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Determination of Etiology and Risk Factors in Patients Applying to Our Outpatient Clinic for Weight Loss

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ABSTRACT

Objective: This study aims to determine the etiological factors and risk factors of 100 adult patients who applied to our outpatient clinic for weight loss.
Methods: Data were collected retrospectively, and age, gender, blood pressure, anthropometric measurements, and laboratory findings were analyzed. Patients with type 1 and type 2 diabetes, those using lipid-lowering drugs, patients with renal or hepatic insufficiency, pregnant individuals, or those under the age of 18 were excluded from the study.
Results: 79% of the patients were female, and according to the body mass index (BMI) classification, 29% were overweight, 39% had stage 1 obesity, 23% had stage 2 obesity, and 9% had stage 3 obesity. A significant difference was found in HOMA-IR values between BMI groups (p=0.002), and as BMI increased, insulin resistance also increased. There were statistically significant differences in fasting plasma glucose (FPG), insulin, LDL, and vitamin D levels between BMI groups. However, no significant relationship was found between smoking and BMI.
Conclusion: In conclusion, the study found a significant relationship between obesity, insulin resistance, and some biochemical parameters, emphasizing that these findings should be considered in the management and treatment of obesity.

Keywords: Obesity, Insulin Resistance, Body Mass Index, Risk Factors

Polikliniğimize Kilo Vermek İçin Başvuran Hastalarda Etiyoloji ve Risk Faktörlerinin Belirlenmesi

Araştırma Makalesi

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ÖZET

Amaç: Bu çalışma, kilo vermek amacıyla polikliniğimize başvuran 100 yetişkin hastanın etiyolojik faktörlerini ve risk faktörlerini belirlemeyi amaçlamaktadır.
Yöntem: Veriler retrospektif olarak toplanmış ve yaş, cinsiyet, kan basıncı, antropometrik ölçümler ve laboratuvar bulguları analiz edilmiştir. Çalışmaya tip 1 ve tip 2 diyabeti olan, lipid düşürücü ilaç kullanan, renal veya hepatik yetmezliği olan, hamile veya 18 yaş altındaki hastalar dâhil edilmemiştir.
Bulgular: Hastaların %79'u kadın olup, vücut kitle indeksi (VKİ) sınıflamasına göre %29'u fazla kilolu, %39'u evre 1 obez, %23'ü evre 2 obez ve %9'u evre 3 obez olarak sınıflandırılmıştır. HOMA-IR değerlerinde, VKİ grupları arasında anlamlı fark bulunmuş (p=0.002), VKİ arttıkça insülin direnci de artmıştır. VKİ grupları arasında açlık plazma glikozu, insülin, LDL ve D vitamini düzeylerinde istatistiksel olarak anlamlı farklılıklar bulunmuştur. Ancak, sigara kullanımı ile VKİ arasında anlamlı bir ilişki saptanmamıştır.
Sonuç: Sonuç olarak, çalışmada obezite ile insülin direnci ve bazı biyokimyasal parametreler arasında belirgin bir ilişki olduğu saptanmış, bu bulguların obezite yönetimi ve tedavisinde dikkate alınması gerektiği vurgulanmıştır.

Anahtar Kelimeler: Obezite, İnsülin Direnci, Vücut Kitle İndeksi, Risk Faktörleri

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Introduction

The morbidity and mortality associated with being overweight have been recognized by the medical profession since the time of Hippocrates. [1] According to the World Health Organization (WHO), obesity is defined as "excessive or abnormal accumulation of fat that is hazardous to health". It has reached epidemic proportions worldwide and is the most serious public health problem of the 21st century. [2,3] While obesity was once considered a problem of developed countries, its prevalence is rapidly increasing in developing countries and in our own, due to the adoption of western lifestyles, widespread consumption of fast food, and decreased energy expenditure compared to increased energy intake. [4]

There is a clear association between obesity and increased central adiposity and an elevated risk of morbidity and mortality. Obesity has a deleterious impact on numerous biochemical markers, including fasting blood glucose, insulin resistance, and cholesterol levels. When left untreated, it has adverse effects on all organs and systems in the body, particularly the endocrine and cardiovascular systems. There is a strong association between obesity and a number of other health conditions, including metabolic syndrome, prediabetes, type 2 diabetes mellitus, dyslipidemia, hypertension, cardiovascular disease, nonalcoholic fatty liver disease, polycystic ovary syndrome, female infertility, male hypogonadism, sleep apnea, asthma, osteoarthritis, depression, and a number of cancers, including endometrial, breast, and gallbladder cancers in women and colon, rectum, and prostate cancer in men.[5,6]

The rapid change in lifestyle in our country has resulted in a critical prevalence of obesity exceeding 30%, which represents a significant threat to public health. The Endocrine and Metabolic Society of Turkey (TEMS) recommends that all individuals over the age of 18 should undergo screening for obesity. In clinical practice, the most commonly employed methods for assessing obesity are Body Mass Index (BMI) and waist circumference measurements. BMI classifications are based on the risk of cardiometabolic disease. Furthermore, there is a strong correlation between waist circumference and the amount of intra-abdominal adiposity. [7-9]

The objective of this study was to determine the obesity-related risk factors in male and female patients over the age of 18 years who applied to our outpatient clinic with the desire to lose weight and who had no known comorbidities.

Materials and Methods

The study was designed as a retrospective study. The archival data of 100 male and female patients over the age of 18 who applied to the Internal Medicine Outpatient Clinic of Health Sciences University Ankara Dışkapı Training and Research Hospital between 01 December 2016 and 01 June 2017 with the desire to lose weight were subjected to analysis.

The following data were obtained from the patients' files: age, gender, medical history, blood pressure, anthropometric measurements and laboratory data. The study excluded patients younger than 18 years of age, pregnant women, and patients with known disease. This included patients with type 1 DM and type 2 DM who were on medication, patients on antilipidemic drugs, patients with renal failure or hepatic failure, patients with myocardial infarction or stroke, patients with a body mass index (BMI) of less than 25 kg/m², and those for whom archival information was not available.

In this outpatient clinic, patients' heights were measured by removing their shoes and using a meter affixed to the wall. Waist and hip circumferences were gauged with a non-stretchable tape measure over thin clothing. The waist measurement was taken at the midpoint of the last costa and iliac crest, while the hip measurement was taken over the trochanter major, identifying the widest diameter. Body mass index (BMI) is calculated by dividing an individual's weight (in kilograms) by the square of their height (in metres). The classification of BMI is based on the recommendations of the National Institutes of Health (NIH) and the World Health Organization (WHO) (Table 1).[10,11].

Table 1. Classification of body mass index

BMI (kg/m)²	Class
<18.5	Underweight
≥18.5 to 24.9	Normal weight
≥25 to 29.9	Overweight
≥30	Obesity
30 to 34.9	Obesity class 1
35 to 39.9	Obesity class 2
≥40	Obesity class 3

All biochemical analyses were conducted in the Biochemistry Laboratory of Dışkapı Yıldırım Beyazıt Training and Research Hospital, following a minimum of eight hours of fasting. The haemograms were determined using a Becman Coulter LH 780 automatic blood count apparatus. The lipid levels were determined by an enzymatic method on a Roche Cobas 6000 Hitachi c501 autoanalyzer. The levels of high-density lipoprotein (HDL) and triglycerides (TG) were quantified, and the level of low-density lipoprotein (LDL) was calculated indirectly using the Friedewald formula (LDL = TK - (HDL + TG/5)). The levels of urea, creatinine, AST, ALT, iron, iron-binding capacity, ferritin, glucose, folic acid, TSH, St4, B12 and vitamin D were determined using the Roche Cobas 6000 Hitachi c501 autoanalyzer. Insulin levels were quantified by means of a chemiluminescent enzyme immunoassay in a Siemens Immulite 2000 autoanalyzer. Insulin resistance was calculated using the HOMA-IR formula (fasting glucose (mg/dl) x fasting insulin (µIU/mL) / 405). Values of 2.5 and above were considered significant.

The study was approved by the Clinical Research Ethics Committee of Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital with decision no. 124 dated 06/12/2018.

Statistical analysis was conducted using the SPSS 22.0 software package. The descriptive statistics of all data collected in the study were calculated. The assumption of normality was tested for continuous quantitative variables using the Kolmogorov-Smirnov and Shapiro-Wilk tests. One-way ANOVA and Kruskal-Wallis tests were employed for the comparison of quantitative variables between groups. A p-value of less than 0.05 was considered statistically significant at the 95% confidence interval.

Results

The study population comprised 100 patients who had sought treatment at the internal medicine outpatient clinic with a desire to lose weight between the specified dates. The study cohort was 79% female. The analysis of the participants according to their body mass index (BMI) revealed the following distribution: 29 individuals (29%) were classified as overweight, 39 (39%) as having stage 1 obesity, 23 (23%) as having stage 2 obesity, and 9 (3%) as having stage 3 obesity. No statistically significant difference was observed in the BMI grouping according to gender (p=0.680). The demographic and blood parameters of female and male patients are presented in Table 2.

Table 2. Distribution of demographic and blood parameters of patients according to gender

Parameters (Median (min-max))	Female	Male
Age	32.00 (18-78)	29.00 (18-64)
FPG	90.00 (69-155)	92.00 (61-115)
PPG	94.00 (61-218)	101.00 (70-219)
Insulin	9.30 (0.57-82.10)	10.90 (4.15-53.20)
HDL	48.00 (31-78)	41.00 (28-141)
LDL (Mean ± SD)	126.77 ± 30.09	124.80 ± 39.72
Triglyceride	126.00 (46-310)	171.00 (36-663)
TSH	2.22 (0.38-6.20)	1.80 (0.45-104.00)
sT4	0.84 (0.50-1.22)	0.79 (0.20-3.70)
Urea	22.00 (12-43)	26.00 (19-42)
Creatinine	0.79 (0.50-1.10)	0.90 (0.70-1.20)
ALT	19.00 (9-43)	23.00 (12-39)
AST	18.00 (7-56)	28.00 (18-82)
Vitamin D	11.20 (5.60-46.30)	12.50 (6.40-27.20)
HGB	13.40 (8.10-15.80)	16.10 (14.10-17.80)
Ferritin	15.00 (1.40-93.50)	44.50 (15.20-148)
Vitamin B12	215.00 (97-1500)	188.00 (107-394)
Body weight (kg)	87.00 (66-140)	100.00 (76-134)
Height (m)	161.00 (150-185)	178.00 (165-186)
Waist circumference (cm, Mean ± SD)	96.35 ± 15.48	102.33 ± 12.10
Hip circumference (cm)	116.00 (96-150)	116.00 (99-140)
Waist/hip ratio (Mean ± SD)	0.83 ± 0.06	0.88 ± 0.09
SBP	110.00 (80-140)	120.00 (90-150)
DBP	70.00 (50-90)	70.00 (60-100)
BMI distribution (n, %)		
Obesity class 1	31 (79.4%)	8 (20.6%)
Obesity class 2	19 (82.6%)	4 (17.4%)
Obesity class 3	8 (88.8%)	1 (11.2%)

FPG: Fasting plasma glucose, PPG: postprandial glucose, HDL: high density lipoprotein, LDL: low density lipoprotein, ALT: alanine transaminase, AST: aspartate transferase, TSH: thyroid stimulating hormone, HGB: hemoglobin, SBP: systolic blood pressure, DBP: diastolic blood pressure

A notable discrepancy was observed between HOMA-IR values and BMI groups (p=0.002). As the BMI group increased, so too did the HOMA-IR values. The median (min-max) values according to the groups were 1.57 (0.5-5.7) in the overweight individuals, 2.19 (0.55-20.20) in the stage 1 obese group, 2.80 (1.09-12.7) in the stage 2 obese group and 3.06 (0.42-6.2) in the stage 3 obese group.

Among the overweight individuals included in the study, 41.3% of the stage 1 obese group, 30.7% of the stage 2 obese group, 26% of the stage 3 obese group and 22.2% of the stage 1 obese group were smokers. No statistically significant correlation was observed between smoking status and BMI (p = 0.580).

Table 3 illustrates the distribution of demographic and blood parameters of the patients according to BMI groups. Significant differences were observed between fasting plasma glucose, insulin value, LDL and vitamin D results and BMI group (p=0.040; p<0.001; p=0.040; p=0.049, respectively).

No significant difference was observed in waist/hip ratio according to BMI groups (p=0.130). Similarly, there was no significant difference in systolic and diastolic blood pressure results according to BMI groups (p=0.080 and p=0.330, respectively).

Discussion

In this study, a comprehensive range of demographic data, blood parameters and anthropometric measurement results were extracted from the medical records of patients who had sought advice from the internal medicine outpatient clinic regarding weight loss. The differences between these values according to BMI groups were then subjected to detailed analysis.

The gender distribution of the 100 patients included in the study was 79% female and 21% male. The proportion of male patients was 7% in the study by Bulur et al. (2022), while the study by Akbaş et al. (2022) found this figure to be 11%. Furthermore, the data from the Turkish Health Survey conducted in Turkey in 2022 revealed that the prevalence of obesity was 20.2%. It was observed that 23.6% of women were obese and 30.9% were pre-obese, while 16.8% of men were obese and 40.4% were pre-obese.[14] In our study, the highest proportion of women was in stage 1 obese, while men were most frequently in the overweight group. In the study by Bulur et al., stage 1 obesity was found to be more prevalent in women, while stage 2 obesity was more common in men. This differs from the findings of our study.[12] Another study by Saygın et al. observed that the majority of both men and women were in the overweight category.[15]

In the Turkish Hypertension Prevalence Study, the mean values of blood pressure were found to be 127.9 ± 21.1 mmHg for systolic and 81.4 ± 12.7 mmHg for diastolic. A gender-based analysis of the distribution revealed mean values for SDB of 126.2 ± 17.4 mmHg in men and 129.8 ± 24.2 mmHg in women. The mean values for diastolic blood pressure (DBP) were 80.8 ± 11.0 mmHg in men and 82.0 ± 14.3 mmHg in women. Additionally, the prevalence of hypertension in Turkey was determined to be 31.8%. The prevalence of hypertension was higher in women (36.1%) than in men (27.5%). (16) In our study, no significant difference was observed between genders in terms of systolic or diastolic blood pressure values. No significant difference was identified between BMI groups in terms of blood pressure measurements. There is a strong association between obesity and elevated blood pressure, which can lead to hypertension. Furthermore, obesity is a significant risk factor for cardiovascular disease due to its adverse effects on insulin resistance and other cardiometabolic processes.^(17–19) As our study did not include a normal weight control group, we are unable to ascertain the impact of overweight on blood pressure in comparison with normal weight. However, the blood pressure values of our participants were comparable across BMI groups.

The risk of impaired glucose tolerance or type 2 diabetes increases in proportion to the degree of body weight excess. The NHANES study, conducted over a period of three decades, revealed that an increase in BMI over time was the most significant of the three covariates (age, race/ethnicity, BMI) studied in relation to the rising prevalence of diabetes.

Evidence suggests that weight loss achieved through lifestyle interventions can reduce the risk of developing type 2 diabetes and improve glycemic management, potentially leading to remission in patients with diabetes mellitus.

In our study, as BMI groups increased, fasting plasma glucose and HOMA-IR values also increased significantly. There is a robust correlation between obesity and coronary heart disease. A meta-analysis indicates that there is a 29 percent increase in the risk of coronary heart disease for every five-unit increase in BMI. The elevated risk of cardiovascular disease in obese patients is further compounded by the frequent coexistence of risk factors such as hypertension, dyslipidaemia and diabetes. The precise extent to which obesity is the sole contributing factor remains uncertain. One explanation for the lack of a significant increase in blood LDL-C levels in obese patients is the capacity of adipose tissue to expand and store cholesterol. A dyslipidaemia, including elevated triglycerides, reduced HDL-C, elevated non-HDL-C, elevated apoB, elevated LDL particle number and elevated small dense LDL particles, is typically observed in individuals with obesity.[23] A significant difference was identified between BMI groups and LDL values.

In their study, Uysal et al. identified a correlation between BMI and impaired liver function tests in patients presenting to an obesity outpatient clinic for weight loss. However, other studies have also indicated that serum aminotransferase activities are associated with the severity of fatty liver in obese patients. of fatty liver in obese patients.[25] Salvaggio et al. demonstrated that serum activity ratios of liver enzymes were significantly correlated with body weight and BMI values.[26] There is no significant difference was observed between BMI groups and liver function tests.

Table 3. Distribution of demographic and blood parameters of patients according to BMI groups

Parameters (Median (min-max))	Overweight	Obesity Class 1	Obesity Class 2	Obesity Class 3	p
Age	28.00 (18-61)	35.00 (18-71)	35.00 (19-78)	36.00 (22-59)	0.130
FPG	86.0 (61-133)	90.00 (72-155)	92.00 (71-136)	97.00 (76-115)	**0.040**
PPG	91.0 (61-149)	94.00 (71-219)	104.0 (64-218)	96.00 (64-151)	0.090
Insulin	7.8 (0.57-25.4)	9.90 (3.1-82.1)	13.07 (4.11-53.2)	11.2 (2.24-29.3)	**<0.001**
HDL	48.00 (31-141)	44.00 (28-78)	44.00 (28-78)	45.00 (32-67)	0.890
LDL (Mean ± SD)	114.17 ± 29.82	130.58 ± 34.80	137.34 ± 29.31	119.22 ± 22.98	**0.040**
Triglyceride	107.00 (36-300)	134.0 (60-592)	130.00 (62-663)	173.00 (75-226)	0.160
TSH	2.3 (0.45-104)	1.80 (0.62-6.2)	2.24 (0.38-4.6)	2.1 (0.8-3.8)	0.620
sT4	0.80 (0.5-0.98)	0.88 (0.20-3.7)	0.80 (0.60-1.10)	0.9 (0.5-1.22)	0.200
Urea	23.00 (13-42)	24.00 (12-38)	24.00 (19-43)	27.00 (17-34)	0.650
Creatinine	0.80 (0.6-1.08)	0.80 (0.6-1.16)	0.80 (0.5-1.2)	0.78 (0.6-1.07)	0.800
ALT	20.00 (12-39)	21.00 (11-43)	20.00 (9-30)	18.00 (14-39)	0.710
AST	20.00 (7-82)	21.00 (7-51)	19.00 (7-41)	21.00 (13-28)	0.970
Vitamin D	13.40 (7.5-27.2)	11.00 (6.5-46.3)	10.10 (6.4-16.5)	11.90 (5.6-23.2)	**0.049**
HGB	13.5 (10.7-17.8)	13.60 (8.1-17)	13.8 (10.3-17.5)	13.3 (12.5-15.8)	0.790
Ferritin	17.60 (2.10-148)	17.5 (1.4-128.1)	63.00 (20-232)	55.0 (12.6-64.3)	0.530
Vitamin B12	227 (115-1500)	175.0 (114-550)	199.0 (97-435)	193.0 (150-270)	0.070
Body weight (kg)	78.0 (66-100)	88.0 (75-159)	94.0 (83-134)	116.0 (94-140)	**<0.001**
Height (m)	165.0 (155-186)	164.0 (155-183)	160.0 (153-185)	162.0 (150-174)	0.110
Waist circumference (cm, Mean±SD)	89.86 ± 10.71	95.30 ± 16.51	104.52 ± 9.04	114.88 ± 11.75	**<0.001**
Hip circumference (cm)	107.0 (97-125)	114.0 (96-134)	125.0 (101-140)	130.0 (111-150)	**<0.001**
Waist/hip ratio (Mean ± SD)	0.82 ± 0.07	0.85 ± 0.07	0.85 ± 0.07	0.87 ± 0.07	0.130
SBP	110.0 (80-140)	110.0 (90-150)	120.0 (100-140)	110.0 (90-150)	0.080
DBP	70.0 (50-90)	70.0 (50-100)	70.0 (60-90)	70.0 (50-90)	0.330

FPG: Fasting plasma glucose, PPG: postprandial glucose, HDL: high density lipoprotein, LDL: low density lipoprotein, ALT: alanine transaminase, AST: aspartate transferase, TSH: thyroid stimulating hormone, HGB: hemoglobin, SBP: systolic blood pressure, DBP: diastolic blood pressure

It has been documented in the literature that the marked increase in the incidence of end-stage renal disease is concurrent with the rise in obesity. In the study by Gomez-Ambrosi et al., creatinine levels rose in direct proportion to obesity among the normal weight, preobese and obese groups. Obesity-related glomerulopathy is characterised by glomerular enlargement and mesangial enlargement. It has been suggested that obesity-related glomerulopathy may be reversible with weight loss. The present study did not identify any statistically significant differences between BMI groups and urea and creatinine values. It is recommended that further studies be conducted with a larger number of patients.

Serum 25(OH)D levels are approximately 20% lower in individuals with obesity compared to those with a normal body mass index (BMI). There is an inverse relationship between serum 25(OH)D levels and BMI, as well as fat mass. Vitamin D plays a pivotal role in bone health and may also exert significant influence over immune and other physiological systems. A deficiency of vitamin D is a common occurrence among obese individuals, regardless of age, ethnicity or geographical location. This may not necessarily indicate a clinical issue. Obese individuals require higher loading doses of vitamin D to achieve the same serum 25-hydroxyvitamin D levels as those of normal weight.[31] Our study revealed a significant difference between BMI groups and vitamin D levels, consistent with the findings of previous research.

In conclusion, obesity represents a significant public health challenge in the coming century. It is essential to elucidate the underlying mechanisms and examine the laboratory values associated with it, with the aim of preventing its adverse consequences.

Conflicts of interest

There are no conflicts of interest in this work.

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