

EFFECT OF SHIFT WORK IN INTENSIVE CARE ON ATTENTION DISORDER IN NURSES

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Abstract

Aim: The purpose of this study is to determine the level of attention between shifts and to make recommendations about the regulation of shifts. **Methods:**The researchers applied the Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A), Pittsburgh Sleep Quality Index (PSQI) and Stroop color word interaction test (SCWI) in 72 intensive care workers working in different shifts. **Result:** The study included a total of 72 participants, including 30 (43.3%) females and 42 (58.3%) males. There were statistically significant differences between the groups in the sub-items of the HAM-D and SCWI test (Table 3). There was a significant elongation in the night shift employees at all times within the SCWI sub-items. A significant height in the number of errors and corrections in the cards applied in the continuation of the test was also determined in the night shift group. **Conclusion:** This study revealed a significant decrease in the level of attention in the night-shift compared to the day-shift. This increase in attention deficit may also be a preventable cause of increased mortality in the night-shift. What is already known about this topic? * Mortality rates in intensive care units are higher than in other clinics. What this paper adds? * Our study reported significantly poor results of the SCWI test in the night-shift compared to the day-shift. The implications of this paper: * This study revealed a significant decrease in the level of attention in the night-shift compared to the day-shift. We believe that it will be beneficial to shorten the shift times, to keep the number of patients per staff at international standards, to set active rest periods and to plan personnel and hours to reduce the lack of attention observed in the night shift. **KEYWORDS** Attention, healthcare worker, night-shift, intensive care

Summary statement

What is already known about this topic?

Mortality rates in intensive care units are higher than in other clinics.

What this paper adds?

Our study reported significantly poor results of the SCWI test in the night-shift compared to the day-shift.

The implications of this paper:

This study revealed a significant decrease in the level of attention in the night-shift compared to the day-shift. We believe that it will be beneficial to shorten the shift times, to keep the number of patients per staff at international standards, to set active rest periods and to plan personnel and hours to reduce the lack of attention observed in the night shift.

Keywords

Attention, healthcare worker, night-shift, intensive care

Introduction

Intensive care units are the units that provide uninterrupted health services for the treatment of critically ill patients. Although the indications for hospitalization in intensive care units include departmental and diagnostic differences, the criticality of the patient's condition is considered a general-accepted reason for hospitalization. The general international rule is that qualified and certified healthcare professionals should work in intensive care units. In this regard, our country and many other countries provide in-service trainings and try to increase the number of qualified health personnel.

Mortality rates in intensive care units are higher than in other clinics. Studies have found different mortality rates, ranging from 8 to 30%¹⁻³. Common causes of mortality include respiratory diseases, coronary heart diseases, infectious causes, and cerebrovascular diseases^{1,4}. There are studies reporting higher rates of mortality in intensive care units in the night-shift and at the weekend shifts compared to the weekday day-shift⁵⁻⁸. In these studies, the leading causes of mortality included insufficient number of healthcare professionals, difficult access to invasive procedures, and the presence of cases with high mortality rates, etc.

There are studies in the literature reporting that the level of attention decreases in night shifts. In a study, Yıldız et al⁹ revealed lower scores of the visual attention test for women working in the night-shift compared to those working in the day-shift. In another study, Osterode et al. found a decrease in cognitive functions in the night-shift in the visual memory test applied to physicians.

In health care services in our country, the night-shift usually starts from the end of the day-shift at 16.00 and continues until the beginning of the day-shift at 08.00. In case of insufficient number of healthcare professionals, the duration of the shift can be extended up to 24 hours. For healthcare professionals working in the Intensive Care Units at the Gazi Yaşargil Training and Research Hospital, which is the center of our research, the night-shift covers sixteen hours from 16.00 to 08.00 on the next day. The day shift group was selected from nurses working in the day shift for the past month. Thus, it was aimed to exclude the possibility of shift-related deterioration in sleep rhythm and hormonal balance in day-shift workers.

Materials and Methods

The present study was conducted on nurses working in the reanimation unit and internal medicine, coronary and neurology intensive care units at Gazi Yaşargil Training and Research Hospital between January 20, 2020 and March 20, 2020. The sample of the study was selected from nurses working in intensive care units, independent of all other departments in the hospital. The day-shift group included nurses working from 08.00 to 16.00, and the night-shift group included nurses working from 16.00 until 08.00 on the next day.

The study included a total of 80 volunteers, including 40 day-shift and 40 night-shift employees, by getting their informed consent and giving information that they can leave the research at any time. The data of the five volunteers were excluded due to their declaration of requesting to leave the study. The study excluded a volunteer because of declaring the use of benzodiazepine, which is likely to impair executive functions, after participation in the study and 2 volunteers due to incomplete completion of the scale. The data of 72 volunteers, 31 in the day-shift and 41 in the night-shift, were included in the evaluation.

The demographic data of the sample groups were obtained by the sociodemographic data form prepared by the researchers. The researchers applied the Hamilton Depression Rating Scale (HAM-D), Hamilton Anxiety Rating Scale (HAM-A), Pittsburgh Sleep Quality Index (PSQI) and Stroop color word interaction test (SCWI) in both groups. All tests were performed at 15:00 in the day-shift group and at 7:00 in the night-shift group. Thus, tests were applied in both groups one hour before the end of the shift.

Evaluation

The Hamilton depression rating scale measures the level and the change in severity of depression. It contains seventeen questions, scored between zero and four, providing the highest total score of 51.

Hamilton anxiety rating scale was prepared by Hamilton (1959)(Hamilton, 1959) to determine the level of anxiety and distribution of symptoms and to measure the change in severity. It consists of 14 items that question both mental and physical symptoms.

The Pittsburg sleep quality index was developed by Buysse et al (1989)¹¹ PSQI is a 19-item self-report scale that evaluates sleep quality and disorder in the last month.

Stroop color word interaction test (SCWI) is a neuropsychological test that reflects the activity of the frontal region. It measures the ability to suppress a habitual behavior pattern and execute unusual behavior, which are among the frontal lobe functions. SCWI task and related tests are accepted as the golden standard for measuring attention level in the literature.¹²

Statistical Analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software version 22.0 (SPSS, Chicago, Ill., USA). Analysis of categorical data was performed using Chi-square test. The Student's t-test for paired groups was used to analyze quantitative data. A p value of <0.05 was considered statistically significant.

Ethical Approval

This study was approved by the ethics committee of Gazi Yaşargil Education and Research Hospital with the decision numbered 410 and dated January 17, 2020. Written informed consent was obtained from all participants at each stage of the study.

Results

The study included a total of 72 participants, including 30 (43.3%) females and 42 (58.3%) males. Analysis of sociodemographic data did not show a significant statistical difference between groups. Most of the participants lived with their families (76.4%). In 88.9% of the participants, there was no previous application for psychiatry outpatient clinic. In the remaining socio-demographic data, there was no statistically significant difference between the groups (Table 1).

There were no significant difference between the groups in terms of tea and coffee consumption. This was important in that the cognitive test applied eliminated the possibility of being affected by psychostimulant intake, such as caffeine. There was no significant difference in the remaining sociodemographic data (Table 2).

There were statistically significant differences between the groups in the sub-items of the HAM-D and SCWI test (Table 3). There was a significant elongation in the night shift employees at all times within the SCWI sub-items. A significant height in the number of errors and corrections in the cards applied in the continuation of the test was also determined in the night shift group. This indicates that cognitive impacts are higher in night shift workers.

Although there were a difference in PSQI and HAM-A scores between groups, this difference was not statistically significant (Table 3).

Discussion

Human physiology is arranged to sleep at night and to be awake in the daytime. This can be evidenced by hormones released in the circadian rhythm. Among these hormones, melatonin is released during nighttime sleep, but not during daytime sleep. Sudden changes in melatonin release can produce a jet-lag-like condition, resulting in a disruption in human mental health and sleep rhythm. Similarly, the shift system that requires staying awake at night can affect sleep physiology and many other hormonal mechanisms. Studies have reported that the night-shift can be associated with a wide range of negative conditions, from decreased visual acuity, lack of attention and sleep disorders to psychiatric comorbidities.

There are many studies on psychiatric disorders associated with nighttime insomnia. These studies addressed problems such as impaired sleep physiology, decreased quality of life, depression and anxiety disorders. However, there is no study literature investigating the concentration and maintenance of attention in healthcare professionals in intensive care units and the risks that might otherwise arise for patients.

The necessity of providing uninterrupted health care services worldwide requires many healthcare professionals to work in the night-shift system. It would not be wrong to say that health problems associated with night-shifts can also be seen in healthcare workers.

As per their duties, healthcare professionals are responsible for carefully monitoring the vital signs of patients and correcting potential disorders. These disorders may be respiratory or cardiac problems that require immediate action. The timely recognition and correction of these situations is directly related to the ability of healthcare professionals to collect and maintain their attention.

Indeed, in a study on shift-working nurses, Zion et al.¹³ reported poorer results of cognitive function tests at 3am than at 7am, suggesting that the night-shift caused a disruption in cognitive functions during night hours. Our study also reported significantly poor results of the SCWI test in the night-shift compared to the day-shift. This study has shown that a more regular circadian rhythm, attention-enhancing activities (visit, patient relatives visit, patient care, etc.) and a higher concentration of people in the day-shift than at night-shift, may result in faster collection of the attention and increased ability to focus due to the greater number of stimuli. Lack of stimuli and deterioration of sleep rhythm may result in distraction and loss of vital data that may require immediate attention. This highlights the patient-related causes of high mortality in the night-shift, as well as factors associated with healthcare professionals. As a result, deaths due to health personnel are among the preventable causes of death.

Studies that prove a decrease in attention level in night-shift workers also draw attention to the cases of self-injury due to carelessness in healthcare workers. Niu et al.⁵ applied the D2 test to nurses working in 3 shifts (day-, evening-, and night-shift), and reported an increase in selective error rate and a decrease in attention level in the night-shift. In this study, there was a day-shift group including nurses working from 08.00 to 16.00 and a night-shift group including nurses working from 16.00 until 08.00 on the next day. Given the longer duration of the night-shift (16 hours), the longer duration of the night-shift (16 hours), it is suggested that the decrease in the attention level of workers in the night-shift may be due to longer periods of work and sleeplessness. The longer duration of the night-shift in this study shows the potential higher rate of poor results when compared to the working hours in the studies by Niu et al.⁵. SCWI test showed a significant deterioration in duration, error and correction scores in the night-shift group, which seems to be consistent with the data of the literature studies.

Apart from the reduction in the attention level, it is also scientifically possible to predict an increase in the level of fatigue among night-shift workers. The study by Thompson et al.¹⁴ can be considered as proof of this prediction. It was reported in this study that performance-based fatigue increased in those working in the night-shift compared to those in the day-shift. It should not be ignored that serious risks may arise for both the patient and the healthcare professionals in case of a decrease in the level of attention in addition to the increase in fatigue. It should be remembered that there may be errors in the regulation of treatments, as well as an increased risk of self-injury in healthcare workers. It can be argued that the risk of injury to patients or healthcare workers will be higher for the night-shift group in our study, given the longer duration of the night-shift in our study (16 hours) compared to the duration of the night-shift (12 hours) in the study by Thompson et al.¹⁴

The imbalance of melatonin levels are known to be involved in the etiology of depression^{15,16}. A study of hormonal changes reported a decrease in melatonin levels and an increase in inflammatory markers in night-shift workers^{17,18}. Depending on the imbalance of melatonin levels, a depressive mood becomes inevitable in the night-shift employees. In our study, a significant difference in the scores of Hamilton depression scale between the employees working in the night-shift and day-shift was found to be compatible with the literature. Although Gumenyuk et al.¹⁹ reported a disturbance in sleep quality as well as distraction in night-time healthcare workers, there was no difference between the groups in our study in terms of the results of PUKI, a test that assesses sleep quality. The difference between the sleep quality scores of our study and the study by Gumenyuk et al.¹⁹ can be attributed to differences in sample size. Gumenyuk et al. used a total of 28 subjects in two groups.

This study was planned based on the hypothesis that a decrease in attention levels may have a significant effect on patient mortality. Literature studies have reported higher mortality rates in nighttime and weekend shifts in patients hospitalized in intensive care units. Although the researchers have tried to attribute high mortality rates to factors such as diagnostic and interventional disruptions, there is an overlook of the high rate of factors that make it difficult to collect attention during the weekend and night-shifts. Attention levels can be negatively affected by factors such as lower concentration of people and longer shift times during weekend and night-shifts, which is believed to contribute to an increase in mortality rates. In addition, the lower number of employees in night and weekend shifts should not be overlooked. The excessive number of chief nurses, support staff, clinicians and intensive care physicians during the day-shift causes the distribution of the burden of patient care. However, we believe that the absence of support staff in the night-shift, the decrease in the frequency of intensive care visits by the physician working in multiple units, and the excess of the number of patients per nurse also contributes to the reduction of attention by increasing the workload.

This study revealed a significant decrease in the level of attention in the night-shift compared to the day-shift. We believe that it will be beneficial to shorten the shift times, to keep the number of patients per staff at international standards, to set active rest periods and to plan personnel and hours to reduce the lack of attention observed in the night shift.

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	Day-shift n (%)		Night-shift n (%)		Total n (%)		X ² p
Gender Female	17 (56.7)	14 (33.3)	13 (43.3)	28 (66.7)	30 (41.7)	42 (58.3)	3.886 0.58
Male							
Marital status	13 (33.3)	18 (54.5)	26 (66.7)	15 (45.5)	39 (54.2)	33 (45.8)	3.280 0.95
Single Married							
Lives with Family / spouse-child Alone	24 (43.6)	7 (41.2)	31 (56.4)	10 (58.9)	55 (76.4)	17 (23.6)	0.032 1
Psychiatric Admission Yes No	3 (37.5)	28 (43.8)	5 (62.5)	36 (56.3)	8 (11.1)	64 (88.9)	0.113 1

Table 1 : Analysis of the socio-demographic data of the participants

	Day-shift n (%)		Night-shift n (%)		Total n (%)		X ² p
Gender Female	17 (56.7)	14 (33.3)	13 (43.3)	28 (66.7)	30 (41.7)	42 (58.3)	3.886 0.58
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Psychiatric Admission Yes No	3 (37.5)	28 (43.8)	5 (62.5)	36 (56.3)	8 (11.1)	64 (88.9)	0.113 1

Table 2: The sociodemographic data of the groups and the frequency of psychoactive products taken while

on duty. No statistically significant difference was found between the data.

	Day-shift n (%)	Night-shift n (%)	Total n (%)	X ² p
Gender Female	17 (56.7) 14 (33.3)	13 (43.3) 28 (66.7)	30 (41.7) 42 (58.3)	3.886 0.58
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Table 3: The relationship between HAM-D, HAM-A, PSQI and Stroop data between groups. HAM-D: Hamilton Depression scale, HAM-A: Hamilton Anxiety Scale, PSQI: Pittsburg Sleep Quality Index SCWI: Stroop color word interaction test *: $p < 0.05$ **: $p < 0.01$, ***: $p < 0.001$