

# Drowsiness trend in night workers and adaptation to night shift in hospital staff

Mohsen Poursadeghiyan<sup>1</sup>, Raze Nabi Amjad<sup>2</sup>, Mohammad Mehdi Baneshi<sup>3</sup>, Mehrdad Farrokhi<sup>4</sup>, Arezoo Poursadeghian<sup>5</sup>, Marzieh Rohani<sup>6</sup>, Mahsa Hami<sup>7</sup>, Alireza Khammar<sup>8</sup>

<sup>1</sup>Psychosis Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, <sup>2</sup>Department of Nursing, School of Nursing and Midwifery, Alborz University of Medical Sciences, Karaj, <sup>3</sup>Social Determinants of Health Research Center, Yasuj University of Medical Sciences, Yasuj, <sup>4</sup>Research Center in Emergency and Disaster Health, University of Social Welfare and Rehabilitation Sciences, Tehran, <sup>5</sup>Student Research Committee, Gonabad University of Medical Sciences, Gonabad, <sup>6</sup>Student Research Committee, Shahid Beheshti University of Medical Sciences, Tehran, <sup>7</sup>Department of Economic Development and Planning, University of Firoozkooh Branch, Islamic Azad University, Firoozkooh, <sup>8</sup>Department of Occupational Health Engineering, School of Public Health, Zabol University of Medical Sciences, Zabol, Iran

## ABSTRACT

**Background:** Nowadays, 24-h performance is an inevitable part in many industries and public services. Night work is a necessity for employees of a main part of labor force. Shift work is considered as working out of usual working hours (about 7–18). **Objective:** The aim of this study is drowsiness trend in night workers and adaptation to night shift in hospital staff. **Materials and Methods:** We used panel method. The studied society belongs to one of the hospitals in Iran. Ninety staffs were selected as samples. To collect sleepiness, data from Stanford Sleepiness Scale demographic information and questionnaire were utilized. The data were analyzed by SPSS software version 22. **Results:** Results show two identical groups of samples have largest degrees over four nights at 5:00 then at 3:00 AM and 1:00 AM. The degree of correspondence of second night was more than the first night. **Conclusion:** These findings can have important applications in increasing the safety and productivity of the workplace and the workers.

**Key words:** Adaptation, hospital staff, sleepiness, work shift

## Introduction

Nowadays, shift workers are engaged in key sectors such as health care, power stations, and military and law enforcement.<sup>[1-6]</sup> Currently, some human resources about 15%-30%, work more than standard daytime hours in developed countries.<sup>[7-9]</sup> Among these, sleeping sicknesses occurs as a common problem because of shift working. Interrupted sleeping in the daytime, impaired function and high rate of car crash are some of the complications of working at night.<sup>[10-13]</sup> The circadian suppression of the metabolism during the night and also circadian interference sleep during the day are responsible for these health issues.<sup>[14]</sup> In the most of the shift work jobs, especially in nuclear power stations or

chemical products factories, safety is an essential issue for workforce and employers. Failure to adjustment could be related to several indicators.<sup>[15]</sup> Factors, such as a central pacemaker and a supra-schismatic nucleus, in the anterior hypothalamus are involved to coordinate circadian rhythms with the external environment.<sup>[16-18]</sup>

The results of a study investigating severe drowsiness demonstrated that the fixed night-shift workers are at a higher risk of complications such as drowsiness, social anxiety, and family conflict compared to the fixed day-shift workers. In addition, shift work could lead to sleep problems in individuals, which in turn could

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## Correspondence:

Dr. Mehrdad Farrokhi, Research Center in Emergency and Disaster Health, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.  
E-mail: me.farrokhi@uswr.ac.ir

expose them to health issues and behavioral disorders. The sleep problems have been found among 10% of workers at night shift.<sup>[19]</sup>

Investigation of relationship between work-related injuries and sleep problems in a study demonstrated that some sleep problems at night including insomnia have a positive association with such work-related injuries.<sup>[20]</sup> Sleepiness is main issue in road safety.<sup>[21,22]</sup>

To find an association between the sleep pattern and history of work complications, a cross-sectional study using a questionnaire proved that 26% of 4407 nurses were suffering from sleepiness over the past 12 months, indicating significantly statistical relationship between work complications and drowsiness.<sup>[23]</sup>

### Objective

The present study aimed to investigate the drowsiness patterns in employees working at night-shift work in a certain period.

### Materials and Methods

The sleepiness process during night was evaluated among shift workers within two groups in this study. This level could be reduced after one night adapting to shift work. Study population included the labors in steel manufacturing facilities in Iran in which 93 shift workers voluntarily participated in the study by signing informed consent form. The advantageous, hazards, and purposes of the study were explained to them who had right to discontinue the study at any time. This study was conducted with approval of the Ethics Committee of University of Social Welfare and Rehabilitation. At the final analysis, three workers out of the total participants were excluded due to personal problems. The repetitive work schedule of participants included 8 h day shift from 22:00 to 6:00 for 2 days, 2 days break, 8 h morning shift from 6:00 to 14:00 for 2 days and 8 h evening shift from 14:00 to 22:00 for 2 days. Four 15-min rests during the night were allowed to the workers in which Stanford Sleepiness Scale (SSS) was used to evaluate the sleepiness level during the breaks.<sup>[24,25]</sup> The subjective alertness was examined among 90 workers in one night. Then, investigation of demographics' characteristics and mean rate of sleepiness worker divided into two same group's: 2 consequence night worker in Group 1 tested then 2 consequence night worker in Group 2 tested.<sup>[26]</sup>

### Data analysis

We used SPSS 11.5 under Windows XP for statistical analysis SPSS r version 21.0 (SPSS Inc., Chicago,

IL). When the Kolmogorov–Smirnov test confirmed normality, parametric tests were carried out. Using the paired *t*-test, we compared sleepiness between two nights in two groups.

### Results

Ninety participants out of 93 volunteered completed the study. The average breaks had a means length of  $15 \pm 1$  min. The timing of breaks or their frequency did not significantly differ between 2 groups.

All of the participants were male aged between 30 and 36 years.

General information related to the people tested in the research is given in Tables 1 and 2.

According to Table 1, there is no significant difference between the age averages, body mass index, years of working, and the level of smoking among both groups of workers attended in the research ( $P = 0.05$ ). Thus, with 99% confidence interval, there is similarity among the studied community. More individual information of both groups is shown in Table 2.

**Table 1: Descriptive of demographic characteristics**

	Mean±SD		P
	The first group	The second group	
Age	30.24±6.36	30.49±5.81	0.850
BMI	24.30±3.19	23.83±2.81	0.458
Years of shift work	4.75±3.32	6.27±3.72	0.054
Smoking rates	1.85±4.41	2.71±5.4	0.413

BMI=Body mass index, SD=Standard deviation

**Table 2: Relative abundance of attended people in the study**

Variable	Group	Subtype	Count	The relative abundance
Marital status	First	Single	10	22.2
		Married	35	77.8
	Second	Single	9	20
		Married	36	80
Educational status	First	Illiterate	1	2.2
		Lower than diploma	12	26.7
		Diploma	27	60
	Second	Higher than diploma	5	11.1
		Lower than diploma	12	26.7
		Diploma	31	68.9
Smoking	First	Higher than diploma	2	4.4
		Nonsmokers	33	73.3
		Smokers	12	26.7
	Second	Nonsmokers	33	73.3
		Smokers	12	26.7

Thus, with 99% confidence interval, there is similarity among the studied community.

**Results of the Average of Sleepiness**

The results of the mean of sleepiness of people in four different times (23:00, 1:00, 3:00, and 5:00) are measured separately in two groups in the base night as shown in Table 3:

In Table 3, a significant difference was detected between two groups.

According to Figure 1, both of the groups have equal level of sleepiness and there is no significant statistical difference.

Figure 1 displays that sleepiness score for two groups is same.

In this sense, we assume that:

- Time 1 = Night one of test of group one
- Time 2 = Night two of test of group one
- Time 3 = Night one of test of group two
- Time 4 = Night two of test of group two

Figures 2 and 3 are comparing sleepiness score between two groups in two nights of shift work.

Figures 2 and 3 display and compare the sleepiness score in two groups and two nights of shift work.

In Table 4, sleepiness score at second night in two groups was significantly less than sleepiness score at first night ( $P < 0.05$ ).

**Discussion**

During the 5 days of study, the steady increase in the sleepiness level was seen at 5:00 h followed by 3:00 h based on the SSS performed at 23:00, 1:00, 3:00, and 5:00 am h. The two groups in this study were matched

in terms of demographic features [Tables 1 and 2]. The same choice of groups in the sense of sleepiness is seen in Figure 1.

The processes of increased sleepiness levels during the beginning until the work time are given in Figures 1-3. Furthermore, the results of max average of sleepiness level within the four nights of study at 5:00 then 3:00 am (the average of sleepiness:  $11:00 \leq 1:00 \leq 3:00 \leq 5:00$ ) shown in Table 3 are in line with the results of other researches, indicating the highest sleepiness level at the hours 2:00, 4:00, and 6:00 at the night shift.<sup>[24,25,27,28]</sup>

Regarding the present results, the sleepiness level has been reduced at the second night of the study compared to the first night. A similar study using KSS questionnaire conducted in Sweden reported that the sleepiness level could be significantly reduced by inducing the 20 min of bright light at night and it was adapted by a dim or bright light at the second night<sup>[24,25,27]</sup> and the bright light exposure resulting adaptation to shift work could be considered as baseline.

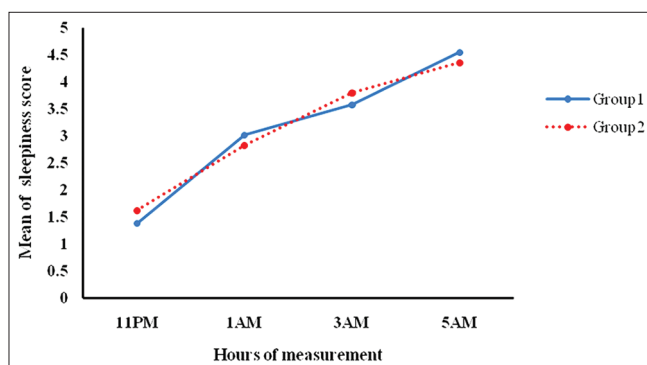
A study on reducing sleepiness showed that experiencing bright light for five consecutive nights could increase the adaption to night shift, confirming our results.<sup>[27]</sup>

**Table 3: The mean of sleepiness in two Groups in base night (time)**

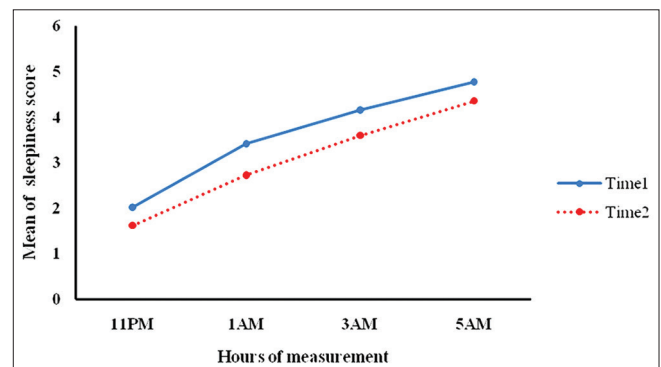
	11 PM	1 AM	3 AM	5 AM
Group 1	1.38	3.02	3.58	4.55
Group 2	1.62	2.83	3.8	4.36

**Table 4: Comparison of rate of sleepiness**

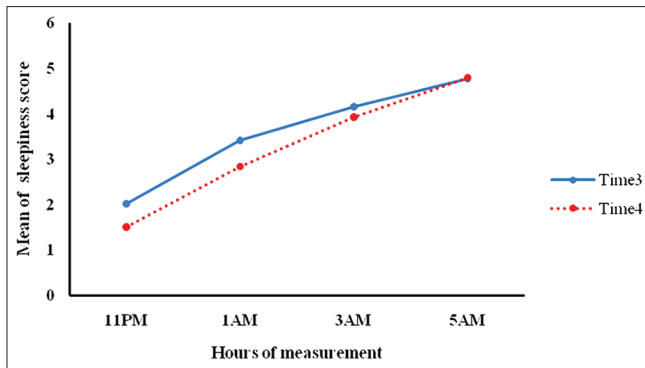
	Group 1	Group 2
Time 1-2	<0.001	
Time 3-4		<0.001



**Figure 1:** Shows the basic night (BASE-TIME)



**Figure 2:** Sleepiness scores in the first group



**Figure 3:** Sleepiness scores in the second group

## Conclusion

This study shows that the sleepiness level has been reduced at the second night of the study compared to the first night. The performance and safety of workplaces and employees could be improved by utilizing these findings.

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## Conflicts of interest

There are no conflicts of interest.

## References

- Nurminen T. Shift work and reproductive health. *Scand J Work Environ Health* 1998;24 Suppl 3:28-34.
- Folkard S, Lombardi DA, Tucker PT. Shiftwork: Safety, sleepiness and sleep. *Ind Health* 2005;43:20-3.
- Costa G. Shift work and occupational medicine: An overview. *Occup Med (Lond)* 2003;53:83-8.
- Khammar A, Amjad RN, Moghadasi M, Rohani M, Poursadeghiyan A, Hami M, et al. Relation between subjective sleepiness and changes in some vital signs among the clinical night workers. *Ann Trop med Publ Health* 2017. [In press].
- Knutsson A. Health disorders of shift workers. *Occup Med (Lond)* 2003;53:103-8.
- Khammar A, Amjad RN, Rohani M, Yari AR, Noroozi M, Poursadeghiyan A, et al. Survey of shift work disorders and occupational stress among nurses: A cross-sectional study. *Ann Trop Med Public Health* 2017;10:978-84.
- Beers IM. Flexible schedules and shift work: Replacing the '9-to-5' workday? *Mon Labor Rev* 2000;123:33-40.
- Shields M. Shift work and health. *Health Rep* 2002;13:11-33.
- Rosekind MR. Managing work schedules: An alertness and safety perspective. *Principles and Practice of Sleep Medicine: Expert Consult Premium Edition-Enhanced Online Features*. 4th ed. Philadelphia, PA: Elsevier Health Sciences 2005. p. 680-90.
- Akerstedt T, Gillberg M. Subjective and objective sleepiness in the active individual. *Int J Neurosci* 1990;52:29-37.
- Poursadeghiyan M, Mazloumi A, Saraji GN, Baneshi MM, Khammar AR, Ebrahimi MH. Using image processing in the proposed drowsiness detection system design. *Iran J Public Health* 2017. [In press].
- Smith L, Folkard S, Poole C. Light treatment for NASA shift workers. *Chronobiol Int* 1995;12:141-51.
- Costa G. The impact of shift and night work on health. *Appl Ergon* 1996;27:9-16.
- Jewett ME, Kronauer RE, Czeisler CA. Light-induced suppression of endogenous circadian amplitude in humans. *Nature* 1991;350:59-62.
- Eastman CI, Stewart KT, Mahoney MP, Liu L, Fogg LF. Dark goggles and bright light improve circadian rhythm adaptation to night-shift work. *Sleep* 1994;17:535-43.
- Moore RY, Eichler VB. Loss of a circadian adrenal corticosterone rhythm following suprachiasmatic lesions in the rat. *Brain Res* 1972;42:201-6.
- Moore RY. Circadian rhythms: Basic neurobiology and clinical applications. *Annu Rev Med* 1997;48:253-66.
- Stephan FK, Zucker I. Circadian rhythms in drinking behavior and locomotor activity of rats are eliminated by hypothalamic lesions. *Proc Natl Acad Sci U S A* 1972;69:1583-6.
- Drake CL, Roehrs T, Richardson G, Walsh JK, Roth T. Shift work sleep disorder: Prevalence and consequences beyond that of symptomatic day workers. *Sleep* 2004;27:1453-62.
- Nakata A, Ikeda T, Takahashi M, Haratani T, Fujioka Y, Fukui S, et al. Sleep-related risk of occupational injuries in Japanese small and medium-scale enterprises. *Ind Health* 2005;43:89-97.
- Karchani M, Mazloumi A, NaslSaraji G, Akbarzadeh A, Niknezhad A, Ebrahimi MH, et al. Association of subjective and interpretive drowsiness with facial dynamic changes in simulator driving. *J Res Health Sci* 2015;15:250-5.
- Poursadeghiyan M, Mazloumi A, Saraji GN, Niknezhad A, Akbarzadeh A, Ebrahimi MH. Determination the levels of subjective and observer rating of drowsiness and their associations with facial dynamic changes. *Iran J Public Health* 2017;46:93-102.
- Suzuki K, Ohida T, Kaneita Y, Yokoyama E, Uchiyama M. Daytime sleepiness, sleep habits and occupational accidents among hospital nurses. *J Adv Nurs* 2005;52:445-53.
- Karchani M, Kakooei H, Yazdi Z, Zare M. Do bright-light shock exposures during breaks reduce subjective sleepiness in night workers? *Sleep Biol Rhythms* 2011;9:95-102.
- Khammar A, Moghimian M, Ebrahimi MH, Abbasi M, Baneshi MM, et al. Effects of bright light shock on sleepiness and adaptation among night workers of a hospital in Iran. *Ann Trop Med Public Health* 2017;10:595-9.
- Poursadeghiyan M, Omidi L, Hami M, Raei M, Biglari H. Drowsiness and its relation with individual characteristics among night workers in a desert hospital in Iran. *Int J Trop Med* 2016;11:98-101.
- Lowden A, Akerstedt T, Wibom R. Suppression of sleepiness and melatonin by bright light exposure during breaks in night work. *J Sleep Res* 2004;13:37-43.
- Karchani M, Mazloumi A, Saraji GN, Nahvi A, Sadeghniai Haghighi Kh, Makki Abadi B, et al. Relationship Between Subjective Sleepiness and Demographic Characteristics in Night Work Drivers. *Advances in Environmental Biology* 2015;9; 3,1012-5.