



Prevalence of elevated alanine aminotransferase levels among HIV patients on HAART in Naguru Hospital in Kampala District. A cross-sectional study.

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Page | 1 **ABSTRACT**

Background:

The study aimed to determine the prevalence of elevated ALT levels among HIV patients on HAART in Naguru Hospital in Kampala District.

Methodology:

The study utilized a cross-sectional design involving participants attending HIV care clinics. Data were collected through patient records, interviews, and laboratory investigations, including liver function tests and metabolic assessments. The prevalence of liver diseases and treatment-related adverse effects was determined. Statistical analysis was conducted to explore relationships between variables. Ethical considerations were observed by obtaining approval from relevant authorities and informed consent from participants, ensuring confidentiality and voluntary participation throughout the research process.

Results:

A total of 88 participants were included. The prevalence of elevated alanine aminotransferase (ALT) levels among participants was 46.6% (41/88), while 53.4% (47/88) had normal ALT levels. Out of the total participants, 56 (63.6%) were female, while 32 (36.4%) were male, indicating that the majority of participants were female. With regard to place of residence, the majority of respondents lived in urban areas (60, 68.2%), whereas 28 (31.8%) resided in rural areas. Most respondents were single (58, 65.9%), while 20 (22.7%) were married. A smaller proportion were divorced (8, 9.1%), and 2 (2.3%) were widowed.

Conclusion:

The study found a relatively high prevalence of elevated alanine aminotransferase (ALT) levels.

Recommendation:

More improved HAART drugs with less toxicity should be introduced to HIV patients to curb the increasing prevalence of elevated ALT levels.

Keywords: Alanine aminotransferase, Elevated ALT levels, fatty liver disease, Liver function, Prevalence, Naguru Hospital.

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BACKGROUND OF THE STUDY

Globally, liver-related complications have emerged as an important concern among people living with HIV (PLWH), particularly in relation to metabolic disorders and antiretroviral therapy. A cross-sectional study conducted in China among 361 PLWH reported a high prevalence of non-alcoholic fatty liver disease (NAFLD) at 37.67% and metabolic-associated fatty liver disease (MAFLD) at

34.90%. Furthermore, individuals with MAFLD had a significantly higher prevalence of elevated alanine aminotransferase (ALT) levels compared to those without MAFLD (44.44% versus 16.17%), indicating a greater burden of liver dysfunction in this population (Liu et al., 2021).

In the Ugandan context, similar concerns have been observed. A study conducted at the Immune Suppression Syndrome Clinic of Mbarara Regional Referral Hospital



found that the prevalence of advanced drug effects among patients on dolutegravir (DTG)-based regimens was 33.1%. Among those affected, 5.6% discontinued treatment due to adverse drug effects, with hyperglycemia and liver toxicity being the leading causes (Namulindwa et al., 2022).

Additionally, another study in urban Uganda revealed that the prevalence of significant liver fibrosis (SLF) was unexpectedly higher among HIV-uninfected individuals compared to those living with HIV attending care clinics (Wekesa et al., 2022). These findings highlight the complex and evolving burden of liver disease in both HIV-infected and uninfected populations, underscoring the need for continued research and targeted interventions to address liver-related complications.

The study aimed to determine the prevalence of elevated ALT levels among HIV patients on HAART in Naguru Hospital in Kampala District.

METHODOLOGY

Study design

A descriptive cross-sectional study design was used to evaluate the ALT levels in HIV patients on HAART at Naguru Hospital. This was the study design of choice because it allowed conclusions to be drawn about the general population after taking a sample of the population at a certain point in time.

Study area

The study was conducted at Naguru hospital located at Naguru Road, on Naguru Hill, Nakawa Division, Kampala District, in Kampala, the capital of Uganda, and the largest city in that country. This location lies approximately 4 kilometers (2 min), by road, east of the central business district of Kampala.

The hospital handles both inpatient and outpatient departments with contact of about 350 clients per day. This was the study area of choice because this facility mostly handles many patients, which helped to draw a conclusion from a large population pool.

Study population

All HIV patients on HAART at Naguru Hospital, Kampala District.

Study variables

Independent variable

HIV status

Dependent variable

ALT levels

Sample size determination

Sample size refers to the number of participants who were included in the study, which was determined by Kish and Leslie (2000) as follows;

$$n = \frac{Z^2 pq}{d^2}$$

Where;

n is the sample size.

Z = the standard normal deviation (1.96) at the 95% confidence level.

p=13.5% (0.135) (estimated prevalence of elevated ALT levels) (Spearman, C. W et al., 2021) q=1-p (1-0.135=0.865)

d= desired level of precision (0.1) Therefore; $n = \frac{(1.96)^2 \times 0.397 \times 0.603}{(0.1)^2}$

The minimum sample size required = 88

Therefore, a total of 88 participants were selected and included in the study.

Sampling technique

A convenience sampling technique was used to select 88 HIV patients from the entire study population. This technique is of choice because it allows the sample size of the study to be obtained in a short period of time.

Selection criteria

Inclusion criteria

All HIV patients on HAART during the period of data collection have consented to participate in the research exercise.

Exclusion criteria

All non-HIV patients were not included in the research exercise.

All HIV patients who were not on HAART at the time of data collection.

Sampling procedure

All HIV patients who were available each day of data collection and who had come for medical services at Naguru Hospital were informed about the objectives of the study.

A consent form was given to each of those who are to participate in the study to sign and agree to be part of the study. This was done until the sample size was reached.



Data collection method

Quantitative data, such as the ALT levels of participants, were obtained by the chemistry analyzer from the chemistry department, and other relevant information was obtained using a question-and-answer method.

Data collection tool

The data collection tool used was a data collection sheet and a questionnaire, onto which relevant information about this study was captured. The tool possessed the following information: the laboratory number of the patient, age, gender, and the ALT test results.

Data collection procedure

After a clear explanation and consent from participants, a questionnaire containing both open and closed-ended questions was issued, and a blood sample was collected in a serum-separating vacutainer (yellow-topped tube). From the questionnaire, information regarding factors associated with elevated ALT was obtained.

The blood sample from the participant was taken to the laboratory (chemistry department), where the ALT test was run, hence the prevalence of elevated ALT and its principle discussed below.

ALT test principle

Alanine aminotransferase (ALT/GPT) catalyzes the transfer of the amino group from alanine to oxoglutarate with the formation of glutamate and pyruvate. The latter is reduced to lactate by lactate dehydrogenase (LDH) in the presence of reduced nicotinamide adenine dinucleotide (NADH).

The reaction is monitored kinetically at 340 nm by the rate of decrease in absorbance resulting from the oxidation of NADH to NAD⁺, proportional to the activity of ALT present in the sample.

ALT/GPT

L-Alanine + 2-Oxoglutarate \longrightarrow L-Glutamate + Pyruvate

M-L-Glutamate + Pyruvate

LDH

Lactate + NAD⁺

Procedure of the ALT test Sample \longrightarrow

Serum, heparinized or EDTA plasma.

Reagent Composition

R1a. Buffer/Substrate

Tris buffer 100 mmol/l, pH 7.5

L-alanine 0.6 mol/l

R1b. Enzyme/Coenzyme / -oxoglutarate

-oxoglutarate 15 mmol/l

LD \geq 1.2 U/ml

Procedure (for manual use)

Wavelength: 340 nm (Hg 334 nm or Hg 365 nm)

Cuvette: 1 cm light path

Temperature: 30/37

Measurement: against the air

Pipette into cuvette:

Sample 0.2 ml 0.1 ml

R1. Enzyme / Coenzyme / -oxoglutarate 2.0 ml 1.0 ml Mix, read initial absorbance after 1 min.

Read again after 1, 2, and 3 min. Note if the absorbance Change per minute is between

0.11 and 0.16 at 340 nm/Hg 334 nm

0.06 and 0.08 at Hg 365 nm, use only the values for the first 2 minutes for the calculation.

Manual Calculation

To calculate the ALT activity, use the following formulae:

$U/l = 1746 \times A_{340 \text{ nm/min}}$ $U/l = 1780 \times A_{Hg 334}$

nm/min $U/l = 3235 \times A_{Hg 365 \text{ nm/min}}$

Results interpretation

0 – 364 days: Normal range 5 – 33 U/L

1 – 12 years: Normal range 9 – 25 U/L

13 – 18 years female: Normal range 8 – 22 U/L

13 – 18 years male: Normal range 9 – 24 U/L Adult: Normal range <5 – 55 U/L

Quality control

Validity of the results

To establish the validity of the data, the data collection tools were given to the research supervisor and the laboratory in charge of the chemistry department at Naguru Hospital to evaluate the relevance of the tool to the collected information. To establish reliability, the researcher first obtained prior knowledge about the study before data collection.

Data Analysis and Presentation

Quantitative data obtained were analyzed using descriptive statistics and presented using Microsoft Excel in the form of column graphs and tables.

Ethical consideration

An introductory letter was obtained from the school administration of Mildmay Laboratory School, which will be presented to the Naguru Hospital administration to seek permission to carry out my research, and once the



permission is granted, I will proceed with the data collection.

Privacy and confidentiality of patients' data were highly observed, and accessibility of the research findings was only available to the researcher and other specified authorities.

RESULTS

Social demographic data of Respondents

Table 1: Showing Demographic Characteristics of Respondents

Characteristics	Category	Frequency(n)	Percentage (%)
Gender	Male	32	36.4
	Female	56	63.6
	Total	88	100.0
Age group	<20 years	11	12.5
	21-40 years	46	52.3
	41-60 years	18	20.4
	61< years	13	14.8
	Total	88	100.0
Education level	Primary	10	11.4
	Secondary	42	47.7
	Tertiary	8	9.1
	University	16	18.2
	None	12	13.6
	Total	88	100.0
	Single	58	65.9
	Married	8	9.1
	Divorced	20	22.7
	Widow	2	2.3
	Total	88	100.0
	Rural	28	31.8
	Urban	60	68.2
	Total	88	100.0



As shown in Table 1, of the 88 participants, the majority were females, 56 (63.6%), and only 32 (36.4) were males. The majority of the participants had attended secondary level as their highest education level, 42 (47.7%), and the least number had attained primary level, 10 (11.4%). Most of the participants were single, 58 (65.9%), and the least were

widows, 2 (2.3%). The majority were urban dwellers, 60 (68.2%), and the remaining 28 (31.8%) came from rural areas.

Prevalence of elevated ALT levels among HIV patients on HAART

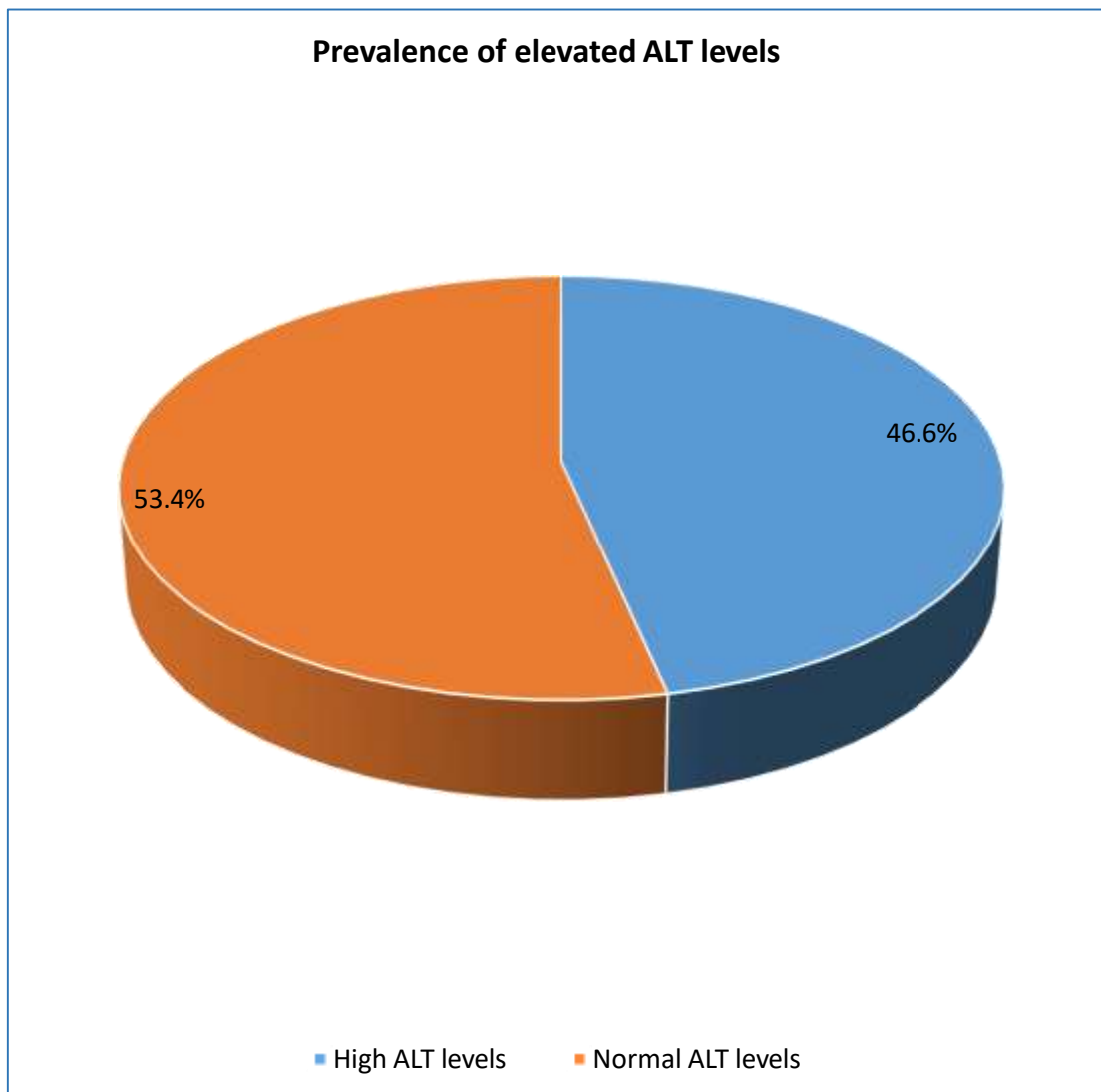
Table 2: Showing prevalence of elevated ALT levels among HIV patients

Prevalence of elevated ALT levels among HIV patients	Frequency (N)	Percentage (%)
Highly elevated ALT levels (Positive tests)	41	46.6
Normal ALT levels (Negative Results)	47	53.4
Total	88	100.0

Data source: Primary

The results in Table 2 show that 41 of the 88 participants were found to have elevated ALT levels, setting the prevalence at 46.6%.

Figure 1: A Pie chart showing the Prevalence of elevated ALT levels among HIV patients on HAART



DISCUSSION

From the study results, 41 of the 48 HIV patients tested positive for ALT level; that is, their ALT levels were past the normal levels, setting the prevalence of elevated ALT levels among HIV patients on HART at 46.6%. This high prevalence was probably because HIV patients are dependent on medication, and this might have caused drug

toxicity, thereby causing damage to the liver walls, hence elevating the ALT levels.

The study results are in agreement with the study results of Liu, D et al, 2021, which revealed that the prevalence of elevated ALT among HIV patients was at 44.44%.

However, the study results do contradict the findings of a study carried out in Uganda, which showed that the prevalence of significant liver fibrosis (SLF) with elevated



ALT was higher in HIV un-infected HIV patients (Wekesa C et al, 2022). The discrepancy was probably because the comparison study was carried out more amongst HIV un-infected persons there by raising their numbers.

CONCLUSION

The prevalence of elevated ALT levels among HIV patients on HART is 46.6%.

RECOMMENDATION

More improved HAART drugs with less toxicity should be introduced to HIV patients to curb the increasing prevalence of elevated ALT levels.

Acknowledgement

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List of abbreviations

ALT – Alanine Aminotransferase
HAART – Highly Active Antiretroviral Therapy
HIV – Human Immunodeficiency Virus
PLWH – People Living with HIV
NAFLD – Non-Alcoholic Fatty Liver Disease
MAFLD – Metabolically Associated Fatty Liver Disease
SLF – Significant Liver Fibrosis
DTG – Dolutegravir
LDH – Lactate Dehydrogenase
NADH – Nicotinamide Adenine Dinucleotide (Reduced Form)

Source of funding

The study received no external funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

HK: collected the data.

AIS: supervised the study.

HN: supervised the study.

FS: supervised the study.

JFN: supervised the study

Data availability

Data is available upon request from the author.

Informed consent

Written informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the purpose of the study, procedures involved, potential risks and benefits, and their right to withdraw at any time without penalty.

Author biography

Hillary Kasadha is a student pursuing a diploma in Medical Laboratory Technology at Mildmay Institute of Health Sciences.

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