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National prevalence of underweight, overweight and obesity in Turkey: cross sectional study of a representative adult population

Tuncay Delibasi[1*], Yasar Karaaslan[2], Ihsan Ustun[1], Ertugrul Koroglu[3] Seref Hosgor[4]

[1] *Department of Endocrinology and Metabolism, Ankara Numune Hospital, 06100 Ankara, Turkey*
[2] *Department of Rheomatology, Ankara Numune Hospital, 06100 Ankara, Turkey*
[3] *Department of Psychiatry, HYB Press, 06533 Ankara, Turkey*
[4] *State Statistic Expert, Faculty of Commercial Sciences, Baskent University , 06490 Ankara, Turkey*

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Abstract: The aim of this study was to determine underweight, overweight, and obesity prevalence in representative sample of adult ($\geq$ 18 years old) Turkish population living in urban and rural area of Turkey. Turkish citizens aged $\geq$ 18 who can represent adult population and permanently resident in Turkey were taken to this study in 1999-2000. The nationally representative sample population was selected from the target population using the census which was performed by national institute of statistics at 1997. Target population was 13.570 individuals living in these houses and 8674 people who aged $\geq$ 18 are chosen for the study. BMI was used as widely accepted diagnostic criteria of obesity. This study demonstrated that the prevalence of underweight was 10.7% in men, 5.9% in women and 8.1% for overall. The prevalence of overweight was 17.4% in men, 20.4% in women and 19% for overall. The prevalence of obesity was 7.8% in men, 22.1% in women and 15.6% for overall. The prevalence of overweight is higher (19.6%) in urban areas but prevalence of obesity is higher (17%) in rural areas of Turkey. Age, educational level and marital status seem to have association with obesity prevalence. The data we obtained showed us that while the underweight is still an issue for men, the overweight and obesity prevalence is high and needs to take early prevention steps for Turkish population.

Keywords: Prevalence, underweight, overweight, obesity, education, Turkish

* E-mail: tuncay@delibasi.net

1 Introduction

In 1986 the World Health Organization (WHO) Expert Committee on Community Prevention and control of Cardiovascular Diseases further emphasize that "at the national level" there is a need for more information on the prevalence of obesity in children and adults. This information would serve as an important index of the health status of the country and could be used to assess the degree to which changes in diet and physical activity were required [1].

Obesity is an increase of total body fat that has profound influence on health risks and continues to be a major clinical problem throughout the world [2, 3]. Life expectance decreases proportionally with its severity, which is a useful predictor of elevated morbidity and mortality risks [4]. Although obesity decreases lifetime and causes many diseases, prevalence is increasing in most of the populations and becoming one of the most important problems that threaten human life [5]. Epidemiological researches showed that prevalence is also increasing in developing countries as well as developed countries [6–24]. Generally, prevalence in women is greater than men but prevalence of overweight is higher in men. According to the WHO Consultation on Obesity, the incidence of obesity has been increasing rapidly since 1990 [25]. The prevalence varies not only among region and countries but also among races and ethnic groups [26].

In Turkey, also, obesity prevalence seems to be increasing. It was reported that overall prevalence of obesity in Turkey in between 1990 and 2000 was increased 17.7% [10]. Other population based surveys and several regional city studies were conducted in recent years [27–35].

In our extended epidemiological research it is planned to find out the prevalence of underweight, overweight, obesity in ≥ 18 aged adult populations living in urban and rural area of Turkey. Results are based on cross sectional data considered to be representative at a national level.

2 Statistical methods and Experimental Procedures

2.1 Study population and sample size

Turkish citizens aged ≥ 18 who can represent adult population and permanently resident in Turkey were taken to this study in 1999-2000. The nationally representative sample population was selected from the target population using the census, which was performed by national institute of statistics at 1997. The reason of choosing six cities is when Turkey is divided into six regions these cities represent the demographic features of their own region [36]. Data is obtained from randomly chosen 3570 houses from the cities, which were enough to account obesity prevalence statistically. Target population was 13.570 individuals living in these houses and 8674 people who aged ≥ 18 are chosen for the study [37].

2.2 Procedure for data collection

Data was obtained by investigators who visited houses. They filled the research forms which were prepared for obesity record. First, this form is used by the investigators in a pilot study and then technical defects are corrected. Research form contained socio-demographic information of household and BMI calculation of people who aged $\geq$ 18. The investigator team had 3 science consultants, 3 project directors, 6 field supervisors, 34 field investigators, 6 people for data entering, 3 people for supporting totally 55 people. There were 17 investigator teams each had a male and a female physicians. Educated teams visited streets and houses of quarters and villages according to the lists that they have been given. The research is done at between 18pm and 21:00pm or at weekends for to find 18 years or older at home.

2.3 Control and safeness of data

During the research, there were 6 physicians who worked as field controllers. These physicians controlled the other physicians who worked in field research whether if they have visited the right houses or the correctness of data on research forms. They have canceled the wrongly filled forms. A central team also controlled field controllers so that the data is totally reliable.

2.4 Determination of criteria and data analysis

Height was measured, to the nearest 0.5 cm, without shoes, back square against the wall tape, eyes looking straight ahead. Weight was measured with a balance, to the nearest 100 grams, without shoes, in light undergarments.

BMI was calculated as weight (in kilograms) divided by height (in meters) squared based on the World Health Organization classification [25]. A body mass index (BMI) lower or equal to 18.5 kg/m^2 is defined as underweight, between 18.5 kg/m^2 and 24.9 kg/m^2 is considered as ideal weight (normal) for individuals. Overweight is defined as BMI between 25-29.9 kg/m^2, and obesity is defined as body mass index above 30 kg/m^2 [25].

2.5 Statistical analysis

Prevalence (%) of BMI was computed in strata of area of residence, marital status and education by direct method on total sample of men and women. Comparisons between groups were performed applying x^2 tests for heterogenecity or for linear trend, when appropriate. Data is entered to computers by using the 9.1 version of SPSS statistical program for Windows in three different centers and all data is checked for to decrease the errors. Using the same statistical program does analysis of data.

3 Results

Totally 8764 people screened in this study. This study demonstrated that the prevalence of underweight was 10.7% in men, 5.9% in women and 8.1% for overall. The prevalence of overweight was 17.4% in men, 20.4% in women and 19% for overall. The prevalence of obesity was 7.8% in men, 22.1% in women and 15.6% for overall (Table 1).

Table 1 Overall prevalence of underweight, overweight and obesity in nationally representative samples of adult Turkish men and women.

	BMI (kg m^{-2})	Men (%)	Women (%)	Total (%)
Underweight	< 18.5	10.7	5.9	8.1
Normal	18.5-24.9	64.1	51.6	57.2
Overweight	25.0-29.9	17.4	20.4	19.0
Obesity	> 30.0	7.8	22.1	15.6
Total		100.0	100.0	100.0

The overweight and obesity prevalence of adults in Turkey starts to increase especially after 30 years of age and reaches to maximum levels between 50-59 ages (Table 2).

Table 2 Prevalence of underweight, overweight and obesity in Turkey by age group.

Age group	BMI (kg m^{-2}) < 18.5 (%)	BMI (kg m^{-2}) 18.5-24.9 (%)	BMI (kg m^{-2}) 25.0-29.9 (%)	BMI (kg m^{-2}) > 30.0 (%)	Total
18-19	17.7	75.1	5.3	1.9	100.0
20-29	12.5	72.4	10.6	4.5	100.0
30-39	6.4	60.0	20.4	13.2	100.0
40-49	5.3	50.6	22.9	21.2	100.0
50-59	5.3	42.0	25.5	27.2	100.0
60-69	6.2	44.5	23.4	25.9	100.0
70+	9.4	52.5	21.3	16.8	100.0

The prevalence of overweight and obesity is similar in rural areas and cities (Table 3).

Table 3 Prevalence of underweight, overweight and obesity in Turkey by region.

	BMI (kg m^{-2})	City (%)	Rural area (%)	Total (%)
Underweight	< 18.5	7.4	10.3	8.1
Normal	18.5-24.9	57.8	55.5	57.2
Overweight	25.0-29.9	19.6	17.2	19.0
Obesity	> 30.0	15.2	17.0	15.6
Total		100.0	100.0	100.0

Overweight and obesity prevalence is lowest in unmarried people and highest in widows and widowers (Table 4).

Table 4 Prevalence of underweight, overweight and obesity in adult Turkish population by marital status.

	BMI (kg m^{-2})	Married (%)	Unmarried (%)	Widowed (%)	Divorced (%)	Separate (%)
Underweight	< 18.5	6.5	17.6	4.2	4.4	18.5
Normal	18.5-24.9	55.1	74.3	41.1	63.2	44.5
Overweight	25.0-29.9	21.5	5.5	22.4	19.1	18.5
Obesity	> 30.0	16.9	2.5	32.3	13.2	18.5
Total		100.0	100.0	100.0	100.0	100.0

The prevalence of obesity is highest in people who are illiterate and lowest in people who graduated from high schools or universities. As education level increases the prevalence of obesity decreases (Table 5).

Table 5 Prevalence of underweight, overweight and obesity in adult Turkish population by education.

	BMI (kg m^{-2})	Illiterate (%)	Literate (%)	Primary school (%)	Secondary school (%)	High school (%)	University (%)
Underweight	< 18.5	5.4	5.2	8.7	8.3	10.5	7.3
Normal	18.5-24.9	43.4	49.1	56.3	66.9	70.2	69.4
Overweight	25.0-29.9	22.2	26.0	19.3	15.8	13.7	17.5
Obesity	> 30.0	29.0	19.7	15.7	9.0	5.6	5.9
Total		100.0	100.0	100.0	100.0	100.0	100.0

4 Discussion

Obesity is a serious public health problem, which should be evaluated frequently by performing prevalence studies. Although many measures for decreasing obesity prevalence are taken in many countries, most of them are unsuccessful and this shows us the seriousness of the problem.

Estimates of the prevalence of obesity in the general population aged $\geq$ 18 in Turkey are presented in this study. This nation wide cross-sectional data obtained from 6 cities considered being representative of Turkish men and women.

In the present study, the prevalence of obesity was found to be 15.6% in both men and women. The combined prevalence of both overweight and obesity was 34.6%. Obesity prevalence in Turkey is high in women compared to men whereas; prevalence of overweight is a little bit higher in women. Compared with other surveys in European, North and Latin America, Middle Eastern and Asian countries which used WHO diagnostic criteria, prevalence of obesity in Turkey was lower than in the Kuwait [7], Bahrain [8], Iran [11], Australia [12], Israel [15], United Kingdom [19], United States [20], but higher than China [26], and similar to Canada [13], Uruguay [21]. In United States, prevalence of obesity in men in 1960 is 10.0%, and in women is 15.0% but in 1991, this ratio is increased to 19.7% in men and 29.7% in women [6]. Data collected from 1999-2002 estimates that nearly 1/3 of adults are obese (27.6% of men and 33.2% of women) [20]. In one of the expended epidemiological study in Europe, it is found out that prevalence in men is 15%

and in women is 22%. In Europe more than half of the 35-65 years and older population is overweight or obese [5]. One study estimates that the obesity prevalence of obesity was about 10% in the European Union and the overweight prevalence was 36.6% and 25.6% among men and women, respectively around year of 1999 [38]. United Kingdom subjects had the highest prevalence of obesity as 12% [38]. In Arabic countries like Kuwait and Bahrain prevalence is as high as 30.3 to % to 44% [7, 8].

In present study, an interesting finding was that there is big difference between prevalence of men and women. Prevalence of obesity in men (7.8%) was found low; even prevalence of underweight (10.7%) overcomes obesity prevalence in men. Generally, there are no such a big differences between men and women in developed countries but there are big differences in developing countries [10–24]. Such a difference in Turkey and developing countries might be due to socio-cultural factors, nourishment habits and also widely cigarette smoking among men and lack of employment outside the home in women.

It has been reported that age is strongly associated with prevalence of obesity and generally, the prevalence of obesity increases until 70 years of age and then begins to decline [5, 9, 12–14, 16, 17, 19, 20, 22–24, 26, 38]. In present study, prevalence increased with age until 50-59 years of age and then slightly went down. The highest prevalence of obesity was in the 50- to 59-years old age group. This association between obesity and age can be explained, in part, by a reduction in the degree of physical activity with age in both men and women [24]. Furthermore, women are also prone to weight gain during menopause starting at 45 years old.

In present study, the prevalence of overweight and obesity in cities and rural areas is similar. This may be because of migration from the rural areas to the cities in the last decades in Turkey. Some studies reported that prevalence of obesity is higher in urban areas than rural areas [11, 24].

Marital status was also to be related to obesity. In this study, the highest prevalence was found in widowed people as 32%. Prevalence of obesity was 16.9% in married people and 2.5% in unmarried people. Some studies reported couples are more likely to be obese than living alone but some studies using multivariate analysis have reported that the prevalence of obesity in widowed people is higher than that in single and married people similar to results of present study [8, 14, 22, 24, 38]. However, the differences in marital status were explained mainly by the age group of men and women because never married were younger as compared with married participants [24].

The relationship of educational level to obesity and underweight is complex, particularly when the whole life-span is taken into consideration. Our study indicated that as educational level decreases, BMI increases. The highest prevalence of obesity was found in illiterate people as 29%. This is important because education can be effective for preventing obesity. Promoting nutritional awareness, encouraging a more physically active and more professionally self fulfilling life style would be expected to result in less weight gain later in life. In many studies, it was reported that obesity had a strong inverse association with the level of education [13, 14, 19, 20, 24, 38]. But some studies reported that this association is less consistent in men than in women [16, 36]. So education seems

to be a risk factor for obesity. Higher obesity ratio in lower educational level might be due to inadequate nutritional knowledge, access to resources, the media, etc [38].

The first population based study about obesity prevalence in Turkey, Turkish Adult Risk Factor Study (TEKHARF), in the year 1990 reported that obesity prevalence was found 9% in men and 28.5% in women [27]. The overall prevalence of obesity was 18.6% [27]. But, in this study, 30 was used in men and 29 was used in women as a cut off-BMI for obesity diagnosis. The same cohort (age >20 years) was followed for 10 years and re-screened for obesity, the overall prevalence rate was increased to 21.9% [10]. Another study, The Turkish Diabetes Epidemiology Study (TURDEP) is a cross-sectional, population-based survey that included subjects which ages > 20 years, reported the overall prevalence of obesity was 22.3% (12.9% in men and 29.9 in women) in year 1999 [28]. The other large-scale population based study, Turkish Obesity and Hypertension Study (TOHS) in year 2000 found that prevalence of obesity was 19.4% (14% in men and 24.6 in women) in subjects which ages of ≥ 20 years [29]. In present study, although, obesity prevalence in women was similar to TOHS study, overall prevalence was found lower than the rates of all other Turkish population studies. These differences might be caused by selected regions. Recently, some studies from different local regions reported that prevalence of obesity was found 23.5% in Trabzon (Back Sea region), 43.4% in Adana (Mediterian region), 29.3 and % in Mersin (Mediterian region), 12% in Kayseri (as a telephone survey in Central Anatolian region). These surveys also are emphasizing the current dimensions of obesity problem in large cities of Turkey. Because present study was across-sectional one, it cannot establish causal relations. Nevertheless, this study provides evidences regarding the prevalence and distribution of obesity, overweight and underweight in representative Turkish adults.

We reported BMI status of adult population in Turkey at the beginning of millennium. The data we obtained showed us that while the underweight is still an issue for men at least for some region of Turkey, the overweight and obesity prevalence are high and early prevention steps need to take for Turkish population.

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