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SLEEP QUALITY AND BODY MASS INDEX OF NURSES: A CROSS-SECTIONAL STUDY

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Abstract

Aim: The aim of this study was to determine the relationship between nurses' sleep quality and body mass index. *Design:* This is a cross-sectional study. *Methods:* This study was conducted with 583 nurses working in a single hospital. It was conducted between July 2018 and June 2019. *Results:* Among the nurses participating in the study, 69.1% of nurses were found to have poor sleep quality. Body mass index was within normal range in 55.4% of nurses. Nurses working in intensive care unit / operation room / emergency units, nurses working for less than 10 years, nurses working on nights shifts have more normal body weights. There were statistically significant differences between body mass index ratios and sleep quality scores. *Conclusion:* Sleep quality was found to be negatively affected as working hours increased. In addition, a positive correlation was observed between sleep quality and BMI. Sleep quality increased as BMI increased.

Keywords: body mass index, nursing, nutrition, sleep, sleep quality.

Introduction

All biological, social, psychological, and cultural needs must be met for an individual to be healthy. One of the most important needs affecting quality of life is sleep (Chang et al., 2017). Sleep is a reversible breakdown of interaction between the individual and the environment. It is located at the first step of Maslow's hierarchy of needs pyramid. Health and quality of life are negatively affected if a person cannot sleep regularly (Günaydin, 2014). Decreased sleep is related to high risk of chronic diseases (Beebe et al., 2017). Changes in sleep quality also affect diet. Poor diet and decreased physical activity are problems experienced by most nurses (Beebe et al., 2017).

Nursing is an occupation that requires working rotating shifts. Long working hours and work stress affect sleep and dietary habits of nurses (Gupta, 2017). The working hours of nurses are limited to 40 hours per week by law (Devlet Memurları Kanunu, 1965). In a recommendation from the International Labor Office (2005) on the working conditions of nurses, the working hours of nurses should not exceed eight hours a day and 40 hours a week; and resting time between shifts should be at least 12

hours. It was also recommended that nurses should have 48 hours (and certainly no fewer than 36 hours) off work a week.

Measurements of body weight, height, and body mass index (BMI) provide a cheap and practical indication of nutritional status. BMI is the ratio of body weight to the square of height. Accurately measured BMI provides important information about nutritional health (Hark et al., 2012).

In the literature, working hours and nutritional status of nurses have been associated with sleeping problems. In a study conducted with 100 nurses working in a hospital, it was found that sleep quality of nurses was poor, mostly due to changes in working hours and working night shifts (Karakaş et al., 2017). In a study involving healthcare professionals, BMI was found to be higher among those working in shifts (Pulat Demir et al., 2017). Similarly, another study determined that nurses working rotating shifts experienced problems with sleep more frequently than those consistently working daytimes or nights; they were observed to be sleepy during the day and thus had a higher risk of accidents, posing a threat to patient safety (Zencirci & Arslan, 2011). Complete well-being of nurses ensures effective nursing care. Previous studies have shown that two significant areas in which nurses experience problems are sleep (Fışkın et al., 2013) and nutrition (Pulat Demir et al., 2017).

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Aim

This study examined sleep quality, body mass index and working characteristics of nurses. The aim was to determine the relationship between nurses' sleep quality and body mass index.

Methods

Design

A cross-sectional study, conducted in a hospital between July 2018 and June 2019.

Sample

The study population was composed of 722 nurses working in a hospital located in western Turkey. No sampling method was used in the study. Some nurses did not agree to participate in the study, while others were absent on sick or maternity leave. Of the 592 nurses willing to participate in the study, 583 nurses completed the data collection forms (response rate: 80%). Nine incomplete forms were discarded.

Data collection

Study data were collected through face-to-face interviews, using the "Nurse Evaluation Form" and "The Pittsburgh Sleep Quality Index" (PSQI). The nurse evaluation form was prepared by the researchers, in accordance with the literature, to determine working characteristics and anthropometric measurements of the nurses (Balcı, 2017; Günaydin, 2014; Karakas et al., 2017; Örmeci et al., 2013). For the anthropometric measurements, a standard tape measure was used to measure the height of the nurses, and electronic scales were used to measure their weight, in metric units. The assessment of nutritional status was based on BMI, since no study with Turkish validity and reliability could be found. The PSQI was used to assess sleep quality of the nurses. The PSQI is a scale with a sufficient level of internal consistency and reliability, which assesses sleep quality and sleep disturbances over the previous month (Buysse et al., 1991). Cronbach's alpha reliability coefficient for the Turkish version of the scale was determined as 0.80

(Ağargün et al., 1996). The PSQI is composed of a total of 24 questions; 19 of which are self-reported. The 19th question of the scale is answered by the roommate of the individual and does not affect the score. The scale has seven domains: subjective sleep quality (domain 1); sleep latency (domain 2); sleep duration (domain 3); habitual sleep efficiency (domain 4); sleep disturbances (domain 5); use of sleep medication (domain 6) and daytime dysfunction (domain 7). Each domain is scored between 0–3. A total score of 5 and above is defined as "poor" sleep quality (Ağargün et al., 1996; Buysse et al., 1991). Cronbach's alpha coefficient for the PSQI was 0.706 in our study.

Data analysis

The data obtained from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS) program, version 21. Continuous variables were presented in the form of median and interquartile range (IQR); and the categorical variables were expressed as numbers and percentages. Since parametric test assumptions were not met for continuous variables, the Mann-Whitney U test and Kruskal Wallis variance analysis were used to compare the differences between independent groups. Differences between categorical variables were analyzed by Chi-square analysis. A value of $p < 0.05$ was considered statistically significant.

Results

The study was conducted with 583 nurses. More than half of the nurses participating in the study were female and were younger than 40 years old. Study characteristics of the nurses are given in Table 1.

It was found that more than half of the nurses had poor sleep quality; with a median PSQI value of 7 (IQR 5), and a mean value of 7.45 (± 3.35) (Table 2). When PSQI scores of the nurses were evaluated based on their BMIs, sleep quality was found to increase as BMI increased (Table 3).

Table 1 Characteristics of the nurses (n = 583)

Characteristics		n	%
Age	40 and younger	397	68.1
	over 40	186	31.9
Gender	female	496	85.1
	male	87	14.9
Education level	vocational health high school	50	8.6
	associate degree in nursing	87	14.9
	baccalaureate in nursing	369	63.3
	master / phd degree in nursing	77	13.2
Number of years in nursing practice	0–9	199	34.1
	10 and over	384	65.9
Current workplace	medical clinics	155	26.6
	surgical clinics	120	20.6
	intensive care unit / operation room / emergency	199	34.1
	other	109	18.7
Number of years in current workplace	less than 1	163	28.0
	1–4	276	47.3
	5–10	98	16.8
	more than 10	46	7.9
Number of patients per nurse per shift	less than 5	169	29.0
	5–9	129	22.1
	10–19	154	26.4
	20 and more	131	22.5
Weekly working hours	40 and less	141	24.2
	more than 40	442	75.8
Work / shift pattern	always day shift	141	24.2
	always night shift	18	3.1
	mix shift / rotating shift	424	72.7
Number of night shifts per month	none	137	23.5
	1–5	85	14.6
	6–7	217	37.2
	more than 7	144	24.7
Body mass index	underweight	21	3.6
	normal weight	323	55.4
	overweight	189	32,4
	obese	50	8.6

Table 2 Sleep characteristics of the nurses (n = 583)

Sleep quality	n	%
PSQI median 7 (IQR 5); mean 7.45 (± 3.35)		
Good (0–5)	180	30.9
Poor (6–21)	403	69.1

PSQI – Pittsburgh Sleep Quality Index; IQR – interquartile range

Table 3 Comparison of BMI according to PSQI scores of the nurses (n = 583)

	BMI				
Sleep quality	**Underweight** **n (%)**	**Normal weight** **n (%)**	**Overweight** **n (%)**	**Obese** **n (%)**	**p-value**
Good	3 (1.6)	90 (50.0)	66 (36.7)	21 (11.7)	0.038
Poor	18 (4.5)	233 (57.8)	123 (30.5)	29 (7.2)	

PSQI – Pittsburgh Sleep Quality Index; BMI – body mass index

Comparison of PSQI and BMI according to the working characteristics of the nurses are presented in Table 4. A statistically significant difference was found between groups in terms of all variables except total working time, and total working time in current workplace (p < 0.05). No significant correlations were found between sleep quality and total working time, and between BMI and total working time in the current workplace.

Table 4 Comparison of PSQI and BMI according to working characteristics of the nurses

| | | Sleep quality | | | BMI | | | | |
| | | Good | Poor | | Underweight | Normal weight | Overweight | Obese | |
		n (%)	n (%)	p-value	n (%)	n (%)	n (%)	n (%)	p-value
Number of years in nursing practice	0–9	56 (28.1)	143 (71.9)	0.304	11 (5.5)	141 (70.9)	36 (18.1)	11 (5.5)	0.001
	10 and more	124 (32.3)	260 (67.7)		10 (2.6)	182 (47.4)	153 (39.8)	39 (10.2)	
Current workplace	medical clinics	32 (20.6)	123 (79.4)		4 (2.6)	83 (53.5)	53 (34.2)	15 (9.7)	
	surgical clinics	22 (18.3)	98 (81.7)		7 (5.8)	71 (59.2)	33 (27.5)	9 (7.5)	
	intensive care unit / operation room / emergency	60 (30.2)	139 (69.8)	0.001	10 (5.0)	128 (64.3)	52 (26.1)	9 (4.5)	0.001
	other	66 (60.6)	43 (39.4)		0 (0.0)	41 (37.6)	51 (46.8)	17 (15.6)	
Number of years in current workplace	less than 1	54 (33.1)	109 (66.9)		7 (4.3)	102 (62.6)	43 (26.4)	11 (6.7)	
	1–4	70 (25.4)	206 (74.6)	0.018	11 (4.0)	150 (54.3)	91 (33.0)	24 (8.7)	0.301
	5–10	35 (35.7)	63 (64.3)		3 (3.1)	51 (52.0)	35 (35.7)	9 (9.2)	
	more than 10	21 (45.7)	25 (54.3)		0 (0.0)	20 (43.5)	20 (43.5)	6 (13.0)	
Number of patients per nurse per shift	less than 5	58 (34.3)	111 (65.7)		10 (5.9)	119 (70.4)	36 (21.3)	4 (2.4)	
	5–9	28 (21.7)	101 (78.3)	0.001	4 (3.1)	68 (52.7)	46 (35.7)	11 (8.5)	0.001
	10–19	35 (22.7)	119 (77.3)		4 (2.6)	83 (53.9)	53 (34.4)	14 (9.1)	
	20 and more	59 (45.0)	72 (55.0)		3 (2.3)	53 (40.5)	54 (41.2)	21 (16.0)	
Weekly working hours	40 and less	80 (56.7)	61 (43.3)	0.001	3 (2.1)	66 (46.8)	57 (40.4)	15 (10.6)	0.042
	more than 40	100 (22.6)	342 (77.4)		18 (4.1)	257 (58.1)	132 (29.9)	35 (7.9)	
Work / shift pattern	always day shift	78 (55.3)	63 (44.7)		1 (0.7)	61 (43.3)	63 (44.7)	16 (11.3)	
	always night shift	3 (16.7)	15 (83.3)	0.001	2 (11.1)	11 (61.1)	4 (22.2)	1 (5.6)	0.002
	mix shift / rotating shift	99 (23.3)	325 (76.7)		18 (4.2)	251 (59.2)	122 (28.8)	33 (7.8)	
Number of night shifts per month	none	77 (56.2)	60 (43.8)		1 (0.7)	60 (43.8)	62 (45.3)	14 (10.2)	
	1–5	31 (36.5)	54 (63.5)	0.001	0 (0.0)	51 (60.0)	27 (31.8)	7 (8.2)	0.001
	6–7	46 (21.2)	171 (78.8)		10 (4.6)	118 (54.4)	70 (32.3)	19 (8.8)	
	more than 7	26 (18.1)	118 (81.9)		10 (6.9)	94 (65.3)	30 (20.8)	10 (6.9)	

Discussion

The study was conducted with nurses to determine the relationship between nurses' sleep quality and body mass index. We used PSQI and anthropometric measurements to achieve this goal. We found that more than half of the nurses had poor sleep quality, and a BMI score within normal range.

Working night shifts has a negative effect on sleep (Persson & Mårtensson, 2006). In studies examining sleep quality of nurses, the sleep quality of three quarters of them was found to be poor (McDowall et al., 2017; Park et al., 2018). In another study examining the perceived sleep quality of nurses, half were reported to have insufficient sleep (Chan, 2009). Other studies have recorded similar results (Günaydin, 2014; Karakaş et al., 2017; Park et al., 2018; Zencirci & Arslan, 2011). Factors such as working in shifts, marital status, workplace, and working time negatively affect sleep quality of nurses (Axelsson et al., 2004; Kunert et al., 2007; Persson & Mårtensson, 2006; Shao et al., 2010). Poor sleep quality also leads to dietary problems, with nurses tending to choose quick and easy meals due to a lack of energy for meal preparation (Persson & Mårtensson, 2006). Poor sleep quality can present a high risk for nurses in terms of being more prone to accidents that endanger patient safety (Zencirci & Arslan, 2011). In addition, working conditions are considered an important factor in poor sleep quality in nurses. Such results have drawn attention to sleep problems in nurses. However, a study by Fışkın et al. (2013) found that 39.3% of nurses had good sleep quality and 41.8% had moderate sleep quality. The difference in study findings is thought to be explained by factors including sample size, working department, and working styles. The reasons why most nurses have lower sleep quality are thought to be working in shifts (Chen et al., 2020), the intensive nature of their work, and working with a high number of patients.

A linear trend has been observed between insufficient sleep and BMI in the literature (Wheaton et al., 2011), with sleep quality found to decrease as the weight of individuals increased (Balcı, 2017; Beebe et al., 2017; Mezick et al., 2014; Taheri et al., 2004;

Wheaton et al., 2011). In contrast, another study reported that nurses sleeping less than seven hours per week lost more weight than those sleeping more than seven hours, resulting in lower BMI (Speroni et al., 2012). In other studies conducted on nurses, no relationship could be found between poor sleep and BMI (Lauderdale et al., 2009; McDowall et al., 2017; Yan et al., 2012). In a study examining the relationship between work and depression severity in female nurses in South Korea, although nearly two-thirds of the nurses (65.7%) were reported to have a normal BMI, there was a significant difference between nurses who worked night shifts and those who did not (Lee et al., 2016). In our study, BMI was found to be related to the sleep quality of nurses. Studies in the literature have reported varying results regarding BMI and sleep quality, which may be due to differences in the nutrition and sleeping habits of societies, and attitudes to these factors.

In our study, we determined that more than half of the nurses had been working for more than ten years, and that half of the nurses worked rotating shifts. No statistically significant correlation was found between number of working years and sleep quality. Some studies in the literature have shown similar results (Akbari et al., 2016; McDowall et al., 2017). This situation can be explained by nurses' adaptation to working life and conditions over the years. Moreover, a significant relationship was found between number of working years and BMI. In terms of total working time, BMI values of nurses working fewer than ten years were found to be significantly lower than those of nurses working more than ten years.

Sleep scores of nurses working in surgical clinics were found to be significantly higher than those of others. A study by Günaydin (2014) indicated that mean sleep quality scores of intensive care and emergency service nurses were higher than those of other nurses. However, Akbari et al. (2016) reported that working in different departments did not affect sleep scores.

Shift work conflicts with biological and social clocks and can result in physiological and psychosocial problems (Chen et al., 2020; Knutsson, 2003; Park et al., 2018). The sleep quality of nurses working in the day shift were better than the nurses working in rotating shift nurses. Rotating shifts impair sleep quality of nurses (Chang, 2018; Ghalichi et al., 2013; Guo et al., 2013).

In our study, sleep quality decreased as weekly working hours increased. Other studies have indicated that sleep quality of those with long

working hours was poor (Arpacı, 2007; Karakas et al., 2017). As in other studies (Demir, 2005; Karaçil Ermumcu & Acar Tek, 2016), half of the nurses in our study had normal BMI. Other studies have reported that more than half of nurses were overweight or obese (Gupta, 2017; Han et al., 2016). A significant correlation has also been indicated between long working hours and weight gain (Gupta, 2017; Han et al., 2016; Peplonska et al., 2015).

BMI values of the nurses working in medical clinics were significantly higher than those of nurses working in intensive care units / operating rooms / emergency wards. BMI values of nurses who had been working more than ten years were found to be significantly higher than those of nurses working for a shorter period. In addition, nurses who had less than five patients per shift were found to have significantly lower BMI values. Age is another factor linked to higher BMI. It is thought that nurses working at internal clinics are generally of middle age and above, whereas nurses tend to be younger in intensive care units. The exhausting, stressful nature of the work in ICUs, and body image perceptions of younger nurses working there are thought to result in significantly lower BMIs.

The BMIs of day shift nurses were found to be higher in our study. In the literature, no significant difference is indicated between working daytimes and BMI (Guo et al., 2013; Huth et al., 2013; Marqueze et al., 2012; Pulat Demir et al., 2017). Nursing involves shift work, and it is thought that working nights encourages increased eating, leading to weight gain. Similarly, a study by Yeh and Brown (2014) indicated a positive correlation between eating at night and BMI.

Limitation of study

The main limitation of the study was the participation of nurses from only one hospital. Therefore, the outcomes of the study are limited to the nurses working in this hospital. Moreover, the assessment of nutritional status was based only on BMIs since there was no valid and reliable Turkish scale to evaluate general nutritional status. Finally, the PSQI is a tool that measures sleep quality only over the previous month.

Conclusion

Based on our study, it was determined that more than half of nurses had poor sleep quality and normal weight. Sleep quality and BMI are affected by the total working time in the current workplace, number of patients per nurse in a shift, weekly working hours, shift pattern, and the number of night shifts per

month. Moreover, as working hours increased, sleep quality and BMI were adversely affected. It is thought that better regulations regarding working conditions will contribute to both protecting and improving the health of nurses and the quality of nursing care.

Ethical aspects and conflict of interest

The study was based on a research project. Before undertaking the study, ethics committee approval was granted (decision no: 60116787-020/47028; date: 07/11/2018) and permission was received from the hospital in which the study was conducted. The study was carried out in accordance with the Helsinki Declaration. The nurses were informed of the purpose of the study. Every nurse who agreed to participate in the study provided their written and verbal consent. A valid and reliable Turkish version of the PSQI was used after receiving consent of the authors of Turkish version of PSQI (Ağargün et al., 1996).

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Author contributions

Conception and design (ND, SA), data collection (ND) data analysis and interpretation (SA, ND), manuscript draft (SA, ND), critical revision of the manuscript (SA, ND), final approval of the manuscript (SA, ND).

References

Ağargün, M. Y., Kara, H., & Anlar, Ö. (1996). Pittsburgh Uyku Kalitesi İndeksi'nin geçerliği ve güvenirliği [Validity and reliability of Pittsburgh Sleep Quality Index]. *Türk Psikiyatri Dergisi*, *7*(2), 107–115.

Akbari, V., Hajian, A., & Mirhashemi, M. S. (2016). Evaluating of sleep quality in shift-work nurses. *Iranian Journal of Sleep Disoreders & Therapy*, *5*(1), 1–4. https://doi.org/10.4172/2167-0277.1000225

Arpacı, F. (2007). Vardiya Usulü Çalışmanın Hemşirelerin Sosyal Yaşamı ve Ev Yaşamı Üzerindeki Etkilerinin İncelenmesi [Examining the effects of working in shifts on nurses' social life and home life]. *E-Journal of New World Sciences Academy*, *2*(4), 71–79.

Axelsson, J., Akerstedt, T., Kecklund, G., & Lowden, A. (2004). Tolerance to shift work – how does it relate to sleep and wakefulness? *International Archives of Occupational and Environmental Health*, *77*(2), 121–129. https://doi.org/10.1007/s00420-003-0482-1

Balcı, K. (2017). *The assessment of the relationship between nutritional status and sleep quality in adult subjects working at Başkent University Ankara Hospital*. Retrieved October 26, 2021, from https://agris.fao.org/agris-search/search.do?recordID=TR2019000415

Beebe, D., Chang, J. J., Kress, K., & Mattfeldt-Beman, M. (2017). Diet quality and sleep quality among day and night shift nurses. *Journal of Nursing Management*, *25*(7), 549–557. https://doi.org/10.1111/jonm.12492

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Hoch, C. C., Yeager, A. L., & Kupfer, D. J. (1991). Quantification of subjective sleep quality in healthy elderly men and women using the Pittsburgh Sleep Quality Index (PSQI). *Sleep*, *14*(4), 331–338.

Chan, M. F. (2009). Factors associated with perceived sleep quality of nurses working on rotating shifts. *Journal of Clinical Nursing*, *18*(2), 285–293. https://doi.org/10.1111/j.1365-2702.2008.02583.x

Chang, W. P. (2018). Influence of shift type on sleep quality of female nurses working monthly rotating shifts with cortisol awakening response as mediating variable. *Chronobiology International*, *35*(11), 1503–1512. https://doi.org/10.1080/07420528.2018.1493491

Chang, Y. Y., Lin, C. L., & Chang, L. Y. (2017). The effects of aromatherapy massage on sleep quality of nurses on monthly rotating night shifts. *Evidence-Based Complementary and Alternative Medicine*, *2017*, 3861273. https://doi.org/10.1155/2017/3861273

Chen, X. Q., Jiang, X. M., Zheng, Q. X., Zheng, J., He, H. G., Pan, Y. Q., & Liu, G. H. (2020). Factors associated with workplace fatigue among midwives in southern China: a multi-centre cross-sectional study. *Journal of Nursing Management*, *28*(4), 881–891. https://doi.org/10.1111/jonm.13015

Demir, A. (2005). Hemşirelerin Vardiya ile Çalışmalarının Anksiyete ve Arteryel Kan Basıncına Etkisinin İrdelenmesi [The investigation of the effects of shift working on nurses' anxiety and arterial blood pressure]. *Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi*, *8*(2), 40–54.

Devlet Memurları Kanunu [State Officers Law]. (1965, 23 July). Resmi Gazete (Sayı: 12056). Retrieved from: https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=657&MevzuatTur=1&MevzuatTertip=5

Fışkın, A., Bayık Temel, A., Yıldırım, J. G. (2013). Hemşirelerde Uyku Sorunları ve Etkili Etmenler [Sleep problems and factors affecting sleep in nurses]. *Ege Üniversitesi Hemşirelik Fakültesi Dergisi*, *29*(2), 13–32.

Ghalichi, L., Pournik, O., Ghaffari, M., & Vingard, E. (2013). Sleep quality among health care workers. *Archives of Iranian medicine*, *16*(2), 100–103.

Günaydin, N. (2014). Bir Devlet Hastanesinde Çalışan Hemşirelerin Uyku Kalitesi ve Genel Ruhsal Durumlarına Etkisi [The quality of sleep and effects on general mental health of nurses who work in a state hospital]. *Journal of Psychiatric Nursing*, *5*(1), 33–40. https://doi.org/10.5505/phd.2014.63935

Guo, Y., Liu, Y., Huang, X., Rong, Y., He, M., Wang, Y., & Chen, W. (2013). The effects of shift work on sleeping

quality, hypertension and diabetes in retired workers. *PloS One*, *8*(8), e71107. https://doi.org/10.1371/journal.pone.0071107

Gupta, S. (2017). Dietary practices and nutritional profile of female nurses from government hospitals in Delhi, India. *Iranian Journal of Nursing and Midwifery Research*, *22*(5), 348–353.

Han, Y., Yuan, Y., Zhang, L., & Fu, Y. (2016). Sleep disorder status of nurses in general hospitals and its influencing factors. *Psychiatria Danubina*, *28*(2), 176–183.

Hark, L., Ashton, K., & Deen, D. (Eds.). (2012). *The nurse practitioner's guide to nutrition* (2nd ed.). Wiley-Blackwell.

Huth, J. J., Eliades, A., Handwork, C., Englehart, J. L., & Messenger, J. (2013). Shift worked, quality of sleep, and elevated body mass index in pediatric nurses. *Journal of Pediatric Nursing*, *28*(6), e64–e73. https://doi.org/10.1016/j.pedn.2013.02.032

International Labour Office. (2005). *ILO Nursing personnel convention No. 149*. https://www.who.int/hrh/nursing_midwifery/nursing_convention_C149.pdf

Karaçil Ermumcu, M., & Acar Tek, N. (2016). Sağlık Profesyonellerinde Sağlıklı Beslenme Kaygısı: Ortoreksiya Nervoza (ON) [Healthy eating concern in health professionals: orthorexia nervosa (ON)]. *Gazi Sağlık Bilimleri Dergisi*, *1*(2), 59–71.

Karakaş, S. A., Gönültaş, N., & Okanli, A. (2017). Vardiyalı Çalışan Hemşirelerde Uyku Kalitesi [The quality of sleep of nurses who work shifts]. *ERÜ Sağlık Bilimleri Fakültesi Dergisi*, *4*(1), 17–26.

Knutsson, A. (2003). Health disorders of shift workers. *Occupational medicine*, *53*(2), 103–108. https://doi.org/10.1093/occmed/kqg048

Kunert, K., King, M. L., & Kolkhorst, F. W. (2007). Fatigue and sleep quality in nurses. *Journal of Psychosocial Nursing and Mental Health Services*, *45*(8), 30–37. https://doi.org/10.3928/02793695-20070801-07

Lauderdale, D. S., Knutson, K. L., Rathouz, P. J., Yan, L. L., Hulley, S. B., & Liu, K. (2009). Cross-sectional and longitudinal associations between objectively measured sleep duration and body mass index: the CARDIA Sleep Study. *American Journal of Epidemiology*, *170*(7), 805–813. https://doi.org/10.1093/aje/kwp230

Lee, H. Y., Kim, M. S., Kim, O., Lee, I. H., & Kim, H. K. (2016). Association between shift work and severity of depressive symptoms among female nurses: the Korea Nurses' Health Study. *Journal of Nursing Management, 24*(2), 192–200. https://doi.org/10.1111/jonm.12298

Marquezea, E. C., Lemosa, L. C., Soaresa, N., Lorenzi-Filhob, G., & Morenoa, C. R. (2012). Weight gain in relation to night work among nurses. *Work*, *41*(Suppl. 1), 2043–2048. https://doi.org/10.3233/WOR-2012-0429-2043

McDowall, K., Murphy, E., & Anderson, K. (2017). The impact of shift work on sleep quality among nurses. *Occupational Medicine*, *67*(8), 621–625. https://doi.org/10.1093/occmed/kqx152

Mezick, E. J., Wing, R. R., & McCaffery, J. M. (2014). Associations of self-reported and actigraphy-assessed sleep characteristics with body mass index and waist circumference in adults: moderation by gender. *Sleep Medicine*, *15*(1), 64–70. https://doi.org/10.1016/j.sleep.2013.08.784

Örmeci, M. T., Odman, E., Olgun, A., Öner, H., Yavuz, C., & Güler, Ç. (2013). Ankara'da faaliyet gösteren bir tıpta uzmanlık dershanesine devam edenlerin bazı beslenme alışkanlıkları ve beslenme durumlarından memnuniyetlerinin belirlenmesi [Meal preferences and satisfaction of nutritional status of medical students and senior doctors attending a private medical specialty examination course]. *Cumhuriyet Tıp Dergisi*, *35*(4), 457–467.

Park, E., Lee, H. Y., & Park, C. S. Y. (2018). Association between sleep quality and nurse productivity among Korean clinical nurses. *Journal of Nursing Management*, *26*(8), 1051–1058. https://doi.org/10.1111/jonm.12634

Peplonska, B., Bukowska, A., & Sobala, W. (2015). Association of rotating night shift work with BMI and abdominal obesity among nurses and midwives. *PloS One*, *10*(7), e0133761. https://doi.org/10.1371/journal.pone.0133761

Persson, M., & Mårtensson, J. (2006). Situations influencing habits in diet and exercise among nurses working night shift. *Journal of Nursing Management*, *14*(5), 414–423.

Pulat Demir, H., Elkin, N., Barut, A. Y., Bayram, H. M., & Averi, S. (2017). Vardiyalı Çalışan Sağlık Personelinin Uyku Süresi ve Beslenme Durumunun Değerlendirilmesi [Evaluation of sleep duration and nutrition status of medical staff workers that work shifts]. *İstanbul Gelişim Üniversitesi Sağlık Bilimleri Dergisi*, *2*, 89–107.

Shao, M. F., Chou, Y. C., Yeh, M. Y., & Tzeng, W. C. (2010). Sleep quality and quality of life in female shift-working nurses. *Journal of Advanced Nursing*, *66*(7), 1565–1572. https://doi.org/10.1111/j.1365-2648.2010.05300.x

Speroni, K. G., Earley, C., Seibert, D., Kassem, M., Shorter, G., Ware, C. C., & Atherton, M. (2012). Effect of Nurses Living Fit™ exercise and nutrition intervention on body mass index in nurses. *The Journal of Nursing Administration*, *42*(4), 231–238. https://doi.org/10.1097/NNA.0b013e31824cce4c

Taheri, S., Lin, L., Austin, D., Young, T., & Mignot, E. (2004). Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. *PLoS Medicine*, *1*(3), e62. https://doi.org/10.1371/journal.pmed.0010062

Wheaton, A. G., Perry, G. S., Chapman, D. P., McKnight-Eily, L. R., Presley-Cantrell, L. R., & Croft, J. B. (2011). Relationship between body mass index and perceived insufficient sleep among US adults: an analysis of 2008 BRFSS data. *BMC Public Health*, *11*(1), 295. https://doi.org/10.1186/1471-2458-11-295

Yan, Z., Chang-Quan, H., Zhen-Chan, L., & Bi-Rong, D. (2012). Association between sleep quality and body mass index among Chinese nonagenarians / centenarians. *Age*, *34*(3), 527–537. https://doi.org/10.1007/s11357-011-9251-3

Yeh, S. S. S., & Brown, R. F. (2014). Disordered eating partly mediates the relationship between poor sleep quality and high body mass index. *Eating Behaviors*, *15*(2), 291–297. https://doi.org/doi: 10.1016/j.eatbeh.2014.03.014

Zencirci, A. D., & Arslan, S. (2011). Morning-evening type and burnout level as factors influencing sleep quality of shift nurses: a questionnaire study. *Croatian Medical Journal*, *52*(4), 527–537. https://doi.org/10.3325/cmj.2011.52.527