

Trends of Obesity in Iranian Adults from 1990s to late 2000s; a Systematic Review and Meta-analysis

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ABSTRACT

BACKGROUND

Obesity is currently emerging as a global epidemic, affecting 10% of adult population worldwide. The primary objective of the current systematic review is to describe the trend of overall prevalence of obesity in Iranian women and men through a meta-analysis.

METHODS

We searched the medical literature published from 1990 to 2007 in Medline (PubMed), EMBASE database, and the Iranian digital library. All published reports of research projects, papers in relevant congresses, unpublished crude data analysis, proceedings, books and dissertations were reviewed. Data from eligible papers that fulfilled the qualification criteria entered meta-analysis (Random Model).

RESULTS

Data from 209,166 individuals were analyzed. The overall prevalence of obesity in adults was 18.5% (95%CI: 15.1-21.8), respectively. The prevalence of obesity in men and women was 12.9% (95%CI: 10.9-14.9) and 26.2% (95%CI: 21.3-30.5), respectively. The trend of obesity was similar in both genders; women had almost a constantly higher risk of obesity than men during the recent two decades.

CONCLUSION

Data from 209,166 individuals were analyzed. The overall prevalence of obesity in adults was 18.5% (95%CI: 15.1-21.8), respectively. The prevalence of obesity in men and women was 12.9% (95%CI: 10.9-14.9) and 26.2% (95%CI: 21.3-30.5), respectively. The trend of obesity was similar in both genders; women had almost a constantly higher risk of obesity than men during the recent two decades.

KEYWORDS

Obesity; Systematic Review; Meta-analysis; Iran

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INTRODUCTION

Obesity is currently emerging as a global epidemic, affecting more than 200 million men and almost 300 million women worldwide, accounting for 10% of the adult population.¹ Obesity is a major culprit of

poor health as it is associated with increased mortality and reduced life expectancy.² As the most prevalent metabolic disorder in the developed countries, obesity is now on the rise as a significant cause of disease burden in developing nations.³ According to current statistics, obesity will be a major public health concern in near future in most low- and middle-income countries, particularly in urban areas.¹

It is known that demographic characteristics such as age, race, gender and socio-economic status affect the prevalence of obesity.⁴ Urbanization, increased energy intake, and sedentary life style are common important contributors to obesity. However, the prevalence of obesity varies markedly across countries, reflecting different risk factors among various populations around the world.¹

The Iranian population comprises several ethnicities with quite different lifestyles and cultures which might lead to variations in the prevalence of obesity.⁵ Many studies have characterized the prevalence of obesity, targeting different age groups and sex distributions around the country. However, there is considerable variation in the estimates of obesity across the studies.

Given that valuable information can be extracted from existing data sources, regular updates of the statistics of obesity are necessary to identify the epidemiologic trend of such disorders in Iran. Hence, the primary objective of the current systematic review is to estimate the trend of overall prevalence of obesity in Iranian women and men. The secondary objective is to assess the degree of heterogeneity and address its potential sources.

MATERIALS AND METHODS

Search Strategy

We searched the English-language medical literature published from January 1990 to December 2007 using the Medline database of the National Library of Medicine, Embase database and the Iranian Digital Library. The medical subject headings (Mesh) were “obesity”, “body mass index” combined with “prevalence” and “Iran” including all subheadings. In addition, all abstracts, conference

proceeding, titles of thesis, dissertations and reports in other databases in Persian (Farsi) language such as Iranmedex, Irandoc, Scientific Information Systems (SID), and Iranian National Library (INL) were searched with a similar strategy; the Persian keywords were equivalent to their English words. Moreover, all submitted Scientific Journals of Iranian medical universities published since 2007 were reviewed by hand searching. As the crude data of non-communicable disease risk factor (STEPS study) are available from 2005 onwards, we also included these findings after data analysis. References of selected articles were checked to maximize the sensitivity of our search.

Obesity Definition

We included those studies that evaluated obesity based on anthropometric measurements (height and weight) in order to calculate body mass index (BMI). All the papers defining obesity as $BMI \geq 30$ Kg/m² were included.

Study selection

In the second step, all sources that reported the prevalence of obesity were reviewed. We then performed a critical appraisal of all papers, deeply and independently, by two well-educated individuals. We generated a simple checklist to evaluate the main issues in descriptive studies such as the sampling method and the validity of measurements. A total of seven items were to be checked, and articles which addressed at least five of them were included (Appendix 1). Studies gaining a quality score lower than 5 were excluded, as well as those which estimated the prevalence of obesity in a non-random sample or in a small sample (less than 100 individuals). Moreover, we excluded duplicated citations and studies that did not mention data collection date or location.

Data extraction

The relevant data from qualified studies were extracted independently by two individuals and listed on Microsoft Excel® worksheets. The unmatched scores were checked by a third investigator to make

the final decision on including or excluding the study from the list. Obesity prevalence, publication date, reference date, and sample size were extracted for each individual sex and totally.

Statistical analysis

The variance of obesity prevalence in each study was computed using the binomial distribution formula. After checking the heterogeneity of prevalence across studies, we decided to apply the random effect model to estimate the overall prevalence of obesity. The reported prevalence of obesity was modeled against the year of data collection (reference year) in both men and women, separately. The best-fit model was determined by R^2 as the goodness of fit indicator to explore the trend of obesity during the last three decades. All analyses were performed using Stata software version 10.

RESULTS

Findings from a total of 32 studies, comprising 209,166 individuals aged 14 - 81 years, were included. All studies defined obesity based on BMI more than 30 Kg/m² (Table 1). Based on time of data collection, we grouped the findings of papers into four categories. As shown in Table 2, the overall prevalence of obesity for adults was 18.5% (CI95% 15.1-21.8). The prevalence of obesity in men and women was 12.9% and 26.2%, respectively. It is clear that the prevalence of obesity in women is about twice as high as men. Such a gender difference remained more or less constant during the past years. The prevalence of obesity increased sharply from 4.3% in 1990-95 to 16.9% in 1996-2000. This sharp rise was observed in both genders. Although the trend was ascending up to 2005, the overall prevalence of obesity has dropped considerably in both genders in recent years (Table 2).

Figure 1 explores the trend of reported obesity by gender and year of data collection. The figure indicates that the obesity percentage has been rising up to 30%. It remains almost constant during the next five years and finally decreases slightly (Figure1-Total). In women, the increase in obesity had a sharper slope than men, but it finally began

falling in recent years, too. The trend is similar in both gender groups (Figure 1-Female, Male).

DISCUSSION

The peak of obesity was observed between 2000 and 2005 which were 27.5% and 15.2% in women and men, respectively. The overall prevalence of obesity was about 18%. The obesity was about twice more frequent in women compared to men and this gender difference ratio remained almost constant during the recent years. Regarding the obesity prevalence in Iran, we observe two separate periods; one begins in 1990 and lasts until 2005 during which the trend increased steadily, reaching from 4.3% to more than 21%. During this period, the percentage of obesity increased in both men and women, mainly due to rapid changes in lifestyle of Iranians from 1995 to 2005.

The sharp increase in prevalence of obesity between the periods 1990-1995 and 1996-2000 (4% to 17%) may be misleading as the estimated prevalence for the years 1990 to 1995 comes from only one study conducted in Fars. This is definitely not representative of the whole country and cannot be extrapolated as the prevalence of obesity in the entire nation.

In recent years, we observe extensive campaigns in Iran run by the Ministry of Health, mass media and other organizations which might be due to the rapid increase of obesity and its complications in the past decade. Although it is very difficult to state a clear conclusion, the drop in the prevalence of obesity in recent years might be due to the impact of these campaigns. It seems that such population based public health interventions constitute one of the reasonable bases of the decline in obesity prevalence in recent years. An alternative explanation is a rapid change in the population structure. Currently, Iran has one of the youngest populations worldwide with more than 55% aged less than 40 years. While this young population is not at risk of obesity for the time being, the inevitable aging which will ensue over the coming years will bring about a rapid increase in non-communicable diseases and their related risk factors such as obesity.

Table 1: Description of studies fulfilling our eligibility criteria

Author	Reference year	Province	Sample Size			% Obesity			Age groups	Quality score
			Total	Male	Female	Total	Male	Female		
GR.Pishdad ⁶	1993-1994	Fars	3378	2301	1077	4.3	2.5	8	20-74	7
A.Barzigar ⁷	1996	Gilan	2423	973	1357	24.6	11.5	34	>25	5
R.Ghorbani ⁸	1996-1997	Sennan	1921	975	946	19.8	12.6	27.1	20-55	5
F.Azizi ⁹	1998-1999	Tehran	2102	808	1294		16.5	32.7	20-80	7
M.Jamshidian ¹⁰	2000	Tehran	749	749	749			41.4	40-60	6
H.Soori ¹¹	2000	Khozestan	1540	899	641	13.9	11.9	36.6	18-84	7
M.Mojibian ¹²	1999-2000	Yazd	570	570	570	16.3		16.3	15-65	6
T.Azizi ¹³	1999-2002	Tehran	7033	2992	4041	27.5	16.3	35.8	30-69	6
Z.Mortazavi ¹⁴	2000-2001	Sistan & Blochestan	720	292	428	1.3	1	1.4	18-43	6
A.Akhavantiabib ¹⁵	2000-2001	Isfahan, Markazi, Najafabad	12514	6141	6373	15.5	9.3	23.4	>19	7
H.Sezavar ¹⁶	2001	Ardabil	384	200	184	15.9	13.5	19	20-80	5
F.Kavian ¹⁷	2001	Tehran	503	503	503			11	25-45	6
S.M. Safari ¹⁸	2001	National Survey	8800			21.7	12.9	30.5	45-60	7
PORA study ¹⁹	2001	National Survey	8753	4201	4552	22	12.9	30.5	45-60	7
F.Azizi ²⁰	1999-2002	Tehran	1766	911	855	46.9	43.6	51.7	>60	6
H.Fakhrzadeh ²¹	2000-2001	Booshehr	1437	1437			10.2		>18	6
F.Azizi ⁹	2001-2002	Tehran	2102	808	1294		20.8	40.3	20-80	7
S.Akbari ²²	2002	Lorestan	986	986	986			7.3	14-18	6
H.Mostafavi ²³	2002-2003	Fars	3245	1305	1940	11.7	7.3	14.8	>18	7
F.Rahmati ²⁴	2003	Tehran	3931	1548	2360	3.2	4.2	2.5	17-48	5
GH.Vaghari ²⁵	2003	Golestan	2854	2854	2854			16.4	>18	6
R.Heshmat ²⁶	2003	Tehran	1573	615	958	30.6	18.6	38.3	25-64	7
N.Agheli ²⁷	2003	Gilan	550	285	265	19.4	19.4	52.8	>30	6
N.Agheli ²⁷	2003	Gazvin	550	274	276	28.4	21	47.4	>30	6
H.Bahram ²⁸	2002-2005	Golestan	8998	3787	5212		17	36.7	35-81	7
Alavi Naeiny ²⁹	2004	Isfahan	1700	731	963	21.6	12	28.9	>60	5
M.Mozafari ³⁰	2004	Ilam	420	420	420			22.3	15-49	5
S.Mazloomzadeh ³¹	2004	Zanjan	2492	1251	1241	15	8.9	21.3	15-64	7
K.Hajian ³²	2004	Mazandaran	3600	1800	01800	18.8	9.9	27.8	20-70	6
STEPS ³³	2005	National Survey	89532	45113	57866	19.7	12.7	27.2	18-64	7
H.Farshidi ³⁴	2006	Hormozgan	2087	681	1397	12.2	7	14.7	<63	6
STEPS ³⁵	2006	National Survey	29953	14958	14995	15.8	9.9	21.8	18-64	7

Table 2: The prevalence of obesity, point estimation and 95% confidence interval classified by gender and years of data collection

Data Collection Years	Number of studies	Female % [95% CI] (N)	Male % [95% CI] (N)	Both % [95% CI] (N)
1990-1995	1	8.0 [6.4-9.6] (1077)	2.5 [1.9-3.1] (2301)	4.3 [3.6-4.9] (3378)
1995-2000	3	27.6 [17.7-37.5] (3597)	11.2 [7.1-15.5] (2756)	16.9 [9.4-24.5] (6446)
2000-2005	25	27.5 [21.1-33.8] (39465)	15.2 [12.5-17.8] (29447)	21.3 [16.3-26.3] (77770)
2005-2010	3	18.3 [11.3-25.3] (74258)	8.6 [5.8-11.4] (60752)	14.1 [10.5-17.6] (121572)
Total	32	26.2 [21.3-30.5] (118397)	12.9 [10.9-14.9] (95286)	18.5 [15.1-21.8] (209166)

The point, upper and lower limits was calculated by Random Model, Meta-Analysis
Obesity = BMI>30 kg/m²

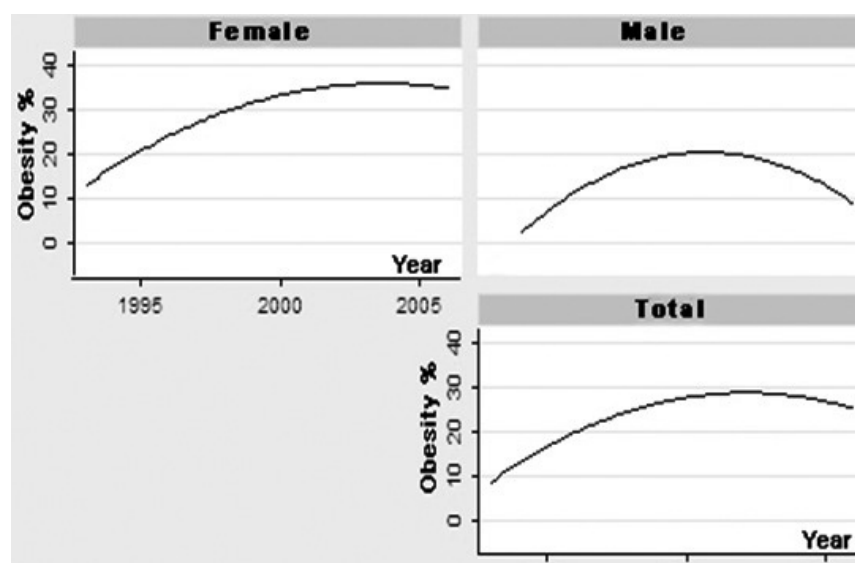


Fig.1: The prevalence of obesity (BMI>30 kg/m²) classified by gender Footnote: The quadratic model fitted the weighted prevalence of obesity

Based on the data available, the worldwide prevalence of obesity varies from less than 5% in rural China, Japan and some African countries to as high as 75% of the adult population in urban Samoa.^{36,37} Obesity levels also vary depending on ethnicity. In the USA, there were considerable variations in the prevalence of obesity particularly among women from different ethnical groups.³⁸ Similarly, we found large variations in the reported obesity prevalence. Indeed, such variations are expected in Iran where more than 70 million people live in 30 provinces with different socioeconomic conditions, lifestyles and health status.⁵

Our findings clearly indicate that the risk of obesity is greater in women. This difference might be partly attributed to women's tendency to be less active physically in their daily life. Based on three

rounds of national surveys, WHO STEPs approach for non-communicable disease risk factors, physical activities in women was much less than men; in all categories of physical activity, women had reported lower levels of physical activity.^{33,35}

Popkin and Doak (1998) used data from eight mid- and low income countries that had at least two surveys to estimate trends, reporting increases of 2.3% to 19.6% in obesity (BMI \geq 30 kg/m²) prevalence over a 10-year period.³⁹ In our study, the prevalence of obesity in adults was about 18.5% which is comparable to other mid-to low income countries. It may be strongly indicated that that our population is also at risk of obesity.

The eligible studies used different age cutoff points to categorize their findings. These differences were one of the main challenges in summa-

rizing the findings to estimate the best representative age-specific prevalence of obesity. In addition, some papers did not present their findings in details, particularly in subgroups, and we were unable to obtain more information by direct contact with the authors.

In conclusion, we found that the risk of obesity was approximately twice greater in women compared to men. In addition, it seems that the very sharp increase in risk of obesity in past 20 years has been reversing in recent years.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to this work.

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Appendix - Critical Appraisal Tool

Articles	Reviewer <input type="checkbox"/> 1 <input type="checkbox"/> 2				
	1	2	3	4	5
STEP1. Primary Evaluation					
Please do this by reading the title/abstract	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept
STEP2. Read the full text deeply and score those articles pass the primary evaluation					
1. Random sample or whole population					
2. Unbiased sampling frame (i.e. census data)					
3. Adequate sample size (>300 subjects)					
4. Standards measures were used?					
5. Outcomes measured by unbiased assessors					
6. Adequate response rate (70%), refusals described					
7. Confidence intervals, subgroup analysis					
Total score					
Final decision	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept	<input type="checkbox"/> Reject <input type="checkbox"/> Accept
If the article meets the criteria, put score 1 in the cell.					
Articles with total score more than 5 are accepted in the study					