

Prevalence of obesity, food choices and socio-economic status: a cross-sectional study in the north-west of Iran

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Abstract

Aim: To document the epidemiological features and influencing factors of obesity in the north-west of Iran, to provide baseline information for setting up a regional population-based centre to control and prevent obesity-related disorders in the area.

Methods: In this cross-sectional study, a total of 300 subjects were selected/studied in Tabriz, one of the major cities in Iran. Data on basic characteristics, anthropometric measurements, dietary assessment and physical activity were collected. Obesity was defined as body mass index $\geq 30 \text{ kg m}^{-2}$ for both women and men.

Results: Total prevalence of obesity in the area was 22.4% (95% confidence interval (CI): 18.0–27.6). The prevalence of obesity was 24% (95% CI: 18.5–31.4) for women and 18% (95% CI: 12.5–25.6) for men. For both women and men obesity prevalence showed a positive association with age ($P < 0.001$), while there was a negative correlation of obesity with education and income ($P < 0.001$). Fruit consumption decreased the risk of obesity in both women and men (odds ratio (OR) = 0.60, 95% CI: 0.49–0.71 vs. OR = 0.62, 95% CI: 0.51–0.74, respectively). The same significant pattern was observed for the consumption of green vegetables (OR = 0.71, 95% CI: 0.57–0.63 vs. OR = 0.86, 95% CI: 0.77–0.98 for women and men, respectively), legumes (OR = 0.70, 95% CI: 0.59–0.84 vs. OR = 0.78, 95% CI: 0.66–0.91 for women and men, respectively) and dairy products (OR = 0.73, 95% CI: 0.61–0.91 vs. OR = 0.77, 95% CI: 0.63–0.93 for women and men, respectively).

Conclusions: Our study showed that educational attainment, higher income and consumption of certain food groups (i.e. vegetables, fruits, legumes and dairy products) may decrease the risk of obesity. Our findings also indicate the crucial necessity of establishing a population-based centre for obesity in the area. The essential information is now achieved to propose to local health authorities to act accordingly. However, more population-based investigations on dietary choices are needed to develop effective preventive strategies to control overweight and obesity disorders in different regions.

Keywords
Obesity
Epidemiology
Food consumption
Iran

Obesity has been described by the World Health Organization as an 'escalating epidemic' as great as that of smoking¹. Obesity has now become a global epidemic and its prevalence continues to increase in both developed and developing countries^{1–3}. The total prevalence of overweight and obesity is estimated at between 50 and 65% of the general population in some developed countries^{4–6}. An increasing trend in overweight and obesity prevalence has also been reported from other developing countries in recent years⁷.

Hereditary, environmental, metabolic and behavioural factors may all have a role in the development and progression of obesity⁸. Obesity is associated with common causes of morbidity and mortality in the population, including diabetes⁹, coronary heart disease, hypertension and dyslipidaemia^{10,11}, some types of cancer¹ and mental health problems¹².

The aim of the present study was to document the epidemiological features and influencing factors of obesity in the north-west of Iran, to provide baseline information for setting up a regional population-based centre to control and prevent obesity-related disorders in the area.

Methods

In this cross-sectional study, a total of 330 eligible individuals were selected using simple random sampling. Although the subjects were routinely followed and encouraged to take part in different stages of this study, the participation rate was 90%. Three hundred subjects including 132 males and 168 females (18+ years) were eventually recruited. The setting of the study was Asadabadi region of Tabriz, one of the major cities located in the north-west of Iran. The area has previously been

described in detail as reliably representative of the general Iranian population in terms of socio-economic status, lifestyle, general health situation and population structure¹³. Data collected included age, gender, weight, height, education, income, physical activity and food intake via a face-to-face interview with participants of the study.

Anthropometric measurements

Height and weight were measured by nutritionists. Body weight was measured using a calibrated beam scales and recorded to the nearest 0.5 kg. The subjects were measured barefoot and wearing light clothing. Height was measured using a mounted tape and recorded to the nearest 0.5 cm. Body mass index (BMI) was then calculated as weight in kilograms divided by the square of height in metres. As recommended by the Iranian Ministry of Health for the whole country, obesity was defined as BMI $\geq 30 \text{ kg m}^{-2}$ for both women and men in this study¹⁴.

Dietary assessment and physical activity

Nutritional status and habits were assessed using a validated food-frequency questionnaire. Subjects were asked how often they ate the following groups of foods: fruit, green vegetables, bread, starchy foods (rice, potatoes and pasta), legumes (beans, peas and lentils), meat, fish (fish and tuna fish) and dairy products (milk, yoghurt and cheese).

Physical activity levels were determined using a questionnaire from the first National Health and Nutrition Examination Survey (NHANES I study)¹⁵, which was validated in the local language through a pilot study.

Statistical analysis

Prevalence rates, 95% confidence intervals (95% CI) and descriptive statistics were calculated to document the epidemiological features of obesity in the region. Logistic regression was used to assess the role of influencing factors on obesity.

Results

Table 1 shows the basic characteristics of the study subjects. The study sample comprised 168 women (56%) and 132 men (44%), with mean age (\pm standard deviation) of 34.6 ± 12.6 and 39.9 ± 16.1 years, respectively. Mean BMI was significantly lower in men than in women (25.2 ± 4.9 vs. $27.1 \pm 5.3 \text{ kg m}^{-2}$, $P < 0.001$). Total prevalence of obesity in the area was 22.4% (95% CI: 18.0–27.6), with 24% (95% CI: 18.5–31.4) of women and 18% (95% CI: 12.5–25.6) of men being obese.

For both women and men obesity prevalence showed a positive association with age (P for trend < 0.001), while there was a negative correlation of obesity with education and income (P for trend < 0.001). The risk of obesity was

low for those having more than 12 years of education (odds ratio (OR) = 0.41, 95% CI: 0.31–0.63 vs. OR = 0.62, 95% CI: 0.36–0.71 for women and men, respectively) and income of more than \$US 220 per month (OR = 0.58, 95% CI: 0.41–0.67 vs. OR = 0.32, 95% CI: 0.24–0.53 for women and men, respectively) (Table 2).

Fruit consumption decreased the risk of obesity in both women and men (OR = 0.60, 95% CI: 0.49–0.71 vs. OR = 0.62, 95% CI: 0.51–0.74, respectively). The same significant pattern was observed for the consumption of green vegetables (OR = 0.71, 95% CI: 0.57–0.63 vs. OR = 0.86, 95% CI: 0.77–0.98 for women and men, respectively), legumes (OR = 0.70, 95% CI: 0.59–0.84 vs. OR = 0.78, 95% CI: 0.66–0.91 for women and men, respectively) and dairy products (OR = 0.73, 95% CI: 0.61–0.91 vs. OR = 0.77, 95% CI: 0.63–0.93 for women and men, respectively) (Table 3).

Discussion

The present investigation was a cross-sectional study designed to describe some of the epidemiological features

Table 1 Basic characteristics of the study subjects

Characteristic	Women		Men	
	<i>n</i>	%	<i>n</i>	%
Age (years)				
18–30	71	42.3	52	39.3
31–50	59	35.1	57	43.1
> 50	38	22.6	23	17.4
Body mass index (kg m^{-2})				
< 18.5	20	11.9	11	8.3
18.5–24.9	31	18.4	43	32.6
25.0–29.9	76	45.2	54	40.9
≥ 30.0	41	24.4	24	18.1
Education (years)				
≤ 5	96	57.1	65	49.2
6–11	54	32.1	52	39.4
≥ 12	18	10.7	15	11.4
Monthly income (\$US)				
≤ 65	82	48.8	15	11.4
66–130	53	31.5	26	19.7
131–220	26	15.4	59	44.7
≥ 221	7	4.2	32	24.2
Recreational physical activity				
Heavy exercise	12	7.6	13	9.8
Moderate exercise	124	73.8	103	78.0
Light exercise	31	18.4	15	11.4
Not known	1	0.2	1	0.8
Non-recreational physical activity				
Physically very active	23	13.7	45	34.1
Moderately active	86	51.2	74	56.1
Inactive	57	33.9	12	9.1
Not known	2	1.2	1	0.8
Food intake				
Fruit	135	80.3	109	82.6
Green vegetables	147	87.5	112	84.8
Bread	164	97.6	124	93.9
Starchy foods (rice, potatoes, pasta)	162	96.4	121	91.7
Legumes (beans, peas, lentils)	137	81.5	105	79.5
Meat	118	70.2	95	71.9
Fish and tuna fish	39	23.3	38	28.7
Dairy products (milk, yoghurt, cheese)	130	77.4	105	79.5

Table 2 Odds ratios for obesity by socio-economic status (adjusted for physical activity)

	Women				Men			
	<i>n</i>	%	OR 95% (CI)	<i>P</i> for trend	<i>n</i>	%	OR 95% (CI)	<i>P</i> for trend
Age (years)								
18–30	10	14.1	1.00 (reference)		5	9.6	1.00 (reference)	
31–50	18	30.5	2.29 (1.96–2.99)		13	22.8	2.42 (1.92–3.01)	
> 50	13	34.2	2.51 (1.98–3.01)	<0.001	6	26.1	2.76 (2.10–3.13)	<0.001
Education (years)								
≤ 5	29	30.2	1.00 (reference)		14	21.5	1.00 (reference)	
6–11	10	18.5	0.65 (0.41–0.79)		8	19.3	0.73 (0.45–0.89)	
≥ 12	2	11.1	0.41 (0.31–0.63)	<0.001	2	13.3	0.62 (0.36–0.71)	<0.001
Monthly income (\$US)								
≤ 65	22	26.8	1.00 (reference)		6	40.0	1.00 (reference)	
66–130	13	24.5	0.87 (0.76–0.96)		8	30.7	0.75 (0.62–0.93)	
131–220	5	19.2	0.72 (0.62–0.81)		7	11.8	0.41 (0.32–0.68)	
≥ 221	1	14.2	0.58 (0.41–0.67)	<0.001	3	9.3	0.32 (0.24–0.53)	<0.001

n – number of individuals with obesity; OR – odds ratio; CI – confidence interval.

of overweight and obesity in Tabriz, one of the major cities in Iran located in the north-west of the country. The population structure and health indices of the area have been studied previously and indicate that it can reliably be considered as representative of the general population¹³. In this study we investigated the prevalence of obesity and its association with eating habits and socio-economic status, to provide baseline information (pilot data) to set up a regional population-based centre to control and prevent obesity-related disorders in the area. The total prevalence of obesity in the region was 22%. Women were at more risk of obesity than men. Despite the fact that the overweight and obesity prevalence was lower than

corresponding figures from developed countries, the overall prevalence in our study falls within the range previously reported from some developing countries and for the world as a whole^{1–7}.

Obesity is related to socio-economic status. Some studies have shown a positive relationship between socio-economic status and obesity¹⁶. However, this has been challenged in some other investigations reporting mainly from developing countries, which indicated an inverse correlation of obesity with socio-economic status^{17–21}.

Socio-economic status is a complex construct, characterised by income, education, occupation and residence status. Our study showed an inverse relationship between

Table 3 Odds ratios for obesity by food choice (adjusted for physical activity)

	Women				Men			
	<i>n</i>	%	OR 95% (CI)	<i>P</i> for trend	<i>n</i>	%	OR 95% (CI)	<i>P</i> for trend
Fruit								
No	12	36.5	1.00 (reference)		6	26.1	1.00 (reference)	
Yes	29	21.1	0.60 (0.49–0.71)	<0.001	18	16.9	0.62 (0.51–0.74)	<0.001
Green vegetables								
No	7	33.3	1.00 (reference)		4	20.6	1.00 (reference)	
Yes	34	23.1	0.71 (0.57–0.83)	<0.001	20	17.2	0.86 (0.77–0.98)	0.005
Bread								
No	1	25.2	1.00 (reference)		1	16.2	1.00 (reference)	
Yes	40	24.1	0.98 (0.79–1.19)	0.481	23	18.3	1.08 (0.96–1.19)	0.342
Starchy foods (rice, potatoes, pasta)								
No	2	26.3	1.00 (reference)		2	18.9	1.00 (reference)	
Yes	39	24.0	0.93 (0.74–1.16)	0.389	21	17.3	0.97 (0.79–1.19)	0.428
Legumes (beans, peas, lentils)								
No	10	32.2	1.00 (reference)		6	22.7	1.00 (reference)	
Yes	31	22.2	0.70 (0.59–0.84)	0.002	18	17.1	0.78 (0.66–0.91)	0.004
Meat								
No	12	24.8	1.00 (reference)		7	17.1	1.00 (reference)	
Yes	29	24.5	1.02 (0.91–1.14)	0.291	17	18.8	1.00 (0.90–1.14)	0.218
Fish and tuna fish								
No	32	24.1	1.00 (reference)		17	18.8	1.00 (reference)	
Yes	9	23.7	0.96 (0.74–1.20)	0.460	7	17.9	0.99 (0.78–1.21)	0.493
Dairy products (milk, yoghurt, cheese)								
No	12	31.5	1.00 (reference)		6	22.7	1.00 (reference)	
Yes	29	22.3	0.73 (0.61–0.91)	<0.001	18	17.1	0.77 (0.63–0.93)	0.003

n – number of individuals with obesity; OR – odds ratio; CI – confidence interval.

socio-economic status and obesity in both males and females, similar to some previous results^{22–24}. Education may play a role in obesity through shaping the knowledge of individuals about diet, physical activity and their consequences on health status^{25,26}. The negative association of education with obesity may therefore be related to a low level of knowledge among individuals about intake of balanced meals in daily life^{27,28}. In the present study we found a statistically significant inverse correlation between income and obesity in both genders. This too is consistent with the findings of other studies^{25,29–31}. The role of income on obesity may be explained by the fact that a higher income may provide access to necessary resources for the prevention of obesity. Sufficient income will also clearly have a preventive role on obesity disorders as people with high income purchase healthier foods (i.e. vegetables and fruits), have more leisure time for physical activity, and have easy access to health-care facilities in order to control weight gain.

In our study, the risk of obesity increased with age. A steady pattern of weight gain across the life span until older adulthood is usually expected, and obesity may increase until the age of 50–60 years in both genders²⁶. Previous studies have reported that women show generally higher obesity prevalence than men, especially after 50 years of age³².

We found that the occurrence of obesity is related to specific food choices of the study population. Consumption of fruits, green vegetables and legumes (i.e. beans, peas and lentils) were all associated with a lower risk of obesity for both women and men. Fruits, green vegetables and legumes are important sources of dietary fibre and are low-glycaemic-index foods. These food choices have been investigated as sources that may contribute to prevent weight gain^{33,34}. Similarly, it has recently been reported that the consumption of fruits, vegetables and legumes also has a role in weight management probably because their consumption decreases energy density, promotes satiety and decreases energy intake³⁵.

This study showed that the risk of obesity decreased with the consumption of dairy products (milk, yoghurt and cheese). This might be related to the high calcium content of dairy products. Some other studies have found that dietary calcium intake, especially from dairy products, can have a protective effect on overweight and obesity^{36–39}.

Conclusions

The present study showed that educational attainment, higher income and the consumption of certain food groups including fruits, vegetables, legumes and dairy products significantly decreased the risk of obesity. Our findings also indicate the crucial necessity to establish a population-based centre for obesity in the area. The essential information is now achieved to propose to local health authorities to act accordingly. However, more

population-based investigations on dietary choices are needed to develop effective preventive strategies to control overweight and obesity disorders in different regions.

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