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Factors Influencing Diabetes Mellitus Type 2 among Adults at Jinja Regional Referral Hospital, Jinja District Uganda

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ABSTRACT

The prevalence of type 2 diabetes mellitus, which has a high morbidity andmortality rate as well as a high societal cost, is rising quickly worldwide. Due to a rapid increase in elements connected to lifestyle, socio-demographics, and health systems, it has become a globalepidemic. This study's main goal was to find out how common type 2 diabetes (DM II) is among patients aged30to 65 who come to the Jinja Regional Referral Hospital's diabetic clinic from April to September 2022. To gather responses, a convenient non-probability random sampling technique was adopted. Structured questionnaires were used to collect the data,which were then analyzed using SPSS version 16.00 and displayed as frequency tables. Additionally, the clinic used random blood glucose testing to identify patients with diabetes. There were 220 participants in all; 74 (69.1%) of them were women and 36 (30.9%) were men. 54.5% of people had DM II overall. Females had a higher prevalence than males. The largest prevalence of DM II was seen in people between the ages of 41 and 65, followed by those between 30 and 40. Socio-demographic characteristics like gender, age, and proximity to a familymember who has type 2 diabetes were substantially correlated with the prevalence of DM II. Food intake, weight, BMI, smoking, and alcohol consumption were all strongly related to DM II. Additionally, there was a strong association between DM II and aspects of the health system. At the Jinja Regional Referral Hospital's diabetic clinic, a higher percentage of people with DM II attend. The age range with the highest prevalence of obesity or overweight is 40 to 65 years. Therefore, it is advised that everyone over 40 who is obeseor overweight be routinely checked for DM II and that all diabetes patients in all hospitals across the country receive the proper public health education.

Keywords: Type 2 diabetes mellitus, Obesity, Diabetic clinic, Hyperglycemia, Prevalence.

INTRODUCTION

Globally, according to the International Diabetes Federation (IDF), there are 452 million adults with impaired glucose tolerance which is a high risk of developing diabetes by 2045 [1].Worldwide, diabetes was found to affect 482 million (7.7%) in 2018 and was estimated to be 583 million (8.3%) by the year 2030. In developed countries, more than half of the people with type 2diabetes mellitus are older than 65 years and only 8% are less than 44 years of age. In developingcountries, 75% of diabetic patients are 45 years old and above and 25% of adults with diabetes mellitus are under 44 years [2]. Diabetes mellitus (DM), also termed "sugar,"is a chronic, non-communicable disease (NCD) that has emerged as one of the leading global health problems associated with the pancreas in the production of insulin leading to hyperglycemia [3-5]. This condition affects both the old and the youth and is highly associated

with morbidity, mortality, and a high health cost to individual patients, their families, and countries. It is associated with a combination of resistance to insulin action and inadequate compensatory insulin secretory response [6,7]. About 90% of all instances of diabetes are of type 2, which is the most common kind [8,9]. In Africa, recent studies indicate that low-income countries of Sub-Saharan Africa have the fastestgrowing 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 millionpeople [10]. In East Africa, the actual number of diabetic patients remains uncertain, although the InternationalDiabetes Foundation (IDF) estimated 6.2 million in 2019 and the figure is projected to double to about 18 million by the year 2040 [11]. More than two-thirds (66.7%) of people living with diabetes are undiagnosed in East Africa [11]. According to IDF [11], the most populous East-African countries have the highest number of people with diabetes. These include Kenya (2.3million), Tanzania (0.8 million), South Sudan (0.8million), Uganda (1.6 million), Rwanda and Burundi (1.3 million) [11]. Impaired Glucose Tolerance (IGT) is also becoming problematic and exceeds 30 per cent in many East-African countries [12]. In Uganda, the prevalence of diabetes in 2018 was 500,600 cases and it is estimated that the number will double by the year 2040 while the number of death due to diabetes was 11,341 deaths[11]. The major factors influencing diabetes type II are family history of DM II, obesity, low levels of physical activity and diet rich in fats and carbohydrates [13,14]. Poor glycemic control in DM II can lead to organ failure and the organs mosly affected are kidney and liver [15-17]. Whereas there is an increase in frequency of diabetes mellitus in Uganda, only a few areas in Uganda have had studies and these include Kampala, Iganga, Wakiso and Kayunga [18]. Unfortunately, no district in Eastern Uganda was included in this study yet preliminary observation by the Principal investigator showed that 10 out of every 35 patients attending diabetes clinic in hospitals in Jinja district were newly diagnosed with diabetes mellitus of which a further 3 out of 10 were diabetes mellitus type 2. This is about 28.6% which is higher compared to the national prevalence of 2.8 % [19]. This raises questions as to what factors could be contributing to Diabetes mellitus type 2 in Jinja district in Eastern Uganda. This study was conducted to fill that information gap because there was so little data available for the region being studied. Thus, the aim of this study was to assess factors influencing diabetes mellitus type 2 among adults aged 30-65 years in Jinja Regional Referral Hospital.

METHODOLOGY

Study design

A descriptive cross-sectional study design was used, involving quantitative analysis.

Area of Study

The study was conducted in Jinja Regional Referral Hospital. The hospital is located at latitude 0o25'51'N and longitude 33o12'17'E, in the Central division of Jinja municipality, Jinja district in Eastern region, Uganda. It is approximately 82 kilometers from the country's capital, Kampala.

Study population

The study population comprised diabetic patients aged 30-65 years who are attending diabetic clinics at JRRH for a period of six months.

Inclusion criteria

Adult diabetic patients with diabetes mellitus type 2 who are attending a diabetic clinic in JRRH during the six months of the research.

Exclusion criteria

- ✓ Those patients who have diabetes mellitus type 2 but not attending the diabetic clinic at JRRH atthe time of the study and those who did not consent.
- ✓ Patients with diabetes mellitus type 1.
- ✓ All patients above 65 years and those below 30 years of age were excluded.

Sample size determination

Determination of the sample size was by Kish Leslie (2016) formula.

$$N = Z^2 P \frac{(1-P)}{E^2}$$

Where:

N= Estimated minimum Sample Size Z
=1.96 for 95% Confidence interval.
P = Proportion of adults with diabetes mellitus type 2. (7.4%), Mayega, [20])E = Margin of Error (E = 5%)

$N = 1.96^2 x (0.074 (1-0.074)) / 0.05^2$

$N= 3.8416 x (0.074x0.926)/ 0.0025$

N= 220
Therefore, the sample size was 220 respondents.

Sampling Procedures

A simple random sampling method was used to obtain participants' responses by the use of questionnaires. Only those participants present at the time of the interview were approached.

Data collection methods

A questionnaire was used to collect data from the patients with diabetes mellitus type 2 attending the diabetic clinic. The questionnaire had 3 sections: Personal factors, lifestyle factors and co-morbidities. The research assistants with some clinical knowledge were trained in data collection.

Data Analysis

Quantitative data was re-checked for completeness and consistency and later analyzed using SPSS Version 26.

Data presentation method

Data was presented in the form of tables, to represent the statistical data collected from the respondents.

Quality control

Pre-testing was done to check for the validity and reliability of the questionnaire to be administered to the respondents and was conducted on 5% of the sample size in a selected Health Center (Njeru Health Centre IV) in Jinja Municipality. The research assistants translated it to Lugisu and Luganda before administering it to the patients.

Training of research assistants

The study involved research assistants who prior to the study were recruited and properly trained for proper data collection.

RESULTS

Influence of socio-demographic factors on diabetes mellitus type 2.

Age, gender, occupation, level of education, and average monthly income in Uganda Shillings areamong the sociodemographic variables taken into account in this study.

Socio-demographic characteristics of respondents.

Table 1: Socio-demographic characteristics of the sample (n=220)

Variable	Categories	Frequency (n)	Percentage (%)
Gender	Male	72	32.7
	Female	148	67.3
Age	30-40 years	90	40.9
	41-65 years	130	59.1
Family history ofDM	Yes	46	20.9
	No	174	79.1
Relation to familywith DM *(n=46)*	Father	8	17.4
	Mother Sibling	12	26
	Uncle	4	8.7
	Aunt	6	13
		2	4.3

	Grandparent	14	30.4
Occupation	Civil servant Peasant Self-employed None	24 132 44 28	21.8 61.8 10 6.4
Highest level of education attained	Primary Secondary Tertiary education None	90 46 22 62	40.9 20.9 10 28.2
Place of residence	Rural Urban	194 26	88.2 11.8
Average monthlyincome in Uganda shillings	<10,000 10,000 to 100,000 Above 100,000	20 152 48	9.1 69.1 21.8

The majority of respondents—148 women, or 69.1%—were female; 130 people, or 59.1%, were older than 40; and 174 people, or 79.1%, said they had no family history of type 2 diabetes. Grandparents were most frequently identified as having type 2 diabetes in families, accounting for30.4% of individuals who reported such a history. According to the chart above, the majority of respondents (69.1%) earned between 10,000 and 100,000 Uganda shillings per month while 136 (61.8%) were peasants and 90 (40.9%) had at least a primary education. The outcomes of the bivariate analysis of the sociodemographic variables are displayed in table 2.

Table 2: Association of socio-demographic factors and diabetes type 2 (n=220).

Variables	Diabetes mellitus (DM).		P-value
	DM II n (%)	Other types of DM n (%)	
Gender Males Female	24 (33.3) 96 (64.9)	48(66.7) 52(35.1)	0.0001*
Age 30 - 40 41-65 years	74 (82.2) 126 (96.9)	16 (17.8) 4 (3.1)	0.000*
Family history ofDM Yes No	34 (73.9) 120 (69.0)	12 (26.1) 54 (31.0)	0.0674
Occupation Civil servant Peasant Self-employed None	40 (83.3) 134 (98.5) 28 (70.0) 24 (85.7)	8 (16.7) 2 (1.5) 6 (30.0) 2 (14.3)	0.567
Level of education Primary			0.967

Secondary	60(66.7)	30(33.3)	
Tertiary education	32(69.6)	14(30.4)	
None	14(63.6)	8(36.4)	
	48 (77.4)	14(22.6)	
Place of residence			0.567
Rural Urban	154(88.5)	20(11.5)	
	20(76.9)	6(23.1)	
Average monthly income			0.000*
<10,000	4 (20.0)	16 (80.0)	
10,000 to100,000	142 (93.4)	10(6.6)	
Above 100,000	42(87.5)	6(12.5)	

Type 2 diabetes and socio-demographic characteristics as gender, age, and average monthly income were substantially correlated (P 0.05). 96 respondents, or 64.9%, were female, while 12 respondents, or 33.3%, were male. The majority of responders with DM II (n = 126) (96.9%) wereolder than 30–40 years old (n = 4) (3.1%). In this study, a large percentage of respondents—120 (69%) reported having no family history of diabetes mellitus, compared to 54 (31%) in other DMII cases, and 34 (73.9%), compared to 12 (26.1%)—had a family history of DM II. As can be seen in table 2 above, type 2 diabetes was not significantly linked with occupation, degree of education attained, family history of DM, or place of residence (P>0.05).

Influence of lifestyle on diabetes mellitus type 2

In this study, bad food, obesity, smoking, physical inactivity, and excessive alcohol intake were all taken into account as lifestyle factors. The table below shows a descriptive statistic for these factors.

Table 3: Life-style characteristics of the respondents (n=110)

Variable	Categories	Frequency(n)	Percentage (%)
Favorite food	Posho &Beans	26	11.8
	Posho & Greens	36	16.3
	Rice and pork	52	23.6
	Kalo and fish	64	29
	Others	42	19.3
Total		220	100
How often do you eat the above food mentioned in a week			
Once		136	61.8
Twice		14	6.3
Thrice		22	10
Daily		48	21.8
Total		220	100

Regarding the respondents' lifestyle traits, the majority of them stated that their favorite dinnerwas fish and kalo 64 (29%), and they also stated that ate such at least once a week 136 (61.8%).

Table 4: Weight and body mass index status of respondents (n=110)

Variables	Categories	Frequency(n)	Percentage (%)
Weight (Kg)			
	50 to 70	20	9.1
	70 to 90	152	69.1
	Above 90	48	21.8
Total		220	100
Height (Meters).			
	1.00 to 1.50	26	11.8
	1.51 to 1.80	174	79
	Above 1.80	20	9.2
Total		220	100
Body Mass Index (Kg/m2).			
	Below 18	14	6.4
	18 to 25	40	18.2
	25 to 30	90	40.9
	Above 30	76	34.5
Total		220	100

The majority of respondents weighed between 70 and 90 kg (69.1%) and were between 1.51 and 1.80 meters tall (79%) in height. Additionally, 76 (35%) of respondents were obese (BMI greaterthan 30 kg/m2), and 90 (40.9%) were overweight (BMI between 25 and 30 kg/m2). According to the study's overall findings, the majority of respondents (40.9%) and obese (35%) in the tableabove

Table 5: Smoking status of respondents

Variables	**Categories**	**Frequency (n)**	**Percentage (%)**
Smoke Cigarette or Tobacco.	Yes No	22 198	10 90
Total		220	100
Sticks of cigarette or tobacco smoked daily *(n=22)***	1 to 3 3 to 5 >5	6 8 8	27.4 36.3 36.3

Only 11 (or 10%) of the participants in the study (who were 99 in total) admitted to smoking cigarettes or tobacco at the time of the study. The majority of the subjects, according to the overallfindings, did not smoke. The study also discovered that, of the 22 respondents who smoked, 3 (27.4%) reported smoking 4sticks of tobacco or cigarrete on average every day, while the same 8 respondents (36.3%) smoked8 sticks of tobacco or cigarrete on average and more than 5 sticks of tobacco or cigarrete every day.

Table 6: Status of respondents' physical activity and their favorite exercise.

Variables	Categories	Frequency (n)	Percentages (%)
Do you Exercise?	Yes	196	89.1
	No	48	11.9
Total		110	100
Favorite exercise (n=98)	Walking	90	45.9
	Jogging	30	15.3
	Running	22	11.2
	Others	54	27.6
Total		196	100
How often do you dothe exercise?	Daily	22	11.2
	Weekly	100	51
	Monthly	28	14.2
	Rarely	46	23.5
Total		220	100
How long do you exercise (minutes)?	<30	130	66.3
	30 to 1 hour	92	23.4
	> 1 hour	20	10.3
Total		220	100

It's noteworthy to notice from the above table that 196 respondents, or 89.1%, reported exercising, while 24 respondents, or 12.0%, said they didn't exercise at all, which included (51%) of those who exercised at least once per week. In addition, individuals who exercised (n=196) said that they typically walk 90 (45.9%) and run 22 (11.2%) and that they exercise for less than 30 minutes130 (66.3%) of the time.

Table 7: Alcohol status of respondents.

Variables	Categories	Frequency (n)	Percentage (%)
Take alcohol	**Yes**	**220**	**100**
	No	**0**	**0**
Favorite beverage	Local spirits	90	40.9
	Local brew Beer Wine	62	28.2
		44	10
		46	20.9
Total		220	100
How often do youtake the above drink?	Daily	90	40.9
	Weekly	56	25.4
	Monthly	14	6.3
	Occasionally	60	27.2
Total		220	100

The majority of respondents said they had ever drunk alcohol, according to the study's findings (100%), and the most popular local alcoholic beverages were waragi and Kongo (40.9% and 28.2%, respectively). According to the data above, they frequently drank this drink every day or sporadically (40.9% and 27.2%, respectively). The table below presents the results of a bivariateanalysis demonstrating the relationship between lifestyle factors and type 2 diabetes mellitus.

Table 8: Table 8. Association of Lifestyle factors and occurrence of diabetes mellitus type 2 amongthe respondents.

Variable	Categories	Diabetes Mellitus status		P-Value
		DM II n (%)	Other types n (%)	
Favorite food	Posho &Beans Posho & Greens Rice and pork Kalo and fish Others	22 (84.6) 22(61.1) 48(92.3) 40(62.5) 20(47.6)	4(15.4) 14(38.9) 4(7.7) 24(37.5) 22(52.4)	0.0001*
how often do you eat the above food mentioned in a week	Once Twice Thrice Daily	120(88.2) 14(100) 18(81.8) 34(70.8)	16(11.8) 0 4(18.2) 14(29.2)	0.567
Weight (Kg)	50 to 70 70 to 90 Above 90	20(100) 146(96.1) 46(95.8)	0 6(3.9) 2(4.2)	0.0334*
Body Mass Index (Kg/M2).	Below 18 18 to 25	6 (42.9) 26(65.0) 80(88.9) 74(97.4)	8(57.1) 14(35.0)	0.000*

	25 to 30 Above 30		10(11.1) 2(2.6)	
Smoke Cigarette or Tobacco	Yes No	20(90.9) 184(92.9)	2(9.9) 14(7.1)	0.967
sticks of cigarette or tobacco smoked daily	1 to 3 3 to 5 >5	4 (66.7) 6 (75) 8(100)	2(33.3) 2(25) 0	0.000*
Do you Exercise	Yes No	160(81.6) 22(91.7)	36(18.4) 2(8.3)	0.0001*
How often do you do the exercise	Daily Weekly Monthly Rarely	16(72.7) 78(78.0) 18(64.3) 44(95.7)	6(27.3) 22(22.0) 10(35.7) 2(4.3)	0.0001*
How long do you practice (minutes)	<30 minutes 3 0 to 1 hour > 1 hour	120(92.3) 34(73.9) 16(80.0)	10(7.7) 12(26.1) 2(20.0)	0.567
Alcohol consumption	Yes No	196(89.1) 0	24(10.9) 0	0.0274*
How often do you take the above drink	Daily Weekly Monthly Occasionally	78(86.7) 52(92.9) 12(85.7)	12(13.3) 4(7.1) 2(14,3)	0.000*

		52(86.7)	8(13.3)	

Source: Primary Field data. * Variable significant at P< 0.05.

According to an analysis of the relationship between lifestyle factors and the prevalence of type 2 diabetes mellitus in people between the ages of 30 and 65 who attended the diabetes clinic at Jinja Regional Referral Hospital, food intake, weight, BMI, quantity of smoking perday, exercise, exercise frequency and duration, alcohol consumption, and alcohol consumption frequency and intervals per week were all significantly (P>0.05) linked to diabetes type 2.

Health system factors associated with type 2 diabetes mellitus.

The respondents' assessment of the issues affecting the health system placed particular emphasis on the lack of diabetic care, a lack of health education, the projected travel time toa medical facility, and the attitude of medical staff toward patients.

Table 9: Health system factors associated with type 2 diabetes mellitus.

Variable	**Categories**	**Frequency (n=220)**	**Percentage (%)**
Availability of healthy facility in yourhome area	Yes	96	87.3
	No	14	12.7
Estimated distance to the health center	<500m	15	13.6
	500 to 1000m	11	10
	>1 Km	84	76.5

Availability of diabetes service at thehealth center Adequate staffing at health center.	Yes No	65 45	59.1 40.9
Attitude of Health workers towardspatients.	Yes, No Fair Good Very good Excellent	28 192 90 62 22 46	12.7 87.3 40.9 28.2 10 20.9

According to the results in the table above, 192 respondents (87.3%) reported having a healthy facility in their neighborhood; only 28 respondents (12.7%) said they had no such facility. 168 (76.5%) of consumers were more than a kilometer away from health facilities, comparedto 30 (10%) who were within 500 meters and 30 (13.6%) who were extremely close to the health facility. Out of the respondents who underwent health factor assessment, 130 (59.1) reported havingaccess to diabetic services at the health facilities, whereas 90 (40.9%) did not. Health facilitiesare significantly understaffed; of the 192 (87.3%), only 28 (12.7%) were identified as having acceptable staffing levels.

Association of Health system factors and occurrence of diabetes type 2.

The bivariate analysis of health system factors associated with type 2 diabetes mellitus is presentedin the table 10 below.

Table 10: Association of Health system factors and occurrence of diabetes type 2.

Variable	DM status		
DM Status	DM I n (%)	DM II n (%)	P-value
Availability of healthy facility in yourhome area Yes No	120 62.5) 16 (57.1)	72(37.5) 12 (42.9)	0.0001*
Estimated distance to the health center <500m 500 to 1000m >1 Km	22(73.3) 20(66.7) 164(97.6)	8(26.7) 10(33 .3) 4(2.4)	0.030*
Availability of diabetes services Yes No	30(23.1) 82(91.1)	100(76.9) 8(8.9)	0.567
Adequate staffing at health center. Yes No	8(28.6) 196(70.8)	20 (71.4) 56(29.2)	0.000*
Attitude of health worker towards patients	76(84.4)	14(15.6)	0.0674

Fair	46(74.2)	16(25.8)
Good		
Very good	16(72.7)	6(27.3)
Excellent	36(78.3)	10(21.7)

Source: Primary field data. * Variables significant at P<0.05.

Health facility factors such as having a Healthy facility in the home area, estimated distance between your home and the health center, and the number of health service providers at the healthfacility were significantly associated with diabetes mellitus type 2 (*P<0.05*) as shown in table 10 above.

DISCUSSION

Influence of socio-demographic factors in the development of diabetes mellitus type 2.Gender, age, relationship to family member with type 2 diabetes, and average monthly income was among the sociodemographic characteristics evaluated. Diabetes type 2 was substantially linked with gender, age, and average income Table 2. On the other hand,as shown in Table 2, there was no significant correlation between type 2 diabetes and occupation, greatest level of education acquired, or place of residence. Gender, age, relationship to family member with type 2 diabetes, and average monthly income were among the sociodemographic characteristics evaluated. Diabetes type 2 was substantially linked with gender, age, and average income Table 2. On the other hand,as shown in Table 2, there was no significant correlation between type 2 diabetes and occupation, greatest level of education acquired, or place of residence. This is in line with the finding of the study by Kibirige *et al.* [21] who reported that age is a risk factor for diabetes, especially in people above the age of 45 years. Furthermore, in Uganda a national cross-sectional study by Bahendeka *et al.* [18], on the prevalence and correlates of diabetes, reported that the occurrence of diabetes mellitus type 2 increases with age. Therefore, special care such as routine screening of DM II and diabetes education should be drawn to individuals aged 41 years and above as these are the most risk groups for DM II. Only 24 (33.3%) of type 2 diabetic patients were male, whereas 96 (64.9%) were female.In contrast to their male counterparts, females have a higher prevalence of type 2 diabetes mellitus. This can be explained by the fact that men exercised more frequently than women did and that in Uganda, the relative risk of obesity is larger in women (6.6%) than in men (1.3%) [16]. This suggests an increased risk factor for developing type 2 diabetes mellitus in females than males as reported in this study. However, the high prevalence registered among females might have been due to women's vulnerability in health-seeking behaviors unlike in men who rarely seek medical attention. In this investigation, there was no statistically significant link between family history and type 2 diabetes. The lack of an association is most likely due to respondents not knowing if their parents or siblings have diabetes. On the other hand, among adult patients at Kitagata Hospital in Sheema district, Uganda, Dickson [22] showed a large and favorable correlation (60%) between family history and type 2 diabetes. Diabetes type 2 diabetes runs in families [23,24]. In this study, there was no association between occupation and the development of type 2 diabetes. The fact that there were 136 subjects from other groups besides the peasantsubjects, who made up the majority with 61.9%, may help explain why there was no correlation in this study. In contrast, Zhao *et al.* [25] found a statistically significant and positive association between occupation and DM II in China, where those with moderate to severe occupational stress were linked to a higher chance of developing DM II. Additionally, the chance of acquiring type 2 diabetes mellitus increases with occupational stress levels [25]. In this study, there was no significant relationship between education level and DM II. The high percentage of 30 (66.7%) respondents in this survey who had DM II and only had an elementary education could be attributed to a lack of knowledge about the disease and its prevention strategies. In contrast, a study by Agardh and colleagues [26] in the Swedish population found a substantial correlation between educational attainment and risk for developing type 2 diabetes. They discovered that lower educational levels across all age groups were responsible for 17.2% of the diabetes burden in males and 20.1% of the diabetes burden in women. In the study population, type 2 diabetes mellitus was substantially correlated with average monthly income. The 71 (93.4%) respondents who reported having an annual income of between $10,000 and $100,000 may have a history of eating junk food and following a high-carbohydrate diet, which raise glucose and fat levels, respectively. An improvement in financial circumstances may go hand in hand with knowledge of diet and food preferences. On the contrary, a 2012 study by Hwang and Shon [27] among the Korean population found that people with low incomes had a higher chance of developing type 2 diabetes than

people withhigh incomes. Additionally, they came to the conclusion that the incidence of diabetes rose inversely with income [27].

Influence of lifestyle on diabetes mellitus type 2

The study looked at DM II prevalence and lifestyle characteristics among people aged 30 to65 who visited the diabetes clinic at Jinja Regional Referral Hospital. The researchers took into account food intake, weight, body mass index, tobacco or cigarette smoking, exercise, and alcohol use. Obesity was categorized using body weight and BMI. According to Table 8 of this study, there is a substantial correlation between food intake and the likelihood of getting type 2 diabetes. This may be due to frequent consumption of high carbohydrate diet, and sugar-sweetened beverages for instance sodas which result in a greater magnitude of weight gain because of excessive calorie content and largely absorbable sugars. This is consistent with the findings of Matovu *et al.* [28] in Uganda, who also reported a positive association between diet and type 2 diabetes. Table 8 shows that there was a significant relationship between body mass index and type 2 diabetes mellitus. As shown in Table 8, 40.9% and 35% of respondents, respectively, reported being overweight or obese, defined as having a BMI of 25 to 30 kg/m² and 31 kg/m²or higher. This is explained by the belly fat, or increased abdominal fat store, which alters the metabolism of insulin by releasing free fatty acid molecules. In addition, these fat molecules release signaling molecules like interleukin-6 and tumor necrosis factor that are crucial for the emergence of insulin resistance and therefore increase the chance of developing type 2 diabetesmellitus [29].

Pamidi and colleagues [30] in their study in Chicago, USA, concurred with this study's findings. Therefore, an increase in BMI is associated with the risk of type 2 diabetes mellitus. It is, therefore, important to routinely screen obesity and overweight in all patients especially those aged 30 years and above at each outpatient visit to the hospital so as to identify earlier risk for DM II. As shown in Table 8 of the data, there was no evidence of a connection between smoking cigarettesor other tobacco products and DM II. According to Table 5's findings, there were 10% (n=11) of current smokers, most of whom were over 40. Table 8's results revealed that, compared to other types of DM (9.9%), DM II had a higher rate of tobacco or cigarette use (90.9%). As shown in Table 8, the researcher did report a positive correlation between the number of cigarettes or tobacco sticks smoked each day and DM II. This is because the increase in age comes withmany responsibilities and eventually emotional stress. Individuals may therefore resort to cigarettesmoking habits as recreation to keep them off worrying. Therefore, the lack of association in this study could be justified by small respondents of a smaller proportion of smokers (n=22). On the other hand, Spruijt-Metz and colleagues [31] reported an association between smoking and DM II. Tobacco has an implication on health, therefore government policy to restrict its production should be put in place so as to reduce the burden on health care. The natureof advertisements on tobacco should include the dark side of tobacco smoking. In this study, there was a statistically significant relationship between exercise and type 2 diabetes, as shown in Table 8. According to this study, a significant number of respondents—196 (89.1%)—exercise, with the majority exercising weekly (100%) and the minority exercising daily (22%)Of these (n=196), 18(18.4%) were different varieties of DM, and 80 (81.6%)% were DM II. As shown in Table 8, the frequency of exercise is significant with DM (P>0.05). The link found in this study is likely due to increased public knowledge of and efforts to avoid diabetes mellitus. Studiesconducted in Uganda by Mutebi *et al.* [32] and Mayega *et al.* [20] found a connection between physical activity and type 2 diabetes. Therefore, adequate sensitization on local radio stations and public gatherings for instance churches and mosques should be emphasized to ensure community awareness and prevention of DM II.As shown in Table 8, drinking alcohol was substantially related to DM II. The reported frequency of alcohol intake in this study was quite high, with 220 (100%), 90(40.9%), and 62(28.25%) participants drinking primarily local beer (koongo) and spirits (waragi), respectively,with wine coming in at 46 (20.9%). 24 respondents (10.9%) had various forms of DM, while 196 respondents (89.1%) were DM II. This could be explained by culture in this region, where alcohol taking is prestigiously considered a cultural practice hence majority take alcohol. Similarly, studies by Muyer and colleagues [33] in Congo, and Oyebade and colleagues [34] in Nigeria reported a significant association between alcohol consumption and DM II. The hypothesized effects of alcohol include its contribution to inadequate insulin release,reduced insulin binding, and inhibition of intracellular signaling with the eventual development of insulin resistance [35]. Alcohol impairs the immune system and therefore increases the risksof diabetic complications such as diabetic foot and frequent infections. Through clan elders and local leaders, alcohol consumption should be discouraged and increase awareness of its relation toDM II.

Health system factors associated with type 2 diabetes mellitus

The elements affecting the health system that were evaluated included the presence of a health center in the respondent's neighborhood, the availability of diabetic services, the degree of staffing, and lastly the attitudes of health professionals. As shown in Table 10, therewas a significant relationship between type 2 diabetes and the presence of a health facility inthe respondents' neighborhood in this study. Compared to 14 (12.7%) respondents

who had no health centers, 192 respondents (87.3%) did. 62.5% of those in their areas (n=192) had type 2 diabetes. In addition, 15.3%, 11.2%, and 76.5% of the population were situated less than 500 meters and more than 1000 meters, respectively, from the health center. In this study, type 2 diabetes occurrence was substantially linked with the estimated distancebetween respondents' homes and the health facility. The majority of respondents, 164 (97.6%), who were classified as having diabetes mellitus type II walked more than a kilometer to the health facility, whereas 4 (2.4%), as shown in table 10, had different kinds ofDM. This could be because traveling long distance to health center coupled with financial constraints impinges health-seeking behaviors, in that the patients will only come to the hospital when severely ill unlike short distance where client easily goes for screening and seek preventive measure before disease onset. In addition, most patients are in rural areas where means of transport to health facilities are scarce. This research is consistent with studies by Kibirige and colleagues [21] in Nsambya Uganda; Baumann and colleagues [36] in Uganda, who reported a significant association between distance from health centers and DM II. In this cross-sectional study, the association between the availability of diabetes services and DM II was not statistically significant. The researcher discovered that 30 (23.1%) of the 130 respondents who provided information aboutthe availability of diabetic care in local health centers were DM II. The remaining 90 (40.9%), of which 82 (91.1%) were DM II as shown in Table 9, reported having no diabetic services in their health centers. On the other hand, researchers from Zambia, Mozambique, and Brazil, including Otero and colleagues [37], identified a strong correlation between DM II and the accessibility of diabetes services. Lack of adequate information makes diabetics resort to the use of herbal concoctions for treatment. The use of herbs in the management of diseases including diabetes is a globally approved practice [38,39]. However, a lack of proper education on the use of herbs could lead to overdose culminating in disease complications. The bioactive principles present in herbs are responsible for their therapeutic properties. These bioactive compounds are the raw materials used for the production of conventional drugs [40,41,42]. Diabetes sufferers should form peer groups to share information on treatment and prevention, and the government should encourage and assist them. The level of staffing was significant with DM II ($P<0.05$) as in Table 10. Only 8(28.6%) of respondents with DM II reported adequate staffing at the health center compared to 10 (71.4%) with other type of DM. Furthermore, 136(70.8%) with DM II reported a low level ofstaffing compared to 56(29.2%) with other types of DM. This means the number of staff available to provide care determines the number of patients attending the clinic because most patients wait for long hours in a queue to be attended to by one doctor or nurse, this affects the seeking behavior seen in diabetic clients, and most resort to not turn up. Low staffing was explained by a number ofstaff on maternity and study leave. This is in line with thefinding by Otero [37]. The hospital administrators should devise annual staff leaves keeping in mind the minimum number of staff onduty. Health center staff attitudes on type 2 diabetes mellitus were not statistically significant ($P>0.05$).The majority of DM II patients, 76 (84.4%), rated a fair attitude of healthcare professionals and 36(78.3%), a good attitude. This can be a result of the clinic's nurses and doctors acting professionally, as well as government and institutional motivation. As opposed to Otero and colleagues [37] who found a link between the attitude of healthcare professionals and the prevalence of type 2 diabetes.

CONCLUSION

The purpose of the study was to evaluate the prevalence and risk factors for type 2 diabetes mellitus at Jinja Regional Referral Hospital from April to September 2022. In the study, 54.5% of diabeticparticipants who were between the ages of 30 and 65 had type 2 diabetes mellitus. This could suggest that a greater percentage of residents in Jinja Regional Referral, Jinja district, haveDM II. Gender, age, relationship to family member with type 2 diabetes, and average monthly income were sociodemographic characteristics that were substantially linked with type 2 diabetes. Analysis of the association of lifestyle factors and prevalence of diabetes mellitus type 2 revealed that food consumed, obesity, number of cigarettes or tobacco smoked in a day, exercise, andalcohol consumption were significantly associated with diabetes mellitus type 2. Furthermore, health system factors such as availability of health facilities in the home area, estimateddistance to the health center, and adequate staffing were significantly associated with diabetes type2. In conclusion, DM II is the most predominant (54.5%) among diabetic patients attending the clinic, also having an increased prevalence in those over 40 years, who are overweight or obese.

RECOMMENDATIONS

To expand access to data on current epidemiological trends of type 2 diabetes, the Ministry of Health in Uganda should ensure that local data on diabetes prevalence and incidence are gathered, for instance through the Demographic and Health Survey (DHS). At every diabetic clinic in every hospital in Uganda, there should be an operational policy or strategic action plan for diabetes, to reduce obesity and overweight, and to reduce physical inactivity. This will raise awareness of diabetes, improve access to information about it, and perhaps prevent the onset of type 2 diabetes in particular.

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