

The prevalence and clinical factors contributing to elevated aspartate aminotransferase levels among diabetic patients attending Henrob Hospital, Zzana, limited in Wakiso. A cross-sectional study.

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ABSTRACT

Introduction

Elevated aspartate aminotransferase AST levels are common in diabetic patients and may reflect hepatic and extra-hepatic complications. Data on the prevalence and clinical factors associated with AST elevation among diabetic patients in Uganda are limited. The study aims to determine the prevalence of elevated AST levels and the clinical factors contributing to it among diabetic patients attending Henrob Hospital, Zzana, Uganda.

Methodology

A retrospective cross-sectional study was conducted through review of medical and laboratory records of 150 diabetic patients using a structured data extraction form. The study was carried out at Henrob Hospital Zzana, Wakiso District, between May and June. Data on sociodemographic characteristics and clinical factors were analysed using descriptive statistics. Elevated AST was defined as values above the laboratory reference range of greater than 40 IU/L.

Results

The study involved 150 respondents, of whom 67.3% (101) were male, and 32.6% (49) were female. The prevalence of elevated AST among diabetic patients was 37.3% 56/150. Males had a higher prevalence 21.3% than their females counterparts 16%. The leading clinical factors associated with elevated AST were hemolysis 32.7%, renal infarction 11.3%, cerebral infarction 8.0%, and malignant/non-malignant conditions 5.3%. Pulmonary embolism 4.0% and acute coronary syndrome 1.3% contributed less, while skeletal muscle damage showed no association.

Conclusion

Elevated AST is common among diabetic patients at Henrob Hospital Zzana, with a higher burden in males. Hemolysis and vascular complications are the primary clinical contributors, reflecting the regional disease burden. Routine monitoring of liver enzymes, particularly in male patients and those with hemolytic or vascular conditions, is recommended for early detection and management of complications.

Recommendation

The results highlight the need for routine monitoring of liver enzymes, particularly in male patients and those with hemolytic or vascular complications, to enable early detection and management.

Keywords: Prevalence, Elevated AST levels, Clinical factors, Diabetic patients, Henrob Hospital, Zzana

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Background

Diabetes mellitus is a group of metabolic disorders characterised by high blood sugar levels and disturbances in insulin production and function. It encompasses various forms such as type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), and Gestational diabetes mellitus (GDM), and other subtypes of diabetes like maturity-onset diabetes in young people and latent autoimmune diabetes in adults. (Rafaqat, 2023). Diabetes mellitus, a global health concern, is increasingly linked to liver dysfunction as evidenced by elevated aspartate aminotransferase AST levels. Studies indicate that 10-20% of patients with type 2

diabetes (T2DM) exhibit elevated AST levels, suggesting underlying liver injury or metabolic dysfunction.

537 million people aged 20-79 years have diabetes worldwide, with more than ¾ of adults living in low- and middle-income countries. The number of people with diabetes in Africa is 24 million, and the number is expected to rise by 2045. The regional prevalence of pre-diabetes in Africa is 7.8% (40.9 million people in 2021 and it is expected to reach 8.0% (84.7 million) by 2030 (Asmelash, 2023). The high prevalence of diabetes in low-income countries, especially in East Africa, imposes additional costs on households already burdened by communicable diseases, extreme drought, conflicts, and poor health

systems. (Asmelash, 2023). Various liver conditions like Non-alcoholic fatty liver disease (NAFLD), hepatocellular carcinoma, and cirrhosis (Noroozi Karimabad, 2022) have been implicated in the pathogenesis of type 2 diabetes mellitus due to its critical role in the maintenance of normal glucose levels in the body. Hepatic dysfunction results in insulin resistance syndrome leading to type 2 diabetes mellitus (T2DM) (Ko, 2015). Liver enzymes such as aspartate aminotransferase (AST), ALT, and GGT are considered surrogate markers for liver function. Recently, elevated serum GGT has been reported as an important risk factor for the development of impaired fasting glucose, T2DM, cardiovascular diseases, and metabolic syndromes, and ALT has been reported to be associated with diabetic syndrome and T2DM. Recent meta-analysis reports stated that ALT and GGT elevations were associated with increased risks of T2DM and that GGT might be a stronger risk factor than ALT. (Ko, 2015). The study aims to assess the prevalence and the clinical factors of elevated AST levels among diabetic patients attending Henrob Hospital, Zzana in Wakiso District.

METHODOLOGY

Study design

A retrospective cross-sectional study based on review of past and current medical/ laboratory records using a structured data extraction form was used. This design allowed estimation of the Prevalence and factors contributing to elevated aspartate aminotransferase levels among diabetic participants at a defined point in time using existing records, and enables exploration of sociodemographic and clinical determinants without prospective data collection. Using routine records makes the study relatively economical and feasible, and provides baseline information useful for planning public-health interventions such as targeted awareness campaigns.

Study area

The study was conducted at Henrob Hospital Zzana, located in Zzana, along Entebbe Road in Wakiso district, and it extends its services to the people in different catchment areas of Kajjansi town council, Ndejje, Bunamwaya, Najjanankumbi, and some parts of Kampala district and Mukono district.

Study population

Inclusion criteria

All complete records from 150 diabetic participants, both male and female, who had tested for Liver function tests, specifically AST levels, in the past 6-month period of the year.

Exclusion criteria

All diabetic individuals with other hepatic disorders attending Henrob Hospital Zzana, and diabetic participants with incomplete data or records.

Sampling method

Records were selected using a purposive, simple random, and systematic sampling technique. Since a non-probability method was used in sample selection, a purposive sample size of 150 diabetic participants will be convenient for the researcher both financially and time-wise.

Sample size determination

The Kish - Leslie sample size determination formula was used to determine the number of individuals who were included in the sample from a larger population for the research study.

Formula:

$$N = \frac{z^2 pq}{d^2} \text{ (Kish, Leslie. 1965)}$$

Where ;

N = required sample size

d = degree of accuracy/allowable error

z = confidence limits (1.96 at 95% level of confidence)

p = the prevalence.

Since the prevalence of elevated AST levels among diabetic patients is not known at Henrob Hospital, Zzana, a prevalence of 50% was used

Q = 1-P

$$\begin{aligned} \text{Therefore, } N &= \frac{(1.96)^2 (0.5) (1-0.5)}{(0.08)^2} \\ &= \frac{3.8416 * 0.5 * 0.5}{0.0064} \\ &= \frac{0.9604}{0.0064} \\ &= 150.06 \end{aligned}$$

Therefore, 150 records of diabetic patients were included in the study

Data collection procedures

A sample of the data collection form is attached to the appendix to collect the clinical factors, socio-demographic factors, and elevated Aspartate aminotransferase levels records as indicated in the hospital laboratory system.

Data collection

The data collection form contained information on demographic features such as age, gender, and clinical features.

The laboratory test forms: these forms were used to record the laboratory test results from the tests conducted, such as AST levels.

The medical review forms: these forms were used to extract relevant data or information from the medical records of the study participants.

Principle of determination of Aspartate aminotransferase

The measurement of aspartate aminotransferase (AST) activity is based on the principle that the amino group from Aspartate is transferred to α -ketoglutarate to glutamate and oxaloacetate, which is catalyzed by GOT - oxoglutarate+Aspartate $\rightarrow$ Glutamate+Oxaloacetate aspartate aminotransferase is measured by monitoring the concentration of oxaloacetatehydrazine formed with 2,4-dinitrophenylhydrazine. (Okike, 2025).

Results interpretation

Biological reference ranges for Aspartate Aminotransferase (AST) in IU/L; the lower limit is 0 IU/L

Piloting the Study

Before the full-scale implementation of the research, pre-testing will be conducted to evaluate the feasibility and robustness of the research methodology. This pilot phase will involve approximately 10% of the calculated sample size, which is roughly 20 participants, and will be carried out at Doctors Hospital Seguku. This facility has been selected for the pilot because it shares similar socio-demographic and clinical characteristics with Henrob Hospital Zzana, yet remains distinct from the primary study site to prevent contamination of the final data pool.

The primary objective of the pilot is to assess the clarity, flow, and cultural appropriateness of the questionnaire. It allows the researcher to identify ambiguous questions that may be misinterpreted by caregivers and to estimate the average time required for each interview. Additionally, the pilot serves as a "dry run" for the logistical aspects of specimen handling and transportation. Feedback gathered during this phase will be used to refine the data collection

tools and clinical protocols, ensuring that the main study proceeds with improved efficiency and that the instruments are optimized to capture accurate data regarding the determinants of elevated AST levels.

Data processing and statistical analysis.

Descriptive statistics were used to summarize the continuous data variables such as age, gender, social factors, and clinical factors. (Muramuzi D. M., 2024.).

Categorized variables such as age and sex were summarized using frequencies and percentages.

The primary analysis involved bivariate analysis to examine the relationship between AST levels, socio-demographic factors, and clinical factors and diabetes.

The Data collected were entered into an Excel spreadsheet and exported to the software for quantitative data analysis.

The significance level was set at 0.05. A receiver operating characteristic curve (ROC) was used to compare Serum AST, socio-demographic and clinical factors with diabetes (Bulamba, 2024.).

Ethical considerations.

Ethical clearance was sought from the Faculty of Research Committee, the Faculty of Medical Research Committee, Mildmay, and the research ethics committee of Mildmay; district administrative permission was sought from the district health officer. The principal investigator sought site administrative permission from the administrator of Henrob Hospital Zzana.

Confidentiality, anonymity, and privacy were safeguarded, and standard clinical practices and protocols will be adhered to. The questionnaires were put in a locked cabin, accessed by only the principal investigator.

RESULTS

Socio- demographic characteristics of participants.

Table 1:Shows socio- demographic characteristics of participants

Column1 Variables	Column2 Response	Column3 Frequency (N)	Column4 Female	Column5 Percentage (%)	Column6 Female	Column7 Total Frequency (N)	Column8 Percentage (%)
Age group	18-25	54	23	36	15.3	77	51
	26-35	30	15	20	10	45	30
	36-45	10	6	6.6	4	16	11
	46-60	7	5	4.6	3.3	12	8
Total		101	49	67.2	32.5	150	100
Gender	Male	101		67.3		101	67.3
	Female		49		32.6	49	32.7
Total		101	49	67.3	32.6	150	100
Marital status	Married	45	23	30	15.3	68	45
	Single	34	15	22.6	10	49	32

	Divorced	16	6	10.6	4.6	23	15
	Widow/widower	5	4	3.3	2.6	9	6
	No response	1	3	0.6	2	4	2
Total		101	49	67.1	32.6	150	100
Religion	Protestants	43	20	28.6	13.3	63	42
	Catholic	23	12	15.3	8	35	23.3
	Moslem	31	15	20.6	10	46	30.7
	Others	4	2	2.6	1.3	6	4
Total		101	49	67.1	32.6	150	100
Education level	Primary	8	5	2	11	13	8.7
	Tertiary	37	15	15	37	52	34.7
	Secondary	55	26	5	76	81	54
	No response	1	3	1	3	4	2.6
Total		101	49	23	127	150	100

The study involved 150 respondents, of whom 67.3% (101) were male, and 32.6% (49) were female. Most participants were aged between 18-25 years (51.3%), followed closely by 26-35 years (30%), while 11.3% were aged between 36-45 years and 7.3% were aged between 46-60 years. Regarding marital status, the majority of the participants,

45% (68), were married, followed by singles, 32% (49); the divorced participants were 15 % (23), and the least were widows or widowers, with 6 % (9). For education level, the tertiary educated participants were 54% (81), followed by those with a secondary education, 34.7% (52), while those with primary education were 8.7% (13).

General prevalence of elevated AST levels among diabetic patients according to gender

Table 2: Shows prevalence of elevated AST levels among diabetic patients according to gender

Variable	Gender	Frequency	Prevalence (%)
Elevated	Male	32	21.3
	Female	24	16
	Total	56	37.3
Normal	Male	43	28.7
	Female	51	34
	Total	94	62.7

According to the study findings, it revealed that out of 150 participants, 56(37.3%) had elevated AST levels, while 94(62.7%) had normal AST levels. When disaggregated by gender, males accounted for a higher proportion of elevated

AST levels compared to their female counterparts. 32 (21.3%) were males, and 24 (16%) were females. Conversely, normal AST levels were more common among females, 51 (34%), and males, 43 (28.7%)

Table 3: Clinical factors contributing to elevated aspartate aminotransferase enzyme in diabetic individuals

Variable	Frequency	Normal	Elevated	Prevalence (%)
Renal infarction	33	16	17	11.3
Acute coronary syndrome	6	4	2	1.3
Pulmonary embolism	12	6	6	4.0
Cerebral infarction	21	9	12	8.0
Hemolysis	67	18	49	32.7
Skeletal muscle damage	3	3	0	0.0
Malignant and non-malignant	8	0	8	5.3

According to the study findings, hemolysis was the most prevalent contributor, accounting for 49 cases of elevated AST out of 67 total cases represented by 32.7%; this was followed by renal infarction, 11.3% (17). Cerebral infarction also demonstrated a notable association with a prevalence of 8% (12). Malignant and non-malignant conditions were entirely associated with elevated AST levels, contributing 5.3%(8) to the overall prevalence; pulmonary embolism, 4%(6), and, least among skeletal muscle damage, 0% (00).

Discussion of the study findings

Prevalence of elevated AST levels among diabetic patients according to gender

This study aimed to determine the prevalence of AST levels among diabetic patients according to gender. According to the study findings, the prevalence of elevated AST levels was higher among males 21.3% than females (16%). This is in agreement with another study by Alzaharani et al.(2019) in Saudi Arabia, who reported a male predominance in AST levels among diabetic patients.

Similarly, another study by Targher et al. (2008) noted that males were an independent predictor of elevated liver enzymes in type 2 diabetes across multiple centres. The similarity in findings could be due to lifestyle and metabolic factors in males.

However, the study findings are in disagreement with other studies by Targher et al. (2008), who found 8.8% elevated AST in 9621 patients, and Alzaharani, who reported 6.16% in Saudi Arabia. The difference in study findings could be due to differences in population characteristics such as differences in income level between study populations, differences in glycemic control, and healthcare access.

Clinical factors contributing to elevated aspartate aminotransferase enzyme in diabetic individuals

This study aimed to determine clinical factors contributing to elevated AST levels in diabetic patients. According to study findings, hemolysis 32.7% was the leading cause of elevated AST levels, followed by renal infarction 11.3%, cerebral infarction 8% and Malignant/non Malignant conditions 5.3%, Skeletal muscle damage contributed 0%. Other studies (Lala et al., 2023) disagree with the study findings; the study states that skeletal muscle damage is the most common cause of non-hepatic AST elevation, whereas the study findings found 0% elevated AST elevation among patients with skeletal muscle damage, and hemolysis was the most dominant factor with 32.7%. This could be due to differences in study populations, as the (Lala et al., 2023) study focused on a general hospital population often in high-income settings where trauma and critical illness are common.

Conclusion

The study revealed a higher prevalence of elevated AST levels among male diabetic patients 21.3% compared to females 16% with an overall prevalence of 37.3%. This indicates that males are more likely to have elevated AST levels in diabetes.

Hemolysis 32.7% was the leading cause of elevated AST levels, followed by renal infarction 11.3%, cerebral infarction 8% and Malignant/non Malignant conditions 5.3%, Other clinical factors, such as pulmonary embolism 4% and acute coronary syndrome 1.3% had a lower contribution, while Skeletal muscle damage showed no association. These findings suggest that in this setting, hemolytic and vascular complications are the primary drivers of AST elevation among diabetic patients rather than muscle injury.

Recommendation

The results highlight the need for routine monitoring of liver enzymes, particularly in male patients and those with hemolytic or vascular complications, to enable early detection and management

Screen for hemolytic and vascular conditions in diabetic patientsmanagement of hepatic and sy 1. Routine liver enzyme monitoring for high-risk groups and systemic injury

. Use AST elevation as a trigger for broader clinical evaluation.

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List of abbreviations

ALT: Alanine Aminotransferase.

AST: Aspartate Aminotransferase.

DM: Diabetes Mellitus.

GDM: Gestational Diabetes Mellitus.

GGT: Gamma Glutamyl Transferase.

NAFLD: Non-Alcoholic Fatty Liver Disease.

T2DM: Type 2 Diabetes Mellitus.

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The study was not funded.

Original Study

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Conflict of interest

The author did not declare any conflict of interest.

Data availability

Data available upon request

Author contribution

Regina Biira Praise collected data and drafted the manuscript of the study

Anthony Ssekitoleko supervised the study

Francisco Semuwemba supervised the study

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