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Evaluation of Work-Related Factors Affecting the Frequency of Overweight and Obesity Among Healthcare Workers in Intensive Care Units in a Training and Research Hospital

Rabia EZBER[1], Merve ACUN PINAR[1], Ceprail ŞİMŞEK[1], Mine Esin OCAKTAN[2]

[1]Ankara Atatürk Sanatoryum Training and Research Hospital, Department of Occupational Disease, Ankara, Türkiye
[2]Ankara University Medical Faculty Hospital, Public Health Department, Ankara, Türkiye

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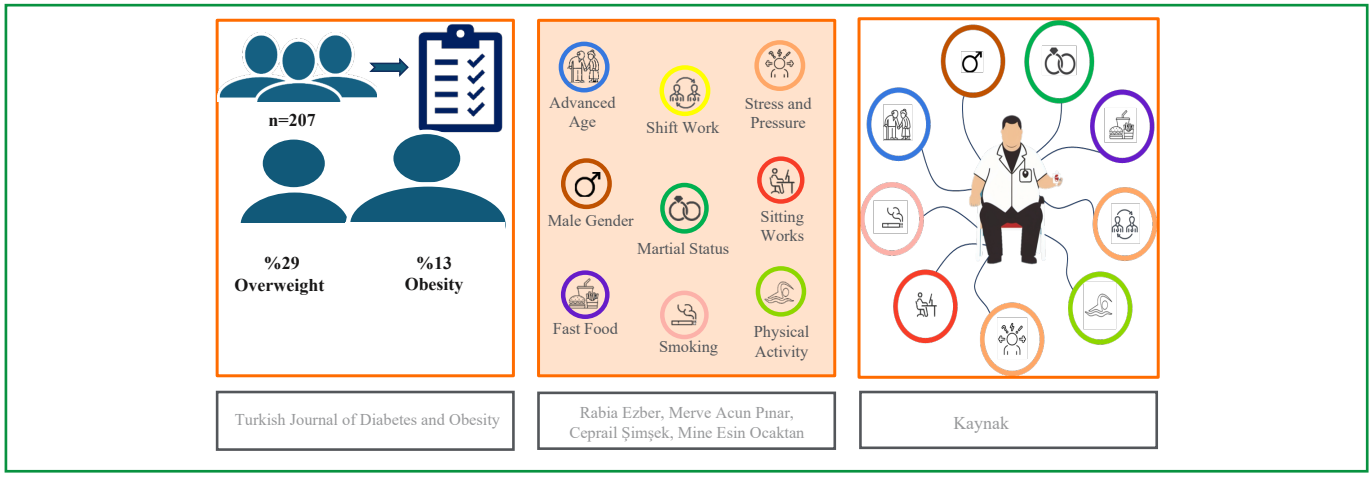
GRAPHICAL ABSTRACT



ABSTRACT

Aim: This study aimed to determine the prevalence of overweight and obesity among healthcare workers (HCWs) in intensive care units (ICU) and to evaluate the affecting work-related factors.

Material and Methods: The cross-sectional study was conducted between 01.09.2022 and 01.11.2022 in HCWs (working in the ICUs) in a training and research hospital. Personal information form, international physical activity questionnaire (IPAQ short) were used in the study, and their self-reported height and body weights were recorded.

Results: According to the Body Mass Index of the participants, 29.0% (n=60) were overweight and 13.0% (n=27) were obese. There are differences between advanced age (p=0.007), male gender (p<0.001), marital status (p=0.008), presence of obesity in family history (p=0.018), smoking (p=0.028), exposure to stress and pressure at work (p<0.001), lack of physical activity (p<0.001), sitting down to work for more than 3.5 hours in a day (p=0.007), shift work duration of more than 9.5 days per month (p<0.001), eating fast food (p=0.002), not being educated about obesity and overweight (p<0.001).

Conclusion: Protecting workers against risk factors associated with overweight and obesity will increase the level of workers' health and the quality of service received from the workers. This situation will have a positive impact on public health, reducing health costs and reducing losses for both the workers and the country's economy.

Keywords: *Obesity, Overweight, Shift work, Work stress, Physical activity*

ORCID: Rabia Ezber / 0000-0002-7702-1139, Merve Acun Pınar / 0000-0003-0985-9148, Ceprail Şimşek / 0000-0003-4767-6393, Mine Esin Ocaktan / 0000-0001-7576-4943

Correspondence Address / Yazışma Adresi:
Rabia EZBER
Ankara Atatürk Sanatoryum Training and Research Hospital, Department of Occupational Disease, Ankara, Türkiye
Phone: +90 (312) 356 90 00 • E-mail: r.altinordu000@gmail.com

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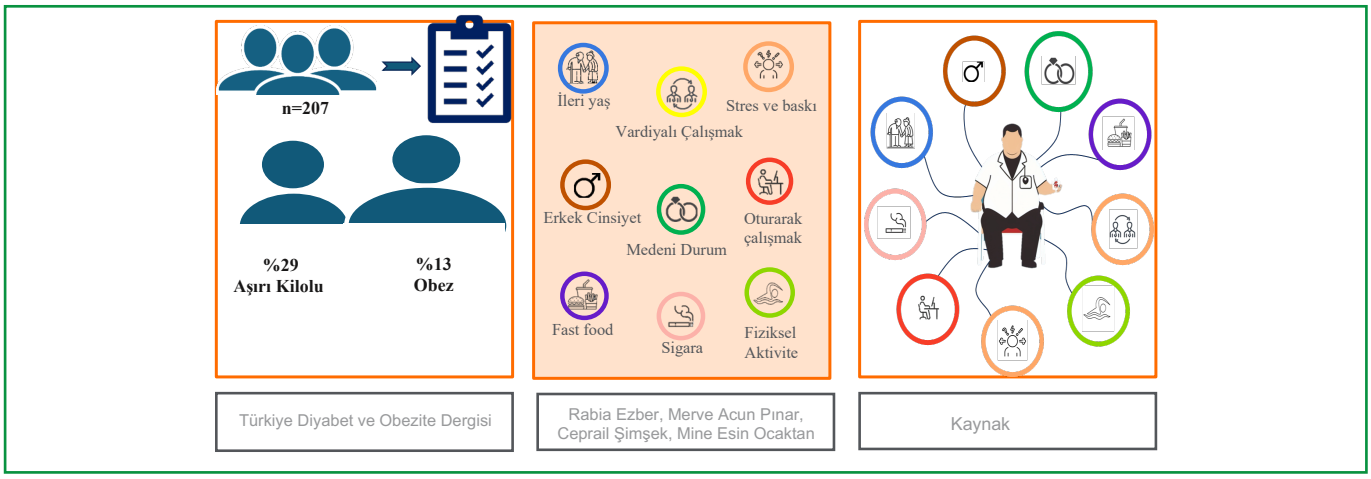
Bir Eğitim Araştırma Hastanesindeki Yoğun Bakım Çalışanlarında Aşırı Kiloluluk ve Obezite Sıklığına Etki Eden İş ile İlişkili Faktörlerin Değerlendirilmesi

GRAFİKSEL ÖZET



ÖZ

Amaç: Bu çalışmada yoğun bakım çalışanlarında aşırı kiloluluk ve obezite sıklığına etki eden iş ile ilişkili faktörlerin değerlendirilmesi amaçlanmaktadır.

Gereç ve Yöntemler: Kesitsel tipteki bu çalışma, 01.09.2022 ile 01.11.2022 tarihleri arasında bir eğitim ve araştırma hastanesindeki (yoğun bakım ünitelerinde çalışan) sağlık çalışanlarında gerçekleştirildi. Araştırmada kişisel bilgi formu, uluslararası fiziksel aktivite anketi (UAFAA kısa) kullanılmış ve katılımcıların beyan ettikleri boy ve vücut ağırlıkları kaydedilmiştir.

Bulgular: Katılımcıların %29,0'u (n=60) aşırı kilolu, %13,0'ü (n=27) obezdir. İleri yaş (p=0,007), erkek cinsiyet (p<0,001), medeni durum (p=0,008), aile öyküsünde obezite varlığı (p=0,018), sigara kullanmak (p=0,028), iş yerinde stres ve baskıya maruz kalmak (p<0,001), fiziksel aktivite azlığı (p<0,001), günde 3,5 saatten fazla oturarak çalışmak (p=0,007), ayda 9.5 günden fazla vardiyalı çalışmak (p<0,001), fastfood tüketimi (p=0,002) ve obezite hakkında eğitim almış olmak (p<0,001) aşırı kiloluluk ve obezite ile ilişkili bulunmuştur.

Sonuç: Çalışanları aşırı kiloluluk ve obezite ile ilişkilendirilmiş risklere karşı korumak çalışan sağlığını ve çalışandan alınan hizmetin kalitesini artıracaktır. Bu durum sağlık maliyetlerini azaltarak hem çalışan hem de ülke ekonomisi için kayıpların azalmasını sağlayacaktır.

Anahtar Sözcükler: *Obezite, Aşırı kiloluluk, Vardiyalı çalışma, İş stresi, Fiziksel aktivite*

INTRODUCTION

Overweight and obesity, which is a very important public health problem, causes negative effects on individual health, social welfare and economy, and ultimately increases the risk of chronic diseases and decreases the quality of life, in connection with modern sedentary life and poor nutritional choices (1). Obese individuals are at risk for comorbidities such as cardiovascular diseases, gastrointestinal disorders, type 2 diabetes mellitus, musculoskeletal diseases, respiratory problems, and psychological problems that may affect their daily lives (2).

It is estimated that approximately 300,000 adults die from obesity-related causes each year in the United States (3). Among 200 countries, Our country ranks 42nd in terms of obesity rates for women; it ranks 60th among men(4). The prevalence of obesity in the adult population in our country has exceeded the critical high rate of 30%. Although the prevalence of obesity is higher in women, the rapid increase in men in recent years has also attracts attention (5) .

HCWs constitute a large part of the working population. According to the statistics of the Ministry of Health, there are approximately 1 million 200 thousand HCWs in our country (6). This rate constitutes 8.4% of the total working population (7). Determining the factors that threaten the health of workers is one of the primary tasks of occupational health and safety in terms of preventive medicine. As a requirement of their duties, HCWs in ICU work in long

shifts, stay awake, waive their rest hours in emergencies, and stay up for long periods of time. For these reasons, they may miss their feeding times, and then skip meals with unhealthy snacks called 'fast food'. In addition to the size of the decisions they make, they constantly encounter patients with poor general conditions, a high probability of resulting in mortality, and their anxious relatives. All these factors threaten the health of HCWs in ICUs and facilitate the development of many systemic diseases.

This study aimed to determine the frequency of overweight and obesity, which are preventable risk factors for many comorbidities and work-related risk factors among HCWs in ICUs.

MATERIAL and METHOD

This analytical cross-sectional study was started on 01.09.2022 after the approval of the ethics committee numbered 2012-KAEK-15/2550 and the institutional permission from Ankara Atatürk Sanatoryum Training and Research Hospital dated 28.06.2022 and was conducted by the principles of the Declaration of Helsinki. Informed voluntary consent was obtained from all participants in the study. The universe of this study consists of all HCWs in ICUs of a training and research hospital (n=213). It was planned to include all workers in the study without calculating the sample size. Data were collected through face-to-face interviews. In the study, the personal information form and the Turkish version of the international physical activity questionnaire (IPAQ short) were used with permission. Since a total of six HCWs did not agree to participate in the study, the study was completed with 207 participants.

In the personal information form; sociodemographic characteristics of individuals, disease and treatment information, presence of obesity in family history, health-related characteristics such as smoking and alcohol use, working life characteristics such as shift work, eating habits, stress and feeling under pressure, and the form consists of a total of 57 questions.

The IPAQ short form consists of seven questions and its validity and reliability studies in Turkey were performed by Öztürk in 2005 (8).

The height and weights of the HCWs were recorded according to their statements. Body Mass Index (BMI) was calculated by dividing weight in kilograms by the square of height in meters. BMI <18.5% kg/m^2 underweight, 18.5-24.99% kg/m^2 normal, 25-29.99% kg/m^2 overweight, 30-34.99% kg/m^2 slightly obese, 35-39.99% kg/m^2 moderately obese, 40-49.99% kg/m^2 morbidly obese, and ≥50% kg/m^2 were considered super obese (5).

Workers were divided into three groups according to their working style: only night(17:00-08:00), only during the day (08:00-17:00) and alternating day-night shift systems.

Statistical Analysis

Data analysis was performed using IBM SPSS (Statistical Package for the Social Sciences) 20 program. The conformity of the quantitative data to the normal distribution was evaluated with the Kolmogorov-Smirnov test. Mann Whitney U test and Kruskal Wallis analysis of variance (Dunn's test was used as a posthoc test) for statistical analysis of quantitative data. Spearman rho test was used for correlation analysis of quantitative data. Roc curve analysis was used to calculate the cut-off value. For the statistical significance of the difference, p<0.05 was accepted.

RESULTS

A total of 207 HCWs with a mean age of 34.6±10.1 (21-58) were included in the study. 72.5% (n=150) of the HCWs are female and 27.5% (n=57) are male. According to the BMI distribution of the participants, 29.0% (n=60) were overweight and 13.0% (n=27) were obese (Table 1).

There is a correlation between age and BMI (p=0.007, rho=0.187). BMIs of male participants were higher than female participants (p<0.001). A significant relationship was found between marital status and BMI (p=0.008). BMIs

Table 1: Distribution of participants' working style and BMI table.

BMI Categories *		Working style			
		Total (n=207)	Only night (n=13)	Only during the day (n=41)	Alternating day and night (n=153)
<18.50 kg/m^2	Underweight	6 (2.9)	0 (0.0)	1 (2.4)	5 (3.3)
18.5-24.99 kg/m^2	Normalweight	114 (55.1)	11 (84.6)	27 (65.9)	76 (49.7)
25.00-29.00 kg/m^2	Overweight	60 (29.0)	1 (7.7)	8 (19.5)	51 (33.3)
30.00-34.99 kg/m^2	Slightly obese	16 (7.7)	1 (7.7)	4 (9.8)	11 (7.2)
35.00-39.99 kg/m^2	Moderately obese	11 (5.3)	0 (0.0)	1 (2.4)	10 (6.5)

*Data are shown as number(percent), n (%). **BMI:** Body Mass Index

of married participants were found to be higher than singles (p=0.012). 52.2% (n=108) of the HCWs have children. There was no significant relationship between the number of children, pregnancies and live births, the time passed since pregnancy, and the BMI of the participants (p=0.104, p=0.256, p=0.185, p=0.548, respectively). There was no significant relationship between the educational status, economic situation, occupational group, and BMI of the participants (p= 0.422, p= 0.181, p=0.279, respectively)

The BMIs of those with a family history of obesity were found to be significantly higher (p=0.018). The BMIs of the participants with a chronic disease were found to be significantly higher (p=0.017). Anxiety disorder was observed in 8.2% (n=17) of the participants, diabetes mellitus in 3.8% (n=8), hypertension in 3.3% (n=7), hypothyroidism in 3.3% (n=7), sleep disturbance in 1.4% (n=3) and 0.4% (n=1) were diagnosed with rheumatoid arthritis, but no significant correlation was found between chronic disease groups and BMI (p=0.312).

32.4% (n=67) of the participants were smokers and the BMIs of the smokers were higher than those who had never smoked (p=0.028). 22.7% (n=47) of the participants consume alcohol. No significant correlation was found between alcohol consumption and BMI (p=0.726).

73.9% (n=153) of the participants work alternating shifts day and night. The average number of shifts per month is 8.27±1.77 days. 19.8% (n=41) of the participants work only during the day and 6.3% (n=13) only work at night. The average weekly working hours are 45.7±6.54 hours. The relationship between participants' working style and BMI groups is given in Table 1.

There is a correlation between shift work time and BMI (p<0.001, rho= 0.318). Shift work duration of more than 9.5 days per month provided 53% sensitivity and 85% specificity in predicting overweight and obesity (Area under the curve: AUC = 0.720, p< 0.001) (Figure 1). 80.7% of the participants (n=167) stated that the shift work pattern affected their sleep duration negatively, but no significant relationship was found between sleep duration and BMI (p=0.416).

As seen in Table 2, 78.7% of the participants stated that they were under stress and pressure at work. Anxiety disorder was diagnosed in 8.2% (n=17) of the participants. The BMI levels of the participants who always felt under stress and pressure were found to be significantly higher than the

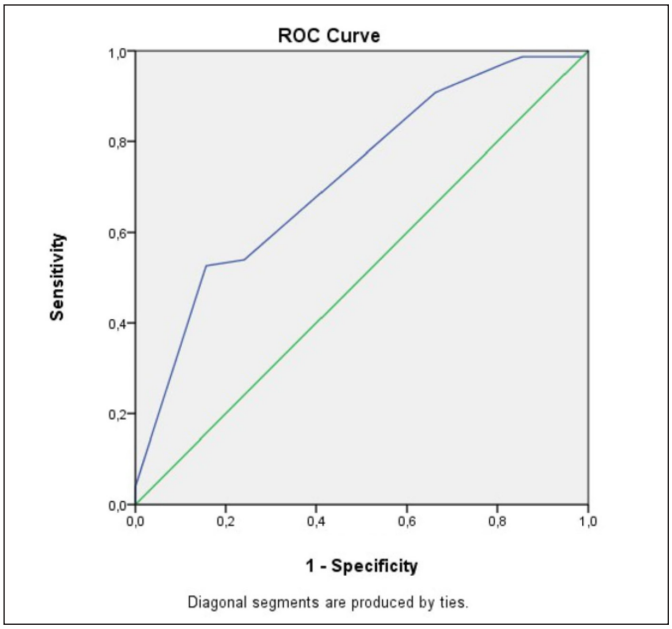


Figure 1: The relationship between shift working hours and overweight and obesity.
Shift work duration of more than 9,5 days per month provided 53% sensitivity and 85% specificity in predicting overweight and obesity.

Table 2: Distribution of the stress and pressure feeling at the workplace of the HCWs participating in the research by BMI (n=207).

Stress and pressure at work		Total (n=207)	BMI, Median (25-75%)	p
Do you feel under stress and pressure at work? *	Yes	163 (78.7)	24.62 (22.43-27.92)	
	No	44 (21.3)	23.13 (21.34-25.07)	**0.006****
How often do you feel stressed and pressured? *	Never	44 (21.3)	23.13 (21.34-25.07)	
	Rarely	16 (7.7)	26.56 (24.24-28.32)	
	Sometimes	60 (29.0	23.77 (22.23-26.19)	**<0.001** #
	Often	55 (26.6)	24.09 (21.45-26.99)	
	Anytime	32 (15.5)	28.06 (25.62-31.44)	
What are your eating habits like when you are under stress and pressure? *	No change	45 (21.7)	24.02 (22.72-27.34)	
	I eat more often	115 (55.6)	24.86 (22.49-27.76)	**0.037** #
	My appetite decreases	47 (22.7)	23.29 (20.70-26.03)	

*Data are shown as number (percent), n (%). **Mann-Whitney U test, # Kruskal-Wallis test, **BMI:** Body Mass Index, **HCWs:** Healthcare workers

Table 3: Distribution of physical activity levels of HCWs participating in the research by BMI (n=207).

Physical activity levels		Total (n=207)	BMI Median (25-75%)	p **
What is your physical activity level at your workplace? *	Sedentary	5 (2.4)	31.56 (28.04-34.53)	
	Less active	60 (29.0)	26.00 (23.72-26.89)	**<0.001**
	Medium motion	62 (30.0)	24.22 (22.66-26.89)	
	Energetic	80 (38.6)	22.88 (20.83-25.18)	
What do you do to increase your physical activity at work? *	I don't make changes	106 (51.2)	24.06 (21.26-27.08)	
	I use stairs instead of an elevator	76 (36.7)	24.38 (22.40-27.76)	0.450
	I go for a walk in the afternoon	15 (7.2)	25.54 (23.24-28.65)	
	I act every chance I get	10 (4.8)	23.77 (22.60-25.25)	
According to the (short) form of the international physical activity questionnaire *	Inactive	135 (65.2)	24.89 (22.68-28.04)	
	Minimally active	35 (16.9)	23.74 (22.49-25.81)	**<0.001**
	Very active	37 (17.9)	22.15 (20.83-24.80)	

*Data are shown as number (percent), n (%). ** Kruskal -Wallis test, **BMI:** Body Mass Index, **HCWs:** Healthcare workers

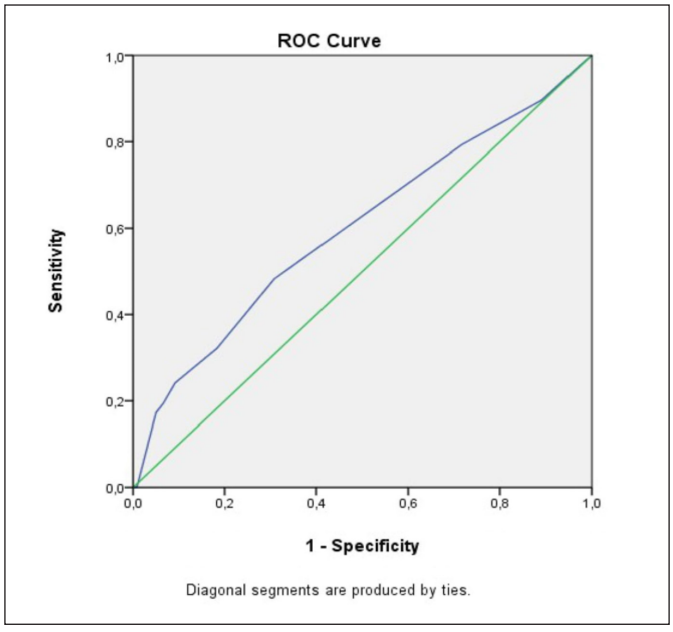


Figure 2: The relationship between sitting working hours and overweight and obesity.
Sitting for more than 3.5 hours a day provided 48% sensitivity and 69% specificity in predicting overweight and obesity.

participants who never, occasionally, and often felt stress (p<0.001, p=0.001, p=0.003). The BMIs of the participants who stated that they ate more frequently under stress and pressure were found to be higher than those who stated that their appetite decreased (p=0.033).

BMIs of the participants working in sedentary and less active jobs were found to be higher than those working in highly active jobs (p=0.002, p<0.001). A correlation was found between daily sitting work time and BMI (p=0.007 rho=0.188). Sitting for more than 3.5 hours a day provided 48% sensitivity and 69% specificity in predicting overweight and obesity. (AUC=0.598, p=0.016) (Figure 2). According to the IPAQ short form, the median MET-min/week of energy spent is 1200 (720-2440). The BMIs of the sedentary and less active participants were found to be higher than the active participants, and the decrease in BMI as the level of activity increased (p<0.001) (Table 3).

34.2% (n=71) of the participants skip breakfast, 20.2% (n=42) skip lunch and 10.1% (n=21) skip dinner. Of those who skipped meals, 26.1% (n=42) stated that they could not find time to eat, 46.6% (n=75) did not eat because they didn't want to, and 27.3% (n=44) stated that their eating habits were like this. There was no significant relationship between skipping meals and BMI (p=0.916). Fast food consumption was present in 63.8% of the participants (n=132), and the BMIs of those who consumed fast food were found to be higher (p=0.002). 68.6% (n=142) of the HCWs stated that they consumed snacks in the evening hours, 26.1% (n=52) in the afternoon, and 5.3% (n=11) in the morning hours. There was no correlation between snack consumption status, time of consumption, type of snack consumed and BMI (p=0.310, p=0.293, p=0.895, respectively) (Table 4). The median daily water consumption of the workers is 8 glasses, and no correlation was found between water consumption and BMI (p=0.773 rho=-0.020).

60.4% (n=125) of the participants stated that there was an increase in weight after starting work, 30.9% (n=64) stated that there was no change and 8.7% (n=18) decreased. 23.9% (n=38) of those who had a change in weight after starting work, had disturbed sleep patterns, 23.3% (n=37) reported that the menus did not suit their taste, 18.2% (n=29) reported that they had a job not being able to reach healthy foods at the workplace, 15.1% (n=24) eating and drinking

Table 4: Distribution of the nutritional characteristics of the HCWs at work according to BMI (n=207).

Nutritional characteristics at work		Total (n=207)	BMI Median (25-75%)	p
Do you skip meals at work? *	Yes	161 (77.8)	24.36 (22.31-27.04)	0.173**
	No	46 (22.2)	24.09 (22.04-27.99)	
Do you think that the meals at work are prepared in a way that supports healthy eating? *	Yes	23 (11.1)	25.22 (21.33-27.76)	0.832**
	No	184 (88.9)	24.22 (22.31-27.54)	
Do you consume snacks while working? *	Yes	97 (46.9)	24.61 (22.31-28.03)	0.310**
	No	110 (53.1)	23.94 (22.23-27.38)	
What do you consume as a snack? *	Fruits and vegetables	27 (13.0)	24.51 (22.49-26.64)	
	Nuts	40 (19.4)	23.73 (22.31-27.21)	
	Toast, pastry, bagel	27 (13.0)	24.09 (23.18-27.68)	0.895 #
	Packaged foods (chips, crackers, biscuits, chocolate…etc)	113 (54.6)	24.54 (21.60-27.76)	
Do you drink while working? *	Yes	171 (82.6)	24.22 (22.31-27.68)	0.394**
	No	36 (17.4)	24.22 (21.16-26.72)	
Do you consume fast food? *	Yes	132 (63.8)	24.83 (22.67-27.84)	**0.002****
	No	75 (36.2)	23.44 (20.83-26.03)	
Do you think your fast food consumption is related to the workplace? *	Yes	111 (53.6)	24.61 (22.66-27.55)	0.130**
	No	96 (46.4)	24.01 (21.30-27.42)	

*Data are shown as number (percent), n (%). ** Mann-Whitney U test, # Kruskal-Wallis test, **BMI:** Body Mass Index, **HCWs:** Healthcare workers

frequently to wake up at night, 8.2% (n=13) not trusting the menus prepared at work in terms of hygiene, 7.5% (n=12) cited workplace stress, 2.5% (n=4) sitting down, and 1.3% (n=2) not finding enough time to do physical activity.

61.4% of the participants (n=127) received at least one education on obesity. The BMIs of the participants who did not receive any education were found to be higher than those who received training (p<0.001). 41.7% (n=53) of the participants received education from the workplace, 37% (n=47) from TV /radio/social media, and 21.3% (n=27) from a private institution. There was no significant difference between the units where the participants received education in terms of BMI (p= 0.712).

DISCUSSION

Genetic factors contribute 40% to BMI (9). Therefore; determining workplace risk factors should be the most basic goal of occupational health and safety services and preventive medicine for the workers who spend most of their days at their workplaces.

In a study conducted at a training and research hospital, it was stated that 13.7% of the participants were obese and 38.7% were overweight. These results are similar to our study (10).

Shift work can cause obesity through various mechanisms such as disruption of circadian rhythm, decrease in blood leptin levels and increase in ghrelin levels due to decreased sleep hours, formation of oxidative stress due to melatonin deficiency, and development of insulin resistance (11-14). In a study, the rate of abdominal obesity in night shift workers was found to be 3 times higher than in day shift workers (15). In another study; It has been observed that the risk of obesity increases in those who work night shifts for 8 days or more per month (16). In this study, 73.9 % of the participants work in alternating shifts day and night. The BMI of those working alternating shifts between day and night was found to be higher than those working only night shifts. Shift work duration of more than 9.5 days per month provided 53% sensitivity and 85% specificity in predicting overweight and obesity.

In a study, workers who sat for less than 4 hours a day had a significantly lower risk of obesity than workers who sat for 4 hours or more per day (17). In this study, sitting for more than 3.5 hours a day provided 48% sensitivity and 69% specificity in predicting overweight and obesity. According to the IPAQ short form, the BMIs of the inactive participants were higher than the very active participants. In a study, it has been observed that the rate of those who do not exercise at all in our country has increased to 69.5% in the 19-30 age group, 73.2% in the 31-50 age group, and 83.7% in the group over 75 years old (18). In this study, 65.2% of the HCWs were physically inactive.

Employees spend a large part of their day at work and have to get about two-thirds of their daily nutritional needs at work. Nutrition habits directly affect the health of the employee. In a study, it was shown that obesity is associated with eating out, consuming refined products, increased nutrition with fast food foods, and increased consumption of fat and sugar (19). In another study, it was stated that energy-dense snacks with low nutritional value, especially consumed at noon and in the evening, are more unhealthy (20). In this study, 63.8% of the participants have fast food consumption and similar to the literature, the BMIs of those who consume fast food were found to be significantly higher.

HCWs in ICUs make important decisions due to their profession, and they constantly encounter life-threatening patients and their anxious relatives. In this study, 78.7% of the workers stated that they were under stress and pressure. Moreover; Anxiety disorder was diagnosed in 8.2% (n=17) of the participants. It is noteworthy that the diagnosis of anxiety disorder is so common among HCWs in ICUs. In the literature, some of the studies examining the relationship between workload, stress and obesity found a significant relationship, while some could not (21-24). In this study, the BMIs of the participants who always felt under stress and pressure were found to be significantly higher than the other participants. The BMIs of the participants who stated that they ate more frequently under stress and pressure were found to be significantly higher than those whose appetite decreased.

The limitations of the study are that the height and weight information of the participants was recorded with their own statements and the job stress status of the HCWs was determined according to the questions prepared by the researchers in this study. On the other hand, rather than determining the prevalence of obesity especially in healthcare workers, attention has been drawn to the workplace risk factors and effects of overweight and obesity that healthcare workers are exposed to.

Shift work is an unchangeable risk factor for ICUs due to the requirement to provide 24-hour service, but the effects of this risk factor can be reduced by administrative arrangements such as shift work rotations and increasing the number of personnel when necessary. Warning signs and audible warning systems should be considered to support physical activity in the workplace, especially to remind employees to move for certain periods while sitting. Preparing menus with sufficient energy, nutritional diversity to support healthy nutrition in the workplace, having the opportunity to access alternative healthy foods in case the menus do not suit the palate, and planning training on obesity and healthy nutrition at regular intervals can protect workers against overweight and obesity. In order to reduce stress and pressure among HCWs, it may be beneficial to organize some administrative organizations such as collective nature walks, dance, food, and artistic activities.

It is possible to protect the health of employees with the measures to be taken against workplace risk factors and health surveillance. With the support of weight control and exercise by the workplace health unit of employees who are determined to be overweight or obese, and the facilitation of managerial approaches, the emergence of many chronic diseases will be prevented, the comfort of employees will be increased, and work accidents and injuries will be reduced. This will contribute to public health, resulting in a reduction in health costs both for the employee and for the country's economy.

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None.

Authorship Contributions
Concept: **Rabia Ezber,** Design: **Rabia Ezber, Merve Acun Pınar,** Data Collection or Processing: **Rabia Ezber, Merve Acun Pınar, Ceprail Şimşek, Mine Esin Ocaktan,** Analysis or Interpretation: **Rabia Ezber,** Literature Search: **Rabia Ezber, Merve Acun Pınar,Ceprail Şimşek, Mine Esin Ocaktan,** Writing: **Rabia Ezber, Merve Acun Pınar, Ceprail Şimşek, Mine Esin Ocaktan.**

Conflicts of Interest
The authors declare that they have no competing interest.

Financial Disclosure
The authors received no financial support for this study.

Ethical Approval
This analytical cross-sectional study was started on 01.09.2022 after the approval of the ethics committee numbered 2012-KAEK-15/2550 and the institutional permission from Ankara Atatürk Sanatoryum Training and Research Hospital dated 28.06.2022 The participants were informed about the aim and purpose of the study, and their verbal consent was obtained.

Peer Review Process
Extremely and externally peer-reviewed.

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