MEDICAL SCIENCES / DAHİLİ TIP BİLİMLERİ

The Effect of Transition from 12-hour to 24-hour Shiftwork on Burnout and Anxiety in Emergency Medicine Residents During the SARS-COV-2 Pandemic

SARS-COV-2 Pandemisi Sırasında Acil Tıp Asistanlarının 12 Saatlik Şift Sisteminden 24 Saatlik Nöbet Sistemine Geçişinin Tükenmişlik ve Kaygıya Etkisi

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Abstract

Objectives: Anxiety and burnout of physicians are increasing day by day during the Coronavirus disease-2019 pandemic period. Emergency medicine doctors also have a higher tendency to burnout due to the high workload. In our study, we aimed to evaluate the effects of a transition from 12-hour to 24-hour shiftwork in emergency medicine residents on burnout and anxiety.

Materials and Methods: In the study initiated with 20 participants in August, 2021, the State-trait anxiety inventory (STAI), the Maslach burnout inventory (MBI) and the Copenhagen burnout inventory (CBI) scores were evaluated at baseline and three months after the transition to 24-hour shiftwork, along with a questionnaire including socio-demographic information.

Results: STAI, MBI and CBI scores were found to be statistically significantly lower in the 24-hour shiftwork system compared to the 12-hour shiftwork system (p<0.05).

Conclusion: Anxiety and burnout in emergency physicians have been detected to a great extent due to current working conditions and the severe acute respiratory syndrome-coronavirus 2 pandemic. It was determined that the change in scheduling had a positive effect as it increased the rest period of the residents. However, it is necessary not only to regulate working conditions, but also to provide mental health support to residents.

Key Words: Burnout, Emergency Medicine, Residents, Shiftwork

Öz

Amaç: Koronavirüs hastalığı-2019 pandemi döneminde hekimlerin kaygıları ve tükenmişlikleri her geçen gün artmaktadır. Acil tıp asistanlarının da yoğun iş yükü nedeniyle tükenmişlik eğilimleri daha yüksektir. Çalışmamızda acil tıp asistanlarında 12 saatten 24 saatlik nöbet çalışma sistemine geçişin tükenmişlik ve anksiyete üzerindeki etkilerini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Ağustos 2021'de 20 katılımcı tarafından başlatılan çalışmada, durumluk-sürekli kaygı envanteri (STAI), Maslach tükenmişlik envanteri (MBI) ve Kopenhag tükenmişlik envanteri (CBI) puanları çalışmanın başında ve 24 saatlik nöbet çalışma şekline geçişten üç ay sonra değerlendirildi. Sosyo-demografik bilgiler içeren bir anket de hekimler tarafından dolduruldu.

Bulgular: STAI, MBI ve CBI puanları 24 saatlik nöbet sisteminde 12 saatlik şift sistemine göre istatistiksel olarak anlamlı derecede düşük saptandı (p<0,05).

Sonuç: Mevcut çalışma koşulları ve şiddetli akut solunum yolu sendromu-koronavirüs-2 pandemisi nedeniyle acil tıp asistanlarında kaygı ve tükenmişlik oldukça fazla oranda tespit edilmiştir. Nöbet sistemi değişikliğinin, asistanların dinlenme süresini artırması nedeniyle olumlu etki yaptığı düşünülmüştür. Çalışma koşullarının düzenlenmesiyle birlikte acil tıp asistanlarına ruh sağlığı desteği de sağlanmalıdır.

Anahtar Kelimeler: Tükenmişlik, Acil Tıp, Asistan, Şiftler Şeklinde Çalışma

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Introduction

The severe acute respiratory syndrome-coronavirus-2 (SARS-COV-2) pandemic has confronted healthcare systems with unprecedented challenges and has brought significant pressure on healthcare professionals (HCP) (1). Mental health problems have been reported in HCP, and among health staff, emergency department (ED) HCP are the one most involved since they are the frontline of care (1). During the pandemic, concerns about contracting the infection and transmitting the virus to their relatives increased the impact of anxiety and burnout in HCP (2).

Given the impact of burnout on both professional and personal lives of HCP, examining the factors associated with burnout following the Coronavirus disease-2019 (COVID-19) pandemic has gained importance (3). Related factors on anxiety and burnout in healthcare workers were examined during and before the pandemic (1). Being young and female, working in a high-risk environment, having lower levels of specialized training and work experience, and lack of social support were defined as potential risk factors (4). Shiftwork hours are also among these factors and unadapted scheduling may increase the level of anxiety and burnout (5).

The shiftwork models of emergency residents may differ according to countries and regions. In Turkey, the commonly applied models are in the form of 12-hour shiftwork system during the day and night or 24-hour continuous working periods (6). Shiftworks can cause harmful effects such as fatigue, decreased attention, irritability, burnout and communication problems in healthcare staff. These negative effects of working in shifts are thought to be related to the disruption of the circadian rhythm and the decrease in daytime rest sleep (7). Similarly, constantly changing shifts negatively affect the mental health of emergency physicians. According to these adverse impact, some recommendations have been made by the American College of Emergency Physicians (ACEP) regarding shiftworks. ACEP recommends that shifts should be planned in accordance with the principles of circadian rhythm whenever possible (8). The policy statement affirms that, whenever possible, excessively long shifts or excessively long consecutive night shifts should be avoided and that such shifts should last twelve hours or less. It strongly recommends that healthcare workers should rest for at least 24 hours until the next working day (8). Being in the frontline, deprivation of sleep, demanding shiftwork schedule are factors leading emergency medicine (EM) HCP to bournout, and anxiety. EM residents in our ED routinely used to work in 12-hour day and night shifts. According to residents demands and with the decision of the academic board, the shiftwork was changed to 24-hour shiftwork periods and 48-hour rest periods. Organizational changes in shift scheduling provide rare opportunities for investigating the effects of such changes on health and wellbeing.

We aimed to evaluate the effects of a transition from 12-hour to 24-hour shiftwork rosters in EM residents on burnout and anxiety.

Materials and Methods

Study Design

This observational study was conducted in an academic ED in Ankara, Turkey. The study population was composed of EM residents working in the ED. Inclusion criteria were providing direct care to ED patients as an EM resident. Exclusion criteria were being on leave, being on rotational clerckship, having an active psychiatric and mental illness and using drugs. All participants who gave informed consent completed the socio-demographic data form, the Maslach Burnout Inventory (MBI), the Copenhagen Burnout Inventory (CBI) and the State-Trait Anxiety Inventory (STAI). Assessments were collected during the 12-hour shiftwork period and were repeated three months after the transition to 24-hour shiftwork. Physicians routinely worked in 12-hour day and night shifts with 24-hour rest periods, after Ankara University Faculty of Medicine, Department of Emergency Medicine decision, the new shifts were arranged as 24-hour period shifts followed by 48-hour rest periods (Figure 1). Ankara University Faculty of Medicine Human Research Ethics Committee approved the study protocol [IRB: 2021000315 (2021/315)].

Socio-demographic Data Form

This form included demographic data such as age, gender, marital status, children, education, and working and life habits like monthly workload, experience, job satisfaction, turnover intentions, physical activity, smoking, alcohol use, presence of sleep disorders and life habits.

The MBI

MBI was developed by Maslach and Jackson in 1981. This scale aims to evaluate burnout by considering 22 items within three different dimensions: MBI-emotional exhaustion (MBI-EE, 9 items), MBI-depersonalization (MBI-D, 5 items) and MBI-personal accomplishment (MBI-PA, 8 items) (9). While each item is scored between 0 and 6 in the original version of the scale, a 5-point Likert scale is used in the Turkish validation of the scale. Personal achievement 33 and below is high, 34-39 is moderate, and 40 and above is low. Participants with increased burnout are expected to have high scores in MBI-EE and MBI-D and a low score in MBI-PA. The Turkish validation study of this scale was carried out by Ergin (10).

The STAI

The State and Trait Anxiety Inventory was designed and defined by Spielberger et al. (11) to describe current state of anxiety (STAI-S) and stable aspects of anxiety (STAI-T). The inventory allocates 20 items to each of the subscales. The sum of items is calculated, then pre-determined constants (50 for the state, 35 for the trait) are added to yield STAI scores. While interpreting both of the results, there are no cut-off values, but higher scores show greater anxiety and mental toughness respectively. Reliability and validity of the Turkish version of STAI were performed by Oner and Le Compte (12) and Pehlivan (13).

The CBI

The CBI was created in 2005 with the aim of measuring burnout in three subdimensions: personal, CBI-work-related

Figure 1: Flow chart

EM: Emergency medicine

(CBI-WR) and CBI-patient related (CBI-PR) related burnout (14). The 19 items of the CBI are rated on a 5-point scale from 1 (never) to 5 (always) or from 0 to 100 points, with high scores indicating high levels of burnout. A Turkish validity and reliability study of the scale was performed by Deliorman et al. (15).

Analysis of Data

Statistical analysis was performed using SPSS version 26.0. Descriptive statistics of categorical variables were expressed as number and percentage. Descriptive statistics of numerical variables were presented as mean $\pm$ standard deviation for normally distributed or median (min.-max.) for non-normally distributed variables. A normal distribution was found among the dependent groups (Shapiro-Wilk n<50, p>0.05) and our numerical variables were evaluated with the paired samples t-test. Statistically, p<0.05 was considered significant. For bivariate correlations, the Pearson correlation coefficient was used, and p-values lower than 0.05 were considered as statistically significant.

Results

Demographic Data

Twenty EM residents were included in our study. Sixteen of the participants were male (80%) and 4 of them were female (20%). The mean age was 28.8±2.2 (range 24-32). Seventeen (85%) of the participants voluntarily choosed medical school. Twelve (60%) of the residents listed the EM residency program at the top of wish list after medical school. While 11 (55%) of the EM residents were married, 9 (45%) were single. Among those who were married, 91% of the spouses were working, and 63% were also healthcare workers (Table 1). The descriptive demographic data are given in Table 1. The mean, standard deviation, and p-values for burnout and anxiety scores are shown in Table 2.

MBI, CBI, STAI

In this study, which we conducted on 20 volunteer EM residents, we investigated whether two different types of shiftwork differ in the levels of anxiety and burnout. The MBI, CBI, STAI scores were used.

Baseline STAI, MBI, and CBI scores were examined between genders. CBI-WR and CBI-PR scores were statistically higher in female than male residents but no significant difference was found in Copenhagen personal scores (Figure 2). The CBI score was found to be 53.9±16 in male gender and 80.2±10 in females, and it was found to be statistically significantly higher in women (p<0.05). The CBI-WR score was significantly lower with 54.2±14.5 in male residents than female residents who had a mean score of 80.3±6.2 (p<0.05). CBI-PR score were found to be 55.5±19.4 in male and 88.5±7.9 in female (p<0.05).
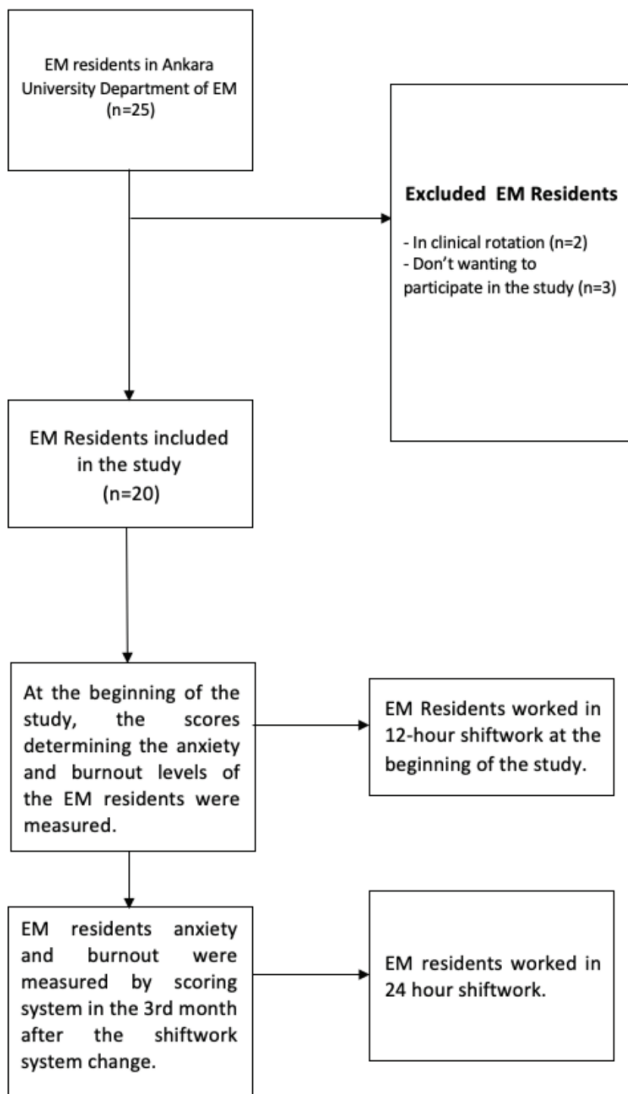
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MBI-EE and MBI-PA scores were found to be significantly higher in female gender (Figure 3). There was no statistical difference in MBI-D scores and total MBI score among male and female residents. There was no statistically significant difference between genders on STAI scores (p>0.05).

Baseline STAI, MBI and CBI scores were evaluated according to the presence of sleep disorders in the residents included in the study. The CBI, the CBI-PA was significantly higher in residents stating to have sleep disorders respectively 63.5±16, 60.8±20.9 (p<0.05) (Figure 4).

Table 1: Demographic information of physicians participating in the study	
Volunteer physicians (n=20)	**Descriptive statistics**
Age (mean ± SD)	28.85±2.2
Residency duration (years) median (min.-max.)	2.75 (1-5)
Professional experience (years) (mean ± SD)	3.6±1.6
Average sleep time per day (hours) Median (min.-max.)	7 (5-11)
Sleep disorder [n (%)] Yes No	17 (85%) 3 (15%)
Smoker [n (%)] Yes No	9 (45%) 11 (55%)
Chronic diseases? [n (%)] Yes No	3 (15%) 17 (85%)
Regular medication? [n (%)] Yes No	3 (15%) 17 (85%)
Alcohol [n (%)] Yes No	10 (50%) 10 (50%)
Sport practice [n (%)] Yes No	13 (65%) 7 (35%)
Willing to go to medical school [n (%)] Yes No	17 (85%) 3 (15%)
EM as first choice for residency [n (%)] Yes No	12 (60%) 8 (40%)
Married [n (%)] Yes No	11 (55%) 9 (45%)
Spouse working? [n (%)] Yes No	10 (91%) 1 (9%)
Married to healthcare professional? [n (%)] Yes No	7 (63.63%) 4 (36.37%)
SD: Standard deviation, n: Number of residents, EM: Emergency medicine	

No statistically significant difference was found between age, marital status, alcohol use, smoking, routine practice of sports, history of chronic disease, and other demographic characteristics and scores (p>0.05). The correlation analysis between the scales evaluated at the beginning of the shift transition and three months after, and the demographic information of the physicians was evaluated. As a result of the analysis, a correlation was found between the thought of changing medical specialty and STAI score (r=0.64, p<0.05).

CBI score was 59.14±18.29 in the 12-hour shift system, it was found to be 44.5±17.96 in the 24-hour shift system, and the CBI score was found to be statistically significantly lower in the 24-hour shift system (p<0.05). CBI-personal score was 38.04±18.01 in the 24-hour shift system and 56.45±22.28 in the 12-hour shift system. The CBI-personal score was found to be significantly lower in the 24-hour shift system. The CBI-WR score was scored as 48.46±16.6 in the 24-hour shift system. It was found to be statistically significantly higher in the 12-hour shift system, and it was found to be 59.46±16.96 (p<0.05). While the CBI-PR score was 45.09±20.74 in the 24-hour shift system, it was found as 62.08±22.16 in the 12-hour shift system. In the 24-hour shift system, the patient-related CBI score was statistically lower (p<0.05) (Table 2).

Maslach score was determined as 51.2±7.15 in the 12-hour shift system and 41.85±7.5 in the 24-hour shift system, and it was statistically lower in the 24-hour shift system (p<0.001). MBI-EE score was 22.35±6.54 in the 12-hour shift system, it was found to be 14.5±7.39 in the 24-hour shift system, and it was lower in the 24-hour system (p<0.001). MBI-D score was determined as 6.5±4.04 in the 24-hour shift system, and 9.55±3.67 in the 12-hour shift system. In the 24-hour shift system, MBI-D score was found to be statistically significantly lower (p<0.05). There was no statistical difference between the two groups in the MBI-PA score in 24-hour and 12-hour shift systems (p=0.24) (Table 2).

STAI-S score was found to be 46.35±12.73 in the 12-hour shift system, this score was 37.15±9.25 in the 24-hour shift system. This score, which was lower in the 24-hour shift system, was also found to be statistically significant (p<0.05). STAI-T score was 43.25±9.2 in the 12-hour shift system and 39.5±7.22 in the 24-hour shift system. This scoring calculated in both working systems is statistically significant in the 24-hour shift system (Table 2).

Discussion

EDs are one of the mostbusy places in any hospital with high workload due to continuous demand and overcrowd. In such an environment, mental fatigue as well as physical fatigue in HCP are inevitable (16). For this reason, it is important to

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protect and improve the mental well-being of HCP (8). The high level of burnout in emergency residents has also been shown in previous studies (17,18), and it was thought that this situation was ignored due to the high level of professional satisfaction (19).

In our study, scores affecting mental well-being levels among EM residents working in Ankara University EM Department were measured. It was determined that transition to the 24-hour shiftwork shift decreased the burnout and anxiety levels in residents when compared to the previous 12-hour shiftwork.
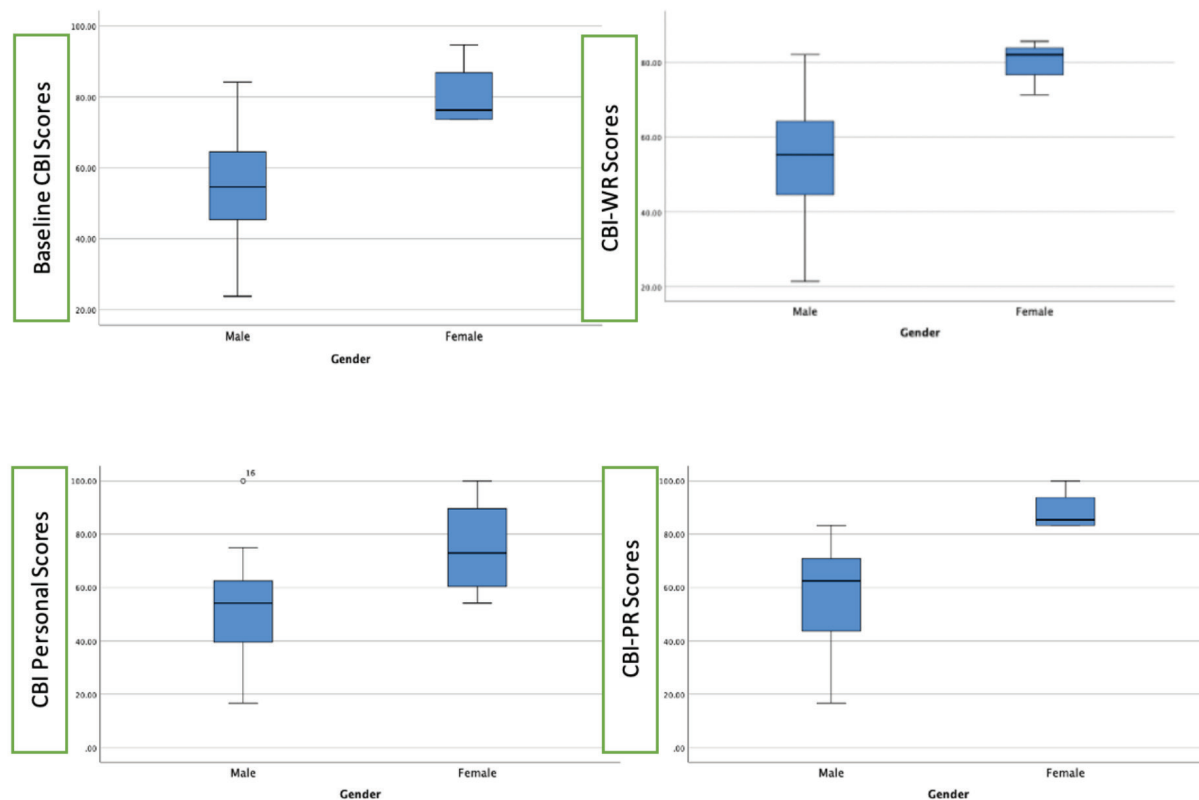

Figure 2: Baseline Copenhagen Burnout Inventory scores according to gender

CBI: Copenhagen Burnout Inventory, CBI-WR: Copenhagen Burnout Inventory-work related, CBI-PR: Copenhagen Burnout Inventory-patient related

Table 2: Statistical analysis of scoring before and after working system change transition to 24-h shiftwork

Scales	12-hour shiftwork		24-hour shiftwork		p-value
	Mean	**SD**	**Mean**	**SD**	
CBI	59.14	18.29	44.50	17.96	**p<0.05**
CBI-Personal score	56.45	22.28	38.04	18.01	**p<0.05**
CBI-WR	59.46	16.96	48.46	16.60	**p<0.05**
CBI-PR	62.08	22.16	45.09	20.74	**p<0.05**
MBI	51.20	7.15	41.85	7.50	**p<0.001**
MBI-EE	22.35	6.54	14.50	7.39	**p<0.001**
MBI-D	9.55	3.67	6.50	4.04	**p<0.05**
MBI-PA	18.80	5.32	20.75	5.04	p=0.24
STAI-S	46.35	12.73	37.15	9.25	**p<0.05**
STAI-T	43.25	9.20	39.50	7.22	**p<0.05**

Paired samples t-test, p<0.05 value was considered significant.
SD: Standard deviation, CBI: Copenhagen Burnout Inventory, CBI-WR: Copenhagen Burnout Inventory-work related, CBI-PR: Copenhagen Burnout Inventory-patient related, MBI: Maslach Burnout Inventory, MBI-EE: Maslach Burnout Inventory-emotional exhaustion, MBI-D: Maslach Burnout Inventory-depersonalization, MBI-PA: Maslach Burnout Inventory-personal accomplishment, STAI-S: State and Trait Anxiety Inventory State, STAI-T: State and Trait Anxiety Inventory Trait

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A total of 58,451 patients were admitted to our clinic in 2021. On average, the number of patients admitted daily was 160. Residents don't have standardized and determined breaks and rest periods, both in shiftwork and 24-hour work. Due to the nature of EM, there is no opportunity to sleep, break and rest in both working modes due to patient admissions that continue for 24 hours, and we think that this study can only be a guide for EM clinics.

Although the number of residents may vary in the working schedules of the physicians working in the Department of EM, Ankara University, there is an average of 7 residents per shiftwork and 24-hour shift. Each of the residents has their own regions in the ED and they evaluate the patients who are

suitable for their duty regions, but the residents worked in other regions, respectively, in the following working days (trauma, triage, etc.). In our study, residents' anxiety and burnout scores were evaluated using the mean and standard deviation data, and we prevented the bias that this situation might cause.

In our study, the decrease in burnout and anxiety levels after shift transition was found to be statistically significant. In the Maslach Personal Success Score and Continuity-Trait Anxiety Scale scoring, no difference was found after the transition. At the same time, sleep disorders and being a female were found to be associated with increased burnout and anxiety levels. However, in the current literature, there is also a study in which male gender is evaluated as a risk factor among HCP (20).
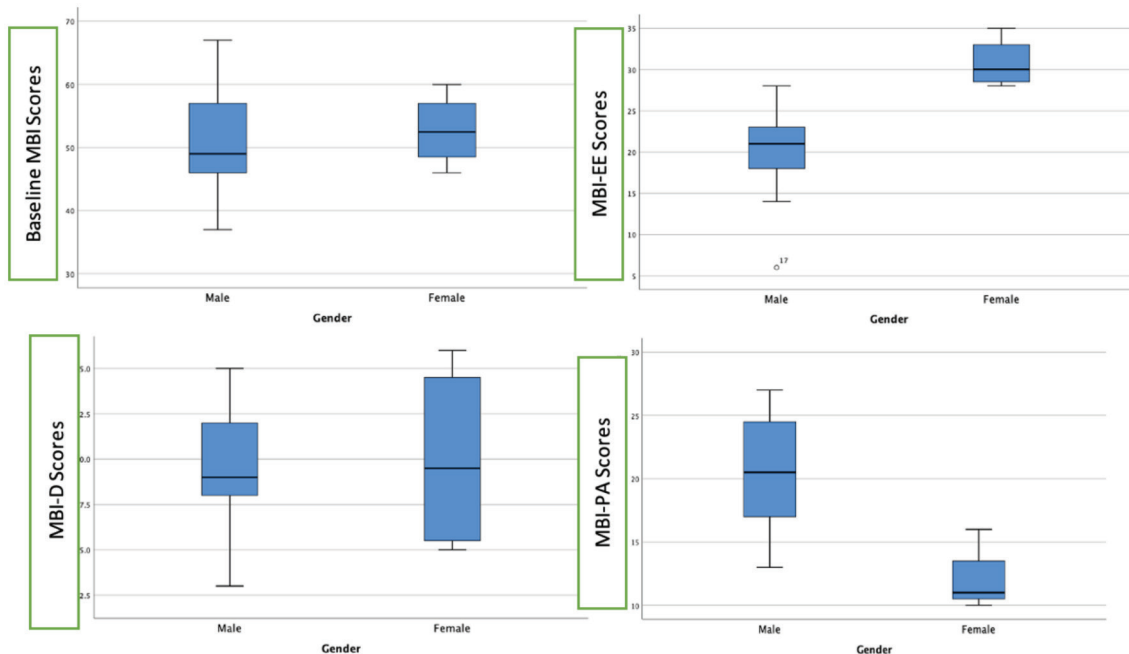

Figure 3: Baseline Maslach Burnout Inventory scores according to gender

MBI: Maslach Burnout Inventory, MBI-EE: Maslach Burnout Inventory-emotional exhaustion, MBI-D: Maslach Burnout Inventory-depersonalization, MBI-PA: Maslach Burnout Inventory-personal accomplishment
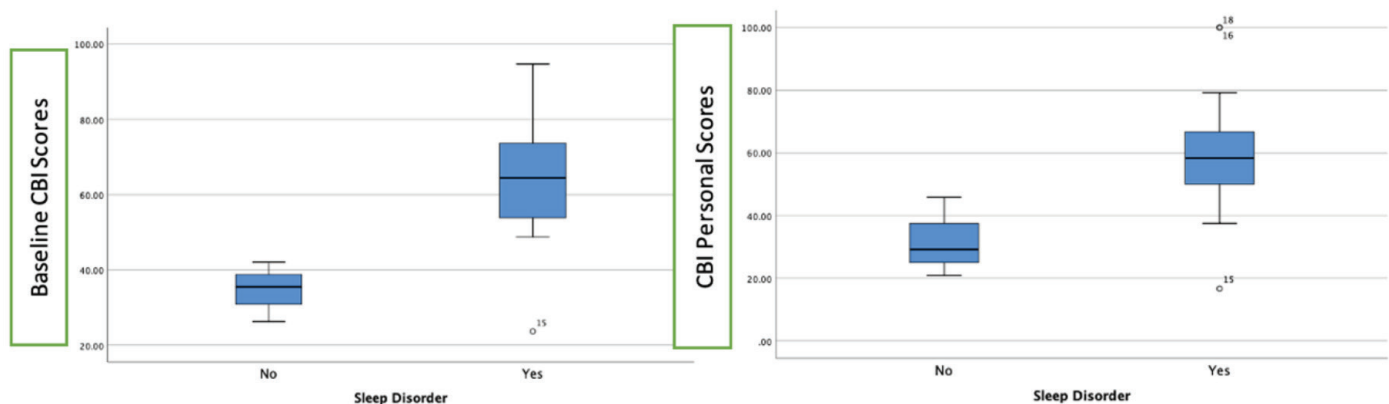

Figure 4: Baseline Copenhagen Burnout Inventory scores according to the presence of sleep disorder

CBI: Copenhagen Burnout Inventory

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The thought of changing residency to another specialty, which is quite frequent in novice EM residents, was found to be associated with anxiety and burnout. Therefore, the mental health of residents should be frequently evaluated at the institutional level. Thus, early detection of the situation may avoid deterioration of residents' mental health and prevent its effects on the healthcare system (8).

Many studies have been carried out by ACEP to protect the mental health of emergency physicians and residents and policies establishing current measures and standards to be taken in this regard have been published (8). Previous studies advice that work schedules of physicians and HCP should be implemented according to circadian rhythm and by considering rest periods (5,8,21). Consistent with our study, it was reported that long shifts on consecutive nights should be avoided (10).

Twelve-hour shiftwork is a frequently opted schedule system among high volume EDs. On the other hand, in the 24-hour shift system, HCP have longer rest periods away from the busy emergency room environments. We believe that the mainstay of the significantly reduced burnout and anxiety levels among the residents after the 24-hour transition is based on having longer rest periods. Similarly, in their study, Martinez et al. also emphasized the importance of the rest period after work (22). We think that our study is important because it is very difficult to standardize the rest, sleep and breaks of emergency physicians. In our study, we think that the fact that the rest periods of the physicians were longer in the 24-hour shift system, ignoring the time they were in the hospital, caused the burnout and anxiety in this system to be lower.

In our study, only the changes in the shiftwork system were made on the same physicians and the change in burnout and anxiety in the emergency physicians was measured after the standardization of other conditions. Residents with psychiatric problems and/or under medication were excluded. The study most similar to ours was conducted by Burch et al. (23) and was carried out on HCP who work only during the day or only during the night. In the cross-sectional study conducted by Shaikh et al. (24), a relationship was found between working hours of hospital staff and increased levels of burnout.

Strength and Limitation

Since the change of the shiftwork system in our study was made after the intense working period during the COVID-19 pandemic period, the 24-hour shiftwork system with a longer rest period may have reduced the burnout on physicians. We think that the long rest period in the 24-hour shiftwork system, the increase in the time spent at home and the increase in the time spent with family are important parameters affecting the outcome of the study. Moreover, we believe that investigating

effects of organizational changes in shiftwork scheduling is a rare opportunity, that makes our results more valuable when considering residents' health and wellbeing.

Study Limitations

The number of participants in our study was small, and our sample size was our biggest limitation. A study on a larger population will provide more reliable information. In addition, a study that includes other health professionals other than doctors is very important in determining whether there is a difference in burnout levels between groups. Since these scores on residents were not face-to-face, their reliability can be questioned. Finally, there are many factors affecting anxiety and burnout among physicians outside of work, that could not be standardized. In addition, a study that includes other health professionals other than doctors is very important in determining whether there is a difference in burnout levels between groups. Since these scores on residents were not face-to-face, their reliability can be questioned. Finally, there are many factors affecting anxiety and burnout among physicians outside of work, that could not be standardized.

Conclusion

Our study is the first study in the literature to measure anxiety and burnout by making changes in the working conditions of the same residents during the SARS-COV-2 pandemic period. In our study, it was determined that the anxiety and burnout of the residents working in Ankara University EM Department were quite high, and it was absolutely necessary to make schedule arrangements in order to support well-being of residents. A statistically significant improvement was observed in anxiety and burnout after the transition to 24-hour shiftwork. According to our results, we may advice other academic ED to opt for a 24-hour shiftwork, especially in outstanding conditions like pandemics since it offers longer rest period to residents.

Ethics

Ethics Committee Approval: Ankara University Faculty of Medicine Human Research Ethics Committee approved the study protocol [IRB: 2021000315 (2021/315)].

Informed Consent: Informed consent was obtained.

Peer-reviewed: Externally peer-reviewed.

Authorship Contributions

Concept: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E., Design: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E., Data Collection or

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Processing: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E., Analysis or Interpretation: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E., Literature Search: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E., Writing: A.K., Ö.Y.E., A.G., A.B.O., S.G., O.P., M.G.E.

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