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Research article

Prevalence and associated factors of overweight/obesity among type2 diabetic outpatients in Southwest Ethiopia

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ABSTRACT

Purpose: Type 2 diabetes mellitus is a major global health threat worldwide. Obesity and overweight is major risk factor for its development. This study aimed to assess the prevalence and associated factors of overweight/obesity among diabetic outpatients at Jimma Medical Center, Southwest Ethiopia.

Methods: Hospital-based, cross-sectional study was conducted during March 02 to June 30, 2020 among systematically selected participants at the study area. Bivariable and multivariable binary logistic regression were used to identify the factors associated with outcome variable. Variables with a p value of<0.25 on bivariable logistic regression were considered candidates for multivariable regression. On multivariable logistic regression variables with p-value of <0.05 were considered as significantly associated with overweight/obesity.

Results: A total of 334 participants with mean age of 51.42 ± 13.33 years were included in the study. The prevalence of overweight/obesity among the study population was 36.2%. According to multivariable logistic regression analysis, residence (AOR = 1.8, 95%CI:1, 3), higher income tercile (AOR = 3.4, 95%CI:1.8, 6.7), family history of overweight and obesity (AOR = 1.9, 95%CI:1.1,3.4), comorbid hypertension (AOR = 2.4, 95%CI:1.4,4) and physical inactivity (AOR = 2.1, 95%CI:1.2,3.5) were significantly associated with overweight/obesity.

Conclusion: There was a high prevalence of overweight/obesity among study participants. It was found that higher income tercile, residence, family history of overweight and obesity, comorbid hypertension and physical inactivity were significantly associated with overweight/obesity.

1. Introduction

Globally, there is rising prevalence of overweight and obesity and associated type 2diabetes (T2DM) in both developing and developed countries. Type 2 diabetes mellitus accounts around 90% of all cases of diabetes [1]. The rising levels of obesity in developing countries is thought to be a result of urbanization, increased consumption of high calorie foods, adoption of a western lifestyle and adoption of a more sedentary lifestyle [2, 3]. World health organization (WHO) has described obesity as the worst non-infectious epidemic in history [4] and it is the second leading cause of preventable death following tobacco use [5].

The upsurge in the prevalence of T2DM is closely connected to the rise in obesity. Among all obesity related diseases, T2DM is most strongly and clearly related with obesity. There is a seven times and three fold greater risk of diabetes in obese and overweight individuals respectively compared to those of healthy weight [6]. Furthermore, it is estimated that around 90% of T2DM is attributable to excess weight [7]. The pathophysiology connecting obesity and diabetes is primarily attributed to insulin resistance and insulin deficiency [8].

Nearly 2.8 million people die globally annually because of being overweight or obese [9]. Overweight and obesity are topmost contributor to the leading killer diseases globally and it is associated with more than 45 comorbidities including diabetes, cardiovascular diseases, cerebrovascular diseases, osteoarthritis, gallbladder diseases, respiratory tract diseases as well as psychological and emotional distress [10, 11].

The likelihood and severity of T2DM are closely interrelated with body mass index. Overweight in people with diabetes could cause cardiovascular disease, increased thrombogenic factors, and interferes with the treatment of hyperglycemia [12]. Furthermore, it has been linked with poor control of cholesterol, blood pressure and blood glucose levels among people with T2DM and there is a seven times greater risk of diabetic complications compared to those with normal weight [13, 14].

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Previous studies done in different settings identified several risk factors for overweight and obesity among T2 DM patients, including physical in activities [15], comorbid hypertension [16], higher economic status [17], residence area [18, 19], gender [20], older age [15] and alcohol consumption [21].

Identification of modifiable risk factors of overweight and weight management among patients with T2DM provides beneficial impacts in treatment, control of metabolic parameters and low cardiovascular risks among diabetic patients [22]. In addition, weight loss plays significant role in improving dyslipidemia and insulin resistance which is associated with T2DM [23]. However, in sub-Saharan Africa, including Ethiopia obesity has not been much of a concern until recently, because priority has been given to under nutrition and communicable diseases due to limited staff and infrastructure [24, 25]. Furthermore, as per investigator knowledge there is limited evidence regarding the magnitude of overweight/obesity and its associated factors among diabetes patients in Ethiopia, including the study area. Hence, this study tried to solve this gap and provide basis for health professionals and policy-makers in designing appropriate intervention strategies to solve this problem.

2. Methods and materials

2.1. Study design and setting

A hospital-based cross-sectional study was carried out from March 02 to June 30, 2020 among adult diabetic patients on the follow-up clinic at Jimma Medical Center (JMC), which is located 355km to the Southwest of Addis Ababa, the capital city of Ethiopia. The hospital serves as a referral site and provides specialized care for southwest Ethiopian population, with a catchment population of about 15 million.

2.2. Eligibility criteria

Participants of age ≥18 years were included and those who were seriously ill, had chronic disease with edema, type 1 diabetes, pregnant women and patients with psychiatric disorder were excluded.

2.3. Sample size calculation and sampling technique

The sample size was calculated using a single population proportion formulae by considering the following assumptions: 40.8% prevalence (p) of overweight from previous studies in Ethiopia [21], 95% confidence interval and a margin of error 5%. It gives initial sample size of 371. Since the source populations of diabetic patients at the clinic were less than 10, 000, we employed population correction/adjustment formula for a finite population. As such, the calculated sample size was 304 and by adding a 10% non-response rate gave the final sample size of 334. Systematic random sampling method was used to select the study participants using their medical record numbers who were on treatment follow-up at Jimma Medical Center.

2.4. Data collection tool and procedure

A pretested structured interviewer-administered questionnaire was used to collect data. The questionnaire was adapted from WHO step wise approach for surveillance of chronic disease risk factors [26] and from related different scientific journals [15, 18, 19, 20, 21, 27]. It contains socio-demographic factors, behavioral variables, anthropometric and clinical variables. Data on behavioral characteristics were collected using the WHO Step wise approach for chronic disease risk factor surveillance questionnaire and clinical variables were taken from patient charts.

The study participants' weight and height and were measured with standardized techniques and calibrated equipment. Body weight was measured with digital scale with light clothing and without feet wear at standing position with the nearest 0.1 kg. Height was measured using a stadiometer in centimeter (cm) in an erect position at a precision of 0.1cm with buttocks, scapula and head positioned in contact with the stadiometer. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. Measurements were taken two times and the average was used in the analysis.

2.5. Operational definitions

Overweight: Body mass index of 25–29.9 kg/m^2
Obesity: Body mass index of greater than 30 kg/m^2
Controlled blood sugar: fasting blood sugar of 80–130 mg/dl [28].

2.6. Data processing and analysis

Data was checked for errors then entered in to Epi-data version 3.1 and exported to SPSS version 20 for analysis. Descriptive statistics were computed using the frequency table and numerical summary measures. A bivariable association between overweight/obesity and several independent variables were examined for statistical significance. All variables with p-value of <0.25 on bivariable analysis were selected for multivariable analysis. Odds ratio with their respective 95% confidence level were computed to determine the strength of association and significant association was declared at p-value of <0.05. Model goodness of fit was checked using the Hosmer Lemeshow test of goodness of fit and gave a p-value of 0.65, indicating evidence of fitness of the model. Multicollinearity among the independent variables were checked using variance inflation factor and none was found. Variance inflation factor of >10 indicates multicollinearity [29].

2.7. Data quality control

Training was given to data collectors and supervisor on the purposes of the study, interview methods and measurement techniques by principal investigator. The collected data were checked carefully on a daily basis for accuracy and clarity by a supervisor and the principal investigator. To ensure the data collectors and respondents understood the questions pretests were carried out on 5% of study population attending the Shenen Gibe hospital diabetic clinic prior to actual study period. Supervisor and principal investigator were validating the completeness and clarity of the questionnaire immediately at the end of the interview daily until the end of study period. Data were collected by three trained nurses with supervision by supervisor and principal investigator.

2.8. Ethical approval

This study was conducted in accordance with the Declaration of Helsinki. Ethical clearance was obtained from Jimma University Institutional Review Board an official letter of permission was obtained from the hospital. Written informed consent was obtained from the study participants to start data collection and privacy and confidentiality of participants was assured.

3. Results

3.1. Socio-demographic characteristics of participants

A total of 334 participants with mean age of 51.42 ± 13.33 years were involved in this study. The majorities of the participants (54.5%) were males and married (78.7%). Regarding the religious affiliation of study participants, 43.7% were Muslim followed by Orthodox Christian (40.1%) (Table1).

3.2. Clinical and behavioral characteristics of participants

The mean duration of diabetes was 6.95 ± 5.37 years and almost half (50.6%) of them were physically inactive. Concerning blood-glucose

Table 1. Socio-demographic characteristics of participants at JMC, Jimma, Ethiopia.

Variables	Category	Frequency(n)	Percentage (%)
Sex	male	182	54.5
	female	152	45.5
Age	<30 years	27	8.1
	30–39 years	27	8.1
	40–49years	80	24
	≥50 years	200	55.7
Marital status	married	263	78.7
	single	13	3.9
	others*	58	17.4
Religion	muslim	146	43.7
	orthodox	134	40.1
	protestant	39	11.7
	others†	15	4.5
Educational status	no formal education	96	28.7
	primary	149	44.6
	Secondary and above	89	26.6
Residence	urban	164	49.1
	rural	170	50.9
Average monthly income (USD)	<29.5	81	24.3
	29.5 to 58.9	34	10.2
	≥58.9	219	65.6

* widowed, separated.
† wakefata, catholic.

levels, a majority (72.5%) had controlled blood sugar. More than one third (36.8%) of study participants had comorbid hypertension (Table 2).

3.3. Prevalence of overweight/obesity

In this study, body mass index were used for defining prevalence of overweight/obesity for each study subject. Accordingly, the combined prevalence of overweight and obesity among the study population was 121 (36.2%) 95% CI (31.1, 41.3)]. Of them, 98[29.3%] were overweight and 23[6.9%] were obese respectively.

3.4. Factors independently associated with overweight/obesity

All variables that had p value ≤ 0.25 in the bivariable analysis were included in the multivariable analysis. In this study age, residence, physical activity level, educational status, monthly income, comorbid hypertension, family history of overweight and obesity and duration of DM were significantly associated with overweight/obesity in bivariable analysis. After adjusting for these variables, monthly income of ≥58.9 USD (AOR = 3.4, 95%CI:1.8, 6.7), residence (AOR = 1.8, 95%CI:1, 3), family history of overweight and obesity (AOR = 1.9, 95%CI:1.1,3.4), comorbid hypertension (AOR = 2.4, 95%CI:1.4,4)and physical inactivity (AOR = 2.1, 95%CI:1.2,3.5) were significantly associated with overweight/obesity (Table 3).

4. Discussion

The pooled prevalence of overweight and obesity among adult population in Ethiopia was 19% and obesity 5.4% respectively [30]. The current study intended to determine the prevalence of overweight/-obesity and its determinants in adult patients with T2DM. Accordingly, the prevalence of overweight and obesity were 29.3% and 6.9% respectively and the overall prevalence of both overweight and obesity was 36.2% [95% CI (31.1, 41.3)]. This finding was comparable with previous studies conducted in Tigray, Hosanna, Ethiopia and in Ghana which reported the prevalence of 40.8%, 35.9% and 32% respectively [15, 21, 31]. However, this finding was lower than studies conducted in Addis Ababa, Yemen, Sudan and Brazil which reported the prevalence as 46.4%, 58.5%,64.4% and 59.7% respectively [16, 25, 27, 32]. The possible reasons for such discrepancy might be due to difference in residence, life style, socio-economic, genetic factor, population, study design and use of different of different BMI cutoff value in the study.

In this study, the odds of overweight/obesity were higher among patients live in urban area compared to their counterparts. This result was supported by other similar studies done [18, 19, 21]. The possible reason might be due to participants who live in urban area live a sedentary way of life and do less exercise and use vehicles for transportation.

In agreement with other reports the current result showed that the risk of being overweight/obesity was higher among participants with higher income tercile compared to participants with their counter parts [17, 33]. This relationship is probably due to participants with higher income level usually adopt western lifestyle, which frequently leads to more intake of high fat and high caloric diet have a higher risk of expose to energy-dense foods and a sedentary way of life.

The results of this study showed that family history of overweight and obesity was significantly associated with the occurrence of overweight/obesity. Even if the exact mechanism connecting family history of overweight and obesity with occurrence of overweight/obesity is not completely understood, the possible explanation is that due to a combination of genetic and environmental factors like shared family lifestyle characteristics.

The magnitude of overweight/obesity was significantly higher among those patients with comorbid hypertension. This is in line with previous studies [16, 34]. This relation could be justified as obesity is associated with activation of the sympathetic nervous system, the renin–angiotensin system, increasing insulin resistance and by increasing renal sodium reabsorption leading to the occurrence of HTN [35].

Finally, physical activity levels of the participants were found significantly associated with overweight/obesity. This association was supported by earlier studies (15,21). The association observed might be due to undertaking physical exercise burns off body fat results in less risk of overweight.

4.1. Limitation of the study

First due to the cross-sectional nature of the study, temporal relations could not be established and limited in evaluating cause-and-effect associations. Secondly, a single institutional based nature of the study that considers only patients under follow-up might limit the generalizability of the findings for all diabetic populations in Ethiopia. Finally, some of

Table 2. Clinical and behavioral characteristics participants at JMC, Jimma, Ethiopia.

Variables	Category	Frequency(n)	Percentage (%)
Comorbid hypertension	yes	123	36.8
	no	211	63.2
Duration of DM since diagnosis	<5year	179	53.6
	≥5year	155	46.4
Alcohol intake	yes	40	12
	no	294	88
Exercise	active	165	49.4
	inactive	169	50.6
Smoking	yes	52	15.6
	never	282	84.4
Glycemic control	controlled	242	72.5
	Not controlled	92	27.5
History of overweight & obesity in family	yes	80	24
	no	254	76

Table 3. Final model demonstrating associated factors of Overweight/obesity among DM Patients on follow up at JMC, Ethiopia.

Variables	Category	Overweight/obesity		Bivariable Analysis		Multivariable analysis	
		Yes	No	p-value	COR (95%CI)	p-value	AOR (95%CI)
Age (years)	<30	4	23	1	1	1	1
	30–39	8	19	.198	2.4 [.6,9.3]	.303	2 [.5,8.6]
	40–49	32	48	.022	3.8 [1.2,12.1]	.360	1.7 [.5,5.9]
	≥50	77	123	.022	3.6 [1.2,10.8]	.476	1.5 [.47,4.9]
Average monthly income (USD)	<29.5	17	64	1	1	1	1
	29.5 to 58.9	12	22	.110	2 [.8,4.9]	.069	2.4 [.9,6.5]
	≥58.9	92	127	.001	2.7 [1.49,4.9]	.≤001*	3.4 [1.8,6.7]
Residence	urban	73	91	.002	2 [1.2,3.2]	.020*	1.8 [1,3]
	rural	48	122	1	1	1	1
History of overweight & obesity in family	yes	40	40	.004	2 [1.3,3.5]	.025*	1.9 [1.1,3.4]
	no	81	173	1	1	1	1
Educational level	no formal education	26	70	.255	.6 [.4,1.3]	.448	.7 [.4,1.6]
	primary	64	85	.217	1.4 [.8,2.4]	.140	1.5 [.8,2.7]
	secondary and above	31	58	1	1	1	1
Exercise	active	49	116	1	1	1	1
	inactive	72	97	.015	1.7 [1.1,2.7]	.008*	2.1 [1.2,3.5]
Comorbid HTN	no	60	151	1	1	1	1
	yes	61	62	≤0.001	2.4 [1.5,3.9]	.001*	2.4 [1.4,4]
Duration of DM(years)	<5	56	123	1	1	1	1
	≥5	65	90	.044	1.5 [1.2.5]	.150	1.5 [.8,2.4]

* value statistically significant, AOR- Adjusted Odds ratio, COR-Crude odds ratio, 1-reference.

the risk factors were identified from self-reported data, which might be affected by recall bias.

4.2. Conclusion

This study revealed high prevalence of overweight/obesity among study participants. It was found that comorbid HTN, family history of overweight and obesity, higher income tercile, physical inactivity and residence area were significantly associated with it. Therefore, all stakeholders who are involved in the management of diabetes should be aware of this situation and should take appropriate interventions to tackle this problem.

Declarations

Author contribution statement

Daba Abdissa: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Abebe Dukessa: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Alemayeu Babusha: Performed the experiments; Wrote the paper.

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Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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