

Weight Misperception is Prevalent Among Turkish Adults and Associated with Higher Age, Body Mass Index and Lower Education Status

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Background: Weight misperception (WM) is common among adults, and it is associated with adverse health outcomes. Research has shown that various factors are associated with weight misperception. Turkish adult population data for weight misperception and related factors do not exist.

Methodology: We conducted a face-to-face cross-sectional descriptive survey in the general internal medicine outpatient clinics of two academic centers. Perception was analyzed both verbally and visually. Misperception was defined for both verbal and visual scales as being thinner than reality misperceptions (TTRM), fatter than reality misperceptions (FTRM), or either of them (ETFTRM). Demographics, anthropometrics, and social determinants of health were analyzed in different misperception groups.

Results: 250 patients participated in the study. The median (interquartile range) age was 55 (14), and the BMI was 28.2 (6.9) for females and 26.9 (4.4) for males. 81.2% had ETFTRM, 45.2% had TTRM, and 22.4% had FTRM. Age and BMI were higher in the ETFTRM and TTRM groups, while education level was lower in both. Multivariate logistic regression showed that higher age, higher BMI, and lower education levels were associated with higher TTRM.

Discussion: WM is common among the Turkish adult population. Similar to the previous studies, aging, high BMI, and low education levels are associated with weight misperception. However, in contrast to previous studies, gender, marital status, and employment were not associated with weight misperception in our cohort.

Keywords: weight perception, body mass index, educational status, obesity

Introduction

Excess body weight is a global health issue that stems from an unhealthy diet, reduced exercise, and an imbalance between energy intake and expenditure.¹ Patients with excess body weight are classified as overweight or obese. Body mass index (BMI) is the most commonly used anthropometric measurement to diagnose overweight and obesity. It is calculated as follows: Body mass is divided by the square of height and expressed as kg/m². Adults with a BMI of 25.0–29.9 kg/m² are classified as overweight, whereas adults with a BMI of 30 and over are classified as obese.¹ Various cardiovascular, metabolic, renal, and oncologic disorder's etiology and progression are tightly associated with excess body weight.^{2–8} These close associations have yielded the development of dietary, pharmacologic, device-based, and surgical therapies for excess body weight and obesity with weight loss rates of 10 to 25%, which are related to improved health indices.^{9,10}

Weight perception is how one perceives their weight and their physical appearance.¹¹ It has been shown that altered weight perception is common, especially among adolescents and young people, and is associated with psychiatric conditions such as depression, suicidality, and disordered eating.^{12–14} Studies about weight misperception illustrate that almost one in two young people perceives their weight inappropriately.^{15,16} Moreover, weight misperception rates are even higher (72%) among overweight and obese youth. Most importantly, weight misperception was demonstrated to be negatively correlated with weight loss trials among adolescents and youngsters.^{15,17}

Adult populations are also susceptible to weight misperception, not just youngsters. Studies have demonstrated that more than 1 in 5 Korean female adults and up to 2 in 3 Saudi Arabian adults have weight misperception.^{18,19} Some of the factors associated with weight misperception were age, level of education, and marital status in the former study; and obesity, age-group, educational level, diagnosed chronic condition, self-rated health, and sedentary lifestyle in the latter. Similar to the studies on adolescents, it has been shown that weight misperception among young adults is also linked with psychiatric conditions such as disordered eating habits.²⁰ Besides psychological issues, studies have demonstrated that weight misperception in adults is associated with lower self-rated health scores and a lower health-related quality of life.^{21,22}

Through our clinical practice, we have observed that weight misperception may play an important yet unrecognized hampering role to the treatment of overweight or obesity among adults. Many patients with obesity, or patients who are overweight with related disorders, refuse obesity treatment because they believe that they are not overweight or obese. Similar to the weight misperception studies that were performed on Korean and Saudi Arabian adults,^{18,19} we have observed that weight misperception among adults may be related to social determinants of health (SDoH). It is known that SDoH is associated with obesity as well.^{23,24} We planned a two-step study on adult weight misperception. This study forms the first step, with the aim of describing the characteristics of weight misperception and its association with SDoH among the general population, namely among adults with or without excess body weight. Findings from this study will be used for designing our step two study, which is planned to be conducted on patients with excess body weight to evaluate their obesity treatment approaches from the perspective of body misperception. To the best of our knowledge, there is no study to evaluate weight misperception among adults in Turkey and its possible effect on obesity treatment utilization.

Methodology

Design and Setting

The study was designed as a descriptive research survey and took place in two academic center's general internal medicine outpatient clinics from August 1st, 2023, to November 1st, 2023, in Ankara, Turkey. Patients who were admitted to these two clinics for various reasons were informed about the survey at the end of their medical visit and were asked whether they would like to participate. If they opted to participate, written informed consent was obtained. The patients were given an anonymous survey number and proceeded with the questions. No identifying name or number was acquired. The whole survey took approximately ten to fifteen minutes to complete.

Survey

The survey was developed by the authors of the study and is not validated. Weight misperception was assessed both visually and verbally via the classification system that was mainly developed from modifications to previous questionnaires and methods.^{18,25} The survey consisted of twenty questions in three parts ([Supplementary Material 1](#)). To maintain consistency, the same researcher (BCE) asked the questions for each patient. All questions were read by the researcher, and each question was explained in detail to participants. The first part consisted of demographics, dietary habits, and social determinants of health. The second part was related to anthropometric measurements and comorbidities. The third and last part was created for the assessment of verbal and visual weight perceptions.

Assessment of Verbal Weight Perception

We used an assessment method similar to one that was used in a recent study.¹⁸ Patients were asked to describe themselves as one of the following: underweight, normal-weighted, overweight, mildly obese, or severely obese. This question was read twice to make sure patients comprehended it correctly.

Assessment of Visual Weight Perception

A previously developed and validated body size guide (BSG) was used for visual perception analysis.²⁵ Patients were shown the images according to their sex and were asked to point out the image they found most similar to themselves.

Appropriate Perception

Appropriate perception (AP) was defined by the authors as “having a BMI in total concordance with both visual and verbal weight perception question’s answers”. For example, if a patient’s BMI was calculated as 31.2 kg/m² (mildly obese), they described themselves verbally as “mildly obese”, and they pointed out “mildly obese” images in their visual BSG, then this patient was labeled as having “appropriate perception”.

Misperceptions and Classifications

Misperception classification was not straightforward, and several misperception classifications were needed due to the following reasons: Firstly, misperception can be the perception of being “thinner” or “fatter” than reality. Secondly, misperception can be “visually”, “verbally”, or “both”. Finally, one can perceive themselves as thinner on a visual scale, or fatter verbally, or vice versa. The term “misperception” was used as an umbrella term to encompass both verbal and visual misperceptions of being thinner than reality or fatter than reality. Three main misperception groups created were thinner than reality misperception (TTRM), fatter than reality misperception (FTRM), and either thinner or fatter than reality misperception (ETFTRM), a group containing any kind of misperception. Misperception and its classification are provided in [Supplementary Material 2](#) in detail.

Statistics

Categorical and continuous variables were first analyzed via descriptive statistical methods. Differences between misperception groups and categorical determinants were analyzed using Pearson’s chi-squared test (χ^2 test) (or Fisher’s exact test when needed). Differences between misperception groups and continuous variables were analyzed using the Student’s *t*-test or Mann–Whitney *U*-test, according to the variable’s distribution patterns. Continuous variables were presented as “mean ($\pm$ standard deviation)” or “median (interquartile range)” according to their distribution pattern. Categorical variables were presented as “numbers (percentages)”. Univariate logistic regression was performed to analyze the determinants of misperception. Variables with a $p < 0.02$ were tested in multivariate logistic regression analysis. Kappa statistics were used to determine the strength of agreement between weight perception and actual BMI. Two-sided significance testing was performed to calculate *p*-values, and *p*-values less than 0.05 were considered significant. All analyses were conducted using IBM SPSS Software version 23.0 (SPSS Inc., Chicago, IL).

Sample Size

We have conducted a literature search to find similar studies conducted where this study was planned. Although we could not find any related data regarding adults, we have identified a study in Turkey regarding adolescent’s weight perception, which illustrated 50% misperception.¹⁶ Since this data would not be ideal to use for our sampling, we used it for preliminary sample sizing and planned to conduct interim analysis to calculate the misperception rate of adults, which turned out to be much higher (to be discussed in the results section). With a 95% confidence interval and a 5% margin of error, at least 246 participants were calculated to be needed for the study.

Ethics

Each patient in the study was assigned an anonymous identification number to protect confidentiality. Written informed consent was obtained prior to survey initiation. The study complies with the principles outlined in the Declaration of Helsinki, and this study was approved by the Başkent University Institutional Review Board on August 1, 2023 (Project number KA23/275).

Results

Demographics and Social Status

Two hundred and fifty patients participated in the study. Of whom, 178 were female (71.2%). 107 (42.8%) patient’s highest education level was primary school and the remainder were similar between middle or high school and college at 28.8% and 28.4%, respectively. The majority of the patients (78%) were married and the remainder were similar between

single and divorced/widow, at 10.4% and 11.6%, respectively. Only 96 (38.4%) patients had a regular job, whereas 146 (58.4%) were not working and 8 (3.2%) had irregular jobs. 135 (54%) patients described their living conditions as moderate, and the rest were almost similar; 51 (20.4%) were described as easy, and 64 (25.6%) were described as difficult. Parts 1 and 2 of [Table 1](#) demonstrate the detailed data regarding demographics and social statistics.

Table 1 Demographic, Social, Nutritional, Habitual, and Anthropometric Characteristics of the Patients

	Answer	Value*
1. Demographics		
Age		55 (14)
Sex	Female	178 (71.2%)
	Male	72 (28.8%)
2. Social Status		
Education Status	Primary School	107 (42.8%)
	Middle or High School	72 (28.8%)
	College	71 (28.4%)
Marital Status	Single	26 (10.4%)
	Married	195 (78%)
	Divorced/Widow	29 (11.6%)
Work Status	Regular worker	96 (38.4%)
	Irregular worker	8 (3.2%)
	No worker	146 (58.4%)
Living Condition	Easy	51 (20.4%)
	Moderate	135 (54%)
	Difficult	64 (25.6%)
3. Nutrition and Access to Food		
Diet Type	Omnivore	248 (99.2%)
	Vegetarian	2 (0.8%)
Access to Balanced and Healthy Food	Easy	79 (31.6%)
	Moderate	122 (48.8%)
	Difficult	49 (19.6%)
Access to Meat and Products	Easy	81 (32.4%)
	Moderate	94 (37.6%)
	Difficult	75 (30%)
Access to Dairy Products	Easy	126 (50.4%)
	Moderate	91 (36.4%)
	Difficult	33 (13.2%)
Access to Bakery Products	Easy	178 (71.2%)
	Moderate	64 (25.6%)
	Difficult	8 (3.2%)
Access to Fresh Fruit and Vegetables	Easy	156 (62.4%)
	Moderate	73 (29.2%)
	Difficult	21 (8.4%)

(Continued)

Table 1 (Continued).

	Answer	Value*
4. Habits		
Tobacco Use	Non-smoker	122 (48.8%)
	Former smoker	58 (23.2%)
	Current smoker	70 (28%)
Alcohol Consumption	Non-drinker	193 (77.2%)
	Social drinker	50 (20%)
	Regular drinker	7 (2.8%)
5. Anthropometric Measurements		
Height	Female	160 (8)
	Male	172 (11)
Weight	Female	73 (19)
	Male	83 (15)
Body mass index	Female	28.2 (6.9)
	Male	26.9 (4.4)
6. Morbidities		
Hypertension		103 (41.2%)
Diabetes Mellitus		98 (39.2%)
Cardiovascular Diseases		41 (16.4%)
Respiratory Diseases		27 (10.8%)
Liver Diseases		16 (6.4%)
Kidney and Related Diseases		8 (3.2%)
Malignancy		21 (8.4%)
Rheumatological Diseases		24 (9.6%)
Neuropsychiatric Diseases		24 (9.6%)
Endocrinologic and Metabolic Diseases		136 (54.4%)
Number of Morbidities		
0		52 (20.8%)
1		76 (30.4%)
2		65 (26%)
3 or More Comorbidities		57 (22.8%)

Notes: *Values denote median (interquartile range) for continuous variables, and frequency (percent %) for categorical variables.

Nutritional Status and Access to Food

All patients except for two (0.8%) described themselves as omnivores. While access to balanced and healthy food was answered as moderate by 122 (48.8) patients, 79 (31.6%) answered as easy and 49 (19.6%) as difficult. Access to dairy products, bakery products, and fresh fruit and vegetables was answered as easy by the majority, with rates of 50.4%, 71.2%, and 62.4%, respectively. Access to meat and products, however, was moderate for 37.6% of the patients, easy for 32.4%, and difficult for 30%. Part 3 of [Table 1](#) illustrates the detailed data regarding nutrition and access to food.

Habits, Anthropometric Measurement, and Morbidities

Only 70 (28%) patients were currently smoking; the remainder were either former smokers or non-smokers, and 77.2% of the patients were not consuming alcohol. The median height, weight, and BMI for females were 160 (8) cm, 73 (19) kg, and 28.2 (6.9) kg/m², whereas they were 172 (11) cm, 83 (15) kg, and 26.9 kg/m² for males, respectively. Hypertension and diabetes were the two most common morbidities among the patients. While 20.8% had no morbidity, 56.4% had either one or two morbidities, and 22.8% had three or more morbidities. Parts 4, 5, and 6 of [Table 1](#) describe the detailed data regarding habits, anthropometric measurements, and morbidities.

General Weight Perceptions

Of the 250 patients, only 47 (18.8%) perceived themselves appropriately on both visual and verbal scales, whereas 98 (39.2%) had both visual and verbal misperceptions. The remainder have either verbal or visual misperceptions. Regarding visual perception, 42% perceived it appropriately, but the remainder had either thinner or fatter than reality misperceptions. With regards to verbal perception, 36.8% had appropriate perception, but the remainder, 63.2%, had either thinner or fatter than reality misperception. The agreement between the actual BMI and the visual weight perception was only slight; however, the agreement between the actual BMI and the verbal weight perceptions was very poor ($\kappa = 0.253$, SE = 0.039, P<0.001, and $\kappa = 0.121$, SE = 0.039, P=0.001, respectively). The strength of agreement between the verbal and visual weight perceptions was also slight ($\kappa = 0.207$, SE = 0.034, P<0.001). Part 1 of [Table 2](#) illustrates detailed data regarding general misperceptions.

Table 2 Detailed Body Perception Analysis and Misperception Subgroups of the Patients

	Value
I. General Weight Perceptions	
Weight Perceptions	
Visually and Verbally Appropriate Perception	47 (18.8%)
Visually Appropriate, Verbally Misperception	60 (24%)
Verbally Appropriate, Visually Misperception	45 (18%)
Visually and Verbally Misperception	98 (39.2%)
Visual Weight Perceptions	
Perception Appropriate with Reality	105 (42%)
Perceives Thinner than Reality	62 (24.8%)
Perceives Fatter than Reality	83 (33.2%)
Verbal Weight Perceptions	
Perception Appropriate with Reality	92 (36.8%)
Perceives Thinner than Reality	139 (55.6%)
Perceives Fatter than Reality	19 (7.6%)
2. Misperception Groups' Subgroups	
Thinner Than Reality Misperception (TTRM) Subgroups	
t-SG 1. No Thinner than Reality Misperception	103 (41.2%)
t-SG 2. Visual Misperception, Verbal Accurate Perception	6 (2.4%)
t-SG 3. Verbal Misperception, Visual Accurate Perception	53 (21.2%)
t-SG 4. Both Visual and Verbal Misperception	54 (21.6%)
SG 5. Visual and Verbal Misperceptions Oppose	34 (13.6%)

(Continued)

Table 2 (Continued).

	Value
Fatter Than Reality Misperception (FTRM) Subgroups	
f-SG 1. No Fatter than Reality Misperception	160 (64%)
f-SG 2. Visual Misperception, Verbal Accurate Perception	39 (15.6%)
f-SG 3. Verbal Misperception, Visual Accurate Perception	5 (2%)
f-SG 4. Both Visual and Verbal Misperception	12 (4.8%)
SG 5. Visual and Verbal Misperceptions Oppose	34 (13.6%)
3. Misperception Groups	
Either Thinner or Fatter Than Reality Misperception (ETFFTRM)	203 (81.2%)
Thinner Than Reality Misperception (TTRM)	113 (45.2%)
Fatter Than Reality Misperception (FTRM)	56 (22.4%)

Abbreviations: f-SG, fatter perception subgroups; t-SG, thinner perception subgroup.

Misperception Groups and Subgroups

The most detailed misperception analysis in this study was acquired by creating subgroups and allocating them to the relevant misperception group. 113 (45.2%) patients had thinner than reality misperception (TTRM), and 56 (22.4%) patients had fatter than reality misperception (FTRM). 34 (13.6%) patients were in subgroup 5, which has opposing visual and verbal perceptions (ie, thinner than reality verbal perception but fatter than reality visual perception, or vice versa). Parts 2 and 3 of [Table 2](#) illustrate detailed data regarding misperception groups.

Misperception Group's Distribution Among Determinants

Age and BMI distributions were significantly different between misperception groups ([Table 3](#)). Patients in both ETFFTRM and TTRM groups were significantly older (57 vs 47, $p < 0.001$ and 57 vs 53, $p = 0.005$). With respect to BMI, patients with ETFFTRM and TTRM had significantly higher BMIs (28.5 vs 23.8, $p < 0.001$ and 30.4 vs 26.8, $p < 0.001$), yet patients with FTRM had lower BMI values (26.8 vs 28.4, $p = 0.003$). [Table 3](#) illustrates the misperception group's distribution among age and BMI in detail.

Regarding categorical variables, the most remarkable distribution differences were observed in education and marital status. TTRM decreased as the level of education increased, and the TTRM was significantly higher among primary school-educated patients compared to middle- or high-school and college-educated patients. On the opposite side, FTRM paralleled education status. FTRM was significantly higher when patient's highest education level was at least middle school. ETFFTRM, which denotes any kind of misperception, was significantly higher at the primary school level compared to patients who have a college degree. With regards to marital status, TTRM and ETFFTRM were significantly low among single patients; however, FTRM did not differ according to marital status. TTRM, FTRM, and ETFFTRM

Table 3 Age and BMI Values According to Different Groups of Misperceptions

	ETFFTRM			TTRM			FTRM		
	ETFFTRM present	ETFFTRM absent	P*	TTRM present	TTRM absent	P*	FTRM present	FTRM absent	P*
Age	57 (12)	47 (25)	<0.001	57 (12)	53 (17)	0.005	55 (15)	56 (13)	>0.05
BMI	28.5 (6)	23.8 (6.4)	<0.001	30.4 (7.6)	26.8 (5.5)	<0.001	26.8 (3.6)	28.4 (7.4)	0.003

Note: * P values < 0.05 are shown in bold.

Abbreviations: BMI, body mass index; ETFFTRM, either thinner or fatter than reality misperception; FTRM, fatter than reality misperception; TTRM, thinner than reality misperception.

misperceptions were similar among different living conditions, access to balanced and healthy food, and access to various food groups. Table 4 illustrates misperception group's distribution among categorical determinants in detail.

Predictors of Misperception

Univariate logistic regression analysis was performed to identify predictors of misperception. Higher age, higher BMI, primary school being the highest education status, and not being single in marital status were associated with ETFTRM and TTRM. Regarding FTRM, predictors were opposite since lower BMI and higher education levels were associated with higher FTRM. Table 5 illustrates the details of the univariate logistic regression analysis. These variables were also tested in multivariate logistic regression to analyze independent predictors of ETFTRM, TTRM, and FTRM. The model for predicting TTRM illustrated that the model consisting of higher age, higher BMI, and lower education status was an independent predictor of TTRM. Table 6 demonstrates multivariate logistic regression analysis in detail. Multivariate logistic regression analysis for ETFTRM and FTRM did not yield satisfactory results, therefore they were not included in the study.

Table 4 Demographic characteristics of participating patients (n = 323)

Determinant	ETFTRM		TTRM		FTRM	
	Rate	P*	Rate	P*	Rate	P*
Sex						
Female vs. Male	80.9% vs. 81.9%	>0.05	47.8% vs. 38.9%	>0.05	19.7% vs. 29.2%	>0.05
Education status						
Primary School vs. Middle or High School	89.7% vs. 80.6%	>0.05	61.7% vs. 38.9%	<0.001	11.2% vs. 30.6%	0.001
Primary School vs. College	89.7% vs. 69%	<0.001	61% vs. 26.8%	<0.001	11.2% vs. 31%	0.001
Middle or High School vs. College	80.6% vs. 69%	>0.05	38.9% vs. 26.8%	>0.05	30.6% vs. 31%	>0.05
Marital status						
Single vs. Divorced/Widow	53.8% vs. 89.7%	<0.001	11.5% vs. 51.7%	0.003	30.8% vs. 20.7%	>0.05
Single vs. Married	53.8% vs. 83.6%	<0.001	11.5% vs. 48.7%	<0.001	30.8% vs. 21.5%	>0.05
Divorced/Widow vs. Married	89.7% vs. 83.6%	>0.05	51.7% vs. 43.7%	>0.05	20.7% vs. 21.5%	>0.05
Work status						
Regular work vs. Irregular work	77.1% vs. 87.5%	>0.05	31.3% vs. 75%	0.019	35.4% vs. 0	>0.05
Regular work vs. No work	77.1% vs. 83.6%	>0.05	31.3% vs. 52.7%	0.001	35.4% vs. 15.1%	<0.001
Irregular work vs. No work	87.5% vs. 83.6%	>0.05	75% vs. 52.7%	>0.05	0 vs. 15.1%	>0.05
Living condition						
Easy vs. Moderate	74.5% vs. 84.4%	>0.05	43.1% vs. 45.9%	>0.05	23.5% vs. 23.7%	>0.05
Easy vs. Difficult	74.5% vs. 79.7%	>0.05	43.1% vs. 45.3%	>0.05	23.5% vs. 18.8%	>0.05
Moderate vs. Difficult	84.4% vs. 79.7%	>0.05	45.9% vs. 45.3%	>0.05	23.7% vs. 18.8%	>0.05
Access to balanced and healthy food						
Easy vs. Moderate	74.7% vs. 86.1%	>0.05	43% vs. 48.4%	>0.05	24.1% vs. 25.4%	>0.05
Easy vs. Difficult	74.7% vs. 79.6%	>0.05	43% vs. 40.8%	>0.05	24.1% vs. 12.2%	>0.05
Moderate vs. Difficult	86.1% vs. 79.6%	>0.05	48.4% vs. 40.8%	>0.05	25.4% vs. 12.2%	>0.05
Access to meat and products						
Easy vs. Moderate	71.6% vs. 85.1%	>0.05	37% vs. 50%	>0.05	27.2% vs. 23.4%	>0.05
Easy vs. Difficult	71.6% vs. 86.7%	>0.05	37% vs. 48%	>0.05	27.2% vs. 16%	>0.05
Moderate vs. Difficult	85.1% vs. 86.7%	>0.05	50% vs. 48%	>0.05	23.4% vs. 16%	>0.05
Access to dairy products						
Easy vs. Moderate	79.4% vs. 85.7%	>0.05	42.1% vs. 47.3%	>0.05	23.8% vs. 23.1%	>0.05
Easy vs. Difficult	79.4% vs. 75.8%	>0.05	42.1% vs. 51.5%	>0.05	23.8% vs. 15.2%	>0.05
Moderate vs. Difficult	85.7% vs. 75.8%	>0.05	47.3% vs. 51.5%	>0.05	23.1% vs. 15.2%	>0.05

(Continued)

Table 4 (Continued).

Determinant	ETFTRM		TTRM		FTRM	
	Rate	P*	Rate	P*	Rate	P*
Access to bakery products						
Easy vs. Moderate	80.3% vs. 85.9%	>0.05	44.4% vs. 46.9%	>0.05	23% vs. 21.9%	>0.05
Easy vs. Difficult	80.3% vs. 62.5%	>0.05	44.4% vs. 50%	>0.05	23% vs. 12.5%	>0.05
Moderate vs. Difficult	85.9% vs. 62.5%	>0.05	46.9% vs. 50%	>0.05	21.9% vs. 12.5%	>0.05
Access to fresh fruit and vegetables						
Easy vs. Moderate	80.8% vs. 86.3%	>0.05	43.6% vs. 49.3%	>0.05	26.3% vs. 16.4%	0.02
Easy vs. Difficult	80.8% vs. 66.7%	>0.05	43.6% vs. 42.9%	>0.05	26.3% vs. 14.3%	>0.05
Moderate vs. Difficult	86.3% vs. 66.7%	>0.05	49.3% vs. 42.9%	>0.05	16.4% vs. 14.3%	>0.05
Tobacco use						
Non-smoker vs. Former smoker	82% vs. 84.5%	>0.05	47.5% vs. 43.1%	>0.05	16.4% vs. 31%	0.03
Non-smoker vs. Current smoker	82% vs. 77.1%	>0.05	47.5% vs. 42.9%	>0.05	16.4% vs. 25.7%	>0.05
Former smoker vs. Current smoker	84.5% vs. 77.1%	>0.05	43.1% vs. 42.9%	>0.05	31% vs. 25.7%	>0.05
Alcohol consumption						
Non-drinker vs. Social drinker	83.4% vs. 70%	>0.05	49.7% vs. 26%	0.003	17.6% vs. 40%	0.001
Non-drinker vs. Regular drinker	83.4% vs. 100%	>0.05	49.7% vs. 57.1%	>0.05	17.6% vs. 28.6%	>0.05
Social drinker vs. Regular drinker	70% vs. 100%	>0.05	26% vs. 57.1%	>0.05	40% vs. 28.6%	>0.05

Note: *P values < 0.05 are shown in bold.

Abbreviations: ETFTRM, either thinner or fatter than reality misperception; FTRM, fatter than reality misperception; TTRM, thinner than reality misperception.

Table 5 Univariate Logistic Regression Analysis of Variables on Different Groups of Misperceptions

	Either Thinner or Fatter Than Reality Misperception			Thinner Than Reality Misperceptions			Fatter Than Reality Misperceptions		
	OR	CI	P*	OR	CI	P*	OR	CI	P*
Age	1.08	1.05–1.11	<0.001	1.04	1.02–1.07	<0.001	0.99	0.96–1.02	>0.05
BMI	1.21	1.12–1.32	<0.001	1.16	1.09–1.23	<0.001	0.90	0.84–0.96	0.001
Education Status	0.34	0.16–0.70	0.004	0.30	0.18–0.51	<0.001	3.51	1.75–7.06	<0.001
Marital Status	4.62	1.97–10.8	<0.001	7.39	2.15–25.3	0.001	0.61	0.25–1.49	>0.05

Note: *P values < 0.05 are shown in bold.

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio.

Table 6 Multivariate Logistic Regression Analysis of Variables on Different Groups of Misperceptions

	Thinner Than Reality Misperceptions		
	OR	CI	P*
Age	1.03	1.00–1.06	0.01
BMI	1.12	1.06–1.20	<0.001
Education status	0.51	0.28–0.90	0.022
Nagelkerke R square 0.218			

Note: *P values < 0.05 are shown in bold.

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio.

Discussion

This study demonstrated that weight misperception is highly prevalent among Turkish adults, with similar rates seen in adults in Saudi Arabia, Malaysia, Nigeria, and the Netherlands,^{19,26–28} but considerably higher than rates seen in South Korea and Mauritius.^{29,30} Whether the differences in weight perception rates among countries are factual or stem from the fact that there is no universally validated assessment tool, each researcher uses their own method. Therefore, our findings cannot be generalized to the entire Turkish adult population.

Due to the lack of a universal assessment tool and the dependence on individual researchers, each researcher employed a unique technique. Joo et al's¹⁸ technique has similarities with our study's verbal assessment part; however, we differ from their study due to the fact that we did not only use verbal assessment but also used Harris et al's²⁵ visual scale. Although both verbal and visual scales' agreement strengths with actual BMI were low, since the visual scale had better kappa statistics than the verbal scale, further studies that will use the visual scale to assess weight perception may end up having lower weight misperception ratios compared to ones that were acquired via verbal scales.

Our study demonstrated that TTRM, namely, weight underestimation, was associated with aging, a higher BMI, and a lower education level, the outcomes that were also reported in recent studies.^{18,19,28,30} Althumiri et al demonstrated that misperception occurs more frequently in those who do not have a bachelor's degree.¹⁹ Our study demonstrated that there is no single threshold and misperception rates gradually decrease as the level of education increases. This gradual decline was also shown in various studies.^{27,29,30} Gender's role in weight perception is controversial. While several studies indicate that gender may be associated with weight misperception,^{20,29,30} our study, along with the others,^{19,28} did not find any association. Different cultural backgrounds strongly influence women's body image, which could explain this difference. For example, overweight women may be regarded as more beautiful in some Middle Eastern and Sub-Saharan African countries, in contrast to western and Chinese culture.^{30–33} Hence, the presence or absence of gender's role may not be generalizable to every other country. Studies consistently show a correlation between age and increased weight misperception, with the exception of a Nigerian study, which found a link between weight misperception and young adult age.²⁷ Considering the fact that women are more susceptible than men to societally imposed ideal beauty standards,³⁴ and this susceptibility weakens with aging,³³ differences in the study characteristics may be partially responsible for the contrasting findings in the studies.

Another factor for which our study found no association, but other studies have suggested a relationship, is marital status. Marital status was a determinant of WM in univariate logistic regression, with being either married or divorced/widowed being associated with weight misperception compared to being single, but there was no difference between them. However, in multivariate logistic regression, they were not found to have an independent association with weight misperception. A recent Malaysian study indicated that being divorced was significantly associated with WM compared to being married (odds ratio: 4.70, CI: 1.44–15.32, $P = 0.01$).²⁶ Similarly, a Korean study also indicated an association between marital status and WM.²⁹ Most of the participants (78%) in our study were married, and only 55 participants were either single or divorced/widowed. The low number of participants in our study is likely to impede a possible association between marital status and WM.

Excess body weight and obesity pathogenesis are not fully understood, yet various genetic and environmental factors have been demonstrated to contribute to this altered energy metabolism syndrome. It has been shown that sex, age, and socioeconomic status have an impact on weight gain. Excess body weight was more likely among women, the elderly, and those of low socioeconomic status. Moreover, lower education is also associated with a higher prevalence of obesity.^{35,36} It is intriguing that, similar to the factors associated with obesity, these risk factors were also shown to be associated with higher odds of weight misperception in adults.^{19,26,28–30} We cannot draw a conclusion from this study that weight misperception is the underlying cause of obesity among the aforementioned groups; however, this hypothesis deserves future research.

Dietary therapy is the cornerstone of overweight or obese treatment strategies. While they are effective in the short term, their long-term efficacy is usually disappointing due to diminished dietary adherence. We do not fully understand the mechanisms of dietary adherence, but we know they are associated with sociocultural/environmental, cognitive, ingestive, and absorptive variables.³⁷ Researchers have never studied or defined weight misperception as a predictor of

dietary adherence. Our research shows that there is a positive relationship between weight misperception and body mass index. This relationship can also help people with TTRM stay on track with their diets.

Our study revealed that while appropriate perception is similar between the visual scale and verbal question (42% vs 36.8%), verbal weight misperception was more prevalent when it came to the perception of being thinner than reality, and visual weight misperception was more prevalent when it came to the perception of being fatter than reality. This finding suggests that we should not use the visual scale and verbal question for perception analysis interchangeably, as the former is more effective in identifying patients who perceive themselves as fatter than reality, while the latter is more effective in identifying patients who perceive themselves as thinner than reality.

We have revealed that t-SG 2, namely visual misperception but verbal accurate perception among the thinner than reality misperception group, was significantly lower than t-SG 3, namely verbal misperception but visual accurate perception (2.4% vs 21.2%). Contrary to this finding, f-SG 2, namely visual misperception but verbal accurate perception among the fatter than reality misperception group, was significantly higher than f-SG 3, namely verbal misperception but visual accurate perception (15.6% vs 2%). We interpreted this finding as saying that those who misperceive themselves as thinner than reality tend to articulate their perception inappropriately but visualize themselves in their minds appropriately, while those who misperceive themselves as fatter than reality tend to articulate their perception appropriately but visualize themselves in their minds inappropriately. This finding may be attributed to different weight misperception mechanisms between TTRM and FTRM.

We acknowledge the limitations of our study. Firstly, we conducted this study in two academic centers, which may limit the generalizability of the findings to the entire Turkish population. Secondly, the median BMI of our patient cohort was in the overweight category, so our findings may underrepresent what is in obese populations. Thirdly, we had female dominance, which is not consistent with societal statistics. Finally, our prediction model's Nagelkerke R square value is not high. The relatively narrow interquartile range of age and BMI appears to be the cause of this.

We also acknowledge the strengths of the study. Firstly, to the best of our knowledge, this is the first study to demonstrate weight misperception and its characteristics among the Turkish adult population. This study was not an e-mail or phone-based study but rather conducted face-to-face with the researcher involved in the study. We believe that this approach prevented misunderstandings of the questions and provided more detailed and consistent answers. Moreover, we did not rush patients to answer the questions as observed in phone-based studies but allocated an abundant amount of time. Secondly, despite the study taking place in academic centers, the nature of general internal medicine means that patients admitted to these outpatient clinics primarily reflect the general public. Finally, we did not dichotomize misperceptions but rather grouped them under three main headings. This is an important classification because, as illustrated above, TTRM and FTRM misperceptions have different associations.

In conclusion, weight misperception is a common phenomenon among Turkish adult patients. Underestimation is more common than overestimation and is associated with older age, a higher body mass index, and lower educational status. The association between weight misperception and adverse health consequences necessitates further research with a larger population.

Disclosure

The authors report no conflicts of interest in this work.

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