Research Article

Overweight and Obesity among Sudanese Rural Population, Sinaar State, Sudan

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Abstract

Background: Overweight and obesity is considered to be the main risk factors for many health problems, contributing to increased illness and disability.

Objectives: To estimate the prevalence of overweight and obesity and their relation to sociodemographic factors.

Methods: A Cross-sectional community-based study was conducted in Sudan rural district, population of the study was employees and their families' working at the local Sugar factory. Sample size amounted to 341 participants including both genders, their age ranged between 25-64 years and they were permanent residents in the area. A probability cluster sampling technique was used. A Standardized administered questionnaire and checklist were used for data collection and the collected data were cleaned, edited and analyzed using SPSS program.

Results: The study included (51.9%) female and (48.1%) male. Most of them their age ranged between 45-55 years, with different educational levels, and (76.8%) were physically inactive. Prevalence of overweight was (31.70%) and similar among gender (16%), while prevalence of obesity was (9.40%) and greater in women (6.9%) (P: value=000). Highly significant prevalence of overweight and obesity were found among age group of 45-54 years and married subjects. While high insignificant prevalence was found among subjects with secondary education and housewives. Also, prevalence of overweight among population with moderate and high income was similar (13.2%). In addition, more prevalence of overweight and obesity was found among people with low exercise level (20.5%-5.1%), respectively.

Conclusion: The study reflected high prevalence of overweight and obesity among rural population, and some of socio-demographic factors significantly affected the prevalence of overweight and obesity such as gender, age and marital status.

Keywords: Overweight; Obesity; Prevalence; Body mass index; Exercise; Education; Income; Rural population; Sudan

Introduction

Global obesity has more than doubled since 1980. In 2014, more than 1.9 billion adults, age 18 years and older were overweight and over 600 million were obese; 39% were overweight and 13% were obese. Overweight and obesity were affecting a large part of the world's population [1]. More than 78 million adults in the United States were obese in 2009-2010 [2]. Obesity and overweight are defined as accumulation of abnormal or excessive fat that may impair health [1]. Overweight refers to an excess amount of body weight that may come from muscles, bone, fat, and water, while obesity refers to an excess amount of body fat [3]. Basic cause of obesity and overweight is an energy imbalance between calories consumed and expended [1]. Overweight and obesity can be treating with diet, exercise, weight-losing drugs and surgery for an extreme obese case [3].

Obesity leads to morbidity and mortality due to hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems, and cancers [2]. In Africa, 8% of adult above 20 years of age were obese and 27% were overweight. In Subsaharan Africa, prevalence of obesity ranges between 21.9%-43.4% and is highest among women than men [4]. Available studies in Eastern Mediterranean countries indicate that obesity has reached at an alarming level among both children and adults [5].

In Sudan overweight and obesity were increased, a study conducted by Abu-Aisha et al, reported that the prevalence of overweight and obesity in police forces households in Khartoum was 30% and 19.2% respectively [6]. Another study by Elfaki AM among Sudanese patients with type 2 diabetes mellitus, reported overweight 33.7% and obesity grade 1 & 2 were 16.8% and 6.9% respectively [7].

The aim of this study was to estimate prevalence of overweight and obesity among rural population and determine the relation to some sociodemographic characteristics.

Materials and Methods

A cross-sectional, community-based study was conducted in a

rural community in Alsakania town, Sinnar State. It's a small town accommodation for family workers and employees of Sugar factory which began 1976. It located far from Khartoum, the capital of Sudan, which is about 300 kilometers south of Khartoum, 40 kilometer from north-east Sinnar city and one and half kilometer from the sugar factory. The study population was employees, workers and their families. The area is surrounded by sugar cane farms, which belong to the factory and represent the resources for manufacture of sugar. Other types of agriculture beside sugar cane plantations include such as fruits, vegetables, wheat and corns seeds.

The last census (2010) estimated the population at 2170 inhabitants residence in 390 housing units. It reflects a community with similar Sudanese characteristics regarding their cultures, norms, income and baseline demographics. There are many ethnic groups with diversity of socio-cultural contexts and beliefs. Only those who working at the sugar cane factory were received the same and free services from the sugar factory to support their income and facilitate their life, such as electricity, health and medical services. Desirable sample size was 338 participants based on standard formula [8] and the collected sample size was amounted to 341 participants. The study included both genders; with ages between 25-64 years. They were permanent residents in the area. Exclusion criteria included ages less than 25 years, visitors and pregnant ladies.

A probability sampling technique was followed to draw study sample, clusters were identified and every member of the cluster was a part of the study [9]. The area was divided geographically into clusters to ensure good coverage of the sample households. Total households (390) were divided by the estimated number of households in each cluster (about 25 house in each cluster); 390/25 = 16 (cluster). The sample size (338) was divided by number of households in each cluster to determine number of clusters that were covered the sample; 338/25= 14 cluster samples. Then a listing of cluster samples frame was taken from one to sixteen clusters in the sample prior to data collection to enumerate all households within the boundaries of the study sample [10]. Cluster samples were selected by simple random sampling technique [11]. Fourteen clusters were selected randomly to cover study sample (338 participants) and only two clusters were excluded from the cluster samples frame for a total of (sixteen clusters) then the entire elements of fourteen clusters were used to collect study data.

Study variables included background variables such as, gender, age, educational level, current occupation, marital status, total income per month, exercise and activity and measurement of the height and weight to determine obesity and overweight. Data were collected using a standardized structured questionnaire that included the following components: section one; included questions about personal data: gender, age, educational level, current occupation, marital status, total monthly income and exercise. Section two included a checklist for measurement of height and weight. Data was collected by senior nurses after a training to follow standardized protocol for administrating the questionnaire and doing measurements. Data collectors were trained with lectures on interviewing technique and contents of the questionnaire, how to conduct an interview, fill out the questionnaire, and measure height and weight. Instruments were tested prior to use in fifteen cases to test the clearness of instruments and measurements, pre-test was conducted in Al Wahda Town;

a neighboring city, to the study area. Al Wahda Town is similar to Alsakania and to ensure reliability and accuracy of the questionnaire and measurements. Data was collected by two teams. Each team was comprised of two interviewers who obtained personal data and took measurements.

The standard questionnaire was completed for the entire sample population (n=341). The survey was completed in a period of three weeks (morning to evening). If the inhabitants were not at home at time of visit, a second visit was conducted, if the inhabitants were not found again at their house, they were dropped from the study. Six houses were dropped from the study. All available members in houses, at time of survey, according to inclusion criteria were interviewed using the detailed questionnaire. Informed consent was obtained from the entire sample who were enrolled in study prior to the interview.

Criteria for measuring height and weight

Weight was measured using an electronic scale that was properly calibrated. Calibration was done at the beginning and end of each examining day, the scale was balanced with both sliding weights at zero and balance bar aligned. The scale was checked using standardized weights and calibration was corrected if an error was greater than 0.2 kg [12]. The scale was placed on a hard-floor surface with a hard wooden platform placed under it [12] and with a large enough platform to support the individual being weight. The subject was asked to remove shoes, heavy outer clothing and step on scale platform facing away from scale read out, with both feet on platform, and arms hanging naturally at the side. The subject was asked to look directly ahead. The weight was read to the nearest 0.1 (1/10) kilogram [13]. The height was measured using the JM.JIEMEL, 5mx16FT, Jm-8006 measure tape. The tape was wall mounted and extendable. The simple compact design range was calibrated in 0-200 cm graduations: The subject was asked to remove shoes, heavy outer clothes, hair ornaments, and stand with his/her back to the height rule. The back of the head, buttocks, calves and heels were touching in the upright position, with feet together, looking straight ahead [14] and standing upright with the head in Frankfort plane. The head piece was used to lower the hair and press it flat onto the scalp. A mark was placed on the wall, then a tape was installed vertically flat against the wall, place measurement base on the ground, stretch metal band until its scale indicated marked position on the wall to record the height [12]. Weight and height were measured in rotational order, as follows: 1st height, weight, 2nd height. If the difference between two height measurements was greater than one inch, the subject was re-measured [15] to ensure accuracy.

Overweight and obesity were assessed by using a Body Mass Index (BMI) calculation program. BMI is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults [1]. According to Centers for Diseases Control and Prevention a Body-Mass-Index (BMI) is defined in categories as shown in the (Table 1) below [16].

Data was analyzed using (SPSS) for windows version 16.0.

Table 1: Standard weight status categories associated with (BMI) ranges for adults.

Body Mass Index (BMI)	Below 18.5	18.5-24.9	25.0-29.9	30.0 and Above
Weight Status	Underweight	Normal	Overweight	Obese

Analysis was indicated both Univariate and Bivariate analysis [17]. Univariate analysis was carried out to describe a single variable, such as socio-demographic factors; gender, age, marital status, educational level, occupational level, monthly income, and exercise. Bivariate analysis was used on two variables to determine relationship between them, such as prevalence of overweight and obesity in relation to socio-demographic factors. Data was presented in percentages [18] in (Tables 2,3,4) below. Chi-square test was used to compare categorical variables and a value of $p < 0.005$ was used to cut-off level for statistical significance [11]. Prevalence of overweight and obesity, as indicated by BMI values, were calculated as weight in kilograms over height in meters squared (weight in Kg/ height in metres²) [16]. The study was approved by an ethical clearance from Institutional Review Board of El Neelain University, agreement from Alsakania Town Popular Committee and informed written consent from the entire participants.

Results and Discussion

Overweight and obesity continue to be highly prevalent, especially in some racial and ethnic minority groups, as well as in those with lower incomes and less education [2]. The study sample is comprised of 177 (51.9%) female and 164 (48.1%) male, with a female to male ratio of 1.1:1. Overall the mean age of subjects was 43.67 + (SD10.508 years), with their ages between 25 and 64 years. The education level of subjects varied from illiterate (6.5%), primary or basic education (22.3%), university and above (27.2%) to (44.0%) secondary education level. Housewife had a higher proportion of occupation 33.7%) than others an occupations, lower proportions were found among students and farmers. Married subjects accounted for 87.3% of the total sample; the remainer of subjects were single, widowed or divorced. Income of subjects ranged from no income, low, and moderate incomes (35.8%) to high income (14.4%) with mean monthly income of 716.28 + (SD 580.95/ Sudanese pounds) among subjects (Table 2).

Prevalence of overweight was (31.70%) and obesity was (9.40%) among the study population (Figure 1). In every region of the world obesity doubled between 1980 and 2008, today half a billion people (12% of the world's population) are considered obese. The World Health Organization (WHO) statistics 2012 reported that the highest obesity levels in the World Health Organization (WHO) region of the Americas (26% of adults), and the lowest in the World Health Organization (WHO) South-East Asia Region (3% obese) [19].

This study found prevalence of overweight and obesity were lower than that prevalence found by the study by Abdalla & Nafeisa (2016) in the urban community in Jabra area, Khartoum State found overweight and obesity (33.7% and 25.6%), respectively [20].

Table 2: Socio-demographic characteristics of study population.

Characteristics		Frequency	Percentage
Gender	Male	164	48.1
	Female	177	51.9
	Total	341	100.0
Age groups in years	25-34	80	23.5
	35-44	80	23.5
	45-54	122	35.7
	55-64years	59	17.3
	Total	341	100.0
Educational level	Illiterate	22	6.5
	Primary / basic school	76	22.3
	Secondary school	150	44.0
	University/post University	93	27.2
	Total	341	100.0
Current occupation	Farmer	6	1.8
	Employed	95	27.9
	Unemployed	22	6.4
	Laborer	31	9.1
	Retired	8	2.3
	House wife	115	33.7
	Student	7	2.1
	Teacher	39	11.4
	Other	18	5.3
	Total	341	100.0
Marital status	Married	298	87.3
	Single	32	9.4
	Widowed	7	2.1
	Divorced	4	1.2
	Total	341	100.0
Monthly income	No income	153	44.8
	Low income	17	5.0
	Moderate income	122	35.8
	High income	49	14.4
	Total	341	100.0
Exercise	yes	79	23.2
	No	262	76.8
	Total	341	100.0

Female: Male ratio 1.1:1. , Mean age 43.67 + (SD10.508 years), mean monthly income 716.28 + (SD 580.95/ SP)
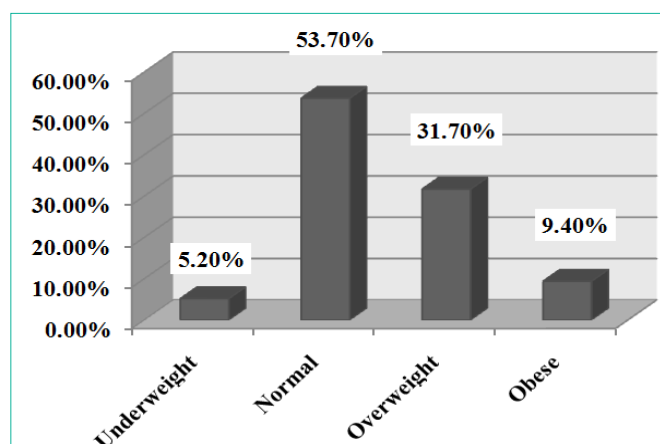

Figure 1: Prevalence of overweight and obesity among study population (n=341).

Table 3: Factors affecting Body Mass Index (BMI) in relation to socio-demographic characteristics (non-modifiable risk factors) of study population (n=341).

Factors affecting Body Mass Index		Body Mass Index (Weight status)				Total	P-value
		Underweight	Normal	Overweight	Obese		
Gender	Male	0.6%	29.9%	15.8%	1.8%	48.1%	.000
	Female	4.8%	24.8%	15.5%	6.9%	51.9%	
Age groups	25-34year	2.6%	16.1%	3.2%	1.5%	23.5%	.001
	35-44 year	1.2%	12.9%	7.3%	2.1%	23.5%	
	45-54 year	0.9%	17.0%	14.4%	3.5%	35.8%	
	55-64 year	0.6%	7.6%	6.7%	2.3%	17.3%	

Table 4: Factors affecting Body Mass Index (BMI) in relation to socio-demographic characteristics (modifiable risk factors) of study population (n=341).

Factors affecting Body Mass Index		Body Mass Index (Weight status)				Total	P-value
		Underweight	Normal	Overweight	Obese		
Educational level	Illiterate	0.3%	3.2%	2.6%	0.3%	6.5%	.221
	Primary/basic	0.9%	11.1%	7.3%	2.9%	22.3%	
	Secondary	1.8%	22.3%	16.1%	3.8%	44.0%	
	University/post University	2.3%	17.0%	5.6%	2.3%	27.3%	
Occupation	Farmer	0.0%	0.9%	0.6%	0.3%	1.8%	.008
	Employed	0.3%	16.7%	8.2%	2.6%	27.9%	
	Unemployed	1.5%	4.1%	0.6%	0.3%	6.5%	
	Laborer	0.9%	5.6%	2.6%	0.0%	9.1%	
	Retired	0.3%	0.6%	0.6%	0.9%	2.3%	
	House wife	1.2%	15.8%	12.9%	3.8%	33.7%	
	Student	0.3%	1.2%	0.3%	0.3%	2.1%	
	Teacher	0.9%	6.2%	3.5%	0.9%	11.4%	
	Other	0.0%	2.6%	2.3%	0.3%	5.3%	
Marital status	Married	2.6%	46.3%	29.9%	8.5%	87.4%	.000
	Single	2.3%	6.2%	0.6%	0.3%	9.4%	
	Widowed	0.3%	0.6%	0.9%	0.3%	2.1%	
	Divorced	0.0%	0.6%	0.3%	0.3%	1.2%	
Monthly income	No income	3.5%	22.3%	4.4%	5.9%	44.9%	.081
	Low income	0.6%	3.2%	0.9%	0.3%	5.0%	
	Moderate income	1.2%	19.6%	13.2%	1.8%	35.8%	
	High income	0.0%	8.5%	13.2%	1.5%	14.4%	
Exercise level	Low exercise	2.6%	47.4%	20.5%	5.1%	2.6%	.242
	Ideal exercise	1.3%	9.0%	10.3%	3.8%	24.4%	

Another study in Karari locality Khartoum state Sudan found about 36.4% overweight or 14.5% obese [21]. The study also documented a lower prevalence of obesity, than previously documented in a study in Saudi Arabia (28.7%) [22], and higher compared to a study in Joba south Sudan among University staff where about 10.2% were overweight and 4.1% were obese [23]. This study reported a prevalence of overweight similar for both men and women at about 16% with a significance level of p: = 0.000. Women had more prevalence of obesity (6.9%). This result was agree with study done in Saudi Arabia [22] found women more obese than men (33.5% and 24.1%), respectively. The prevalence of obesity in this study was lower than the prevalence reported by a previous study in western Turkey, which reported 23.6% prevalence of obesity; with

14.6% among males and 31.9% among females [24]. In all parts of the world, women are more obese than men; this puts women at greater risk of diabetes, cardiovascular disease and cancers [19].

Some socio-demographic factors; non-modifiable and modifiable risk factors had significant effects on overweight and obesity (Tables 3 and 4). High prevalence of overweight and obesity were significantly (p: value < 0.005) found among people in age group 45-54 were 14.4% and 3.5%, respectively (Table 3). The sharp increase in weight was in ages 45-54, and then after age 54 the weight decreased. I think the age processing is a main factor of this decline. Education level was found to be insignificant with about 16.1% of subjects having a secondary education were considered to be overweight, while 3.8%

were obese. Overweight and obesity in relation to current occupation were insignificant among housewife women.

Approximately, thirteen percent of housewives were overweight and 3.8% obese, 8.2% of employed subjects were overweight, and a low prevalence of overweight and obesity found among other occupations subjects. Approximately, 30% of the married population was overweight, while 8.5% was obese. This result was highly significance (p: < 0.005). Also the prevalence of overweight among population with moderate and high income was found to be high and insignificant at 13.2% (p: > 0.005). A highly insignificant prevalence of overweight and obesity were found among people with low exercise level (20.5%, 5.1%) respectively (Table 4). Only 23.2% of the sample population was exercising and 76.8% were physically inactive (Table 2). This finding disagrees with the urban study finding conducted in Karari Locality, Khartoum State Sudan (2014), which found 56% of subjects were physically active [21].

Equations and Formula

Determination of Sample size

n = N/ 1+N (D2)

n: is the desirable sample size

N: is the population size (universe).

D: is the degree of accuracy desired (or the accepted margin of error and is usually set to 0.05.

n = 2170/1+2170 (0.05x0.05) = 338 participants

Limitations

The study ignored some important risk factors of overweight and obesity such as dietary factors.

Conclusion

The findings provide important information on prevalence of overweight and obesity and confirm its increasing rates in a rural Sudan community. Sociodemographic factors were positively correlated with overweight and obesity. The high significance prevalence of overweight and obesity was found among people in age group from 45-54 years, and married population. While higher insignificant prevalence was found among subjects with secondary education level, housewives, moderate and high income and low exercise level.

Recommendations

The study findings recommend that, health education should be stressed to improve population knowledge about overweight and obesity and its burden. No programs available in the Sudan to control overweight and obesity, most of the strategies directed towards underweight and malnutrition. So improvement of awareness and early prevention among communities may reduce risk to develop overweight and obesity. Also, the importance of changing life-style habits of populations by means of educational programs should be a part of health programs will provide by nurses and all others health providers to encourage life style modification is highly recommended.

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