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ORIGINAL RESEARCH

Factors associated with overweight and obesity among adults in northeast Ethiopia: a cross-sectional study

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Objective: Currently, the growing prevalence of overweight and obesity is an emerging public health problem in middle- and low-income countries such as Ethiopia. However, the prevalence of overweight and obesity among Ethiopian adults who live in the major cities is not well documented. Therefore, the study aimed to assess the prevalence and factors associated with overweight and obesity among adults in Dessie town, northeast Ethiopia.

Subjects and methods: A community-based cross-sectional study was conducted from March 15 to April 10, 2015. A total of 751 adults aged 18–64 years were included. Multistage followed by systematic random sampling method was used to select the study participants. Both bivariable and multivariable ordinal logistic regression were done. The proportional odds ratio (POR) with a 95% CI was reported to show the strength of association. A *P*-value <0.05 was considered statistically significant.

Results: Of all participants, 19.9% (95% CI: 16.9%, 23.1%) were recorded to be overweight and 8.6% (95% CI: 6.6%, 10.9%) to be obese. The odds of being overnourished (overweight or obese) were higher among adults who had snack intake habit (POR =1.52; 95 CI: 1.04, 2.20), drank alcohol (POR =1.75; 95% CI: 1.04, 2.97), had higher wealth status (POR =2.29; 95% CI: 1.26, 4.19), and were married (POR =2.22; 95% CI: 1.49, 3.29) compared to their counterparts.

Conclusion: Compared to the previous local reports, the prevalence of overweight and obesity in the study area is high; this appears to be an emerging problem in Ethiopia. Hence, there is a need to develop a control and prevention strategy on potentially modifiable risk factors of overweight and obesity.

Keywords: overweight, obesity, adult, Dessie, Ethiopia

Introduction

Overweight and obesity are global problems that are increasing at an alarming and uncontrollable rate. According to the WHO, 2.3 billion adults are overweight and the prevalence is higher in females of childbearing age than males.[1–4] Overweight and obesity are associated with numerous comorbidities of great public health concern, particularly cardiovascular diseases, type 2 diabetes, high blood pressure, high blood cholesterol, high triglycerides, certain types of cancer, and sleep apnea.[5] In addition, the compromised quality of life resulting from overweight and obesity is related to higher medical, psychological, and social burden to the society.[5]

The global burden of overweight and obesity is recorded to be 2.8 million deaths per year and 35.8 million disability-adjusted life-years. Additionally, 44% of diabetes,

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23% of ischemic heart diseases, and 7%–41% of certain cancers are caused by overweight or obesity.[7] Currently, overweight and obesity are becoming an emerging public health problem in developing countries, despite the continual high prevalence of undernutrition.[8] In Africa, the body mass index (BMI) increased over time across all regions, which parallels the global average. However, the mean BMI was higher than the global average in northern and southern Africa. The prevalence of overweight and obesity is estimated to be 20%–50% by 2025 in Africa.[9] For instance, reports show that in the adult populations, 20.8% of Nigerians are overweight, 31.3% of South Africans are obese, and 37.1% and 27.8% of Ghanaians are overweight and obese, respectively.[10–12]

Primarily, diet, physical activity level, and environmental factors are responsible for overweight and obesity. The total calorie consumption of an individual has been found to be related to obesity. Consumption of sweetened drinks or energy-dense, big-portion, and fast-food meals is believed to be contributing to the rising rates of obesity.[13] In addition, genetics and socioeconomic status have also contributed to overweight and obesity.[14]

In the past several years, overweight and obesity were not a common problem in Ethiopia. But recently, the prevalence of adult overweight and obesity has increased from 4% in 2000 to 6% in 2016.[15,16] Similarly, different pocket area studies showed that the prevalence of adult overweight ranges from 16.1% to 25.3% and obesity ranges from 5.6% to 16.2%.[17–20] As it is known, overweight and obesity have become a complex problem resulting from a combination of genetic, behavioral, cultural, and environmental influences; this calls for not only behavioral changes at individual levels, but also changes in public policy, social environment, and cultural norms. However, most nutritional interventions in Ethiopia are focused on addressing childhood undernutrition. Hence, identifying the risk factors which contribute to the rapid increment of overweight and obesity will have a paramount importance in the prevention and control of these emerging public challenges in Ethiopia.[21] Therefore, this study was targeted to assess the prevalence of overweight and obesity and its associated factors among adults in Dessie town, northeast Ethiopia.

Methods

Study setting and design

A community-based cross-sectional study design was carried out from March 15 to April 10, 2015. The study was conducted in Dessie town, a town with a population of 203,095, which is located in the northeastern part of Ethiopia, 400 km away from Addis Ababa, the Ethiopian capital. Of the adult population numbering 85,521, 41,100 were males and 44,421 were females. The administration contains 16 kebeles (the smallest administration unit in Ethiopia).

Sample size and sampling procedure

All adults aged 18–64 years who were living in Dessie town were eligible for the study, except pregnant women and women who gave birth in the last 6 months, adults with spinal problems (kyphosis, lordosis, scoliosis, and kyphoscoliosis), and those who were edematous, critically ill, and unable to communicate. The sample size of the study was computed using Epi Info version 7 by considering the following assumptions: prevalence of overweight 20.6%,[20] level of significance 95%, 4% margin, and 1.5 design effect. Finally, the sample size of 805 was obtained by adding 5% non-response rate. Multistage sampling was used to select the study participants. Initially, 4 kebeles were selected, of the overall 16 kebeles, by using lottery method. The total number of households in each kebele was obtained from the kebele administrators. The proportionate-to-population size calculation was used to select the number of households in each kebele. Next, the sampling interval (K) was determined by dividing the total number of households in each kebele by the allocated sample size to each kebele. A lottery method was used to determine the starting households in each of the four kebeles. Consequently, the K value was added until the allocated sample size to each kebele was reached. When more than one eligible adult was found in the selected households, the lottery method was used to select one eligible adult.

Data collection instrument and procedure

A structured interviewer-administered questionnaire was used to collect data. The questionnaire was first prepared in English and was translated into the local language (Amharic) and finally back translated to English to maintain consistency. The questionnaire consisted of information on socioeconomic characteristics, dietary history, physical activity, and alcohol intake. The global physical activity questionnaire analysis guide[21] and the WHO steps instruments for chronic disease risk surveillance questionnaire were used after minor modifications.[22]

A pretest was done on 5% of the sample from the study area. A 2-day training on how to conduct the interview and perform anthropometric measurements was given for data collectors and supervisors. A total of four data collectors and two supervisors (public health experts) were recruited for the

study. Daily supervision and feedback were carried out by the investigators and supervisors during the entire data collection period. Anthropometric measurement tools were calibrated before measurement to maintain the accuracy of the data.

Measurements

Weight and height

The weight was measured with the participants in a standing position without shoes and with light clothing using a beam balance to the nearest 10 g. Similarly, the height was measured to the nearest 0.1 cm with the participants in an upright position with the head in the Frankfort plane. Then, BMI of the adults was calculated by dividing the body weight by height in meters squared (kg/m^2). BMI values of 18.5–24.9, 25–29.9, and ≥30 kg/m^2 were used to classified adults as normal, overweight, and obese, respectively.[21]

Assessment of dietary habit

Respondents were asked about their dietary habit using a dichotomous yes and no questionnaire; if the respondent answered yes, then further questions were asked about how frequent per week and per month specific food consumption occurred. This included their intake of snacks between meals.

Wealth index

The household's wealth status was determined from the key household asset ownership variables (household assets such as quantity of cereal products, and house, livestock, and agricultural land ownership). First, the variables were coded between 0 and 1. Then, the variables were entered and analyzed using Principal Component Analysis, and those variables having a communality value of >0.5 were used to produce factor scores. Finally, the factor scores were summed and ranked into tertiles as poor, medium, and rich based on the lower, middle, and higher score tertiles, respectively.

Physical activity

The WHO standard total physical activity calculation guide was used to assess the physical activity level of participants. Then, the activity levels were determined according to the three settings (or domains). These included activity at work, travel to and from places and recreational activities, and sedentary behavior. Finally, moderate physical activity was defined as low-impact aerobic exercise classes, brisk walking or hiking, and recreational team sports (volleyball, soccer, and so on). Running or jogging, high-intensity aerobic classes, competitive full-field sports (soccer), and basketball were considered as vigorous physical activity. No exercise or no physical activity was classified as a low physical activity.

Alcohol intake

Alcohol intake was assessed using a 1-month recall period. Differences in prevalence of obesity or overweight between respondents who consumed alcoholic beverages and the respondents who did not consume alcohol at all were found; however, the quantity of alcohol intake was not accounted for or recorded.[31]

Data processing and analysis

The collected data were reviewed and entered into Epi Info version 7 and exported to SPSS version 20 statistical software for analysis. Descriptive statistics were carried out and the result was presented using text and tables. An ordinal logistic regression model was used to identify factors associated with overnutrition. The ordinal logistic regression model was used because the nutritional status determined by using BMI is an ordinal data (normal vs overweight vs obese). The proportional odds model (POM), equivalent to performing two binary logistic regression analyses simultaneously, was fitted to identify factors associated with overweight and obesity. The necessary assumptions for POM were checked using chi-squared and parallel line tests. The chi-squared test for the proportional odds assumption was employed to see whether the model assumptions were violated or not. The Pearson chi-squared goodness-of-fit test showed that the observed data were consistent with the fitted model (P=0.838). Moreover, the appropriateness of the POM was evaluated by the parallel line test, and it revealed that the general model did not significantly differ from the fitted POM (P=0.406), indicating that the model was not violated. Bivariable analyses were performed between the dependent and independent variables. All variables with a P-value <0.25 in the bivariable analysis were fitted into the multivariable POM to control for confounding effects. Adjusted proportional OR with a 95% CI was used to evaluate the strength of statistical association between explanatory and outcome variables. All tests were two-sided, and variables with P-values <0.05 in the multivariable analysis were considered to be statistically significant.

Results

Sociodemographic and economic characteristics of respondents

A total of 751 adults, with a response rate of 93.29%, were involved in the study. About 51.4% and 48.9% of the study participants were female and attended college and above,

respectively. More than half of the respondents, 433 (57.7%), had a family size of more than four members. Nearly half, 363 (48.3%), of the respondents came from economically low households (Table 1).

Dietary habits, alcohol intake, and physical activity

A substantially higher proportion, 631 (97.4%), of the study participants ate cereal-based foods. Similarly, more than half (52.9%) of the study participants consumed fruits one to four times per week. Milk and milk products, fatty foods, legumes, and sweets were commonly used in the study setting (Table 2). Among the study participants, 243 (32.4%) respondents consumed alcohol. Regarding the physical activity of the respondents, almost all respondents, 744 (99.1%), were engaged in low to moderate workplace activities. However, three-fourths (74.8%) of the study participants had no leisure time physical activity and about 55.4% spent three or more hours sitting without any exercise. Concerning their mode of transportation, 350 (46.6%) traveled by car, while 283 (37.7%) traveled on foot.

Prevalence of overweight and obesity

In this study, the prevalence of overweight and obesity was 19.9% (95% CI: 16.9%, 23.1%) and 8.6% (95% CI: 6.6%, 10.9%), respectively. The combined prevalence of overweight and obesity was 28.5% (95% CI: 25.3, 31.9). A similar proportion of males and females were overweight (20.2% male vs 18.1% female) and obese (8.8% male vs 8.6% female). However, about 78 (10.4%) of the study participants were chronic energy deficient.

Factors associated with the level of nutritional status

From the final model, chi-squared test provided a chi-squared value of 819.121 (*P*-value 0.838); this implied that the model had a good fit. Furthermore, the chi-squared test of parallelism showed that the ORs were constant across all cutoff

Table 1 Sociodemographic and economic characteristics of adults, Dessie district, northeast Ethiopia, 2015

Variables	Nutritional status			Total frequency, n (%[b])
	Normal, n (%[a])	Overweight, n (%[a])	Obese, n (%[a])	
Religion				
Orthodox	231 (66.4)	82 (23.6)	35 (10.0)	348 (51.7)
Muslim	240 (78.4)	44 (14.4)	22 (7.2)	306 (45.5)
Protestant	9 (47.4)	8 (42.1)	2 (10.5)	19 (2.8)
Marital status				
Currently married	278 (65.4)	99 (23.3)	48 (11.3)	425 (63.2)
Currently unmarried	202 (81.5)	35 (14.1)	11 (4.4)	248 (36.8)
Sex				
Male	403 (70.9)	115 (20.2)	50 (8.9)	568 (84.4)
Female	77 (73.3)	19 (18.1)	9 (8.6)	105 (15.6)
Occupation				
Merchant	192 (73.6)	49 (18.8)	20 (7.6)	261 (38.8)
Government employee	185(66.5)	59 (21.2)	34 (12.3)	278 (41.3)
Daily worker	33 (73.3)	12 (26.7)	0 (0)	45 (6.7)
Other[c]	70 (78.6)	14 (15.7)	5 (5.7)	89 (13.2)
Educational status				
Cannot write and read	34 (80.9)	5 (11.9)	3 (7.1)	42 (6.2)
Primary	80 (82.5)	13 (13.4)	4 (4.1)	97 (14.4)
Secondary	129 (63.5)	51 (25.1)	23 (11.4)	203 (30.2)
College and above	237 (71.6)	65 (19.6)	29 (8.8)	331 (49.2)
Wealth status				
Rich	35 (57.4)	15 (24.6)	11 (18.0)	61 (9.1)
Medium	201 (66.8)	67 (22.3)	33 (10.9)	301 (46.2)
Poor	244 (78.5)	52 (16.7)	15 (4.8)	311 (46.2)

Notes: [a]The percentage is calculated for row, the denominator is row total for each category. [b]The percentage is calculated for column, the denominator is column total for each category. [c]Students, farmer.

Table 2 Dietary habits among adults in Dessie district, northeast Ethiopia, 2015

Dietary habits	Nutritional status			Total frequency, n (%[b])
	Normal, n (%[a])	Overweight, n (%[a])	Obese, n (%[a])	
Cereal consumption				
Daily	470 (71.8)	129 (19.7)	56 (8.5)	655 (97.3)
Weekly	6 (50.0)	4 (33.3)	2 (16.7)	12 (1.8)
Monthly	4 (66.7)	1 (16.7)	1 (16.6)	6 (0.9)
Fruits				
Daily	120 (71.0)	31 (18.3)	18 (10.7)	169 (25.1)
Weekly	247 (68.6	86 (23.9)	27 (7.5)	360 (53.5)
Monthly	81 (76.4)	13 (12.3)	12 (11.3)	106 (15.8)
Never use	32 (84.2)	4 (10.5)	2 (5.3)	38 (5.6)
Vegetable				
Daily	124 (64.9)	45 (23.6)	22 (11.5)	191 (28.4)
Weekly	280 (74.1)	67 (17.7)	31 (8.2)	378 (56.2)
Monthly	57 (70.4)	18 (22.2)	6 (7.4)	81 (12)
Never use	19 (82.6)	4 (17.4)	0 (0)	23 (3.4)
Milk and milk products				
Daily	133 (66.2)	46 (22.9)	22 (11.5)	201 (29.9)
Weekly	151 (72.6)	42 (20.2)	15 (7.2)	208 (30.9)
Monthly	112 (72.3)	30 (19.4)	13 (8.4)	155 (23)
Never use	84 (77.1)	16 (14.7)	9 (8.3)	109 (16.2)
Fats				
Daily	53 (58.2)	23 (25.3)	15 (16.5)	91 (13.5)
Weekly	206 (68.9)	64 (21.4)	29 (9.7)	299 (44.4)
Monthly	173 (76.5)	44 (19.5)	9 (4.0)	226 (33.6)
Never use	48 (84.2)	3 (5.3)	6 (10.5)	57 (8.5)
Meat, egg, and fish				
Daily	13 (56.5)	4 (17.4)	6 (26.1)	23 (3.4)
Weekly	84 (65.5)	36 (28.1)	8 (6.4)	128 (19)
Monthly	140 (72.9)	38 (19.8)	14 (7.3)	192 (28.5)
Never use	243 (73.6)	56 (17.0)	31 (9.4)	330 (49)
Snack use				
Yes	265 (74.4)	68 (19.1)	23 (6.5)	356 (52.9)
No	215 (67.8)	66 (20.8)	36 (13.4)	317 (47.1)
Number of meals per day				
Once	2 (100)	0 (0)	0 (0)	2 (0.3)
Twice	96 (73.8)	27 (20.8)	7 (5.4)	130 (19.3)
Three times	370 (70.3)	106 (20.2)	50 (9.5)	526 (78.2)
Four and above	12 (80)	1 (6.7)	2 (13.3)	15 (2.2)
Frequency of soft drink use				
Weekly	142 (75.5)	37 (19.7)	9 (4.8)	188 (27.9)
Three times weekly	108 (76.1)	23 (16.2)	11 (7.7)	142 (21.1)
Two times weekly	104 (72.7)	23 (16.1)	16 (11.2)	143 (21.2)
Never use	126 (63.0)	51 (25.5)	23 (11.5)	200 (29.7)

Notes: [a]The percentage is calculated for row, the denominator is row total for each category. [b]The percentage is calculated for column, the denominator is column total for each category.

points of nutritional status for the final model at a 5% level (*P*-value =0.406). Accordingly, the results of POM revealed that the risk of being in the higher order of nutritional status (overweight or obesity) was 1.52 times (POR =1.52; 95 CI: 1.04, 2.20) higher among adults who had snack intake habit compared to adults who had no habit of snack intake. The risk of developing obesity or overweight was 1.75 times (POR =1.75; 95 CI%: 1.07, 2.97) higher among adults who consumed alcohol compared with adults who did not drink alcohol at all. As compared to the poor adults, the risk of being overweight or obese was 2.29 times higher among rich adults. Similarly, married adults were 2.22 times more likely to be overweight or obese (POR =2.22; 95 CI: 1.49, 3.29) compared to the unmarried adults (Table 3).

Discussion

Identification of potentially modifiable risk factors of overweight and obesity is an important step to prevent and control the epidemic dimension of overweight and obesity in developing countries. In this study, the prevalence of overweight and obesity was 19.9% (95% CI: 16.9%, 23.1%) and 8.6% (95% CI: 6.6%, 10.9%), respectively. In addition, marital status,

Table 3 Factors associated with the level of nutritional status among adults, Dessie district, northeast Ethiopia, 2015

Variables	Nutritional status			cPOR	*P*-value	aPOR	*P*-value
	Obesity, n (%[a])	Overweight, n (%[a])	Normal, n (%[a])				
Mode of transport							
Car	26 (9.4)	74 (26.6)	178 (64.0)	1.34 (0.82, 2.19)	0.250	1.12 (0.66, 1.89)	0.673
Foot	20 (7.0)	40 (14.0)	227 (79.0)	1.06 (0.67, 1.68)	0.810	0.96 (0.59, 1.56)	0.876
Both	13 (12.0)	20 (18.5)	75 (69.5)	1.00		1.00	
Educational status							
College and above	237 (71.6)	65 (19.6)	29 (18.8)	0.60 (0.27, 1.34)	0.217	0.61 (0.27, 1.42)	0.253
Secondary	129 (63.5)	51 (25.1)	23 (11.4)	0.42 (0.18, 0.95)	0.038	0.47 (0.19, 1.09)	0.077
Primary	80 (82.5)	13 (13.4)	4 (4.1)	1.14 (0.45, 2.88)	0.778	1.00 (0.38, 2.62)	0.992
Unable to read and write	34 (81.0)	5 (12.0)	3 (7.0)	1.00		1.00	
Wealth status							
Rich	35 (57.4)	15 (24.6)	11 (18.0)	2.90 (1.66, 5.06)	<0.0001	2.29 (1.26, 4.19)	0.007**
Medium	201 (66.8)	67 (22.3)	33 (10.9)	1.56 (0.91, 2.69)	0.105	1.38 (0.77, 2.44)	0.274
Poor	244 (78.5)	52 (16.7)	15 (4.8)	1.00		1.00	
Snack intake							
Yes	265 (44.3)	68 (11.4)	265 (44.3)	1.43 (1.02, 1.98)	0.024	1.52 (1.04, 2.20)	0.044**
No	215 (43.3)	66 (13.4)	215 (44.3)	1.00		1.00	
Alcohol intake							
Yes	53 (8.8)	110 (18.3)	439 (72.9)	1.77 (1.07, 2.90)	.024	1.75 (1.04, 2.97)	.037**
No	6 (8.5)	24 (33.8)	41 (57.7)	1.00		1.00	
Vegetable consumption							
Daily	124 (65.0)	45 (23.5)	22 (11.5)	0.37 (0.12, 1.14)	0.083	0.33 (0.10, 1.12)	0.073
Weekly	280 (74.1)	67 (17.7)	31 (8.2)	0.56 (0.18, 1.73)	0.317	0.41 (0.12, 1.32)	0.137
Monthly	57 (70.4)	18 (22.2)	6 (7.4)	0.48 (0.15, 1.59)	0.233	0.37 (0.10, 1.27)	0.115
Never	19 (79.2)	4 (16.7)	1 (4.1)	1.00		1.00	
Marital status							
Currently married	278 (65.4)	99 (23.3)	48 (11.3)	2.35 (1.62, 3.42)	<0.0001	2.22 (1.49, 3.29)	<0.0001**
Currently unmarried	202 (81.5)	35 (14.1)	11 (4.4)	1.00		1.00	
Physical activity							
Low	50 (8.9)	117 (20.7)	397 (7.4)	0.85 (0.16, 4.55)	0.152	0.98 (0.17, 5.72)	0.983
Moderate	9 (8.8)	15 (14.7)	78 (76.5)	1.13 (0.20. 6.35)	0.888	1.16 (0.18, 7.08)	0.873
High	1 (12.5)	2 (25.0)	5 (62.5)	1.00		1.00	

Notes: [a]The percentage is calculated for row, the denominator is row total for each category. **Significant at *P*-value <0.05.
Abbreviations: aPOR, adjusted proportional odds ratio; cPOR, crude proportional odds ratio.

snacking, alcohol drinking, and economic status were the main contributory factors of overweight and obesity.

The finding is comparable with the prevalence of overweight and obesity reported in Benin (19.2%)[23] and Nigeria (20.8%).[12] However, it was higher than the prevalence reported from Addis Ababa (9.8%).[24] This might be due to the difference in the dietary habit of the study participants; increased consumption of obesogenic and energy-dense foods in the study population may contribute to the discrepancy in the prevalence of overweight and obesity.

Furthermore, the prevalence of overweight and obesity in our study was lower than those reported in studies from developed countries such as USA, Canada, Greece, and Italy.[25–27] This might be because adults in developed countries may consume energy-dense foods more frequently than adults living in developing countries. In addition, consumption of mainly cereal-based monotonous diet, having a low household income to buy food commodities, and having a relatively non-sedentary behavior among adults in the study setting may contribute to the lower prevalence of overweight and obesity in the study area. Furthermore, cultural restriction of some animal food items in the fasting period of orthodox Christians may contribute to the lower consumption of energy-dense foods and associated lower prevalence of overweight and obesity as compared to adults in other countries.

In line with the established fact,[28] this survey also confirmed that the risk of being in the higher orders of nutritional status was higher among rich adults compared to poor adults. This finding was also reproducible with the results from different developing countries such as India and Kenya.[29,30] Adults with high income levels have a higher risk of expose to energy-dense foods and a sedentary way of life.[9] Similar results were also reported from Vietnam[31] and Mexico,[25] where an increased risk of obesity was found among wealthier families. This may be related to changes in the dietary habits of wealthier adults. Adults from higher socioeconomic class are known to adopt a western lifestyle, which often times leads to greater intake of high fat and high caloric diet; these tendencies may substitute the healthy traditional diet (cereals, fruit, vegetables, etc).[32] In addition, patterns of high-energy expenditure among the poor and the cultural values favoring a larger body size may contribute to positive energy balance.[33] Furthermore, food purchasing ability of the household is determined by income, and adults from the highest income group had a probability of purchasing energy-dense foods.[34]

The result also showed that the risk of being overweight and obese was higher among adults who consumed alcohol compared to adults who did not consume alcohol. There are several sources of evidence that suggest the potential influence of alcohol on weight gain. When a person consumes alcohol, the caloric intake increases and it causes weight gain.[35] This relationship between alcohol intake and weight gain is probably due to the relatively high energy content of ethanol compared to other macronutrients. Pure ethanol has an energy density of 7.1 kcal/g, while the energy density of lipids (fat) is 9 kcal/g; proteins and carbohydrates have an energy density of 4 kcal/g.[36] Excessive consumption of ethanol may result in a positive energy balance, which may, over time, result in being overweight or obese.

The results of this study also showed that marital status had a significant association with the occurrence of overweight and obesity. Based on the result, married adults were found in higher order of nutritional status as compared to unmarried adults. Even if the exact linking mechanism of marital status and overweight and obesity is not completely understood, the possible explanation is that married adults pay less focus on the nutritional issue, including being attractive and physically active.[37] Married individuals have more social support and increased energy-dense regular eating patterns, which may lead to overweight and obesity.

In this study, the odds of being in the higher order of nutritional status were higher among adults who had snack intake habit compared to their counterparts. This result is supported by other similar studies done in Hawasa and Gondar which showed that having a snacking habit had a key role in the incidence of overweight and obesity.[38,39] A consistent effect was also found among adolescent and early adult subjects in Saudi Arabia.[40] In addition, some studies in the developed countries indicated that consuming a snack between meals increases the total daily energy intake, and thus body weight. Otherwise, other studies have suggested that having a snacking habit is not related to weight gain, but the nature of snacking is a matter of concern.[41] Snack intake provides few calories, but consumption of several snacks contributes to high caloric intake.[42] Even though the prevalence and risk factors associated with overweight and obesity in adults were assessed using representative data, the study has its own limitations. Frist, due to the cross-sectional nature of the study design, establishing a cause–effect relationship becomes difficult. Second, the quantity of alcohol consumed was not recorded and the measurement of fat and fat-free mass was not done.

In conclusion, compared to the previous local reports, the prevalence of overweight and obesity in this study was found to be high in the study area. Consuming alcohol, high economic status, and snacking were positively associated with the higher order of nutritional status. However, being an

unmarried adult is negatively associated with higher orders of nutritional status. This finding is useful for the planning of health and nutrition programs as well as intervention strategies to combat adult overweight and obesity. Therefore, there is a need to develop a control and prevention strategy on potentially modifiable risk factors of overweight and obesity. Furthermore, including the measurement of frequency and quantity of alcohol consumption, and body composition is recommended in future study.

Ethical considerations and consent to participate

Ethical clearance was obtained from the Institutional review board of the University of Gondar. Permission was obtained from Desse City Administration Office. Informed oral consent was obtained from each study subject after the data collectors clearly explained the aims of the study. Respondents were also informed that they could refuse or discontinue participation at any time. Information was recorded anonymously to maintain confidentiality and privacy of respondent. Also, this study was conducted in accordance with the Declaration of Helsinki.

Data sharing statement

Due to ethical restrictions and privacy concerns, a dataset is available upon request from the author Zegeye Abebe: zegeye24@gmail.com

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Author contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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