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Research Article

Prevalence and Risk Factors Associated with Type 2 Diabetes in Elderly Patients Aged 45-80 Years at Kanungu District

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Background. Type 2 diabetes is a worldwide disaster including in Uganda, specifically in Kanungu District which had a rise in diabetic patients in 2018/2019 as compared to the 2017/2018 financial year. This research was determined to access the prevalence and risk factors associated with type 2 diabetes on elderly patients aged 45-80 years attending Kanungu Health Centre IV, Kanungu District. *Methods*. A cross-sectional study was conducted among patients aged 45-80 years attending Kanungu Health Centre IV from June to August 2019. The prevalence of type 2 diabetes was determined by the blood sugar of patients. Questionnaires were used to collect data for factors associated with type 2 diabetes. Data were statistically analyzed using the statistical package for social sciences (SPSS) version 25 (SPSS Inc., USA) at $P < 0.05$. *Results*. The overall prevalence of type 2 diabetes was 18.7% among the tested patients. 22.8% of diabetic patients were females as 7.8% were males. The age group most affected by diabetes was 61-65 years. Alcoholism, smoking, body mass index (BMI), and family history were found to be significantly associated with type 2 diabetes at P value < 0.05. *Conclusion*. There was a high prevalence of type 2 diabetes observed in this study compared to studies done in previous years which raise a public health concern. This study also found that females and patients aged 61-65 years were most affected by diabetes. Lastly, the presence of family history for diabetes, overweight, and being obese increases the chances of acquiring type 2 diabetes.

1. Introduction

Diabetes mellitus (DM), also termed as "sugar," is a chronic, noncommunicable disease (NCD) which has emerged as one of the leading global health problem associated with the pancreas in the production of insulin leading to hyperglycemia [1, 2]. Type 2 diabetes mellitus is associated with a combination of resistance to insulin action and inadequate compensatory insulin secretory response [3].

Type 2 diabetes affects both the old and the youths and is highly associated with morbidity, mortality, and a high health cost to individual patients, their families, and countries [4]. It was found to affect 382 million (7.7%) in 2013 and was estimated to 483 million (8.3%) by the year 2030. In developed countries, more than half of the people with type 2 diabetes mellitus are older than 65 years and only 8% are less than 44 years of age. In developing countries, 75% of diabetic patients are 45 years old and above and 25% of adults with diabetes mellitus are under 44 years [1]. In recent studies, low-income countries of Sub-Saharan Africa including Uganda have the fastest growing rates of diabetes mellitus whereby the diabetes population has drastically increased from an estimated 98,000 patients in 2000 to about 1.5 million in 2010 from a population of 30 million people [5].

Globally, according to the International Diabetes Federation (IDF), there are 352 million adults with impaired glucose tolerance which is a high risk of developing diabetes by 2045 [6]. Despite the increase in diabetes burden, interventions are still poor and epidemiological data are scarce. There is no national noncommunicable disease (NCD) surveys in Uganda, so information is from a few local surveys [5]. Despite policy stating that primary care facilities should provide services for type 2 diabetes, studies have demonstrated that most dispensaries and health centers in Uganda do not provide such services. This might be due to the lack of

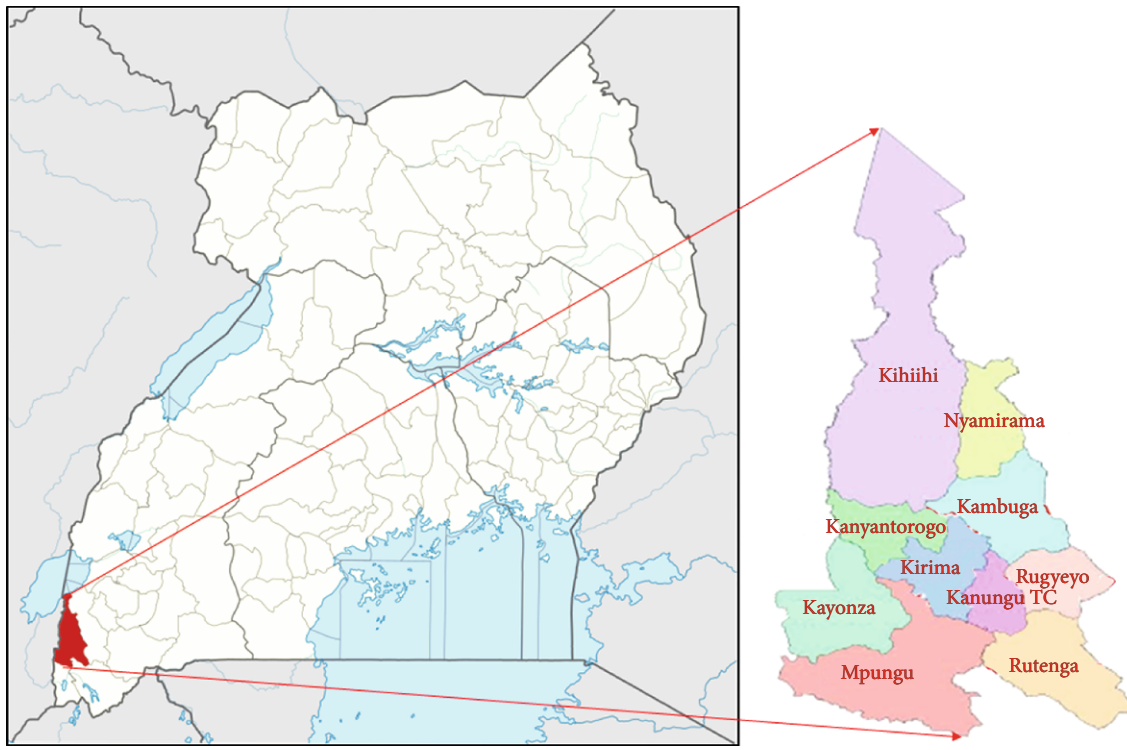

Figure 1: Map of Uganda and Kanunga District, picture sourced from Google map.

guidelines, basic supplies, diagnostic tools, and training that are frequently cited [7]. Assessing the prevalence of type 2 DM is important for national health planners; therefore, this study is aimed at determining the prevalence of type 2 diabetes mellitus and its associated risk factors among elderly patients aged 45-80 years attending Kanungu Health Centre IV, Kanungu District.

2. Materials and Methods

2.1. Study Area. The study was conducted at Kanungu Health Centre IV in Kanungu District (00°53′49″S, 29°46′32″E/0.89694°S, 29.77556°E) with a total population of 252,144. Being a government health facility and its location near the Democratic Republic of Congo (DRC) border, it receives a high number of patients from both Uganda and Congo for medical services (Figure 1).

2.2. Study Design and Population. A cross-sectional study was conducted on patients aged 45-80 years old at Kanungu Health Centre IV facility in Kanungu District from June to August 2019. The sampling size of the study population was determined with the formula;

$$n = Z^2P(1 - P)/W2 \quad (1)$$

where n = minimum sample size, $Z = 1.96$ (for 95% confidence interval), P = estimated prevalence of diabetes to be 10.1%, and W = margin of error to be 5%.

Patients within the age group but were critically ill and pregnant women were excluded from the study as only those who satisfied the inclusion criteria were enrolled in the study.

2.3. Blood Sample Collection and Testing. To determine the prevalence of diabetes, a capillary whole blood sample was collected for both random and fasting blood sugar from the patient's fingertip by selecting a suitable puncture site using a new lancet. The blood drop was placed on a test strip attached to a glucose monitoring system (One Touch® Select Simple™) and testing was done following the manufacturer's standard operating procedure. The displayed result on the meter display that was below 11 mmol/L was recorded as random blood sugar (RBS). If results that were displayed were over 11 mmol/L on the meter display, the patient was advised to undergo fasting blood sugar (FBS). Biosafety measurements were followed by discarding and disposal of the used lancet and test strip.

The patient for FBS testing was instructed to go for overnight fasting equivalent to 8 hours before retesting following the procedure as described in the glucose monitoring system (One Touch® Select Simple™). FBS > 7.0 mmol/L was considered positive for DM. Results were reviewed along with the patient to ensure participation in the study and documented accordingly.

2.4. Factors Associated with Type 2 Diabetes. Data were collected from the participants using pretested questionnaires that had social-demographic, economic factors, behavioral factors, physical measurements, and biochemical parameters with close-ended questions to gather qualitative data from

Table 1: Bivariate analysis of sex, age groups, and risk factors associated with type 2 diabetes.

	Frequency	Presence of DM		*P* value	Odds ratio
		Diabetic	Not diabetic		
Sex					
Male	38 (27.3%)	3 (7.9%)	35 (92.1%)	0.045	0.275
Female	101 (72.7%)	23 (22.8%)	78 (77.2%)		
Age group					
45-50	53 (38.1%)	7 (13.2%)	46 (86.8%)		
51-55	23 (16.5%)	7 (30.4%)	16 (69.6%)		
56-60	23 (16.5%)	4 (17.4%)	19 (82.6%)		
61-65	20 (14.4%)	13 (65%)	7 (35%)	0.698	1.048
66-70	2 (1.4%)	0	2 (100%)		
71-75	8 (5.8%)	1 (14.3%)	7 (85.7%)		
76-80	10 (7.2%)	0	10 (100%)		
BP (mmHg)					
Normal	46 (33.1%)	4 (11.1%)	32 (88.9%)		
Prehypertensive	38 (37.3%)	7 (18.4%)	31 (81.6%)	0.147	0.663
Hypertensive	65 (46.8%)	50 (76.1%)	15 (23.1%)		
BMI (kg/m^2)					
Underweight	7 (5%)	2 (28.6%)	5 (71.4%)		
Normal	79 (56.8%)	10 (12.7%)	69 (87.3%)	0.067	0.583
Overweight	41 (29.5%)	32 (78%)	9 (22%)		
Obese	12 (8.6%)	7 (58.3%)	5 (41.7%)		
Smoking					
Yes	118 (84.9%)	93 (78.8%)	25 (21.2%)	0.109	0.186
No	21 (15.1%)	1 (4.8%)	20 (95.2%)		
Alcohol					
Yes	54 (38.8%)	35 (64.8%)	19 (35.2%)	0.566	0.757
No	44 (31.7%)	7 (15.9%)	37 (84.1%)		
Family history					
Yes	95 (68.3%)	76 (80%)	19 (20%)	0.000	6.049
No	85 (61.1%)	7 (8.2%)	78 (91.8%)		

the selected individuals. Anthropometric measurements of blood pressure (mmHg), weight (kg), and height (cm) were taken at the outpatient department reception by a qualified and enrolled nurse for elderly patients aged 45-80 years. Height measurements were converted from cm to m^2 for calculating the BMI.

2.5. Data Analysis. Data for sociodemographic findings and risk assessments were computed and analyzed using Microsoft excel and subjected to bivalent and multivalent analysis by Statistical Package for Social Sciences (SPSS) version 25 (SPSS Inc., USA) at $P < 0.05$.

3. Results

3.1. Sociodemographic Findings and Risk Factors Associated with Type 2 Diabetes. In our study, 72.7% of one hundred and thirty-nine patients who satisfied the inclusion criteria were female. 7.9% and 22.8% of the males and females, respectively, were found to be diabetic. Diabetes was found to be high in the age group of 61-65 with 65% followed by the age group of 51-55 with 30.4%. The age groups of 66-70 and 76-80 showed 100% nondiabetic (Table 1).

The bivalent analysis showed that sex (female), age groups of 61-65, blood pressure (hypertensive), body mass index (overweight and obese), smoking, alcoholism, and family history were significantly related to being diabetic (Table 1). Multivariate analysis using backward stepwise selection, variables with P value < 0.2 showed that BMI (obese), hypertension, smoking, and family history were significantly related to being associated with diabetes (Table 2).

4. Discussion

According to this cross-sectional study, results from the RBS and FBS tests showed that the prevalence of diabetes has risen by 5.88%. Kanungu district databases had recorded 49 diabetic patients in the 2017/2018 financial year, whereas in this study there were 51 newly affected patients with diabetic condition recorded at Kanungu Health Centre [8]. Reports

Table 2: Multivariate analysis of risk factors associated with type 2 diabetes.

		Presence of DM			
		Diabetic	Not diabetic	*P* value	OR (95% CI)
BP (mmHg)	Hypertensive	50	15	1.000	
BMI (kg/m2)	Underweight	2	5	0.811	1.355 (0.112-16.380)
	Overweight	32	9	0.088	0.234 (0.044-1.239)
	Obese	7	5	1.000	
Smoking	Yes	93	25	1.000	
	No	1	20	0.064	0.121 (0.013-1.131)
Family history	Yes	35	19	0.000	8.452 (2.799-25.520)
	No	7	78	1.000	

by Chiwanga et al. [7] and Bahendeka et al. [9] showed that prevalence of diabetes was high in Uganda as compared to other East African countries; they recorded a prevalence of 10.1% in rural Ugandan residents, 8.3% rural Tanzanian residents, and 2.4% in rural Kenya residents.

4.1. Sex Most Affected by Type 2 Diabetes. This study found that females were more affected by type 2 diabetes compared to males. These results were similar to the study by Cho et al. [2] which stated that the mortality rate was 1.7% times higher in females than males. However, this disagrees with the study by Bahendeka et al. [9] who reported a prevalence of diabetes mellitus among males and females was 1.6% and 1.1%, respectively. Machado-Alba et al. [10] state that females are highly affected by type 2 diabetes because they are less muscular which does not support high uptake of fixed glucose load and have relatively high levels of estrogen and progesterone which are involved in the reduction of the whole-body insulin sensitivity. Additionally, Bommer et al. [6] reported that the females in Uganda are physically inactive by performing less exercise to burn excess fat in the body tissues, and yet they take an unhealthy diet containing many fats and starches leading to the predisposition of NCDs such as type 2 diabetes.

4.2. Age Group Most Affected by Type 2 Diabetes. This study found that the age group of 61-65 years was highly affected by type 2 diabetes mellitus, this is to some extent in agreement with findings by Cho et al. [2], where adults aged 45-64 were the most diagnosed age group for type 2 diabetes mellitus. Research by ADA [3] showed that management of diabetes is directly affected by gender and a person's age, where females and adults of 60 years and above are affected due to the coexistence of multiple medical conditions involving the heart and the kidney leading to limitation and insufficiencies of medical prescription.

4.3. Risk Factors Associated with Type 2 Diabetes. This study found that the major causes of diabetes were overweightedness, obesity, heredity, and lifestyle which includes smoking and alcoholism, this is in line with a report by WHO [1] which suggests that Uganda like many other Sub-Saharan countries, had risen cases of type 2 diabetes due to the rapidly changing lifestyle. A study by Zunt et al. [11] suggested BMI as one of the factors that increased the incidence of diabetes in almost all countries. The study findings are also comparable to a report by Bahendeka et al. [9]; he reported that personal lifestyle and eating habits which lead to overweightedness and obesity were the primary causes of type 2 diabetes.

Obesity is a risk factor for diabetes and also a continuing risk factor for complications in those with established diabetes. A report by Ein et al. [12] showed that diabetic patients had inherited the disease from either of the parents. Bommer et al. [6] also found that type 2 diabetes had a hereditary factor from a close family and was associated with gene mutations that are transferred to the genetic line of the family.

According to this study, majority of the diabetic patients were associated with high blood pressure (hypertension); research by Rahman et al. [13] showed that 20% of the diabetic population were associated with low blood pressure and 12% had normal blood pressure. Extensive prevalence of type 2 diabetes in Kanungu District might be aided by ignorance because of undiverse information concerning such chronic disease. More so, facilities and knowledge on screening diabetes are still lacking in health centers of Kanungu District; furthermore, medications for diabetic patients are scarce thus leading to such high prevalence.

5. Conclusion and Recommendations

There was a high prevalence of type 2 diabetes observed in this study compared to studies done in previous years which raise a public health concern. This study also found that females and patients aged 61-65 years were most affected by diabetes. Lastly, the presence of family history for diabetes and being obese was found to increase the chances of acquiring type 2 diabetes.

Findings from this study recommended investment in research and health systems at Kanungu District to curb down this increased rate of diabetes. Secondly, improvement and advancement of Education programs on the media are emphasized to sensitize the public about the burden and complications of type 2 diabetes should be emphasized. Thirdly, people should do regular exercise to reduce body mass which has been found to be a continuing risk factor for complications in those with established diabetes. Though

family history increases the risk of getting type 2 diabetes, adjusting environment factors such as lifestyle among other ways were seen to alter that. Therefore, eating fruits and vegetables and regular exercise are recommended to be done.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Authors' Contributions

All authors have significantly contributed in the present review. All authors are in agreement with the content of the manuscript.

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