



Prevalence and Associated Factors of Overweight and Obesity among Adult Gondar Town Residents, North West Ethiopia

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Abstract

During the last few decades the prevalence of overweight or obesity has been growing at an alarming rate in both the developed and the developing countries at all age level. Overweight and obesity are found to be the leading risk factors contributing for the development of various cardiovascular diseases such as hypertension, type-2 diabetes mellitus, and stroke. It also accounts for some types of cancers like colorectal, breast and endometrial (1-4). However few studies were conducted so far on adults in Gondar town.

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The main purpose of this study is to assess the prevalence of overweight or obesity and abdominal obesity and to identify associated factors among adults 18 years and older in Gondar town, North West Ethiopia.

Community based cross-sectional study conducted from March 18 up to March 27, 2014 in Gondar town on 968 study participant. Data gathered using WHO STEP wise instrument using multistage sampling method. Anthropometric measurements such as height, weight and waist circumference measured from study participant using international standard of anthropometric assessment guideline. The prevalence of overweight or obesity and abdominal obesity were assessed using WHO cut off points. Bivariate and multivariate logistic regression models were fitted to see the association between the response and predictor variables and p-value less than 0.05 used as cut point for statically significance. The prevalence of overweight or obesity in the study population was 17.56% [95%CI: 15.56, 19.96], in men 12.69% [95%CI: 9.36, 16.02] and in women 20.79% [95%CI: 17.49, 24.09]. The prevalence of abdominal obesity in the study population was 36.36% [95%CI: 33.33, 39.40], 8.55% [95%CI: 5.75, 11.35] in men and 54.81% [95%CI: 50.76, 58.86] in women. The factors significantly associated with overweight or obesity were sex, age, number of children, wealth index, and eating while watching television. Variables sex, age, wealth index, walking or bicycling were significantly associated with abdominal obesity. The prevalence of overweight or obesity among adult Gondar town residents was high as compared to Ethiopian Demographic and Health Survey reports. The proportion of abdominal obesity in the town was also high. Prevention strategies should be formulated to increase physical activity level and improve dietary habit of the community.

Key words: Prevalence,
Overweight, Obesity,
Abdominal obesity



Introduction

During the last few decades obesity has been growing at an alarming rate in both the developed and the developing countries (5, 6). Overweight and obesity are found to be the leading risk factors contributing for the development of various cardiovascular diseases such as hypertension, type-2 diabetes mellitus, and stroke. It also accounts for some types of cancers like colorectal, breast and endometrial (1-4). Abdominal obesity also, has greater risk for different blood abnormalities such as increased level of blood cholesterol, triglycerides, low density lipoproteins and metabolic syndrome (7,

8). Although genetic factor plays significant role in overweight and obesity fast economic growth and development, urbanization, and changes in dietary and lifestyle patterns including the work, household, recreational, transportation, sedentary lifestyle, and physical inactivity also affects overweight and obesity(9, 10). In Ethiopia, few studies have been conducted so far on overweight or obesity and these studies were institution based and school children and adolescent focused(11-13). However, during the past only few studies have been conducted nationally in addition to Ethiopian Demographic and Health Surveys (EDHS). These studies are not comprehensive in addressing all age groups. For example, the EDHS 2011 report shows that only 15 to 49 years of female and 15 to 59 years of male are included in the study. Other few studies conducted previously in some part of the country are mainly focused on school children and adolescents.

Currently, it is also important to study the contribution of different determinant factors for overweight and obesity as well as the abdominal obesity. The present study is important to assess current prevalence of overweight, obesity and abdominal obesity and to identify associated factors in the study area so that the community, health professionals, policy makers and other stakeholders take appropriate measures to maintain healthy lifestyles of the community. Therefore, main aim of this study was to estimate the prevalence of overweight or obesity and abdominal obesity among adults in Gondar town and to identify factors associated with overweight or obesity among adults in Gondar town

Methods

Study Design and Period

A community based cross-sectional study conducted from March 18 up to 27, 2014.

Study Area

The study conducted in Gondar town which is located around 727 km from the capital city of Addis Ababa. Currently, the town has 12 urban sub-cities and 11 rural kebeles (the smallest administrative units). According to Central Statistical Authority (CSA) National Statistical Abstract report the population size of Gondar town in 2013 was estimated to be 264964(125569 male and 139395 female)

Source Population

The source population for this study were all adults 18 years and older and living in Gondar.

Study Population

All urban dwellers of Gondar town selected as a representative sample from Gondar town.

Inclusion Criteria



All adult residents age 18 years and older living in Gondar town for at least six months were included in the study.

Exclusion Criteria

Pregnant women, mothers less than 2 months post-delivery, and individuals with edema excluded from the study since the measurement of overweight or obesity and abdominal obesity can be affected due to these conditions

Sample Size Determination

For the prevalence of outcome variable, overweight or obesity the minimum optimum sample size calculated using the following assumptions. Population size: 264964; Expected frequency: 27.2%; Margin of error: 4%; Design Effect: 2. and 95% confidence level so, the minimum optimum sample size was 950. Similarly, sample size calculated for the associated factors based on the following assumptions. A 95% level of confidence, 80% of power to detect real association of exposure variable and exposed to unexposed ratio: 1:1. To determine the sample size frequency of exposure variables sex, physical activity and unhealthy diet are taken from different literatures. Final sample size is calculated using Epi Info version 3.5.3.

Since the sample size for the prevalence (950) is higher it was taken to get larger sample size and adding 7% non-response rate from experience of previous study(14) the final sample size for the study became 1016.

Sampling Procedures

Multi stage sampling technique used to select study subjects. First from 12 urban sub-cities 3 of them were selected using simple random

sampling method. Then 1016 households selected by systematic random sampling technique. The total number of households obtained from each selected Sub-city used to calculate sampling fraction. The first household for data collection selected randomly using lottery method then every 4th household followed then after. The selection of each household started from the beginning of the first house hold according to the household number in each sub-city and continued in clockwise direction whenever there were two or more household existed in a compound. From each household only one individual who fulfill the inclusion criteria were selected for the study. If two or more individuals are fulfilling the inclusion criteria lottery method were used to select one. Before selecting one individual from each household the data collector registered all individuals who fulfill the inclusion criteria in alphabetical order.

Data Collection Procedures

Data regarding the demographic and behavioral factors assessed using WHO STEPwise instrument for chronic disease risk surveillance. Structured questionnaire prepared and administered by trained data collectors which consist of 3 female midwives and 3 male health officers. Close supervision during data collection employed by a master physiotherapist and the principal investigator. Anthropometric measurements were taken using standardized techniques and calibrated equipment. Subjects weighed to the nearest 0.1 kg in light indoor clothing and bare feet. Height measured using a



stadiometer; the subject stands in erect posture, without shoes, and recorded to the nearest 0.5cm. Measurements taken two times, and the average considered in the analysis. Body mass index (BMI) calculated as the ratio of weight in kilograms to square of height in meters. Waist circumference measured by placing a plastic tape to the nearest 0.5 cm, horizontally midway between the 12th rib and iliac crest on the mid-axillary line. Hip circumference measured horizontally on the greater *trochanter*. During data collection when some people not available during working hours they were visited again during Saturday and Sunday otherwise the next subject selected.

Data Quality Control

Data collection tool prepared in English and translated into local language, Amharic and then translated back to English after it is collected. The data collection tool pretested on 35 individuals obtained from non-selected urban sub-cities of Gondar town and modification done whenever necessary. Close supervision were performed by one supervisor and the principal investigator. All data collectors trained for two consecutive days regarding how to administer the questionnaire, collect the anthropometric measurements, and keep confidentiality of the participant.

Data Processing and Analysis

After all the data obtained from the study participants it was cleaned and entered into epi-info version 3.5.3 then exported into STATA version 12. Descriptive and inferential statistics performed using STATA version 12. The association between the response variable,

overweight or obesity and predictor variables measured using OR and 95% CI. Variables significantly associated with the outcome variable in the bivariate analysis were taken to multivariate analysis with a cut point of $p > 0.2$. Hosmer and Lemshow goodness of fit test were used to check whether the predictors adequately explain the response variable. Variables which were significantly associate with overweight or obesity in bivariate analysis were also tasted with abdominal obesity for their significance in multivariate analysis.

Ethical Considerations

Before data collection took place ethical clearance was obtained from the Institutional Review Board of the University of Gondar, Institute of Public Health. Official permission letters also obtained from selected sub cites. Only those who respondents gave verbal consent involved in the study. Questionnaire administered anonymously at respondent home or other selected place by him/her. Confidentiality of information obtained from the study participant assured by all data collectors and the principal investigator.

Results

General Information

The study conducted in 3 sub cities of Gondar town on a total of 1016 individuals selected as a representative samples. Out of the total sample size 968(95.28%) individuals participated in the study. The remaining 48(4.72%) individuals refused to take part in the study.

Socio-demographic Characteristics of the Study Population

From the total subjects participated in the study (39.9%) were males and (60.1%) were female.

The median age of the participant was 28 years (IQR: 40, 23). The majority of the study participants (79%) were 44 years or younger and rest (21%) were 45 – 96 years. Socio-

demographic characteristics are shown in (Table 1)

Table 1. Socio-demographic characteristics of the study population by sex for adults age 18 years and above , North West Ethiopia, 2014 (n = 968)

Characteristics	Sex		
	Male n (%)	Female n (%)	Total n (%)
Age group(years)			
18 – 24	131(38.4)	210(61.6)	341(35.2)
25 – 34	121(40.3)	179(59.7)	300(31)
35 – 44	50(40.3)	74(59.7)	124(12.8)
45 – 54	44(44.4)	55(55.6)	99(10.2)
55 – 64	22(42.3)	30(57.7)	52(5.4)
>64	18(34.6)	34(65.4)	52(5.4)
Education			
Cannot read and write	24(16.1)	125(83.9)	149(15.4)
Read and write	49(45.8)	58(54.2)	107(11.1)
Grade 1 – 8	28(25.9)	80(74.1)	108(11.2)
Grade 9 – 12	151(43.0)	200(57)	351(36.3)
Diploma or above	134(53.0)	119(47.0)	253(26.1)
Ethnicity			
Amhara	332(38.8)	524(61.2)	856(88.43)
Kemant	31(43.1)	41(56.9)	72(7.44)
Tigre	19(54.3)	16(45.7)	35(3.62)
Others	4(80.0)	1(20.0)	5(0.5)
Marital status			
Never married	216(49.7)	219(50.3)	435(44.9)
Married/cohabited	152(39.3)	235(60.7)	387(40.0)
Divorced	8(13.7)	51(86.4)	59(6.1)
Widowed	5(8.8)	52(91.2)	57(5.9)
Separated	5(16.7)	25(83.3)	30(3.1)
Occupation			
Self employee	104(46.9)	118(53.2)	222(22.9)
Government employee	115(54.3)	97(45.8)	212(21.9)
Student	100(47.9)	109(52.2)	209(21.6)
Home maker	0(0.0)	189(100.0)	189(19.5)
Unemployed	17(32.7)	35(67.3)	52(5.4)
NGO employee	21(42.9)	28(57.1)	49(5.1)
Retired	29(82.9)	6(17.1)	35(3.6)
Number of children			
0	221(50.9)	213(49.1)	434(44.8)
1 – 2	80(28.7)	199(71.3)	279(28.8)
3 – 4	47(31.5)	102(68.5)	149(15.4)
>4	38(35.9)	68(0.3)	106(11.0)
Wealth index			
Low	173(37.9)	283(62.1)	456(47.1)
Middle	82(45.1)	100(55)	182(18.8)
High	131(39.7)	199(60.3)	330(34.1)

Prevalence of Overweight, Obesity and Abdominal Obesity

The prevalence of overweight in the study population was 15.19% [95%CI: 12.92, 17.45] and obesity 2.38% [95%CI: 1.41, 3.33]. The overall prevalence of overweight or obesity in the study population was 17.56% [95%CI: 15.56, 19.96]. The prevalence of overweight or obesity was 12.69% [95%CI: 9.36, 16.02] in men and 20.79% [95%CI: 17.49, 24.09] in women.

The prevalence of abdominal obesity in the study population was 36.36% [95%CI: 33.33, 39.40]. The prevalence of abdominal obesity was 8.55% [95%CI: 5.75, 11.35] in men and 54.81% [95%CI: 50.76, 58.86] in women.

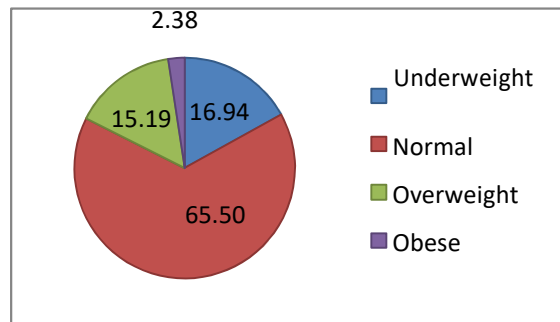


Figure 1 Pie Chart showing the nutritional status of study population by BMI for adults 18 years and older, North West Ethiopia, 2014

Associated factors of overweight or obesity and abdominal obesity

In the bivariate analysis sex, age, marital status, number of children, wealth index, vigorous physical activity at work, eating watching television were significantly associated with overweight or obesity. However, in multivariate analysis variable sex, age, number of children, wealth index, and eating watching television

were remaining significantly associated with overweight or obesity (Table 2).

Females were 1.60 times more likely develop overweight or obesity as compared to males [AOR: 1.60; 95%CI: 1.05, 2.44].

Adults age 25 to 34 years were 2.40 times more likely develop overweight or obesity as compared to 18 to 24 years [AOR: 2.40; 95%CI: 1.33, 4.36]. Those at age range of 33 to 44 years were 3.52 times more likely developing overweight or obesity [AOR: 3.52; 95%CI: 1.70, 7.31].

The risk of overweight or obesity was high in adults rearing 4 or more children. Adults having 4 or more children were 4.58 times more likely developing overweight or obesity as compared to adults with no children [AOR: 4.58; 95%CI: 1.86, 11.25].

Adults with high wealth index category were 1.83 times more likely to develop overweight or obesity as compared to adults in low wealth index category [AOR: 1.83; 95%CI: 1.19, 2.83].

The risk of overweight or obesity were reduced by 0.41 times in adults performing vigorous physical activity at their work as compared to not doing [AOR: 0.41; 95%CI: 0.18, 0.90].

Adults who were eating while watching television were 1.51 times more likely developing overweight or obesity as compared to those not eating during television watching [AOR: 1.51; 95%CI: 1.04, 2.21].

In bivariate analysis variable sex, age, marital status, number of children, wealth index, vigorous physical activity at work, numbers of



days walking or bicycling were significantly associated with abdominal obesity. In multivariate analysis sex, age, wealth index, numbers of days walking or bicycling were significantly associated with abdominal obesity (Table 3).

Females were 20.22 times more likely developing abdominal obesity as compared males [AOR: 20.22; 95%CI: 12.35, 33.12].

Age was significantly associated with abdominal obesity. Adults in age range of 25 to 34 were 1.95 times were more likely developing abdominal obesity as compared to those in age category of 18 to 24 [AOR: 1.95; 95% CI: 1.18, 3.24]. Those adults in age range of 35 to 44 were 3.71 times more likely developing abdominal obesity as compared to those in age category of 18 to 24 [AOR: 3.71; 95% CI: 1.84, 7.50]. In adults with age range of 45 to 54 the risk of obesity were 4.6 times more likely developing abdominal obesity as compared to those in age category of 18 to 24 [AOR: 4.6; 95% CI: 2.01, 10.54]. The highest risk was observed in age range of 55 to 64. In adults with age range of 55 to 64 the risk of obesity were 8.67 times more likely developing abdominal obesity as compared to those in age category of 18 to 24 [AOR: 8.66; 95% CI: 3.25, 23.15].

Adults in the high wealth index category were 1.62 times more likely develop abdominal obesity as compared to adults in low wealth index category [AOR: 1.62; 95%CI: 1.08, 2.44].

Adults who were walking or bicycling for at least 10 minutes 3 to 5 days per week were 0.60 times less likely developing abdominal obesity as compared adults not walking or bicycling [AOR:0.60;95%CI:0.39, 0.93]. And those adults who were walking or bicycling 6 to 7 days were 0.60 times less likely develop abdominal obesity as compared to similar reference category [AOR:0.60;95%CI:0.37, 0.98].

Discussion

The overall prevalence of overweight or obesity in the study population was 17.56%, out of this 12.69% in men and 20.79% in women. This result showed that high prevalence of overweight or obesity as compared to Ethiopian Demographic and Health Surveys report which was 6.9% in urban men and 14.9 % in urban women . It was also higher as compared to Amhara region which was 1.2% in men and 3.6 % in women adults urban dwellers. In Gondar town the prevalence of overweight or obesity on adult were 27.2 %(14) which is lower than the prevalence of this study. The reason for this difference could be partly due to in sampling procedure. In some African country like Malawi the prevalence of overweight or obesity was 21.9 which were higher than our study(15). The prevalence of abdominal obesity in the study population was 36.36%. The prevalence of abdominal obesity was



8.55% in men and 54.81% in women. Similar finding were obtained from another study

conducted in Gondar town, 37.7% in urban dwellers(4).

Table 2 Bivariate and multivariate analysis of factors associated with overweight or obesity among adult Gondar town residents, North West Ethiopia (2014)

Variable	Overweight/Obesity		COR[95%CI]	AOR [95%CI]	P- value
	Yes	No			
Sex					
Male	49	337	1`	1	
Female	121	461	1.81[1.26,2.59]	1.60[1.05,2.44]*	0.028
Age					
18 – 24	25	316	1	1	
25 – 34	59	241	3.09[1.88,5.08]	2.40[1.33,4.36]*	0.004
35 – 44	39	85	5.80[3.32,10.12]	3.52[1.70,7.31]*	0.001
45 – 54	23	76	3.82[2.05,7.11]	1.77[0.73,4.29]	0.208
55 – 64	13	39	4.21[1.99,8.90]	1.66[0.62,4.48]	0.315
>64	11	41	3.39[1.55,7.39]	1.13[0.39,3.24]	0.827
Marital status					
Never married	44	391	1	1	
Married/cohabited	98	289	3.01[2.05,4.44]	0.86[0.46,1.61]	0.634
Separated	4	26	1.37[0.46,4.10]	0.47[0.14,1.60]	0.227
Divorced	8	51	1.39[0.62,3.13]	0.40[0.15,1.07]	0.068
Widowed	16	41	3.47[1.80,6.69]	0.89[0.35,2.26]	0.801
Number of children					
0	36	398	1	1	
1 – 2	61	218	3.09[1.98,4.82]	2.40[1.21,4.78]*	0.013
3 – 4	36	113	3.52[2.12,5.85]	2.29[1.01,5.22]*	0.048
>4	37	69	5.93[3.51,10.02]	4.58[1.86,11.25]*	0.001
Wealth index					
Low	55	401	1	1	
Middle	33	149	1.61[1.01,2.58]	1.41[0.85,2.34]	0.188
High	82	248	2.41[1.65,3.51]	1.83[1.19,2.83]*	0.006
Vigorous physical activity work					
No	163	722	1	1	
Yes	7	76	0.41[0.18,0.90]	0.49[0.21,1.14]	0.097
Eating watching television					
No	81	465	1	1	
Yes	89	333	1.53[1.10,2.14]	1.51[1.04,2.21]*	0.029

*Significant at p<0.05



Table 3 Bivariate and multivariate analysis of factors associated with abdominal obesity among adult Gondar town residents, North West Ethiopia (2014)

Variable	Abdominal Obesity		COR[95%CI]	AOR [95%CI]	P- value
	Yes	No			
Sex					
Male	33	353	1	1	
Female	319	263	12.97[8.76,19.2]	20.22[12.35,33.12*]	<0.001
Age					
18 – 24	69	272	1	1	
25 – 34	108	192	2.22[1.56,3.16]	1.95[1.18,3.24]*	0.010
35 – 44	60	64	3.70[2.38,5.74]	3.71[1.84,7.50]*	<0.000
45 – 54	51	48	4.19[2.61,6.73]	4.60[2.01,10.54]*	<0.000
55 – 64	33	19	6.85[3.67,12.77]	8.67[3.25,23.15]*	<0.000
>64	31	21	5.82[3.15,10.75]	4.36[1.59,11.97]*	0.004
Marital status					
Never married	83	352	1	1	
Married/cohabited	189	198	4.05[2.97,5.53]	1.62[0.93,2.83]	0.089
Separated	11	19	2.46[1.13,5.36]	0.57[0.26,1.23]	0.241
Divorced	26	33	3.34[1.90,5.89]	1.30[0.51,3.35]	0.153
Widowed	43	14	13.03[6.81,24.9]	0.56[0.21,1.47]	0.584
Number of children					
0	77	357	1	1	
1 – 2	129	150	3.99[2.84,5.61]	1.64[0.90,2.99]	0.105
3 – 4	81	68	5.52[3.68,8.29]	1.38[0.65,2.93]	0.403
>4	65	41	7.35[4.63,11.67]	1.74[0.74,4.09]	0.206
Wealth index					
Low	145	311	1	1	
Middle	62	120	1.11[0.77,1.60]	1.27[0.79,2.03]	0.321
High	145	185	1.68[1.25,2.25]	1.62[1.08,2.44]*	0.020
Vigorous physical activity work					
No	336	549	1	1	
Yes	16	67	0.39[0.22,0.68]	0.64[0.32,1.29]	0.208
Number of days walking/bicycling					
0 day/week	106	112	1	1	
1 – 2 days/week	45	46	1.03[0.63,1.69]	0.85[0.46,1.57]	0.605
3 – 5 days/week	122	253	0.51[0.36,0.72]	0.60[0.39,0.93]*	0.022
6 – 7 days/week	79	205	0.41[0.28,0.59]	0.60[0.37,0.98]*	0.039

*Significant at $p < 0.05$

Another study on abdominal obesity, conducted in Addis Ababa on adults reported 12.9% in males and 64.6 in females (16) which is higher than this study finding. The difference may arise due to the lifestyle factors between the two populations. In African country like Malawi abdominal obesity reaches about 28.8% and in Senegal 21.2% which were lower than this study finding.

Our data suggests that females were 1.60 times more likely develop overweight obesity as compared to male and this result is consistent with other similar studies conducted in Nigeria and Tanzania (17, 18) Positive association was observed with increasing age. In this study adults age 25 to 34 years were 2.40 times more likely develop overweight or obesity as compared to 18 to 24 years. Those at age range of 33 to 44 years were 3.52 times more likely developing



overweight or obesity. This result is line with other study although in our study beyond age 44 the magnitude of the risk shows decreasing trend despite it is not significant(17).

In the current study number of children was significantly associated with overweight or obesity. As the number of children increases the risk of obesity also increases. Adults having 1 to 2 children were 2.4 times more likely developing overweight or obesity as compared to adults with no children. Having 3 to 4 children were 2.29 times more likely developing overweight or obesity. Those adults rearing 4 or more children were 4.58 times more likely developing overweight or obesity. This result is supported by other similar study conducted in Iran (19).

The current study shows that adults in the high wealth index category were 1.83 times more likely develop overweight or obesity as compared to adults in low wealth index category. The reason for this could be partly due to increased food intake and reduced physical activities.

The risk of overweight or obesity was reduced by 0.41 times in adults performing vigorous physical activity at their work as compared to adults not doing. This finding is consistent in other study on adults conducted in USA(20)

Inverse association was observed between doing vigorous physical activity at work and overweight or obesity. Adults who perform vigorous physical activity at work were 0.41 times less likely developing overweight or obesity. This is established fact that doing

moderate or vigorous intensity physical activities related to work, recreation or sport will result in substantial decrease in weight and fat accumulation from the body(21).

In this study adults who were eating while watching television were 1.51 times more likely developing overweight or obesity as compared to those not eating during television watching. Other studies shows that television watching increases density food consumption and hence there would be extra weight gain and fat accumulation because of increased calorie intake (22). However, the likelihood of overweight or obesity may increase depending upon the duration of watching television and type of food they would consume (23)

Significant association is observed between sex and abdominal obesity and this finding is consistent with other findings conducted in South Africa(24)

In this study age were positively associated with abdominal obesity. However, the magnitude of association increase as age increases until 64 years. This could be partly explained by as age increases muscles atrophy increases and fat accumulation in the viscera and abdominal areas increases.

High socioeconomic status in wealth index was significantly associated with abdominal obesity. The reason for this could be associated with the sedentary lifestyle and dietary habit.

Walking or bicycling for at least 10 minutes 3 to 5 days per week or more were 0.60 times less



likely developing abdominal obesity as compared adults not walking or bicycling. This might be due to the fact that walking or bicycling exercise has aerobic nature and metabolize substrates and reduces fat accumulation in the abdominal area.

Conclusion and Recommendations

This study revealed that the prevalence of overweight and obesity among Gondar town residents was high as compared to Ethiopian Demographic and Health Survey reports. The proportion of abdominal obesity in the town was

also high compared to some Sub-sharan countries like Malawi and Senegal. The factors associated with overweight or obesity were sex, age, number of children wealth index, and eating while watching television. Variables sex, age, wealth index, walking or bicycling were significantly associated with abdominal obesity. Prevention strategies should be formulated to increase physical activity level and improve dietary habit of the community.

References

- Wolin KY, Carson K, Colditz GA. Obesity and cancer. *Oncologist*. 2010;15(6):556-65. PubMed PMID: 20507889. Pubmed Central PMCID: PMC3227989. Epub 2010/05/29. eng.
- Ma Y, Yang Y, Wang F, Zhang P, Shi C, Zou Y, et al. Obesity and risk of colorectal cancer: a systematic review of prospective studies. *PloS one*. 2013;8(1):e53916. PubMed PMID: 23349764. Pubmed Central PMCID: PMC3547959. Epub 2013/01/26. eng.
- De Pergola G, Silvestris F. Obesity as a major risk factor for cancer. *Journal of obesity*. 2013;2013:291546. PubMed PMID: 24073332. Pubmed Central PMCID: PMC3773450. Epub 2013/09/28. eng.
- Abebe SM, Berhane Y, Worku A, Assefa A. Diabetes mellitus in North West Ethiopia: a community based study. *BMC public health*. 2014 Jan 30;14(1):97. PubMed PMID: 24479725. Epub 2014/02/01. Eng.
- Popkin BM. The nutrition transition and obesity in the developing world. *J Nutr*. 2001 Mar;131(3):871S-3S. PubMed PMID: 11238777. Epub 2001/03/10. eng.
- Eckel RH, York DA, Rossner S, Hubbard V, Caterson I, St Jeor ST, et al. Prevention Conference VII: Obesity, a worldwide epidemic related to heart disease and stroke: executive summary. *Circulation*. 2004 Nov 2;110(18):2968-75. PubMed PMID: 15520336. Epub 2004/11/03. eng.
- Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. *Lancet*. 2005 Apr 16-22;365(9468):1415-28. PubMed PMID: 15836891. Epub 2005/04/20. eng.
- Carr DB, Utzschneider KM, Hull RL, Kodama K, Retzlaff BM, Brunzell JD, et al. Intra-abdominal fat is a major determinant of the National Cholesterol Education Program Adult Treatment Panel III criteria for the metabolic syndrome. *Diabetes*. 2004 Aug;53(8):2087-94. PubMed PMID: 15277390. Epub 2004/07/28. eng.
- Ly KA, Ton TG, Ngo QV, Vo TT, Fitzpatrick AL. Double burden: a cross-sectional survey assessing factors associated with underweight and overweight status in Danang, Vietnam. *BMC public health*. 2013;13:35. PubMed PMID: 23316727. Pubmed Central PMCID: PMC3671199. Epub 2013/01/16. eng.
- Laux TS, Bert PJ, Gonzalez M, Unruh M, Aragon A, Lacourt CT. Prevalence of obesity, tobacco use, and alcohol consumption by socioeconomic status among six communities in Nicaragua. *Rev Panam Salud Publica*. 2012 Sep;32(3):217-25. PubMed PMID: 23183562. Epub 2012/11/28. eng.
- TESHOME T, SINGH P, MOGES D. Prevalence and Associated Factors of Overweight and Obesity Among High School Adolescents in Urban Communities of Hawassa, Southern Ethiopia. *Current Research in Nutrition and Food Science*. 2013;1(1):23-36.
- Alemu E, Atnafu A, Yitayal M, Yimam K. Prevalence of Overweight and/or Obesity and Associated Factors among High School Adolescents in Arada Sub city, Addis Ababa, Ethiopia. *J Nutr Food Sci*. 2013;4(2).
- Tran A, Gelaye B, Girma B, Lemma S, Berhane Y, Bekele T, et al. Prevalence of Metabolic Syndrome among Working Adults in Ethiopia. *Int J Hypertens*. 2011;2011:193719. PubMed PMID: 21747973. Pubmed Central PMCID: PMC3124293. Epub 2011/07/13. eng.

Cited as: Derese Mekonnen Yigzaw Kebede; Solomon Mokonnen (2020): *Prevalence and Associated Factors of Overweight and Obesity among Adult Gondar Town Residents, North West Ethiopia: Ethiopian Journal of Sport Science (EJSS)*,



- Amare B, Moges B, Moges F, Fantahun B, Admassu M, Mulu A, et al. Nutritional status and dietary intake of urban residents in Gondar, Northwest Ethiopia. *BMC public health*. 2012;12:752. PubMed PMID: 22958394. Pubmed Central PMCID: PMC3490783. Epub 2012/09/11. eng.
- Msymamboza KP, Kathyola D, Dzowela T. Anthropometric measurements and prevalence of underweight, overweight and obesity in adult Malawians: nationwide population based NCD STEPS survey. *Pan Afr Med J*. 2013;15:108. PubMed PMID: 24244794. Pubmed Central PMCID: PMC3828071. Epub 2013/11/19. eng.
- Tesfaye F, Byass P, Wall S. Population based prevalence of high blood pressure among adults in Addis Ababa: uncovering a silent epidemic. *BMC cardiovascular disorders*. 2009;9:39. PubMed PMID: 19698178. Pubmed Central PMCID: PMC2736927. Epub 2009/08/25. eng.
- Shayo GA, Mugusi FM. Prevalence of obesity and associated risk factors among adults in Kinondoni municipal district, Dar es Salaam Tanzania. *BMC public health*. 2011;11:365. PubMed PMID: 21605360. Pubmed Central PMCID: PMC3118244. Epub 2011/05/25. eng.
- Wahab KW, Sani MU, Yusuf BO, Gbadamosi M, Gbadamosi A, Yandutse MI. Prevalence and determinants of obesity - a cross-sectional study of an adult Northern Nigerian population. *Int Arch Med*. 2011;4(1):10. PubMed PMID: 21362196. Pubmed Central PMCID: PMC3055810. Epub 2011/03/03. eng.
- Bakhshi E, Eshraghian MR, Mohammad K, Foroushani AR, Zeraati H, Fotouhi A, et al. The positive association between number of children and obesity in Iranian women and men: results from the National Health Survey. *BMC public health*. 2008;8:213. PubMed PMID: 18554417. Pubmed Central PMCID: PMC2447835. Epub 2008/06/17. e
- Spees CK, Scott JM, Taylor CA. Differences in amounts and types of physical activity by obesity status in US adults. *American journal of health behavior*. 2012 Jan;36(1):56-65. PubMed PMID: 22251783. Pubmed Central PMCID: PMC3888549. Epub 2012/01/19. eng.
- Hajian-Tilaki KO, Heidari B. Prevalence of obesity, central obesity and the associated factors in urban population aged 20-70 years, in the north of Iran: a population-based study and regression approach. *Obesity reviews : an official journal of the International Association for the Study of Obesity*. 2007 Jan;8(1):3-10. PubMed PMID: 17212790. Epub 2007/01/11. eng.
- Blass EM, Anderson DR, Kirkorian HL, Pempek TA, Price I, Koleini MF. On the road to obesity: Television viewing increases intake of high-density foods. *Physiology & behavior*. 2006 Jul 30;88(4-5):597-604. PubMed PMID: 16822530. Epub 2006/07/11. eng.
- Inoue S, Sugiyama T, Takamiya T, Oka K, Owen N, Shimomitsu T. Television viewing time is associated with overweight/obesity among older adults, independent of meeting physical activity and health guidelines. *Journal of epidemiology / Japan Epidemiological Association*. 2012;22(1):50-6. PubMed PMID: 22156288. Pubmed Central PMCID: PMC3798580. Epub 2011/12/14. eng.
- R M, C H, Østbye T, Hughes G, Schwartz D, Tsolekile L, et al. Determinants of obesity in an urban township of South Africa. *S Afr J Clin Nutr*. 2008;21(4):315-20.

