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Determinants of Obesity among Working Adults in Wolaita Sodo Town, Southern Ethiopia

Dagim Abera[1] Minyahil Tadesse Boltena[2]
1. Department of nutrition, Wolaita Sodo University, Ethiopia.
2.Wolaita Sodo University, Health Sciences and Medicine College, School of Public Health

Abstract
Background: Obesity among working adults is a major public health problem in low-income countries and it increases the risk of morbidity and mortality. This study aimed to assess the determinants of overweight and /obesity among working adults in Wolaita Sodo town, Southern Ethiopia.**Methods:** Institutional based cross sectional study was conducted from March to April, 2016. Working adults (n=422) were the study population. A Simple random sampling technique was used to select study participants. Overweight and /obesity was classified according to WHO classification. Data was entered into EPI info version 3.5.1 and exported into SPSS version 20.0 for analysis. Binary logistic regression model was used to identify factors associated with the outcome variable, and finally multivariate logistic regression model was used to identify independent predictors of overweight and /obesity, with statistical significance set at p<0.050 (95% confidence interval (CI)).**Results:** Prevalence of overweight and / obesity was 40.7%, out of which 71.4% were among male and 28.6% were among female. The mean ±SD age of male and female was 42.6 ±10.3 years and 40 ± 11.1 years respectively. Salt intake in diet (AOR= 0.101, 95% CI = 0.3 – 0.32); meal frequency (AOR=23.69, 95% CI= 1.67 – 3.34); use of "Hayat" oil for food preparation (AOR=7.43, 95% CI = 1.72 – 32); being male (AOR=1.79, 95% CI = 1.09 – 2.95) were determinants of overweight and / obesity.**Conclusion:** This study showed high rate of overweight and /obesity among working adults. Findings suggest the need to implement evidence-based working adults' nutrition policy and strategies as well as need for intervention to improve dietary salt consumption and the quality of edible oil.
Keywords: Obesity, Working adults, Southern Ethiopia

Background

Overweight and/ Obesity is defined as an abnormal or excessive fat accumulation in the body that may impair health. The most widely used screening tool for diagnoses of overweight and/ obesity is BMI (Body Mass Index) but now a day's waist circumference and waist hip ratio are additionally used as a tools for diagnosing excess fat accumulation[1-2].

In 2014, nearly 2 billion adults aged 18 years and older were overweight globally. Of these, over 600 million adults were obese. That is 39% of adults aged 18 years and over (38% of men and 40% of women) were overweight. The worldwide prevalence of obesity was more than doubled between 1980 and 2014. People who were overweight and/ obese are more likely to develop and die from CVD (Cardiovascular Diseases), heart attack, stroke and other CNCD (Chronic and non-chronic Communicable Diseases) [3].

In sub saran Africa, especially in Ethiopia, the prevalence of Overweight and obesity of adults has been increasing through years. As Ethiopia has not get rid of the problem of malnutrition and low birth weight for generations', there is a concurrent increase in prevalence of Overweight and obesity in which it leads to the development of NCDs. Due to the increases in urbanization, change in life style, nutritional transition and over nutrition, Overweight and Obesity will soon be a leading cause of ill health, disability and premature death. [4-8]

Government employee adults are one of major work force that contributes to the growing economy of the country; there is a gap on addressing the health and nutritional problems of those societal groups. Due to this information is vital to understand the magnitude, severity and factors associated with Overweight and/ obesity among government employee adults.

METHODS

Study area and setting

Institutional based cross sectional study, was conducted in Wolaita Sodo town, located in Southern Nation Nationalities and Peoples Region (SNNPR), which is 360 KM from Addis Ababa, the capital of Ethiopia. The source population was all government employee adults living in the study area. The study population was government employee adults who were actively working during the commencement of the study. Working adults suffering from diseases and who are pregnant were excluded.

Sample size and sampling procedure

The sample size was determined by using a formula for estimation of single population proportion with the assumption of 95% confidence level, an error margin of 5% and the prevalence of overweight and /obesity in Wolaita Sodo (50%). After considering 10% non-response rate, the total sample size was estimated to be 422.

Simple random sampling technique was used. Sampling was done after Proportion to size allocation of individuals to all offices and from each office sampling frame was developed and individuals were selected by simple random sampling /lottery method/ form the sampling frame.

Data collection

The data was collected by a pretested structured and interviewer administered questionnaire which was adopted from WHO [9]. The questionnaire was already prepared in English language and then translated to Amharic language. Before the data collection all of the study subjects were oriented and well informed about the purpose of the study, and their right to accept, or refuse to participate in the interview. The research assistants read out the questions loud and the study participants answered every question accordingly.

Data collectors and Measurements

Eight data collectors, based on their previous experience, were recruited and trained for data collection, and two trained public health officers supervised collection of the data. The recorded parameter was height and weight. Height and weight were measured while participants were bear footed, wearing light clothes, heavy materials and hair ornaments were removed. Weight was measured by using well calibrated portable prestige, seca weight scale and reading was taken to the nearest to 0.1kg and height was measured by using stadiometers with the participant looking straight ahead and the back as straight as possible head, shoulders, buttocks, and heels were in contact with the vertical surface and measurements were taken to the nearest to 0.1cm [10].

Waist circumference was measured at the midpoint between the lowest rib and anterior superior iliac crest by using non stretchable fixed tension tape wrapped around at this point, parallel to the floor, ensuring it was adjusted without compressing the skin. The reading was taken at the end of a normal breath and also the hip circumference was taken around the maximum circumference of the buttocks. Both readings were taken to the nearest to 0.1cm [11].

Data quality control

Before the actual data collection, the questionnaire was pre-tested on similar setting outside the study area. The data collectors and supervisors were trained for two days on principles, ethical considerations, procedures, equipment use and measurement criteria, and details of the questionnaire. The principal investigator closely monitored the data collection process. The data collectors were trained to measure the heights and weights of the study participants using a measuring scale, according to the WHO recommendations.

Data Management

Completed questionnaires were checked for their consistency and completeness every day, and then entered into EPi-Info version 3.5.1 statistical software, then, it was coded and the data was exported to another statistical software package SPSS, version 20.0 for further cleaning and analysis. Logistic regression analysis was carried out at two levels. Firstly, a bivariate analysis was performed to determine the differentials of overweight and /obese working adults by explanatory variables. Secondly, those predictor variables which were significantly associated with the outcome variable at less than 0.25 levels of significance from the bivariate analyses were entered into the multivariate logistic regression model. Statistical significance was set at $p<0.050$ and 95% confidence interval.

Operational definition

Overweight and/or obesity were operationally defined according to WHO Classification on the characteristics of body mass index and waist hip ratio classification (table 1). [12]

Table 1 WHO classification of Overweight and /obesity

BMI		Underweight	<18.5 Kg/Cm^2
		Normal	18.5-24.9 Kg/Cm^2
		Overweight	25-29.9 Kg/Cm^2
		Obese	≥30 Kg/Cm^2
		Overweight and Obese	≥25 Kg/Cm^2
WC	Male	Obese	≥94Cm
	Female	Obese	≥80Cm
WHR	Male	Obese	≥0.90
	Female	Obese	≥0.85

RESULT

Socio Demographic, Behavioral and Dietary Characteristics

A total of 413 study subjects were participated yielding a response rate of 97.8%. Among the study participants 137 (33.1%) were females. The mean ±SD age of male 42.6 ±10.3 years and female was 40 ± 11.1 years. The majority of participants 331 (80.1%) were Wolaita in ethnicity and 275 (66.6%) were first degree holders. From all participants 331 (80.1%) were married.

From the total participants, 221 (53.5%) had alcohol drinking behavior and only 79 (19.1%) of had a

smoking behavior. 144 (34.9%) of respondents had khat chewing behavior and nearly 96 (23.2%) of study units had addiction at least one of the three behaviors.

Individual diet diversity score show that 154 (37.3%) study participants has shown low diversification of their diet, while only 5 (1.2%) consumes highly diversified diet. The most commonly consumed food groups were starchy staples like cereals, roots and tubers and they were main food sources. Legumes, green leafy vegetables, meat and milk were less frequently eaten food groups.

The majority of study participants, 305 (73.8%) eat three times per day and 4 (1%) eat more than three times per day. From the total study subjects 114 (27.6%) use "Abena" oil for food preparation followed by 108 (26.2%) of Mixed use of oils and 89 (21.5%) of "vaiking" (Table 2).

Table 2: Socio demographic characteristics

Variables		Sex		p-value
		Male =276	Female =137	
Age	<24 years	16	8	0.022
	25-34 years	56	42	
	35-44 years	59	36	
	45-54 years	109	33	
	>55 years	36	18	
Educational status	Less than certificate	4	5	0.121
	Certificate	19	11	
	Diploma	50	22	
	First degree	190	85	
	Second degree above	13	14	
Marital status	Married	225	106	0.572
	Single	43	27	
	Others	8	4	
Total monthly Income (EBR)	Low(<3963)	98	45	0.033
	Medium(3964-5945)	165	76	
	High(>5946)	13	16	
Alcohol drinking	No	129	63	0.885
	Yes	147	74	
Cigarette smoking	No	221	113	0.558
	Yes	55	24	
Khat chewing	No	182	87	0.624
	Yes	94	50	
Diet diversity score	Low (<3 score)	106	48	0.772
	Medium (4-6score)	167	87	
	High (>7score)	3	2	
Meal frequency	DnR	22	7	0.627
	<3 times/Day	51	24	
	3 times/Day	201	104	
	>3 times/Day	2	2	

Prevalence of Overweight and /Obesity among government employee adults

The prevalence of overweight and/obesity was determined by the WHO definition of obesity by measuring BMI of an individual (Table 3). The overall prevalence of overweight and obesity was found to be 168 (40.7%), out of which, 120 (71.4%) were male and 48 (28.6%) female. However, according to the WHO definition of abdominal obesity by measuring WHR the overall prevalence was 277 (67%) and it was 164 (59.2%) among males and 113 (40.8%) among females.

The prevalence of overweight and/ obesity was higher for employee aged (45-54) years old 56 (33.3%) as compared to their counterparts. Married individuals were more overweight and obese 136 (81%) than single ones 25 (14.9%).

Table 3: prevalence of Overweight and /obesity among working adults

Characteristics		Male n=276	Female n=137	Total n=413
BMI	Underweight (<18.5)	7 (2.5%)	6 (4.3%)	13 (3.1%)
	Normal (18.5-24.9)	149 (53.9%)	83 (60.5%)	232 (56.1%)
	Overweight (25-29.9)	97 (35.1%)	39 (28.4%)	136 (32.9%)
	Obese (≥30)	23 (8.3%)	9 (6.5%)	32 (7.7%)
	Overweight and Obese(≥25)	120 (43.4%)	48 (35%)	168 (40.6%)
Waist Circumference (WC) (≥94cm&≥80cm)		104 (37.68%)	114 (83.2%)	218(52.7%)
Waist Hip Ratio (WHR)(≥0.85&≥0.90)		164(59.4%)	113(82.4%)	277(67%)
Mean (Standard Deviation)				
Waist Circumference (WC)		91(8.9)	88.7(9.6)	90.3(9.2)
Hip Circumference (HC)		98.5(9.8)	95.1(11.7)	97.4(10.6)

Study participants who eat more frequently were found to be more obese as compared to their counterparts, those study units who eat their meal three times per day were 123 (73.2%) overweight and/ obese as compared to their counterparts who eat less than three time 32 (19%) and those who don't have regular meal frequency 10 (6%). Among adult employees with diet diversity score, medium diet diversity scored study participants 103 (61.3%) were more overweight and obese than low diet diversity scored employees 65 (38.7%).

Factors associated with Overweight and Obesity

As WHO classification of Overweight and obesity, variables such as sex, age, marital status, educational level, level of income, smoking behavior, khat chewing, wake up time, stress level, frequency of physical activity, meal frequency, type of oil used for food preparation, type of soft drinks and amount of salt consumed, were significantly associated with obesity and overweight using bivariate analysis. After adjusting for all confounding variables;- being male, sleep wakeup time/ having fragmented sleep /, use of "Hayat" oils for food preparation and use of salt in diet were independent predictors of the outcome variable (Table 4).

DISCUSSION

This study was conducted to determining the prevalence of overweight and obesity and factors associated among adult employees. This study revealed the prevalence of overweight and obesity to be high (40.7%) among adult employees, of which, 43.5% were males and 35% were females.

This was higher as compared to other studies, Canada 33.6% [13], Tanzania 32.54% [14], Benin 19.20% [15]. This difference could be due to the change in to sedentary lifestyle, risky behavioral activities, cultural factor and nutritional transition in which the food choice changes within and between the study participants.

The prevalence of abdominal obesity which is the increase in waist circumference and waist hip ratio was high among females WC 81.8% and WHR 68.5% as compared to males WC 30.4% and WHR 57.7% respectively. This finding is more similar with other studies [16-19].The disparity on prevalence of WC and WHR between male and female may be due to the difference in physiology.

This study indicates that male participants had 1.79 times higher odds to become overweight and/ Obese than their counterparts which is consistent with a study conducted in Canada [13].

This study shows that those study subjects who wakeup one to two times during overnight were 2.99 times higher odds of being overweight and/ obese and those study units who did not remember they have ever waken up has 69% decreased the odds of being Overweight and/ obese. This finding is consistent with other studies [20-21]. This similarity could be due to having less time of sleeping has a wide range of negative effects involving appetite hormone signaling, eating behavioral change, physical inactivity, dizziness and even fat-loss rates. However there is also growing evidence showing, having long time sleep >9 h/d has impact on increasing odds of overweight or obesity [22, 23].

This study indicates that having medium stress level has 1.94 times higher odds of being overweight and/ obese but having high stress level has decreased being overweight and/ obese by 73%. This finding was not in agreement with other studies in which being stressed has increasing effect on obesity[24, 25], however, other findings explained that being stressed has decreasing effect on body weight and eating behavior [26-28].

Increasing the Meal frequency has a direct association with being overweight and/obesity, having meal frequency of less than three times per day has 3.69 times higher, eating meal three times per day has 3.17 times higher and also having meal frequency of greater than three times per day has 23.69 times higher odds of becoming overweight and / obese as compared to their counterparts who don't have regular meal frequency. This finding is more consistent with other findings in which increasing meal frequency has impact on increasing body weight [41-43]. This could be due to the increase in food or meal frequency result in higher body fat, protein and carbohydrate accumulation in adipose tissue and resulting in increased weight gain.

This study shows that those study participants who use "Hayat" oil most frequently for food preparation had 7.43 times higher odds of becoming overweight and/ obese as compared to their counterparts. This finding was supported by other longitudinal studies [44-47] which shows the impact of vegetable oils on increasing the probability of being overweight and/ obese. This could be due to some vegetable oils containing high amount of fatty acids.

This study reveals that adding salt to daily meal or diet has decreased being overweight and /obese by 89.9%. This finding is not in agreement to other studies in which salt intake has direct impact on the development of being overweight and/obese. This difference could be due to the variation in the amount of salt intake and consumption during meal time in the study areas [48-50].

The higher prevalence of overweight and /obesity and increased WHR among government employee adults will lead to the development of chronic non communicable disease and worsen the current situation until there is a multi sector intervention plan is developed and implemented at different community level.

Conclusion

This study showed that overweight and obesity was high in the study area. The prevalence of overweight and obesity differs across sex and age categories. Overweight and Obesity was significantly associated with being male, sleep wakeup time /fragmented sleep/, stress level, use of salt in diet, use of "Hayat" oil for food preparation and meal frequency. Findings suggest the need to implement evidence-based working adults' nutrition policy and strategies as well as need for intervention to improve dietary salt consumption and the quality of edible oil.

Table 4: factors affecting overweight and / obesity among government employee adults

Variables		Not Overweight Obese %	Overweight and obese %	COR 95%CI	P Value	AOR 95%CI	P value
Sex	Male	156()	120()	1.42(0.93 – 2.18)	0.10*	1.79 (1.09 – 2.95)	**0.022***
	Female	89()	48()	1		1	
Marital status	Single	45()	25()	0.39(0.11– 1.38)	0.14*	0.57 (0.13– 2.35)	0.571
	Married	195()	136()	0.49(0.15 – 1.60)	0.24*	0.70 (0.13– 3.59)	0.708
	Others	5()	7()	1		1	
Smoking	No	206()	128()	1		1	
	Yes	39()	40()	1.65 (1.0 – 2.7)	0.046*	1.14 (0.58 – 2.23)	0.692
Khat	No	172()	97()	1		1	
	Yes	73()	71()	1.72 (1.14 – 2.6)	0.009*	1.89 (0.89 – 4.04)	0.097
Drinking alcohol	No	120()	72()	1		1	
	Yes	125()	96()	1.28 (0.86 – 1.90)	0.221*	1.21 (0.68 – 2.14)	0.511
Sleep wakeup time	No	148()	81()	1		1	
	1-2/Day	23()	42()	3.33(1.87 – 5.93)	0.001*	2.99 (1.45 – 6.16)	**0.003***
	>2/D	41()	36()	1.60(0.95– 2.70)	0.007*	1.52 (0.78 – 2.98)	0.214
	Don't Re.	33()	9()	0.49(0.22– 1.09)	0.082*	0.31 (0.12 – 0.78)	**0.013***
Stress level	No	51()	28()	1		1	
	Low	80()	50()	1.13(0.63 – 2.03)	0.662	1.12 (0.55 – 2.24)	0.748
	Medium	89()	84()	1.71(0.99– 2.97)	0.053*	1.94 (1.01 – 3.73)	**0.045***
	High	25()	6()	0.43(0.16– 1.19)	0.106*	0.27 (0.08 – 0.88)	**0.030***
Meal frequency	Don't Re.	19()	10()	1		1	
	<3X/day	43()	32()	1.4 (0.57- 3.4)	0.44	3.69 (1.18 –11.4)	**0.024***
	3X/day	182()	123()	1.2 (0.57- 2.8)	0.54	3.17 (1.13–8.86)	**0.027***
	>3X/d ay	1()	3()	5.7 (0.52- 62.1)	0.15*	23.69 (1.67- 3.34)	**0.019***
Fried foods	No	118()	70()	1		1	
	Yes	127()	98()	1.3 (0.87- 1.93)	0.19*	1.10 (0.68–1.78)	0.694
Salt in diet	No	6()	20()	1		1	
	Yes	239()	148()	0.18 (0.07- 0.47)	0.001*	0.101(0.03 –0.32)	**0.001***
Type of oil	Viking	49()	40()	1		1	
	Abena	69()	45()	0.79(0.45- 1.4)	0.433	1.8 (0.88– 3.67)	0.107
	Hayat	5()	10()	2.4(0.77 - 7.7)	0.127*	7.43 (1.72– 32)	**0.007***
	Hagare	19()	8()	0.51(0.20 – 1.30)	0.161*	0.85 (0.28-2.61)	0.789
	Ok	11()	10()	1.14(0.42 – 2.88)	0.825	2.14(0.69–6.57)	0.183
	USA	24()	6()	0.30(0.11 - 0.82)	0.019*	0.76(0.24-2.39)	0.643
	Mxed	68()	49()	0.88(0.50 - 1.53)	0.660	1.83(0.90–3.7)	0.092

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from Research and Ethical Committee of Wolaita Sodo University, School of Public Health. Informed verbal consent was obtained from each study subject prior to data collection.

Consent for publication

Not applicable

Availability of data and material
The datasets during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests
The authors declare that this study is free of any competing financial and non-financial interests.

Abbreviations
BMI: body mass index; C.I.: confidence interval; CVD: cardio vascular disease; CNCD: chronic non communicable disease; EBR: Ethiopian Birr; HC: hip circumference; IDDS: individual diet diversity score; NCD: non communicable disease; SD: standard; WHO: World Health Organization; WHR: Waist Hip Ratio; WC: Waist Circumference

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Authors' contributions
DA; was involved in principal role in the conception of ideas, developing methodologies and writing the article. MTB participated in the analysis, interpretation and writing. All authors read and approved the final version of the manuscript.

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Authors' information
Dagim Abera: Department of nutrition, Wolaita Sodo University, Ethiopia. (BSc, MSc).
Minyahil Tadesse: Wolaita Sodo University, Medicine and Health Sciences College, School of Public Health.

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