

Relation between subjective sleepiness and changes in some vital signs among the clinical night workers

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ABSTRACT

Background: Individuals with shift work sleep disorder are at risk for significant behavioral and health related such as emotional, psychological, and somatic issues. Sleeping problems in the health-care workers can lead to medication error incidents, resulting in undesired patients' safety. **Objective:** The aim of this study was to assess the relationship between the subjective sleepiness and changes in some vital signs of the night shift health care workers. **Materials and Methods:** This was a cross-sectional and descriptive-analytical study that has been done in a hospital in Iran, 2017. Clinical staffs were as the study population; all of them were in shift working schedule. Seventy-nine personnel were selected in random. Data gathered using a researcher-developed demographic questionnaire and Stanford Sleepiness Scale to measure the intensity of the sleepiness. Data were analyzed using *t*, ANOVA, and Pearson's tests by SPSS V20. Responders were aged 35.24 ± 6.35 (mean \pm standard deviation) years. **Results:** Staff had the lowest amount of sleepiness at around 22:30 and the highest at the end of the shift. Sleepiness was significantly correlated with age, work experience, and body mass index (BMI), and level of education. A significant relationship was observed between age, work experience, BMI, and education level ($P < 0.05$). Beat and breath rates were in diverse and significant relationship with sleepiness ($P < 0.05$). **Conclusions:** Sleepiness in two studied groups was similar. Sleepiness can decrease beat and breath rates, so decision makers should pay attention to physical health of staffs, especially on health-care centers to increase staff and patients safety.

Key words: Beat rate, breath rate, clinical staff, shift workers, sleepiness

Introduction

Sleepiness is a major risk factor for serious injury and death in accidents. Sleepiness is a main result of insufficient sleep. Sleepiness, a consequence of insufficient sleep, plays a key role in accidents leading to injury and death.^[1,2]

Several subjective ratings such as Karolinska Sleepiness Scale (KSS), a tool in Likert type can easily be used as alternatives.^[3,4]

Researchers have also used subjective measures where drivers are asked to rate their level of drowsiness either

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verbally or through a questionnaire. These ratings indicate drowsiness intensity.^[5,6] On the other hand, given the public health-care quality, improvement is directly related to occupational and individual factors of these centers' employees.^[7,8] The effect of hospital works on health staffs' performance, communication, and quality of life has been considered in some research projects.^[9,10] Shift work is described as any work regularly done at the time out of the day work time.^[11,12] Evidence indicates that sleep disorder is the major complaint among the staff working at industrial, hygienic, and medical environments based on a shift work system. According to the definition, shift works are the works that regularly should be done out of the traditional working hours.^[11,12] Sleep disorder is the most common complaint reported by the shift workers in industrial, hygiene, and medical environments.^[13] Sleep disorder are likely to be able to affect individuals' general^[14] and mental conditions.^[15,16]

A normal sleep contains 7–7.5 h in a day, whereas a shift worker sleep around 4–6 h as mean, that is, 5–20% lower than the sleep time of day shift workers.^[17] A sleepiness which happens at an undesirable time can also be considered abnormal.^[18] To keep the mental balance, a person needs sleeping, and sleeping disorder is considered as a psychological disease.^[19] The imbalance in the cycle of sleeping-waking^[20] results in inconsistency of the individual's psychological and somatic state, and as a consequence, disorders such as digestive problems, heart problems, panic attacks, hallucination, aggression, poor emotional health, and lack of concentration. An imbalanced sleeping-waking cycle^[20] may result in psychological and somatic disorders including digestive problems, heart problems, panic attacks, hallucination, aggression, poor emotional health, and lack of concentration.^[21]

On the other hand, sleeping problems, associated with the shift working, may cause problems in the vital sleeping problems in the health-care workers can lead to medication error incidents, resulting in undesired patients' outcome. Probability of errors occurred,^[22,23] and then accidents^[24] among people working in shift schedules were higher than in other groups, present conditions are encouraging.^[25,26]

Sleep disorders and breathing problem relation has been studied in some researches and their relation was demonstrated. Research shows a significant relation between sleep disorders and breathing problems.^[27] A study was developed to investigate sleep patterns and occupational incidents' history. The relation between sleep patterns and occupational incidents was investigated.^[28]

Sleep disorders associated with shift working are by 10% more among night and rotating shift workers.^[29] Heart rate variability monitoring, alone, or in combination with other physiologic measures can be used in safety devices to warn about drowsy operators.^[30] It has been reported that staff's degree of awareness varies during the different hours of a shift work; as time closes to the last hours of a shift work, the degree of awareness and attention is decreased.^[30]

Objective

This study was aimed to assess sleepiness and its relation with breath and beat rate among the clinical staff at a hospital in Iran.

Materials and Methods

This was a cross-sectional and descriptive-analytical study that has been done in a hospital in Iran, 2012. Clinical staffs were as the study population; all of them were in shift working schedule with an experience of at least for 1 year. Furthermore, they had no history of long-term medicine consumption or working at night work shift for two consecutive nights. Seventy-nine personnel were selected randomly based on the confidence level of 95%, test power of 8%, and absolute error of 25%. The subjects of the present study included all clinical staff's shift who are working with at least 1 year of experience. Those with a history of long-term medicine consumption and those with two consecutive night shifts were excluded from the study. Finally, adopting a confidence level of 95%, a test power of 8%, and an absolute error of 25%, 79 participants were selected in random. Personnel were in two shift work programs.

Data gathered using a researcher-developed demographic questionnaire (age, gender, body mass index [BMI] score, education level, marital status, time of working on shift work system, and smoking)^[31] and Stanford Sleepiness Scale to measure the intensity of the sleepiness. Its validity (0.68) and reliability (0.88) have been proved previously.^[32]

The questionnaires were completed by the group working 8 pm to 3:30 am at 9:00 pm, 10:30 pm, 12:00 pm, 1:30 am, and 3:00 am and by the second group at 9:00 pm, 10:30 pm, 12:00 pm, and 1:30 am. Breath and beat rates were simultaneously monitored directly at the mentioned times.

Pearson's correlation test was used to examine the relationship of the sleepiness variable with BMI score, years of shift work experience, age, and marital status, and *t*-test and ANOVA were employed to compare the

mean values through SPSS V16 SPSSr version 21.0 (SPSS Inc., Chicago, IL). Using Pearson's correlation test, the relationship between BMI score, years of shift work experience, age, and marital status was investigated. T-test and ANOVA were also used to compare the mean values.

Results

Responders were aged 35.24 ± 6.35 (mean \pm standard deviation) years. Nearly 45% of participants were male. The mean years of work experience were 14 ± 3.6 . Married responders outweighed singles with 69.6%. BMIs mean score was 24 ± 3 . Only one participant (1.26%) was a smoker. Furthermore, 57% of the participants had the education degree lower than bachelor. Nearly 36.7% had B.Sc., and people with a degree higher than B.Sc. were in minority (6.33%).

Figure 1 compares the intensity of sleepiness along the shift work time between two groups of working schedules.. Staff had the lowest amount of sleepiness at around 22:30 and the highest at the end of the shift in both groups. Figures 2 and 3 show the changes in beat rate, and Figures 4 and 5 show the changes in breath rate during the shift work time between the two groups.

Difference of sleepiness level among groups of ages (20–30, 30–45, and >45 years) was significant ($P = 0.001$). Furthermore, employees with different BMI (<18.5, 18.5–25, and > 25) ($P = 0.027$) and levels of education (lower than B.Sc., B.Sc., and higher than B.Sc.) depicted significant differences in terms of sleepiness ($P = 0.001$). Sleepiness was also different significantly among participants with various work experiences ($P = 0.001$). No significant difference in sleepiness was identified with respect to marital status ($P > 0.05$). A significant difference was observed in differences of sleepiness level among age groups (20–30, 30–45, and >45) ($P = 0.001$). A significant difference was also observed regarding sleepiness in employees with different BMI (<18.5, 18.5–25, and >25) ($P = 0.027$) and different levels of education (lower than B.Sc., B.Sc., and higher than B.Sc.) ($P = 0.001$). A significant difference was identified in participants with various work experiences ($P = 0.001$). Meanwhile, marital status had no significant impact on sleepiness ($P > 0.05$).

Correlations between sleepiness and age, work experience, and BMI were found to be significant and direct by Pearson ($r = 0.240$ – 0.589 , $P < 0.05$). Beat rate was in diverse and significant relationship with

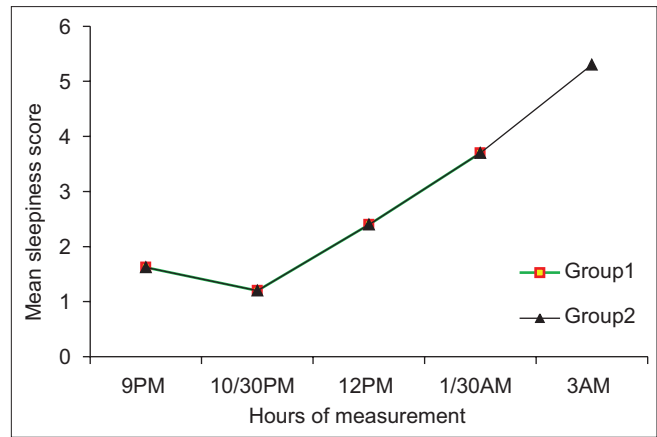


Figure 1: Trends of sleepiness at different work hours of both groups' staff

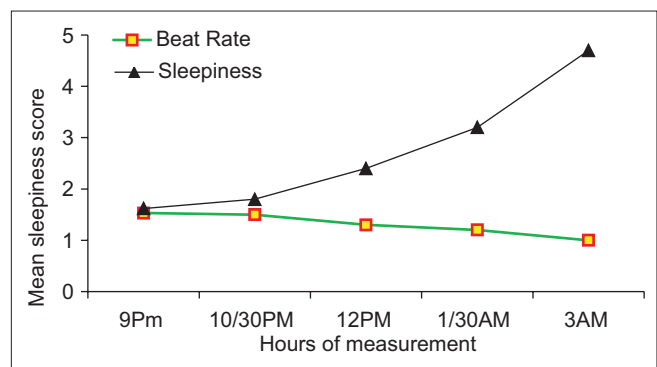


Figure 2: Trends of beat rate regards to sleepiness at different work hours (Group 1)

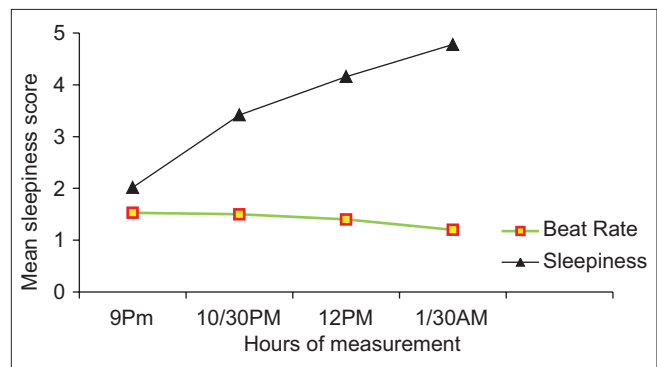


Figure 3: Trends of beat rate regards to sleepiness at different work hours (Group 2)

sleepiness ($r = 0.328$, $P < 0.05$). In addition, breath rate was in negative and significant correlation with sleepiness ($r = 0.199$, $P < 0.05$).

Discussion

Findings represented at 3:00 am could be found the highest level of sleepiness at first and then at 1:30 am. This result is similar to outcomes of a study that tells the maximum drowsiness occurs at 2:00, 4:00, and 6:00 am

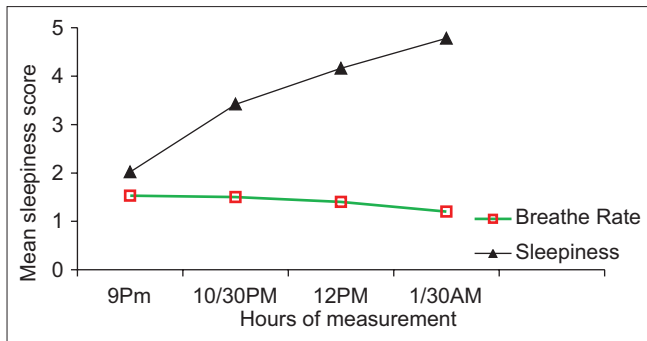


Figure 4: Trends of breath rate regards to sleepiness at different work hours (Group 1)

in night shift. As the findings of the study show, the highest levels of sleepiness happened at 3.00 and 1.30 am, respectively.^[32] Hence, this could be concluded that work shift influences sleeping quality. Melatonin secretion, as a hormone that helps to feel sleepy, is increased in the morning. Therefore, it can be said that work shift affects sleeping quality. The reason is an increase in melatonin secretion, a hormone that causes feeling sleepy, in the morning.^[33] Results of a research among nurses have demonstrated that the melatonin secretion reaches the peak at 4:00 am, and it is significantly higher than at other hours of the day. According to some studies conducted among nurses, melatonin secretion reaches its highest level at 4.00 am.^[34]

As mentioned above, Figures 2-5 illustrate that increased sleepiness leads to a reduction in breath and beat rates. Some documents concluded that changing in heart rate could be used as an alarm to sleepiness,^[35] and sleep disorders are in relation with breathing problem.

Researchers found that there is a direct relationship between work experience on shift working system and drowsiness. A direct relationship was observed between the experience of working in a shift working system and drowsiness; it means more work experience leads to more issues in fitting to shift working. Performance of the shift working employees is negatively affected by sleepiness.^[36] The significant difference in the level of sleepiness among participants with various ages has been shown in the present study it is in line with findings of Härmä *et al.*^[37] Furthermore, there was a significant difference between staff's sleepiness and their BMI as like as some other studies.^[38,39]

Conclusions

Altogether, sleepiness in two studied groups was similar. Although there were some significant differences among demographic groups regards to drowsiness. It is crucial to consider demographic and physiological features of

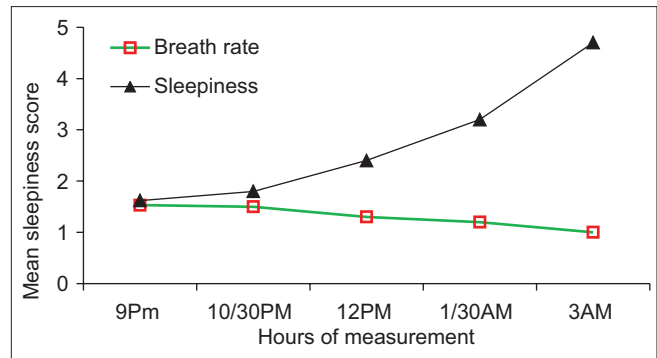


Figure 5: Trends of breath rate regards to sleepiness at different work hours (Group 2)

staff to find suitable individuals for shift working as a main managerial action to minimize shift working systems problems. Sleepiness can decrease beat and breath rates, so decision makers should pay attention to physical health of staffs, especially on health-care centers where nurses are dealing with patients and their own and patient safety would be at risk.

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Conflicts of interest

There are no conflicts of interest.

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