



Original article

Factors Affecting Occupational Health of Shift Nurses: Focusing on Job Stress, Health Promotion Behavior, Resilience, and Sleep Disturbance

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ABSTRACT

Background: This study aims to allow the development of efficient measures to improve occupational health of shift-working nurses focusing on job stress, health promotion behavior, resilience, and sleep disturbance.

Methods: It was conducted on a subject panel of 137 nurses who were aware of the purpose of the study and agreed to participate. They worked three shifts at a tertiary hospital or a general hospital located in metropolitan city B. The collected data were analyzed by the independent *t* test and one-way analysis of variance and post-tested by Scheffe's test, Pearson's correlation coefficients, and multiple linear regression analysis using SPSS/WIN 25.0.

Results: The significant influencing factors on sleep disturbance were of those whose subjective health status was 'normal' ($\beta = 0.29, p < .001$), 'not healthy' ($\beta = .40, p < .001$), who have job stress ($\beta = .22, p = .003$), and who have health promotion behavior ($\beta = -0.17, p = .023$). The overall explanatory power was 31.1% ($F = 16.31, p < .001$).

Conclusion: Through this study, nurses' subjective health status and job stress of working shifts were found to be important factors influencing the sleep disturbance level, and the most influencing factor was identified as the subjective health status.

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1. Introduction

1.1. Background

In the Republic of Korea, 82.1% of the nurses in general wards of hospitals work in a three-shift system, where the monthly average number of night shift days is 6.2. The most severe difficulty with shift work is irregular lifestyle patterns followed by sleep disturbance due to shift work [1]. Nurses have a high level of job stress as they typically work under time constraints to solve various problems promptly. Moreover, they spend ample time outside their working hours to acquire new information because of medical technology advancements [2]. Job stress among nurses is closely related to working patterns [3]. Nurses working in shifts cannot adapt to a circadian rhythm readily as their work shifts and working patterns often change. This causes poor sleep quality and chronic fatigue, causing difficulty in focusing during work [4]. Sleep disturbances are

likely to be significant risk factors for occupational health in the hospital setting. Untreated sleep disturbances diminish alertness and exert deleterious effects of cognitive and psychomotor performance, contributing to occupational accidents, nursing errors, injuries, and decreased workplace productivity [5].

A healthy work environment also meets the essential criteria to guarantee occupational health and the quality of nursing care [6]. In particular, nurses are required to practice health promotion behaviors actively to improve their health conditions and the quality of patient care [7]. However, nurses' health and work conditions can easily lead to unhealthy lifestyle habits, owing to the nature of shift patterns, and nurses are more prone to unhealthy lifestyle habits. Moreover, they are at a greater risk of exposure to infectious diseases [8]. Thus, nurses have difficulties managing their health conditions and poorly practicing health promotion behaviors, such as physical activity, nutrition, and stress management [9]. Managing psychological and physical stress and practicing health

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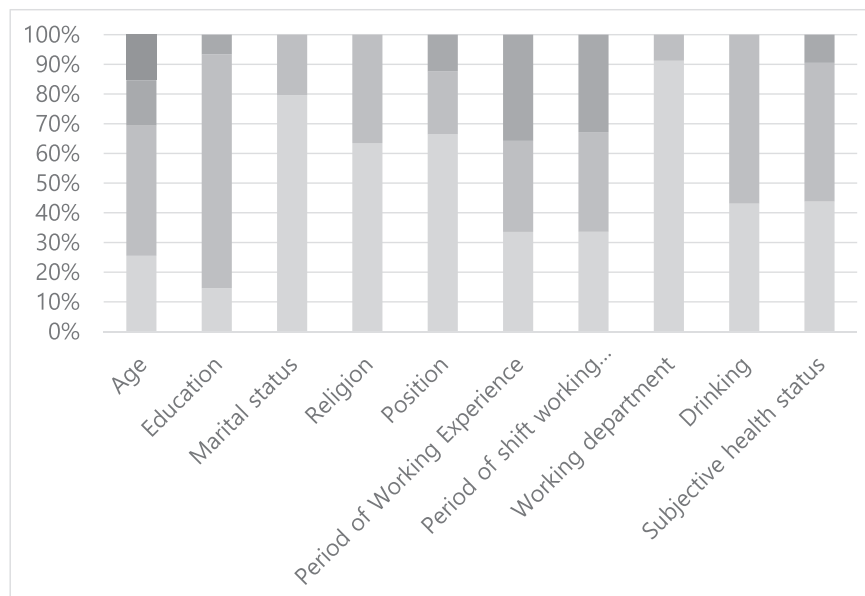


Fig. 1. Sleep disturbance in accordance with general characteristics of participants.

promotion behaviors are crucial for nurses to perform their duties efficiently as they affect the quality of service directly [10].

Work shifts cause the circadian rhythm to be broken owing to the consistently changing sleep–wake cycle. This ultimately leads to sleep disturbance, also known as circadian rhythm sleep disorder [11]. Nurses who work in shifts are known to feel a higher level of fatigue than nurses who work on a fixed schedule [12] because the vicious cycle of poor sleep quality from accumulated fatigue is repeated [13]. Work-related fatigue is another crucial aspect to occupational health and safety where it has been recognized as a source of adverse impact on quality of care, client satisfaction, and patient and nurse safety [14,15]. Moreover, nurses who work in shifts, where sleep disturbance reduces the quality of nursing service, are more likely to experience insomnia than nurses who work on a fixed schedule [16]. Among nurses, sleep disturbance at night is associated with fatigue during the day, inducing passiveness in behavior and incapability of performing simple nursing tasks [17]. Nurses working in extended hours and short recovery period may experience cognitive, psychomotor, and behavioral impairment that leads to slow reaction time, a lapse in critical judgment, reduced motivation, and thus an increase in nursing errors [15].

Resilience helps overcome the difficulties and stress experienced by nurses daily at work and promotes adaptation and functions above a certain level [18]. Furthermore, nurses must strive to practice health promotion behaviors for forming desirable lifestyle habits to manage stress appropriately with a positive attitude [10]. Therefore, this study aims to identify the degree and relationship of these variables, focusing on job stress, health promotion behavior, resilience, and sleep disturbances among the factors that affect occupational health for shift nurses. In particular, the government intends to provide primary data to reduce the risk of occupational safety accidents caused by inappropriate sleep of shift nurses by identifying the factors affecting sleep disturbances.

1.2. Research purpose

This study aims to identify the effects of job stress, health promotion behavior, resilience, and sleep disturbance to improve the occupational health of nurses working in shifts. This is mentioned in detail in the following:

- First, identify the general characteristics and the degree of job stress, health promotion behavior, resilience, and sleep disturbance of the participants.
- Second, identify the difference in sleep disturbance in accordance with the general characteristics of the participants.
- Third, examine the correlation between job stress, health promotion behavior, resilience, and sleep disturbance of the participants.
- Finally, investigate the factors influencing sleep disturbance in the participants.

2. Materials and methods

2.1. Research design

This research is a descriptive study designed to examine the degree of job stress, health promotion behavior, resilience, and sleep disturbance to improve occupational health among nurses working in shifts. In addition, we analyze the correlation among these variables while identifying the factors influencing nurses' sleep disturbance.

2.2. Research participants

The participants of this study were nurses who work in three shifts at a tertiary hospital and a general hospital located in a B metropolitan city. The nurses who do not work night shifts, who are pregnant, and who only work night shifts were excluded.

2.3. Research tool

2.3.1. Job stress

For measuring job stress, the tool developed by Kim and Gu [19] and supplemented and revised by An [20] for nurses was used after obtaining permission. The tool consists of 23 items scored based on a 5-point Likert scale with 1 point being 'not at all severely' and 5 points being 'extremely severely'. Thus, the total score ranges from 23 to 115, where the higher score indicates a higher level of job stress. Cronbach α , the reliability coefficient, of this tool was 0.95, as

Table 1
Sleep disturbance in accordance with general characteristics of participants (N = 137)

Characteristics	Categories	Characteristics n (%) or M±SD	Sleep disturbance		
			M±SD	t/F	p Scheffé
Age (years)	≤24	35 (25.5)	2.13 ± 0.69	0.71	.548
	25–29	60 (43.8)	2.24 ± 0.57		
	30–34	21 (15.3)	2.31 ± 0.43		
	≥35	21 (15.3)	2.35 ± 0.49		
		28.47 ± 5.51			
Education	Junior college	20 (14.6)	2.36 ± 0.45	0.54	.587
	University	108 (78.8)	2.22 ± 0.60		
	Graduate school or higher	9 (6.6)	2.21 ± 0.43		
Marital status	Single	109 (79.6)	2.22 ± 0.57	-0.86	.390
	Married	28 (20.4)	2.32 ± 0.57		
Religion	None	87 (63.5)	2.25 ± 0.59	0.15	.880
	Have	50 (36.5)	2.23 ± 0.54		
Position	Junior nurse	91 (66.4)	2.22 ± 0.62	0.21	.813
	Senior nurse	29 (21.2)	2.27 ± 0.48		
	Charge nurse	17 (12.4)	2.31 ± 0.49		
Period of working experience (years)	<3	46 (33.6)	2.09 ± 0.67	2.03	.137
	3–<6	42 (30.7)	2.35 ± 0.55		
	≥6	49 (35.8)	2.28 ± 0.47		
		6.15 ± 5.73			
Period of shift working experience (years)	<3	46 (33.6)	2.08 ± 0.65	3.14	.046
	3–<6	46 (33.6)	2.37 ± 0.55		
	≥6	45 (32.8)	2.28 ± 0.47		
		5.88 ± 5.44			
Working department	General ward	125 (91.2)	2.25 ± 0.59	0.61	.545
	Intensive care unit	12 (8.8)	2.14 ± 0.40		
Drinking	No	59 (43.1)	2.22 ± 0.54	-0.44	.663
	Yes	78 (56.9)	2.26 ± 0.60		
Subjective health status	Healthy ^a	60 (43.8)	1.96 ± 0.50	21.48	<.001 a<b,c
	Moderate ^b	64 (46.7)	2.39 ± 0.49		
	Unhealthy ^c	13 (9.5)	2.84 ± 0.59		

SD, standard deviation.

reported by Kim and Gu [19], 0.83, as reported by An [20], and 0.92, as obtained in this study.

2.3.2. Health promotion behavior

Health promotion behavior refers to self-directed multidimensional behavior patterns that maintain and enhance individual well-being, self-realization, and satisfaction. For measuring the degree of health promotion behavior, the health promotion lifestyle profile developed by Walker et al [21] for general adults and adapted by Yoon and Kim [22] was used after obtaining permission. The tool consists of 52 items scored based on a 4-point Likert scale, with 1 point being 'not at all' and 4 points being 'always'. The total score ranges from 52 to 208, where the higher score indicates a higher degree of health promotion behavior. Cronbach α of this tool was 0.94 in the study conducted by Walker et al [21], 0.91 in the study conducted by Yoon and Kim [22], and 0.94 in this study.

2.3.3. Resilience

Resilience is the ability to recover or cope successfully with adversity [18]. For measuring the degree of resilience, the Connor-Davidson Resilience Scale developed by Connor and Davidson [23] [adapted in Korean by Baek [24]], whose reliability and validity have been verified, was used after obtaining permission. The tool consists of 25 items scored based on a 5-point Likert scale with 0 being 'extremely unlikely' and 4 points being 'extremely likely'. Thus, the score ranges from 0 to 100, where the higher score indicates a higher degree of resilience. Cronbach α of this tool was 0.89, as reported by Connor and Davidson [23], and 0.93, as obtained in this study and that conducted by Baek [24].

2.3.4. Sleep disturbance

For measuring the degree of sleep disturbance, the sleep assessment tool developed by Snyder and Verran [25] for general

adults [adapted in Korean and supplemented by Oh et al [26]] was used after obtaining approval. The tool consists of 15 items scored based on a 4-point Likert scale, with 1 point being 'not at all' and 4 points being 'always'. The total score ranged from 15 to 60, where the higher score indicated a higher degree of sleep disturbance. Cronbach α of this tool was 0.75 in the study conducted by Oh et al [26] and 0.92 in this study.

2.4. Collection of data

The data of this study were collected from August 31 to September 21, 2020. The researcher visited a tertiary hospital and a general hospital located in a B metropolitan city for data collection after obtaining permission. The purpose, content, data collection, and ethical aspects were explained in detail to the head of each nursing department before distributing the questionnaires in envelopes after obtaining consent. The questionnaire required approximately 15 minutes to complete.

2.5. Analysis of data

The collected data were analyzed using SPSS/WIN 25.0 as follows:

- The participants' general characteristics and the degree of job stress, health promotion behavior, resilience, sleep disturbance, and occupational safety were analyzed based on frequency, percentage, mean, standard deviation, and minimum and maximum values.
- In accordance with the general characteristics, the difference in sleep disturbance was analyzed using the independent *t* test and one-way analysis of variance. The Scheffé test was used as a *post hoc* test.

- To confirm the internal consistency of the measurement tool, it was analyzed with the Cronbach alpha coefficient. The Cronbach alpha value is '0-1'; '0' means no internal consistency at all, and '1' means complete internal consistency.
- The correlation between job stress, health promotion behavior, resilience, and sleep disturbance was analyzed using Pearson's correlation coefficients. In addition, to reduce the probability of incorrectly rejecting the null hypothesis, the *p*-value was taken as less than 0.05.
- Finally, the factors influencing sleep disturbance of the participants were analyzed using stepwise multiple regression analysis after verifying the histogram and normal probability plot.

2.6. Ethical considerations

This study was conducted after obtaining approval from the institutional review board of University I to protect the participants. As the collected data are used only for statistical purposes and the personal information is only used for verifying the data, anonymity and confidentiality for the protection of personal information are guaranteed and clearly stated. The informed consent form included the purpose and procedure of the research, voluntariness of participation and withdrawal, and confidentiality of information, thus ensuring ethical considerations. The completed questionnaire was enclosed in an envelope and collected by the researcher at the nursing department.

3. Research results

3.1. Sleep disturbance in accordance with the general characteristics of the participants

In this study, 43.8% {60} of the participants were aged between 25 and 29, and 78.8% {108} of the participants had a bachelor's degree in nursing. A total of 79.6% {109} of the participants were single in terms of marital status. Moreover, 63.5% {87} of the participants did not have religion, and 66.4% {91}, 21.2% {29}, and 12.4% {17} of the participants were floor nurses, charge nurses, and senior nurses, respectively. In terms of clinical experience, 33.6% {46} of the participants had less than three years of experience, 30.7% {42} had between three and six years of experience, and 35.8% {49} had more than six years of clinical experience. Regarding shift work, 33.6% {46} of the participants had less than three years or between three and six years of shift work, whereas 32.8% {45} of the participants had more than six years of shift work. Interestingly, 91.2% {125} of the participants work in a general ward. However, 43.8% {60}, 46.7% {64}, and 9.5% {13} of the participants claimed their subjective health status as healthy, average, and unhealthy, respectively. In addition, the degree of sleep disturbance in accordance with the general characteristics of the participants had a significant difference in the experience of shift work ($F = 3.14, p = 0.046$) and subjective health status ($F = 21.48, p < 0.001$) (Table 1, Fig. 1).

3.2. Degree of job stress, health promotion behavior, resilience, and sleep disturbance of the participants

The participants' average scores for job stress and health promotion behavior were 3.56 ± 0.59 and 2.20 ± 0.40 points, respectively. The participants' average score for resilience and sleep disturbance was 2.33 ± 0.50 and 2.24 ± 0.57 points, respectively (Table 2).

Table 2
Descriptive statistics of study variables (N = 137)

Variables	Range	Min	Max	M±SD	Item M±SD
Job stress	23–115	31	111	81.85 ± 13.55	3.56 ± 0.59
Health promotion behavior	52–208	64	196	114.34 ± 20.90	2.20 ± 0.40
Resilience	0–100	7	95	58.17 ± 12.47	2.33 ± 0.50
Sleep disturbance	15–60	16	60	33.59 ± 8.60	2.24 ± 0.57

SD, standard deviation.

3.3. Correlation between job stress, health promotion behavior, resilience, and sleep disturbance of participants

Job stress of the participants had a significantly negative correlation with health promotion behavior ($r = -0.20, p = 0.017$), whereas resilience and health promotion behavior had a significantly positive correlation ($r = 0.49, p < 0.001$). Sleep disturbance had a significantly positive correlation with job stress ($r = 0.32, p < 0.001$) and a negative correlation with health promotion behavior ($r = -0.32, p < 0.001$). More specifically, the degree of sleep disturbance increased as the level of job stress increased and decreased as the degree of health promotion behavior increased. A significantly negative correlation existed between job stress and health promotion behavior ($r = -0.20, p = 0.017$) (Table 3).

3.4. Influential factors of sleep disturbance in the participants

For identifying the factors influencing sleep disturbance of the participants, job stress and health promotion behavior, which had a significant correlation, were set as independent variables by including the experience of shift work and subjective health status among the general characteristics that had significant differences in sleep disturbance. The experience of shift work and subjective health status, which are categorical variables, were set as dummy variables for the analysis. The Durbin–Watson statistic, a test conducted to examine autocorrelation between error terms, was 1.994, the tolerance was 0.223–0.772, and the variance inflation factor was 1.11–1.19, thus eliminating the problem of multicollinearity. The analysis results showed that the influential factors of sleep disturbance were moderate ($\beta = 0.29, p < 0.001$) and unhealthy ($\beta = 0.40, p < 0.001$) subjective health status, job stress ($\beta = 0.22, p = 0.003$), and health promotion behavior ($\beta = -0.17, p = 0.023$). The overall explanatory power was 31.1% ($F = 16.31, p < 0.001$) (Table 4).

4. Discussion

This descriptive study aimed to examine the relationship between job stress, health promotion behavior, resilience, and sleep disturbance of nurses in shift work. In addition, this study aimed to identify the factors influencing sleep disturbance and occupational

Table 3
Correlations of job stress, health promotion behavior, resilience, and sleep disturbance (N = 137)

Variables	Job stress	Health promotion behavior	Resilience	Sleep disturbance
<i>r</i> (<i>p</i>)				
Job stress	1			
Health promotion behavior	-.20 (.017)	1		
Resilience	-.10 (.254)	.49 (<.001)	1	
Sleep disturbance	.32 (<.001)	-.32 (<.001)	-.14 (.093)	1

Table 4
Factors affecting sleep disturbance in the participants (N = 137)

Variables	B	SE	β	t	p
Subjective health status (Ref: healthy)					
Moderate	0.34	0.09	.29	3.78	<.001
Unhealthy	0.78	0.15	.40	5.25	<.001
Job stress	0.22	0.07	.22	3.04	.003
Health promotion behavior	-0.24	0.11	-.17	-2.30	.023
Adjusted R ² = .31, F = 16.31, p < .001					

Durbin-Watson = 1.994, tolerance = .88 ~ .94, VIF = 1.06 ~ 1.19.

health. Therefore, the following implications need to be considered based on the research results.

The sleep disturbance score of the nurses in shift work was 2.24 ± 0.57 points out of 4 points, which is close to 2.12 ± 0.51 points derived in the study conducted by Yang et al. [17] on nurses who work in shifts using the same tool. However, a direct comparison cannot be made because preliminary studies examined sleep disturbance among nurses who only work in the day shift. Nevertheless, in a study conducted by Yu [27], the sleep disturbance score of nurses who worked in day shifts was 1.8 ± 0.43 points, whereas that of nurses in shift work was 2.34 ± 0.60 points. This implies that the degree of sleep disturbance is higher among nurses in shift work than that among those who only work in the day shift. Furthermore, sleep disturbance induces various physical problems, such as increased fatigue, poor concentration, decreased appetite, and indigestion [16,17]. Such problems decrease the quality of nursing care and health. Therefore, nurses in shift work must establish and follow specific plans for lifestyle patterns appropriate for shift work circumstances. In addition, a program needs to be developed for improving the quality of sleep to reduce the degree of sleep disturbance of nurses in shift work.

With respect to the degree of sleep disturbance of nurses in shift work in accordance with their general characteristics, nurses with three to six years of shift work experience had a higher degree of sleep disturbance than those with less than three years or more than six years of shift work experience. This result is similar to the findings of a study conducted by Han and Yu [28] using the same tool, which reported that sleep quality is lower in the intermediate work experience group than that in entry-level or senior-level groups. In addition, in a study conducted by Han and Yu [28], the highest number of participants had three to five years of clinical experience, whose work demands were the highest. Specifically, the intermediate work experience group with three to five years of experience typically has high work demands because of administrative work along with basic and more advanced tasks, such as being a preceptor. In another study, multivariate logistic regression performed after adjusting for age showed that nurses currently performing shift work or who had performed shift work previously were significantly more likely to have poor sleep quality than those who had never performed shift work [29]. Therefore, support must be actively provided with more attention on the division of labor to manage the sleep disturbance of nurses with three to five years of work experience. Moreover, the participants who answered 'unhealthy' as their subjective health status had the highest degree of sleep disturbance. In a study conducted by Jeong and Goo [30], which was conducted on nurses in shift work, the participants who responded with 'unhealthy' as subjective health status had the most insufficient sleep quality. This corresponds to the results obtained in this study. The nurses in shift work rarely get sound sleep owing to irregular shifts. This may have caused deterioration in the health of individual nurses. To reduce the sleep disturbance of nurses, individuals must actively engage in physical activities and spend more time doing hobbies for enhancing psychological health,

thus reducing the degree of sleep disturbance and improving the overall health.

In the correlation between job stress, health promotion behavior, resilience, and sleep disturbance of nurses in shift work, job stress and health promotion behavior had a significantly negative correlation. This signifies that nurses' higher level of job stress in shift work leads to a lower level of engagement in health promotion behavior. Furthermore, sleep disturbance and health promotion behavior also had a significantly negative correlation. This implies that a lower degree of health promotion behavior of the participants increased sleep disturbance. This result corresponds to the findings of a study conducted by Shin [31], which targeted the nurses in shift work who work in general hospitals.

On the other hand, sleep disturbance and job stress had a significantly positive correlation. The higher level of job stress leads to a higher degree of sleep disturbance because of stress from the work environment, irregular sleep time from working in shifts, and poor sleep quality. This result corresponds to the findings of a study conducted by Han et al. [32], where the problems related to sleep, such as poor sleep quality, worsened as the level of job stress increased, and the result of a study by Yang et al [17], which was conducted on the nurses in shift work at general hospitals. Resilience is the most crucial positive resource when navigating a turbulent and stressful workplace. Resilient nurses are better equipped to cope with stressors in a workplace environment that continues to change [33]. However, the results of this study showed that resilience was not correlated with other variables. Therefore, the resilience will need to be reviewed later.

The factors influencing sleep disturbance of the nurses in shift work were subjective health status, job stress, and health promotion behavior. The degree of sleep disturbance was the highest among participants that responded with 'unhealthy' as their subjective health status. In a study conducted by Kim et al [34], individuals who worked in shifts had more unsatisfactory health conditions and sleep quality. These results are most likely affected by the lack of sufficient rest or break time because of the repetitive tasks and shift work. In addition, the participants who responded with 'unhealthy' as their subjective health status had the most inferior sleep quality in a study conducted by Jung [30] on nurses working in shifts. It can be inferred that the individuals who perceive their health condition as unhealthy have a higher degree of sleep disturbance. The degree of sleep disturbance may be higher as the participants perceive that their health condition was poor. Accordingly, the health conditions of nurses should be improved to reduce the sleep disturbance of the nurses in shift work. Moreover, a higher level of job stress is associated with a higher degree of sleep disturbance of nurses in shift work. It was confirmed in the study conducted by Jung [30] that job stress was an influential factor of sleep disturbance. Han [32] reported that job stress related to physical environments affects the quality of sleep. Therefore, strategies must be established for decreasing the level of stress that nurses experience in their workspace to reduce sleep disturbance. Therefore, hospitals must improve the workplace environment based on the measures required for reducing stress. Finally, health promotion behavior was also confirmed as a factor that influences sleep disturbance. The study conducted by Jung [30] reported that physical activity was a variable that affected the quality of sleep. Sleep quality is poor when individuals are rarely engaged in physical activities, whereas the quality of sleep improves significantly as the extent of physical activity increases [30]. As nutrition and stress management were confirmed as influential factors in a study conducted by Shin [31], it is necessary to decrease stressful situations and manage nutrition to reduce the sleep disturbance of nurses. Notably, sleep disturbance and fatigue caused by shift work increase the risk of accidents, such as medication errors, lowered

competency, incorrect operation of medical devices, and error in patient identification, and threaten health and safety [12]. As these accidents can cause severe problems in patients who cannot protect themselves from incorrect intervention or are unable to recuperate [35], nurses should pay closer attention to health and safety to prevent medical accidents.

5. Conclusions

This study revealed that the factors influencing sleep disturbance of nurses in shift work are subjective health status, job stress, and health promotion behavior. However, subjective health status was the most critical factor. In other words, poor health conditions worsen sleep disturbance, and sleep deprivation can ultimately affect the health of nurses. Thus, the harmful effects of sleep deprivation in nurses can lead to severe issues. Therefore, measures should be taken to improve the subjective health status of nurses to reduce the problem of sleep disturbance of nurses in shift work. Hence, more time should be spent exercising or in hobbies to supplement the irregular lifestyle patterns caused by shift work. Furthermore, individuals should put forth effort in establishing guidelines on lifestyle management in accordance with working patterns. Gymnasiums available 24 hours a day can be provided at hospitals, or adequate compensations, such as additional medical examination or support for hobbies and environmental improvements, must be offered. From an institutional perspective, legislative measures for improving the sleep quality of nurses in shift work can be implemented at all hospitals. Legislation may not change welfare benefits depending on the hospital's grade. Therefore, this will result in the improvement of sleep quality and a safe working environment at hospitals. Various means for improving the work environment and promoting the well-being of nurses must be developed by continuously researching sleep disturbance among nurses in shift work to decrease the problem of sleep disturbance. Accordingly, enhancement in nurses' health conditions and job satisfaction will result in better nursing care provided to patients.

Conflicts of interest

The authors declare no conflict of interest.

References

- [1] Hospital Nurses Association. A survey on the working conditions of nurses in hospitals. Seoul, Korea: Hospital Nurses Association; 2020.
- [2] Hong KJ, Tak YR, Kang HS, Kim KS, Park HR, Kwag WH, Kim JE, Choi JR. The job stress, job satisfaction, and health of women who work in the professional job: nurses and teachers. *J Korean Acad Nurs* 2002;32(4):570–9.
- [3] Lin SH, Liao WC, Chen MY, Fan JY. The impact of shift work on nurses' job stress, sleep quality, and self-perceived health status. *J Nurs Manag* 2014;22(5):604–12. <https://doi.org/10.1111/jonm.12020> [Internet].
- [4] Shim JY, Seo NS, Kim MA, Park JS. Influence of job stress, sleep quality and fatigue on work engagement in shift nurses. *Korean J Stress Res* 2019;27(4):344–52. <https://doi.org/10.17547/kjsr.2019.27.4.344> [Internet].
- [5] Barger LK, Rajaratnam SM, Wang W, O'Brien CS, Sullivan JP, Qadri S, Lockley SW, Czeisler CA. Common sleep disorders increase the risk of motor vehicle crashes and adverse health outcomes in firefighters. *J Clinical Sleep Med* 2015;11:233–40. <https://doi.org/10.5664/jcsm.4534>.
- [6] Lin L, Liang BA. Addressing the nursing work environment to promote patient safety. *Nurs Forum* 2007;42(1):20–30. <https://doi.org/10.1111/j.1744-6198.2007.00062.x>.
- [7] Kim JH, Lee EH, Hyun HJ, Gil JH, Kim JS, Park YS, Park JS, Lee HY. A study of the affecting factors on the health-promoting behaviors of the clinical nurses. *J Korean Biolog Nurs Sci* 2009;11(2):143–8.
- [8] Yeun EJ, Kim HJ, Jeon MS. Factors influencing health-promoting behavior among hospital registered nurses—Mood states, resourcefulness, and health perception. *J Korean Acad Nurs Admin* 2011;17(2):198–208. <https://doi.org/10.11111/jkana.2011.17.2.198> [Internet].
- [9] Yun JY, Ham OK, Cho IS, Lim JY. Effects of health-promoting behaviors and mental health status of shift and non-shift nurses on quality of life. *J Korean Public Health Nurs* 2012;26(2):268–79. <https://doi.org/10.5932/JKPHN.2012.26.2.268> [Internet].
- [10] Jang YM, Park JY. The effect of job stress on health promotion behaviors of nurses in a regional general hospital: the mediating effects of positive psychological capital and nursing work environment. *Korean J Occup Health Nurs* 2018;27(3):160–70. <https://doi.org/10.5807/kjohn.2018.27.3.160> [Internet].
- [11] Jeong JL, Eun HJ, Kwon HM, Kim TH, Choi MR. Effects of perceived stress, sleep, and depression on resilience of female nurses in rotating shift and daytime fixed work schedules. *Sleep Med Psychophysiol* 2019;26(2):111–24. <https://doi.org/10.14401/KASMED.2019.26.2.111> [Internet].
- [12] Yuan SC, Chou MC, Chen CJ, Lin YJ, Chen MC, Liu HH, Kuo HW. Influences of shift work on fatigue among nurses. *J Nursing Manag* 2011;19(3):339–45. <https://doi.org/10.1111/j.1365-2834.2010.01173.x> [Internet].
- [13] Kho HJ, Kim MY, Kwon YS, Kim CN, Park KM, Park JS, Park YS, Park CJ, Shin YH, Lee KH, Lee BS, Lee EJ. The fatigue experience of shift work nurses. *J Korean Public Health Nurs* 2004;18(1):103–18.
- [14] Martin DM. Nurse fatigue and shift length: a pilot study. *Nursing Economics* 2015;33(2):81 [Internet]. <http://search.proquest.com/docview/1674728475?accountid=9765>.
- [15] Witkoski A, Dickson VV. Hospital staff nurses' work hours, meal periods, and rest breaks: a review from an occupational health nurse perspective. *J Am Associa Occup Health Nurs* 2010;58(11):489–97 [Internet]. <http://journals.sagepub.com/doi/pdf/10.1177/216507991005801106>.
- [16] Saleh AM, Awadalla NJ, El-masri YM, Sleem WF. Impacts of nurses' circadian rhythm sleep disorders, fatigue, and depression on medication administration errors. *Egyptian J Chest Diseases Tuberculosis* 2014;63(1):145–53.
- [17] Yang EO, Choi IR, Kim SM. The impact of sleep disorder and job stress on turnover intention of shift-working nurses. *Korean J Stress Res* 2017;25(4):255–64. <https://doi.org/10.17547/kjsr.2017.25.4.255> [Internet].
- [18] Tusaie K, Dyer J. Resilience: a historical review of the construct. *Holistic Nursing Practice* 2004;18(1):3–10.
- [19] Kim MJ, Gu MO. The development of the stresses measurement tool for staff nurses working in the hospital. *J Korean Acad Nurs* 1984;14(2):28–37.
- [20] Ahn MK. The effect of nurse's job stress on health practice behavior [master's thesis]. Seoul: Yonsei University of Korea; 2003. p. 1–49 [in Korean].
- [21] Walker SN, Sechrist KR, Pender NJ. Health promotion model-instruments to measure health-promoting lifestyle: health-promoting lifestyle profile (HPLP II) (Adult version); 1995.
- [22] Yoon SN, Kim JH. Health-promoting behaviors of the women workers at the manufacturing industry-Based on the Pender's health promotion model. *Korean J Occup Health Nurs* 1999;8(2):130–40.
- [23] Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Dep Anxiety* 2003;18(2):76–82.
- [24] Baek HS. Reliability and validity of the Korean version of the connor-davidson resilience scale (K-CD-RISC) [master's thesis]. Daejeon: Eulji University of Korea; 2010. p. 1–30 [in Korean].
- [25] Snyder-Hr, Verran JA. Instrumentation to describe subjective sleep characteristics in healthy subjects. *Res Nurs Health* 1987;10(3):155–63.
- [26] Oh JJ, Song MS, Kim SM. Development and validation of Korean sleep scale A. *J Korean Acad Nurs* 1998;28(3):563–72. <https://doi.org/10.4040/jkan.1998.28.3.563> [Internet].
- [27] Yoo HJ. Effects of job stress on depression and sleep disorder of hospital clinical nurses [master's thesis]. Incheon: Inha University of Korea; 2014. p. 1–53 [in Korean].
- [28] Han JH, Yoo EK. The study of preceptor nurses' occupational stress and burden. *Korean J Stress Res* 2018;26(1):38–45. <https://doi.org/10.17547/kjsr.2018.26.1.38> [Internet].
- [29] Zhang L, Sun DM, Li CB, Tao MF. Influencing factors for sleep quality among shift-working nurses: a cross-sectional study in China using 3-factor Pittsburgh sleep quality index. *Asian Nurs Res* 2016;10(4):277–82. <https://doi.org/10.1016/j.anr.2016.09.002>.
- [30] Jeong JY, Gu MO. The influence of stress response, physical activity, and sleep hygiene on sleep quality of shift work nurses. *J Korean Academia-Indust Cooperation Soci* 2016;17(6):546–59. <https://doi.org/10.5762/KAIS.2016.17.6.546> [Internet].
- [31] Shin SW, Kim SH. Influence of health-promoting behaviors on quality of sleep in rotating-shift nurses. *J Korean Acad Fundam Nurs* 2014;21(2):123–30. <https://doi.org/10.7739/jkafn.2014.21.2.123>.
- [32] Han KS, Park EY, Park YH, Lim HS, Lee EM, Kim L, Ahn DS, Kang HC. Factors influencing sleep quality in clinical nurses. *J Korean Acad Psychiatric Mental Health Nurs* 2011;20(2):121–31 [Internet].
- [33] Avey JB, Luthans F, Jensen SM. Psychological capital: a positive resource for combating employee stress and turnover. *Human Res Manag* 2009;48(5):677–93. <https://doi.org/10.1002/hrm.20294>.
- [34] Kim EJ, Kim MA, Kwon KR. Comparison of health status and sleep patterns between shift workers and non-shift workers in manufacturing plants. *Korean J Occup Health Nurs* 2008;17(1):45–54.
- [35] Scott LD, Rogers AE, Hwang WT, Zhang Y. Effects of critical care nurses' work hours on vigilance and patients' safety. *Am J Critical Care Nurses* 2006;15(1):30–7. <https://doi.org/10.4037/ajcc.2006.15.1.30> [Internet].