

# The Effects of Night Duty on Anxiety Levels of Anesthesia Residents

## Gece Nöbetinin Anestezi Asistanlarının Anksiyete Derecesi Üzerine Etkileri

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Geliş Tarihi/Received: 15.10.2010

Kabul Tarihi/Accepted: 06.12.2010

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**ABSTRACT Objective:** Shift work is known to affect physiological and cognitive function and disrupt circadian rhythms. Anesthesiologists are subject to night shifts and long duration shifts and are a group of physicians at high risk for anxiety and depression. **Material and Methods:** This study was performed to assess the depression levels and to compare anxiety in anesthesiology residents before and after, day and night shifts by using the Beck Depression Inventory, Beck Anxiety Inventory, State and Trait Anxiety Inventories. The Beck Depression Inventory was performed once to all residents. The BAI and STAI was administered to residents before and after eight-hour day work and 16-hour night shift work. **Results:** Data were obtained from all 87 anesthesia residents from four university teaching hospitals in Turkey. The residents' mean age was 30.98±3.65 years and the mean residency duration was 22.11±12.95 months. The Beck Depression Inventory was >17 in 15 of the 87 subjects. There were no differences in the before work anxiety measures for eight-hour day work and 16-hour night shift work. In contrast, following night shift duty all anxiety measures were significantly increased (p<0.001). **Conclusion:** While patient illness severity and workload may contribute to increased anxiety in anesthesiology residents following night shift, it is clear that night shifts form anxiety that may results an insufficient patient care. Further studies are needed to optimize shift work schedules to provide excellent anesthesiology care

**Key Words:** Anxiety; depression; physician assistants

**ÖZET Amaç:** Gece nöbetleri insan psikolojisini ve düşünme gücünü etkilemekte ve sirkadiyen ritimde tahribat oluşturmaktadır. Anestezistler gece nöbetlerinin ve uzun nöbetlerin sıklıkla görüldüğü bir bölüm olup, anksiyete ve depresyon açısından yüksek risk taşımaktadır. **Gereç ve Yöntemler:** Bu çalışma gündüz çalışması ve gece nöbetleri öncesi ve sonrasında Beck Depresyon ölçeği, Beck Anksiyete Envanteri (BAI), Durumluk ve Sürekli Kaygı Ölçekleri (STAI) kullanılarak anestezi asistanlarının anksiyete durumlarının değerlendirilmesi amacıyla planlandı. Beck Anksiyete Envanteri tüm araştırma görevlilerine bir kez uygulandı. BAI ve STAI testleri 8 saatlik gündüz çalışma ve 16 saatlik gece nöbetleri öncesi ve sonrasında araştırma görevlilerine uygulandı. **Bulgular:** Çalışmaya dört farklı üniversite eğitim hastanesinden 87 anestezi araştırma görevlisi katıldı. Çalışmaya katılan araştırma görevlilerinin ortalama yaşı 30,98±3,65 yıl olarak saptanırken ortalama asistanlık süresi 22,11±12,95 ay olarak bulundu. BAI, 87 katılımcının 15 tanesinde >17 fazla olarak bulundu. 8 saatlik gündüz çalışma ve 16 saatlik gece nöbetlerinde nöbet öncesi ölçülen anksiyete değerlendirmeleri arasında fark saptanmazken, gece nöbetleri sonrası anksiyete ölçümlerinde anlamlı artışlar saptandı (p<0.001). **Sonuç:** Gece nöbetleri sonrası hastanın hastalığının şiddeti ve artmış iş yükü anestezi asistanlarında artmış anksiyeteye katkıda bulunsa da, gece nöbetleri sonrasında anestezi asistanlarında gelişen anksiyetenin hasta takibini etkilediği açıktır. En iyi anestezi bakımını vermek için nöbet programlarının düzenlenmesi yönünde ileri çalışmalar yapılmasını öneriyoruz.

**Anahtar Kelimeler:** Anksiyete; depresyon; doktor yardımcıları

Anesthesiology has been previously identified as a stressful specialty.<sup>1</sup> Sources of stress include long working hours, shift work and emergency conditions.<sup>2-4</sup> Shift work is known to affect physiological systems and cause circadian rhythm disruption. These conditions lead to anxiety and disorders in daily activities.<sup>4-7</sup> A survey that was made among retired anesthesiologists demonstrated that night call is the most stressful point of anesthesia practice.<sup>2</sup>

Persistent stress often leads to anxiety and abuse of alcohol or drugs and suicide. Multiple studies have shown that anesthesiologists are under stress.<sup>1,3,7,8</sup> A study found that 19.3% of the anesthesiologists had been stressed in the last month and, of these, 33% had been severely stressed and 6.8% had experienced more than severe stress.<sup>1,8</sup>

The implication of anesthesiologists' responsibility increases stressful conditions. In particular, anesthesiologists are regarded as a special risk group for excessive anxiety, stress and burnout.<sup>8-10</sup>

Hospital administrative responsibilities must guarantee 24-hour patient treatment and care. Shift work may alter mood and decrease cognitive and psychomotor performance, cause anxiety and it may increase attention failures by reducing peak mental abilities and response times.<sup>9,10</sup> Anxiety and anxiety-related anger lead to detachment for patients and may contribute to severe medical errors that affect patient safety.<sup>11-16</sup>

The aims of this study was firstly to assess depression levels and secondly compare before and after anxiety levels of 8-hour day work and 16-hour night shift work of anesthesia residents in four university hospitals in Turkey.

## MATERIAL AND METHODS

The study took place in the Department of Anesthesiology of Trakya University, Osmangazi University, Cerrahpasa University, and Selcuk University Hospitals. The subjects were 87 residents in anesthesia. Ethical approval was achieved and the anesthesiologists were informed and agreed to participate in the study. Working hours were 08-16 for day shift and 16-08 for night shift.

These working hours were regular shift periods and were not changed for study purposes. Day shift was defined as all clinical activities, administrative duties, and teaching work during daylight hours of work. Day shift was defined as all clinical activities and teaching work during daylight hours of work.

In many university hospitals the residents work during daylight hours and then they continued working during the night and after night shift work they continued working as far as the first hours of afternoon. We accepted this situation for our study.

Exclusion criteria were pregnancy and current psychiatric drug usage. None of the residents were pregnant or used any drugs.

The number of night duty per month, the sleep time during night shifts, the sleep time after daylight work and the operation numbers during night shifts were all recorded.

The depression levels of anesthesia residents were evaluated by means of the Beck Depression Inventory (BDI). Changes in anxiety levels during eight-hour day work and 16-hour night shift work were evaluated with the Beck Anxiety Inventory (BAI) and State-Trait Anxiety Inventory (STAI).

The BDI was developed by Beck and is a series of questions developed to measure the intensity, severity, and depth of depression.<sup>17</sup> The form is composed of 21 questions. The BDI was administered to all residents at least one week before night duty. Common cut-off scores of 17 suggest depression.

The BAI was also developed by Beck and is a 21-item Likert scale self-report questionnaire measuring common symptoms of clinical anxiety.<sup>17</sup> Each symptom is rated on a four-point scale, with higher scores corresponding to higher levels of anxiety. The BAI was administered to residents before and after eight-hour day work and 16-hour night shift work.

The STAI was developed by Spielberger in order to determine event specific and continuous anxiety levels separately.<sup>18</sup> The STAI is a 40-item Likert scale that assesses separate dimensions of

“state” anxiety (Items 1-20) as well as “trait” anxiety (Items 21-40). Both STAI scales were developed as unidimensional measures. STAI tests were administered to the residents before and after eight-hour day work and 16-hour night shift work.

### STATISTICAL ANALYSIS

Results were expressed as mean±sd or number. Normality distribution of the variables was tested using one sample Kolmogorov Smirnov test. Differences between before and after values in each group were assessed using the Wilcoxon signed rank test.

A p value <0.05 was considered statistically significance. Statistica 7.0 (StatSoft Inc. Tulsa, OK, USA) statistical software was used for statistical analysis.

## RESULTS

A total of 87 anesthesia residents were included in this study. Gender, age, and residency durations, sleep time during night duty, after normal day work, night duty per month and operation numbers in night shift works are shown in Table 1. The residents' mean age was  $30.98 \pm 3.65$ . The mean residency duration was  $22.11 \pm 12.95$  months. The sleep time during night duty was  $3.66 \pm 0.73$  hours and  $6.28 \pm 0.29$  hours after normal day work. The mean night duty per month was  $8.5 \pm 1.2$ . The number of operations during night shift works was  $4.0 \pm 0.8$ .

Fifteen anesthesia residents had depression scores of more than 17 as assessed with the BDI. Overall depression scores were  $10.85 \pm 5.83$  (Table 1).

The variations in BAI scores after eight-hour day work and 16-hour night shift work are shown in Table 2. The mean BAI scores were increased after eight-hour day work and 16-hour night shift work. The mean BAI score increased from  $5.09 \pm 2.71$  to  $5.10 \pm 2.68$  after eight-hour day work, with no statistical difference detected ( $p > 0.005$ ). Mean BAI scores were  $7.45 \pm 6.76$  before 16-hour night shift work, and increased to  $16.02 \pm 8.64$ . There was statistical difference detected ( $p < 0.005$ ).

**TABLE 1:** Demographic data.

	Residents (n=87)
Age (years)	32.92±3.88
Gender (M/F)	38/49
Duration of residency (months)	22.11±12.95
Sleep time during night duty (hr)	3.66±0.73
Sleep time after day shift work (hr)	6.28±0.29
Night duty (per month)	8.5±1.6
Operations during night shift work	4.0±0.8
BDI Scores	10,85±5,83

Data are presented as mean±SD.

BDI: Beck Depression Inventory/

The state scores of the STAI tests were increased after eight-hour day work and 16-hour night shift work (Table 2). The mean state scores before eight-hour day work were  $89.03 \pm 8.04$  and, after eight-hour day work, increased to  $89.05 \pm 8.08$ . No statistical difference was detected ( $p > 0.005$ ). The state scores of the STAI tests were increased from  $89.75 \pm 8.38$  to  $100.76 \pm 9.22$  after the 16-hour night shift work group. Statistical difference was detected ( $p < 0.005$ ).

The trait-state scores of the STAI tests were also increased after eight-hour day work and 16-hour night shift work (Table 2). The man trait scores were  $74.40 \pm 6.82$  before eight-hour day work and increased to  $74.43 \pm 7.01$ . There was no statistical difference ( $p > 0.005$ ). Mean trait scores were increased from  $73.72 \pm 6.75$  to  $82.07 \pm 8.29$ . Statistical difference was detected after eight-hour day work and 16-hour night shift work ( $p < 0.005$ ).

## DISCUSSION

We aimed to evaluate depression levels and to compare before and after anxiety levels of eight-hour day work and 16-hour night shift work of anesthesia residents in four university hospitals in Turkey. In our study we found that 17% of the anesthesia residents had depression scores of more than 17 as assessed with the BDI.

Studies conducted in different countries demonstrated that depression is an important health problem among physicians.<sup>19,20</sup> Demir et al. made a

**TABLE 2:** Characteristics of residents from daytime and night shifts.

	Day time shift (n=87)		p	Night shift (n=87)		p
	Before	After		Before	After	
BAI Scores	5,09±2,71	5,10±2,68	0,843	7,45±6,76	16,02±8,64	0,000
State scores of STAI	89,03±8,04	89,05±8,08	0,841	89,75±8,38	100,76±9,22	0,000
Trait scores of STAI	74,40±6,82	74,43±7,01	0,941	73,72±6,75	82,07±8,29	0,000

Data are presented as mean±SD.

BAI: Beck Anxiety Inventory

STAI: State-Trait Anxiety Inventory

study to demonstrate the prevalence of depression among resident doctors working in a training hospital and demonstrated that the prevalence rate of probable depression was as 16.0%.<sup>19</sup> The authors used BDI to demonstrate the depression levels. In another study made by Thommasen et al. suggested that medicine is a stressful occupation wherever physicians choose to work.<sup>20</sup> In these studies the authors used BDI to assess the depression levels of physicians.

Several studies examined the stress among anesthesiologists.<sup>9,21</sup> Morais et al. did a study to assess stress in Portuguese anesthesiologists.<sup>21</sup> They used a perceived stress scale to assess the consequences of stress, and found that among 263 anesthesiologists, 57.9% experienced emotional exhaustion. The authors concluded that there are stress conditions among Portuguese anesthesiologists. Another study performed by Nyssen et al. found that the mean stress level in anesthetists was no higher than among other working populations.<sup>9</sup> They concluded that the main sources of stress were a lack of control over time management, work planning, and risks. Nyssen et al. measured the effects of stress together with sources of stress and job characteristics, and the authors found that the mean stress levels in anesthetists were no higher than in other working populations.<sup>9</sup> They concluded that anesthetists reported high empowerment, high work commitment, high job challenge, and high satisfaction. The authors used the psychological state of stress measure to measure the level of stress. In our study we used BDI to evaluate the

depression levels of residents and demonstrated that the prevalence rate of depression was as 17.0%. In our opinion the reduced sleep time and the high risk because of high risk patients during night works were the reason for this situation. In our study we did not ask any questions about the risk of patients during night shift works but we all know that in Turkey because of being the third step, university hospitals usually deal with high risks patients. However, it is difficult to make a comparison among studies as each study included different proportions of at-risk groups (according to working year, gender and speciality).

Several previous studies have demonstrated the effects of shift work on cognitive function, performance, and mood.<sup>22-25</sup> Dula et al. conducted a study to demonstrate the cognitive functions of emergency physicians who worked the day shift and night shift.<sup>22</sup> The authors concluded that working a series of night shifts results in a decline in cognitive performance. Dru et al. demonstrated that overnight duty impairs behavior in medical doctors.<sup>23</sup> Another study made by Choobineh et al. concluded that social and subjective problems were more prevalent in shift workers than day workers.<sup>24</sup> Bara et al. examined the impact of shift work on mental health and found that night shifts were associated with an increased risk of anxiety and depression.<sup>25</sup>

The second result of our study was the BAI and STAI scores were higher after eight-hour day work and 16-hour night shift work. In our results, statistical difference was detected before and after BAI and STAI scores of night shift work.

The effects of night duty on anxiety levels were demonstrated by several studies.<sup>26,27</sup> Munakata et al. made a study to assess the influence of night shift work on psychologic state in 18 healthy nurses and found that tension anxiety, depression and anger-hostility were higher after a night shift. In this study each subject's psychologic state was assessed using a validated questionnaire.<sup>26</sup> Saricaoglu et al. did a study to demonstrate the effects of day and night shift work on the anxiety levels of anesthesia residents.<sup>27</sup> They found that anxiety levels were similar between the groups. In this study they used the STAI for assessing anxiety levels. In our study we enrolled 87 anesthesia residents from different university hospitals and found that anxiety levels were increased after night shifts.

Night shift work had been shown to associate with serious health problems, such as suicidality, cardiovascular disease, metabolic disorder, breast cancer and mortality.<sup>28-31</sup> The deterioration of cognitive performance caused by shift work had also proved to be a risk to the safety of patients.

Anesthesiologists often work extended duty shifts. A workweek of greater than 60 hours is common, and residents sometimes work more than 80 hours in a week.<sup>12</sup> Anesthesiology residents are precluded from the guidelines of the Accreditation Council for Graduate Medical Education in some countries, but the regulations or guidelines concerning duty and rest periods for anesthesiologists in Turkey were not clear.

There were some limitations to our study. It was not blinded, because all subjects were informed about the study. We also think that to assess affectivity and anxiety of the participants completely was not so easy, and this was another limitation of this study.

In conclusion, while patient illness severity and workload may contribute to increased anxiety in anesthesiology residents following night shift, it is clear that this work schedule may increase anxiety in residents sufficiently to compromise patient care. Further studies are needed to optimize shift work schedules to provide excellent anesthesiology care.

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