Extent and Associated Factors of Obesity among Patients at a Specialized Outpatient Clinic in Uganda

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Abstract

Background: Diabetes and obesity are considered a global epidemic by the World Health Organization (WHO) due to their increasing prevalence. Obesity is common in Type 2 Diabetes (T2D) as a comorbid condition often termed as "Diabesity". Approximately 60-90% patients with T2D are overweight or obese. WHO projects 300 million people will suffer from diabetes by 2025, most of which can be attributed to obesity. There is limited data about diabesity at the study area. Therefore, our study aimed at studying the prevalence and factors associated with obesity in the study area.

Methods: A facility based cross-sectional study was undertaken between August and November 2018 involving adults aged ≥ 18 years at the Diabetes outpatient clinic of Mulago National Referral Hospital. Data were collected about the participants' sociodemographic and other characteristics by individual face to face interviews by trained study staff using a predesigned questionnaire. Body Mass Index (BMI) was calculated and classified into 3 groups: 18.5-24.9, 25.0-29.9, ≥ 30.0 as normal weight, overweight respectively following the WHO standard.

Results: A total of 319 patients participated in this study: 66.46% of them were female, the mean age and age range in years was 51.1 and 20 to 77 years respectively. Obesity was prevalent in 24.45% and 15.67% had central obesity; by BMI classification 41.69%, 33.86% and 24.45% were normal weight, overweight, and obese respectively. In the multivariate regression, gender (p=0.004), age (p<0.001), DBP (p=0.003), SBP(p=0.023), family history of DM (p=0.004) and HT p=0.006), known hypertension status (p<0.001) were the risk factors significantly associated with obesity.

Conclusion: Obesity is prevalent in this study population. Among the factors associated with obesity in our study, blood pressure is the only modifiable factor. Cardio-metabolic complications in patients with obesity, diabetes and hypertension are preventable through the reduction of blood pressure.

Keywords: Obesity; Extent; Prevalence; Associated Factors; Uganda

Abbreviations

ABI: Ankle Brachial Index; ADA: American Diabetic Association; BMI: Body Mass Index; BP: Blood Pressure; CVD: Cardiovascular Diseases; DM: Diabetic mellitus; HbA1c: Glycosylated Hemoglobin/ Hemoglobin A1c; HDL: High-Density Lipoprotein; LDL: Low-Density Lipoprotein; LLD: Lipid Lowering Drugs; TC: Total Cholesterol; TG: Triglycerides; T2DM: Type 2 Diabetes Mellitus; WHC: Waist Hip Ratio; WHO: World Health Organization.

Introduction

The burden of Diabetes with that of Obesity is increasing worldwide and for this reason that both conditions are considered a global epidemic by the World Health Organization (WHO) which projects

that around 300 million people will suffer from diabetes by 2025[1]. About 60-90% of all patients with type 2 diabetes are overweight (BMI ≥ 25 kg/m2) or obese (BMI ≥ 30 kg/m2) [2-4].

Obesity and Diabetes are strongly associated with research suggesting the role of obesity in Type 2 Diabetes (T2D). Furthermore, obesity is a documented risk factor accounting for about 80%-85% of the risk of developing T2D, while recent evidence suggests that obese people are up to 80 times more likely to develop type 2 diabetes than those with a BMI of less than 22 particularly if you have excess weight around your abdomen, therefore the increasing incidence of diabetes can be attributed to the global epidemic of obesity [5]. Obesity in diabetic persons is associated with poorer control of blood glucose levels, blood pressure, and cholesterol [6,7] which puts these patients at higher risk of cardiovascular and micro vascular disease [8].

Obesity directly and indirectly leads to the development of T2D and its complications through its effects on insulin resistance which appears early in the disease, and is primarily compensated by hyperinsulinaemia [9-12]. The complications in obese diabetics such as CVD seem to result from both conditions but most especially obesity [13]. Obesity is a common comorbid condition often termed as "Disability" in type 2 diabetes patients with [14,15].

Sedentary lifestyle and changing food habits could be the main reasons for continuously increasing incidence of obesity and diabetes. Weight gain increases the risk of cardiometabolic complications, other fatal conditions like coronary artery disease (CAD)[16] which are the main reason of morbidity and mortality in T2D[13]. Recent recommendations from the American Diabetes Association and the European Association for the Study of Diabetes note that aggressive management of cardiovascular risk factors, which include high blood pressure and obesity, may be even more beneficial in patients with T2DM [17].

Obesity is a major preventable risk factor for T2D whose modification through weight reduction decreases the associated morbidity, mortality and health care costs. Knowledge and guidelines about diet, physical activity, and sedimentary lifestyle is very important, and evidence exists that obese adolescents who follow these guidelines had lower insulin resistance, better glycaemic control, and higher rate of T2D prevention[10,18] and dyslipidemia associated with T2DM [19] however this may not be possible in developing countries with limited healthcare access. Knowledge about the prevalence of obesity and comorbidities is crucial to the designing of management policies aimed at reducing weight while controlling blood pressure and glucose in this population.

Methods

Study design

A facility based cross-sectional study was undertaken on a sample from a diabetic population between August and November 2018.

Settings

The study was performed at the Diabetes outpatient clinic of Mulago National Referral Hospital located in Kampala, the capital city of Uganda. The hospital serves as a primary and tertiary facility receiving patients of all forms of DM, ranging from early to late disease from across the country and neighboring areas but is also a teaching hospital. It has 300,000 registered patients with diabetes mellitus.

Sample size

The size of the sample was obtained with the Kish and Leslie formula for cross-sectional studies. A total of 319 consenting adult patients were recruited into the study using a systematic sampling technique. We have used an average prevalence of 29.4% since none or very little information on the prevalence of obesity are available a margin of error of 0.05; a confidence interval of 95%.

Participants, inclusion and exclusion criteria

All patients aged 18 years and above attending care at the Diabetic outpatient clinic of the National

referral hospital that gave their written consent for study participation were included according to inclusion criteria. Critically ill patients, newly diagnosed diabetes were excluded from the study. Recruitment of participants happened during their clinic visits.

Data collection

Participants data were collected by individual face to face interviews by trained study staff using a predesigned questionnaire which included questions on socio-demographic characteristics (age, sex, education level, occupation, monthly income, and family history of DM, HT), lifestyle and behavioral variables such as smoking, physical activity and medical history on family history of Hypertension and diabetes, duration since diagnosis of Diabetes. Trained professional study staff recorded the anthropometric measurements that included weight, height and blood pressure.

Weight was measured with a weighing scale and was recorded to the nearest kilogram; height was measured in meters using a tape while standing barefoot without headgear. Measured body weight and height were used to calculate the Body Mass Index (BMI) (kg/m²) by dividing weight in kilograms by height in meters squared [weight (kg)/height (m2)]. The waist and hip circumference was recorded and were used in calculations for Waist Hip Ratio (WHR), the Ankle Brachial Index (ABI) Normal <1.0. Blood pressure was recorded in sitting position in right arm, using a sphygmomanometer.

Blood Samples were taken for measurement of Random Blood sugar, Glycosylated Haemoglobin (HbA1c), HIV status, Low-Density Lipoprotein (LDL), High-Density Lipoprotein (HDL), Total Glycerides and Cholesterol. HbA1c was measured using the MINDRAY BS120 Chemistry analyzer 2013-06 by Shenzhen Mindray Bio Medical Electronics Co. HIV status was ascertained according to the National guidelines using standard rapid testing kits.

Operational definition

The variables were categorized into two groups as follows: Age was grouped as below and above 45 years, and educational status which was the highest level of education that the patient attained and reported during the interview as informal, formal. The patients' involvement in physical activity was categorized into involvement or non-involvement in exercise and the number of hours of exercise per week which were categorized as less or more than 4 hours per week while income was categorized as less or greater than 80 USD. Study subjects were categorized into two glycaemic control groups defined at HbA1c cutoff of 7 (≤ 7%) as defined by American Diabetes Association (ADA) criteria.

Participants were classified into 3 groups: normal weight (BMI 18.5-24.9), overweight (BMI 25.0-29.9), or obese (BMI ≥ 30.0) following the WHO standard.

WHR were classified as normal <0.9, <1.0 for female and male respectively weight, overweight and obese, and ABI termed as Normal <1.0. Respondents were considered to be hypertensive if they met any of the following criteria: 1) measured systolic blood pressure exceeding 130 mmHg and/or diastolic blood pressure exceeding 85 mm Hg; or 2) the respondent reported known knowledge of their Hypertension status.

Data analysis

Analysis was conducted with STATA 14. A multivariate logistic regression model was fitted, to compare socio-demographic characteristics and obesity in our study population. The association between obesity and related factors was measured by using a multivariate logistic regression model. All factors were included in the bivariate model and then eliminated some based on P-values of <0.05. These variables were put into the final model and those with P-values of <0.05 were considered statistically significant.

Ethics

Ethical clearance was obtained from the ethics committees of the faculty of medicine at Makerere

University and the Uganda National Council of Science and Technology.

Results

A total of 319 patients were enrolled into this study. Table 1 shows the socio demographic and other characteristics of the study population. The mean age and age range in years of the study participants was 51.1 and 20 to 77 respectively. A greater proportion (68.97%) of them was above 45 years old. The female 212 (66.46%) were more than male 33.54%. Among the study patients, more than half 181(56.74%) had informal education, almost two-thirds 200 (62.70%) had a monthly income of less than 80 US Dollars. More than one-third 130 (40.75%) had been suffering from diabetes for more than 10 years since diagnosis, 203 (63.64%) had a family history of hypertension. Over half of study participants 195(61.13%) had poor glycemic control reflected by HbA1C ≥ 7.0%, more than 50%, 186 (58.31%), of study participants were overweight or obese according to the BMI but 50 (15.67%) had central obesity.

The prevalence of obesity according to the BMI classification was 78(24.45%) of the study subjects. Out of the 319 study subjects, 133(41.69%), 108(33.86%) and 78(24.45%) were normal weight, overweight, and obese, respectively. Table 2, shows the bivariate regression analysis with BMI as the dependent variable and the other characteristics as the independent variables. There was a significantly higher proportion of obesity among females compared to male participants. Obesity was more prevalent in females 79.49% compared to males 20.51% using BMI classification and this difference was statistically significant, p=0.001

The three categories of BMI considered as normal, overweight and obese in this study were higher among females compared to males. 44/78 (56.41%) of the obese participants were ≥45 years old. The obese hypertensives were more than the obese non-hypertensive, 23.08% and 76.92% respectively. The prevalence of obesity was higher among those with family history of hypertension compared to those with no family history of hypertension, (80.77%; n=63), p=0.001. Again the prevalence of obesity was higher among those with family history of diabetes compared to those with no history of diabetes. (76.92%, n=60), p < 0.002. These observations were statistically significant. More than half of the obese study participants, 64.10% had poor glycaemic control although this was not statistically significant, p<0.087.

Table 3 shows the association between the participants' characteristics and obesity and only includes variables from bivariate analysis that had statistical significance at p<0.05. Gender, age, monthly income, DBP, SBP, family history of DM and HT, known hypertension status, physical activity and the frequency of weekly exercises were the variables associated with obesity in the bivariate model analysis and were the factors taken into the multivariate regression analysis.

However gender (p=0.004), age (p<0.001), DBP(p=0.003), SBP(p=0.023), family history of DM (p=0.004) and HT (p=0.006), hypertension (p<0.001) were the independent factors that showed statistically significant association with obesity in the multivariate model.

Diabetic patients who were 45years and above were 0.19 times likely to be obese (OR 0.19, 95% CI 0.092–0.395; p<0.001) compared to those below 45 years old. The study patients with a family history of diabetes or hypertension were ~2.67 times (OR 2.67, 95% CI 1.369–5.212; P=0.004) and ~2.75 times (OR 2.75, 95% CI 1.333–5.658; P=0.006) respectively, more likely to be obese than the patients without a family history of Diabetes or hypertension.

Moreover, the odds of being obese among those with a known history of hypertension were 5.22 times higher (OR 5.22, 95% CI 2.345–11.5981; P<0.001) compared to those with no known history of hypertension.

Discussion

In this study, obesity was assessed by BMI classification. The results revealed that the prevalence of obesity among type 2 diabetic patients was 24.45%. The prevalence noted is comparable to past study findings in Uganda [20] and Sudan [21].

Prevalence of obesity was higher among female than male participants. These study findings concur

with the earlier reports in Uganda [20] and Sudan [22,23] but higher than the proportion of obesity in females reported by Mogre [24].

Age, gender are some of the factors significantly associated with obesity and T2DM in our study. This finding is similar to other study findings that revealed age, gender as factors affecting the obesity-DM relationship [25]. The prevalence of obesity is associated with females than male participants [24, 26–28] except Gopalakrishnan [29]. The higher rate of obesity among the females may be expected because our study population was predominantly female; furthermore there is usually a gender-based food preference which may lead to fatness in the females but the higher rate in females can be attributed to less physical activity, rapid urbanization, and cultural reasons [30-32]. The women in study population were probably using contraceptives which are known to cause increased fat production resulting from their effects on appetite [33].

A majority of the obese study participants were 45 years old, the mean age of our study participants was 51.1 years and the age range was 21 to 77years. Age-related declines in muscle and increases in adipose tissues have been demonstrated [34] although there is more peripheral fat in older women than men [35]. Age was also found to be associated with obesity in other African studies [36-39].

Family history of hypertension or diabetes was associated with obesity, p values 0.004 and 0.006 respectively in our study. Systolic and diastolic hypertension, p values 0.023 and 0.003 respectively also showed statistically significant association with obesity in this study. Similar results in a study among adolescents in Srilanka showed BMI was significantly associated with both systolic and diastolic hypertension [40]. In a Korean study there was an association between body mass index range 16 to 31 kg/m^2 and systolic and diastolic blood pressure [41].

Limitations

The study was cross-sectional in design and its sample size may not be representative of the general population. We used the WHO categories for BMI as the measure of obesity but BMI has limitations although it is still widely used in the assessment of weight status. There are other known associated factors in obesity such as the diet, cultural issues that were not included among the variables in this study.

Conclusion

These findings revealed that obesity is prevalent in this study population. Blood pressure is the modifiable factor among the factors that were associated with obesity. The reduction in blood pressure decreases the risk of cardio-metabolic complications in patients with obesity and hypertension. The study findings are important in designing of education materials targeting weight reduction and the management package of obesity, hypertension and diabetes.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on request.

Disclosure

The authors report no conflicts of interest in this work.

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Table 1: Characteristics of the Study Subjects

Characteristic		Number	Proportion %
Age (yrs)	<45	99	31.03
	>45	220	68.97
Education	Informal	181	56.74
	Formal	138	43.26
Sex	Male	107	33.54
	Female	212	66.46
Income (dollars)	Below $80	200	62.7
	Above $80	119	37.3
HIV	Negative	291	91.22
	Positive	28	8.78
Known history of HT	No	109	34.17
	Yes	210	65.85
HBAIC	Poor control	195	61.13
	Good control	124	38.87
Duration of DM	Below 10 yrs	189	59.25
	Above 10 yrs	130	40.75
WHC ratio	Abnormal	50	15.67
	Normal	269	84.33
SBP	Below 130	91	28.53
	Above 130	228	71.47
DBP	Below 85	146	45.77
	Above 85	173	54.23
BMI	Abnormal	186	58.31
	Normal	133	41.69
ABI	Abnormal	29	9.09
	Normal	290	90.91
Family history of DM	No	127	39.81
	Yes	192	60.19
Family history of HT	No	116	36.36
	Yes	203	63.64
LDL	Below 2,6	165	51.72
	Above 2.6	154	48.28
TCHOL	Below 5.2	134	42.01
	Above 5.2	185	57.99
TG	Below 2.3	215	67.4
	Above 2.3	104	32.6
Weekly exercises in hour	Less than 4hrs	130	40.75
	More than 4hrs	189	59.25
History of exercising	No	63	19.75
	Yes	256	80.25
History of smoking	No	295	92.48
	Yes	24	7.52
HDL	Below	23	7.21
	Above	296	92.79

Table 2: Characteristics and BMI groups among diabetic patients attending the Outpatient Diabetes Clinic at Mulago National Referral hospital from August to November 2018.

Characteristic	Normal weight	Overweight	Obesity	P value
SEX				
Male	62	29	16	0.001
Female	71	79	62	
Age group				
30-45	36	29	34	0.022
45-50	97	79	44	
Education				
Informal	74	65	42	0.652
Formal	59	43	36	
INCOME				
Below $85	74	65	42	0.009
Above $85	59	43	36	
DURATION OF DM				
Below 10years	84	62	43	0.463
Above 10years	49	46	35	
WHR				
Abnormal	113	86	62	0.468
Normal	20	22	16	
HIV				
Negative	124	99	68	0.318
Positive	9	9	10	
DBP				
Below 85	65	38	43	0.017
Above 85	68	70	35	
SBP				
Below 130	54	19	18	0.001
Above 130	79	89	60	
ABI				
Abnormal	12	9	8	0.903
Normal	121	99	70	
HBAIC				
Poor control	88	57	50	0.087
High control	45	51	28	
Family history of DM				
No	63	46	18	0.002
Yes	70	62	60	
Family history of HT				
No	51	50	34	0.001
Yes	82	58	44	
History of HT				
Non hypertensive	54	37	18	0.035
Hypertensive	79	71	60	

LDL				
Below 2.6	78	53	34	0.085
Above 2.6	55	55	44	
HDL				
Below 1.1	6	7	10	0.074
Above 1.1	127	101	68	
TCHOL				
Below 5.2	65	41	28	0.106
Above 5.2	68	67	50	
TG				
Below 2.3	91	75	49	0.603
Above 2.3	42	33	29	
Exercise per week in hours				
Less than 4hrs	68	32	13	0.003
More than 4hrs	65	76	65	
History of exercise				
No	40	10	13	0.001
Yes	93	98	65	
History of smoking				
No	121	105	69	0.057
Yes	12	3	9	

Table 3: Factors associated with obesity among diabetic patients attending the Outpatient Diabetes Clinic at Mulago National Referral hospital from August to November 2018.

	Test statistic		
Variables	Odds ratio	95% Conf. Interval	P value
Gender	0.35	0.169- 0.719	0.004
Age (yrs)	0.19	0.092- 0.395	0
Monthly income (dollars)	0.55	0.288- 1.049	0.07
DBP	0.347	0.174- 0.692	0.003
SBP	2.52	1.138- 5.581	0.023
Family history DM	2.67	1.369- 5.212	0.004
Family history HT	2.75	1.333- 5.658	0.006
Known history of HT	5.22	2.345 –11.598	0
Weekly exercise (hrs)	0.89	0.439-1.806	0.747
Physical activity	0.66	0.253-1.737	0.403