



**PREVALENCE AND EPIDERMIOLOGICAL RISK FACTORS OF OBESITY IN
TURKEY**

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Abstract

Prevalence of Obesity in Turkey: What are Epidemiologic Risk Factors?

Obesity is a progressing problem both in developed or developing countries. Relations between increased body fat and high mortality especially with cardiovascular diseases, diabetes mellitus, and hypertension are well known. Several large studies suggest that abdominal obesity is closely related to cardiovascular risk. Knowledge about the Turkish population was not satisfactory. In this study we aimed to find out the prevalence of obesity indicated as BMI and investigate some of the epidemiologic risk factors. Certain socio-economic and demographic features, physical activity levels, and some life style features of the 1936 subjects aged 18-65 years old were asked by face-to-face interview

and their weight, height, and waist circumferences were measured, waist/hip ratios and body mass index were calculated.

699 (36.1%) subjects were over weighted and 529 (27.3%) subjects were obese. The epidemiologic risk factors for obesity (Body Mass Index = 30 kg/m²) were; age (Odds Ratio [OR]=1.06), female gender (OR=1,38), marital status (to be married) (OR=2,77), to be never smoker (OR=1,40); sedentary life style, having diabetes mellitus disease, regular exercises, alcohol use and habitation had no effect.

More effective health promotion programs must be organized in order to control both android and general obesity being an important health problem.

Key Words: Obesity; classifications, obesity; epidemiology, risk factors, body weight and height measurements, body mass index, Turkey

Introduction:

World Health Organization (WHO) declared that obesity is a chronic disease prevalent in both developed and developing countries, and its impact is so diverse and extreme that it should now be regarded as one of the greatest neglected public health problems of our time with an impact on health which may will prove to be as great as of smoking. Obesity is a complex multi-factorial chronic disease that develops from an interaction of genotype and environment. Our understanding of how and why obesity develops is incomplete, but involves the integration of social, behavioral, cultural, physiological, metabolic and genetic factors. The signs and symptoms of obesity include an excess accumulation of adipose tissue and from the pioneer studies like Framingham and Nurses Health Study; it's known that, there is a 'U or J' shape relationship between mortality and fat weight. While low body mass index (BMI) is associated with high mortality rates principally from pulmonary and gastrointestinal diseases, in contrast high BMI levels have an impact on high risk of mortality from cardiovascular disease (CVD), diabetes mellitus (DM), hypertension, dislipidemia, stroke, and cancer.

Both obesity prevalence and its epidemiological risk factors like physical activity levels, smoking, and alcohol consumption are not well studied in Turkish population. In two major studies; TEKHARF (Turkish Adults Hearth Disease and Risk Factors Study) and TURDEP (Turkish Diabetes Epidemiology Study) the obesity is studied as an independent risk factor for CVD and DM nationwide.

In TURDEP study the obesity prevalence (BMI>29.9 kg/m²) is found 22% while in TEKHARF study it is found 21.1% among males and 43.0% in females.

According to the results of TURDEP study, male subjects had mean BMI, waist hip ratio (WHR) and waist circumference (WC) of 25.47±4.58 kg/m², 0.88±0.10, 90.03±13.86 cm and females had 27.45±5.76 kg/m², 0.81±0.09, 87.20±14.61 cm respectively. In TEKHARF study among male subjects mean BMI, WHR, WC are found 26.8±3.9 kg/m²,

0.93±0.07, 91.8±10.6 cm and in females 29.2±5.3 kg/m², 0.86±0.70, 89.4±12.1 cm respectively. In TEKHARF study BMI was found as an independent risk factor for CVD in men and the cardiovascular event risk were found to be increasing 9% in every 1 kg/m² BMI increment. Also in TURDEP study it was found that prevalence of DM and impaired glucose tolerance increased with increment in BMI, WHR or WC.

These results indicates the importance of monitoring the obesity nationwide and in different regions of the Turkey, because there is a great difference of the socio-economical status between the populations who live in different parts of the country. In this cross-sectional study carried out in Edirne, Turkey it was aimed to find out the prevalence of obesity indicated as BMI=30 kg/m², and to identify epidemiological risk factors.

Material & Methods: The Study Design

This cross-sectional descriptive study was held between January and March 2001 in Edirne city, that is located at Bulgaria and Greece border of Turkey and have a population of 110,000 inhabitants. Study universe were 87,143 people aged 18-65 years living the urban and central rural Edirne. 1936 subjects were selected by multi-stage sampling method using the population reports of local governmental health office for year 2000. Study universe were divided into 57 leagues (45 urban, 12 rural) of known geographic borders and population counts. All the leagues were accepted as homogeneous. Subjects were selected by researchers coincidentally from the leagues in numbers weighted to their population. Only 12 (0.6%) women subjects were omitted the study because they were pregnant that could effect the anthropometrical measurements.

Data collection:

Two structured researchers collected data with face-to-face interviews at home and work sites of subjects. Demographic features, socio-economic statues (SES), important personal and family history data (especially about DM), smoking habits and nicotine dependency, alcohol use and dependency, frequency and intensity of regular physical exercises and physical activity level (PAL) were interviewed with a structured questionnaire in every subject. Subjects were categorized as smokers, non-smokers, ex-smokers regarding their tobacco usage, and as users and non-users regarding their alcohol usage. With a detailed interview, PAL of subjects were divided into four activities groups, labeled as levels L1 to L4 in increasing order. The first two levels (L1 and L2) were accepted as sedentary life style [8].

Anthropometric Measurements:

Every subject's height was measured in centimeters while the participant stood still without shoes, and weight was measured in kilograms while the participant stood without shoes and lightly clothing. BMI was calculated as weight divided by square of height (kg/m²). Waist circumference was measured in centimeters at the midpoint between the button of the ribs and the top of the iliac crest. Hip circumference was measured at the

largest posterior extension of the buttocks. Waist hip ratio was calculated by dividing these two values with each other.

Subjects:

Subjects were categorized according to their BMI as the criteria of WHO [1], as follows: a) Under Weight (<18.5 kg/m²) b) Normal (18.50-24.9 kg/m²) c) Over Weight (25-29.9 kg/m²) d) Obesity Stage I (30-34.9 kg/m²) e) Obesity Stage II (35-39.9 kg/m²) f) Obesity Stage III (>40kg/m²). WHR and WC were categorized according to relative cardiovascular risk profiles as a) No risk b) Medium risk c) High risk.

Statistical Methods:

Many statistical methods including Pearson correlation test, one-way ANOVA Tukey test, independent sample's t test, x-square test, linear regression test were used to evaluate the data. Variables associated with obesity (BMI=30 kg/m²) in univariate tests were included in logistic regression model. The backwards elimination method was used and odds ratios were calculated. A significance level of 95% was accepted.

Results:

The demographic characteristics of the study population are represented in table 1. The mean values of height, weight, BMI, WC, WHR of the subjects according to their sexes are shown in table 2. BMI was found correlated with WC (R=0.781) and WHR (R=0.196). The correlation was permanent in males and in females in different power.

Android and General Obesity:

According to their BMI measurements, 699 (36.1%) of the subjects were over weighted, 529 (27.3%) of them were obese among study population. The BMI groups in sexes are shown in figure 1. According to WHR 364 subjects (18.8%) and to WC 704 (36.3%) had measurements indicated as high CVD risk. The mean values of WHR and WC classified for relative CVD risks are shown in table 3.

Risk Factors for Obesity:

The epidemiologic risk factors for obesity (Body mass index=30 kg/m²) were; age (OR=1.06 [95% Confidence Interval 1.05-1.07]), female gender (OR=1.38 [1.12-1.72]), marital status (to be married) (OR=2.77 [1.96-3.91]) and to be never smoker (OR=1.40 [1.12-1.74]), while socio-economical status, sedentary life style, having diabetes mellitus, regular exercises, usage of alcohol and habitation had no effect on general obesity. In male subjects the WC values were 5 cm (mean=100.94±11.03, p=0,001) and BMI were 2 kg/m² (mean=28.83±3.75, p=0,002) higher in the subjects who have DM. Female DM patients had significantly higher BMI (mean=31.76 kg/m²), WHR (mean=0.86), and WC (mean=96.45 cm) than other subjects (p<0.001).

Life Style Factors and Obesity:

Physical activity: The interviewed life style factors of the subjects are summarized in table 4. While most of the subjects (82.2%) had a sedentary life style, 708 (26.7%) of the subjects claimed that they had weekly regular exercise and 20.5% of them were performing regular exercise three or more times a week. The mean exercise time was 78.56 minutes/week. The most frequent type of exercise was jogging (60.4%). Male subjects were more active than females ($p<0,001$).

The WC is found significant according to the PAL of the male subjects ($p=0.006$), the least active group (mean=97.45 cm) have 3.8 cm higher WC than the most active group respectively. In females BMI ($p=0.005$) and WC ($p=0.030$) were statistically different in PAL groups. The least active group had 1.5 kg/m² higher BMI (mean=27.91 kg/m²) and 2.8 cm WC (mean=86.36 cm) values than most actives.

Smoking and Alcohol: Smokers had significantly lower BMI and WC levels compared to never smokers and ex-smokers but WHR was affected only for women ($p<0.001$). The male smokers' WC and BMI were 4.8 cm and 1.6 kg/m² lower than never smokers' respectively. Female smokers have 2.9 kg/m² BMI, 0.28 WHR, and 6.08 cm WC lower measurements than never smokers.

In a linear regression model, the duration of the smoking and Fagerstrom nicotine dependence scores had no relation with BMI, WHR or WC. Alcohol use didn't make a significant difference between anthropometrical measurements also. Only male heavy drinkers (Elias Alcohol Consumption test, fifth level) had wider WHR than others ($p=0.024$).

Discussion:

In this cross-sectional study, 21.7% of the males and 31.0% of the females have BMI=30 kg/m² and an additional 43.4% of the males and 28.8% of the females were overweighted. Android obesity was also very frequent in both sexes. In a self reported study it has been reported that obesity prevalence is nearly 10% and overweight prevalence is 36.6% and 25.6% among males and females among in 15 European Union countries. Also in different studies around the world whether designed rational or national, the obesity prevalence has been found ranging between 1 and 59% while overweight prevalence has been found ranging between 4 and 34% in different countries. Our results regarding the mean anthropometric parameters are confirmed the results of TURDEP study while the obesity ratio in females was lower than TEKHARF study results. The age of studied population cause the difference as in TEKHARF study, main priority was to identify the cardiovascular risk factors, so the study population was chosen over 30 years old while in TURDEP the subjects are chosen =20 years old. In this study one of most important epidemiologic risk factor for obesity was the age. In TEKHARF study it is estimated that the weight gain ratio is much faster until the age of 50-59 years in Turkish female adults and have a peak at 60-69 years.

The age group (18-65 years) of our study population may be the explanation of the low rates of obesity in females. Female gender also was found as an obesity risk factor in this study like two of these previous studies.

In many segments of the society, obesity is considered to be the result of an individual's failure to exercise self-control over patterns of physical activity and eating. One of the most important results of this study is the dominance of the sedentary life style among our subjects. A small percentage of the subjects who have regular exercise perform it three times a week while only a few of them perform at least 30 minutes as recommended. Apart from controlling weight gain, one of the main health promotion activities should be about a qualitative and quantitative regular exercise.

Another interesting point in our results was the alcohol usage had no effect on obesity. We believe obesity can be dependent on the amount and duration of the alcohol that is used. Social alcohol usage might have no effect on obesity as in our study heavy male drinkers according to the Elias alcohol test, had android obesity risk while there was no heavy female drinker at all. Smoking is not a risk factor for obesity while the duration and intensity of smoking test had not an important effect on anthropometric measurements. As it is confirmed in TEKHARF study, mean BMI, WC, and WHR measurements of the smokers are lower than the non-smokers.

5.3% of our subjects had declared that they had been diagnosed as DM patient. But in TURDEP study it is estimated that DM prevalence is about 7.1% and impaired glucose tolerance is 7.6% and it is also confirmed about obesity as an independent risk factor in Turkish adults for DM and glucose intolerance. However these results points out that there could be undiagnosed DM patients among our subjects so DM might have a higher odds ratio than observed. In a recent study which is based on 11 European population surveys it has been found that 1kg/m² increase in BMI is associated with an overall increase in diabetes of 12% in men and 10% in women and impaired glucose tolerance 7% in both sexes. Besides, in our study we were unable to detect the subjects with the impaired glucose tolerance so this important point might be also masked.

This study may have some limitations in data gathering like all cross-sectional studies. While smoking and alcohol usage confirmed by valid objective scales, subjects had declared the exercise frequency and duration subjectively that might have an effect on our results as the sedentary life style was defined according to them. It is imperative that strategies be developed to identify, treat, and ultimately prevent obesity. In the coming years new management and therapeutic strategies for obesity will likely emerge. Both existing strategies and those are developed in the future will need to be studied in randomized clinical trials that their impact on morbidity and mortality outcomes in the setting of obesity can be rationally assessed.

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Table 1: Demographic Features of the Study Group	
Number of Subjects	1936
Sex	980 (50.6%) males 956 (49.6%) female
Age	40.73±11.84 (min 18, max.65)
Habitation	1691 (87.3%) Urban 245 (12.7%) Rural
Education Year (mean)	8.91±3.99 years (min 1, max.18) 47 (3.5%) literate 21 (1.1%) illiterate
Marital Status	1554 (80.6%) married 19 (1.0%) divorced 86 (4.4%) widow 277 (14.3 %) single
SES	265 (13.7%) Well 540 (27.4%) Medium 621 (32.1%) Low 510 (26.3%) Very Low

Table 2: The Anthropometric Measurements				
	Males		Females	
	Mean	SD	Mean	SD
Height	172.51	6.92	159.33	6.63
Weight	80.20	13.56	69.19	13.55
WC (cm)	95.56	11.27	85.19	13.07
WHR	0.92	0.31	0.80	0.37
BMI kg/cm ²	26.89	4.17	27.46	5.58

Figure 1: Obesity Classification According To BMI

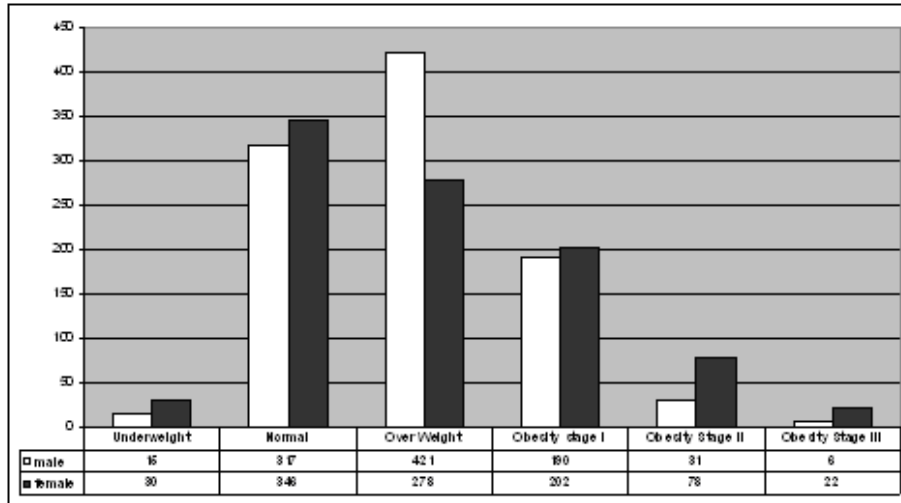


Table 3: The Waist/Hip Ratio and Waist Circumference According to Relative Risk Of Cardiovascular Diseases

		Males	N	%	Females	N	%
WHR	No Risk	(<0.90)	389	39.7	(<0.80)	482	50.4
	Medium Risk	(0.90-1.0)	446	45.5	(0.81-0.85)	255	26.7
	High Risk	(>1.0)	145	14.8	(>0.85)	219	22.9
WC	No Risk	(<94 cm)	407	41.5	(<80 cm)	342	35.8
	Medium Risk	(94-101 cm)	258	26.3	(80-87 cm)	225	23.5
	High Risk	(>101 cm)	315	32.2	(>88 cm)	389	40.7

List of Abbreviations:

BMI Body Mass Index
 CVD Cardiovascular disease
 DM Diabetes Mellitus
 OR Odds Ratio
 PAL Physical Activity Level

SD Standard Deviation
 SES Socio-economic Status
 WC Waist Circumference
 WHO World Health Organization
 WHR Waist Hip Ratio

Table 4: Some Life Style Factors of Study Group			
		Males	Females
Smoking Habit	Never Smoker	265 (27.0%)	615 (64.3%)
	Ex-Smoker	165 (16.8%)	71 (7.5%)
	Smoker	550 (56.2%)	270 (28.2%)
Alcohol Use	Non-user	612 (62.5%)	931 (97.4%)
	User	368 (37.5%)	25 (2.6%)
Physical Activity Level	L1: very low	318 (32.4%)	546 (57.1%)
	L2: low	443 (45.2%)	294 (30.8%)
	<i>Sedentary(L1+L2)</i>	<i>763 (77.6%)</i>	<i>840 (87.9%)</i>
	L3: medium	123 (12.6%)	80 (8.4%)
	L4: high	96 (9.8%)	36 (3.8%)