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Sleep Quality and Related Factors in Medical Residents

Asistan Hekimlerde Uyku Kalitesi ve İlgili Faktörler

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ABSTRACT

Introduction: The aim of this study was to assess the sleep quality and daytime sleepiness of resident doctors, to compare the sleep quality between surgical and medical branch residents and to examine effects of working hours, number of duties, clinical branches and some other daily habits on the sleep quality of resident doctors in a hospital in Turkey. **Methods:** A survey was conducted to gather data on (i) demographics, lifestyle and daily habits as well as to determine (ii) Epworth sleepiness scale (ESS) score and (iii) Pittsburgh sleep quality index (PSQI) scores of the participants. Data collection was based on the use of a self-administered questionnaire. **Results:** Of 138 resident doctors, 45.7% were classified as having good sleep quality based on a cut-off score of 5 in PSQI. The mean ESS and PSQI scores were 6.59 ±3.92 and 6.30 ±3.22, respectively. Significantly positive correlations were found between Epworth score and the number of night duties (p=0.010), working hours per week (p=0.006), total cigarettes per day (p=0.033), and daily tea consumption (p=0.013). Also, there were statistically significant positive correlations between PSQI scores and the number of night duties (p<0.001), working hours per week (p=0.007), total cigarettes per day (p=0.013) and daily coffee consumption (p=0.002). Surgical residents had significantly poor sleep quality (p=0.015). ESS score was higher in female residents and surgical residents, with a significant difference in these two sub-groups (p=0.018, p=0.008 respectively). **Conclusions:** Sleep quality and daytime sleepiness of the resident doctors were closely related to lifestyle factors including working hours, number of night duties and branch of residency as well as to certain demographic factors and daily habits.

Keywords: Sleepiness, sleep deprivation, lifestyle

ÖZET

Giriş: Bu çalışmanın amacı bir hastanede çalışan asistanların uyku kalitesini ve gün içi uykululuk durumunu değerlendirmek, cerrahi ve medikal branşlar arasında uyku kalitesini karşılaştırmak ve haftalık çalışma saatleri, nöbet sayıları , bazı günlük alışkanlıklar ve yaşam tarzının uyku kalitesi üzerine etkisini araştırmaktır. **Yöntem:** Çalışma üç bölümden oluşan veriler ile yapılmıştır; (i) demografik özellikler, günlük yaşam tarzı ve alışkanlıklarla ilgili bilgiler, (ii) Epworth uykululuk ölçeği (ESS) skoru, (iii) Pittsburgh uyku kalitesi ölçeği (PSQI) .Veriler katılımcılardan anket yoluyla ve etik kurallara uygun olarak alınmıştır. **Bulgular**: 138 asistan doktorun % 45.7'sinin uyku kalitesi PSQI kesme puanı olan 5'e göre uyku kalitesi iyi olarak değerlendirildi. Ortalama ESS ve PSIQ puanları sırasıyla 6.59 ±3.92 ve 6.30 ±3.22 olarak bulundu. Epworth skoru ile gece nöbet sayısı (p=0.010), haftalık çalışma saatleri (p=0.006), günlük içilen sigara sayısı (p=0.033), günlük çay tüketimi (p=0.013) arasında anlamlı pozitif korelasyon bulundu. PSQI skorları ile, gece nöbeti sayıları (p<0.001), haftalık çalışma saatleri (p=0.007), günde içilen sigara sayısı (p=0.013), günlük kahve tüketimi (p=0.002) arasında anlamlı pozitif korelasyon saptandı. Cerrahi bölüm asistanlarının uyku kalitesi daha düşük rapor edildi (p=0.015). ESS skorları kadın asistanlarda ve cerrahi bölüm asistanlarında daha yüksek gözlendi ve bu farklar istatistiksel olarak anlamlı bulundu (sırasıyla p=0.018, p=0.008). **Sonuç:** Asistan doktorların uyku kalitesi ve gün içi uykululuk durumu, demografik faktörler ve günlük alışkanlıklarla ilgili olduğu kadar, haftalık çalışma saatlerinin uzunluğu, nöbet sayıları ve asistanlık yapılan bölüm gibi yaşam tarzı faktörleriyle de yakından ilişkilidir.

Anahtar sözcükler: Uykululuk, uyku yoksunluğu, yaşam tarzı

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INTRODUCTION

Common sleep disorders are insomnia, hypersomnia, parasomnia and sleep-related breathing disorders such as obstructive sleep apnea (OSA). In a study by Cristopher L. Drake et al. "shift work sleep disorder'' was reported in almost 10% of the individuals who have night and rotating shift work, and this was defined as a risk factor for behavioral and health-related morbidity.[1] and sleep quality is linked with physical and mental health in many ways. Poor sleep quality may be an important symptom of many organic and psychiatric disorders.[2] Several factors have been investigated as being caused by, or being risk factors for, sleep disturbances. Among medical students, high levels of stress have been associated with sleep problems.[3] Medical residency is intensive training within a specific branch of medicine, and most residency programs involve prolonged working hours, which is a part of medical training in almost all clinical specialties. Prolonged working hours can be associated with adverse health consequences as a result of sleep deprivation. Sleep deprivation affects residents performance and safety.[4]

In view of the clinical significance of the sleep quality, this study was undertaken to assess the effects of working hours, number of the duties some other daily habits on the sleep quality and daytime sleepiness of resident doctors and to compare the results between surgical and medical branch residents in our hospital.

MATERIALS AND METHODS

This study was carried out between November 2013 and December 2013 in Istanbul Okmeydani Training and Research Hospital. The target population was the resident doctors in all medical departments at all seniority stages. In this time period, there were about 240 resident doctors in 22 clinical departments in the hospital. The study sample consisted of 138 resident doctors in these medical departments from their first to the last year. The medical departments were categorized as surgical and medical branches. We used a convenient sampling method. The volunteers were informed about the study and their verbal consents were taken in accordance with national and international medical ethical rules.

Participants completed a self-administered questionnaire including 60 questions and consisting of three parts: (A) a general questionnaire gathering data on demographics such as age and gender, lifestyle and daily habits (38 questions); (B) Epworth sleepiness scale (ESS) (8 questions); and (C) Pittsburgh sleep quality index (PSQI)(24 questions). Recruitment and collection of data continued for four weeks. We could not achieve all the resident doctors in the hospital in the time period of the study. There were 12 drop-outs in the study; we couldn't get 9 questionnaires back and 3 questionnaires were not completed fully.

In our study, we chose ESS because it is widely used and reliable predictor of daytime sleepiness. Also, we used PSQI because it is a validated and frequently used scale which assesses sleep quality. We selected these specific scales because we aimed to assess sleep quality and daytime sleepiness of resident doctors. These scales were validated and appropriate for our study.

ESS was originally developed by Dr. Murray Jones of Epworth Hospital, Australia in 1991, with the intent to measure daytime sleepiness through the use of a very short questionnaire.[5] ESS is a self-administered questionnaire with 8 questions that provides a measure of daytime sleepiness or average sleep propensity in a day. Over time, it has become the gold standard method for assessing daytime sleepiness. Participants are requested to rate on a 4-point scale (0-1-2-3) for 8 situations of daily activities. A score between 0 and 9 is considered normal, while a score of 10-24 warrants medical intervention.[5]

PSQI is a self-rate questionnaire that assesses sleep quality and disturbances over a 1-month period. Nineteen distinct items generate seven scores; Sleep duration (PSQIDURAT), sleep disturbances (PSQIDISTB), sleep latency (PSQILATEN), daytime dysfunction due to sleepiness (PSQIDAYDYS), habitual sleep efficiency (PSQIHSE), use of sleeping medication (PSQIMEDS), and subjective overall sleep quality (PSQISLPQUAL). The sum of scores for these seven components produces one total score.[6] Scores ≥5 indicated poor sleep quality and <5 considered good sleep quality.

In addition sleep assessment tools, Pittsburgh sleep quality index and Epworth sleepiness scale, study data were collected from the following areas: working years as a resident, number of night duties in a month, weekly working hours, having kids or not, number of persons living in the house, time spent in traffic during a day, daily hours of television watching and computer use, daily coffee, tea, cigarette and alcohol consumption, use of medicines, and physical activity level.

Furthermore, information was gathered on sleep hygiene like watching TV for sleeping, leaving lights on while sleeping, eating something and drinking coffee or tea before sleep, sleep time variation between days.

Study data were analyzed with Statistical Package for Social Sciences (SPSS) statistical software package version 17.0 using correlation analysis, independent sample t-test, chi-square test and regression analysis as the statistical methods. Statistical significance was set at $p \leq 0.05$ value.

RESULTS

Medical residents (n=138) from 22 different specialties participating in our study. The clinics were categorized as surgical and medical branches.

The mean age of the participants was 28.10±2.86 years, mean working years as a medical resident was 2.19±1.14, mean weekly working hours was 67.74±24.14, and the mean number of night duties was 5.82±4.08 days/month. The mean PSQI and ESS scores were 6.30± 3.2, 6.59 ±3.92 respectively.

Certain variables tested in the study were found to influence PSQI and ESS scores, although some only had minor effects on PSQI sub-scores, while others had no effect on sleep quality and daytime sleepiness. Statistical analysis revealed statistically significant positive and weak correlations between Epworth score and the number of night duties (r=0.218, p=0.010), working hours per week (r=0.231, p=0.006), total cigarettes per day (r=0.182, p=0.033), and daily tea consumption (r=0.211, p=0.013) (Table 3).

Also, there were statistically significant positive correlations between PSQI and the number of duties ($r = 0.399$, $p < 0.001$), the working hours/week ($r = 0.229$, $p = 0.007$), total cigarettes/day ($r = 0.211$, $p = 0.013$) and the amount of daily coffee consumption ($r = 0.260$, $p = 0.002$). Total duration of daily TV watching negatively correlated with PSQI ($r = -0.192$, $p = 0.024$). (Table 3). The correlation between the Epworth score and PSQI was also positive and statistically significant (r=0.302, p<0.001). In PSQI sleep quality was poorer than residents of medical branches among residents of surgery (p=0.015) (Table 4).

In t-test group-wise comparison of sleep quality group, PSQI scores were significantly different between residents who had poor or good sleep quality in terms of the average number of duties (p<0.001), the average working hours (p=0.011), and the average daily coffee consumption (p=0.025).

In group-wise comparison tests regarding scores the Epworth scale score was significantly higher in females than in males, and in residents of surgery than in residents of non-surgical medical branches (p=0.018 and p=0.008 respectively) (Table 1). Variation in sleep time was associated with higher Epworth (p=0.001), PSQI (P=0.003), PSQIDURAT (p=0.012) and PSQISLPQUAL scores (p=0.001). Also, coffee intake was associated with higher PSQIMEDS score (p=0.001).

Two regression analyses were conducted where PSQI and ESS were considered to be independent variables. In the PSQI regression model, independent variables were number of night duties (p=0.002), number of persons living in the house(p<0.001), daily cups of coffee consumed(p=0.009), and daily number of cigarettes smoked(p=0.065) and those variables explained 25% of the total variability in PSQI scores (Table 5) and the regression model was statistically significant with p<0.001 (Table 5). In the regression model of ESS working hours (p=0.037), clinical branch (surgical vs. non-surgical) (p=0.010), gender (p=0.010) and drinking coffee or tea before sleep (p=0.022) were independent variables and 19% of the total variability in ESS scores was explained by those variables and the regression model was statistically significant with p<0.001 (Table 5).

DISCUSSION

In our study, we compared the results between surgical and medical branch residents. In correlation analysis, both the number of night duties and weekly working hours emerged as significant determinants of sleep quality and daytime sleepiness. In the study by Mota et al. [7] subjective sleep measures in resident doctors were investigated with dietary patterns and metabolic markers. They also used ESS and PSQI as subjective sleep measures, but in our study, we didn't investigate any metabolic markers. In this study using subjective sleep measures in resident physicians, mean PSQI score was 6.2±2.5, a figure closely resembling our findings. In our survey mean PSQI score of the participants was 6.3±3.22, and a PSQI score greater than >5 indicates poor sleep quality. However, despite significant gender differences in PSQI scores (5.9 for women and 7.5 for men p=0.01) in that study, no gender difference observed for PSQI scores in our study.

Table 1. The mean values for ESS and Pittsburgh PSQI scores				
	Number (n)	**Percent (%)**	**ESS (mean±SD)**	**PSQI (mean±SD)**
Gender				
Female	53	38.4	7.58±4.03	6.68±3.51
Male	85	61.6	5.98±3.74	6.06±3.03
Specialty				
Medical	103	74.6	5.98±3.37	6.04±3.19
Surgical	35	25.4	8.40±4.81	7.06±3.23

Mean ESS and PSQI scores of female and male residents; medical and surgical residents

Table 2. Distribution of sleep quality based on PSQI		
SLEEP QUALİTY	**Number (n)**	**Percent (%)**
Good	63	45.7
Poor	75	54.3
Total	138	100

Medical residents, 45.7% were classified as having good sleep quality as assessed by a PSQI cut-off score of 5 (i.e., ≥5: poor sleep quality and <5: good sleep quality)

Table 3. Correlation analysis of PSQI and ESS scores versus life style variables		
	PSQI	**ESS**
Number of duties/month	r= 0.399 p<0.001**	r=0.218 p=0.010*
Working hours/week	r=0.229 p=0.007**	r=0.231 p=0.006**
Cigarettes/day	r=0.211 p=0.013*	r=0.182 p=0.033*
Coffee consuption cup /day	r=0.260 p=0.002**	r=0.96 p=0.261
Tea consumption cup/day	r=-0.008 p=0.926	r=0.211 p=0.013*
TV watching duriation hour/day	r=-0.192 p=0.024*	r=-0.151 p=0.077

(*) Significant at p≤0.05
(**)Significant at p≤0.01

Table 4. Group-wise comparison of sleep quality (chi-square test)						
p=0.015	Sleep quality					
Clinical specialty	Good		Poor		Total	
	n	%	n	%	n	%
Medical	53	51.5	50	48.5	103	100
Surgical	10	28.6	25	71.4	35	100
Total	63	45.7	75	54.3	138	100

PSQI scores were higher and sleep quality was poor in surgical branches. PSQI cut-off score of 5 (i.e., ≥5: poor sleep quality and <5: good sleep quality

Table 5. Model summary of regression analyses in PSQI and ESS			
Model	R Square	Std. Error of the Estimate	Regression Significance(p)
PSQI	0.253	2.82930	<0.001
ESS	0.193	3.57316	<0.001

Regression model was statistically significant with p<0.001 in PSQI and ESS scores

The mean ESS score reported by Mota et al. , i.e. 11.0 ± 3.9, was prominently higher, but the mean ESS score did not show any gender differences. Our mean ESS score was 6.59±3.91. Daytime sleepiness in female residents was higher by the statistically significant difference in mean ESS scores between females (i.e. 7.6) and males (i.e. 5.9) (p=0.018).

A study by Siddigua at al.[8] investigated sleep patterns and predictors of poor sleep quality among medical students in King Khalid University in Saudi Arabia by using PSQI. In this study the overall mean sleep quality score was 6.79 with a standard deviation of 3.06. Poor sleep quality was reported by 74.2% students. Significantly high mean sleep quality scores were observed for students with very poor subjective sleep quality (mean = 10.50, SD = 2.58) . In our study the mean PSQI score was 6.30± 3.2 and poor sleep quality was reported 54.3% among residents. The recommended limits for the PSQI values are below 5. Both studies indicate poor sleep quality in participants using same scales. Our study was involving medical residents while other study was among medical students.

In a study by Giri PA et al.[9] investigating sleep habits and sleep problems of medical students, ESS and PSQI were used like current study. Sleep quality was better among females than males. No gender difference observed in sleep quality in our study. Factors identified as adversely affecting the sleep quality in the study by Giri PA et al. included excessive coffee intake, alcohol intake, and use of mobile phones and laptops, while regular exercise seemed to lessen the severity of sleep disturbances.[9] In our study, the number of cigarettes smoked per day correlated positively with both PSQI and ESS scores. In addition, coffee consumption positively correlated with the PSQI score and tea consumption positively correlated with the ESS score. No such correlations could be determined for both scores with mean hours of using computer per day. Another result in group-wise comparisons was the absence of a significant effect of regular exercise and alcohol consumption on sleep quality.

Nojomi M et al.[10] in a study to determine the prevalence of sleep disorders in medical students and residents by using questionnaire based on DSM-IV criteria and Pittsburg on sleep patterns compared groups. They reported higher mean insomnia scores in females than in males and lower mean scores person who did exercise both for medical students and residents. In our study in ESS daytime sleepiness were higher in female and exercising regularly was not a significant factor in sleep quality. Objectives and scales used were different in two studies.

In the study of Murthy at al.[11] to evaluate the association of sleep quality with satisfaction with life and daytime sleepiness, PSQI and ESS and Satisfaction with life scale (SWLS) were also used. Association between sleep quality and sleepiness and satisfaction with life was evaluated. From the data collected, comparisons were made between the clinical and para-clinical department residents. A significant number of residents belonging to the clinical faculty were poor sleepers; reported high levels of abnormal daytime sleepiness compared to residents in para-clinical faculties. In our study clinics were classified as surgical and clinical branches and we didn't use Satisfaction with life scale. We can say that in the previous study clinical department also includes surgical branches. In our study, 54.3% of the participants had poor sleep quality and surgical branch residents were poor sleepers.

Medical residents from surgical branches were found to have poorer sleep quality than those in non-surgical branches in our hospital, as seen by PSQI and ESS results. Factors that were associated with scores indicating poor sleep quality in PSQI were the higher number of night duties, longer working hours, and coffee intake, while longer working hours and tea intake were associated with ESS scores indicating daytime sleepiness.

Therefore, it was observed weekly working hours and number of night duties had the most dramatic impact on the sleep quality in our sample. Also, daily intake of coffee and tea seemed to have an adverse effect.

Many studies have shown an association between the occurrence of medical errors and injuries and long working hours of resident doctors. For instance, Harvard Work Hours Health and Safety Group found that interns with extended shifts were more likely to cause medical errors.[12] In a randomized control trial, medical errors were found to be more common on a schedule with frequent extended shifts.[13] Again, a systematic review of interventions to reduce shifts over 16 hours reported 64% improved safety and quality.[14,15] In contrast, others found no significant effect of sleep deprivation on the quality of patient care.[16] In a review by Ellman and colleagues examining 6751 cardiac surgeries, mortality and surgical complication rates were not significantly different in procedures performed by surgeons who had been awake the previous night from those that were performed by surgeons who had slept the previous night.[17]

Limiting medical residents' working hours may be associated with interruptions in the course of residency training. Some educators hold the view that reduced working hours for residents should be compensated by the additional duration of residency.[18] In USA resident working hours are limited to 80 hours per week and not more than 24 hours of continuous work. In emergency departments, shifts of residents' working hours are limited to 12 hours. However, in many other countries, resident working hours are well above 80 hours per week. Also, several reports suggest that restriction of working hours alone is insufficient to avoid the effects of sleep deprivation.[4]

Several limitations of our study should be mentioned. Firstly, the study duration was limited to one month, which may have diminished our ability to fully show the general sleep quality of the participants. Secondly, the participants might have had an inclination to provide "acceptable" answers rather than "honest" answers to the questions. And thirdly, considering the wide range of factors that may influence the sleep quality, a certain amount of bias would always remain. In addition, PSQI and ESS were used for sleep quality assessments in our study; and use of other tools to measure the sleep quality in other studies makes comparisons challenging.

CONCLUSION

Sleep deprivation adversely affects mental and physical health and cognitive performance of the medical, residents, and poor sleep quality is associated low clinical performance and medical errors. Sleep disturbances of medical residents are largely affected by excessive working hours and the number of night duties. Medical residents in surgical branches generally have lower sleep quality than in other branches. Also, daily coffee and tea consumption may have an unfavorable effect on sleep quality.

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