

## Overweight and Obesity among Type 2 Diabetic Patients at Nigist Elleni Memorial Hospital, Hosanna Town, Southern Ethiopia

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### Abstract

**Background:** Non-communicable diseases, especially type 2 diabetes mellitus, are increasing at an alarming rate in Sub-Saharan Africa countries, including Ethiopia. However, little is known about the nutritional status of type 2 diabetic patients and associated factors in low-income countries like Ethiopia.

**Objective:** To assess the prevalence of overweight, obesity and the associated factors among type 2 diabetes mellitus patients at Nigist Elleni Memorial Hospital, Hadiya Zone, Southern Ethiopia, from February 1 to 28, 2017.

**Methods:** An institutional cross-sectional study was conducted on 420 type 2 diabetic patients from Nigist Elleni Memorial Hospital. Anthropometric measurements and a pretested structured questionnaire were used to collect the data, and they were entered into EpiData Version 3.02 and analysed with SPSS Version 20. Descriptive analysis was done and results are shown using frequency tables. Multivariable logistic regression was used to identify the factors associated with the outcome. Level of statistical significance was declared at p value less or equal to 0.05.

**Results:** Of the 407 study participants, 146 were found overweight/obese (35.9%, 95% CI: 30.8 - 40.5). Overweight/obesity was more common among study participants who were above 55 years old (AOR= 3.24, 95% CI: 1.74-6.06), who had been doing physical activity for less than 30 minutes per day (AOR= 2.31, 95% CI: 1.30-4.11), who had been with diabetes for three or more years [AOR =2.55, 95% CI: 1.48-4.40], and who had been up taking poor diet (AOR=2.98, 95% CI: 1.79-4.96).

**Conclusion:** The magnitude of overweight/obesity was very high, and the factors significantly associated with the overweight/obesity were older age, lack of enough physical exercise, and poor diet. The patients' body weight determined the progression of the disease into complications. This shows a need to add health promotion and preventive programs such as dietary modification and physical exercise to the therapeutic programs for the disease.

**Key words:** *Overweight, obesity, type 2 diabetes mellitus, dietary practice, Haramaya University, Ethiopia*

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### Introduction

Type 2 diabetes mellitus (T2DM) is a medical condition characterized by hyperglycemia. This metabolic disorder can occur due to insulin resistance or insulin deficiency (Bassam and Rasool, 2013). T2DM is the most common form of diabetes, accounting for 90-95% of diabetic cases (CDC, 2015). Being overweight is a major contributor to the T2DM epidemic. In the US, nearly 80% of the T2DM patients are considered to be overweight (American Association of Diabetic Educators, 2014). In Ethiopia, a study conducted in Addis Ababa showed that 46.4% of the diabetic patients were overweight or obese (Worku *et al.*, 2014).

The types of food people eat have been changing because of the higher access to and the lower price of food stuff, together with the bigger income of families. The traditional plant-based diets which include fruits and vegetables that are endowed with sugar, starch, and fibre are replaced by animal products. This

transition and the prevailing sedentary lifestyle, which hardly involves any physical activity, are the underlying factors for the development of chronic diseases like diabetes (WHO and FAO, 2003).

An increase in body mass index (BMI) results in severe obesity and its consequence is higher on type 2 diabetic patient than on healthy person (Mary *et al.*, 2014). There is a seven times greater risk of diabetic complications in individuals who weigh too much compared to those with normal weight (Gatineau *et al.*, 2014). Too much weight, or obesity, raises blood pressure, blood cholesterol, and insulin resistance, and thus can result in death (World Cancer Research, 2014). Gaining excessive weight can be prevented by checking diet and making exercise regularly. A combination of diet and exercise has been proven more effective in regulating blood sugar more than diabetic medications do (Bassam and Rasool, 2013).

Even though nutritional intervention is one of the diabetic managements, little is known about it in relation to the T2DM patients in Ethiopia in general, and in the study area in particular. This study was thus conducted with the aim of assessing the nutritional status of T2DM patients in Nigist Elleni Memorial Hospital, Hossana, Ethiopia, the study setting and identifying the factors associated with the Overweight and obesity.

## Materials and Methods

### *Study design and Setting*

A facility based cross-sectional study was conducted in Nigist Elleni Memorial Hospital on 420 type 2 diabetic patients. The Hospital is zonal Hospital located in Hosanna Town, Hadiya Administrative Zone, Southern Ethiopia. Hosanna town is located 230 km from Addis Ababa, and 194 km from the regional capital city Hawassa. Data were collected from February 01 to 28, 2017.

### *Participants and Sampling Procedure*

On the basis of a previous study, considering the outcome variable as the prevalence of overweight and obesity, the sample size was determined using a proportion overweight and obese T2DM patients at the outpatient department of Yekatit 12 Medical College Hospital, Addis Ababa, Ethiopia prevalence of overweight and obesity was 46.4% (Amelmal Worku *et al.*, 2014). A non-response rate of 10 % was added and the final sample size was 420.

All the T2DM patients in the hospital, were included in the study, except the ones who were severely ill; had chronic liver disease (CLD), congestive heart failure (CHF) with ascites, and mental illness; and pregnant women.

### *Data Collection Method*

Data were collected by interviewing eligible subjects using a pretested structured questionnaire. The participants' height and weight were measured with standardized techniques and calibrated equipment. Height was measured using a studio meter. The participants stood without shoes, erect, with buttocks, scapula and head positioned in contact with the studio meter and the results were recorded to the nearest 0.1 cm. This was done twice and the average of the measures was considered in the analysis. Finally, subjects were weighed to the nearest 0.1 kg in light indoor clothing and bare foot. To prevent measurement errors, calibration of instruments was one every time between each measurement and TEM was fixed for intra observers at 1.5%.

### *Measurements*

The BMI was calculated and classified according to the World Health Organization criteria (World Health Organization, 2000). All classes of obesity were combined together as an obesity category. Based on the world health organization criteria a patient is categorized as chronic energy deficiency (CED) with BMI <18.5 kg/m<sup>2</sup>, Normal if BMI 18.5 to 24.99 kg/m<sup>2</sup>, overweight 25 to 30 kg/m<sup>2</sup>, and Obese ≥30 kg/m<sup>2</sup> (World Health Organization, 2011).

Dietary practice was assessed using the conceptualized form of perceived dietary adherence questionnaire for people with Type2 Diabetes. Out of the nine items in the questionnaire, six items were used because of accessibility of the products. The score for each item ranged from 0 to 7, with the maximum value ranging from 0 to 42. The Participants that scored above the mean value were considered as having "good" dietary practice and those scored below the mean value were labelled as "poor" dietary practice (Abebe *et al.*, 2006; Asaad *et al.*, 2015).

The wealth index was calculated using Principal Component Analysis (PCA), based on PCA assumptions. Accordingly, the households were categorized into three wealth terciles for further analysis.

### *Data Processing and Analysis*

The data were coded and entered to EpiData Version 3.0 and analyzed using SPSS Version 20. Bivariate logistic regression analyses was made to determine the association between each independent variable and the outcome variable; and those variables with P-value < 0.25 were considered as candidate variables for the final model. Model fitness was checked with the Hosmer and Lemeshow goodness of fit test in which p-value was found to be 0.311, indicating the goodness of the model for multivariate logistic regression analysis. Multi-collinearity was checked. The Odds ratio along with 95% CI was estimated to identify the predictors of overweight and obesity using multivariate logistic regression analysis. Level of statistical significance was declared at p-value < 0.05.

### *Ethical considerations*

The study was approved by Institutional Health Research Ethical Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University. Written informed consent was obtained from each participant.

## Results

### *Socio-demographic Characteristics of the Study Participants*

Four hundred seven T2DM patients participated in the study, with a response rate of 97%, and 278 (68.3%) were male (Table 1).

Based on six item questions, the mean dietary practice was  $34.37 \pm 3.27$ . The most frequent dietary practice was consumption of carbohydrate-containing foods with a low Glycaemic Index (Table 2). Depending on this mean, only 146 (35.9%) study participants had “good” dietary practice and the rest 261(64.1%) have poor dietary practice. Out of study participants with poor dietary practice, while 254(97.3%) received nutritional education from different sources and seven of them did not get any education.

From the respondents 380(93.4%) responded that they have difficulty to choose daily food for different reasons such as cost 212(55.4%) and lack of access 171(44.6%).

Behavioural and personal practices known to contribute to overweight and obesity were as follows: 237 (58.2%) drunk alcohol at least once in last 12 months, whereas 170 (41.8%) had not had alcohol in the past 12 months. With regarding to the frequency of drinking alcohol among drinkers, 84 (20.7%) had alcohol on some days in a week and 153 (37.6%) were occasional drinkers. Overall, 125 (30.7%) study participants were “good” at doing physical activity, i.e., for more than 30 minutes a day; and 282 (69.3%) were “poor”, meaning active for less than 30 minutes per day. Many of the respondents (316 (77.6%)) had seven or more hours of sleep a day. (Table 3).

Table 1: Socio-demographic characteristics of type 2 diabetic patients at Hosanna Nigist Elleni memorial Hospital, Southern Ethiopia, in 2017. n=407

<b>Variable</b>	<b>Frequency</b>	<b>Percent</b>
<b>Sex of participants</b>		
Male	278	68.3
Female	129	31.7
<b>Age</b>		
25-34	23	5.7
35-44	120	29.5
45-54	156	38.3
55=<	108	26.5
<b>Current marital status</b>		
Married	357	87.7
Others	50	12.3
<b>Educational status</b>		
No formal education	18	4.4
Primary education	70	17.2
Secondary education	135	33.2
Technical and vocational training	30	7.4
University	154	37.8
<b>Occupation</b>		
Civil servant	154	37.8
Private employ	44	10.8
House wife	22	5.4
Retried	19	4.7
Farmer	82	20.1
*Other	86	21.1
<b>Family wealth index</b>		
Low	129	31.7
Medium	138	33.9
High	140	34.4
<b>Residential area</b>		
Urban	260	63.9
Rural	147	36.1

\*others were merchant and daily laborers (private workers)

Table 2: Dietary practice of type 2 diabetic patients at Nigist Ellen memorial Hospital of Hosanna, Hadiya Zone, Southern Ethiopia, 2017. (n=407)

Item	Responses in number of days							
	0 day: No (%)	1 day: No (%)	2 day: No (%)	3 day: No (%)	4 day: No (%)	5 day: No (%)	6 day: No (%)	7 day: No (%)
Healthful eating plan such based on Ethiopian Food Guide for diabetics	0	0	0		2	99 (24.3)	91 (22.4)	215 (52.8)
Fruit and vegetable servings	1	0	42 (10.3)	126 (31.0)	88 (21.6)	64 (15.7)	77 (18.9)	9
Carbohydrate-containing foods with a low Glycaemic Index	0	0	5	30 (7.4)	15 (3.4)	56 (13.8)	79 (19.4)	222 (54.5)
Foods high in sugar	2	3	0	2	6	52 (12.8)	165 (40.5)	177 (43.5)
Foods of freely or with minimal restrictions for diabetics	5	0	0	10	62 (15.2)	139 (34.2)	63 (15.5)	128 (31.4)
Foods high in fat	1	4	0	0	3	70 (17.2)	131 (32.2)	198 (48.6)

\*For question number 4 & 6, value ranges from 0 (used food items for 7 days) to 7 (eat food item for 0 days)

Table 3: Behavioural practice of Type 2 diabetic patients at Hosanna Nigist Elleni memorial Hospital, 2017 (n= 407)

Variable	No.	%
<b>Habit of alcohol drinking</b>		
Never drink in the past 12 months	170	41.8
Drunk at least once	237	58.2
<b>Physical activities</b>		
>30 minute daily activities	125	30.7
<30 minute daily activities	282	69.3
<b>Sleeping hour per night</b>		
Sleep $\geq$ 7 hours during night	316	77.6
Sleep 2-6 hours during night	91	22.4
<b>Dietary practice</b>		
Poor dietary practice	261	64.1
Good dietary practice	146	35.9

In this study, 64.1% of the participants were normal weight (95% CI: 59.5-69.2) and 35.9% were overweight or obese (35.9%, 95% CI: 30.8-40.5). Among the male participants, 63.5% were normal weight, 29.8% were overweight, and 4.3% were obese. Among the female respondents, 61.1% were normal weight, 32.8% were overweight and 4.7% were obese (Figure 1).

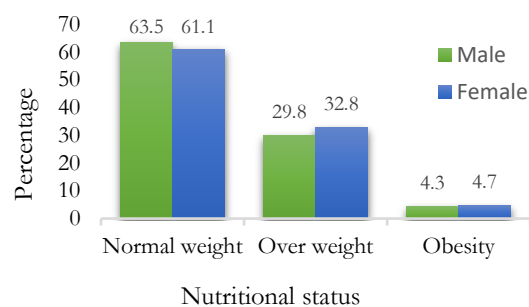


Figure 1: Sex specific nutritional status of type 2 diabetic patients at Nigist Elleni memorial Hospital of Hosanna, Hadiya Zone, Southern Ethiopia, 2017.

In the final multivariate logistic regression model, the factors which were significantly associated with overweight and obesity were 55 or above years of age (AOR=3.24, 95% CI: 1.74-6.06), poor physical activity (AOR= 2.31, 95% CI: 1.30-4.11), being diabetic for 3-6 years (AOR= 2.55, 95% CI: 1.48-4.4), and poor dietary practice (AOR= 2.98, 95% CI 1.79-4.96). The patients aged 55 years or above had 3.24 odds of being overweight or obese compared with those aged less than 55 years. The odds of being overweight or obese were 2.31 times higher among diabetic patients who engaged in physical activity for less than 30 minutes per day compared with their counterparts. Being T2DM patients for 3-6 years and poor dietary practice increased the odds of being over-nourished by nearly 3 times compared with their counterparts (Table 4).

Table 4: Factors associated with overweight / obesity among type 2 diabetic patients in Hosanna Nigist Elleni memorial Hospital, Hadiya Zone, Southern, Ethiopia, 2017.

Characteristics	Overweight/Obese		COR(95%CI)	AOR (95% CI)
	Yes No. (%)	No No. (%)		
<b>Age</b>				
25-44 years	30(21%)	113(79%)	1	1
45-54 years*	66(42.3%)	90 (57.7%)	2.76 (1.65-4.61)	2.41 (1.34-4.31)
55=< years*	50(46.3%)	58(53.7%)	3.24 (1.87-5.64)	3.24(1.74-6.06)
<b>Marital Status</b>				
Married	148(40.4)	218(59.6)	3.92 (1.71-8.95)	2.5 (0.93-6.68)
Other Δ	7(4.8)	43(86%)	1	1
<b>Occupation</b>				
Private employ	8(5.5)	36 (81.8)	1	1
Private work	13(26.0)	37 (74.0)	1.58 (0.59-4.27)	1.43(0.47-4.42)
Farmer	27(32.9)	55 (67.1)	2.21 (0.90-5.40)	1.14 (0.40-3.30)
Merchant	12(33.3)	24(66.7)	2.25 (0.80-6.32)	0.70 (0.21-2.33)
House wife	8(5.5)	14(63.6)	2.57 (0.81-8.19)	0.98(0.26-3.70)
Civil servant	67(45.9)	87(56.5)	3.47 (1.51-7.95)	1.36 (0.50-3.66)
Retired	11(57.9)	8(3.1)	6.19 (1.88-20.34)	1.76 (0.43-7.16)
<b>Alcohol Consumption</b>				
Yes	95(65.1)	142(59.9)	1.56(1.03-2.37)	1.52 (0.94-2.47)
No	51(30.0)	119(70.0)	1	1
<b>Physical activities</b>				
≥30 minute daily activities	34(27.2)	91(72.8)	1	1
<30 minute daily activities	112(39.7)	170(60.3)	1.76 (1.11-2.79)	2.31(1.30-4.11)
<b>Duration of diabetics</b>				
0-2 years	31(23.0)	104(77.0)	1	1
3-6 years	88(44.9)	108(55.1)	2.73 (1.68-4.46)	2.55(1.48-4.40)
Above 6 years	27(35.5)	49(64.5)	1.85 (0.99-3.43)	1.87(0.94-3.7)
<b>Dietary practice</b>				
Good dietary practice	30(20.5)	116(79.5)	1	1
Poor dietary practice*	116(44.4)	145(55.6)	3.09 (1.93-4.95)	2.98 (1.79-4.96)
<b>Sleeping hours during night</b>				
Sleep ≥7 hours	121(38.3)	195(61.7)	1	1
Sleep 2-6 hours	25(25.8)	66(74.2)	0.56 (0.33-0.95)	0.67(0.37-1.22)

\*P value<0.05 significant AOR =adjusted odd ratio, CI= Confidence interval, COR=crude odd ratio.

ΔOthers= single, separated but married, divorced, widowed.

The model adequately fits the data at P-value = 0.311 (Hosmer and Lemeshow goodness of fit)

## Discussion

This study showed that 35.9% of the T2DM patients were overweight and obese. Of whom 31.5% were overweight and 4.4% were obese. This is similar to a finding from a study in diabetic follow-up clinics of three hospitals in the Harari Regional State, Ethiopia, which reported that 5.9% of the patients were obese (Ketema *et al.*, 2011). Similar to this study, participants were both urban and rural in both cases.

However, an institution-based cross-sectional quantitative study in the outpatient department of Yekatit 12 Medical College Hospital, Addis Ababa, revealed that 46.4% of the patients were overweight and obese (Worku *et al.*, 2014). The differences could be due to the socio economic and urbanization differences between the two areas. Another study in Brazil revealed that 59.7% of the patients had excess weight, 40.8% overweight and 18.9% obese (Niciane *et al.*, 2013) and in Yemen, 58.5% were overweight (28.8% being obese) (Al-Sharafi and Gunaid, 2014). Again, the differences may be due to the socio economic differences between the countries.

In this study older age, lack of regular physical activities, being a diabetic patient for 3 years or more and poor dietary practices were significantly associated with the Overweight and obesity of the T2DM Patients. Overweight and obesity were significantly associated with the dietary practices of the study participant; the risk of being overweight and obesity was 2.98 times higher among the “poor” dietary practicing patients (64.1%). This magnitude is higher than the one found by a study done in Addis Ababa, in which 51.4% of the T2DM patients practiced poor diet (Worku *et al.*, 2014). The fact that Hosanna is semi urban, unlike Addis Ababa, where information is more accessible, might have contributed to the difference.

However, the level of poor dietary practice in our study was lower than the ones reported from Bangladesh, where 90% of the 508 newly diagnosed T2DM patients did not follow the dietary advice given by the diabetes educator (Saleh *et al.*, 2012), and from South Africa, where 73.3% of the respondents had poor knowledge regarding a healthy nutrition (Okonta *et al.*, 2014). In the present study, the lower figure may be due to the assessment tool difference to determine dietary practice among the diabetic patients.

Another factor associated with overweight and obesity among the diabetic patients was physical activity; the participants who did not do physically exercise for at least 30 minutes per day were 2.31 times more likely to be overweight or obese. A similar finding has also been reported from Ghana 40.8% were obese who are not physically active (Obirikorang *et al.*, 2016). Like a similar research in Asia, in the present study age above 55 years was associated with overweight and obese. (Amin *et al.*, 2015). As people age, their physical activity decreases due to decreased skeletal muscle strength (sarcopenia) and decreased mobility resulting in weight gain at old age.

Duration of T2DM was another associated factor. A duration of having diabetes after diagnosis of three years and above was 2.68 times more likely to be associated with overweight or obesity. This is similar to a study finding in Yemen, in which BMI values tended to increase with duration of diabetes (Al-Sharafi and Abdallah, 2014).

Our study showed no statistical association between residence and overweight or obesity. However, a cross-sectional survey among adults living in Benin revealed that the risk of being overweight was 2 times higher among urban dwellers (Gbary *et al.*, 2014). The similarity of the prevalence of overweight and obesity at both urban (36.5%) and rural (34.7%) settings shows that overweight and obesity is not only the problem of urban areas but it was also problem of rural communities. Therefore, the finding of this study give better insight into the prevention and detection of DM.

The limitation of this study could be, failure to generalize about all diabetic patients of the area as the study considers only patients under follow-up. In addition, there may be a recall bias in answering questions relating to dietary practices for a week.

## Conclusion

The magnitude of overweight and obesity was high. For diabetic patients, body weight determined the progression of the disease into complications. This shows a need for focusing on health promotion and preventive programs such as dietary modifications and physical exercise to the current therapeutic programs of type 2 diabetes mellitus.

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## Competing interests

The author(s) declare that they have no competing interests.

## Authors' Contributions

AL participated in conception, designing of the study and analyzed and interpreted the data. AA, GE and BM participated in the designing of the study, analysis, write-up and drafting of the manuscripts. AA and GE and BM critically reviewed and drafted the manuscript. All authors read and approved the final draft.

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