Turkish Journal of Endocrinology and Metabolism, (2003) 1 : 31-35 **ORGINAL ARTICLE**

The Prevalence of Obesity in Adult Population in a City on the Mediterranean Coast of Turkey

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The aim of the study was to determine the prevalence and type of obesity in Mersin city center on the Mediterrenean coast of Turkey, as well as its relationship with age, sex, education level, blood pressure and menopause. This study has been conducted on 1496 people (855 women, 641 men) age group between 20 and 74. Of 1496 people who were examined in this study, 483 (32.3%) had normal body weight, and 575 (38.4%) were overweight, and 438 (29.3%) were obese. The average Body mass index (BMI) was higher in the women, and the average ratio of waist to hip was higher in the men, and the waist circumference was higher in the men. Positive correlations were determined between BMI and waist circumference, and waist-to-hip ratio, and age and blood pressure in the obese group. High waist circumference was determined in 45.5% of the women and 22.9% of the men. High ratio of waist to hip was determined 13.2% of the women and 13.3% of the men. The prevalence of obesity increased with age, the presence of diabetes mellitus, in postmenopausal period, and in the population of low educational levels. Hypertension risk was higher in the presence of obesity than in the presence of normal bodyweight.

Key words: Obesity, prevalence, Body Mass Index, waist circumference, waist to hip ratio, abdominal obesity.

Introduction

Obesity is a worldwide epidemic that contributes to many chronic diseases and early mortality (1,2). Adverse health consequences associated with obesity include increased incidence rate of type 2 diabetes mellitus, coronary artery disease, dyslipidemia, hypertension, respiratory tract system and gallbladder diseases, osteoartritis and various malignancies as well as psychosocial effects (3). Furthermore, distribution of body fat is also important. Abdominal fat is more strongly associated with health risk than fat stored in other regions of the body (4). Abdominal obesity which is closely associated with intra-abdominal fat, is commonly related to the metabolic syndrome. Therefore, the increase in the prevalence of abdominal obesity become a major public health problem. High calory diet and decrease in physical activity are the most important causes of the increased prevalence of obesity, however, the role of genetic causes has been important (5,6).

In a study, based on body mass index ≥ 30 kg/m^2, the prevalence of obesity was found 22.3% among Turkish population (7). The prevalence of obesity may even vary according to epidemic variations in the same country (8). In this study, therefore, we aimed to determine the prevalence and type of obesity in Mersin city center on the mediterrenean coast of Turkey, as well as its relationship with

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age, sex, educational level, blood pressure, diabetes mellitus and menopause.

Material and Methods

The population of Mersin city, where the study has been conducted, was reported as 728.141. The population of aged in ranging 20 to 74 years was 432.830. Study population were selected by a stratified random sampling method from seven different regions in the city according to identical age groups. A letter, that included the aims of the study, was sent to 1755 people (866 men and 889 women) to invite them to the hospital. Of those, 1496 people including 855 women (57.2%) and 641 men (42.8%) attended the screening program. The attendence rate to the program was higher for women (96.1%) than for men (74%). As shown in figure 1a and 1b, the population was categorized according to their ages as four years for each group. The questionnaire form included the assessment of educational level, presence of hypertension, diabetes mellitus, and other systemic illnessess, menoupause in women. In addition, the measurement of weight, height, waist and hip was done for each person. The height was measured without shoes, and the weight was measured with light weight clothing. The waist circumference was measured at the narrowest region between torax and iliac crest, and the hip circumference measurement was done at the widest point with light weight clothing (9).

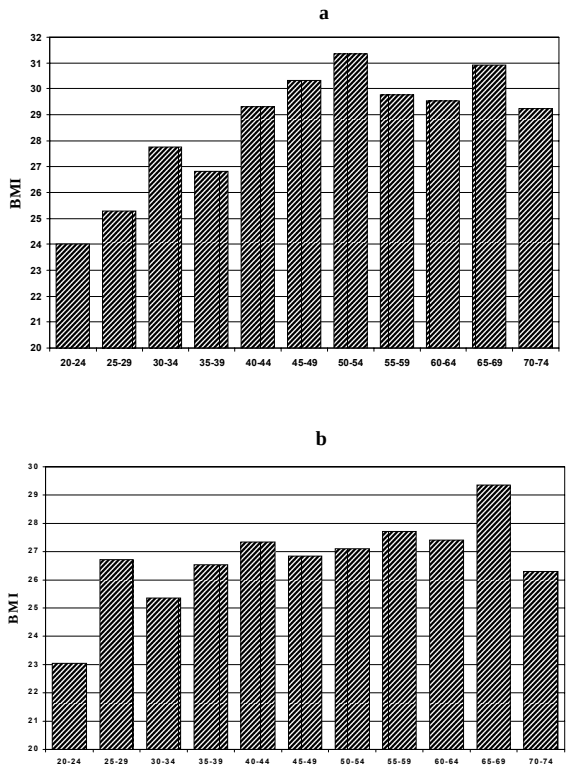

Figure 1. The average BMI values in age groups (a. in female and b.in male)

Blood pressure was measured with an calibrated aneroid manometer at rest in a sitting position from the right arm which was kept at the heart level. This measurement was repeated after a 5 minutes interval. The average blood pressure of two measurements was taken. The BMI (kg/m^2) and the ratio of waist to hip were calculated. The study population was divided into three groups using the World Health Organization criterias (10): BMI ≤24.9 defined as normal weight (group 1), BMI: 25-29.9 defined as overweight (group 2), and BMI ≥30 defined as obese (group 3). Abdominal obesity was defined as the waist-to-hip ratio >0.90 in female and >1.00 in male. Also waist circumference as marker of abdominal fat accumulation had used >102 cm for men and >88 cm for women (11).

Statistical Analysis

All data was evaluated using a commercial available package program (SPSS v 9.05) for statistical analyses. The destrictive statistics were done for all parameters. All values are expressed as mean ± S.D. (standard deviation). ANOVA test was used to compare differences in the average waist-to-hip ratio and waist circumference among the groups based on BMI values and differences in the average BMI among the age groups. The differences in the average BMI for educational level and sex parameters were compared with t test, and Mann-Whitney U test was used to compare the average blood pressure according to BMI, the presence of diabetes mellitus and menopause, and was used to compare the average waist circumference and waist to hip ratio in between diabetic and non-diabetic. The relative risk (RR) of the obese group and overweight group according to normal weight group for hypertension was calculated with chi-square test. The high waist circumference ratios and the high waist to hip ratios in the groups were compared with chi-square test. The Pearson correlation analysis was performed for correlations.

Results

Of 1496 people who were examined in this study, 483 (32,3%) had normal body weight, and 575

(38,4%) were overweight, and 438 (29,3%) were obese. Table 1 shows the BMI, the waist circumference, the waist to hip ratio, and mean blood pressure of the study population.

Of the women, 34.9% were overweight and 34.5% were obese. Of the men, 43.2% were overweight, and 22.3% were obese. The average BMI was 28.05 ± 5.45 in the women, and 26.55 ± 3.98 in the men (p<0.001). The average waist circumference was 87.32 ± 12.37 cm in the women, and 93.79 ±12.16 cm in the men (p<0.001). The average ratio of waist to hip was 0.79 ± 0.06 in the women, and 0.88 ± 0.07 in the men(p<0.001). Positive correlations were detected between BMI and waist circumference, and waist-to-hip ratio, and age and blood pressure (Pearson Correlations= r:+0.707, r:+0.246, r:+0.283, r:+0.320). The average waist circumference was 79.77 ± 10.31 cm (83.87 ± 9.72 cm in the male and 76.30 ± 9.51 cm in the female) in group 1, 90.58 ± 8.86 cm (94.99 ± 7.99 cm in the male, 86.48 ± 7.58 cm in the female) in group 2 and 100.83 ± 9.85 cm (106.79 ± 8.39 cm in the male and 97.94 ± 9.19 cm in the female) in group 3. The average waist circumference in the groups were significantly different from each other (p <0.001 for group 1 vs. group 2, p <0.001 for group 1 vs. group 3, and p <0.001 for group 2 vs. group 3).

High waist circumference was detected in 3.9% of group 1 (1.4% in the male and 6.1% in the female), 25.9% of group 2 (13.7% in the male and 37.2% in the female) and 84 % of group 3 (74.1% in the male and 88.8% in the female). The high waist circumference ratios in the groups were significantly different from each other (p <0.001 for group 1 vs. group 2, p <0.001 for group 1 vs. group 3, and p <0.001 for group 2 vs. group 3).

The average ratio of waist to hip was 0.79 ± 0.07 (0.84 ± 0.07 in the male and 0.76 ± 0.06 in the female) in group 1, 0.84 ± 0,07 (0.89 ± 0.07 in the male, 0.80 ± 0.06 in the female) in group 2 and 0.85 ± 0.08 (0.93 ± 0.06 in the male and 0.82 ± 0.06 in the female) in group 3. While the average ratio of waist to hip was significantly lower in group 1 than in group 2 and group 3 (p<0.001, p<0.001), this difference was not statistically significant between group 2 and group 3 (p>0.05).

Abdominal obesity was detected in 2.3% of group 1 (0,5% in the male and 3,8% in the female), 5.4%

Table 1. The BMI, the waist circumference, the waist to hip ratio and mean blood pressure of the study population.

PARAMETER	
N	1496
Sex	Male : 641/1496 (42.8%) Female : 855/1496 (57.2%)
BMI (kg/m^2)	Male : 26.55± 3.98 Female: 28.05± 5.45 Low education: 28.37± 6.04 High education: 26.37± 4.19 Diabetic: 30.11±6.30 Non-diabetic: 27.34±4.98 Postmenapausal (age 40-50): 31.49±4.77 Premenapausal (age 40-50): 29.67±5.37
Waist circumference	Male : 93.79±12.16 cm Female: 87.32±12.37 cm Obese : 100.83±9.85 cm (male: 106.79± 8.39, female : 97.94±9.19) Overweight : 90.58±8.86 cm (male: 94.99±7.99 , female : 86.48±7.58) Normal weight : 79.77±10.31cm (male: 83.87± 9.72 , female : 76.30±9.51)
Waist-to-hip Ratio	Male : 0.88± 0.07 Female: 0.79± 0.06 Obese : 0.85± 0.08 (male: 0.93± 0.06 , female : 0.82± 0.06) Overweight : 0.84± 0.07 (male: 0.89± 0.07 , female : 0.80± 0.06) Normal weight : 0.79± 0.07 (male: 0.84± 0.07, female : 0.76± 0.06)
Blood pressure	High waist circumference (+) : 129,51 ± 25.59 mmHg (systolic pressure) High waist circumference (-) : 115.23± 20.96 mmHg (systolic pressure) Hypertension (Obese group+ Overweight group) : 17.57% (178 /1013) Hypertension (Normal weight group) : 4.55% (22/483) Relative Risk : 3.85

of group 2 (3.2% in the male and 7.4% in the female) and 13.2 % of group 3 (13.2% in the male and 13.2% in the female). The abdominal obesity ratios in the groups were significantly different from each other ($p < 0.05$ for group 1 vs. group 2, $p < 0.001$ for group 1 vs. group 3, and $p < 0.001$ for group 2 vs. group 3). Of 66 people who were diagnosed with diabetes mellitus, the mean BMI was 30.11 ± 6.30. When comparing this value to the mean BMI in the people with no diabetes ($p<0.001$). The average waist circumference in diabetics was 98.32 ± 13.51 cm, and the average waist to hip ratio in diabetics was 0.87 ± 7.55. The average waist circumference and waist to hip ratio in diabetics were higher than non-diabetics (respectively $p<0.001$, $p<0.001$). The incidence of hypertension was 3.85 times higher in group 2 and group 3 than in group 1 (RR: 3.85). The mean systolic blood pressure was 129.51 ± 25.59 mmHg in the population with high waist circumference, and 115.23 ± 20.96 mmHg in the population with normal waist circumference ($p<0.001$). The mean systolic blood pressure was 135.70 ± 27.14 mmHg in the population with high waist to hip ratio, and 119.25 ± 23.09 mmHg in the population with normal waist to hip ratio ($p < 0.001$). The mean BMI was significantly higher in the population with lower educational level, than in the population with higher educational level ($p<0.001$). The mean BMI increased with age. The highest values of BMI were noted in the women between ages 50-54, and in the men ages 65-69 (Fig 1a and 1b). For women of menopausal age, while premenopausal women had a mean BMI of 29.67 ± 5.37, postmenopausal women had a mean BMI of 31.49 ± 4.77 ($p<0.001$).

Discussion

The prevalence of obesity reported in the literature varies with the BMI reference values which are used to describe obesity and overweight. However, the criterias described by World Health Organization (WHO) in 1997 are most generally used (10). In a study using the WHO criterias to describe obesity, where the measurements were given individually by the participants, the prevalence of obesity was reported as 17.9% (8). The prevalence of obesity varies between the ethnic groups, age and gender. In a study conducted with Latinas of Mexican descent, the prevalence of obesity has been reported as high as 48% (12). Although the prevalence of obesity has been increasing, European populations are less obese than American populations. Similarly, there has been a reported higher prevalence of obesity in Russia, the Middle Eastern and Asia (5). In our study, the prevalence of obesity was 29.3% which is higher than the reported studies from these countries and from previously reported values of Turkish population. Our results are also in accordance with other studies that found a higher prevalence among women with respect to men. The factors that affect these differences include childbearing, hormonal status, patterns of smoking and alcohol consumption (13).

Abdominal obesity, which is evaluated by waist to hip ratio and waist circumference, causes the increased risk in coronar artery diseases, diabetes, hypertension and hyperlipidemia (14-16). In the present study, we found that the systolic blood pressure in the obese population with high waist to hip ratio, than in the population with normal waist to hip ratio. We also demonstrated that waist circumference and waist to hip ratio were higher in diabetics. Having an increased waist circumference can indicate increased risk even at a healthy weight (6). Therefore, 3.9 % of the population with normal BMI in our study group is under health risk. Similarly to other studies, the prevalence of obesity increased with age. The causes of weight gain with aging may be decline in resting metabolic rate and in physical activity, increase in food intake with aging and genetic factors. In our study, the highest prevalence of obesity, which was detected at earlier ages in women than in men, could be explained by the effect of menopause (17). In the study, the mean BMI was significantly higher in the postmenopausal women than in the premenopausal women.

In conclusion, obesity is an important health problem in our region. The prevalence of obesity increases with age, the presence of diabetes mellitus, in postmenopausal period, and in population of low educational levels. For this reason, not only do we need to treat individual obese patients but also a national systematic approach needs to be created to circumvent the problems of a growing obese population.

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