ORGINAL ARTICLE

Prevalence and Incidence of Obesity, Overweight & Abdominal Obesity in Adults: A 5-year Longitudinal Study in Ahvaz (2009-2014)

Azam Erfanifar[1], Seyed Mahmoud Latifi[2*], Hajieh Shahbazian[3], Armaghan Moravej Aleali[4]

1. Endocrinologist, Internal Ward, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
2. PhD in Research (Diabetes Epidemiology) Diabetes Research Center, Health Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
3. Professor of Endocrinology, Director of the Diabetes Research Center, Health Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
4. Diabetes Research Center, Health Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

*Correspondence:
Seyed Mahmoud Latifi, Diabetes Research Center, Health Research Institute, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
Tel: (98) 916 113 3490
Email: sml1381@yahoo.com

Abstract

Objective: The data on the changes in the prevalence of obesity and overweight could help policy makers to make better plans for improving the health status of people; hence, the aim of his study is to evaluate the prevalence and incidence of overweight, obesity and abdominal obesity in Ahvaz during five years.

Materials and Methods: Cohort study was the method of choice in this survey, conducted on 605 people aged over 20 years who were selected among the people covered by health centers in Ahvaz. The participants weight, height, and waist circumferences were measured two times in 2009 and 2014. The incidence and prevalence of obesity, abdominal obesity and overweight were evaluated. The SPSS 22 statistical software was used to analyze the data, and paired T-test to compare the level of changes. The significant level for *P*-value < 0.05.

Results: Among 605 people aged over 20 years, the prevalence of overweight, obesity and abdominal obesity in 2009 and 2014 were respectively: overweight (40% and 38.50%), obesity (26.90% and 27.10%), and abdominal obesity (26.80% and 33. 90%).This prevalence increased from 11.70% to 14.90% in men and from 39.90% to 50.50% in women. The incidence of overweight, obesity and abdominal obesity were respectively 102.50, 22.50 and 76.5 per 1000 person's year in Ahvaz people.

Conclusion: The findings of our study showed that the prevalence of overweight, obesity and abdominal obesity in adult population in Ahvaz is high. Also, the prevalence of obesity and abdominal obesity in women is higher than men; therefore special attention must be paid to this issue in women. Also the age groups 35-64 years are higher risk.

Keywords: Overweight, Obesity, Abdominal obesity, Prevalence, Incidence, Ahvaz

Introduction

Obesity is an important health issue worldwide. Nowadays, overweight and obesity are the fifth major cause of mortality worldwide that lead to 2.6 million deaths per year (1). Obesity globally affects all socio-economic status, all age groups, both

genders, and all ethnicities (2,3). According to the WHO, obesity and overweight are the excessive storage of fat in adipose tissue; fat accumulation is a chronic process which occur due to the positive balance between energy and some environmental factors including low physical activity, western high fat diets, and urbanization (1).

The investigations in the United States of America have shown that" In 2017–2018, the age-adjusted prevalence of obesity in adults was 42.4%, and there were no significant differences between men and women among all adults or by age group"(4).

In 2017, the WHO reported: "in 2016, more than 1.9 billion adults (39%), 18 years and older, were overweight. Of these over 650 million (13%) were obese". Therefore the prevalence of obesity worldwide nearly tripled between 1975 and 2016 (5).

The body mass index (BMI) is the most common and useful tool to evaluate overweight and obesity in adult patients. People with a BMI higher than $25kg/m^2$ are at risk of several diseases. In addition, according to studies, overweight is the fourth most common worldwide risk factor for diseases. "In 2015, the ten largest contributors to global DALYs included (death disability-adjusted life-years) among Level 3 risks were high systolic blood pressure (211·8 million [192·70 to 231·10 million] global DALYs), smoking (148·6 million [134·20 to 163·10 million]), high fasting plasma glucose (143·10 million [125·10 to 163·50 million]), high BMI (120·10 million [83·8 to 158·40 million]) among others (6).

According to a 2011 study in Iran," in adults of 25-65 years old, at the national level, excess BMI was responsible for 39.50% of total deaths that were attributed to 9 BMI paired outcomes (7).

Some researches on the prevalence of overweight and obesity in Iran (different provinces or cities including Ahvaz, a big city in southwest of Iran) have been formerly conducted (8-15). One population-based cross-sectional study was performed via random cluster sampling method in 6 health centers in Ahvaz in 2015. The results showed that the total prevalence of obesity, overweight, and central obesity were 26.50%, 38.70%, and 28.60%, respectively (16).

In regards to the incidence of obesity, the only reported study worldwide is the Framingham study in 2007. Results showed that the incidences of obesity, overweight and stage 2 obesity increased across the decades in both sexes. The incidence of overweight rose from 21.80% (95% confidence interval [CI], 17.60-26.50) in the 1950s to 35.20% (95% CI, 28.6-42.50) in the 1990s; of obesity from 5.80% (95% CI, 4.4-7.6) to 14.80% (95% CI, 12.20-17.90). Overall, incidence rates of overweight increased 2-fold and that of obesity more than 3-fold over 5 decades (17).

It is also worth noting that Prevalence studies show the proportion of cases in the population at a given time rather than rate of occurrence of new cases but incidence study conveys information about the risk of contracting the disease.

The aim of this study is to evaluate the incidence and prevalence of overweight, obesity and abdominal obesity in Ahvaz during a five-year period, from 2009 to 2014.

Materials and Methods

This cohort study was carried out on 605 participants in a study on the prevalence of metabolic syndrome investigated in adults in the city of Ahvaz in 2009(18).

Cross-sectional study of the prevalence of metabolic syndrome in 2009 performed with random cluster sampling method in 6 health center in Ahvaz. In each selected center, 55 households were randomly selected. After obtaining informed consent by volunteers, they were invited to participate in this study.

A questionnaire included: age, sex, marital status, ethnicity, education level, weight, height, body mass index (BMI) [Weigh(kg)/Height(m)2], and waist circumference were measured in each

participant. Anthropometric measurements were taken after removing shoes and wearing a light dress. Weight and height were measured according to the standard program.

Waist circumference was measured at the midpoint between the lowest rib and the upper lateral border of the right iliac crest and hip circumference at the point of maximum hip diameter.

Their weight by Seca scales, height, and waist circumference with meter were measured. Five years later, for the second phase in 2014, participants were contacted for a re-evaluation of overweight and obesity. Finally, a total of 605 participants referred to the health centers and their weight, height, and waist circumference measured again and registered in their profile.

WHO defines overweight and obesity for adults, as follows: overweight is a $29.99 \geq BMI \geq 25$ and obesity is a $BMI \geq 30$(19).

Abdominal obesity (Waist circumference ≥ 102 cm in men and ≥ 88 cm in women) (according to ATP III criteria update 2005) (20). As the data were obtained only for 605 people in both phases, the results were reported only for this group of individuals. SPSS 22 software was used to analyze the collected data.

Qualitative variables were reported in form of frequency and percentage and quantitative variables were reported in form of mean and standard deviation (SD). Paired T-test was used to compare the level of changes. *P*-value< 0.05 was set as the significant level.

Ethical considerations

The study received ethical approval from Jundishapur University of Medical Sciences in Ahvaz and oral consent was also obtained from all individuals before enrolling them into the study. (Ethics Code: IR.AJUMS.REC. 1393.43)

Results

A total of 605 individuals over 20 years of age consisting of 285(47%) men and 320 (53%) women .the mean age of participants was 43.00(5.00) in 2009. Overall, the prevalence of obesity and overweight in all participants in 2009 were 26.90% and 40% and in 2014 were 27.10% and 38.50% respectively.

In 2009 and 2014, the prevalence of overweight was higher in men than women, but the prevalence of obesity in women in 2009 and 2014 was higher than men. In terms of age, the highest prevalence of overweight in 2009 and 2014 was 35-49 years and 50-64 years, respectively.

Also, the highest prevalence of obesity in 2009 and 2014 was 50-64 and 35-49 years, respectively (Table 1).

Of 200 people with normal BMI in 2009, 41(20.50%) and 9 (4.50%) persons became overweight and obese in 2014 respectively. Of 242 overweight individuals in 2009, 24(10%) persons became obese in 2014. The incidence of overweight and obesity were 102.50 and

Table 1. Prevalence of overweight and obesity in 2009 and 2014 by sex and age groups

Variable		(years of 2009) BMI				(years of 2014) BMI		
		Normal N(%)	Overweight N(%)	Obese N(%)	Total N(%)	Normal N(%)	Overweight N(%)	Obese N(%)
Gender	Male	109 (38.70)	124 (44)	49 (17.30)	282 (100)	113 (39.70)	118 (41.40)	54 (18.90)
	Female	91 (28.20)	118 (36.50)	114 (35.30)	323 (100)	95 (29.70)	115 (35.90)	110 (34.40)
	Total	200 (33.10)	242 (40)	163 (26.90)	605 (100)	208 (34.40)	233 (38.50)	164 (27.1)
`**Age (years)**	20-34	92 (48.90)	66 (35.10)	30 (16)	188 (100)	87 (46.30)	70 (37.20)	31 (16.50)
	35-49	51 (24.60)	89 (43)	67 (32.40)	207 (100)	62 (30)	82 (39.60)	63 (30.40)
	50-64	40 (24.50)	68 (41.70)	55 (33.80)	163 (100)	44 (27)	72 (44.20)	47 (28.80)
	≥65	17 (36.20)	19 (40.40)	11 (23.40)	47 (100)	20 (42.60)	17 (36.20)	10 (21.20)
	Total	200 (33.10)	242 (40)	163 (26.90)	605 (100)	208 (34.40)	233 (38.50)	164 (27.10)

22.50 per 1000 person's year in people over 20 years of age in Ahvaz respectively. The incidence of overweight was higher in men than women (60 vs 42.5 per 1000 person's year) and obesity in women (15 per 1000 person's year) was twice as high as in men (7.50 per 1000 person's year). The highest incidence of obesity and overweight were in the age group of 20-34 years.

The prevalence of abdominal obesity in 2009 was 26.80% which increased to 33.90% in 2014. This prevalence of abdominal obesity increased from 11.70% to 14.90% in men and from 39.90% to 50.50% in women.

At the end of the five years of the study, there was a significant increase in mean of waist circumference in both males [from 90 (10.72) cm in 2009 to 92.91 (11.23) cm in 2014, P-value< 0.00001] and females [from 86.01 (11.82) cm in 2009 to 90.04 (11.47) cm in 2014, P-value< 0.0001] .

Of 421 people with normal waist circumferences in 2009 (240 males and 181 female), 16.90% [10% of males and 26 % of females] have abdominal obesity at the end of the five years of the study The highest incidence of abdominal obesity in 2014 was observed in men aged 50-64 years and in women aged 35-49 years. The overall incidence of abdominal obesity was 76.50 per 1000 person's years, which was 40 in men and 103.90 in female per 1000 person's years.

Discussion

In this study, we evaluated the prevalence and incidence of overweight, obesity and abdominal obesity in a period of 5 years (2009-20014) in adults in Ahvaz, a city in southwest of Iran.

The prevalence of overweight, obesity and abdominal obesity in 2009 and 2014 were respectively: overweight (40% and 38.50%), obesity (26.90% and 27.10%), and abdominal obesity (26.80% and 33.90%).

One of the strengths of this study is focused on overweight, obesity and abdominal obesity incidence further studies in this field especially in Iran focused on prevalence of

obesity and overweight. The incidence of overweight, obesity and abdominal obesity in normal BMI in 2009 over five years were 102.50, 22.50and 76.50 Per 1000 person-years respectively. In one population-based cohort study in Tehran, (non-abdominally obese (AO) participants, aged ≥20 years), were followed for incidence of AO for a median of 6 years. The results showed that during the follow-up, 3093 (1373 men) developed AO with incidence rates of 96·0 per 1000 person-years (21) which is more than the incidence of abdominal obesity (76.50) in this study.

In this study, the incidence of obesity in women was higher than men (15 in women and 7.5 in men in per 1000 person-years), but the incidence of overweight in men was higher than in women (60 in men and 42.50 in women per 1000 person-years). Also the incidence of obesity was highest in 20-35 age groups. Abdominal obesity in women had higher incidence than in men (women 26 and men 10 per 1000 person-years).

The prevalence of overweight and obesity in current study (38.50% and 27.10%) in 2014 were higher than the prevalence rates reported by studies in Iran. For instance, Moghimi-Dehkordi's study in Tehran in 2013, reported the prevalence of overweight and obesity among a population aged 20-84 years old were 34% and 15%, (8) Also, 29.60% and 13% are in the report of Najafipour and et al.'s in the study of Kerman in 2016 respectively (9). In addition, according to Bakhshi et al.'s study, the prevalence of obesity in Iran was 22.30% in 2015 (10).

The differences observed between the results of our study and the mentioned studies in Iran may be attributable to differences in cultural backgrounds, socioeconomic classes, eating styles, and types of foods used in various provinces of Iran. Moreover, some other factors such as environmental, genetic, and climate factors affect dietary habits, moods, and the level of activity. Additionally, the urbanization phenomenon is a risk factor for obesity which is significantly increasing in Iran especially in Tehran (11-15).

The prevalence of obesity in Ahvaz city in 2014 was 18.90% and 34.40% in men and women respectively, which is much lower compared to gulf countries of Kuwait (36% men, 48% women), Saudi Arabia (28% men, 44% women), and United Arab Emirates (25% men, 42% women), close to Bahrain (21% men, 38% women) and Qatar (19% men, 32% women), and higher than Lebanon (15% men, 27% women) and Oman (8% men and 17% women) (22). Also prevalence of obesity in 2010 Turkey (27% men and 44% women) was being higher than this study (23).

The prevalence of obesity in women was higher than in men in 2014 in this study. In line with our results most of other studies reported the higher prevalence of obesity in females than males (24-26) that could be due to lower physical activity in females.

The prevalence of overweight in this study is 38% (44% men and 36.50% women) in 2014, higher than the 2010 Turkey study (37%) (23), and lower than United Arab Emirates on 43% (27). It is also higher than the 2014 study in Kuwait (37%) (28).

The prevalence of abdominal obesity is 33.90% in this study (14.90% men, 50% women), being 3 times higher in women, and rising with age up to 64 years. In the study of prevalence of total obesity and abdominal obesity in the Spanish adult population (25–64 years) for 2014-2015, The prevalence of abdominal obesity was estimated at 33.40% and was higher among women 43.30%; than among men 23.30% and also rose with age which is consistent with the results of this study (29).

Also in Tanzania using a community-based cross-sectional survey, for participants aged 18 years and above, the overall prevalence of abdominal obesity was found to be 24.88%. The prevalence of abdominal obesity was significantly higher among women than men (35.14% vs. 6.89%) (30).

In summary, overweight and obesity seem to have become a global health problem in all age groups and both genders. The prevalence and incidence of overweight and obesity during the past three decades has become doubled and quadrupled even among children and adolescents (31). A study in the United States of America showed that the prevalence of obesity among children and adolescents, respectively, changed from 7% and 5% in 1980 to18% and 21% in 2012 (32).

Our results showed similar results in increasing incidence of obesity, therefore more special attention should be paid to decrease the prevalence of obesity and its risk factors such as physical inactivity and high-calorie diets.

Our study has some limitations in clarifying causal relationships between overweight and/or obesity and risk factors such as lifestyle, eating habits, smoking, physical activity, and genetic heredity; and overweight and/or obesity, therefore the study could not explain the reasons for causes of higher prevalence of overweight and/or obesity in Ahvaz city in Khuzestan province in Iran.

Conclusions

The findings of our study showed that the prevalence of overweight, obesity and abdominal obesity in adult population in Ahvaz is high.

Also, the prevalence of obesity and abdominal obesity in women is higher than men and special attention should be paid to this issue in women. Also the age group of 35-64 years, is at higher risk.

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Conflict of Interest

The authors have declared that there is no conflict of interest.

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