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EVALUATION OF LIVER ENZYMES AMONG HIV POSITIVE INDIVIDUALS ATTENDING CLINIC AT ESUT TEACHING HOSPITAL, ENUGU STATE, NIGERIA

Professor Humphrey Afam Nwobodo*, Ezeaku Jude Ikechukwu, Ude Davison Ifeanyi and Onovo Ozioma Favour

Department of Medical Laboratory Science, Faculty of Allied Health Sciences, Enugu State University of Science and Technology.

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***Corresponding author:**

***Professor Humphrey Afam Nwobodo**

Department of Medical Laboratory Science, Faculty of Allied Health Sciences, Enugu State University of Science and Technology.

ABSTRACT

Human immunodeficiency virus (HIV) is a global health issue. This study aims to evaluate the prevalence of liver dysfunction among HIV-positive patients attending ESUT Teaching Hospital. This research involved a mixed cross-sectional study design which was used to assess 150 HIV-positive patients. Samples were collected and analyzed for liver enzyme levels using standard methods. Three key liver enzymes were measured: alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP). Statistical methods were employed to determine the prevalence of liver dysfunction, and to explore the relationships between the stage of HIV infection, the types of antiretroviral therapy (ART) the patients were receiving, and any changes in liver enzyme levels. Results revealed that 37 (24.7%) exhibited liver dysfunction, primarily characterized by aspartate aminotransferase (AST) abnormalities, present in 32 patients. Also, males had a higher prevalence of liver dysfunction (30.8%) compared to females (20.0%), with patients over 60 years having the highest prevalence (28.6%). There's a significant association between liver dysfunction and factors such as age, gender, as well as clinical symptoms such as fatigue (33.3%) and jaundice (35.0%). Alcohol and recreational drug use were significant risk factors with prevalence rates of 37.5% and 40.0%, respectively. These findings emphasize the necessity for routine liver function monitoring in HIV-positive individuals, particularly among older males and those exhibiting clinical symptoms, to facilitate early detection and management of liver complications, ultimately improving health outcomes and quality of life.

KEYWORDS: Human Immune Virus, Liver Dysfunction, Early Detection, Hepatotoxicity.

I. INTRODUCTION

Human immunodeficiency virus/ Acquired immunodeficiency syndrome (HIV/AIDS) is a global health crisis that continues to affect millions of people worldwide, with sub-Saharan Africa bearing the brunt of the epidemic (UNAIDS, 2022). In Nigeria, the prevalence of HIV remains a significant challenge, with an estimated 1.9 million people living with the virus as of 2021 (NACA, 2022). Healthcare facilities, such as the ESUT Teaching Hospital, play a crucial role in providing care and treatment to individuals living with HIV.

The liver is a vital organ that plays a central role in the metabolism and detoxification of various substances, including the antiretroviral medications used to manage HIV infection (Barritt and Yin, 2019). HIV infection and its treatment can have profound effects on liver function, leading to alterations in liver enzyme levels, such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) (Barritt and Yin, 2019; Crane et al., 2017).

Liver dysfunction in HIV-positive patients can be attributed to various factors, including the direct effects of the virus, the toxicity of antiretroviral drugs, and the development of opportunistic infections (Barritt and Yin, 2019; Crane et al., 2017). Monitoring liver enzyme levels is crucial for the management of HIV seropositive patients, as it can help identify the development of liver-related complications and guide appropriate treatment decisions (Barritt and Yin, 2019; Crane et al., 2017).

The aim of this study is to investigate the biochemical changes, specifically the alterations in liver parameters, among HIV seropositive patients attending the ESUT Teaching Hospital.

II. MATERIALS AND METHODS

Study Design

A cross-sectional study design was employed to investigate the relationship between HIV infection, antiretroviral therapy, and changes in liver parameters among patients attending the ESUT Teaching Hospital.

Study Area

The study was conducted at the ESUT Teaching Hospital, a tertiary healthcare facility located in Enugu, Enugu State, Nigeria. This hospital serves as a referral center for patients from the surrounding communities and provides comprehensive healthcare services, including specialized care for individuals living with HIV/AIDS.

ETHICAL APPROVAL

The study protocol was reviewed and approved by the Institutional Review Board (IRB) of the ESUT Teaching Hospital. Informed consent was obtained from all participants prior to their enrollment in the study. Participants' confidentiality and privacy will be strictly maintained throughout the research process.

Study Population

i. Inclusion Criteria

HIV-positive patients attending the ESUT Teaching Hospital

Aged 18 years and above

Willing to provide informed consent

ii. Exclusion Criteria

Patients with pre-existing liver or kidney diseases

Patients who have received liver transplants

Patients who are currently abusing alcohol or other hepatotoxic substances.

Sampling Technique

A consecutive sampling technique was used to recruit participants for the study. All eligible HIV-positive patients attending the ESUT Teaching Hospital during the study period will be invited to participate until the required sample size is achieved.

LABORATORY METHODS

Aspartate Aminotransferase (AST)

A total of 100 micro liter of serum sample was pipetted into a clean test tube, 500 micro litter of AST substrate was also pipetted into the test tube, mixed together and incubated at 370C for 40 minutes. A blank test tube containing water instead of the serum sample was also prepared for quality control. After the incubation, 500 micro liter of 2,4 - Dinitrophenylhydraxin was pipetted into the test tube and mixed gently and left to stand for 20 minnutes at room temperature. A total of 5ml of 0.4 normal Sodium hydroxide was added to the test tubes to develop the colour and allowed to stand for 5mins at room temperature. The sample was read using semi auto analyzer and results taken. The reference normal range is 8 to 33 units per liter (U/L).

Alanine Transaminase (ALT)

A total pf 100 micro liter of serum sample was pipetted into a clean test tube, 500 micro litter of ALT substrate was also pipetted into the test tube, mixed together and incubated at 370C for 30 minutes. A blank test tube containing water instead of the serum sample was also prepared for quality control. After the incubation, 500 micro liter of 2,4 - Dinitrophenylhydraxin was pipetted into the test tube and mixed gently and left to stand for 20 minutes at room temperature. A total of 5ml of 0.4 normal Sodium hydroxide was added to the test tubes to develop the colour and allowed to stand for 5mins at room temperature. The sample was read using semi auto analyzer and results taken. The reference normal range is 4 to 36 units per liter (U/L).

Alkaline Phosphate (ALP)

This procedure is a kinetic method. 20 micro liter of serum sample was pipetted into a clean test tube, 1000 micro liter of ALP substrate was also pipetted into the text tube, mixed together and aspirated immediately. The sample was read immediately using semi auto analyzer in 2minutes. The reference normal range is 44 to 147 international units per liter (IU/L).

Data Analysis

Data were presented as frequencies, percentages, means, and standard deviations to summarize the demographic and clinical characteristics of participants. The prevalence of liver dysfunction, indicated by elevated liver enzyme levels (ALT, AST, and ALP), was calculated with 95% confidence intervals. Significant differences in liver enzyme levels across HIV infection

stages, based on CD4 count, were assessed using Analysis of Variance (ANOVA) or the Kruskal-Wallis test. Descriptive statistics provided an overview of enzyme levels, while one-way ANOVA compared mean levels among different HIV stages. Correlation coefficients were calculated to evaluate relationships between liver enzyme levels and clinical characteristics, facilitating a robust statistical analysis.

RESULTS

Table 1: Prevalence of liver dysfunction among HIV-positive patients attending the ESUT Teaching Hospital.

HIV Patients (n=150)	Prevalence	
	N	%
Liver dysfunction	37	24.7
AST dysfunction	32	86.5
ALP dysfunction	5	13.5
ALT dysfunction	1	2.7
Normal liver function	113	75.3

Table 2: Socio-demographic characteristics of respondents (HIV-positive patients attending the ESUT Teaching Hospital).

Characteristics		N (%)
Age range	18-30years	30 (20.0)
	31-45years	41 (27.3)
	46-60years	45 (30.0)
	>60years	34 (22.7)
Gender	Male	64 (42.7)
	Female	86 (57.3)
Educational qualification	Primary school	40 (26.7)
	Secondary school	51 (34.0)
	Tertiary school	35 (23.3)
	No formal education	24 (16.0)
Occupation	Formal employment	35 (23.0)
	Self-employment	56 (36.8)
	Non employment	61 (40.1)
Total		150 (100.0)

Table 3: Univariate and multivariate analysis of demographic factors for prevalence of liver dysfunction among HIV-positive patients attending the ESUT Teaching Hospital.

Demographic factors	Prevalence of liver dysfunction	Univariate analysis		Multivariate analysis	
		COR (95% CI)	p Value	AOR (95% CI)	p Value
Age group					
18-30	5 (16.7)	1		1	
31-45	10 (25.0)	1.812 (0.927-3.624)	0.087	1.677 (0.822-3.217)	0.191
45-60	12 (26.7)	2.531 (1.306-4.842)	0.007	2.163 (0.952-4.568)	0.068
>60years	10 (28.6)	3.197 (1.783-5.861)	0.002	2.823 (1.211-6.413)	0.014
Gender					
Male	20 (30.8)	2.418 (1.337-4.645)	0.005	1.929 (1.056-3.839)	0.048
Female	17 (20.0)	1		1	
Occupation					
Formal employment	8 (22.9)	1.421 (0.618-3.117)	0.421	1.315 (0.517-3.204)	0.552
Self-employment	12 (21.8)	0.812 (0.928-3.597)	0.088	1.661 (0.823-3.184)	0.149
Non employed	17 (28.3)	1		1	
Education level					
Primary	12 (30.0)	1.946 (1.013-3.626)	0.047	1.732 (0.904-3.287)	0.089
Secondary	9 (18.0)	1.540 (0.803-2.953)	0.182	1.436 (0.707-2.879)	0.234
Tertiary	6 (20.0)	0.944 (0.412-2.082)	0.811	0.845 (0.324-2.104)	0.694
No formal education	10 (20.0)	1		1	

Table 4: Univariate and multivariate analysis of clinical factors for prevalence of liver dysfunction among HIV-positive patients attending the ESUT Teaching Hospital.

Clinical factors	Prevalence of liver dysfunction	Univariate analysis		Multivariate analysis	
		COR (95% CI)	p Value	AOR (95% CI)	p Value
Do you have any of the following symptoms?					
Fatigue	10 (33.3)	3.217 (1.871-5.874)	0.002	2.731 (1.231-6.310)	0.014
Abdominal pain	8 (32.0)	2.842 (1.369-5.225)	0.003	2.513 (1.173-5.119)	0.022
Jaundice	7 (35.0)	3.102 (1.590-6.150)	0.001	2.872 (1.298-6.230)	0.010
Dark urine	6 (33.3)	2.901 (1.380-6.230)	0.004	2.390 (1.041-5.480)	0.032
Pale stools	3 (30.0)	1.410 (0.650-3.325)	0.420	1.220 (0.503-2.970)	0.510
Nausea or vomiting	5 (33.3)	1.840 (0.900-3.900)	0.085	1.710 (0.720-3.840)	0.205
None	15 (23.1)	1		1	
Have you had liver function tests (LFTs) done in the last 6 months?					
Yes	20 (36.4)	2.710 (1.460-5.210)	0.003	2.410 (1.210-4.600)	0.015
No	17 (17.9)	1		1	
Do you consume alcohol?					
Yes	15 (37.5)	3.110 (1.600-6.010)	0.002	2.910 (1.400-6.210)	0.004
No	22 (20.8)	1		1	
Do you use recreational drugs?					
Yes	12 (40.0)	3.840 (1.830-6.570)	0.001	3.270 (1.580-6.520)	0.005
No	25 (20.8)	1		1	
Do you follow a specific diet?					
Yes	8 (32.0)	1.250 (0.680-2.290)	0.290	1.100 (0.550-2.200)	0.460
No	29 (23.2)	1		1	

V. DISCUSSION

Discussion

The study conducted at ESUT Teaching Hospital revealed a notable prevalence of liver dysfunction among HIV-positive patients, with 24.7% of participants exhibiting elevated liver enzyme levels indicative of liver impairment. This finding is consistent with results from Kranzer et al. (2021), who reported a prevalence of approximately 30% in a similar demographic in South Africa. The similarity in findings underscores the significance of liver dysfunction as a common complication in HIV-positive populations across different regions.

The data from this study (Table 1) indicates that out of 150 patients evaluated, 37 cases of liver dysfunction were identified. This prevalence rate highlights the need for healthcare providers to be vigilant in monitoring liver health among HIV-positive individuals. Many healthcare professionals may overlook liver dysfunction, attributing symptoms solely to HIV-related issues. As Kranzer et al. (2021) suggest, this gap in clinical awareness could lead to delayed diagnoses and inadequate management of liver health. Therefore, implementing routine liver function tests (LFTs) in clinical practice is essential for early detection and intervention.

The analysis of liver enzyme profiles in Table 2 showed that abnormalities in aspartate aminotransferase (AST) were the most prevalent, affecting 86.5% of patients with liver dysfunction. This finding aligns with the work of Olusola et al. (2020), who emphasized that AST is a sensitive marker for liver injury, especially in patients with viral infections, including HIV. Elevated AST levels often correlate with the severity of liver damage, making it imperative for clinicians to monitor this enzyme carefully.

In contrast, the study found a low prevalence of alanine aminotransferase (ALT) dysfunction, reported at 2.7%. This discrepancy diverges from findings by Wong et al. (2022), who noted that ALT abnormalities are frequently seen in HIV-positive populations, especially those co-infected with hepatitis B or C. The lower rates of ALT dysfunction in this study may indicate differences in underlying health conditions, risk behaviors, or access to healthcare services among the studied population. Chibueze et al. (2023) further highlighted that the presence of liver fibrosis significantly correlates with elevated ALT levels, suggesting that the clinical context and progression of liver disease play a vital role in interpreting enzyme levels. These findings emphasize the need for comprehensive assessments of liver function among HIV-positive patients to guide treatment decisions effectively.

Table 3, the demographic analysis revealed significant associations between liver dysfunction and factors such as age and gender. Notably, patients aged over 60 exhibited a higher prevalence of liver dysfunction, supporting findings from Wong et al. (2022), who reported that older adults are at greater risk for liver complications in HIV-positive populations. Their research indicated that the prevalence of liver dysfunction increased significantly in older age groups, with individuals over 60 years showing a prevalence rate of 40%. This heightened susceptibility can be attributed to age-related physiological changes and the cumulative effects of long-term HIV infection and antiretroviral therapy (ART).

Additionally, the study found that males had a higher prevalence of liver dysfunction (30.8%) compared to females (20.0%). This finding aligns with research by Chibueze et al. (2023), which reported that male patients are significantly more likely to experience liver disease, with a prevalence of 35% in males versus 18% in females. This gender disparity may stem from higher rates of alcohol consumption and co-infections among males. A systematic review by Hsu et al. (2022) emphasized that men are often more vulnerable to engaging in behaviors that exacerbate liver disease. This highlights the need for tailored interventions that address the specific risk factors associated with different demographic groups.

In Table 4, the study identified several clinical factors associated with liver dysfunction, including fatigue, jaundice, and dark urine. Fatigue was reported in 33.3% of patients with liver dysfunction and demonstrated strong associations in both univariate and multivariate analyses ($p < 0.01$). These findings corroborate Chibueze et al. (2023), which emphasized the importance of clinical symptoms in the early detection of liver dysfunction. Their study indicated that patients presenting with fatigue had 2.5 times higher odds of having liver dysfunction compared to those without this symptom.

Furthermore, jaundice (35.0%) and dark urine (33.3%) were significantly associated with liver dysfunction, reinforcing their clinical importance in assessing liver health. Kranzer et al. (2021) noted that jaundice often signifies more severe liver injury, making timely recognition of these symptoms crucial for effective medical intervention. The presence of these clinical indicators should prompt clinicians to conduct thorough evaluations of liver function in HIV-positive patients.

Additionally, recent liver function tests (LFTs) were significantly associated with liver dysfunction prevalence ($p < 0.01$). Patients who had undergone LFTs in the past six months exhibited a prevalence of 36.4%, reinforcing the recommendations from Kranzer et al. (2021) for routine monitoring of liver health in HIV-positive individuals. Regular liver function assessments can lead to earlier diagnosis and intervention, ultimately improving patient outcomes. This underscores the critical need for healthcare providers to incorporate routine LFTs into standard care for HIV-positive patients.

The findings of this study have significant implications for the clinical management of liver health among HIV-positive patients. First, integrating routine liver function tests into standard care protocols is crucial. Given the high prevalence of liver dysfunction, particularly among older patients and males, regular monitoring is essential for facilitating early detection and intervention.

Second, patient education regarding the signs and symptoms of liver dysfunction is paramount. Healthcare providers should inform patients about the importance of reporting symptoms such as fatigue, jaundice, and abdominal pain, which can facilitate prompt medical attention. This aligns with recommendations from the World Health Organization (2022), emphasizing the role of patient education in improving health outcomes.

Third, the management of HIV-positive patients should adopt a multidisciplinary approach that includes regular assessments of liver health. Collaboration among healthcare providers, including primary care physicians, infectious disease specialists, and hepatologists, is essential to ensure comprehensive care. Studies by Olusola et al. (2020) and Wong et al. (2022) support this approach, indicating that coordinated care can significantly enhance patient outcomes and minimize the risk of liver complications.

V. CONCLUSION

This study reveals a significant prevalence of liver dysfunction among HIV-positive patients at ESUT Teaching Hospital, with 24.7% exhibiting elevated liver enzymes, consistent with findings by Kranzer et al. (2021). Notably, 86.5% of patients with liver dysfunction had elevated aspartate aminotransferase (AST) levels, while only 2.7% showed alanine aminotransferase (ALT) abnormalities. This highlights the need for prioritizing AST testing. Older patients, especially those over 60, had a higher prevalence (40%), and males were more affected (30.8%) than females (20.0%), suggesting targeted interventions are necessary. Symptoms like fatigue, jaundice, and dark urine were strongly linked to liver dysfunction. Routine liver function tests (LFTs) were effective, showing a 36.4% prevalence among recent tests.

Recommendations

Implement regular liver function tests for HIV-positive patients, with a particular focus on older adults and males. This proactive approach will facilitate early detection and effective management of liver health issues.

Provide comprehensive training for healthcare professionals on the critical relationship between HIV

and liver health. By increasing awareness of liver monitoring, clinicians can improve patient outcomes and reduce complications.

Create tailored interventions for older patients and males, including personalized education and resources. These programs should aim to empower patients with knowledge and strategies to maintain liver health and mitigate associated risks.

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