

# COMPARISON OF BODY MASS INDEX LEVEL BY TRIAGE LEVEL IN THE EMERGENCY DEPARTMENT

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## ABSTRACT

**INTRODUCTION:** Obesity is a high cause of death in both non-communicable and communicable diseases such as COVID-19. The aim of this study is to increase the awareness of emergency department (ED) managers and employees about this problem by showing obesity rates according to triage level in patients admitted to the ED.

**MATERIAL AND METHODS:** BMI levels and complaints of 1246 patients admitted to the ED according to the 3-level triage were re-evaluated with the 5-level ESI (Emergency Severity Index) triage for this study.

**RESULTS:** The mean BMI of 1246 patients was found to be  $27.25 \pm 5.88$  (overweight). 26% of the ED patients were found to be obese and 37.7% of them were overweight. While the mean BMI score of the 6–11 age group was found to be class 1 obesity, the other pediatric and adult age groups were found to be overweight. The highest mean BMI according to both the 3-stage triage system and the 5-stage ESI triage system was found in triage 1 patients ( $28.8011 \pm 7.98$ ;  $28.18 \pm 6.78$ , respectively). Obese patients mostly applied to the ED with orthopedic problems and trauma (26.5%). Also, of the patients with class 3 severe obesity, 50% presented with trauma.

**CONCLUSIONS:** The higher the BMI, the higher the triage severity level. BMI levels should be evaluated in the field of triage together with vital signs, especially in trauma patients, and obesity should be considered in ED and hospital management.

**KEY WORDS:** BMI; obesity; triage; emergency department

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## INTRODUCTION

Obesity has been recognized as one of the biggest public health problems of the 21<sup>st</sup> century by the World Health Organization (WHO). [1] Obesity is defined by the WHO as „abnormal or excessive fat accumulation in the body to the extent that it impairs health“ [2].

Obesity is already responsible for 2–8% of health-care costs and 10–13% of deaths [1]. According to

WHO data in 2016, 39% of adults aged 18 years and older were overweight (over 1.9 billion adults) and 13% (over 650 million) were obese. It has been reported that 39% of men and 40% of women are overweight, 11% of men and 15% of women are obese [2].

According to CDC data, the rate of those with BMI:  $\geq 30$  in the age groups over 20 years of age in the United States between 2015 and 2018 was

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31.8–43.9% in men and 35.6–46.2% in women [3]. In addition, the obesity rate in children aged 2–19 in the United States in 2017–2018 was reported as 13.4–21.2% [4].

Obesity is known to be directly or indirectly related to morbidity and mortality.

Being overweight and obesity are among the risk factors that contribute to metabolic causes of death due to non-communicable diseases in the world, after high blood pressure, along with hyperglycemia and hyperlipidemia [5]. In a meta-analysis of 239 prospective studies with 10,625,411 participants from 4 continents (Asia, Australia and New Zealand, Europe, and North America), both overweight and obesity were associated with high mortality [6].

Obesity is a cause of high mortality not only in non-communicable diseases but also in communicable diseases [7–9].

During the COVID-19 pandemic, obesity has increased the risk of hospitalization and death in both adults and children [7]. In a meta-analysis study by Sawagado et al., in which 208 studies with 3 550 997 participants from more than 32 countries were examined, it was found that being overweight only increases the risk of COVID-19-related hospitalization, whereas obesity and extreme obesity increase both the risk of COVID-19-related hospitalization and the risk of death [8]. Apart from the COVID-19 pandemic, obesity has also been reported as a problem in other disasters. Hospital evacuation of obese patients was one of the biggest problems in the United States during Hurricane Katrina in 2005 and Storm Sandy in 2012 [9].

Overweight and obese patients face problems both in the pre-hospital and in the hospital process due to the inadequacy and incompatibility of transport and intervention devices [10–13].

Obesity is evaluated according to body mass index (BMI) by both WHO and CDC. It is defined as a person's weight in kilograms divided by the square of his height in meters ( $\text{kg}/\text{m}^2$ ). According to the CDC, obesity classification is as follows: If  $\text{BMI} < 18.5 \text{ kg}/\text{m}^2$  is underweight if  $\text{BMI}: 18.5\text{--}24.99 \text{ kg}/\text{m}^2$  is a healthy weight if  $\text{BMI}: 25.0\text{--}29.99 \text{ kg}/\text{m}^2$  is overweight and is  $\text{BMI} > 30.0 \text{ kg}/\text{m}^2$  is obesity (if  $\text{BMI}: 30.0\text{--}34.99 \text{ kg}/\text{m}^2$  as class 1 obesity, if  $\text{BMI}: 35.0\text{--}39.99 \text{ kg}/\text{m}^2$  as class 2 obesity if  $\text{BMI}: > 40 \text{ kg}/\text{m}^2$  as class 3-severe obesity) [14].

Flegal KM et al. In a meta-analysis of 97 studies with a sample size of more than 2.88 million and more than 270,000 deaths, a significant asso-

ciation was found between all-cause mortality in patients with BMI 30–35 and BMI  $\geq 35$  compared to normal weight [15]. In another study evaluating 57 prospective studies with 900,000 adult patients, mortality was found to be lowest in those with a BMI of 22.5–25  $\text{kg}/\text{m}^2$  in both genders. In this study, it was determined that every 5  $\text{kg}/\text{m}^2$  increase in BMI increases mortality by 30% [16].

However, there are few studies on the prehospital and hospital data of these patients. Studies examining the relationship between emergency diseases, obesity levels, and emergency disease levels (triage levels) of patients admitted to the ED are also insufficient in the literature.

Triage levels were investigated only in the study of Ngui et al. in which obese and nonobese patients were compared. BMI and Ngui et al. reported that 48.2% ( $n = 92$ ) of obese ( $\text{BMI}: > 30$ ) patients admitted to the ED were in the triage 3 categories [17]. Baskerville et al. In a study investigating the duration of stay in the emergency room of obese patients at ESI 2 and 3 triage levels, it was reported that the mean duration of stay in the emergency room of morbidly obese patients was 101 minutes longer than the average length of stay in the emergency room of normal or lightweight patients [18].

Obesity, which is one of the leading causes of death in both non-communicable and communicable diseases such as COVID-19, has become a public health problem with an increased risk at the disaster level. The aim of this study is to increase the awareness of ED managers and employees about this problem by showing obesity rates according to triage level in patients admitted to the ED.

## MATERIAL AND METHODS

This study was carried out retrospectively, cross-sectionally, between 15 November and 15 December 2017 (1 month), after the approval of the ethics committee (Bakirkoy Dr. Sadi Konuk Education and Research Hospital Ethics committee — Date: 25.12.2017; Decision no: 2017-18-27).

1344 outpatients who applied to the Adult ED of Kanuni Sultan Süleyman Training and Research Hospital during the daytime in a 1-month period were included in the study. Eighty-eight patients whose triage levels, ages, heights, and weights were written incompletely on the study forms were excluded from the study, and the data of 1246 patients were analyzed. Body Mass Index (BMI) was calculated

according to the information obtained from the height and weight of the patients in the study file. Body mass indexes of the patients were compared with age, gender, and presentation complaints. Calculations and intervals determined by CDC and WHO were used in BMI evaluation [14].

In this study, the emergency complaints of the patients admitted to the ED according to the three-level triage system were evaluated according to the five-stage triage system (Emergency Severity Index). The Emergency Severity Index (ESI), developed by emergency medicine doctors Richard Wuerz and David Eitel in 1998, was used to evaluate the five levels of triage [19].

The information obtained from the patient files was recorded in the SPSS for the windows 15 program and statistical analyzes were performed. Frequency tables and cross tables were used for categorical variables, and mean, median, standard deviation, minimum and maximum were used for numerical variables. Independent samples t-test and one-way ANOVA test were used for mean differences between independent groups. The statistical significance level was accepted as  $p < 0.05$ .

## RESULTS

Of 1246 ED patients included in the study, 60% ( $n = 747$ ) were female and 40% ( $n = 499$ ) were male. While the mean age of 1246 ED patients was  $36.66 \pm 15.29$  (Median: 35; Min: 2; Max: 86), there was no statistical difference between the mean age of female patients ( $36.98 \pm 14.91$ ) and the mean age of male patients ( $36.18 \pm 15.83$ ), ( $p = 0.361$ ).

The mean height of the ED patients was  $163.87 \pm 13.03$  cm (Median: 165 cm; Min: 60 cm; Max: 205 cm). The mean height of male patients, ( $165.83 \pm 15.40$  cm) was higher than the mean height of female patients, ( $162.56 \pm 10.99$  cm), ( $p = 0.00$ ).

The mean weight of the ED patients was  $72.89 \pm 14.81$  kg (Median: 73 kg; Min: 11 kg; Max: 162 kg). The mean weight of male patients, ( $73.81 \pm 14.04$  kg) was higher than the mean weight of female patients, ( $72.27 \pm 15.29$  kg), ( $p = 0.068$ ).

BMI of 1246 outpatients admitted to the ED and included in the study was analyzed.

The mean BMI of the ED patients included in the study was  $27.25 \pm 5.88$  kg/m<sup>2</sup> (Median: 26.22 kg/m<sup>2</sup>; Min: 14.69 kg/m<sup>2</sup>; Max: 73 kg/m<sup>2</sup>). The mean BMI

of female patients, ( $27.44 \pm 6.01$  kg/m<sup>2</sup>) was higher than the mean of male patients, ( $26.98 \pm 5.69$  kg/m<sup>2</sup>), ( $p = 0.169$ ) (Tab. 1).

In this study, 36.2% of the ED patients were underweight and healthy weight, and 63.7% were overweight and obese. The mean BMI of the healthy weight and underweight ED patients was  $22.08 \pm 1.97$  kg/m<sup>2</sup>, while the mean BMI of the overweight and obese ED patients was  $30.20 \pm 5.31$  kg/m<sup>2</sup> ( $p = 0.00$ ).

In this study, 2.1% of the ED patients were underweight, 34.2% were healthy weight, 37.7% were overweight, 16.6% were class 1 obesity, 7.9% were class 2 obesity and 1.4% were class 3 obesity-severe was detected (Fig. 1).

According to the 3-level triage system, 1.2% of the patients were triage 1 level (red code), 21.8% were triage 2 level (yellow code), 77% were triage 3 level (green code). According to the 5-level ESI triage system, 2.6% of the patients were ESI 1 triage level, 13.3% ESI 2 triage level, 32.7% ESI 3 triage level, 22.7% ESI 4 triage level and 28.7% ESI 5 triage level. (Tab. 1).

In both 3-level and 5-level ESI triage systems, mean BMI values were found in the overweight range (BMI: 25.0–29.99 kg/m<sup>2</sup>) at all triage levels.

In this study, it was found that the mean BMI of the patients increased as the triage severity level increased.

According to the 3-level triage system, the highest mean BMI ( $28.8011 \pm 7.98$  kg/m<sup>2</sup>) was found in triage 1 (red code) patients and the lowest ( $27.1733 \pm 5.65$  kg/m<sup>2</sup>) in triage 3 (green code) patients. According to the ESI triage system, the highest mean BMI ( $28.18 \pm 6.78$  kg/m<sup>2</sup>) in ESI 1 triage (critical triage code), and the lowest mean BMI ( $26.87 \pm 5.31$  kg/m<sup>2</sup>) were found in patients with ESI 5 triage level. However, the difference between the 3 triage and ESI 5 triage levels and the mean BMI was not statistically significant ( $p = 0.446$ ;  $p = 0.464$ , respectively) (Tab. 1).

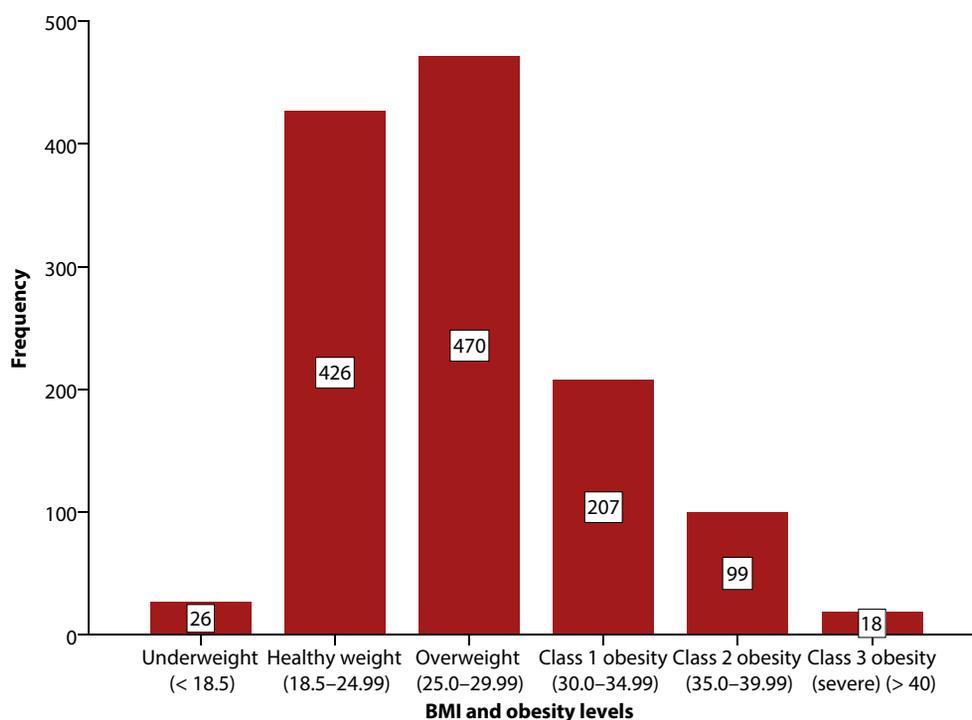
Triage levels of 324 obese patients (BMI: >30) were analyzed. According to 5-level ESI, 3.4% of obese patients were ESI 1 triage level, 14.2% ESI 2 triage level, 29.6% ESI 3 triage level, 25.6% ESI 4 triage level and 27.2% were evaluated in ESI 5 triage level. However, 71.8% of 32 patients at ESI 1 triage level were overweight or obese (37.5% overweight and 34.3% obese) (Fig. 2).

In this study, it was found that the mean BMI of the patients increased with increasing age.

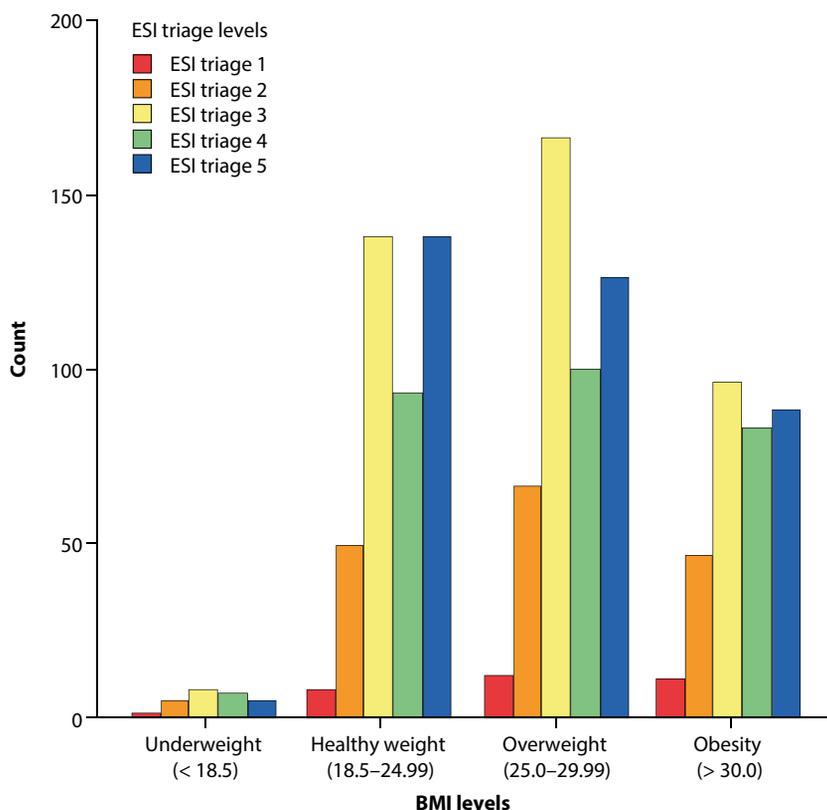
**Table 1. Body mass index levels of patients according triage levels and demographic characteristics**

	Triage	n	BMI Mean $\pm$ SD	Min–Max	BMI levels	p
Sex	Female	747	27.44 $\pm$ 6.01	14.80–73.00	Overweight	p = 0.169*
	Male	499	26.98 $\pm$ 5.69	14.69–73.00	Overweight	
Age groups	2–5 years	5	28.9939 $\pm$ 7.22	20.82–37.81	Overweight	p = 0.000**
	6–11 years	9	33.4440 $\pm$ 17.64	14.80–71.43	Class 1 obesity	
	12–19 years	115	25.0811 $\pm$ 5.34	16.73–45.37	Overweight	
	20–34 years	488	26.4135 $\pm$ 4.83	14.69–57.64	Overweight	
	35–44 years	285	28.1055 $\pm$ 6.66	17.99–73.00	Overweight	
	45–54 years	171	28.4673 $\pm$ 5.80	19.84–73.00	Overweight	
	55–64 years	115	28.7564 $\pm$ 5.83	16.73–47.05	Overweight	
	65–74 years	26	27.3313 $\pm$ 5.66	18.59–42.52	Overweight	
	75 years and over	32	26.5654 $\pm$ 5.11	17.30–41.86	Overweight	
3-level MOH triage	Red triage 1	15	28.8011 $\pm$ 7.98	17.30–44.08	Overweight	p = 0.446**
	Yellow triage 2	272	27.4799 $\pm$ 6.55	14.80–73.00	Overweight	
	Green triage 3	959	27.1733 $\pm$ 5.65	14.69–73.00	Overweight	
5-level triage (ESI)	ESI triage 1	32	28.18 $\pm$ 6.78	17.30–44.08	Overweight	p = 0.464**
	ESI triage 2	166	27.77 $\pm$ 6.35	14.80–71.43	Overweight	
	ESI triage 3	408	27.28 $\pm$ 5.94	16.73–73.00	Overweight	
	ESI triage 4	283	27.30 $\pm$ 6.10	17.26–73.00	Overweight	
	ESI triage 5	357	26.87 $\pm$ 5.31	14.69–57.64	Overweight	
Total		1246	27.2598 $\pm$ 5.88	14.69–73.00	Overweight	

\*Independent Samples Test; \*\*One-Way ANOVA; BMI — body mass index; ESI — emergency severity index; MOH — Ministry of Health; SD — standard deviation



**FIGURE 1.** Obesity levels of the emergency department (ED) patients; BMI — body mass index



**FIGURE 2.** Comparison of 5 level triage system (ESI) and body mass index (BMI) levels of emergency department (ED) patients

In this study, the rates of overweight and obesity by age group are shown in figure 3 (Fig. 3).

The obesity rates in women with BMI:  $\geq 30$  were found 19.5% for 20–34 years, 32.4% for 35–44 years, 40.7% for 45–54 years, 47.2% for 55–64 years, 23.1% for 65–74 years, and 29% for 75 years and over. The obesity rates in men with BMI:  $\geq 30$  were found 17.1% for 20–34 years, 29.9% for 35–44 years, 20% for 45–54 years, 38.5% for 55–64 years, 23.1% for 65–74 years, and 15.8% for 75 years and over.

Mean BMI was found to be overweight in all age groups except the 6–11 age group. In the 6–11 age group, the average BMI was found to be class 1 obesity ( $33.44 \pm 17.64 \text{ kg/m}^2$ ). (Tab. 1, Fig. 3).

The difference between the mean BMI levels in the age groups was found to be statistically significant ( $p = 0.000$ ). In the Post Hoc analysis, it was determined that this difference was between the 12–19 age group and other groups, and between the 25–34 age group and other groups.

While 94.1% of the patients applied to the ED with a single complaint, 72 patients applied to the ED with two complaints, and one patient with three complaints.

The complaints of the ED patients included in the study were divided into 14 different groups. Patients, the first 5 most common complaints; orthopedics and traumatology (22.8%), gastrointestinal system (16.6%), infection (15.2%), ENT (12.2%), and neurology-brain surgery (12.2%) (Tab. 2).

Nine children aged 6–11 years with Class I obesity were brought to the emergency room due to trauma (5 falls, 1 traffic accident, 1 cut, 2 fractures) (Tab. 2).

Obese patients ( $n = 324$ ) applied to the ED mostly with orthopedic problems and trauma complaints (26.5%), gastrointestinal system complaints (20.6%), and respiratory tract complaints (12.3%). According to application complaints 68.44% of infectious patients, 71.49% of gastrointestinal system patients, 66.31% of orthopedics and traumatology patients, 50% of gynecology and obstetrics patients, 63.63% of ENT patients, 63.63% of genitourinary system patients, 33.33% of dermatology patients, 80% of ophthalmological patients, 63.66% of neurology-neurosurgery patients, 68.08% of respiratory patients, 86.95% of dental patients, 75.6% of cardiovascular patients, 80% of endocrinology patients

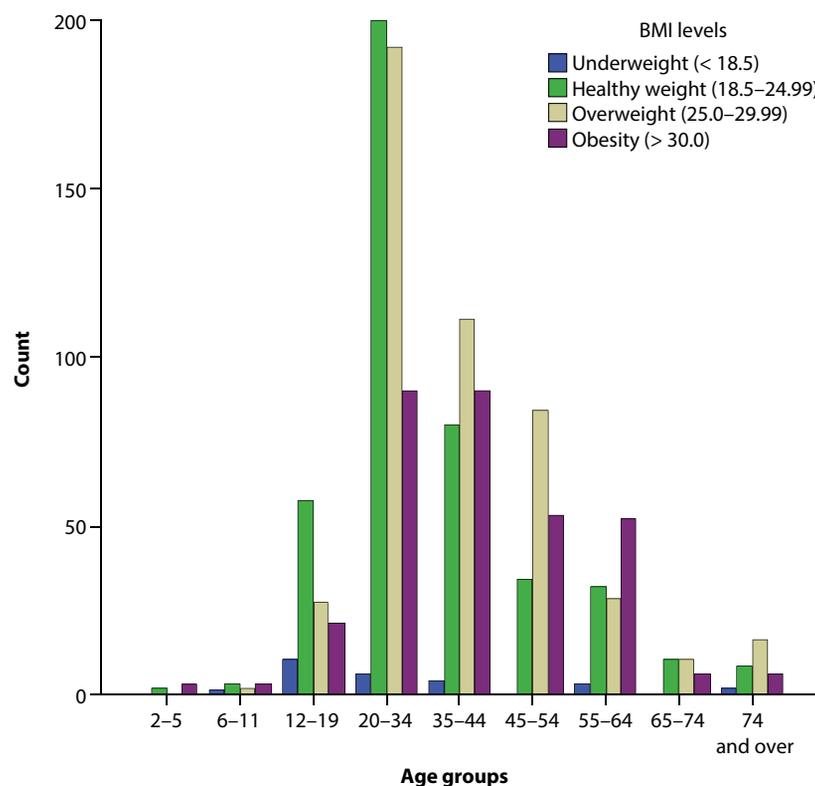


FIGURE 3. According to age groups body mass index (BMI) levels

Table 2. Complaint groups and body mass index levels of patients admitted to the emergency department

Complaint groups	BMI levels				
	n	Underweight	Healthy weight	Overweight	Obese
Orthopedics and traumatology	285	5	91	103	86
Gastrointestinal tract	207	7	62	71	67
Infection	187	3	76	80	28
Ear Nose Throat	154	1	75	46	32
Neurology-neurosurgery	153	3	48	66	36
Respiratory diseases	94	4	26	24	40
Genitourinary system	66	0	24	33	9
Cardiovascular diseases	41	1	9	24	7
Dental diseases	23	1	2	9	11
Dermatology	12	1	7	3	1
Ophthalmology	10	0	2	7	1
Endocrinology	10	0	2	3	5
Gynecology and Obstetrics	2	0	1	1	0
Oncology	2	0	1	0	1
Total	1246	26	426	470	324

Underweight: BMI < 18.5; Healthy weight: BMI: 18.5–24.99; Overweight: BMI: 25.0–29.99; Obesity BMI: > 30.0; BMI — body mass index

and 50% of oncology patients were detected overweight and obesity in this study (Tab. 2).

The patients included in the study applied to the ED with 73 different complaints. Most applications were due to URTI-Upper Respiratory Tract Infection (14%), throat ache (10.8%), headache (10.4%), stomach ache (9.3%), and cough (6.2%). Also, in this study, 100% of cold and flu patients, 100% of leg pain patients, 100% of shoulder pain patients, 100% of foot wound patients, 100% of burn patients, 86.95% of toothache patients, 85.77% of sinusitis patients, 80% of the patients who had an occupational accident, and 80% of the patients with hyperglycemia were overweight or obese.

## DISCUSSION

Obesity is a serious medical condition that can cause complications such as metabolic syndrome, high blood pressure, atherosclerosis, heart disease, diabetes, cancer, and sleep and life disorders [2].

According to CDC data, obesity rates in men with a BMI:  $\geq 30$  in the U.S. between 2015 and 2018 are 37.2% for 20–34 years, 42.5% for 35–44 years, 42.9% for 45–54 years, 43.9% for 55–64 years, 65–74 years 41.9% and 75 years and over 31.8% were reported. The obesity rates in women with BMI:  $\geq 30$  are 35.6% for 20–34 years, 45.0% for 35–44 years, 43.1% for 45–54 years, 46.2% for 55–64 years, 45.9% for 65–74 years, and 36.1% for 75 years and over were reported [3].

The prevalence of obesity is increasing all over the world. The prevalence of obesity worldwide nearly doubled between 1980 and 2008. It was reported by the WHO in 2008 that more than 50% of both men and women in Europe were overweight, with about 23% of women and 20% of men obese [1]. The prevalence of morbid obesity in the United States has been reported as 4.7% (1999–2000) [20]. In India, one of the most populated countries in the world, the prevalence of obesity was reported as 11.8–31.3% in 2015 [21]. In a study conducted in Iran, one of the West Asian countries, in 2016, the prevalence of normal weight was found to be 36.7%, overweight prevalence 59.3%, and obesity prevalence 22.7% among Iranian adults [22]. In a prevalence study by Iseri et al. in Turkey covering the age groups of 20–85 years, it was determined that 56% of the Turkish population was overweight and 41% was in the normal range [23]. In the results of the Turkish National Nutrition and Health

Survey-2010 conducted with 9820 individuals in Turkey, the prevalence of overweight adults was 34.6% (39.1% in men, 29.7% in women) and the prevalence of obese adults was 30.3% (20.5% in men, 41.0% in women) [24].

In our study, 63.7% of 1246 patients were found to be overweight and obese according to BMI. Our study, which was conducted 10 years after other studies in Turkey, showed that obesity is becoming an increasing problem. In our study, BMI  $> 25$  was found in all age groups. However, in our study, as in other studies, the rate of overweight in men and obesity in women was found to be higher. Also, the mean BMI of women was found higher than the mean BMI of men. The rate of women with BMI:  $\geq 30$  in all age groups was also found to be higher than the rate of men.

Prendergast HM et al., in patients over 65 years of age, approximately 29% of the patients were of normal weight, 35% were overweight and 36% were obese. In this study, it was reported that the older the patient, the higher the probability that the patient belongs to the lower weight classification [25].

In our study, contrary to Prendergast HM et al., it was found that weight gain increased with age [25]. In our study, 44.8% of patients aged 65 and over were overweight and 20.7% were obese.

Especially in recent years, it has become an increasing health problem in both children and adults with the change in nutrition and movement habits. According to WHO, an estimated 6.6 million young children under the age of 5 and one in five adults are currently overweight. [26] In a pediatric ED study, about one-fifth of 4 to 5-year-olds and about one-third of 10 to 11-year-olds were overweight or obese. [27] In the U.S., in 2017–2018, the obesity rate in children aged 2–5 was 13.4%, 20.3% between the ages of 6–11, and 21.2% between the ages of 12–19 [4]. In our study, the obesity rate was 60% in children aged 2–5, 33.3% in children aged 6–11, and 18.3% in children aged 12–19. In addition, 19.8% of the 5–19 age group were obese and 42.9% were overweight. In our study, 6–11 age group children were in class 1 obesity class.

Triage is to prioritize patients in EDs according to disease severity. While determining the severity of the disease with the ESI (Emergency Severity Index), the patient's complaints at admission, use of resources, and vital signs are taken into account [19]. In the literature, there is no detailed study investigating the relationship between BMI and triage levels

in the ED, except for Ngui et al.'s study comparing obese and nonobese patients in the ED [17].

In the study of Ngui et al. with 520 non-obese and 191 obese (BMI: > 30) patients admitted to the ED, 0.5% of obese patients were triage-1, 37.7% triage-2, 48.2% triage-3, 13.1% triage-4 and 0.5% triage-5 evaluated in the category [17]. In our study, the highest number of admissions among patients with high BMI was at the triage 3 levels (32.7%).

In our study, 1246 patients admitted to the ED were analyzed in both three-level and five-level triage systems according to their BMI levels. The mean BMI values of the patients were determined as overweight in both the three- and five-stage triage system and at all triage levels.

In our study, we found that the mean BMI of the patients increased as the level of triage severity increased according to both 3-level and 5-level ESI triage systems. While the highest mean BMI according to both the 3-level triage system and 5-level ESI triage system was found in triage 1 patient, the lowest BMI mean was found in triage 3 according to the 3-level triage system and in ESI 5 triage according to ESI 5-level triage system. On the other hand, according to the 5-level ES triage system, 71.9% of the patients (37.5% overweight and 34.4% obesity) with T1 code were found to have a BMI > 25.

In the study of Prendergast et al., in which the complaints of admission to the ED were also evaluated, it was found that those presenting with neurological, pulmonary, or gastrointestinal complaints had a higher weight classification. In their study, 37.2% of the patients who applied with cardiovascular complaints were overweight and 36.1% were obese, 12.7% of those who applied with gastrointestinal complaints were overweight and 7.2% were obese, 9% of those who applied with musculoskeletal complaints were overweight and 15.1% were obese, and 11.1% of those who applied with respiratory complaints were overweight and 11.1% obese class [25]. In the study of Ngui et al., patients admitted to the ED with 29.3% (n = 56) chest pain/arrhythmia, 22% abdominal complaints, 16.2% respiratory complaints, 7.9% applied with musculoskeletal or trauma complaints and 13.6% with other complaints [17]. Being overweight or obese in the study of Frey C et al. significantly increases the chance of orthopedic problems such as tendinitis, fasciitis, and osteoarthritis in general [26]. In the study of von Mach MA et al. with 299 patients, 41% of the subjects were found to be morbidly

obese, while the prevalence of arterial hypertension, edema, dyspnea, eczema, and depression was found to be higher in these patients [27]. In the study of Teixeira CA et al., it was reported that dyspnea is a common complaint in individuals with class II or III obesity [28].

In our study, the patients included in the study applied to the ED with 73 different complaints divided into 14 different classes. When the ED complaints were examined, it was determined that the most frequent complaints were due to URTI, throat ache, headache, stomach ache, and cough.

In our study, 26.5% of obese presented to the ED due to orthopedics problems and trauma, 20.6% with gastrointestinal system complaints, and 12.3% with respiratory tract complaints.

Class 3-severe obesity was detected in 18 patients, 2 patients with incision, 1 patient with soft tissue trauma, 2 patients with fracture, 1 patient with joint pain, 2 patients with back pain, 1 patient with cough, 1 patient with chest pain, 3 patients with nausea, 1 patient had a burning sensation while standing, 1 patient had an asthma attack and 1 patient presented to the ED with complaints of constipation.

In our study, 42.2% of those presenting with a stomach ache, 38.9% of those presenting with cough, 37.3% of those presenting with backache, 47.8% of those presenting with toothache, 47% of those presenting with dizziness, 56.2% of those presenting with dyspnea, 50% of those presenting with hyperglycemia, 83.3% of those presenting with leg pain, 80% of those presenting with foot pain, 50% of those presenting with weakness, and 50% of those presenting with cold-flu were obese patients.

Obese patients comprised 42.5% of the patients who applied with respiratory disease complaints, 47.8% of the patients who applied with dental complaints, and 50% of the patients who applied with endocrinology complaints.

While the majority of patients admitted to the ED with only ENT complaints and dermatological complaints were healthy-weight people, most of the complaints in all other groups consisted of people in the overweight and obese class.

In our study, 57.7% of infectious patients, 66.6% of gastrointestinal tract patients, 66.3% of orthopedics and traumatology patients, 50% of gynecology and obstetrics patients, 50.6% of ENT patients, 63.6% of genitourinary system patients, 33.3% of dermatology patients, 80% of ophthalmology

patients, 66.6% of neurology-neurosurgery patients, 86.9% of respiratory diseases patients, 75.6% of cardiovascular diseases patients, 80% of endocrinology patients, 50% of oncology patients are overweight and obese was found.

Literature studies show that obesity (overweight and obesity) is directly or indirectly related to morbidity and mortality [5–7, 15, 16].

However, studies investigating BMI levels of all ages in detail according to ED complaints and triage levels are insufficient in the literature.

This study determined that the increasing obesity problem in the world is also present in ED patients. In particular, it was determined that 86.9% of the patients who applied with the complaints of respiratory diseases with a high risk of morbidity and mortality, 75.6% of the patients who applied with the complaint of cardiovascular diseases, and 80% of the patients who applied with the complaint of endocrinology had BMI levels as overweight and obese.

In the study of Paulis WD et al. [29], overweight and obesity were associated with musculoskeletal pain, injuries, and fractures from childhood. In a study evaluating the risk of obesity injury in the 3–14 age group in the U.S., 16.5% of patients who applied to the pediatric ED were evaluated as obese, while lower extremity fractures were more common in obese children than non-obese children [30].

In this study, the fact that all the complaints of children aged 6–11 years, who applied to the emergency department and defined as class 1 obesity, were due to orthopedics and traumatology, showed that the increasing obesity problem in childhood age groups should be prevented. Obesity should be considered in the management of trauma patients in pediatric EDs.

This study showed that BMI values should be taken into account at least as much as vital signs in the triage management of patients admitted to the ED.

Obesity is no longer just a simple public health problem, it has become both a pre-hospital and hospital problem, especially in EDs. Obesity patient management requires special preparation and management from patient stretcher to bed, blood pressure device cuff size, from intubation to other invasive procedures, from patient follow-up to radiological imaging devices and methods [10–13]. As obesity increases, hospital stay, mortality, and morbidity increase. At the same time, as the level of triage severity increases, the severity of the emer-

gency disease also increases. In our study, the mean BMI was found to be higher as the level of triage severity increased. BMI measurements and evaluations should be performed in the emergency triage area in order to make the disease severity and management more careful and careful and to diagnose obesity.

Obesity has become a serious public problem in recent years, increasing morbidity and mortality in developed and developing countries. Obesity causes many short-term (such as traumas, and fractures) and long-term (such as cardiovascular and respiratory problems) health problems in people of all ages. In the literature, there are not enough studies examining the prevalence of obesity in the emergency department, patient complaints, and triage level.

This study showed that similar to the general population, a significant proportion of ED patients are overweight and obese patients. For this reason, both pediatric and adult EDs should be reorganized as both a team and equipment for the management of obese patients. In addition, training should be given to the ED team about the characteristics and severity of obese patients.

Although obesity is one of the most important causes of mortality from both communicable and non-communicable diseases, both pre-hospital and hospital emergency department studies on obesity are not sufficient. However, there are very few studies on disaster recovery and disaster medicine related to obesity. Apart from the problems experienced in the evacuation of obese patients in the 2005 hurricane and the superstorm disasters in 2012 in the United States, there are studies showing the relationship between obesity and mortality in the COVID-19 pandemic [7–9].

This study showed that most of the patients presenting to the ED are overweight and obese. Therefore, further studies are needed in both pre-hospital emergency health services and hospital emergency services. In addition, there is a need for more studies on obesity in disasters other than infectious diseases such as the COVID-19 pandemic.

## CONCLUSIONS

Obesity is an increasing public health problem at the disaster level, increasing morbidity and mortality. This study showed that, as a reflection of society, overweight and obesity are also high in ED patients. As the triage severity level, which indicates the severity of the disease, increases, the mean BMI

level also increases. However, the average BMI level at each circulation level is overweight and higher. These findings have shown how serious obesity has become in society. In this study, the mean BMI level was found to be obese in patients aged 6–11 years, while the mean BMI level was found to be overweight in all triage levels of all other outpatients. BMI levels, which affect the prognosis of patients, should be considered in emergency triage management, especially in pediatric patients, and should be evaluated together with vital signs. At the same time, the teams and equipment of the EDs should be prepared and organized according to the management of obese patients. In addition, this study said that there is a need for studies on obesity in emergency medical services and disasters.

### Limitation

Due to the difficulty in obtaining the height and weight measurements of the patients brought to the ED by ambulance or other vehicles, outpatients admitted to the ED were included in this study.

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### Authors' contributions

DNO, SD, SC were involved in the study's design, methodology, ethical process, data collection, analysis, and article writing. All authors have read and approved the final article. All authors accept responsibility for the accuracy and completeness of the work.

### Ethical approval

Istanbul Bakirkoy Dr. Sadi Konuk Education and Research Hospital Ethics committee — Date: 25.12.2017; Decision no: 2017-18-27.

### Conflict of interest

All authors declare no conflict of interest.

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