ISSN 2458-8865 E-ISSN 2459-1505
www.fppc.com.tr
Family Practice and Palliative Care
https://doi.org/10.22391/fppc.432505

Original Article

The awareness of obesity associated comorbidities among normal weight, overweight and obese individuals: a cross sectional analysis

Normal kilolu, kilolu ve obez bireylerin obezite ilişkili hastalıklar hakkındaki bilinç düzeylerinin değerlendirilmesi: kesitsel analiz

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ABSTRACT

Introduction: Obesity is one of the most important community health threatening problem, because of its high prevalence and associated comorbidities. Each of these comorbidities have various risks for health. There are very few studies investigating the awareness of people about obesity associated comorbidities

Methods: Five-hundred adult patients, admitted to Endocrinology & Internal Medicine outpatient clinics, whose body mass index was>18.5 kg/m^2 and completed a questionnaire concerning obesity associated comorbidities were included in this study. Each correct answer was scored as 1 point. Each participant's total score and mean total score (MTS) was calculated. The scores among normal weight, overweight and obese groups were compared. Besides the questionnaire, age, gender, education level was asked and waist and hip circumference, height and weight were measured by the researchers.

Results: Mean education score was the lowest in the obese group, altough MTS was the highest. Awareness of obesity associated stroke, breast cancer and osteoarthritis were significantly higher in the obese group when compared to the other groups, but there was no difference between men and women. Awareness of obesity associated menstrual irregularity and infertility was higher in women, hypertension and prostate cancer was higher in men.

Conclusions: Although the education level was lowest in the obese group, the awareness of obesity-associated comorbidities was highest.

Keywords: Obesity, comorbidities, awareness, education level

ÖZ

Giriş: Obezite, yüksek prevalansı ve eşlik eden komorbiditeleri nedeniyle toplum sağlığını tehdit eden en önemli sorunlardan biridir. Bu komorbiditelerin her birinin sağlık için çeşitli riskleri vardır. Obezite ile ilişkili komorbiditeler hakkında insanların farkındalığını araştıran çok az çalışma vardır.

Yöntem: Bu çalışmaya, Endokrinoloji ve Dahiliye polikliniklerine başvuran, vücut kitle indeksi >18,5kg/m^2 olan ve obezite ile ilişkili komorbiditelere ilişkin bir anket doldurmayı kabul eden beş yüz yetişkin hasta dahil edildi. Her doğru cevap 1 puan olarak puanlandı. Her bir katılımcının toplam puanı ve ortalama toplam puanı hesaplandı. Skorlar normal kilolu, kilolu ve obez gruplarda karşılaştırıldı. Anketin yanı sıra yaş, cinsiyet, eğitim düzeyi ve bel çevresi, kalça çevresi, boy ve kiloları ölçüldü.

Bulgular: Toplam puanı en yüksek olmasına rağmen obez grupta ortalama eğitim skoru en düşüktü. Obezite ile ilişkili inme, meme kanseri ve osteoartritis farkındalığı obez grupta diğer gruplara göre anlamlı olarak yüksek bulundu, ancak kadın ve erkek arasında fark yoktu. Obeziteye bağlı menstrüel düzensizlik ve infertilite farkındalığı kadınlarda daha yüksek iken obezite ilişkili hipertansiyon ve prostat kanseri farkındalığı erkeklerde daha yüksekti.

Sonuç: Eğitim düzeyi obez grupta en düşük olmasına rağmen obezite ile ilişkili komorbiditelerin farkındalığı en yüksek düzeydedir.

Anahtar kelimeler: Obezite, eşlik eden hastalıklar, farkındalık, bilgi düzeyi

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Introduction

Overweight and obesity becomes a global health problem because of its increasing prevalence and associated comorbidities that causing more than 3 million deaths worldwide and is the biggest avoidable cause of cancer after smoking [1, 2]. According to World Health Organization (WHO), more than 1.9 billion adults were overweight and over 650 million were obese. Among whole population, 39% of adults were found overweighted in 2016, and 13% of those were obese. Furthermore, 41 million children under the age of 5 were overweight or obese in 2016. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 [3].

Obesity is associated with many comorbidities like; cardiovascular diseases (CVD) [4], hypertension (HT) [5], stroke [6], diabetes mellitus (DM) [7, 8], dyslipidemia [5], malignancy [9-11] (prostate [12-14], breast cancer in postmenopausal women [15, 16], colon cancer [17]), infertility [18, 19], osteoarthritis [20, 21] and sleep apne syndrome (SAS) [22-24]. Each of these comorbidities have various risks for health. Because of its high prevalence and associated comorbidities, obesity is one of the most important problems threatening community health. There are very few studies investigating the awareness of people about obesity-associated comorbidities (OAC) especially, evaluating the population attending to hospitals. In our study, we aimed to compare the awareness levels of normal weight, overweight and obese individuals, admitting to the University Hospital for different reasons.

Methods

Study design

This was a survey study carried out in Endocrinology & Metabolism and Internal Medicine outpatient clinics. The ethical approval was taken on 15th April 2008 with the approval number 2008-8/16 from Uludag University ethical comitee. Total 500 adults (108 Male, 392 Female) older than 18 years-old, with body mass index (BMI)>18.5 kg/m^2 were included in this study. Written informed consent given volunteers completed the questionnaire by face to face interview. Age, gender, education level was asked, and height, weight, waist and hip circumferences were measured. BMI was calculated in kg /m^2 and a standart definition of BMI to classify the participants as normal weight (NW, BMI between 18.5 and 24.9 kg/m^2), overweight (OW, BMI between 25 and 29.9 kg/m^2) or obese (OB, BMI $\geq$ 30 kg/m ^{2}) is used [3]. Education level of the participants were evaluated according to their graduated school. Each school year was calculated as one point; so, participants who could not read or write were scored as 0, primary school graduates as 5, middle school graduates as 8, high school graduates as 12 and university graduates as 16. Mean education score (MES) was calculated for normal weight, overweight and obese groups.

Questionnaire

The participants were asked to fill the blank in the 'What do you think about the frequency of ……. among obese individuals compared to normal weight individuals?' sentence with 'increase', 'decrease', 'same' and 'I don't know' options for each comorbidity (HT, CVD, stroke, DM, dyslipidemia, malignancy (prostate, breast, colon), menstrual irregularity, infertility, snoring, SAS, osteoartritis) to evaluate their awareness (Table 1). Each correct answer is scored as 1 and incorrect answer is scored as 0 points. Participant's total scores and mean total scores (MTS) were calculated. The results were compared by gender and NW, OW and OB groups.

Statistical analysis

All statistical analysis was performed by using the Statistical Package for Social Sciences vers 13.0 (SPSS Inc; Chicago, IL, USA). Continuous variables were given as mean values ± standard deviations and minimum, maximum values. Distribution of normality was evaluated by Shapiro-Wilk test. Correlation analysis among variations of continuous variables was performed with Pearson or Spearman Correlation tests. Independent sample test was used in the comparison of two groups with independent variables distributed normally. Independent variables that were not normally distributed (non-parametric) were compared with Kruskal-Wallis Test among three groups and Mann-Whitney U Test among two groups. In the comparison of groups with categorical value variables Pearson and Fisher's exact chi-square tests were used. The level of statistical significance was defined as $p < 0.05$.

The reliability of the questionnaire was evaluated by test-retest reliability method. The same questiones were asked to the first 20 participants 2-5 days after the first application. Mc Nemar test did not show any difference between two questionnaires applied to the same subjects ($p > 0.05$). The questionnaire was determined highly reliable ($r = 0.95$, $p < 0.01$).

Results

Five-hundred participants [108 men (21.6 %) and 392 women (78.4 %)] joined to the study. The overall response rate was 100%. Among men 26.9% (29) were NW, 44.4% (48) were OW and 28.7% (31) were OB. These percentages were 29.6 % (116), 29.1 % (114) and 41.3 % (162) for women, respectively.

Participants demographic features among the three groups according to BMI, is seen in Table 2. The mean age was 35.9 in NW, 48 in OW and 49.8 in OB. OW and OB were significantly older than NW ($p < 0.001$, Table 2). MES of the NW, OW and OB were 10.63 ± 4.27, 9.00 ± 4.78 and 7.11 ± 4.34 respectively. MES of the NW is significantly higher than the OW and OB, while it was lower in OB compared to OW (Table 2).

Table 1. Questions about obesity associated comorbidities in the questionnaire

What do you think about the frequency of ……. among obese individuals compared to normal weight individuals? Please fill the sentence with 'increase', 'decrease', 'same' or 'I don't know'	
1	High blood pressure
2	Heart diseases
3	Paralysis
4	Diabetes mellitus
5	Dyslipidemia
6	Breast cancer
7	Prostate cancer
8	Intestinal cancer
9	Menstrual derangement
10	Infertility
11	Joint calcification
12	Snoring
13	Transient breath hesitation

Table 2. The characteristics and education status of normal weight, overweight and obese participants

	Normal weight n=145	Overweight n=162	Obese n=193	p
Age (year)	35.9±12.0	48±12.2[a]	49.8±10.5[a]	<0.001
Gender (M/F)	29/116	48/114[b]	31/162	0.007
BMI (kg/m²)	22.2±1.8	27.5±1.4[a,b]	35.1±4.8[a]	<0.001
Waist circumference (cm)	78.3±7.8	91.9±8.2[a,b]	105.7±11.2[a]	<0.001
Waist /hip ratio	0.82±0.07	0.88±0.08[a,c]	0.90±0.07[a]	<0.001
MES	10.63±4.27	9.00±4.78[c,d]	7.11±4.34[a]	<0.001

M: Male, F: Female, BMI: Body Mass Index, MES: Mean Education Score, [a] p <0.001 vs normal weight, [b] p <0.001 vs obese, [c] p <0.05 vs. obese, [d] p <0.01 vs. normal weight

In the evaluation of awareness of OAC among groups, MTS of NW was 7.11 ± 2.75, OW 7.53 ± 2.90 and OB 7.96 ± 2.97. MTS of the OB was significantly higher than NW (p=0.005, Table 3). Concerning vascular and metabolic comorbidities, awareness level could not reach the level of significance among groups, except stroke (Table 3). The awareness of obesity associated stroke was higher in the OB compared to NW and OW (p <0.001, p <0.05) while lower in NW compared to OW (p<0.05). Awareness of obesity associated breast CA was higher in the OB compared to NW and OW (p<0.05, p <0.01, Table 3). OB was significantly more aware about obesity associated osteoarthritis compared to NW (p=0.002, Table 3). Awareness of obesity associated HT, CVD, DM, dyslipidemia, prostate and colon cancer, menstrual irregularity, infertility, snoring and SAS among the groups was not
significant (Table 3).

When the awareness is compared among male and female volunteers, the obesity associated HT, prostate CA, menstrual irregularity and infertility reached statistical significance (Table 4). While, female volunteers were more aware of obesity associated menstrual irregularity and infertility, male volunteers were more aware of obesity associated HT and prostate CA (Table 4). All other associations could not reach statistical significance.

Table 3. Awareness of obesity associated comorbidities in normal weight, overweight and obese groups

	Normal weight (n=145)	Overweight (n=162)	Obese (n=193)	p
MTS	7.11 ± 2.75	7.53 ± 2.90	7.96 ± 2.97[a]	0.005
HT (n, %)	115 (79.3)	126 (77.8)	158 (81.9)	0.625
CVD (n, %)	121 (83.4)	134 (82.7)	163 (84.5)	0.906
Stroke (n, %)	66 (45.5) [b]	94 (58)	135 (69.9) [a, b]	<0.001
DM (n, %)	113 (77.9)	127 (78.4)	152 (78.8)	0.984
Dyslipidemia (n, %)	113 (77.9)	131 (80.9)	163 (84.5)	0.307
Breast CA (n, %)	25 (17.2)	38 (23.5)	64 (33.2) [b, c]	0.003
Prostate CA (n, %)	27 (18.6)	32 (19.8)	46 (23.8)	0.455
Colon CA (n, %)	37 (25.5)	40 (24.7)	62 (32.1)	0.229
Menstrual derangement (n, %)	54 (37.2)	56 (34.6)	70 (36.3)	0.884
Infertility (n, %)	63 (43.4)	83 (51.2)	97 (50.3)	0.334
Snore (n, %)	109 (75.2)	130 (80.2)	155 (80.3)	0.449
SAS (n, %)	108 (74.5)	125 (77.2)	130 (67.4)	0.100
Osteoarthritis (n, %)	80 (55.2)	104 (64.2)	142 (73.6) [a]	0.002

MTS: Mean total score, HT: Hypertension, CVD: Cardiovascular disease, DM: Diabetes mellitus, CA: Cancer, SAS: Sleep apnea syndrome, [a] p <0.001 vs normal weight, [b] p <0.05 vs. overweight, [c] p <0.01 vs. normal weight

Table 4. Awareness of obesity associated comorbidities in male and female subjects.

	Male (n=108)	Female (n=392)	P
HT (n, %)	94 (87.0)	305 (77.8)	0.034
CVD (n, %)	96 (88.9)	322 (82.1)	0.094
Stroke (n, %)	62 (57.4)	233 (59.4)	0.705
DM (n, %)	90 (83.3)	302 (77.0)	0.160
Dyslipidemia (n, %)	93 (86.1)	314 (80.1)	0.156
Breast CA (n, %)	20 (18.5)	107 (27.3)	0.064
Prostate CA (n, %)	34 (31.5)	71 (18.1)	0.003
Colon CA (n, %)	35 (32.4)	104 (26.5)	0.228
Menstrual derangement (n, %)	17 (15.7)	163 (41.6)	<0.001
Infertility (n, %)	36 (33.3)	207 (52.8)	<0.001
Snore (n, %)	90 (83.3)	304 (77.6)	0.194
SAS (n, %)	79 (73.1)	284 (72.4)	0.886
Osteoarthritis (n, %)	77 (71.3)	249 (63.5)	0.134

HT: Hypertension, CVD: Cardiovascular disease, DM: Diabetes mellitus, CA: Cancer, SAS: Sleep apnea syndrome

Discussion

Obesity is one of the major and growing preventable health problem in the world. In a national study conducted in Turkey, obesity prevalence was determined as 12.5% in men and 32% in women in 1990 [25]. In another study published in 2010, overall overweight prevalence was 37%, total obesity prevalence was 36% (female 44%, male 27%) [26]. In our group's previous study, we found overall overweight prevalence as 43.2% and obesity prevalence as 35.5 % (Female 40.7%, Male 24.3%) [27]. In our present study, the obesity rates are similar to that of in the literature (41.3% of women and 28.7% of men were obese). Since all subjects in our study were Caucasian, we could not evaluate ethnic differences.

Erem, C. et. al. [28] reported that obesity prevelance increase until 70 years-old and then decrease a little thereafter. Some reports in the literature about increasing obesity prevelance by age [25, 29, 30] verifies this study. Similarly, we found that obese and overweight participants were older than normal weighted participants.

We found education level in obese participants was lower than normal and overweight individuals. Many studies from Turkey mentioned a relationship between low education level and obesity [28, 31, 32].

Coulson et. al.[33] reported that there is no significant difference among the NW, OW and OB participants in case of awareness of obesity associated heart disease, type 2 diabetes mellitus, stroke, sleep apnea, fertility problems and arthritis. In our study, we found that awareness of OAC were directly related with the BMI of participants. Although, obese participants had the lowest education level, they had the highest awareness. This might be due to the fact that obese individuals are more interested in educating themselves about OAC to protect themselves from possible risks. We also found that awareness of obesity associated stroke, breast CA and osteoarthritis was significantly high in OB groups. Although, obesity associated osteoarthritis awareness in male participant was higher than female participants it could not reach the statistically significance. As in Coulson's study[33], the awareness of overweight associated arthritis was not different between men and women.

We noticed that the awareness of overweight associated cancer was lower compared to other comorbidities as in Coulson et al.'s [33] study. While, Leite-Pereira et.al. [34] reported 32% of overweight and obese individuals identified obesity as a risk factor for colorectal cancer we found this rate as 27.8%.

A study conducted in postmenaposal women having a family history of breast CA from England indicated that 67% those were aware of obesity and breast CA association [35]. In our study, the rate of awareness of obesity and breast CA association was not as high as in this study (27.3%, Table 4). This may be explained with the selected study population's properties that having a family history of breast CA. Those women might have incited themselves to educate for the risk factors of breast CA.

The higher awareness level of obese subjects in obesity associated stroke, osteoarthritis and breast CA might be due to self-recognition of obesity and its hazards makes them to wonder about OAC and as a result with different ways like getting knowledge from their health care providers, television programs or magazines they may be educated themselves.

The awareness of obesity association with HT, prostate CA, menstrual irregularity and infertility reached statistical significance among gender was evaluated. While, awareness of obesity association with menstrual irregularity and infertility was higher in women, awareness of obesity association with HT and prostate CA was higher in men. Since prostate cancer and menstrual irregularity are sex related disorders, higher awareness of obesity associated with prostate CA in men and menstrual irregularity in women is as expected. CVD is the majority cause of mortality among men and since HT is one of the major risk factors of CVD, high awareness of obesity associated with HT in men is expected as well. In Coulson et al [33] reported that the awareness of overweight association with fertility problems in women was higher then men like the case in our study.

Limitations

Our participants were included from patients admitted to Endocrinology & Metabolism and Internal Medicine outpatient clinics. Some of the participants may have some chronic diseases. So, they could be expected to have higher awareness compared to healthy individuals.

University Hospital is in a higher socioeconomic and sociocultural populated area of the city. So, the patient population can be expected to have higher educational status that can influence the awareness level.

Conclusion

Being overweight and obese are getting global problems with their various comorbidities together. According to our study data, we found that obesity was more frequent in low educated women. Besides, although the education level of obese participants was lower among our study groups, their awareness about OAC were higher Physicians and health care providers should strive to improve awareness of ideal body weight and the health hazards of being overweight or obese. Especially, more efforts should be given for less educated and obese women. In our opinion, this effort will also help to create more aware healthy generation about obesity and its comorbidities.

Conflict of interest: None.

Financial support: None.

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