

The Relationship Between Sleep Quality and Body Mass Index in Nurses

Hemşirelerde Uyku Kalitesi ve Beden Kütle İndeksi Arasındaki İlişki

Anita KARACA¹, Leyla KAYA², Sibel YAŞAR³, Zahide KAYA⁴

ABSTRACT

Objective: To evaluate the association between sleep quality and body mass index (BMI) among nurses.

Methods: The sample of this descriptive study consisted of 120 nurses working at a training and research hospital between December 2019 and January 2020. The data were collected using the Nurse Information Form and Pittsburgh Sleep Quality Index. The data obtained on obesity in nurses were analyzed and interpreted in accordance with the World Health Organization's body mass index classification criteria.

Results: The mean values of the BMI and waist circumference of the nurses were 23.99 ± 3.89 kg/m² and 75.76 ± 10.48 cm, respectively. Majority of the nurses BMIs were within normal limits, 8.3% were obese. Nurses were usually working in day-night shifts (70.8%) and over 40 hours per week (73.3%), while more than half of the sample could sleep for 3 to 5 hours after their shifts (63.6%). The relationships between sleep quality and BMI ($r = -0.157$; $p > .05$) and waist circumference ($r = -0.117$; $p > .05$) were not statistically significant.

Conclusion: Nurses' BMIs were within normal limits but their sleep quality was poor. Our analyses revealed no relationship between sleep quality and BMI among nurses.

Keywords: Body mass index, nurse, obesity, quality of sleep

ÖZ

Amaç: Hemşirelerde uyku kalitesi ve beden kütle indeksi (BKI) arasındaki ilişkiyi değerlendirmek amacıyla gerçekleştirildi.

Yöntem: Araştırmanın örneklemini, bir eğitim ve araştırma hastanesinde Aralık 2019-Ocak 2020 tarihleri arasında çalışan 120 hemşire oluşturdu. Verilerin toplanmasında "Hemşire Bilgi Formu" ve "Pittsburgh Uyku Kalitesi Ölçeği" kullanıldı. Hemşirelerde obeziteye ilişkin elde edilen veriler Dünya Sağlık Örgütü'nün beden kitle indeksi sınıflandırma kriterleri doğrultusunda analiz edilerek yorumlandı.

Bulgular: Hemşirelerin BKI ve bel çevresi ortalaması sırasıyla, $23,99 \pm 3,89$ kg/m² ve $75,76 \pm 10,48$ cm olarak belirlendi, Hemşirelerin çoğunluğunun BKI değeri normal sınırlarda, %8,3'ü ise obezdi. Hemşirelerin çoğunluğu gündüz-gece vardiyasında (%70,8) ve haftada 40 saatin üzerinde (%73,3) çalıştığını, örneklemin yarısından fazlası (%63,6) ise nöbet sonrası 3-5 saat uyuyabildiğini belirtmiştir, Uyku kalitesi ile BKI ($r = -,157$; $p > ,05$) ve bel çevresi ($r = -,117$; $p > ,05$) arasındaki ilişkiler istatistiksel olarak anlamlı bulunmamıştır,

Sonuç: Hemşirelerin BKI verileri normal sınırlarda olup uyku kalitelerinin kötü olduğu belirlenmiştir. Ayrıca, hemşirelerde uyku kalitesi ile BKI arasında bir ilişki olmadığı saptanmıştır.

Anahtar Kelimeler: Beden kitle indeksi, hemşire, obezite, uyku kalitesi

Introduction

Sleep is a physical function characterized by a disconnection from perception and responsiveness to the environment, resulting in many qualitative and quantitative changes in healthy individuals (1). As one of the most basic human needs, sleep

1-RN, Ph.D., Assist. Prof. Biruni University, Faculty of Health Sciences Nursing Department, Istanbul, Turkey

E-posta: anitakaraca@hotmail.com ORCID ID: 0000-0001-6552-4399

2-RN, Ph.D., Zeynep Kamil Women and Children Diseases Training and Research Hospital, Istanbul, Turkey

E-posta: leylakaya02@hotmail.com ORCID ID: 0000-0002-2199-0854

3-RN, Ph.D., Assist. Prof., Kırklareli University, School of Health, Kırklareli, Turkey E-posta: sibelyasar39@hotmail.com

ORCID ID: 0000-0001-8261-234X

4-RN, MSc, Uskudar State Hospital

E-posta: zahide_kaya@hotmail.com ORCID ID: 0000-0002-7461-2013

Gönderim Tarihi:29.11.2021 - Kabul Tarihi: 05.07.2023

is at the bottom of Maslow's hierarchy of needs; a regular night's sleep is considered one of the most critical components of health and quality of life (2). Sleep quality is evident when an individual feels fit, in shape, and ready for a new day after waking up. Furthermore, sleep quality includes quantitative (sleep duration, sleep latency, number of nightly awakenings) and subjective aspects including sleep depth and its relaxing effect (3).

Working during the evening and night causes a lapse in the hours available for sleeping. Furthermore, exposure to artificial light significantly affects sleep duration, the extent of exposure to darkness, and the circadian rhythm, which result in retiring to bed later at night, sleeping less, and being

active and snacking late at night (2,4). Schedule changes associated with rotating shifts can impact nurses' circadian rhythms, affecting sleep duration and quality and work performance and efficiency (5). Studies show that approximately 50 to 70% of nurses experience poor sleep quality, and most have difficulty initiating and sustaining sleep (6-8). Moreover, Özvurmaz and Öncü (9) found that nurses who engage in rotating shifts experience more sleep disorders. Modern lifestyle increases insomnia in individuals, and sleeping less than 6 to 7 hours causes weight gain (2). Furthermore, delayed feeding due to prolonged wakefulness at night causes circadian desynchronization (4), which results in associated cardiometabolic changes and increased risk of metabolic syndrome and cardiovascular disease in shift workers (10). In addition, concerning the relationship between circadian desynchrony and obesity and metabolic disorders, obesity can be presented as a chronobiological disease (11).

Nurses in shift work have a higher frequency of sleep disorders and poorer sleep quality due to the disrupted sleep-wake cycle, which poses a significant obesity risk (12). Although the prevalence of overweight and obesity among nurses varies between 54.5% and 79.1% (13-15), different results were reported for the relationship between body mass index (BMI) and sleep quality. Some studies indicate an association between poor sleep quality and the possibility of being overweight or obese (16-18). While others reported no significant relationship between these two factors (2,19,20).

Nurses are among the professional groups that perform shift work, which may disrupt a healthy night's sleep, causing sleep problems and diminishing sleep quality. Sleep quality problems may negatively affect nurses' physical, mental, and social well-being, potentially increasing the risk of chronic diseases due to overweight or obesity. This situation caused by their work conditions may adversely affect their life and work-life quality, which reduces nurses' work efficiency, causes financial losses for the institution, increases accidents, and puts caregivers at risk. Thus, to enhance their work and life quality and the

institution's success, effectiveness, and efficiency, nurses' sleep quality should be assessed.

Material and Methods

Aim: This study was carried out to evaluate the association between sleep quality and BMI among nurses.

Study Design: This is a descriptive study.

Research Questions: (1) How is the sleep quality of nurses? (2) What are the BMI and waist circumference (WC) measurements of nurses? (3) Is there a relationship between sleep quality and BMI in nurses?

Setting and Sample: This study was conducted in a training and research hospital affiliated with a state university between December 2019 and January 2020. The study population consisted of 191 nurses working at the hospital. We aimed to include all nurses without sample selection, but only 120 (62.8%) could be reached due to some nurses having time off or sick leave and others declining participation.

Data Collection: The researchers obtained the data using questionnaires, which the nurses were asked to complete. We measured the nurses' body weight (kg) with a calibrated digital scale and height (cm) and waist circumference (cm) using a non-stretch measuring tape.

Instruments

Data were collected using the "Nurse Information Form" and "Pittsburgh Sleep Quality Index" (PSQI).

Nurse Information Form: This form was prepared by the authors based on literature (2,21,22) and includes questions about sociodemographic characteristics, working life, and the assessment of obesity status using nurses' BMI and WC measurements. The nurses' obesity data were analyzed and interpreted according to the WHO BMI classification criteria (23-25).

Body mass index is the most widely used measure for overweight and obesity and is easily calculated in adults by dividing the weight in kilograms by

the square of the height in meters (kg/m^2) (26). The index ranges are based on excessive body fat linked to disease and death and are very closely related to adiposity. An individual's BMI should be maintained between 18.5 and 24.9 kg/m^2 ; values between 25.0 and 29.9 kg/m^2 represent an overweight, and $\geq 30 \text{ kg/m}^2$ indicates an obesity (24,25).

The WC measures, essential and practical indicators of fat distribution and health deterioration in the abdominal region, provide additional information about overweight and obesity. The accumulation of fat in the abdominal region and internal organs causes insulin resistance, and a single WC measurement of > 94 and > 102 cm in men and > 80 and > 88 cm in women is associated with increased disease risk and substantially increased risk, respectively (24,25). We obtained the BMI and WC data following the WHO's guide to physical measurements (23-25) and used nurses' rooms in the clinic to perform the measurements.

Height measurements were carried out with a non-stretch measuring tape, while participants were barefoot and after they had removed any materials, such as hairpins and bows, that could affect the measurement. All participants were asked individually to stand facing us with their backs leaning against the wall, feet together, heels against the wall, knees stretched and straight, while looking straight ahead. Height was measured from the top of the head to the bottom (ground) using a measuring tape and recorded in centimeters (23).

Weight was measured with a calibrated digital scale. During the weight measurement, the scale was on a flat, even surface, not a carpet. After a "0.0" reading was displayed on the scale, the participants were asked to remove their shoes, socks, and excess clothing (cardigans, vests) and to step onto the scale with feet slightly apart on the plate. They had to stand still and look forward with arms close to the sides of the body and wait until they were told to step off the scale. The participants' weights were recorded in kilograms (23).

Waist circumference measurements were obtained using a non-stretch measuring tape directly on the skin or over light clothing any thick or bulky clothing was removed first. The participants were asked to stand upright with arms relaxed by their sides. The measuring tape was placed over the midpoint between the lowest border of the rib cage and the upper part of the hipbone and wrapped around the waist. The measurement was performed at the end of a normal expiration and recorded in centimeters (23,25).

Pittsburgh Sleep Quality Index (PSQI): The PSQI, a self-rated questionnaire that assesses sleep quality and ailments over a 1-month period, was developed by Buysse et al. (27) and used in our study to evaluate the nurses' quality of sleep over the preceding month. The Turkish validity and reliability study was conducted by Ağargün et al. (28). This index consists of 19 items and 7 components, (1) subjective sleep quality, (2) sleep latency, (3) sleep duration, (4) habitual sleep efficiency, (5) sleep disturbance, (6) use of sleeping medication, and (7) day-time dysfunction. Each item is evaluated on a scale from 0 to 3 according to symptom frequency. The sum of the seven component scores constitutes the total PSQI score, which ranges from 0 to 21. A high total score (> 5) indicates poor sleep quality, and a total score of ≤ 5 indicates good sleep quality.

Data analysis: We analyzed the data using the Statistical Package for Social Sciences (SPSS) for Windows version 22.0 (SPSS Inc., Chicago, IL, USA). The means, standard deviations, frequencies, and percentages were used as descriptive statistical methods, and a t-test compared continuous quantitative data between two independent groups. We applied Pearson's correlation analysis to evaluate the continuous variables of the study.

Ethical considerations: Ethical approval was obtained from the Clinical Research Ethics Committee (Decision number: 109/04.12.2019). Written informed consent was obtained from the hospital management. Written consent was obtained by explaining the research purpose and method and the confidentiality of the data.

Results

Among the nurses included in the study, 38.4%, 98.3%, 55.8%, and 85% were aged 31 years and older, female, single, and undergraduates, respectively. Furthermore, 58.3% of the nurses were working in clinics, and 76.7% were service nurses; 63.3% had been working in the profession for 10 years or less and 70% between 1 and 5 years in the same units. Moreover, 70.8% of the nurses worked day-night shifts, and 73.3% worked over 40 hours per week. Among those working night shifts, 49.1% stated that they preferred to eat chocolates, biscuits, cookies, etc., and 51.7% drank tea and coffee the most. The majority of the study group (91.7%) did not have any disease including type 2 diabetes mellitus, hypertension, dyslipidemia potentially associated with obesity (Table 1).

Furthermore, the mean BMI and WC of the nurses were 23.9 ± 3.89 (Minimum = 16.41; Maximum = 36.20) and 75.76 ± 10.48 (Minimum = 54; Maximum = 105), respectively (Table 2).

Table 1. Characteristics of nurses related to sociodemographics, working life and sleeping habits (N=120), İstanbul 2020

Characteristics	Category	n (%)
Age (years)	25 and below	37 (30.8)
	26-30	37 (30.8)
	31 and above	46 (38.4)
Gender	Female	118 (98.3)
	Male	2 (1.7)
Marital status	Married	53 (44.2)
	Single	67 (55.8)
Education status	Vocational high school	2 (1.7)
	Associate degree	6 (5.0)
	Undergraduate	102 (85)
	Postgraduate	10 (8.3)
Working unit	Clinics (internal medicine, surgery, etc.)	70 (58.3)
	Specialized units (emergency, intensive care, operating room)	45 (37.5)
	Other (polyclinic, management)	5 (4.2)
Working time in the profession	<10 years	76 (63.3)
	≥10 years	44 (36.7)
Working duration in the unit	Less than one year	25 (20.8)
	1-5 years	84 (70.0)
	More than five years	11 (9.2)
Position at work	Service nurse	92 (76.7)

In terms of sleeping, 63.6% of the nurses stated that they could only sleep after a shift. However, 25.8% could not find an opportunity to sleep due to their day-time work at most. The data regarding scores on the PSQI and its subcomponents are shown in Table 3.

The mean score of nurses' sleep quality was 7.80 ± 4.24 (Minimum = 0; Maximum = 21), reflecting poor sleep quality. The relationship between the nurses' BMI and their sleep quality is shown in Table 4. Of the nurses, 70.8%, 18.4%, and 8.3% were normal weight, overweight, and obese, respectively. Among the nurses with poor sleep quality, 76% had normal weight and only 8% were obese. Notably, no significant difference was found between BMI and sleep quality ($X^2 = 5.441$; $p = .489 > .05$) (Table 4). Also, the study found no statistically significant correlations of Pittsburgh Sleep Quality scores with BMI and WC (respectively, $r = -0.157$, $p = .086$; $r = -0.117$, $p = .203$) (Table 5).

	Responsible nurse	13 (10.8)	
	Other (polyclinic nurse, executive nurse)	15 (12.5)	
Working style	Always at day-time	32 (26.7)	
	Always at night-time	3 (2.5)	
	In shifts	85 (70.8)	
Weekly working time	Below <40 hours	32 (26.7)	
	Over 40 hours	88 (73.3)	
Foods usually eaten/drunk at evening shift*	Eats nothing	2 (1.7)	
	Chocolate, biscuits, cookies, etc.	59 (49.1)	
	Fruits	49 (40.8)	
	Tea, coffee	62 (51.7)	
	Milk, yogurt, ayran, cheese	26 (21.7)	
	Soft drinks, soda	22 (18.3)	
	Bagel, sandwich, toast, pastry etc.	39 (32.5)	
	Other (home cooked food, soup, salad, etc.)	12 (10)	
	Duration of sleeping after the shift	Never sleeps	2 (2.3)
		1-2 hours	8 (9.1)
3-5 hours		56 (63.6)	
6-8 hours		22 (25)	
More than 8 hours		-	
Factors that prevent sleeping after the shift*	I have trouble falling asleep	21 (15.0)	
	I cannot find the opportunity to sleep because of my work	35 (25.8)	
	I have to take care of my children	5 (4.2)	
	I go to school during the day	3 (2.5)	
	Other (I do not want to spend my day sleeping, I cannot sleep because I have a headache, etc.)	22 (18.3)	
Obesity-related disease status	Type 2 diabetes	3 (2.5)	
	Hypertension	2 (1.7)	
	Coronary artery disease	5 (4.1)	
	None	110 (91.7)	
BMI (kg/m²)	n (%)		
Underweight < 18.5	3 (2.5)		
Normal weight 18.5–24.9	85 (70.8)		
Overweight 25–29.9	22 (18.3)		
Obesity > 30	10 (8.4)		
WC (cm)			
Normal F: ≤ 80; M: ≤ 94	F: 86 (71.7); M: 1 (0.8)		
Increased risk F: > 80; M: > 94	F: 18 (15.0); M: 1 (0.8)		
Substantially increased risk F: > 88; M: > 102	F: 14 (11.7)		

*More than one answer was given

Female: F; Male; M

Table 2. Anthropometric measurements ($N = 120$) , İstanbul 2020

	Mean \pm SS	Minimum-Maximum
BMI (kg/m ²)	23.99 \pm 3.89	16.41 - 36.20
WC (cm)	75.76 \pm 10.48	54 -105
WC (F) (cm)	75.55 \pm 10.36	54 - 105
WC (M) (cm)	88.00 \pm 14.14	78 - 98

F: Female M: Male

Table 3. Means of Pittsburgh Sleep Quality Scale and subcomponents scores of nurses ($N = 120$) , İstanbul 2020

Classification	Mean \pm SS	Minimum-Maximum
Subjective Sleep Quality	1.23 \pm 1.00	0 - 3
Sleep Latency	1.52 \pm 0.93	0 - 3
Sleep Duration	0.73 \pm 0.97	0 - 3
Habitual Sleep Efficiency	0.20 \pm 0.42	0 - 2
Sleep Disturbances	1.36 \pm 0.75	0 - 3
Use of Sleeping Medication	1.43 \pm 0.83	0 - 3
Day-time Dysfunction	1.31 \pm 1.34	0 - 6
Total	7.80 \pm 4.24	0 - 21

Table 4. Comparison of Pittsburgh Sleep Quality scores according to BMI ($N = 120$) , İstanbul 2020

	Sleep Quality			Total	
	Healthy Sleep	Poor Sleep	Sleep Disorder		
	n (%)	n (%)	n (%)		
BMI (kg/m²)					
Underweight (< 18.5)	-	1 (2)	2 (6.4)	3 (2.5)	X ² = 5.441 p = .489 > .05
Normal (18.5 - 24.9)	25 (64.1)	38 (76.0)	22 (71.0)	85 (70.8)	
Overweight (25.0 - 29.9)	10 (25.6)	7 (14.0)	5 (16.1)	22 (18.4)	
Obesity (\geq 30)	4 (10.3)	4 (8.0)	2 (6.5)	10 (8.3)	

Table 5. Correlations of Pittsburgh Sleep Quality scores with BMI and WC ($N = 120$) , İstanbul 2020

	Sleep Quality	
	r	p
BMI	-0.157	.086
WC	-0.117	.203

Discussion

We found that the nurses’ PSQI scores were 7.80 \pm 4.24, and their sleep quality was poor. Other studies showed similar results to ours. In Kaçan

et al.’s (12) study, nurses’ average PSQI score was 12.49 \pm 5.79 while Günaydın³ reported a mean sleep quality score of 7.66 \pm 0.33 among 70.97% of studied nurses, showing poor sleep quality. Dong et al. (29) found a similar mean PSQI score among nurses (7.32 \pm 3.24) and reported that 55% had a PSQI score of \geq 8. Furthermore, Surani et al.’s (30) study, which assessed sleep quality in nurses, reported poor sleep quality for 63% of the nurses with a mean PSQI score of 6.29 \pm 2.82 for day-time and 7.96 \pm 3.42 for night-time workers. In Zhang et al.’s (8) research, 72.1% of the nurses reported poor sleep quality. Determining nurses’ sleep quality is crucial for protecting

and maintaining their efficiency. It is important to understand the sleep patterns and quality of nurses with different work shifts as this will make managing shifts more efficient, reducing the impact of shift work on sleep quality.

In terms of BMI, our study showed that nurses' mean BMI was within the normal range (23.99 ± 3.89), and the mean WC was below 80 cm (75.76 ± 10.48). Notably, the relationship between nurses' sleep quality and BMI and WC was not statistically significant ($p > .05$). Previous studies comparing the quality of sleep in nurses and the parameters of obesity are very limited. Chang and Yang (31) found that nurses who work shifts and experience greater irregularity in their sleep-wake cycles were at larger risk of increased BMI. However, Çatırtan and Okan Bakır (2) found no significant difference in BMI and WC due to the shifts and sleep quality of both female and male healthcare workers.

Some general studies suggested that poor sleep quality is associated with the possibility of being overweight or obese (17,32,33). Akova and Koçoğlu (34) also found that sleep duration and quality decreased with BMI, neck circumference, WC, waist-hip ratio, and waist-height ratio in women. In contrast, other findings consistent with ours showed no significant relationship between poor sleep quality and the possibility of being overweight or obese (19,35) Türközü and Aksoy (20) also found no statistically significant relationship between sleep quality and duration and the anthropometric measurements (BMI, WC, hip circumference, waist-hip ratio) of students living in dormitories. In addition, Rahe et al. (22) found that poor sleep quality was not associated with BMI or WC.

Although no relationship was found between sleep quality and BMI and WC in our study, short sleep duration and poor sleep quality tend to be associated with obesity risk. Therefore, the poor sleep quality identified in nurses may present a risk in terms of being overweight or obese. Importantly, more research is necessary to clarify whether increased sleep duration or improved sleep quality protects against weight gain.

In terms of BMI, we found that 70.8%, 18.4%, and 8.3% of the nurses had a normal weight, were overweight, and were obese, respectively. However, in the literature, the prevalence of overweight and obesity in nurses ranges between 54% and 79.1% (14,36,37). Thus, the overweight and obesity rates of the nurses in our study were quite low compared to previous research. Interestingly, among the nurses with poor sleep quality in our study, 76% had normal weight, and only 8% were obesity status.

Poor sleep quality can affect dietary choices; individuals with insomnia are more likely to choose foods and drinks with high-fat and high-sugar content than those with normal sleep patterns (31). Moreover, people who sleep less than six hours a day consume significantly more sugary drinks than those who sleep between 7 and 8 hours (38). Most of the participants in our study did not consume healthy foods during their shifts, constituting a major obesity risk. Among the nurses, 49.1% of those who worked night shifts preferred to eat chocolates, biscuits, cookies, etc.; 32.5% preferred sandwiches, toast, pastries, etc.; and, in terms of drinks, 51.7% stated that they preferred tea and coffee. Thus, tea and coffee were the most consumed products during shifts, helping nurses to stay awake.

Similarly, in another study among healthcare workers (21), 43.5% of participants consumed biscuits, crackers, and chips; 23.4% consumed toast, bagels, and pastries; 14.3% consumed sugar, chocolate, and wafers; and 6.5% consumed fruit and fruit juices. In our study, it was observed again that nurses did not prefer healthy foods. However, most of the participants (91.7%) in our study stated that they did not have any obesity-related diseases. Özvurmaz and Öncü⁹ also reported that, among the nurses in their study, 72.1% did not have any health problems. However, among Rahe et al.'s (22) participants with poor sleep quality, 27.2%, 4.6%, and 1.5% had hypertension, diabetes, and a history of myocardial infarction, respectively. Generally speaking, increased BMI is a major risk factor for both noncommunicable diseases and poor sleep quality. Importantly, supportive environments are fundamental in

shaping people's choices, and choosing healthier foods is the easiest way to prevent overweight and obesity.

In terms of shifts and sleeping hours, more than half of the nurses (63.6%) participating in our study stated that they can sleep for 3 to 5 hours after shifts; nurses who did not sleep at all or had little sleep after the shift could not do so mostly because of their daytime work. Chang and Li (5) determined that nurses working day and evening shifts experienced more regular and consistent rest-activity cycles than nurses working night shifts. Furthermore, nurses with more daytime sleep interruptions and/or increased irregular rest-activity cycles experienced poor sleep quality. Those who have poor sleep quality showed lower levels of daytime activity during workdays. Niu et al. (39) reported that nurses working rotating night shifts had significantly lower sleep efficiency and shorter onset latency than those working both day and evening shifts.

In Günaydın's (3) study, 48.5% of the nurses slept after their shifts, and 50.5% slept for only 2 to 3 hours after the shift. Another study reported that, for 51.1% of the healthcare workers who constantly work at night and 56.1% of those working shifts, sleeping hours may vary with their shift status (21). Moreover, 61% of those participants had less than 6 hours a day of sleep during the weekday while 45.5% slept between 6 and 8 hours over weekends. Thus, working in shifts affects and shortens sleep hours. In addition, most nurses are female, and women usually take more responsibility for housework and children doing household chores or performing child care even if they have finished working shifts. This may further inhibit sleeping time after shifts.

Limitations

This study was limited to a small sample of nurses who worked at only one hospital where the research was conducted and agreed to participation. Furthermore, not all employees were included in the study and therefore, our findings cannot be generalized to the whole population. In addition, the very sparse research on this topic

restrained the comparability of our results, a further limitation of this study. Moreover, BMI measurements are the most widely used tools to correlate health problems with weight; we used only two parameters (height and weight), which presents a further limitation. The small number of male nurses is also among the limitations of this study.

Conclusion

In this study, data on obesity among nurses were within the normal limits, but sleep quality was poor. There was no relationship between sleep quality and BMI. Still, the nurses did not eat healthily during night shifts, which presents obesity and chronic disease risks. To improve the poor sleep quality of nurses, we recommend reduced nightly and weekly working hours, improved working conditions. Similar studies with a larger sample size are required.

References

1. Pıçak R, İsmailoğulları S, Mazıcıoğlu MM, Üstünbaş HB, Aksu M. Approaches and recommendations to sleep disorders in primary care. *Turkish Journal of Family Medicine and Primary Care* 2010;4(2):12-22.
2. Çatırtan H, Okan Bakır B. Comparison of sleep quality, waist circumference, and body mass index among shift and non-shift workers. *J Turk Sleep Med* 2018;5:40-45. doi: 10.4274/jtism.33043.
3. Günaydın N. The quality of sleep and effects on nurses' general mental health who works in a state hospital. *J Psychiatr Nurs* 2014;5(1):33-40.
4. Beccuti G, Pannain S. Sleep and obesity. *Curr Opin Clin Nutr Metab Care* 2011;14(4):402-412. doi: 10.1097/MCO.0b013e3283479109
5. Chang WP, Li HB. Differences in workday sleep fragmentation, rest-activity cycle, sleep quality, and activity level among nurses working different shifts. *Chronobiol Int* 2019;36(12):1761-1771. doi: 10.1080/07420528.2019.1681441
6. An FR, Qi YK, Zeng JY, et al. The prevalence of insomnia, its demographic correlates, and treatment in nurses working in Chinese psychiatric and general hospitals. *Perspect Psychiatr Care* 2016;52(2):88-94. doi: 10.1111/ppc.12103
7. Uekata S, Kato C, Nagaura Y, Eto H, Kondo H. The impact of rotating work schedules, chronotype, and restless legs syndrome/Willis-Ekbom disease on sleep quality among

- female hospital nurses and midwives: A cross-sectional survey. *Int J Nurs Stud* 2019;95:103-112. doi: 10.1016/j.ijnurstu.2019.04.013
8. Zhang L, Sun DM, Li CB, Tao MF. Influencing factors for sleep quality among shift-working nurses: A cross-sectional study in China using 3-factor Pittsburgh Sleep Quality Index. *Asian Nurs Res* 2016;10(4):277-282. doi: 10.1016/j.anr.2016.09.002
9. Özvrmaz S, Öncü AZ. The effect of shift working and rotating shifts on nurses. *Journal of Adnan Menderes University Health Sciences Faculty* 2018;2(1):39-46.
10. Bass J, Takahashi JS. Circadian integration of metabolism and energetics. *Science* 2010;330(6009):1349-1354. doi: 10.1126/science.1195027
11. Garaulet M, Ordovás JM, Madrid JA. The chronobiology, etiology, and pathophysiology of obesity. *Int J Obes* 2010;34(12):1667-1683. doi: 10.1038/ijo.2010.118
12. Kaçan CY, Örsal Ö, Köşgeroğlu N. The sleep quality among nurses. *Journal of Anatolian Nursing and Health Sciences* 2016;19(3):145-151.
13. Goon DT, Sonto MM, Lebeso R, Olukoga A, Khoza LB. Overweight, obesity and underweight in nurses in Vhembe and Capricorn districts Limpopo Province: South Africa. *S Afr J Clin Nutr* 2013;26(3):147-149.
14. Kyle RG, Neall RA, Atherton IM. Prevalence of overweight and obesity among nurses in Scotland: A cross-sectional study using the Scottish Health Survey. *Int J Nurs Stud* 2016;53:126-133. doi: 10.1016/j.ijnurstu.2015.10.015
15. Zitkus BS. The relationship among registered nurses' weight status, weight-loss regimens, and successful or unsuccessful weight loss. *J Am Acad Nurse Pract* 2011;23(2):110-116.
16. Gökaş E, Çelik F, Özer H, Gündüzoğlu NÇ. The determination of the quality of sleep of obese individuals. *Dokuz Eylül University E-Journal of Nursing Faculty* 2015; 8(3):156-161.
17. Kristicevic T, Stefan L, Sporis G. The Associations between sleep duration and sleep quality with body-mass index in a large sample of young adults. *Int J Environ Res Public Health* 2018;15(4):758. doi: 3390/ijerph15040758.
18. Vargas PA, Flores M, Robles E. Sleep quality and body mass index in college students: The role of sleep disturbances. *J Am Coll Health* 2014;62(8):534-541.
19. Huth JJ, Eliades A, Handwork C, Englehart JL, Messenger J. The shift worked, quality of sleep, and elevated body mass index in pediatric nurses. *J Pediatr Nurs* 2013;28:e64-e73. doi: 10.1016/j.pedn.2013.02.032
20. Türküzü D, Aksoydan E. The influence of sleep duration and quality on nutrition and body composition. *STED* 2015;24(1):10-17.
21. Demir HP, Elkin N, Barut AY, Bayram HM, Averi S. Evaluation of sleep duration and nutrition status of medical staff workers that working shift. *Gelisim Universitesi Journal of Health Sciences* 2017;2:89-107.
22. Rahe C, Czira ME, Teismann H, Berger K. Associations between poor sleep quality and different measures of obesity. *Sleep Med* 2015;16(10):1225-1228.
23. World Health Organization. Noncommunicable Diseases and Mental Health Cluster. WHO STEPS surveillance manual : the WHO STEPwise approach to chronic disease risk factor surveillance / Noncommunicable Diseases and Mental Health, World Health Organization. World Health Organization; 2005.
24. Household Health Survey – Prevalence of Noncommunicable Disease Risk Factors in Turkey 2017 (STEPS). Üner S, Balcılar M, Ergüder T editors. World Health Organization Country Office in Turkey, Ankara, 2018.
25. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008. Geneva: World Health Organization; 2011.
26. World Health Organization. Obesity and overweight. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> (2020, accessed 30 Nov 2020).
27. Buysse DJ, Reynolds 3rd CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res* 1989;28(2):193-213. doi: 10.1016/0165-1781(89)90047-4
28. Ağargün MY, Kara H, Anlar Ö. The validity and reliability of the Pittsburgh Sleep Quality Index. *Turkish Journal of Psychiatry* 1996;7(2):107-115.
29. Dong H, Zhang Q, Sun Z, Sang F, Xu Y. Sleep problems among Chinese clinical nurses working in general hospitals. *Occup Med* 2017;67(7):534-539. doi: 10.1093/occmed/kqx124.
30. Surani S, Hesselbacher S, Guntupalli B, Surani S, Subramanian S. Sleep quality and vigilance differ among inpatient nurses based on the unit setting and shift worked. *J Patient Saf* 2015;11(4): 215-20. doi: 10.1097/PTS.0000000000000089
31. Chang WP, Yang CM. Influence of sleep-wake cycle on body mass index in female shift-working nurses with sleep quality as mediating variable. *Ind Health* 2020;58(2):161-9. doi: 10.2486/indhealth.2019-0066
32. Fatima Y, Doi SA, Mamun AA. Sleep quality and

- obesity in young subjects: A meta-analysis. *Obesity Reviews* 2016;17(11):1154-1166.
33. Hung HC, Yang YC, Ou HY, Wu JS, Lu FH, Chang CJ. The association between self-reported sleep quality and overweight in a Chinese population. *Obesity* 2013;21(3):486-492. doi: 10.1002/oby.20259
34. Akova İ, Koçoğlu G. The relationships among sleep duration, quality, physical activity level, and some anthropometric measurements in adults above 20 years of age. *Ahi Evran Med J* 2018;2(3):67-73.
35. Sarı ÖY, Üner S, Büyükakkuş B, Bostancı EÖ, Çeliköz AH, Budak M. Sleep quality and some factors affecting sleep quality in the students living in the residence hall of a university. *TAF Preventive Medicine Bulletin* 2015;14(2):93-100.
36. Bogossian FE, Hepworth J, Leong GM, et al. A cross-sectional analysis of patterns of obesity in a cohort of working nurses and midwives in Australia, New Zealand, and the United Kingdom. *Int J Nurs Stud* 2012;49(6):727-38. doi: 10.1016/j.ijnurstu.2012.01.003
37. Miller SK, Alpert PT, Cross CL. Overweight and obesity in nurses, advanced practice nurses, and nurse educators. *J Am Acad Nurse Pract* 2008;20(5):259-65. doi: 10.1111/j.1745-7599.2008.00319.x
38. Prather AA, Leung C, Adler NE, Ritchie L, Laraia B, Epel ES. Short and sweet: associations between self-reported sleep duration and sugar-sweetened beverage consumption among adults in the United States. *Sleep Health* 2016;2(4):272-6. doi: 10.1016/j.sleh.2016.09.007.
39. Niu SF, Miao NF, Liao YM, Chi MJ, Chung MH, Chou KR. Sleep quality associated with different work schedules: A longitudinal study of nursing staff. *Biol Res Nurs* 2017;19(4):375-381. doi: 10.1177/1099800417695483