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Lipid Profile and Some Liver Enzymes in HIV/AIDS Patients on Antiretroviral Therapy (ART) in University of Abuja Teaching Hospital.

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Abstract

Hepatotoxicity is one of the most serious complications in patients using antiretroviral therapy (ART). Also, it has been documented that abnormal lipid profile was observed in patients placed on ART by investigators in Europe and Asia. This study was carried out to find out if similar finding is obtained in patients on ART in University of Abuja Teaching Hospital (UATH). One hundred and fifty-three participants were involved in the study which consists of fifty-two HIV/AIDS patients receiving ART, fifty-one HIV/AIDS patient who ART-naive and fifty apparently healthy HIV negative subjects where observed as control. Lipid profile and some liver enzymes were analysed using conventional methods. The lipid parameters are; total cholesterol, Triglycerides, High Density Lipoprotein (HDL)-Cholesterol, Low Density Lipoprotein (LDL)– Cholesterol, Very Low-Density Lipoprotein (VLDL) – cholesterol. The enzymes determined were Alanine amino transferase (ALT), Aspartate amino transferase (AST) and Alkaline phosphatase (ALP). In the study significant increase was observed in T. Cholesterol, HDL-cholesterol and LDL – cholesterol (p<0.001, <0.006 and <0.001) in HIV/AID study group respectively. However, Triglyceride and VLDL – Cholesterol values in study group showed no significant difference when compared with that of the control group (p>0.05). The mean values of ALT, AST and ALP enzymes activity of (HIV/AIDS) patients on ART, showered significant difference (p<0.001) when compared with the ART- naïve HIV/AIDS patients and HIV-negative control group. The mean activity in the ART- naïve HIV/AIDS patients show significant difference when compared with the HIV-negative control group (p< 0.001), but however, ALP showed no significant difference (p>0.05). In the study, abnormal lipid profile and liver enzyme were obtained in patient receiving ART, we suggest that ART regimen should be administered with caution to ensure little or no side effect on the liver hepatocytes.

Keyword: *Lipid profile, Liver enzymes, HIVAIDS, Antiretroviral Therapy (ART)*

Introduction

Acquired Immunodeficiency Syndrome (AIDS), is a fatal illness caused by a retrovirus known as the, human immunodeficiency virus (HIV) which breaks down the immune system, leaving the patient vulnerable to a host of life threatening opportunistic infections, neurological disorder and unusual malignancies (Grunfeld *et al.*, 1991).

Infection can increase triglyceride (TG) levels by decreasing the clearance of circulating lipoproteins, a process considered to be the result of reduced lipoprotein lipase (LPL) or by stimulating hepatic lipid synthesis through

increases in either hepatic fatty acid synthesis or re- esterification of fatty acid (FAA) derived from lipolysis (Grunfeld et al, 1991). Hypertriglyceride was the first dyslipidaemia to be reported in HIV infected patients, but other lipid abnormalities such as hypocholesterolaemia or High-Density Lipoprotein-cholesterolaemia have been reported (Grundeld *et al.*, 1992).

The first case of HIV/AIDS in Nigeria was reported in 1986, since then the number of people living with HIV or AIDS (PLWHA) has steadily increased and the epidemic moved into generalized state with an increase in sero prevalence from 1.8% in 1991 to 5.8% in 2001 and a slight drop to 4.4% (National Guideline, 2007). It is estimated that Nigeria has 2.86 million infected persons, the third highest in the world. Estimates also show a cumulative death of 1.45 million people. The high burden of the disease with its associated morbidity and mortality despite the concerted efforts of the Federal Government of Nigeria and its international and local partners to combat the disease continues to constitute a major public health concern for the country. The epidemic has impacted all segments of the society, marked reducing gains in life expectancy which Nigeria had achieved over the past four decades since her independence. Also, Nigeria guideline documented that it has further weakened and threatened to overwhelm the Nigeria health care system, increased the number of orphans and increased the cost of achieving set developmental goals by decreasing size of the workforce, affecting mainly adults in their most productive years of life (15-60 years). They stated that the high manpower intensive sectors of the economy are the most affected including the agricultural, educational and health sectors. These effects unless controlled, will continue to undermine the quality of life of Nigerians.

In response to the challenge of reversal in the gains in development and life expectancy and the fact that about 3000,000 -700,000 PLWHA were estimated to be in need of treatment based on the sero survey report of 2001, the Federal Government of Nigeria, as part of its care and support strategies initiated the National Antiretroviral Drug Access Programmed in 2002 in 25 sites across the country. The goal was to provide access to affordable ARV drugs thereby improving the health and quality of life of PLWHA in Nigeria, in order for them to meaningfully contribute to the sustainable development of the Nation (Audu *et al.*, 2007).

Specifically, the program was to provide immediate access to ART, fully utilize the capacity of the current infrastructure for a coordinated care agenda and develop an environment that would support a broader access to ART across the nation through the creation of an enabling environment for long-term collaboration between the Nigeria Government and other partners. An ART Committee was inaugurated to guide the implementation of the programmed. This committee provides technical support for the development of the first ART guideline, which was produced by the FMOH in 2004 to equip caregivers to manage patients appropriately in all tiers of our health care system (Grunfeld *et al.*, 1991).

The Nigeria Government fully committed to increasing access to treatment developed a scale-up plan targeting treatment for one million PLWHA by 2009 and universal access by 2010. Appreciable progress has been made and there are over 150 ART sites nationwide supported by funds provided by Global fund to

fight AIDS, Tuberculosis and Malaria (GFATM), the world Bank and the U.S President's Emergency Plan for AIDS Relief (PEPAR). In addition, faith based and private partners are also providing services. In spite of these, there remains a monumental gap to be bridged.

An increasing challenge today is the need to standardize treatment to ensure the highest quality of care, with current advances in technology and better understanding of the infection, case management of HIV and AIDS will continue to improve and guidelines on HIV and AIDS care treatment will continue to be subject to regular review as indications emerge from scientific research and advancement. The Nigeria ART guideline has been updated based on literature review and relevant local experiences and is meant for the treatment of adults and adolescents. It is hoped that it will provide relevant, simplified but adequate information required for the effective management of our patients. It is also expected that the Nigeria ART guideline will assist in building capacity among clinicians who have the primary responsibility of managing the patients. The use of the guideline will prevent or curtail the emergence of drug resistance as a result of inappropriate and irrational use of ART.

Justification/ Rationale for the Study

Hepatotoxicity is one of the most serious complications in patients on Antiretroviral Therapy (ART), (Prakash *et al.*, 2001). It has also been documented that abnormal lipid profile was observed in patients placed on Antiretroviral Therapy. This observation was made by investigator in Europe and Asia (Rogowska and Borzuchowska, 1991). This study was carried out to determine the effect of ART therapy on the lipid profile and some liver enzymes of HIV/AIDS patients.

Material and Method

Study Area

The study was carried out in the University of Abuja Teaching Hospital Gwagwalada Abuja, Nigeria.

Subject

One hundred and fifty-three participants were involved in the study which consisted of fifty-two HIV/AIDS patients receiving Antiretroviral Therapy (ART), fifty- one HIV positive ART -naive and fifty apparently healthy subjects who served as control group.

Sample Collection

Five millilitres of blood sample were drawn from each of the subject after a 12 hour fast. The samples were refrigerated at the temperature of $4^{O}C$ until analysis.

Study Design

This study was a hospital- based case control analytical study.

Ethical Approval

Ethical approval was sought and obtained from the ethical committee of the University of Abuja Teaching Hospital.

Inclusion and exclusion criteria

Inclusion criteria included; age (18-65 years), confirmed HIV infection, ART use and willingness to offer written informed consent after counselling to participate in the study. Participants who did not meet the inclusion criteria (age < 18 years and above 65 years, HIV positive ART-naïve, HIV-negative and HIV positive ART competent who refused to

offer a written informed consent to participate in the study were excluded from the study.

Methodology:

Determination of total cholesterol (TC) was carried out as described by Trinder (1969), triglycerides as described by Bucolo (1973), high density lipoprotein as described by Friendwald et al. (1972), Alanine Aminotransferase (AIT) as described by Reitman (1937), Aspartate Aminotransferase (AST) as described by Reitman (1957) and Alkaline Phosphatase (ALP) as described by Englehardt (1970).

Statistical Analysis

Data was statistically analyzed using Epi info 3.5.1 and significance was expressed as p-value of ≤0.05. Correlation was found out by using regression analysis.

Results

The age distribution of participants in the control and study group is represented in table 1. The distribution in control group and study group is represented in table 2. The values of lipid profile in the control and HIV patients not on ART (study group 1), are represented in table 3. The values of lipid profile in the control and patients on ART (study group 2) are represented in table 4. The values of lipid profile in study group 1 and is group 2 is represented in table 5. The value of liver enzymes in control and study group 1 is represented in table 6. The value of liver enzymes in the control and study group 2 is represented in table 7. The values of liver enzymes in study group 1 and study group 2 is represented in table 8. The correlation between lipid profile parameters is represented in table 9. The correlation between lipid profile enzymes parameters is represented in table 10.

To assess the possible role of Antiretroviral therapy on lipid concentration, we first compared triglycerides, total between cholesterol, HDL-cholesterol, VLDL cholesterol values between groups of the apparently healthy which serve as control, and the HIV/AIDS subjects who are on Antiretroviral Therapy (ART) study group 2. It is observed that HIV/AIDS subjects who are ART have lower total cholesterol, HDL cholesterol, LDL-cholesterol values. While there was significant increase in the value of triglyceride VLDL cholesterols values.

In this study, a total of 153 individuals aged 18-65 years participated in the study. Majority of the HIV-positive subjects on ART 17 (33%) were in the 26-30 years age group followed by the 36-40 years age group 12 (23.5%). It is observed that age 26-40yrs is the highest hit with HIV diseases.

It was observed that 15 (28.9%) of the ART-naïve HIV patients fall within the age bracket (36-40yrs), while 13 (25%) were in the (23-30 years) age group.

Table 1: Age Distribution of Participants in the Control and Study Group

Age Groups (Years)	HIV-Neg	HIV-Pos ART -Naive	HIV-Pos ART Competent
20-25	2(4%)	4(8%)	5(10%)
26-30	12(24%)	13(25%)	17(33%)
31-35	5(10%)	7(13%)	10(20%)
36-40	13(26%)	15(28.9%)	12(23.5%)
41-45	4(8%)	9(17%)	4(8%)
46-50	5(10%)	3(6%)	1(2%)
51-55	3(6%)	1(2%)	1(2%)
56-60	6(12%)	0(0%)	1(2%)
>60	0(0%)	0(0%)	0(0%)
Total	50(100%)	51(100%)	52(100%)

Key
% = Percentage, Pos = Positive, Neg = Negative

Gender distribution of the control group and study groups

The study consists of male and female in both the control and the study groups. In the HIV - negative control groups 23 (46%) are made up of the male while 27 (54%) were made up of females. Among HIV positive ART-naïve group, 28 (54.9%) were male while 23 (46%) were females. Among the HIV-positive ART competent subjects 28 (53.8%) were males while 24 (46.2%) were female.

Table 2: Gender Distribution in the Control and Study Groups

Gender	HIV-Neg	HIV-Pos ART -Naive	HIV-Pos ART Competent
Male	23(46%)	28(54.9%)	28(54.9%)
Female	27(54%)	23(45.1%)	23(45.1%)
Total	50(100%)	51(100%)	51(100%)

Table 3 show the values of the lipid profile in the control and study group1 (HIV subjects not on ART). The result shows that the value of total cholesterol in the HIV negative control group was significantly higher (3.99± 0.69mmol/L) compared to the total cholesterol of HIV positive ART- naïve participants (2.02± 0.79mmol/L) $p<0.05$. The mean values of triglyceride of the HIV negative control group was significantly lower (1.02± 0.31mmol/L) compared to that of the HIV positive ART-naïve participants, (2.67± 0.93mmol/L) $p<0.001$. The value of triglyceride in the HIV positive ART- competent subjects (3.86± 0.74mmol/L) was significantly higher that of HIV negative control group ($p<0.001$)

The mean value of HDL-cholesterol of the HIV negative control group was significantly higher than that of HIV positive ART- naïve

participants (2.88± 0.29mmol/L versus 1.98± 0.26mmol/L) respectively (p <0.001). There were no statistically significant differences in the mean value of LDL-cholesterol of the HIV negative control group and that of HIV positive ART- naïve participants (0.75± 0.5mmol/L versus 0.85± 0.72mmol/L) respectively (p >0.05). The mean values of VLDL-cholesterol of the H.

IV negative control group control group was significantly lower compared to that of the HIV positive ART- naïve participants (0.38± 0.26mmol/L versus 0.54± 0.07) respectively (p <0.05).

Table 3: Mean of lipid profile among the HIV negative control group and HIV positive ART-naïve participants

Parameters (mmol/L,)	HIV-Neg (n= 50)	HIV-Neg ART-Naïve (n= 51)	Z- score	p- value
T-cholesterol	3.97± 0.69	3.02± 0.79	0.34	0.73
Triglycerides	1.02± 0.31	2.67± 0.93	1.10	<0.001
HDL	2.88± 0.29	1.98± 0.26	1.52	0.13
LDL	0.75± 0.51	0.85± 0.72	0.86	>0.001
VLDL	0.38± 0.26	0.58± 0.07	0.57	<0.001

Table 4 shows the values of lipid profile in the control group and HIV/AIDS subjects on ART. The results show that there was a significant difference when the results of the study of HIV/AIDS subjects on ART was compared with that of the control group. The mean value of total cholesterol of HIV/AIDS subjects on ART was 2.54 ± 1.30 when compared with that of the control group 3.97±0.69 mmoI/L (p<0.001). The mean value of triglycerides among the HIV/AIDS subjects on ART was significant higher than that of the HIV-negative controls (3.86 ± 0.74mmoI/L versus 1.02±0.31), p<0.05. The mean value of HDL-cholesterol of the study group was significantly higher among the HIV negative participants compared to the HIV/AIDS subjects on ART (2.88±0.29 versus 1.24 ± 0.34mmoI/L) respectively, p=0.006). The mean value of LDL – Cholesterol of the HIV/AIDS subjects on ART was significantly higher when compared with that of HIV negative control (1.10 ± 0.34 mmoI/L versus 0.75±0.51), p< 0.006. The mean value of LDL-Cholesterol of the HIV/AIDS subjects on ART was significantly higher than that of HIV negative control (1.10 ± 1.08mmoI/L versus 0.75±0.51), p<0.001. The mean value of VLDL – Cholesterol HIV/AIDS subjects on ART was significantly higher than that of HIV negative control (0.022 ± 0.12mmoI/L versus 0.38±0.26), p <0.05.

Table 4: Mean of Lipid parameters among the HIV -negative control and ART competent Subjects

Parameters (mmol/L)	HIV-Neg	HIV-Neg ART-competent	Z- score	p- value
T-Cholesterol	3.97±0.69	2.54±1.30	7.50	<0.001
Triglycerides	1.02±0.31	3.86±0.74	1.12	<0.05
HDL	2.88±0.29	1.24±0.34	2.78	<0.006
LDL	0.75±0.51	1.10±1.08	13.88	<0.001
VLDL	0.38±0.26	0.77±0.12	1.18	<0.05
HDL-C/TC	0.73±0.42	0.49±0.26	---	---

Key:
Cardiovascular Risk Predictor
Positive Risk Factor<1.0mmol/L; Negative Risk Factor >1.6mmol/L

Table 5 show value of lipid profile of the HIV-positive ART naïve participants and that of HIV/AIDS subjects on ART. The results of the total cholesterol of the HIV-positive - naïve participants and that of HIV/AIDS subjects on ART was compared. The mean total cholesterol was significantly higher among the ART- naïve participants compared to the ART competent subjects
(3.02±0.79 versus 2.54±0.130) respectively, p<0.001. Triglycerides value was in the two groups.

The triglyceride level was significantly higher among the ART competent subjects compared to the ART- naïve participants (p <0.001). The mean HDL-Cholesterol level was significantly higher among the ART- naïve participants compared to the ART competent subjects (p <0.001). The mean VLDL-Cholesterol level was significantly higher among the ART competent subjects compared to the ART-naïve participants (p <0.001).

Table 5: Mean of Lipid profile parameters among HIV-positive ART- naïve participants and HIV/AIDS subjects on ART

Parameters (mmol/L)	HIV-Pos ART-Naïve	HIV/AIDS subjects on ART	Z- score	p- value
T-Cholesterol	3.02±0.79	2.54±0.130	7.1	<0.001
Triglycerides	1.02±0.93	3.86±0.74	2.7	<0.001
HDL	1.98±0.26	1.24±0.34	7.8	<0.001
LDL	0.85±0.72	1.10±1.08	12.9	<0.001
VLDL	0.58±0.07	0.77±0.12	3.9	<0.001
HDL-C/TC	0.66±0.33	0.49±0.29	---	---

Key:
Cardiovascular Risk Predictor
Positive Risk factor<1.0mmol/L; Negative Risk Factor>1.6mmol/L

Table 6 showed the values of liver enzymes among the HIV negative and HIV-positive ART- naïve participants. The values of Alanine amino transferase (ALT) was significantly higher among the HIV-positive ART- naïve compared to the HIV negative (20.19±7.01U/L. versus 13.68±3.13U/L) respectively, p<0.001. The mean ALT, AST and ALP levels was significantly higher among the HIV-positive ART- naïve (20.19 ± 7.01, 20.11 ± 20.61 and 92.03 ± 20.61) compared to the HIV-negative controls (13.68 ± 3.12, 13.82 ± 14.54 and 88.94 ± 14.54) respectively, p=<0.001, <0.001 and <0.05.

Table 6: Means of liver enzymes among HIV Negative controls and HIV-positive ART-naïve participants

Parameters (U/L)	**HIV-Negative n=50**	**HIV-positive ART-naïve (n=51)** (n=51)	**Z-score**	**p-value**
ALT	13.68 ± 3.12	20.19 ± 7.01	6.0	<0.001
AST	13.82 ± 14.54	20.11 ± 20.61	6.24	<0.001
ALP	88.94 ± 14.54	92.03 ± 20.61	0.87	<0.05

Table 7: Mean of liver enzymes among HIV Negative controls and HIV/AIDS subjects on ART

Parameters (U/L)	**HIV-Negative n=50**	**HIV/AIDS subjects on ART (n=52)**	**Z-score**	**p-value**
ALT	13.68 ± 3.12	63.28 ± 39.20	7.05	<0.001
AST	13.82 ± 2.26	59.26 ± 32.62	7.52	<0.001
ALP	88.94 ± 14.54	115.59 ± 31.17	5.49	<0.001

The mean values of Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST) and Alkaline Phosphate (ALP) were significantly higher among the HIV/AIDS subjects on ART (63.28 ± 39.20, 59.26 ± 32.62 and 115.59 ± 31.17) compared to that among the HIV-negative controls (13.68 ± 3.12, 13.82 ± 2.26 and 88.94 ± 14.54), p <0.001 respectively.

Table 8 showed the mean values of liver enzymes among the HIV-naïve participants and HIV/AIDS subjects on ART). The mean values of Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST) and Alkaline Phosphate (ALP) were significantly higher among the HIV/AIDS subjects on ART (63.28 ± 39.20, 59.26 ± 32.62 and 115.59 ± 31.17) compared to that of HIV-positive ART- naïve participants (20.19 ± 7.01, 20.11 ± 6.76 and 92.03 ± 20.61, p=<0.001 respectively. The values were 3 to 5-fold times the upper limit of normal values.

Table 8: Mean of liver enzymes among HIV-positive ART- naïve and HIV/AIDS subjects on ART

Parameters (U/L)	HIV-positive ART- naïve n=51	HIV/AIDS subjects on ART (n=52)	Z-score	p-value
ALT	20.19 ± 7.01	63.28 ± 39.20	6.1	<0.001
AST	20.11 ± 6.76	59.26 ± 32.62	6.4	<0.001
ALP	92.03 ± 20.61	115.59 ± 31.17	4.5	<0.001

Table 9 showed correlation between lipid profile parameters. The total cholesterol and triglycerides show a positive correlation of the strength of 10%. The total Cholesterol and HDL – Cholesterol show negative correlation of 14%. The total Cholesterol and LDL – Cholesterol shows positive correlation of the strength of 87%. The Total cholesterol and VLDL – Cholesterol show negative correlation of 10%. The triglyceride and LDL – Cholesterol show a positive correlation with the strength of 22%. The triglyceride and VLDL-Cholesterol show positive correlation with strength of 100%. The VLDL-Cholesterol and HDL – cholesterol shows positive correlation of 10%. The VLDL-Cholesterol and LDL-Cholesterol show negative with strength of 22%. HDL-Cholesterol and LDL – Cholesterol show negative correlation with a strength of 48%.

Table 9: Correlation between Lipid Profile parameters

Parameters	Coefficient of Correlation(r)	Strength
T. Chol and T. G	0.10	10%
T. Chol and HDL	0.14	14%
T. Chol and LDL	0.87	87%
T. Chol and VLDL	- 0.1	10%
TG and HDL	-0.1	10%
TG and LDL	0.22	22%
TGL and VLDL	1	100%
VLDL and HDL	0.1	10%
VLDL and LDL	0.22	22%
HDL and LDL	0.48	48%

Alanine amino transferase (ALT) and Aspartate amino transferase (AST) show positive phosphatase (ALP) show a positive correlation of 67%. Alkaline Phosphatase (ALP) and Aspartate amino transferase (AST) show a positive correlation with strength of 63%.

Table 10: Correlation between liver enzymes

Lipid Parameters	Coefficient of Correlation (r)	Strength
ALT and AST	0.83	91%
ALT and AST	0.45	67%
ALP and AST	0.40	63%

Discussion

This study showed that lipid profile and some liver enzymes are altered in HIV/AIDS subjects. The alteration in the serum lipid profile and some of the liver enzymes occurred when the patients or subjects were placed on antiretroviral therapy (ART).

A total of 153 subjects were involved in the study and they were classified into three groups: the control group (apparently healthy subjects), HIV-positive ART-naïve and HIV/AIDS ART competent subject. Our finding is consistent with a previous study have demonstrated that patients with HIVAIDS on ART exhibit highly abnormal total lipid concentration in plasma (Mullamitha and *Pazare, 1999).*

Few authors, who determine the levels of plasma triglycerides, total cholesterol, HDL-Cholesterol LDL – Cholesterol in HIV infected individuals also came to the same conclusion that with an increase of immunological deficiency and a clinical development of HIV infection (AIDS), lipid profile disorders, indicated by an increase in triglyceride level and decreased concentrations of HDL-Cholesterol intensified as well.

Consistent with earlier reports, we observed elevated values of Total Cholesterol, HDL-Cholesterol and LDL-Cholesterol, VLDL-Cholesterol and triglyceride among HIV/AIDS subjects on ART and HIV-infected ART-naïve participants. These findings are consistent with a previous report which found the values of Triglyceride elevated in HIV/AIDS subjects (*Duobu and Payen, 2000).*

Shoe et al. (1995) reported similar findings in which they show significant low levels of Total Cholesterol, HDL – Cholesterol and LDL – Cholesterol in HIV/AIDS patients when compared to sero negative controls ($p < 0.05$). This elevated level of Total Cholesterol HDL – cholesterol and LDL – Cholesterol was reported to be associated with elevated levels of beta -2 microglobulin. Similarly, Kerveur and Colleagues (1991), stated that hypocholesterolaemia observed in HIV/AIDS infection is due to cytokine effects on different enzymes of lipid metabolism. Fermandez and his Colleagues (1991) had reported that HIV/AIDS is characterized by a high prevalence of hypertriglyceride, hypocholesterolaemia and elevated level of cytokines. They observed decreased cholesterol containing lipoprotein in both HIV/AIDS infection. Our observed increase in some of the lipids could be due to cytokines as well as ART.

Liver enzymes: Alanine amino transferase, Aspartate amino transferase among the subjects on ART were significantly elevated. This finding is consistent with some authors who had earlier investigated liver enzymes in HIV/AIDS patients on ART and also suggested a novel mechanism for hepatotoxicity (Nunez *et al.*,

2006). The liver as a drug metabolizing and detoxifying organs in the body, is subject to potential damage from an enormous array of pharmaceuticals and environmental chemicals. Lee (1995) suggested that injury may result from direct toxicity, by hepatic conversion of a xenobiotic to an active toxin or through immune mechanisms, usually by a drug or a metabolite acting as a hapten. Predictable drug reaction may occur in anyone who accumulates a sufficient dose. This may be responsible for the increase in the liver enzymes in infected liver cells. Changes in three mentioned liver enzymes should not be surprising since it is likely that an intact immune response to trail replication is necessary to produce the hepatocellular necrosis and inflammation seen in active hepatitis due to HIV infections and AIDS.

When the liver enzymes Alanine amino transferase (ALT), Aspartate amino transferase (AST) and Alkaline phosphatase (ALP) of the HIV-negative control group and the HIV-positive ART-naive, were compared, a significant difference was observed in ALT, AST and ALP. The liver enzymes in HIV/AIDS subject on ART also shows a significant difference when compared with the control subject. These findings agree with other investigators, who found out that liver enzymes of patients on Anti-retroviral therapy were 3 to 5-fold higher than the normal subjects. Liver enzymes abnormalities should be interpreted with care; however, some ART has been found to increase the levels of some liver enzymes (Inductivo-Yu and Bonacini., *2008).*

The correlation between lipid profile parameters was carried out in our study, it is found that there was a positive correlation between the following lipids: Total Cholesterol and HDL – Cholesterol, Total cholesterol and LDL – Cholesterol show 100% positive correlation; however, negative correlation was observed between the following lipids: Total Cholesterol and VLDL – Cholesterol, VLDL – Cholesterol and LDL – Cholesterol, and HDL – Cholesterol and LDL – Cholesterol, while there was negative correlation between Total Cholesterol and HDL-Cholesterol, Triglyceride and HDL – Cholesterol. The correlation between the liver enzymes parameters showed positive correlation between ALT and ALP, positive correlation between ALP and AST, positive correlation between ALT and AST

Conclusion

Elevation of Triglyceride, VLDL – Cholesterol and Low total cholesterol HDL – Cholesterol, LDL – Cholesterol and high liver enzymes activities was observed among subjects on ART. Therefore, we wish to suggest that a novel mechanism of ART administration be followed in order to achieve less hepatotoxicity and to avoid cardiovascular risk. ART should be administered with caution to ensure there are no with little or no negative hepatic and cardiovascular risk effect.

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