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Overweight and obesity prevalence and its predictors in a general population: A community-based study in Kerman, Iran (Kerman coronary artery diseases risk factors studies)

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Original Article

Abstract,

BACKGROUND: The aim of this study was to present age-sex standardized prevalence of overweight and obesity as well as central obesity and its associated variables in an adult population of Iran.

METHODS: Around 5900 adult individuals aged 15-75 years enrolled to the study from 2009 to 2011 applying randomized cluster household survey in Kerman, southeastern of Iran. Overweight was defined as body mass index (BMI) 25-29.9 kg/m², obesity was considered as BMI ≥ 30 kg/m², and central obesity was regarded as waist circumference (WC) > 88 cm for women and 102 cm for men.

RESULTS: The overall age-sex standardized prevalence of overweight, obesity and central obesity was 29.6% (29.5% men, 29.7% women), 13.0% (9.3% men, 16.9% women) and 14.4% (7.5% men, 21.5% women), respectively. "Overweight/obesity" increased by age, [adjusted odds ratio (AOR): 7.9 95% confidence interval (CI): 5.8, 10.7)] for 65-75 years old, 11.7 (95% CI: 9, 15.3) for 55-65 years old, 10.1 (95% CI: 7.8, 13) for 45-54 years old compared with the first age group), female gender [AOR: 1.5 (1.3, 1.8); P < 0.001], higher education (AOR > 1.5 compared with illiterate individuals; P < 0.001), and low physical activity [AOR: 1.4 (95% CI: 1.1, 1.8); P = 0.006] and decreased by smoking [AOR: 0.4 (95% CI: 0.3, 0.6); P < 0.001] and opium using [AOR: 0.5 (95% CI: 0.4, 0.7); P < 0.001]. Female gender [AOR: 4.1 (95% CI: 3.3, 5); P < 0.001], advanced (AOR > 7 for age groups ≥ 35 years old; P < 0.001) positively, while smoking [AOR: 0.6 (0.4, 0.8); P = 0.004] negatively were the most significant predictors for abnormal WC.

CONCLUSION: Our data reveal that overweight and obesity affected almost half of the adult population (43.0%), and central obesity was around 15.0%, which reflect the high prevalence of this abnormality. In addition, several demographic, social and lifestyle factors were associated with obesity. Appropriate interventions and strategies with a concentration of the general population are needed to deal with its potential subsequent consequences.

Keywords: Body Mass Index; Overweight; Obesity; Central Obesity; Risk Factors, Iran

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Introduction

Abnormal body mass index (BMI) which can be in the forms of overweight and obesity has been one of the most health challenges worldwide. Recent studies have also indicated the increasing trend of overweight and obesity in both developed and developing countries.[1,2] There is no doubt that obesity has been associated with plenty of diseases such as type 2 diabetes mellitus (DM), cardiovascular diseases, hypertension and cancers.[3]

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According to the World Health Organization (WHO) report in 2005, approximately 1.6 billion people suffered from overweight, and around 400 million people were clinically obese, although it is expected to increase these figures to 2.3 billion people and 700 million people, respectively.[4-9]

The problem of obesity involved Asian countries and the Persian Gulf countries, especially Iran, and it becomes one of the top priorities in such countries.[1,5,6] WHO reported the prevalence of obesity and overweight in the Middle East countries at 54.2% among women and 31.4% in men which annually resulted in 150000 deaths.[1] WHO in 2002 also reported that about 70.0% of all mortalities (268000 cases) in Iran resulted from chronic diseases, of which overweight and obesity were the most significant reasons. The prevalence of overweight among Iranian men and women by WHO reports were 54.0 and 70.0%, respectively, which projected to raise this prevalence to 74.0% among women, but constant among men during the period of 2005-2015.[7] Studies in Iran have also proven the projections and numerous researches have implied the upward trend of obesity prevalence[8-10] as well as metabolic syndrome[11] in all age groups of older than 15 years old.

Iran, with plentiful differences of sociocultural issues in all provinces across the country, and due to considerable variations in both lifestyle and dietary/nutritional culture in recent years has observed a varied pattern of overweight and obesity prevalence. Several studies regarding obesity and overweight have been performed across the country so far, the last and recent one is a systematic review[12] which compiled different study related to overweight and obesity in Iran. However, Kerman, Iran, lacks from a population-based study with appropriate sample size to show its condition. The current study is a part of the first phase of a population-based research named Kerman coronary artery diseases risk factors studies (KERCADRs) in Kerman to determine the prevalence of overweight, obesity, and central obesity in an adult population aged 15-75 years old.

Materials and Methods

The first phase of the study known as KERCADRs, which is a population-based cohort study, was initiated from 2009 to 2011 among 5900 adult subjects aged 15-75 years old in Kerman. Using a non-proportional to size one-stage cluster sampling household survey, the study samples were recruited. The methodology of the KERCADRs has been published elsewhere in detail.[13] The study protocol of the study was approved by the Ethics Committee of the Kerman University of Medical Sciences (Ethic code 88/110KA). An informed consent was to participate was given by all subjects' prior participation in the study.

Interview and measurements

Interviews were conducted by trained interviewers. In addition, a specialist physician evaluated the study participants for various coronary artery diseases (CAD) risk factors using a standard and structural questionnaire. The data were consisted of socio-demographic variables such as age and sex, and the highest level of achieved education [in three categories: illiterate (no attended school), primary to high school (grades 1-8), and above high school (> grade 8)], the status of the participants in terms of cigarette smoking (two categories: currently smoking cigarette/non-current or past smoker), and their status regarding opium use (three categories: non-current or past daily user/occasional as using for recreational purposes/and currently consuming opium). The level of depression and anxiety was assessed using Beck questionnaire. Global Physical Activity Questionnaire (GPAQ) and Metabolic Equivalents (METs) were used to evaluate the level of physical activity in the present study. Hence, the total metabolic equivalent time (per minute) was computed for the status of the activity in work, transport and recreation. Therefore, it was categorized into three levels of low, moderate and high levels.[14] Likewise, the more detailed explanations of the selected variables utilized in the current study have been already published.[13]

Definition of overweight and obesity

In the process of interviewing and conducting clinical examination, three anthropometric measurements of height, weight, and waist circumference (WC) were also gauged by a standard method. Using a tape measure, through measuring of waist diameter of the level of the midpoint between iliac crest and lower border of tenth rib, WC was obtained. WC more than 88 cm for women and 102 cm for men were considered as an inappropriate measurement. BMI was calculated by dividing weight in kg to height in meter squared (kg/m^2), which was according to the WHO standard recommended method.[15] Based on the WHO definition, BMI was classified into three categories of normal (BMI 18.5-24.9 kg/m^2), overweight (BMI 25-29.9 kg/m^2), and obese (BMI $\geq$ 30 kg/m^2).[16]

Data management and all statistical analyses

were conducted using STATA (version 12, StataCorp. 2011 College Station, TX: Stata Corp LP.). Survey data analysis package was used for the analysis of the data collected from this study. Then, census statistics of Kerman population in 2006 was utilized for age and sex direct standardizations.[17] We reported weighted prevalence[18] for overweight, obesity and central obesity. Data were reported as relative frequencies along with 95% confidence interval (CI). A univariate and multiple logistic regression models were performed to determine the potential predictors of overweight and obesity, and central obesity and then, crude and adjusted odds ratio (AOR) were presented. The prevalence of co-morbidities including type 2 DM, hypertension, hypercholesterolemia, hypertriglyceridemia, levels of depression and anxiety were also reported. $P < 0.050$ was considered as statistically significant.

Results

Overweight, obesity and central obesity

In total, the age- and sex-standardized the prevalence of overweight and obesity was 29.6% (men 29.5% vs. women 29.7%; $P < 0.001$) and 13.0% (men 9.3% vs. women 16.9%; $P < 0.001$), respectively, whereas the prevalence of central obesity was 14.4% (men 7.5% vs. 21.5%; $P < 0.001$) (Table 1). Overall, a mean BMI was 25.8 kg/m^2 (men 24.8 vs. women 26.7 kg/m^2) and overall mean WC was 85.5 cm (men 87.4 vs. women 83.4 cm) (Table 2).

The overweight prevalence constantly increased from 14.9% in young subjects (aged 15-24 years) to its highest level at 43.4% among group of 55-64 years old. Obesity among the first age group was 5.6% and significantly increased by advanced age (24.0% for 45-54, 23.0% for 55-64 and 17.6% for 65-75 years old; $P < 0.001$). We also found that there was a significant increase in the prevalence of central obesity by advanced age; from 3.6% among subjects aged 15-24 years to 31.9 and 30.9% among elderly adults aged 55-64 and 65-74 years old ($P < 0.001$), respectively (Table 1). Mean BMI from 22 kg/m^2 among 15-24 years old reached to its maximum at 27.3 among 45-54 years old and decreased to 25.9 among the highest group of age. Mean of WC for the first age group was 73.7 cm and reached to 90.7 cm among 55-64 years old (Table 2).

Around 40.0% of people in the lowest level of education had overweight, which went down to 28.1% among people in the moderate level of education (primary and high school), while it was vice versa for obesity prevalence; 5.1% for illiterate people and 13.9% for the second category of education. The prevalence of central obesity ranged from 11.8 to 14.8% in different education groups. Cigarette smoker had a lower prevalence of overweight while slightly higher prevalence of obesity. Central obesity was almost similar among smokers (15.4%) and non-smokers (14.9%). In regard to those who were addicted to opium, in comparison with occasional users, people with no using and also dependent users had more prevalence of overweight (18.0 vs. 30.2% and 26.4%) and obesity (9.1 vs. 13.5% and 14.4%). In terms of central obesity, dependent users had a higher prevalence. Overweight was observed among 26.5% of depressed people and 29.2% of those with anxiety signs, whereas it was 12.4 and 13.2% for obesity status and 14.9 and 14.7% for the status of central obesity. People with higher physical activity had lower overweight, obesity and central obesity (Table 1).

Predictors of abnormal BMI and WC (Table 3)

Multiple logistic regression analysis showed that the odds of abnormal BMI (both overweight and obesity) significantly increased in women [AOR 1.5 (95% CI: 1.3, 1.8)], advanced age [OR ranged from 3.2 (95% CI: 2.5, 4.1) to 11.7 (95% CI: 9, 15.3) vs. 1 for 15-24 years old as reference group], higher education level [AOR 1.6 (95% CI: 1.3, 2) for the second level and 1.8 (95% CI: 1.4, 2.3) for the third level) and low physical activity (AOR 1.4 (95% CI: 1.1, 1.8)], conversely decreased significantly among cigarette smokers [AOR 0.4 (95% CI: 0.3, 0.6)] and dependent opium users [AOR 0.5 (95% CI: 0.4, 0.7)]. These analysis for central obesity revealed that odds of abnormal WC significantly increased in women gender [AOR 4.1 (95% CI: 3.3, 5)], advanced age groups [AOR ranged 3.7 (95% CI: 2.3, 6) to 15.7 (95% CI: 9.9, 24.7) vs. the first age group], anxious people [AOR 1.2 (95% CI: 1, 1.5)], while significantly decreased by the status of cigarette smoking [AOR 0.6 (95% CI: 0.4, 0.8)].

Co-morbidities (Table 4)

On the whole, anxiety (75.5% with overweight and 77.2% with obesity) was the most prevalent co-morbidities in the total society, but the lowest one was hypertriglyceridemia (18.9% with overweight and 24.2% with obesity). The range of prevalence of other co-morbidities including hypertension, hypercholesterolemia, and depression with overweight was 30-37%, and for obesity ranged 19-39%. Similar prevalence of co-morbidities with inappropriate WC ranged 28.3 for hypertriglyceridemia to 78.0% for anxiety.

Table 1. The standardized prevalence of obesity (body mass index) and central obesity (waist circumference), community-based cohort study (KERCADR-1st Round, n = 5895) in Kerman

Subgroups	BMI			P	Normal WC	Inappropriate WC	P
	Normal	Overweight	Obese				
Overall	57.4 (55.7, 59.1)	29.6 (28.1, 31.1)	13 (12.0, 14.1)		85.6 (84.6, 86.6)	14.4 (13.4, 15.4)	
Sex							
Men	61.2 (59.9, 62.5)	29.5 (28.3, 30.7)	9.3 (8.6, 10.1)	< 0.001	92.5 (91.8, 93.1)	7.5 (6.9, 8.2)	< 0.001
Women	53.5 (52.4, 54.5)	29.7 (28.7, 30.6)	16.9 (16.1, 17.6)		78.5 (77.7, 79.2)	21.5 (20.8, 22.3)	
Age groups (year)							
15-24	79.4 (78.2, 80.6)	14.9 (13.9, 16.0)	5.6 (5.0, 6.4)	< 0.001	96.4 (95.8, 96.9)	3.6 (3.1, 4.2)	< 0.001
25-34	56.6 (55.8, 57.5)	31.8 (31.1, 32.6)	11.5 (11.0, 12.1)		88.1 (87.5, 88.7)	11.9 (11.3, 12.5)	
35-44	37.8 (37.2, 38.3)	43.5 (42.9, 44.1)	18.7 (18.2, 19.2)		79.4 (79.0, 79.9)	20.6 (20.1, 21.0)	
45-54	35.9 (35.5, 36.3)	40.1 (39.7, 40.5)	24 (23.7, 24.3)		70.4 (70.0, 70.7)	29.6 (29.3, 30.0)	
55-64	33.7 (33.5, 33.9)	43.4 (43.2, 43.6)	23 (22.8, 23.1)		68.1 (67.9, 68.2)	31.9 (31.8, 32.1)	
65-75	42.6 (42.4, 42.7)	39.8 (39.6, 40.0)	17.6 (17.5, 17.8)		69.1 (69.0, 69.3)	30.9 (30.7, 31.0)	
Education							
Illiterate	54.6 (44.0, 64.8)	40.2 (30.2, 51.2)	5.1 (3.8, 6.9)	< 0.001	88.2 (79.7, 93.4)	11.8 (6.6, 20.3)	< 0.001
Primary to high school	58.0 (56.1, 59.9)	28.1 (26.4, 29.9)	13.9 (12.7, 15.3)		85.2 (83.9, 86.3)	14.8 (13.7, 16.1)	
Above high school	51.7 (48.3, 55.2)	36.5 (33.1, 39.9)	11.8 (9.8, 14.1)		86.1 (83.9, 88.1)	13.9 (11.9, 16.1)	
Current cigarette smoker							
No	55.8 (54.0, 57.5)	31.0 (29.4, 32.7)	13.3 (12.2, 14.4)	0.058	85.1 (84.0, 86.2)	14.9 (13.8, 16.0)	< 0.001
Yes	63.6 (55.9, 70.7)	19.5 (13.6, 27.0)	16.9 (10.3, 26.5)		84.6 (76.8, 90.1)	15.4 (9.9, 23.2)	
Opium addiction							
No	56.3 (54.5, 58.1)	30.2 (28.6, 31.9)	13.5 (12.3, 14.7)	0.029	85.3 (84.2, 86.4)	14.7 (13.6, 15.8)	0.590
Occasional user	72.9 (68.4, 77.0)	18.0 (14.9, 21.6)	9.1 (6.3, 12.8)		87.1 (83.1, 90.2)	12.9 (9.8, 16.9)	
Depended user	59.2 (50.8, 67.1)	26.4 (19.9, 34.2)	14.4 (8.9, 22.3)		82.8 (74.5, 88.8)	17.2 (11.2, 25.5)	
Depression							
No	55.9 (53.8, 57.9)	30.9 (29.1, 32.9)	13.1 (11.9, 14.5)	0.064	85.8 (84.6, 87.0)	14.2 (13.0, 15.4)	< 0.001
Yes	61.1 (58.2, 64.0)	26.5 (24.0, 29.2)	12.4 (10.6, 14.4)		85.1 (83.1, 86.8)	14.9 (13.2, 16.9)	
Anxiety							
No	56.3 (52.6, 60.0)	31.3 (28.0, 34.8)	12.4 (10.2, 15.0)	0.180	86.2 (83.5, 88.5)	13.8 (11.5, 16.5)	0.001
Yes	57.7 (55.7, 59.6)	29.2 (27.4, 30.9)	13.2 (12.0, 14.5)		85.3 (84.1, 86.4)	14.7 (13.6, 15.9)	
Physical activity							
Low	53.9 (51.1, 56.8)	31.0 (28.5, 33.7)	15.0 (13.2, 17.1)	< 0.001	84.0 (82.3, 85.6)	16.0 (14.4, 17.7)	< 0.001
Moderate	58.3 (55.8, 60.8)	30.0 (27.8, 32.4)	11.6 (10.2, 13.2)		86.7 (85.3, 87.9)	13.3 (12.1, 14.7)	
High	62.2 (56.9, 67.3)	26.5 (22.2, 31.3)	11.2 (8.0, 15.5)		88.8 (84.9, 91.7)	11.2 (8.3, 15.1)	

Numbers are reported as % and [95% CI (confidence interval)]; Normal: BMI < 25, Overweight: 25 ≤ BMI < 30, and Obese: BMI ≥ 30. Central obesity was defined as > 88 cm for women and > 102 cm for men. KERCADR: Kerman coronary artery diseases risk factors; BMI: Body mass index; WC: Waist circumference

Table 2. The mean body mass index and waist circumference according to sex and age groups, community-based cohort study (KERCADR-1st Round, n = 5895) in Kerman

Subgroups	Mean BMI	Mean WC
Overall	25.8 (25.7, 26.0)	85.5 (85.1, 85.9)
Sex		
Men	24.8 (24.6, 25.0)	87.4 (86.8, 87.9)
Women	26.7 (26.5, 26.9)	83.9 (83.4, 84.4)
Age groups (year)		
15-24	22.0 (21.6, 22.4)	73.7 (72.8, 74.6)
25-34	24.7 (24.3, 25.0)	81.0 (80.1, 82.0)
35-44	26.6 (26.3, 27.0)	85.7 (84.9, 86.5)
45-54	27.3 (27.0, 27.6)	88.5 (87.7, 89.2)
55-64	26.9 (26.6, 27.2)	90.7 (89.9, 91.5)
65-75	25.9 (25.5, 26.3)	89.9 (88.8, 91.0)

BMI: Body mass index; WC: Waist circumference; KERCADR: Kerman coronary artery diseases risk factors

Table 3. Crude and adjusted odds ratio for different associated factors of obesity and central obesity, community-based cohort study (KERCADR-1st Round, n = 5895) in Kerman

Subgroups	Overweight and obesity		Adjusted P	Central obesity		Adjusted P
	Crude OR	AOR		Crude OR	AOR	
Sex						
Men	1	-		1	-	
Women	1.9 (1.7, 2.1)	1.5 (1.3, 1.8)	< 0.001	4.6 (3.8, 5.4)	4.1 (3.3, 5.0)	< 0.001
Age groups (year)						
15-24	1	-		1	-	
25-34	3.0 (2.3, 3.8)	3.2 (2.5, 4.1)	< 0.001	3.6 (2.3, 5.7)	3.7 (2.3, 6.0)	< 0.001
35-44	6.9 (5.4, 8.8)	7.9 (6.1, 10.2)	< 0.001	7.6 (4.9, 11.8)	7.6 (4.8, 12.0)	< 0.001
45-54	7.7 (6.0, 9.8)	10.1 (7.8, 13)	< 0.001	12.8 (8.3, 19.7)	13.9 (8.9, 21.7)	< 0.001
55-64	7.8 (6.1, 10.1)	11.7 (9.0, 15.3)	< 0.001	12.7 (8.2, 19.6)	15.7 (9.9, 24.7)	< 0.001
65-75	5.1 (3.8, 6.7)	7.9 (5.8, 10.7)	< 0.001	10.8 (6.8, 17.1)	14.4 (8.8, 23.5)	< 0.001
Education						
Illiterate	1	-		1	-	
Primary to high school	1 (0.9, 1.2)	1.6 (1.3, 2.0)	< 0.001	0.5 (0.4, 0.6)	1.0 (0.8, 1.3)	0.990
Above high school	1 (0.8, 1.2)	1.8 (1.4, 2.3)	< 0.001	0.4 (0.3, 0.5)	1.0 (0.7, 1.4)	0.980
Current cigarette smoker						
No	1	-		1	-	
Yes	0.4 (0.4, 0.5)	0.4 (0.3, 0.6)	< 0.001	0.3 (0.2, 0.4)	0.6 (0.4, 0.8)	0.004
Opium addiction						
No	1	-		1	-	
Occasional user	0.9 (0.7, 1.2)	0.9 (0.7, 1.2)	0.390	0.7 (0.5, 0.9)	1.0 (0.7, 1.4)	0.880
Depended user	0.5 (0.4, 0.6)	0.5 (0.4, 0.7)	< 0.001	0.6 (0.4, 0.8)	0.7 (0.5, 1.0)	0.058
Depression						
No	1	-		1	-	
Yes	1.1 (0.9, 1.2)	0.9 (0.8, 1.1)	0.290	1.7 (1.4, 1.9)	1.0 (0.9, 1.3)	0.560
Anxiety						
No	1	-		1	-	
Yes	1.1 (0.9, 1.2)	1.0 (0.9, 1.2)	0.630	1.7 (1.4, 2.0)	1.2 (1.0, 1.5)	0.091
Physical activity						
High	1	-		1	-	
Moderate	1.8 (1.4, 2.2)	1.1 (0.9, 1.5)	0.270	2.5 (1.8, 3.4)	1.2 (0.8, 1.7)	0.420
Low	2 (1.6, 2.5)	1.4 (1.1, 1.8)	0.006	2.8 (2.0, 3.9)	1.4 (1.01, 2.1)	0.073

OR: Odds ratio; AOR: Adjusted odds ratio; KERCADR: Kerman coronary artery diseases risk factors
Numbers are reported as OR and [95% CI (confidence interval)]

Sex, age, physical inactivity on obesity

Overweight and obesity among male subjects were slightly higher before the age of 25 years, but it became similar in the age group of 25-29 for both sexes. From this age point, the differences between males and females became more evident so that the prevalence of obesity among women grew higher than men. The prevalence trend was constantly upward in both sexes until the age of 59 years. The trend decreased in both sexes after thus age, while it was still more prevalent among women. However, the pattern of physical inactivity prevalence was different, because the prevalence among females was higher in the first age groups; afterward it became similar with a stable trend, although it was partially greater among men. After the age of 59 years, by decreasing trend of overweight and obesity in both sexes, the prevalence of physical inactivity among females increased and among males decreased (Figure 1).

The prevalence of central obesity among females was remarkably higher in all age groups. There was an increasing pattern of central obesity prevalence among females and it started to become rising from the age group of 25 years old (around 15.0%) and with an upward trend reached to its highest prevalence in the last age group; 70-74 years old (around 60.0%), but there was a stabilized trend for male subjects ranged from 3.2 to 15.4%. while the prevalence of physical inactivity from the first age groups by 49 years old was greater than central obesity prevalence. Since 49 years old, the prevalence of central obesity and physical inactivity with a similar trend simultaneously increased (Figure 2).

Table 4. The prevalence of different co-morbidities with obesity and central obesity, community-based cohort study (KERCADR-1st Round, n = 5895) in Kerman

Co-morbidities	BMI			Normal WC*	Inappropriate WC
	Normal	Overweight	Obese		
DM	7.0 (6.0, 8.2)	10.2 (9.0, 11.7)	11.6 (9.4, 14.1)	7.7 (7.0, 8.6)	12.8 (10.0, 16.3)
BP	22.6 (19.9, 25.6)	37.4 (31.6, 43.6)	19.7 (18.5, 20.9)	16.5 (15.4, 17.7)	40.9 (32.8, 49.6)
Hypercholesterolemia	23.9 (22.1, 25.8)	37.2 (33.7, 40.8)	39.4 (33.3, 46.0)	28.1 (26.5, 29.6)	33.8 (28.4, 39.7)
Hypertriglyceridemia	9.4 (8.1, 10.8)	18.9 (16.3, 21.7)	24.2 (19.0, 30.2)	12.5 (11.4, 13.6)	28.3 (20.8, 37.2)
Depression	36.2 (33.9, 38.6)	30.5 (27.1, 34.0)	32.2 (26.3, 38.7)	34.3 (32.5, 36.3)	35.6 (27.3, 44.8)
Anxiety	77.4 (75.3, 79.4)	75.5 (71.8, 78.9)	77.2 (70.8, 82.6)	76.8 (75.1, 78.5)	78.0 (70.6, 83.9)

Numbers are reported as % and [95% CI (confidence interval)], Normal: BMI < 25 kg/m^2, Overweight: BMI 25-29.9 kg/m^2, Obese: BMI ≥ 30 kg/m^2. *Normal WC: WC < 88 cm for women and 102 cm for men; Inappropriate WC: WC > 88 cm for women and 102 cm for men.

BMI: Body mass index; WC: Waist circumference; DM: Diabetes mellitus; BP: Blood pressure; KERCADR: Kerman coronary artery diseases risk factors

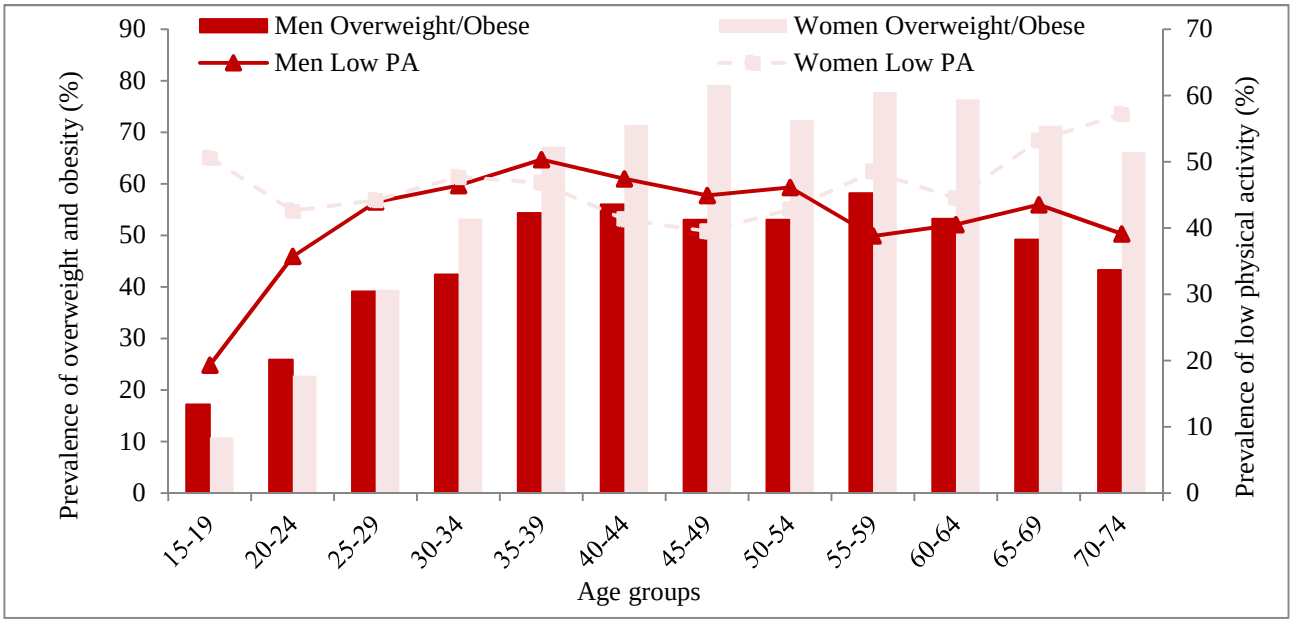

Figure 1. Prevalence of obesity (body mass index) and low physical activity by age group and sex in Kerman, 2009-2011 community-based cohort study [KERCADR (Kerman coronary artery diseases risk factors)-1st Round, n = 5895]

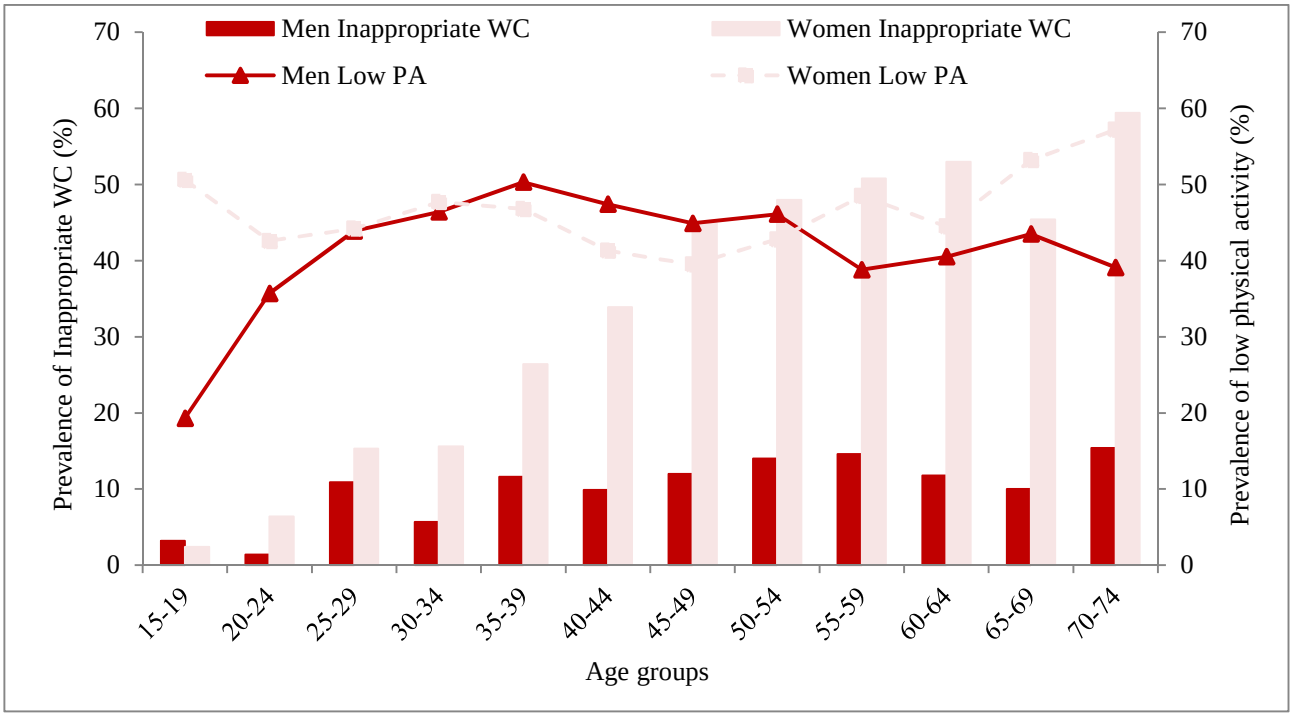

Figure 2. Prevalence of central obesity (waist circumference) and low physical activity by age group and sex in Kerman, 2009-2011 community-based cohort study [KERCADR (Kerman coronary artery diseases risk factors)-1st Round, n = 5895]
WC: Waist circumference

Discussion

Our data showed that prevalence of overweight and obesity was 43.0%, and central obesity was around 15.0%. In addition, several demographic, social and lifestyle factors including gender, age, anxiety, physical inactivity and cigarette smoking and opium use were associated positively or negatively with obesity. In a recent systematic review, it has been shown that prevalence of overweight in sub-national studies among adults ranged 12.8-76.4% and obesity ranged 2.4-35.4%, while for the national studies it was from 27.0 to 38.5% for overweight and from 12.6 to 25.9% for obesity prevalence.[12]

We could show a notable association between the two baseline variables of female gender and advanced age and occurring overweight and obesity. The authors believe that the main reasons for a higher rate of obesity in these baseline subgroups include improper lifestyle such as unhealthy dietary habit, and tend to inactivity style. Interestingly, the patterning of obesity worldwide is gendered and has been showed to be greater in women compared with men.[19] As of 2008 the WHO estimates that at least 500 million adults (< 10%) are obese, with higher rates among women than men.[20] Most of the studies in Iran have shown the greater prevalence of overweight and obesity among women,[21-23] which physical inactivity can be introduced as one the main reason of this discrepancy between men and women.[24]

The rate of obesity also increases with age at least up to 50 or 60 years old.[20] According to a report published, 26.0% of women and 19.0% of men were classed as inactive and 46.0% of men and 37.0% of women reported walking of at least moderate intensity for 10 minutes or more on at least 1 day in the last 4 weeks. In this regard and to link dietary habit to the cause of increasing trend of obesity, it can be noted that different contextual factors drive gender differences in food consumption in our society so men often report consuming healthier foods, while women consume more fat-rich foods and fast foods than men.[25]

Similar reports to our results have been also in previous studies on Iranian population. In a study by Janghorbani et al.,[26] the age-adjusted prevalence of overweight or obesity was 42.8% in men and 57.0% in women; 11.1% of men and 25.2% of women were obese while 6.3% of men and 5.2% of women were underweight. In this regard, advanced age, low physical activity, low educational attainment, marriage, and residence in urban areas were strongly associated with obesity. In another

study by Bahrami et al.[27] The age-adjusted prevalence rates of overweight and obesity in this Iranian population were 62.2 and 28.0%, respectively. Both overweight and obesity were a more common in women than men. Ghadiri-Anari et al.[28] also found that in both genders, the rate of obesity and overweight raised by increasing of age up to 50 years old. Overall, the prevalence of obesity was higher in women compared with men in all ages. In total, an unhealthy diet and sedentary lifestyles are concerns for all adults especially for women.

Our study could clearly show a direct link between obesity and lower educational level. In this regard, those men and women with less than a college degree were more likely to be obese than those with a lower educational degree. It may be well explained by this fact that those with higher socioeconomic level have more appropriate lifestyle regarding daily activities, and dietary behaviors as well as less tending to smoking and drinking behaviors. In fact, higher educational level keys to better health. Cutler found that those with more years of schooling are less likely to smoke, drink a lot, to be overweight or obese or to use illegal drugs. Similarly, the better educated are more likely to exercise.[29] A review by Grossman and Kaestner concluded that years of formal schooling is the most important correlate of good health.[30]

A cross-sectional estimate from a study of twins conducted by Webbink et al.[31] also confirms the negative relationship between education and the probability of being overweight. Similar observations could be found in Iranian reports. In a study by Veghari et al.,[32] the prevalence of obesity was seen in 24.0% of subjects and significantly was seen in 3.1 and 14.1% of uneducated people more than in 1-9 years schooling and in high school or college-educated people, respectively with a significant difference. After adjusted for location area, gender, age, and economic stats, the risk of obesity was 2.044 in uneducated people compared to high school or college-educated subjects. Moreover, in another study carried out by Veghari et al.[33] an inverse association between educational level and prevalence of central obesity was revealed; 50.1% for uneducated people, 35.1% for individuals with 1-9 years of schooling and 19.0% for those educated higher than high school. In addition, compared with educated participants, OR of having an abnormal central obesity among uneducated people was 4.214 and among individuals with 1-9 years of schooling was 2.2. Overall, education can play a role in tackling overweight and obesity due to its strong link to better lifestyle and nutritional habits.

Similar to previous reports, both overweight and obesity are less frequent in smokers than in non-smokers. Smoking has a significant effect on an individual's weight. Those who quit smoking gain an average of 4.4 kg for men and 5.0 kg for women over 10 years.[34] Nicotine acutely increases energy expenditure[35] and could reduce appetite, which likely explains why smokers tend to have lower body weight than do nonsmokers and why smoking cessation is frequently followed by weight gain.[35,36] Similarly, in our survey, opium use led to decreasing body weight. In some experimental studies, the use of opioids such as morphine lower food intake.[37] This association can be mediated by activation of some opioid receptors affecting overeating.[38]

Overall, overweight and obesity are major public problems in Iran with a significant heterogeneity between the genders (more in women than in men), age subgroups (more in the elderly than in the younger), education levels (more in lower education levels), and smoking habit (less in smokers and opium users). In this regard, the effect of each of these baseline parameters can be mediated by poorer lifestyle and nutritional behaviors.

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Conflict of Interests

Authors have no conflict of interests.

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