Knowledge of diabetes and associated factors among diabetic clients living with HIV in Eastern Uganda Baseline cross-sectional survey

Abstract

Introduction: Poor diabetes knowledge among diabetes clients living with HIV remains a big public health challenge in Africa.

Aim: This study assessed the level of diabetes knowledge and its associated factorsamong diabetes clients living with HIV in Eastern Uganda.

Study design: A cross-sectional study was conducted in Mbale and Soroti Regional Referral Hospitals in Eastern Uganda from May to June 2024.

Materials and Methods: Random sampling was done to select eligible registered participants. The diabetes knowledge questionnaire was used to gather the data, and Stata version 14 was used for analysis. Univariate analysis and Binary logistic regression were used to identify associated factors. P <0.05 was considered statistically significant at a 95% confidence interval.

Results:A total of 257 participants in Mbale and Soroti Hospitals participated in this study. The majority 152(59.1%) were females and 156(60.7%) of these participants were above the age of 50 years. The married were 59.1%. Only 20.2% had tertiary education. More than half (58.4%) had a below-average level of knowledge regarding diabetes, 78.2% did not know how diabetes is managed and 58.4% were not aware of the common diabetes complications. In addition, 49.80% were not knowledgeable about the recommended diabetes tests, and 46.30% were not knowledgeable about the diets.

Conclusions: The level of knowledge about diabetes is low among diabetes people living with HIV at Mbale and Soroti Hospitals in Eastern Uganda. Routine diabetes education bythe facility's health workers is encouraged and the focus should be on recommended diabetes tests, diets, drugs and possible complications.

Contribution: Identifies specific areas to be strengthened in diabetes education.

Keywords HIV, Diabetes, Diabetes knowledge among HIV, and Eastern Uganda.

INTRODUCTION

The prevalence of diabetes among HIV clients globally and especially in Sub-Saharan Africa has increased, as revealed by a study in South Africa and a systematic review by Peer [1], [2]. The systematic review by Peer and team noted that the burden of diabetes among African PLHIV was high due to suboptimal detection; however, HIV-related factors did not alter prevalence; instead, they were probably impacted by conventional risk factors [2].A majority of studies have noted that a highly active antiretroviral therapy has improved life expectancy but increased the risk of non-communicable diseases including diabetes among HIV clients [3], [4]. The study by Kumar [3] reported that Patterns in diabetes incidence over time showed that HIV and ART are substantial contributors. Yet, these patterns fluctuate from generation to generation, demonstrating the uneven impact of ART.The factors associated with the development of diabetes among HIV clients are; Age, Medication, gender, genetic factors and obesity [4], [5]. The World Health Organization (2023) reported that Uganda has a diabetes prevalence of 5.8% among PLWH however a study by Ssentongo [6] showed a higher prevalence of 7.5% in Mulago.Diabetes is a lifelong illness that occurs either when the body fails to generate enough insulin or cannot use the insulin it does generate efficiently; diabetes remains a major public health problem globally[7].

Knowledge about diabetes and its complications is a key element in self-management of diabetes however studies done in Sub–Saharan Africa reveal a lack or poor level of knowledge about diabetes and related complications among diabetes clients [8], [9]. A study by Zwane [10] “Self-Management of Diabetes and Associated Factors among Patients Seeking Chronic Care in Tshwane, South Africa’ revealed that only 55% had average diabetes knowledge and recommended diabetes education that is tailored to individual patient circumstances [10].A similar study in Benin revealed poor attitudes, inadequate practice and lack of knowledge among the surveyed diabetes community, and suggested the need for structured educational programs to assist diabetic patients[11].An additional study in Western Uganda also reported that only 56% of the participants had adequate self-care diabetes knowledge [12]. The factors associated with lack of knowledge in diabetes care are age, level of education, health services and clinical characteristics [8], [9], [13].Poor level of knowledge among diabetes clients is a serious threat to individual health, and Knowledge is essential for effective control of diabetes, as it allows the patient to play an active and cooperative role in planning and monitoring the therapeutic, which promotes informed decisions [14].

Although diabetes knowledge and related complications are known among diabetes patients, the target populations and study settings have been patients with only diabetes and outpatient diabetes clinics, respectively. Little is known about levels of diabetes knowledge and associated factors among diabetes patients living with HIV (two chronic conditions with life-long treatment) and receiving care in HIV outpatient clinics.

This study, therefore, aimed to assess the level of diabetes knowledge and its associated factors among diabetes clients living with HIV in Eastern Uganda. The findings of this study will be used to provide baseline information for new interventions that will address knowledge gaps of diabetes knowledge among HIV clients in Uganda and similar contexts.

Methodology

Study design A cross-sectional study of randomly selected registered diabetes clients living with HIV (HIV-diabetes) was conducted from May to June 2024.

Study Setting The people living with HIV(PLWH) and diabetes in Mbale and Soroti Hospitals receive health education in groups whenever they come for drug refills. Health workers do health education with the support of expert clients. The focus of health education is on HIV and little emphasis is put on diabetes. The expert clients are HIV clients who have good knowledge about their condition. The HIV-Diabetes clients go for drug refills and routine medical check-ups every two to three months. Mbale Hospital is a public Hospital funded by the Ministry of Health Uganda (MOH). Mbale Hospital has a big

catchment population of over 4.5 million and serves thirteen districts. Soroti Hospital is also a public hospital funded by the MOH Uganda. Soroti is located 320km northeast of Kampala with a latitude of 1.716111 and a longitude of 33.613056, serving eight districts. Both Hospitals have a relatively higher prevalence of HIV compared to their neighbours. In Uganda HIV and Diabetes health services are provided by the private and public subsectors. The Public Sector includes Health Centres (two to four), District hospitals, and Regional Referral Hospitals like Mbale and Soroti and National Referral Hospitals. The private health services providers include Complementary and traditional practitioners and private for-profit and not-for-profit organisations. These health facilities provide curative and preventive services and are free in Public facilities. The regional and national hospitals have specialists and some are teaching Hospitals.

Study Population The study population constituted registered Diabetes clients living with HIV (HIV-Diabetes), in Mbale and Soroti Regional Referral Hospitals. Registered HIV-Diabetes clients who have both HIV and Diabetes who are 18 years and above were included in the study. Included also were registered Expert HIV clients.

Sample size and sampling The sample size of 267, was determined using findings from a study in Ethiopia by Melaku et al.,(2020) and the modified Cochran formula for a small known population. The confidence interval was 95%, an error margin was 5 % and the registered population was 524.Where p was the proportion of HIV-Diabetes clients with good glycemic control was=0.381, q=1-p =1-0.381 =0.619, z= standard normal deviation (1.96) at 95% of confidence. d=degree of accuracy desired in our study was 0.05. The sample size was adjusted by 20% to cater for the non-response rate. Below is the formula used.

The modified Cochran Formula for Sample Size Calculation in Smaller Populations

Since the population we're studying was small, we modified the sample size we calculated using this

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Here n_0 was Cochran's sample size recommendation, N was the population size of 524, and n was the new, adjusted sample size.

362 / (1 + (362 / 524)) = 214. The 214 plus 20% addition for non-response gives us a total sample sizeof **267**

The Cochran formula is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

- e was the desired level of precision (5%)

- p was the proportion of the HIV-Diabetes clients with good glycemic control=0.381.
- q was 1 – p =0.619, and z= standard normal deviation (1.96) at 95% confidence.

Purposive sampling was used to select Mbale and Soroti Hospitals because they have a bigger population of HIV-Diabetes clients. Random sampling was used to select the 267 participants. Each registered diabetes client living with HIV in both Hospitals was first assigned a number(the researcher labelled each of the 524 participants with a unique number from 1 to 524). The random number generator was utilised to generate 267 unique random numbers within the range of 1 to 524. The third step involved matching the generated random numbers with corresponding participants. The researcher made sure that each random number was selected only once and the total selected was 267. Out of 267 randomly selected participants, ten did not participate in the study, so we had 257. Out of the ten who didn't participate six refused to consent to the study and four had incomplete and inaccurate entries in the facility register. Six participants refused to consent and four had incomplete and inaccurate entries in

the facility registers.

Eligibility criteria The inclusion criteria were; The participant could provide informed consent, the participant was registered and diagnosed with both diabetes and HIV in Soroti and Mbale Hospitals, and were adults aged 18 years and above.

Exclusion criteria were; Registered diabetes clients living with HIV who had mental health issues that affected their ability to participate were excluded.

Study Variables

Outcome variable. The outcome variable was the level of knowledge of diabetes. We adapted, modified and translated the self-administered Diabetes knowledge test (DKT) to assess the level of knowledge. This study also had an additional questionnaire that tested if the HIV-Diabetes clients were knowledgeable about diabetes, types of diabetes, tests routinely done, recommended diets, diabetic complications, and drugs used for the management and prevention of highly infectious diseases (COVID-19) among HIV-Diabetes clients. DKT was adapted because it's a validated tool suitable for the study context. The DKT scores were classified according to a similar study by Phoosuwanet al.,(2022) where the average total diabetes knowledge was considered to be (11-17) and the total possible score for the 23 questions ranged from 0-23 points. The responses to questions by the PLWH and Diabetes were scored, computed and categorised as either below or above average level of knowledge. Independent **variable.** The independent variables were categorised into HIV-Diabetes client's gender, age in completed years, residence (district), religion, marital status, level of education, employment status, income, distance to the nearest facility, alcohol consumption, and smoking. The other independent variables included were the viral load levels, HbA1c, BMI and drugs used by the clients.

Statistical Analysis The collected data was checked for completeness and cleaned before data analysis. Stata version 14 was used for statistical analysis. In univariate analysis, data were expressed in the form of proportions (%) and counts (frequency) for categorical variables. Bivariate logistic regression was done to determine levels of association. The P-value of <0.05 was considered statistically significant.

Ethical Consideration This study was approved and the approval number was BUFHS-2024-160. Written informed consent was obtained from all the study participants. The consent form was translated into the local languages to cater for those who can not read English. Confidentiality was observed and data gathered was kept under lock and key by the principal investigator. All the research assistants were trained in how to ensure privacy and confidentiality.

Results

Sociodemographic characteristics of the research participants

A total of 257 out of 267 diabetes clients living with HIV from Mbale and Soroti Regional Referral Hospitals participated in this study. Ten participants out of the calculated 267 didn't participate because six of them refused to consent and four had incomplete entries. The majority 152(59.1%) were females and 156(60.7%) of these participants were above the age of 50 years. More than half 152(59.1) were married and 21.8% were widows. Only 52 (20.2%) had tertiary education and 45% had primary education. The participants employed were 147(57.2%. (Table 1 below has the details).

Table 1 Sociodemographic characteristics of the participants

Variable	Frequency n=257	Percentage (%)
1. Age (years)		
20-34	20	7.8
35-49	81	31.5
50+	156	60.7
2. Gender		
Female	152	59.1
Male	105	40.9
3. Religion		
Catholic	72	28.0
Muslim	44	17.1
Protestant	98	38.1
Pentecostal		
Others	9	3.5
4. Marital status		
never married (single)	25	9.7
Others specify(5)	1	0.4
divorced/separated(4)	41	16.0
married(2)	134	52.1
widow(3)	56	21.8

6. Number of children		
none	13	5.1
1-2	41	16.0
3-4	68	26.5
5+	135	52.5
7. Highest level of education attained or school		
Absence of formal education(1)	16	6.2
Primary level(2)	118	45.9
Secondary Level(3)	71	27.6
Tertiary level(4)	52	20.2
8 Current employment status		
Unemployed	110	42.8
Employed.	147	57.2

Clinical characteristics of the participants

A majority 256(99.6%) of the participants were on HIV treatment,255(99.2%) had viral load tested and all(100%) the clients were on diabetes treatment.

Level of diabetes knowledge among participant

More than half (58.4%) had a low (below-average) level of knowledge regarding diabetes. The score of 11-17 was considered average based on a similar study by Phoosuwan et al., (2022) in Thailand.

Knowledge of specific areas of diabetes that all study participants must know.

A large proportion (78.2%) did not know how diabetes is managed, and 58.4% didn't know the common complications of diabetes. Close to fifty per cent (49.80%) were not knowledgeable about the recommended diabetes tests to be performed regularly, and 46.30% were not knowledgeable about the recommended diet.

Table 2: Knowledge of the recommended diabetes diets and medicines, and common diabetes complications

Variable	Frequency n=257	Percentage(%)
Knowledgeable about diabetes complications an HIV-Diabetic client can get if they do not treat diabetes		
no	150	58.40%
yes	107	41.60%
Knowledgeable about how diabetes is treated in HIV-positive clients		

no	201	78.20%
yes	56	21.80%
Knowledgeable about the food (diet) HIV-Diabetes clients must eat daily and why		
no	119	46.30%
yes	138	53.70%
Knowledgeable about regular medical tests or examinations that HIV-Diabetes clients must book regularly		
no	128	49.80%
yes	129	50.20%
Knowledgeable about how other highly infectious diseases (COVID-19) are prevented in HIV		
no	87	33.90%
yes	170	66.10%

Factors associated with diabetes knowledge

The factors positively associated with diabetes knowledge included age group above 50 years, male gender, religion, divorce, unemployment, level of the nearest health facility and smoking. The factors negatively associated with diabetes knowledge included being single, a widow, drinking alcohol, and a primary level of education. There was no association between diabetes knowledge and being employed, being married, age group group (20-34), and secondary level of education. All these associations were not statistically significant at a 95 per cent confidence interval, as detailed in the table below.

Table 3 Bivariate analysis results with odds ratios and p values to determine the association between diabetes knowledge and Socio-demographic and clinical characteristics.

Variable	**Total**	**Total score**		**cPOR(95% CI)**	**P-value**
	n=257(100.0)				
		50+	<50		
		n =107(%)	n=150(%)		
1.Age (years)					0.941
20-34	20(7.8)	9(8.4)	11(7.3)	1	
35-49	81(31.5)	34(31.8)	47(31.3)	1.1(0.4, 3.0)	0.807
50+	156(60.7)	64(59.8)	92(61.3)	1.2(0.5, 3.0)	0.734
2. Gender					0.659
Female	152(59.1)	65(60.7)	87(58.0)	1	
Male	105(40.9)	42(39.3)	63(42.0)	1.1(0.7, 1.9)	0.659

3. Religion					0.788
Catholic	72(28.0)	34(31.8)	38(25.3)	1	
Muslim	44(17.1)	19(17.8)	25(16.7)	1.2(0.6, 2.5)	0.672
Protestant	98(38.1)	38(35.5)	60(40.0)	1.4(0.8, 2.6)	0.271
Pentecostal				1.4(0.6, 3.3)	0.386
Others	9(3.5)	3(2.8)	6(4.0)	1.7(0.4, 7.7)	0.435
4. Marital status					0.862
married	134(52.1)	55(51.4)	79(52.7)	1	
never married (single)	25(9.7)	12(11.2)	13(8.7)	0.8(0.3, 1.8)	0.519
Others specify	1(0.4)	0(0.0)	1(0.7)	-	
divorced/separated	41(16.0)	16(15.0)	25(16.7)	1.1(0.5, 2.2)	0.818
widow	56(21.8)	24(22.4)	32(21.3)	0.9(0.5, 1.7)	0.817
5. Number of children					0.073
none	13(5.1)	7(6.5)	6(4.0)	1	
1-2	41(16.0)	17(15.9)	24(16.0)	1.6(0.4, 5.8)	0.436
3-4	68(26.5)	36(33.6)	32(21.3)	1.0(0.3, 3.4)	0.952
5+	135(52.5)	47(43.9)	88(58.7)	2.2(0.7, 6.9)	0.182
6. Highest level of education attained or school					0.106
Absence of formal education(1)	16(6.2)	5(4.7)	11(7.3)	1	
Primary level(2)	118(45.9)	55(51.4)	63(42.0)	0.5(0.2, 1.6)	0.252
Secondary Level(3)	71(27.6)	22(20.6)	49(32.7)	1.0(0.3, 3.3)	0.984
Tertiary level(4)	52(20.2)	25(23.4)	27(18.0)	0.5(0.1, 1.6)	0.241
7. Current employment status					0.220
Unemployed	110(42.8)	41(38.3)	69(46.0)	1.4(0.8, 2.3)	
Employed.	147(57.2)	66(61.7)	81(54.0)	1	
8. Source of hospital income when sick/visiting a hospital?					0.586
From my salary/business	60(23.3)	30(28.0)	30(20.0)	1	
Donations from friends	5(1.9)	2(1.9)	3(2.0)	1.5(0.2, 9.6)	0.669
Support from children/relatives	73(28.4)	31(29.0)	42(28.0)	1.4(0.7, 2.7)	0.386
Use free government services	116(45.1)	43(40.2)	73(48.7)	1.7(0.9, 3.2)	0.100

Others	3(1.2)	1(0.9)	2(1.3)	2(0.2, 23.0)	0.580
Who owns the nearest health facility?					0.482
Government	248(96.5)	103(96.3)	145(96.7)		
Private clinic/hospital	8(3.1)	3(2.8)	5(3.3)	1.2(0.3, 5.1)	0.820
Private not-for-profit	1(0.4)	1(0.9)	0(0.0)	-	
9. Level of that nearest health facility					0.064
Health Centre II (Level II)	20(7.8)	12(11.2)	8(5.3)	1	
Health Centre III (Level III)	96(37.4)	46(43.0)	50(33.3)	1.6(0.6, 4.3)	0.328
Health center IV (Level IV)	64(24.9)	26(24.3)	38(25.3)	2.2(0.8, 6.1)	0.133
District hospital (Level V)	21(8.2)	7(6.5)	14(9.3)	3(0.8, 10.7)	0.091
Regional Referral (Level VI)	56(21.8)	16(15.0)	40(26.7)	3.8(1.3, 10.9)	0.015
10. Distance to the facility					0.707
within 5km	189(73.5)	80(74.8)	109(72.7)	1	
>5km	68(26.5)	27(25.2)	41(27.3)	1.1(0.6, 2.0)	0.707
11. Ever smoked cigarettes					0.384
No	241(93.8)	102(95.3)	139(92.7)	1	
Yes	16(6.2)	5(4.7)	11(7.3)	1.6(0.5, 4.8)	0.388
12. Ever drunk alcohol?					0.603
No	194(75.5)	79(73.8)	115(76.7)	1	
Yes	63(24.5)	28(26.2)	35(23.3)	0.9(0.5, 1.5)	
13.When was the last time you visited a hospital?					0.186
<6months ago	238(92.6)	103(96.3)	135(90.0)	1	
Approximately a year ago	14(5.4)	3(2.8)	11(7.3)	2.8(0.7, 10.3)	0.122
Never visited	2(0.8)	1(0.9)	1(0.7)	0.7(0.04, 12.34)	0.849
Two years prior	3(1.2)	0(0.0)	3(2.0)	-	
14. When did you have a thorough medical checkup done?					0.160
Five years ago	6(2.3)	4(3.7)	2(1.3)	1	
Less than one year ago	29(11.3)	13(12.1)	16(10.7)	2.5(0.4, 15.6)	

Less than six months ago	197(76.7)	84(78.5)	113(75.3)	2.7(0.5, 15.0)	
More than five years ago	12(4.7)	1(0.9)	11(7.3)	22.0(1.5, 314.33)	
Two years ago	12(4.7)	5(4.7)	7(4.7)	2.8()	
missing	1(0.4)	0(0.0)	1(0.7)	-	
15.On any treatment for HIV?					0.397
0. No	1(0.4)	0(0.0)	1(0.7)	-	
1.Yes	256(99.6)	107(100.0)	149(99.3)	-	
16.Have you checked your viral load?					0.230
0. No	2(0.8)	0(0.0)	2(1.3)	-	
1. Yes	255(99.2)	107(100.0)	148(98.7)	-	

Discussion

This study determined the level of diabetes knowledge among a sample of People living with HIV(PLWH) and diabetes at Mbale and Soroti Hospitals Eastern Uganda. The study also determined possible associations between the level of diabetes knowledge and Sociodemographic characteristics and clinical parameters. This study showed that 58.4% of the participants had below-average (low) levels of diabetes knowledge. The proportion of the participants who had below-average is relatively high compared to other regional studies for example the one done in Tanzania by Luambanoet al.,(2023) which revealed 35.9% with inadequate diabetes knowledge. This is because the HIV clinics focus mainly on health education about HIV, not diabetes. The integration of diabetes management in HIV care has not been implemented in the two Hospitals and this affects the quality of diabetes care PLWH receive in both hospitals. This explanation of this study's findings is supported by a study that found health workers were more knowledgeable about HIV than diabetes and this can affect the quality of diabetes health education they provide and the level of clients' diabetes knowledge. [15]. This could additionally explain why a majority of the diabetes clients living with HIV had a low level of diabetes knowledge in this study. These findings concur with a study that reported a sizeable number of respondents with low levels of diabetes knowledge [13]. A scoping review by Mhlanga [9] also noted the lack of knowledge on modifiable factors of diabetes among the study participants. In addition, a study by, Phoosuwan [16] reported a majority (90%) of their participants had poor knowledge about diabetes, which is also in line with this study's findings.

This study also, found that 78.2% of the participants did not know how diabetes is managed and 58.4% didn't know the common complications of diabetes. This is because little or no time is devoted to health education on diabetes and its complications in both HIV clinics. Most participants visited the clinic once in three months for health education and drug refills. The participants were also not eager to learn more about diabetes complications because the perceived severity of HIV among HIV-Diabetics was higher compared to diabetes. These findings are in line with Adongo [17] where they concluded that more than half of the studied population had inadequate knowledge of diabetes complications. They noted that female gender, rural dwellers, and low education level were factors positively associated with low knowledge of diabetes complications [17]. The study by Obirikorang [15] had similar findings and they reported that a majority (60%) of participants did not have knowledge of diabetes complications [15]. Our study also found close to fifty per cent, (49.80%) were not knowledgeable about the recommended diabetes tests to be performed regularly, and 46.30% were not knowledgeable about the recommended diabetes diets, these findings are similar to findings by Sami and Alaofe respectively [18],[11].

Conclusion

The level of knowledge about diabetes is low among diabetes clients living with HIV at Mbale and Soroti Hospitals in Eastern Uganda. The age group above 50 years, male gender, religion, divorced, being unemployed, level of the nearest health facility and smoking were positively associated though not statistically significant at 95% CI. Routine diabetes education bythe facility's dieticians and physicians is highly recommended and must focus on clients above 50 years, males, unemployed, and those who smoke.

Contributions of the study

This study provides baseline information for future studies and interventions among diabetes clients living with HIV (HIV-Diabetes) in Eastern Uganda.Prior research in our setting primarily examined clients with only one of the two medical conditions either diabetes or HIV. The study revealed specific areas in diabetes knowledge that need to be improved and strengthened among diabetes clients living with HIV for example diabetes knowledge in recommended diets, tests, drugs and possible complications.

Limitations of the study

The cross-sectional data used will only establish associated factors, not causality. A self-reported questionnaire was used for the study, however, this is vulnerable to recall bias because it's based on self-reported responses.

Ethical Consideration

This study was approved and the approval number was BUFHS-2024-160. Written informed consent was obtained from all the study participants. The consent form was translated into the local languages to cater for those who can not read English. Confidentiality was observed and data gathered was kept under lock and key by the principal investigator. All the research assistants were trained in how to ensure privacy and confidentiality.

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