

SLEEP DISORDER STATUS OF NURSES IN GENERAL HOSPITALS AND ITS INFLUENCING FACTORS

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SUMMARY

Background: This study aimed to evaluate the current sleep disorder status of nurses in general hospitals and analyze its influencing factors.

Subjects and methods: A total of 2,033 nurses who have worked for 6 months in 3 general hospitals, namely, The First Affiliated Hospital of Harbin Medical University, The Second Affiliated Hospital of Harbin Medical University, and The Third Affiliated Hospital of Harbin Medical University, were selected by random sampling from April 2015 to November 2015 and investigated. The Effort–Reward Imbalance Questionnaire (ERI) and Job Content Questionnaire (JCQ) were applied to evaluate occupational stress. The Pittsburgh Sleep Quality Index (PSQI) was used to evaluate the sleep disorder status of the research subjects. Logistic regression analysis was adopted to determine the influencing factors of nurses' sleep disorders.

Results: The average PSQI score of 2,003 research subjects is 7.26 ± 3.56 , including 860 subjects with $PSQI \geq 8$, accounting for 42.9%. The female research subjects in the department of gynecology and obstetrics, emergency department, and ICU show high risks of sleep disorders (i.e., many years of working; job title: registered nurse; many times of night shift per month; no frequent exercise; many efforts and few rewards; high decision-making autonomy). Educational background and marital status did not exhibit statistical relevance with sleep disorders.

Conclusions: The sleep disorder status of nurses in general hospitals is closely related to occupational stress. As such, nurse managers should focus more attention to the influencing factors of nurses' sleep disorders and relieve their occupational stress to reduce the occurrence rate of sleep disorders.

Key words: nurse - sleep disorder - occupational stress - general hospital - influencing factor

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INTRODUCTION

As an important reference index of psychological health, sleep has been the focus of considerable attention (Cho 2014, Zhou et al. 2013). Sleep disorders refer to the physical and psychological states that trigger a series of untoward effects because of the abnormal amount of sleep or low and even poor sleep quality. Studies show that approximately 20% of people in America are troubled by intermittent or chronic sleep disorders (Sateia et al. 2000). About 35.5% of Chinese nurses suffer from sleep disorders (Liu & Chen 2015). Sleep disorders will lead to listlessness and distractibility, and interfere with people's normal working state. Long-term sleep disorders will lead to even more serious effects, such as thought retardation, hypomnesia, slow response, low spirit, irascibility and even the increase in the possibility of depression and suicidal tendency (Mieda & Sakurai 2013, Rosado et al. 2015). Sleep disorders may also result in inattention in work and the increase in work risks (Kling et al. 2010).

Nurses are a special occupational group, and their job nature is unique. Nurses bear a relatively high mental stress and large amount of job tasks in caring for patients. Nurses also need to keep an all-night vigil. Such working mode makes their sleep time irregular (Costa 2003, Pallesen et al. 2010, Vogel et al. 2012). Occupational injuries caused by nurse–patient and

doctor–patient contradictions have also become increasingly serious in recent years (Shi et al. 2011). Thus, nurses are faced with physiological, mental, and social pressures. The sleep quality problem of nurses has become a prominent social focus (Bobbio et al. 2012). Several researchers indicated that nurses' sleep disorders not only influence their own health but also affect nursing quality and even the patients' psychological health and treatment process (Feleke et al. 2015, Wang & Gong 2006).

Occupational stress refers to the physiological and mental stresses caused by the imbalance between individual objective requirements and adaptive capacity under occupational conditions (Luo et al. 2013, Roca et al. 2015). As a special occupational group with high pressure, heavy responsibility, and high risk, nurses constantly encounter diseases, traumas, and even deaths, such that they are highly susceptible to occupational stress (Gao et al. 2012). If nurses are under such stress state for a long time, then they may experience lassitude, anxiety, depression, and other psychological problems (Choenarom et al. 2005, Li et al. 2015, Liu et al. 2011). This study analyzes the current sleep disorder status of clinical nurses working in general hospitals, the differences of the sleep disorder status of nurses with different gender, age, educational background, job title, years of working, department, and exercise habits, and the factors influencing their sleep disorders. The

relevance between nurses' sleep disorders and occupational stress is also analyzed to provide the basis for improving nurses' sleep quality, relieving their occupational stress, and promoting their physical and psychological health.

SUBJECTS AND METHODS

Subjects

A total of 2,033 nurses who have worked for 6 months in 3 general hospitals, namely, The First Affiliated Hospital of Harbin Medical University, The Second Affiliated Hospital of Harbin Medical University, and The Third Affiliated Hospital of Harbin Medical University, were selected by random sampling from April 2015 to November 2015 and investigated. Exclusion criteria include the following: nurses who took maternity leave, marriage leave, sick leave, and leave for personal affairs; nurses whose sleep was affected by other causes, such as disease, family history of sleep disorders, drinking liquor, drinking tea, and taking medicines. All research subjects participated in this study voluntarily. However, 30 questionnaires that lacked key variables and were filled in irregularly were eliminated. As such, 2,003 research subjects were analyzed. The effectivity rate of the questionnaires is 98.5%.

The distribution of questionnaires strictly followed the principle of informed consent, and permission from the Ethics Committee of Harbin Medical University was obtained. The investigators introduced the purpose, basic information, and principle of confidentiality to the respondents in detail. The respondents agreed to participate in this research after deliberation.

Methods

PSQI

The PSQI was prepared by Buysse et al. (1989). Liu et al. (1996) translated the PSQI and verified its reliability and validity. The coefficient of internal consistency Cronbach's $\alpha=0.845$. This scale is suitable for evaluating the sleep quality of patients with sleep disorders and individuals without sleep disorders. This scale consists of 7 dimensions and 18 items. The 18 self-evaluation questions form 7 factors, and each factor is scored according to the levels 0–3. The accumulative score of each factor is the total score of the PSQI. The total score ranges from 0 to 21. A high score indicates worse sleep quality. Clinically, a score of 7 serves as the critical reference score. A score of 8 or above may be diagnosed as sleep disorder (Buysse et al. 1989, Liu et al. 1996).

JCQ

The JCQ is based on the job content of the job demand–control model proposed by Karasek et al. (1979). This questionnaire includes three parts, namely, job demand, control, and social support, which consist of 6, 10, and 8 items, respectively. The items were set by

adopting Li's five-level assignment method. Occupational stress degree was graded according to the specific value of job demand mean and control mean. If the specific value is greater than or equal to 1, then the occupational stress degree is high. Researchers (Li et al. 2013; Van Der Doef & Maes 1999) also applied this questionnaire to conduct numerous studies on the occupational stress of different groups. The results show the good validity, reliability, and application value of the JCD.

ERI

The ERI is based on the Effort–Reward Imbalance Model proposed by Siegrist et al. (2004). The ERI is used to evaluate the nurses' occupational stress. The Chinese version of this questionnaire was translated and verified by Li et al. The Cronbach's α coefficient of this questionnaire is 0.71, which indicates good reliability and validity (Li et al. 2005). The questionnaire involves external effort (referring to job demand and job duties, 7 items), reward (referring to money, respect, and job opportunity, 11 items), and overcommitment (refers to the internal pressure of the individual in the process of work, 6 items). External effort and reward were scored according to levels 1–5, whereas overcommitment was scored according to levels 1–4 (Li et al. 2005).

Statistical analysis

Data were analyzed by using the SPSS 15.0 statistical software. Qualitative data were expressed by the number of cases and percentage. Single-factor chi-square test and multielement logistic regression analysis were applied to analyze the influencing factors of sleep disorders. $p<0.05$ indicates that the difference has statistical significance.

RESULTS

General conditions

A total of 2,033 research subjects participated in this research. However, 30 questionnaires that lacked key variables and were filled in irregularly were eliminated. As such, 2,003 research subjects were analyzed. The effectivity rate of the questionnaires is 98.5%. The average age of the 2,003 research subjects is 27 ± 7 , including 118 male subjects (5.9%) and 1,885 female subjects (94.1%). The average PSQI score is 7.26 ± 3.56 . The average PSQI score of 860 subjects (42.9%) is greater than or equal to 8.

Comparison of sleep disorder detection rate for different research subjects

Table 1 shows that sleep disorders are related to gender, age, years of working, department, job title, times of night shift per month, and frequent exercise or not ($p<0.05$). No evident statistical relevance between educational background and marital status is observed.

Table 1. Comparison of sleep disorder detection rate for different research subjects

		Total number of subjects	The number of subjects with PSQI ≥ 8	Detection rate (%)	χ^2	P
Gender	Male	118	25	21.19	24.208	0.000
	Female	1,885	835	44.30		
Age group	Less than 25	821	324	39.46	6.985	0.030
	25–34	1,090	496	45.50		
	35 and above	92	40	43.48		
Years of working	1–5 years	1,024	406	39.65	11.250	0.004
	6–10 years	668	320	47.90		
	More than 10 years	311	134	43.09		
Educational background	Technical secondary school	289	122	42.21	1.112	0.774
	Junior college	1,062	467	43.97		
	University	604	252	41.72		
	Master's or above	48	19	39.58		
Department	Internal medicine	708	289	40.82	33.832	0.000
	Surgical department	528	210	39.77		
	of pediatrics	174	56	32.18		
	of gynecology and obstetrics	151	75	49.67		
	Emergency department	244	127	52.05		
	Operating room	89	39	43.82		
	ICU	109	64	58.72		
Job title	Registered nurse	429	188	43.82	8.071	0.018
	Primary	1,198	535	44.66		
	Intermediate	376	137	36.44		
Times of night shift per month	Few	475	157	33.05	26.386	0.000
	General	700	310	44.29		
	Many	828	393	47.46		
Marital status	Married	817	353	43.21	4.394	0.111
	Single	1,149	485	42.21		
	Others	37	22	59.46		
Frequent exercise or not	Yes	421	127	30.17	35.474	0.000
	No	1,582	733	46.33		

Table 2. Relevance between sleep disorders and occupational stress

Factor			Total number of subjects	The number of subjects with PSQI ≥ 8	Detection rate (%)	χ^2	P
ERI	External effort	Low	492	189	38.41	5.441	0.020
		High	1,511	671	44.41		
	Reward	Low	1,253	574	45.81	11.285	0.001
		High	750	286	38.13		
	Overcommitment	Low	1,356	539	39.75	17.395	0.000
		High	647	321	49.61		
JCQ	Technical autonomy	Low	1,108	465	41.97	0.949	0.330
		High	895	395	44.13		
	Decision-making autonomy	Low	1,280	518	40.47	8.808	0.003
		High	723	342	47.30		
	Job demand	Low	1,352	573	42.38	0.521	0.470
		High	651	287	44.09		
	Superiors' support	Low	1,560	671	43.01	0.017	0.896
		High	443	189	42.66		
	Colleagues' support	Low	1,286	559	43.47	0.416	0.519
		High	717	301	41.98		

Table 3. Logistic regression analysis of multiple factors influencing sleep disorders

Variable and assignment	B	S.E.	Wald	p	OR	95% C.I. for OR	
						Lower	Upper
Gender (1 = male, 2 = female)	1.029	0.239	18.588	0.000	2.797	1.753	4.465
Years of working: 1–5 years					1		
6–10 years	0.547	0.119	21.122	0.000	1.728	1.369	2.182
More than 10 years	0.556	0.168	10.906	0.001	1.743	1.253	2.424
Department: Internal medicine					1		
Surgical department	0.032	0.123	0.069	0.793	1.033	0.811	1.316
of pediatrics	–0.346	0.187	3.412	0.065	0.707	0.490	1.021
of gynecology and obstetrics	0.439	0.188	5.462	0.019	1.551	1.073	2.242
Emergency department	0.478	0.156	9.359	0.002	1.612	1.187	2.190
Operating room	0.152	0.236	0.414	0.520	1.164	0.733	1.848
ICU	0.806	0.218	13.717	0.000	2.240	1.462	3.432
Job title: Registered nurse					1		
Primary	–0.167	0.130	1.641	0.200	0.847	0.656	1.092
Intermediate	–0.700	0.190	13.557	0.000	0.497	0.342	0.721
Times of night shift per month: Few					1		
General	0.438	0.132	11.034	0.001	1.550	1.197	2.006
Many	0.588	0.127	21.383	0.000	1.800	1.403	2.309
Frequent exercise (1 = yes, 0 = no)	–0.678	0.123	30.318	0.000	0.508	0.399	0.646
External effort (1 = low, 2 = high)	0.363	0.113	10.326	0.001	1.438	1.152	1.794
Reward (1 = low, 2 = high)	–0.350	0.101	11.881	0.001	0.705	0.578	0.860
Overcommitment (1 = low, 2 = high)	0.405	0.102	15.863	0.000	1.500	1.229	1.831
Decision-making autonomy (1 = low, 2 = high)	0.227	0.099	5.244	0.022	1.255	1.033	1.524

Relevance between sleep disorders and occupational stress

In terms of the ERI, sleep disorders exhibited statistical relevance with external effort, reward, and overcommitment ($p < 0.05$). In terms of the JCQ, sleep disorders exhibited statistical relevance with decision-making autonomy ($p < 0.05$) and did not exhibit statistical relevance with technical autonomy, job demand, superiors' support, and colleagues' support ($p > 0.05$). For further details, see Table 2.

Logistic regression analysis of multiple factors influencing sleep disorders

The variables that exhibited statistical significance in single-factor analysis, as shown in Tables 1 and 2, served as the independent variables, and sleep disorder served as the dependent variable. Multifactor logistic stepwise regression analysis (backward method) was adopted. The detailed results are shown in Table 3. Table 3 shows that sleep disorders exhibit independent relevance with gender, years of working, department, job title, times of night shift per month, frequent exercise or not, external effort, reward, overcommitment, and decision-making autonomy. In other words, the female research subjects in the department of gynecology and obstetrics, emergency department, and ICU (many years of working; job title: registered nurse; many times of night shift per month; no frequent exercise; many efforts and few rewards; and high decision-making autonomy) show high risks of sleep disorders.

DISCUSSION

Analysis of the sleep quality of clinical nurses in third-level hospitals

The results show that the average PSQI score of nurses in third-level hospitals is 7.26 ± 3.56 , and the average PSQI score of 860 nurses is greater than or equal to 8 (42.9%). Thus, the overall occurrence rate of sleep disorders of clinical nurses is high. This finding indicates that nurses' sleep disorders should be the focus of more attention. However, this result is slightly lower than the results of other researchers. For example, Zhao et al. conducted a cross-sectional study of 575 nurses from 6 hospitals in Liaoning Province, China in 2011 and determined that the sleep disorder rate of nurses in Liaoning Province was 75.9% (Zhao et al. 2013). Zhang et al. (2008) conducted a sampling survey of 1,145 medical workers in Wenzhou, Zhejiang and determined that the occurrence rate of nurses' sleep disorders was 62.68%. The causes may include the following: First, the samples selected are different. The research subjects in this study came from affiliated hospitals of Harbin Medical University. The clinical nursing specialty of The First Affiliated Hospital of Harbin Medical University is a national key construction project of China and the pilot hospital of nurse post management of the Ministry of Health. Clinical nursing work of the entire hospital starts from actual conditions and implements vertical management of nursing department from management function, personnel allocation and deployment, and management mode. Compared with other hospitals, nursing management of this hospital is more scientific

and standard. Second, the hospitals investigated in this study set up 10 nurse assistance departments, such as Nursing Training Education Committee, Nursing Safety Education Committee and Working Committee of Men Nurses. These organizations further help and support the work and life of clinical nurses, relieve the nurses' work anxiety, and improve the nurses' sleep quality.

The result of this research is higher than those of other groups. For instance, other researchers conducted sampling survey of 1,130 civil servants and determined that the average PSQI score was 4.535 ± 2.959 and the occurrence rate of sleep disorders was 13.82% (Zhong et al. 2012). Meanwhile, the occurrence rate of sleep disorders for college journal editors was 33.33% (Shen et al. 2013). This difference may be due to the fact that the research subjects are nurses and that all of them come from third-level general hospitals.

Hospital level classification criteria in China are based on the function, facility, and technical force of hospitals, rather than background and ownership nature. In accordance with the Hospital Classification Management Standards (Guo et al. 2013, Ji 2010), hospitals in China are reviewed and classified into three levels, namely, first level, second level, and third level. The third level is the highest level. All research subjects came from third-level hospitals. Such hospitals receive and treat many patients with critical disease, difficult disease, and major surgery. Patients demand higher requirements for nursing service. As such, updating the knowledge hierarchy in time and boosting the clinical practice ability are necessary, which may result in potential pressure to nurses (Huang et al. 2013). Therefore, compared with workers in other occupations, nurses may suffer from sleep disorders more easily.

Influence of sociodemographic factor on the sleep quality of clinical nurses

This research shows that female nurses may suffer from sleep disorders more easily than male nurses. This result is consistent with the result of Wu et al. (2010). This finding may be related to the female physiological and psychological features. Female nurses also need to work and take care of their family at the same time, such that their life pressure is higher than that of male nurses. Thus, their sleep quality may be affected. The studies of foreign researchers indicate that depression and anxiety may be reflected in sleep quality difference caused by gender difference (Voderholzer et al. 2003). Thus, the sleep quality of female nurses should be the focus of more attention.

For nurses with years of working exceeding 10 years, the risk of sleep disorders is higher, followed by nurses with years of working between 5 years and 10 years. This result is consistent with the result of Shi et al. (2011) that the subjective sleep quality of nurses with years of working between 5 years and 10 years is significantly better than that of nurses with years of

working between 10 years and 20 years. The findings of this research reveal that nurses with years of working exceeding 10 years are generally nursing cadres, such that their work pressure is higher (Shi et al. 2011). Nurses with years of working exceeding 10 years also need to participate in academic education. Thus, they have high risk of sleep disorders.

Meanwhile, nurses with the job title of registered nurse may suffer from sleep disorders more easily. This result is consistent with the findings of Xie and Wang (2007) who evaluated the sleep quality of nursing personnel with different job titles. The occurrence of this result may be related to the following pressures: First, the Ministry of Health in China classified the grades of nurses according to their years of working, working ability, and capacity for scientific research, as follows: registered nurse, primary, intermediate, sub-senior, and senior. New nurses who have recently graduated and obtained their registered certificate still need to master the specialty proficiently and to input considerable efforts for in-depth learning. Second, nurses are faced with the increasing pressure of further job title evaluation. As scientific research develops continuously, more and higher requirements are proposed for job title evaluation, such as publishing an article and fund application.

This research shows that educational background and marital status are not influencing factors of sleep disorders. Previous studies show no evident difference between sleep disorders and educational background (He et al. 2013, Li et al. 2008). The research revealed that people with good educational background have higher requirements, more affairs, and higher pressure than those with poor educational background and consider longer-term problems. Thus, people with good educational background have a higher possibility of suffering from sleep disorders (Lasalvia & Tansella 2011). However, several researchers determined that a good educational background is a protection factor of sleep disorders (Patel et al. 2010). The inconformity of these conclusions may be related to sample size and urban living surroundings. Further research is still needed. This research also shows that marital status did not exhibit statistical relevance with sleep disorders. This finding is similar to the latest reports (Bai et al. 2015, Hu 2013). However, research indicated that the marital status and mental health of nurses exhibited significant correlation (Liu & Gao 2011). The reasons why the aforementioned conclusions are different are as follows: First, the survey time is inconsistent. In recent years, with the advent of reform and feminism, the relationship between marriage and career has changed to "complementation" and "balance." Thus, marital status has a slight influence on sleep disorders (Bai et al. 2015). Second, the age of the research subjects is inconsistent. In this research, the respondents are young. Thus, the conclusions also show evident differences. As such, further research should be conducted in the future.

Effects of job nature, department, and exercise habit on sleep disorders

This research indicates that PSQI scores have significant differences in different departments. The order of departments that may result in sleep disorders most easily is as follows: ICU, emergency department, and department of gynecology and obstetrics. Nurses in the ICU show the highest risk of sleep disorders, which may be related to the heavy workload, long-term contact with critically and seriously ill patients, evident occupational exposure, high work intensity, and high pressure. For example, given the particularity of the ICU, family members are not allowed to accompany and attend to patients. Thus, clinical nurses of the ICU bear all basic nursing work (Sha 2010). The research of Bjorvatn et al. (2012) also indicated that clinical nurses of the ICU show poor sleep quality, drowsiness, fatigue, anxiety, and depression. Of the nurses 25% exhibit poor sleep and 70% exhibit excessive drowsiness. However, the root causes of these findings are unconfirmed. Nurses in the emergency department and department of gynecology and obstetrics rank top 2 in terms of occurrence rate of sleep disorders. Medical disputes often occur in the emergency department. In 2013, several researchers indicated that 80.2% of nurses in the emergency department suffered violence during work in the past year, such as abuse, threats, and physical aggression (Wang et al. 2011). Meanwhile, emergency nurses need to care for critically and seriously ill patients for a long time. In this process, their mind is highly stressed and their body is fatigued, their sleep quality may be affected (Trousselard et al. 2016). In the specialized work of the department of gynecology and obstetrics, observing the state of an illness and handling serious problems are necessary, which results in poor sleep-awakening rules. Thus, human brain adaptation is reduced and sleep disorders are easily generated.

Nursing personnel with many times of night shift per month and without exercise habits may suffer from sleep disorders more easily. Clinical nurses frequently take turns in working the night shift, which disturbs their body clock and results in irregular sleep patterns (Korompeli et al. 2013, Manenschijn et al. 2011). With the accelerated development of China's economy, hospitals have to reduce the number of personnel to improve the economic benefit and decrease the expenditure. Thus, the weekly night shift frequency of doctors and nurses increases. The night shift frequency of nurses is more frequent. On average, the nurses will be on night duty for two to three days every week (16 hours for each night shift) (Tian et al. 2015). Nursing workload in the night shift is also heavy. Most often, nurses in the night shift work independently and lack group support. As such, nurses are more intense in the night shift than in the day shift. Their mind and body are in the stress state. Thus, their cerebral cortex malfunctions and their biological rhythm is disturbed,

which will also directly lead to nurses' sleep disorders. The results on exercise is basically consistent with the results of other studies (Zhao 2009) because proper exercise can induce the human brain to secrete the substances that restrain excitation, accelerate sleep, and facilitate the depth of sleep (Xu et al. 2006, Zhao 2009).

Certain correlation between sleep disorders and occupational stress

In terms of occupational stress, the research subjects with high internal and external efforts, low reward, and high decision-making autonomy show high risks of sleep disorders. This result is similar to that reported by Xu et al. (2006). In multiple-factor analysis, reward is also a factor influencing the nurses' sleep disorders. Nursing work is a high-pressure job, with heavy workload and high risks. Thus, nurses need to input a large amount of time and energy. Meanwhile, nurses still need to learn new knowledge continuously to improve their ability and ensure promotion. In accordance with the Regulations on Nurses issued by the Ministry of Health (Liu & Zeng 2008), nurses are not allowed to give medical advice, except when rescuing patients. Nurses need to honor the arrangement of doctors and adhere to hospital rules and regulations. If the doctors' advice has no mistakes and the patients basically follow the doctor's advice, then the treatment autonomy is poor. Compared with the wage of doctors, the wage of nurses is generally low, which may lead to the imbalance between nurses' effort and reward and the increase in their pressure and sleep disorders (Wang et al. 2012).

CONCLUSIONS

This research shows that the overall occurrence rate of sleep disorders of clinical nurses in Chinese third-level general hospitals is high. This result shows that sleep disorder has been a major psychological health problem of nurses, which needs to be solved urgently. Sleep disorder is also related to nurses' occupational stress. This finding indicates that nurse managers should formulate a rational work plan according to the influencing factors of sleep disorders and relieve nurses' occupational stress to reduce the occurrence rate of nurses' sleep disorders. In this research, the sample size of male nurses is small and sampling is only limited to third-level hospitals in Harbin. Research should be further expanded in the future.

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