

Factors contributing to the elevated creatinine levels among patients attending the diabetic clinic at Entebbe Regional Referral Hospital. A retrospective study.

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ABSTRACT

Background:

Diabetes mellitus is the leading risk factor for impaired kidney function, a chronic metabolic disorder that can lead to various vascular complications. The study aims to determine the prevalence and individual factors contributing to elevated creatinine levels among diabetic individuals.

Methodology:

A retrospective study. Data were extracted from the patients' medical records or laboratory management system (LMS) of the study site. Every patient from the records was assigned a unique laboratory number for identification, recorded on the data collection form, which captured creatinine levels, age, sex, and race among diabetic individuals attending Entebbe Regional Referral Hospital diabetic clinic.

Results:

The prevalence of hypercreatinemia was found to be 18.75%. The prevalence of hypercreatinemia was high among those with a family history of CVD, 4(44.4%). Most respondents, 48(59.9%), were aged 50 and above; most of the participants were females, 46(57.5%). Respondents with a BMI of $>30.0\text{kg/m}^2$ (obese) had the highest number with elevated creatinine levels, 6(40.0%). Respondents who took alcohol had a higher prevalence at 27.0% than non-alcohol takers. Daily alcohol consumers had the highest percentage with hypercreatinemia, 8(80.0%). Monthly consumers had 3(42.9%) and weekly 2(50.0%). Smokers had a higher hypercreatinemia prevalence, 5(20.8%), with daily smokers having the highest. 64(80.0%) did not have other conditions other than diabetes. 11(68.7%) had hypertension while least number 2(12.5%) had kidney disease and 3(18.8%) had heart disease.

Conclusion:

Hypercreatinemia remains a concern among diabetic patients, highlighting the need for routine renal monitoring, early risk identification, and targeted lifestyle interventions to prevent kidney dysfunction.

Recommendation:

The government and the hospital should invest in research and health systems at ERRH to identify the relationship between DM and age as a way of curbing this increased rate of diabetes.

Keywords: Prevalence of diabetes mellitus, Elevated creatinine levels, Hypercreatinemia, Entebbe Regional Referral Hospital.

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Background

Diabetic nephropathy is the leading cause of renal morbidity, which occurs when chronic diabetes destroys the filtering system of the kidneys (Ullah, 2023). Diabetes mellitus is the leading risk factor for impaired kidney function, a chronic metabolic disorder that can lead to various vascular complications like cardiovascular, renal, neurological, and retinal complications. Diabetes mellitus is associated with dyslipidemia, hypertension, and visceral

adiposity, which collectively increase the risk of developing chronic kidney disease (Shrestha, 2008).

Diabetes mellitus is characterised by chronic hyperglycaemia due to derangement in carbohydrates, fats, and protein metabolism and is associated with absolute or relative deficiencies in insulin secretion, insulin action, or both. Diabetic nephropathy affects 30% of all diabetics, and it is a leading cause of end-stage renal disease (Bamanikar, 2016). Assessment of a patient's renal function may be used

for two different purposes. One is to diagnose impaired renal function, and the other is to detect the presence of a progressive loss of renal function (SA Bamanikar, 2016).

Diabetic nephropathy is a public health concern of increasing proportions, becoming the world most common single cause of end stage renal disease all over the world (Bhatia, 2019). In diabetes, the cells are unable to receive glucose, and most of it is accumulated in the blood, which can lead to heart disease and damage to the nerves and kidneys. When blood sugar is increased, it induces stress on the kidneys and damage to the blood vessels, leading to kidney disease. The kidneys excrete metabolic waste products and regulate the serum concentration of a variety of substances. At the stage of renal disease, these substances often become abnormal, and the extent of the abnormality depends on the severity of the disease. Serum creatinine and urea concentrations change inversely with changes in GFR, so these are useful to detect the degree of renal dysfunction. Changes in serum creatinine concentrations more reliably reflect changes in GFR than serum urea concentrations (Wang, 2025). Creatinine is the breakdown product of creatinine phosphate released from skeletal muscles at a steady state; it is filtered by the glomerulus, and a small amount is also secreted into the glomerular filtrate by the proximal tubules.

In diabetic nephropathy, the biomarker creatinine is known to be raised with hyperglycaemia in uncontrolled diabetics and usually correlates with severity of kidney damage (Mohan, 2024). Measurement of serum urea and creatinine is an easily available test for this purpose, which can assist in detection and prevention of diabetic kidney disease at an early stage and can limit the progression to end-stage renal disease (ESRD) (Kurniawan, 2020). The study aims to determine the prevalence and individual factors contributing to elevated creatinine levels among diabetic individuals attending the diabetic clinic in Entebbe Regional Referral Hospital.

Methodology

Study design

A retrospective study design was conducted to assess the prevalence and factors contributing to elevated creatinine in diabetic individuals attending Entebbe Regional Referral Hospital diabetic clinic, collecting data at a single point in time in order to establish the prevalence and contributing factors for elevated creatinine levels in diabetic individuals.

Study area

This study was conducted at Entebbe Regional Referral Hospital, located in Entebbe Municipality, central Uganda, in Wakiso district. Its catchment areas are Katabi Town

Council, Kajjansi Town Council, Bussi Islands, and cover part of Kampala district, Mukono, and Mpigi.

Study population

Records of Diabetic individuals attending Entebbe Regional Referral Hospital in Entebbe Municipality, Wakiso District, Central Uganda.

Sampling method

Convenient sampling was used to recruit the records of diabetic patients who were tested for creatinine.

Sample size determination

The formula $n = (Z^2PQ)/d^2$ (Kish, 1965) is used to determine the sample size

Where,

D is the level of precision +/- 0.05

Z is the level of significance (1.96) for confidence interval of 95%

P is the prevalence from the literature (90%) (Kirya, 2024)

A single population proportion formula is to be used to calculate the minimum Sample size required by using a P value of 0.5 and a 95% confidence interval.

Q is the percentage of the population of people not affected. (1-P)

$n = (1.96)^2 * 0.7 * 0.3 / (0.05)^2$

$n = 320/4$ (due to limited time factors and quarterly in the year)

$n = 80$

Inclusion criteria

Well-filled records of diabetic individuals with elevated creatinine levels attending Entebbe Regional Referral Hospital diabetic clinic.

Exclusion criteria

Records of Individuals with elevated creatinine levels but who are non-diabetic were withdrawn from the study, as were records with missing information.

Data collection procedures

Data were extracted from the patients' medical records or laboratory management system (LMS) of the study site. Every patient from the records was assigned a unique laboratory number for identification, recorded on the data collection form, which captured creatinine levels, age, sex, and race among diabetic individuals attending Entebbe Regional Referral Hospital diabetic clinic.

Data collection tool

The following was used to capture data: a structured, pretested questionnaire was used to collect data from

participants, such as demographic features like age and sex, to determine the factors contributing to elevated creatinine levels among diabetic individuals. The chemistry analyser will be used to establish the prevalence of elevated creatinine levels among diabetic individuals. Laboratory materials include a chemistry analyser, laboratory request form, and laboratory records book.

Data processing and Statistical analysis

Descriptive statistics were used to summarise continuous variables such as age, gender, and estimated glomerular filtration rate. Categorical variables such as sex and age were summarised using frequencies and percentages. The primary analysis involved bivariate analysis to examine the relationship between creatinine and estimated glomerular filtration rate with the independent variables.

Data were collected and entered in Excel spreadsheets and then exported to the StataBE 17 Statistical app for quantitative data analysis.

The significance level for statistical tests was set at $p=0.05$.

Ethical consideration

Ethical clearance was sought from the Faculty Research Committee, Faculty of Medical Laboratory Science, Mildmay, and the Research Ethics Committee of Mildmay. District administrative permission was sought from the District Health Office.

The principal investigator sought site administrative permission from the administrator of Entebbe Regional Referral Hospital.

The study was registered with the Uganda National Council of Science and Technology (UNCST) (Nuwagaba and Rule, 2015).

Confidentiality, anonymity, and privacy were safeguarded, and standard clinical practices and protocols were adhered to.

The questionnaires were in a locked cabin accessed by only the principal investigator.

RESULTS

Socio-demographic characteristics of respondents

Table 1: Showing socio-demographic features of 80 respondents

N=80			
Variables	Category	Frequency	Percentage (%)
Age	18-30	6	7.5
	31-39	9	11.3
	40-49	17	21.3
	50 and above	48	59.9
Sex	Male	34	42.5
	Female	46	57.5
Marital status	Single	10	12.5
	Married	57	71.3
	Divorced	8	10.0
	Widowed	5	6.2
Religion	Catholic	20	25.0
	Protestant	23	28.8
	Moslem	9	11.2
	Pentecostal	14	17.5
	Others (Traditionalist)	14	17.5
Nationality	Ugandan	74	92.5
	Kenyan	6	7.5
	Tanzanian	0	0
	Rwandese	0	0

Source: primary data (2026)

Table 1 shows the socio-demographic data of 80 respondents who were enrolled in the study. About age, most of the respondents, 48(59.9%), were aged 50 and above, and the least, 6(7.5%), were aged 18-30 years; 17(21.3%) were aged 40-49 years and 9(11.5%) were aged 31-39 years. Concerning sex, most of the participants were

females, 46(57.5%), and males were 34(42.5%). With respect to marital status, most of the participants were married, 57(71.3%), and the least were widowed, 5(6.2%). singles were 10(12.5%) and divorced 8(10.0%). Pertaining to religion, the majority of the study subjects were protestants 23(28.8%), and a minority were Muslims

9(11.2%). Catholics were 20(25.0%), Pentecostals and traditionalists were 14(17.5%) each respectively. Both Tanzanians and Rwandese had no respondents. Nationality of the respondents had the majority as

The Prevalence of elevated creatinine levels among the respondents

Table 2: showing Prevalence of elevated creatinine levels.

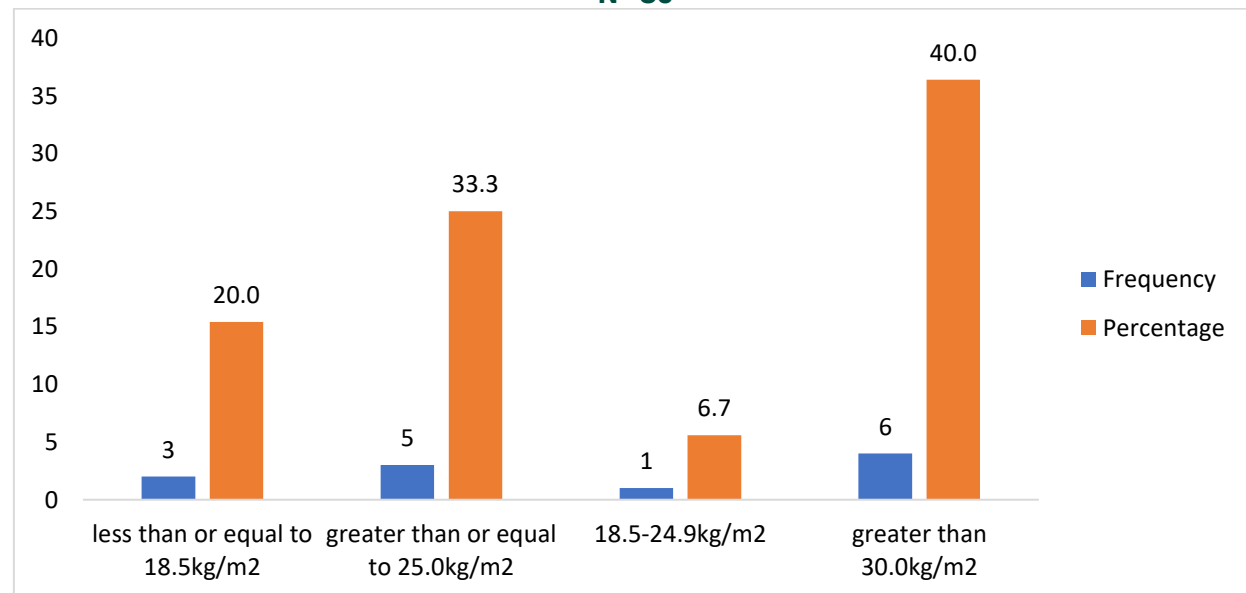
Creatinine levels	Frequency N=80	Percentage (%)
Normal	65	81.25
Elevated creatinine	15	18.75

Source: Primary data (2026)

From Table 2, out of 80 participants whose creatinine was measured, only 15 (18.75%) had elevated levels of creatinine, whereas 65(81.25%) had normal creatinine levels. The prevalence of hypercreatinemia was found to be 18.75% among the respondents.

Factors associated with elevated creatinine among the respondents

Figure 1: showing how BMI contributes to elevated creatinine levels among the respondents N=80



Source: Primary data (2026)

From figure 1, respondents with BMI of $>30.0\text{kg/m}^2$ (obese) had the biggest number with elevated creatinine level 6(40.0%) followed by BMI $>$ or equal to 25.0kg/m^2 (overweight) 5(33.3%) and respondents with BMI of 18.5kg/m^2 - 24.9kg/m^2 (normal) had the smallest number with elevated creatinine level 1(6.7%).

Table 3: showing behavioural factors contributing to diabetes mellitus among the respondents

N=80

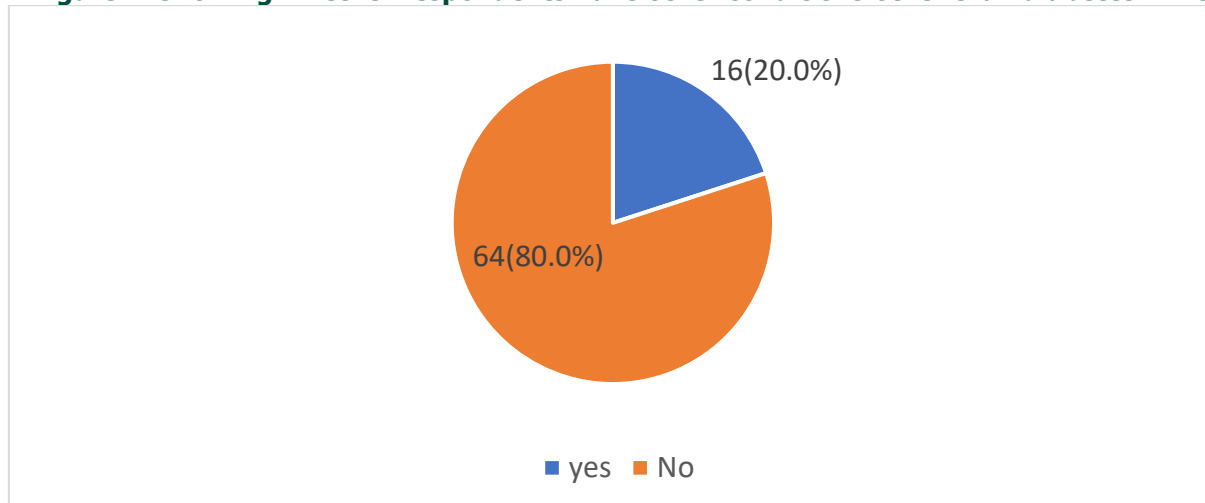
Page 5	Variable	Category	Hypercreaticimic		Normal		TOTAL	
			Frequency	%	Frequency	%	Frequency	%
	Do you take alcohol?	Yes	7	27.0	19	73.0	26	32.5
		No	8	14.8	46	85.2	54	67.5
			N=26					
	If yes, how often?	Daily	8	80.0	2	20.0	10	38.5
		after 2 days	2	40.0	3	60.0	5	19.2
		Weekly	2	50.0	2	50.0	4	15.4
		Monthly	3	42.9	4	57.1	7	26.9
	Do you smoke?	Yes	5	20.8	19	79.2	24	30.0
		No	10	17.9	46	82.1	56	70.0
			N=24					
	If yes, how often?	Daily	9	64.3	5	35.7	14	58.3
		After 2 days	5	62.5	3	37.5	8	33.3
Weekly		0	0.0	0	0.0	0	0.0	
Monthly		1	50.0	1	50.0	2	8.3	

Source: Primary data (2026)

Table 3 indicates that, regarding alcohol consumption, respondents who took alcohol had a higher prevalence at 27.0% than non-alcohol takers, which had 14.8%. Among the former, daily alcohol consumers had the highest percentage with hypercreatinemia, 8(80.0%), while after 2 days had the lowest, 2(40.0%). Monthly consumers had 3(42.9%) and weekly 2(50.0%).

Concerning smoking, Smokers had higher hypercreatinemia prevalence, 5(20.8%), with daily smokers having the highest, 9(64.3%), while monthly smokers, 1(50.0%), had the least. Weekly smokers had no respondents.

Figure 2: Showing whether respondents have other conditions other than diabetes. N=80

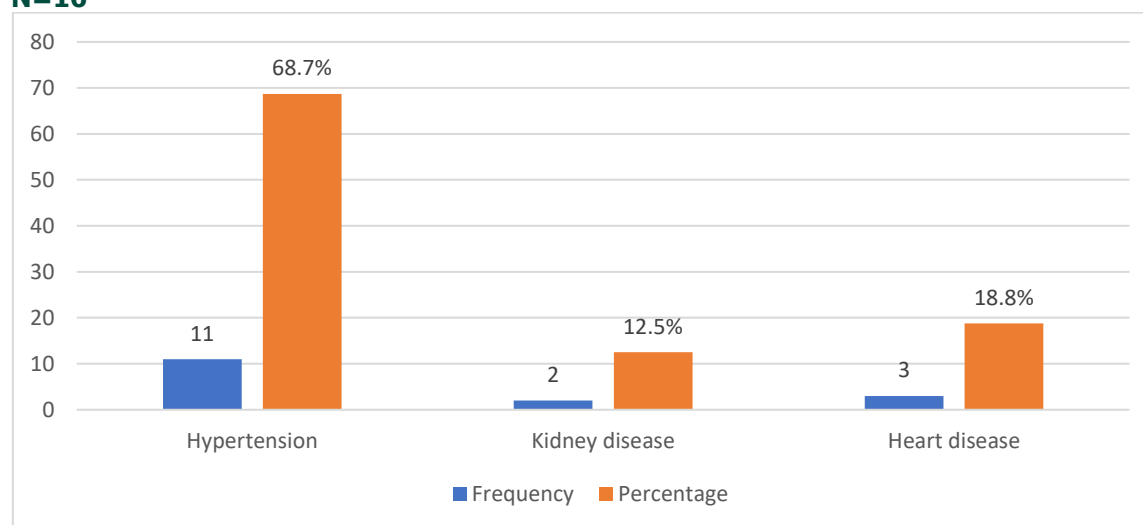


Source: Primary data (2026)

Figure 2: The majority of the respondents, 64(80.0%), did not have other conditions other than diabetes, while a minority, 16(20.0%), had.

Figure 3: showing distribution of other conditions among respondents with hypercreatinemia N=16

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Source: Primary data (2026)

From Figure 3, most of the respondents, 11(68.7%), had hypertension while least number 2(12.5%) had kidney disease and 3(18.8%) had heart disease.

Table 4: showing family history of CVD and duration with DM by the respondents

N=80		Hypercreatinemic		Normal		Total	
Variable	Response	Frequency	%	Frequency	%	Frequency	%
Do you have a history of CVD in your family?	Yes	4	44.4	5	55.6	9	11.3
	No	11	15.5	60	84.5	71	88.7
How long have you been with DM?	< 5 years	3	6.5	43	93.5	46	57.5
	5-10 years	5	35.7	9	64.3	14	17.5
	>10years	7	35.0	13	65.0	20	25.0

Source: Primary data (2026)

From Table 4, the prevalence of hypercreatinemia was high among those with a family history of CVD 4(44.4%) and low among those without (11, 15.5%).

Concerning duration of diabetes mellitus, respondents with 5-10 years of DM had the highest percentage with hypercreatinemia, 5(35.7%), while those <5 years had the lowest percentage, 3(6.5%).

Discussions

Prevalence of elevated creatinine levels in diabetic individuals

The study revealed that out of 80 respondents who were involved in the study, 15 respondents were found with elevated creatinine levels, indicating an overall prevalence of 18.75%. This means that the prevalence of elevated creatinine levels in the diabetic individuals was high at Entebbe Regional Referral Hospital as compared to the previous findings in the literature review. These findings were in agreement with the findings of Kiconco R. K.

(2025) on prevalence and factors associated with elevated creatinine among T2DM elderly populations, where Diabetic nephropathy (DM) was high and accounted for about 20-50% of all cases, and 25.9% (Kirya, 2024) in a cross-sectional study to determine the burden of diabetes complications in Kenya. This is probably attributed to the fact that all these studies used a cross-sectional study design, where data were collected at one point in time, and relatively low sample sizes were used.

These findings, however, contradict the findings of the study which was conducted by Li (2022), which found a lower prevalence of 8.8% of diabetic nephropathy among adults globally. This high increase in the percentage of elevated creatinine levels in DM to 18.75% at Entebbe Regional Referral Hospital may be attributed to the gradual changes in lifestyle and standards of living as compared to the previous year. Additionally, these studies were conducted at the national level, while my study was conducted in the hospital setting.

It was found that out of the diabetic people, those who took alcohol had a higher prevalence of elevated creatinine levels (27.0%) than non-alcoholics (14.8%), where those who drank daily had a higher frequency 8(80.0%). This is probably attributed to the fact that excessive alcohol consumption makes the body less sensitive and causes chronic pancreatitis, which interferes with insulin production. This, in turn, causes inflammation and oxidative stress in the kidney tubules, which filter creatinine out of the blood, resulting in its buildup in the blood. Furthermore, heavy drinking in diabetes often leads to liver disease, which messes up toxin clearance and can raise creatinine too. This finding was in line with a study done by (Rugang Li, 2023) on the association between serum creatinine and type 2 diabetes in the Chinese population, which found that in the highest creatinine group, participants generally had higher age and higher rates of current smoking and drinking. The findings of this study revealed that diabetic patients who are smokers had a higher prevalence of elevated creatinine levels (20.8%) than non-smokers (17.9%), with daily smokers (64.3%) being highly exposed. This is because smoking makes regulation of insulin levels more difficult, and high levels of nicotine can lessen the effectiveness of insulin, causing smokers to need more insulin to regulate blood sugar levels. Nicotine accumulation therefore makes the tiny arteries of the kidneys clamp down and floods kidneys with free radicals, triggering chronic inflammation in kidney tubules that excrete creatinine. This finding is in line with the findings by Rugang Li (2023) in China, who found that higher rates of current smokers and drinkers were found in the highest creatinine group participants.

It also found that obesity (40.0%) and overweight (33.3%) are more highly predisposing patients to diabetes mellitus

than normal (6.7%). This is because obesity leads to excessive free fatty acids being released by adipose tissue, which tends to decrease insulin sensitivity of muscles, fat, and liver, which is followed by raised glucose levels. Obesity is a risk factor for diabetes and a continuing risk factor for complications in those with established diabetes. In this, fats around the kidneys coupled with higher abdominal pressure raise pressure in the kidney's filtering units, leading to its scarring over time. The study findings agree with a study by Chen (2025), which suggests that Fat accumulation in the abdomen and trunk, also called central obesity, significantly increases the risk of elevated creatinine levels in T2DM patients.

From this study, it was also evident that participants with conditions other than diabetes (80.0%) had a higher prevalence than participants without (20.0%), where hypertension had the highest (11, 68.7%) and the least being kidney disease 2(12.5%). This is so because, on top of the kidneys being stressed by the presence of excess sugar, which sticks to kidney proteins, the presence of other conditions doubles up this effect and weakens the kidneys further. Hypertension means buildup of pressure inside each filter, which tears the delicate filter walls apart over time, leading to tissue scarring and thus increased creatinine level in the blood. This finding is in agreement with a study by Mendelsohn (1999) on the conditions linked to elevated creatinine levels in T2DM patients, which pointed out that other disorders in adult patients with hypertension, atherosclerotic disease, diabetes mellitus or unexplained anaemia were found to be significant factors.

Conclusion

The study established that the prevalence was 18.6%. Factors such as alcohol consumption, lack of physical activity, smoking and consumption of sugars and sweeteners significantly contributed to the prevalence of diabetes mellitus among patients aged 40 years and above.

Recommendations

The Government through its Ministry of Health should embark on bringing medical services closer to people in rural settings so that even the grassroots people can access services such as blood sugar testing to enhance early diagnosis of diabetes mellitus.

The government should bring organ function tests nearer to lower health centres to increase early detection of organ complications in DM.

Ministry of Health and the Ministry of Education should also concentrate on improving and advancing Education programs on the media to sensitise the public about the causes, risk factors, symptoms, complications, and Management of T2DM.

The government and the hospital should invest in research and health systems in Wakiso District to identify the relationship between DM and age as a way of curbing this increased rate of diabetes.

People in the community should be encouraged to do regular exercise to reduce body mass, which is a continuing risk factor for complications in those with diabetes. Therefore, eating fruits and vegetables and regular exercise were recommended.

The Hospital should concentrate on sensitising the patients by providing free medical education during hospital visits so that these patients know how to manage their conditions.

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List of abbreviations

BMI: Body Mass Index, **DM:** Diabetes Mellitus, **ESRD:** End-Stage Renal Disease, **ERRH:** Entebbe Regional Referral Hospital

Source of funding

The study was not funded.

Conflict of interest

The authors did not declare any conflict of interest.

Data availability

Data are available upon request.

Author contributions

Vivian Namugerwa collected data and drafted the manuscript of the study

Anthony Ssekitolesko supervised the study

Francisco Ssemuwemba supervised the study

Nansereko Hasifa supervised the study

Jane Frank Nalubega supervised the study

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