/AIDS positive subjects and 50 HIV/AIDS negative subjects as control were recruited into the study from January to September, 2014.

Study Population/Sample Size

The population consists of immune compromised (HIV/AIDS) males or/and females attending Irrua Specialist Teaching Hospital. The sample size was determined using the statistical formula

$$n^{=1.96II\ (1-II)}$$
$$e^2$$

n=sample size.
II=Literature prevalence rate of attribute in population.
E=error margin accept

Sample Collection

Five millilitres of venous blood were collected from each of the subjects visiting the Department of Human Virology, Irrua Specialist Teaching Hospital, Irrua (ISTH) in Edo State into plain containers after informed consent. The samples were centrifuged at 11,000 rpm for 5 minutes, and the serum separated into a plain containers. All samples were analysed immediately after collection. Patients for HIV/AIDS treatment were classified according to their CD4 lymphocytes count.

Ethical Approval

This was obtained from the Ethical Committee, Irrua specialist teaching hospital (ISTH).

Sample Analysis

Blood samples were analyzed for liver enzymes (ALP, ALT, AST and GGT) using standard biochemical methods of Tiez (1983). The CD4 count was estimated by Partec Cyflow Counter of Partec Flomax Software (2005).

Statistical Analysis

The data generated from this study were analysed using SPSS statistical package to determine the mean, standard deviation as well as the comparison of the test with the control using student's t-test at 95% confidence limit.

RESULTS

Table 1 shows the mean $\pm$SD of alkaline phosphatise (ALP), alanine amino transferase (ALT), Aspartate amino transferase (AST), and Gama glutmyl transferase (GGT) in both HIV/AIDS and control subjects. There was no statistical significant difference ($P>0.05$) in the values of ALT;15.1$\pm$14.2IU/L, AST; 16.2$\pm$12.9IU/L and GGT;15.8$\pm$7.7IU/L of HIV/AIDS when compared with control subjects values of 15.7$\pm$4.4IU/L, 15.8$\pm$3.8IU/L and 16.8$\pm$5.6IU/L respectively. There was significant increase ($p<0.05$) in the value of alkaline phosphatise ALP;73.3$\pm$40.9IU/L of HIV/AIDS when compared with the control subjects of 27.6$\pm$6.1IU/L. Table 2 shows the mean$\pm$SD values of alkaline phosphatise (ALP), Alanine amino transferase (ALT), Aspartate aminotransferase (AST), and Gamma glutmyl transferase (GGT) and CD4 count of female and male HIV/AIDS subjects. There was no significant difference ($p>0.05$) in the values of ALP;78.5±45.4IU/L,AST;15.1±11.2IU/L,GGT; 15.4±7.5IU/L and CD4;154.3±108.1IU/L of female HIV/AIDS when compared with male subjects values of 61.1±25.2UI/L, 18.8±16.5IU/L, 16.6±8.1IU/L and 181.1±108.6IU/L respectively. There was a significant increase ($p<0.05$) in the value of

ALT; 11.7±9.3IU/L of female HIV/AIDS when compared with the male subjects value of 22.8±20.1IU/L. Table 3 shows the mean±SD values of alkaline phosphatise (ALP), alanine amino transferase (ALT), aspartate aminotransferase (AST) and Gamma glutmyl transferase (GGT) of HIV/AIDS and male control subjects. There was no significant increase ($p>0.05$) in the values of ALT;22.8±20.1IU/L, AST;18.8±16.5IU/L and GGT;16.6±8.1IU/L of male HIV/AIDS when compared with male control subjects values of 15.6±4.2IU/L, 16.3±4.4IU/L and 18.6±6.4IU/L respectively. There was a significant increase ($p<0.05$) in the value of ALP;61.1±25.2IU/L of male HIV/AIDS when compared to male control subjects value of 27.6±6.4IU/L. Table 4 shows the mean±SD values of alkaline phosphatise (ALP), alanine aminotransferase (ALT), aspartate aminotransferase (AST) and Gamma glutmyl transferase (GGT) of female HIV/AIDS and female control subjects. There was a statistically significant increase ($p<0.05$) in the values of ALP;78.5±45.4IU/L and ALT;11.7±9.3IU/L of female HIV/AIDS when compared with female control subjects of values of 27.5±5.9IU/L and 15.8±4.7IU/L respectively. There was no significant increase ($p>0.05$) in the value of AST;15.1±11.2IU/L and 15.4±7.5IU/L of female HIV/AIDS when compared to female control subjects value of 15.2±3.1IU/L and 14.9±3.9IU/L respectively.

Table 1: Serum ALP, ALT, AST and GGT levels of HIV/AIDS and the control subjects

Parameters (IU/L)	HIV/AIDS mean±SD N=50	Controls mean±SD N=50	T-value	P-value
ALP	73.3±40.9*	27.6±6.10	7.8	P<0.05
ALT	15.1±14.2	15.7±4.4	0.29	P>0.05
AST	16.2±14.2	15.8±3.8	0.21	P>0.05
GGT	15.8±7.7	16.8±5.6	0.74	P>0.05

Table 2: Serum ALP, ALT, AST, GGT and CD4 levels of HIV/AIDS females and HIV/AIDS male subjects

Parameters (IU/L)	Female HIV/AIDS mean±SD N=35	Male HIV/AIDS mean±SD N=15	T-value	P-value
ALP	78.5±45.4	61.1±25.2	1.39	P>0.05
ALT	11.7±9.3*	22.8±20.1	2.69	P<0.05
AST	15.1±11.2	18.8±16.5	0.92	P>0.05
GGT	15.4±7.5	16.6±8.1	0.51	P>0.05
CD4 COUNT	154.3±108.1	181.1±108.6	0.80	P>0.05

Table 3: Serum ALP, ALT, AST and GGT levels of HIV/AIDS male and male control subjects

Parameters (IU/L)	Male HIV/AIDS mean±SD N=15	Male Controls mean±SD N=25	T-value	P-value
ALP	61.1±25.2*	27.6±6.4	6.36	P<0.05
ALT	22.8±20.1	15.6±4.2	1.74	P>0.05
AST	18.8±16.5	16.3±4.4	0.72	P>0.05
GGT	16.6±8.1	18.6±6.4	0.86	P>0.05

Table 4: Serum ALP, ALT, AST and GGT levels of HIV/AIDS Female and Female Control subjects

Parameters (IU/L)	Female HIV/AIDS mean±SD N=35	Female Controls mean±SD N=25	T-value	P-value
ALP	78.5±45.4*	27.5±5.9	5.57	P<0.05
ALT	11.7±9.3*	15.3±4.7	2.02	P>0.05
AST	15.1±11.2	15.2±3.1	0.04	P>0.05
GGT	15.4±7.5	14.9±3.9	0.30	P>0.05

DISCUSSION

Elevation of liver enzymes is frequent in HIV/AIDS infected patients, especially those on Highly Active Antiretroviral Treatment (HAART) as earlier stated by Lefkowitch (1994) and Cappell (1991). Although reports of liver enzymes elevation are frequent, the analysis of these events is limited, because HIV/AIDS infected patients have several risk factors for biochemical abnormalities and a

precise etiology is rarely clearly defined. The present study has shown a significant increase in alkaline phosphatise in female and male HIV/AIDS infected patients when compared with controls. This is contrary to the findings of Kovari et al., (2010) who reported elevated alanine aminotransferase level in HIV and Tuberculosis infected individuals in the absence of hepatitis C and B virus co-infections in their study. Although there was a significant increase in alanine aminotransferase level in female HIV/AIDS patients in this study but there was no significant difference in all the liver enzymes estimated in female HIV/AIDS patients when compared with the male patients. However, the increased levels of alkaline phosphatise and alanine aminotransferase observed may be attributed to the life styles of the inhabitants of the studied area .This might have played a significant role in the development of liver disease among the immune compromised subjects. Dallapiazza et al., (2010) in their study stated that chronic elevation of alanine aminotransferase level was associated with high body mass index, frequent alcohol consumption, and cumulative exposure to combination of antiretroviral therapy, especially to stavudine. This is inconsonance with our findings because the subjects enrolled into this study were confirmed HIV/AIDS positive on antiretroviral therapy. Liver enzymes elevations after the introduction of an antiretroviral drug mainly correspond with the development of drug-related hepatitis that revolves after discontinuation of the causative drug. In co-infected patients with underlying liver disease, the diagnostic and management of these biochemical abnormalities are more difficult. This study further shows that increased level of alkaline phosphatase could be due to apoptosis of hepatocytes resulting from HIV attack on CD4 T cell of the liver as earlier stated by Cao et al., (1992) and Hufert et al., (1993) that hepatic cells, Kupfer cells and differentiated tissue macrophages that reside in the liver can be infected by HIV in vivo. In addition, antiretroviral drugs have the capacity to increase alkaline phosphatise level in HIV/AIDS; therefore it is suggested that specific estimation of ALP and ALT should be carried out on HIV/AIDS patients before any kind of treatment.

REFERENCES

Benjamini E, Leskowitz S (1993): Immunology. A short course. Wiley-liss Inc. pp: 224-230.

Cappel MS (1991): Hepatobillary manifestation of the acquired immune deficiency syndrome. Am J Gastroenterol. 86:1-15.

Cao YZ, Dieterich D, Thomas PA, Huang YX, Mirabile M, Ho DD (1992): Identification and quantitation of HIV-1 in the liver of patients with AIDS. Pp. 65-70.

Dalla PM, Amorosa VK, Localio R, Kostman JR, Lo Re V (2010): Prevalence and risk factors for significant liver fibrosis among HIV mono infected patients. BMC Infect Dis. 10:116.

Federal Ministry of Health (2006): National HIV/AIDS and Reproductive survey 2005. Abuja. Nigeria: Federal Ministry of health.

Gendrault JL, steffan AM, Schmitt MP, Jaeck D, Aubertin AM, Kirn A (1991): Interaction of cultured human Kupffer cells with HIV infected CEM cells: an electron microscopic study. Pathology. 59:223-226.

Hufert FT, Schmitz J, Schreiber M, Schmitz H, Racz P, von laer DD(1993): Human Kupffer cells infected with HIV-1 in vivo. J Acquir Immune Defic Syndr 6:772-777.

Khiangte L, Vidyabati Rk, Singh MK, Bilasini S, Devi T, Rajen S, Gyaneshwar W, Singh A (2007): Study of serum lipid profile in human immunodeficiency virus(HIV) infected patients JIACM. 8(4):307-11.

Knox TA, Zafonte-Sanders M, Fields-Gardner C, Moen K, Johansen D, Paton N (2003): Assessment of nutritional status, body composition and human immunodeficiency virus-associated morphological changes. Clin Infect Dis 36: S63-S68.

Kovari H, Ledergerber B, Battegay M, Rauch A, Hirschel B, Foguena Ak, Vernazza P, Bernasconi E, Mueller NJ, Weber R(2010): Incidence and risk factors for chronic elevation of alanine aminotransferase levels in HIV-infected persons with hepatitis B or c virus co-infection. Clin Infect Dis. Pp. 502-511.

Kumar A, Sathian B (2011): Assessment of lipid profile in patients with human immunodeficiency virus (HIV/AIDS) without antiretroviral therapy. Asian pacific Journal of Tropical Disease. (1):24-27.

Leftowitch JH (1994): Pathology of AIDS related liver disease. Dig Dis. 12: 211-30.

Macallan DC (1999): Wasting in HIV infection and AIDS. J Nutr 129: 238S-242S.

Nemechek P, Polsky B, Gottlieh MS (2000): Treatment guideline for HIV associated wasting. Mayo Clin Proc 75: 386-394.

Palmer C (2003): HIV treatments and highly active antiretroviral therapy. Austr Prescr 26:59-61.

Position of the American dietetic association (1989): Nutrition intervention in the treatment of HIV. J Diet Association 92; 477-478.

Shafer RW, Vuilton DA (1999): HAART for the treatment of infection with HIV-1. Biomedicine and Pharmacotherapy 53:73-86.

Schmitt MP, Gendrault JL, Schweitzer C, Steffan A M, Beyer C, Royer C, Jaeck D, Pasquali JL, Kirn A, Aubertin AM (1990): Permissivity of primary cultures of human Kupffer cells for HIV-1.AIDS Res Hum Retroviruses. 6:987-991.

Tang AC, Hong F, Saiman Y, Wang C, Ozkok DM, Mosoian A, Chen P, Chen BK, Klotman ME, Bansal MB (2002): Human immunodeficiency virus (HIV)-1 infects human hepatic stellate cells and promotes collagen 1 and monocyte chemo attractant protein-1 expression: implications for the pathogenesis of HIV/Hepatitis C virus induced liver fibrosis. Hepatology, 52:612-622.

World Health Organization (2003) Nutrient Requirements for people living with HIV/AIDS: Report of a Technical Consultation. Geneva.