

Shift work sleep disorder and job stress in shift nurses: implications for preventive interventions

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PAROLE CHIAVE: Lavoro a turni; stress lavoro-correlato; insonnia; sonnolenza; interventi

SUMMARY

Background: A growing literature has revealed a relationship between shift-work, including night-shift, and the disturbance of sleep-wake cycle, leading to insomnia and/or increased daytime sleepiness in shift nurses; recent findings showed an association between shift work sleep disorders and distress, work accidents, decreased job performance and, consequently, lower quality of health service provision and lower standards of care. **Objectives:** To analyze across the gender how shift nurses experience shift work sleep disorders and job stress. **Methods:** A cross-sectional study was performed following the STROBE Statement. The Italian version of the Job Content Questionnaire, the Bergen Insomnia Scale and the Epworth Sleepiness Scale were administered to the registered nurses employed in three Departments of General Practice and Elderly Care Medicine. **Results:** No significant association was found between high job strain and insomnia and daytime sleepiness. Significantly more women than men experienced high job strain, insomnia and daytime sleepiness; among women the level of social support was significantly and negatively associated with insomnia and daytime sleepiness. **Conclusions:** The findings of this study suggest that interventions aimed to prevent shift work sleep disorder and job stress in shift-nurses should incorporate the assessment of social support across the gender. Moreover, longitudinal studies are required to evaluate the effectiveness of interventions targeted on social support to minimize the occurrence of insomnia and daytime sleepiness in shift nurses.

RIASSUNTO

«Disturbo da lavoro a turni tra infermieri turnisti. Implicazioni per interventi preventivi» **Introduzione:** Una crescente letteratura ha rivelato tra gli infermieri turnisti una correlazione tra lavoro a turni, incluso il turno notturno, ed il disturbo del ciclo sonno-veglia con conseguente insonnia e/o aumentata sonnolenza diurna; recenti studi hanno mostrato un'associazione tra disturbi del sonno e distress, infortuni sul lavoro, ridotta prestazione lavorativa e, conseguentemente, minore qualità delle prestazioni sanitarie ed un più basso standard di cura. **Obiettivi:** Analisi di genere dei disturbi del sonno e dello stress lavorativo percepito da infermieri turnisti. **Metodi:** È stato condotto uno studio trasversale seguendo il regolamento STROBE. Sono stati somministrati agli infermieri turnisti di tre dipartimenti di medicina e geriatria i seguenti questionari: Job Content Questionnaire, Bergen Insomnia Scale ed Epworth Sleepiness Scale. **Risultati:** Non è stata rilevata una associazione significativa tra alto strain lavorativo ed insonnia e sonnolenza diurna. Significativamente più donne che uomini sono risultate esposte ad alto strain lavorativo, insonnia e sonnolenza diurna: tra le donne il livello di supporto sociale è risultato significativamente e

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negativamente associato ad insonnia e sonnolenza diurna. **Conclusioni.** *I risultati del presente studio suggeriscono che interventi mirati a prevenire il disturbo da lavoro a turni e lo stress lavorativo dovrebbero includere la valutazione di genere del supporto sociale. Sono richiesti, inoltre, studi longitudinali per valutare l'efficacia di interventi mirati al supporto sociale per minimizzare l'occorrenza di insonnia e sonnolenza diurna tra gli infermeri turnisti.*

INTRODUCTION

Prevention of sleep disorders in shift healthcare workers represents a growing global health concern. In fact, existing research highlighted a relationship between shift-work, including night-shift, and the disturbance of sleep-wake cycle, also known as circadian rhythm, leading to poor sleep and/or increased daytime sleepiness consistent with the circadian rhythm sleep disorder known as shift work sleep disorder (5, 6, 8, 9, 30, 42, 47). Specifically in relation to healthcare work in hospital wards, where service is given for 24 hours 7 days a week and healthcare workers are largely locked into schedules including night shift, recent findings showed an association between shift work sleep disorder and work accidents, decreased job performance and job satisfaction, distress, deficits in cognitive functioning and, consequently, lower quality of health service provision (7, 12, 14, 27, 41). A recent study by Giorgi et al. (15) found that shift-work nurses' sleep quality and burnout correlated positively and the female gender and personal burnout were significantly associated with impaired sleep quality; based on these findings, the author suggested to take actions targeted on shift work risk as a strategic way to improve the sleep quality of shift nurses and, indirectly, the job performance. In fact people with disturbed sleep cannot perform their daily activities efficiently; disturbed sleep impairs quality of life and daytime functioning (19); workers affected by shift work sleep disorders also tend to show a more depressed mood and have low energy during the daytime (13).

In accordance with DSM V (Diagnostic and Statistical Manual of Mental Disorders, fifth edition) the circadian rhythm sleep disorders are a specific diagnostic category because they share a common chronophysiologic basis (3); the main trait of these disorders is a persistent or recurrent misalignment between the patient's sleep pattern and the pattern that is desired or regarded as the societal norm. Based

on the definition made by DSM V, shift work sleep disorder is a type of circadian rhythm sleep disorder and it is characterized by complaints of insomnia or excessive sleepiness that occurs in relation to work hours being scheduled during the usual sleep period. Since most shift healthcare workers are unable to synchronize their circadian rhythms to the atypical hours of sleep and wake, they appear susceptible to excessive sleepiness and/or insomnia consistent with a diagnosis of shift work sleep disorder (28, 43). In a recent cross-sectional study Zhang et al. (49) found that performing current shift work and having previous shift work were major factors that influenced sleep quality; in addition, based on the three-factor Pittsburgh Sleep Quality Index scoring model, current shift work was found to be significantly associated with sleep efficiency, sleep quality and daily dysfunction. In line with these findings Bjorvatn B. et al. (4) found that nurses working rotational shift work schedules had greater risk of confusional arousal and nightmares, than nurses working daytime only, and hypothesized the relationship with the circadian rhythm misalignment and sleep deprivation caused by shift schedules.

Although literature findings showed that shift workers experiencing psychosocial stress (organizational factors and an imbalance of demands, skills and social support at work, or any combination of these) were more likely to have sleep disorders, to date the relationship between shift work sleep disorder and job stress is uncertain (19); in fact some studies associated social support but not job strain with insomnia, on the contrary, other studies did not show a buffering effect of social support and high job control on better sleep quality (29). A recent study by Johannessen & Sterud (20) showed the need of a gender approach in the assessment of the relationship between psychosocial stressors and sleep problems; in fact, among men, psychosocial stressors at work and sleep problems resulted reciprocally and reversely related; in particular, interventions focused

on improving across time the effort-reward imbalance (OR=0.36; 95% CI=0.19-0.69) and the lack of social support (OR=0.55; 95% CI=0.32-0.93) among men, and work-family imbalance (OR=0.26; 95% CI=0.15-0.46) among women proved to be effective in minimizing the risk of sleep problems. In line with these findings, a gender approach was suggested by many authors in order to moderate job stress in nurses, as the generation of job stress has a different pattern in men and women (32, 35, 45, 50). Given these evidences, the aim of the present study was to analyze across the gender how shift nurses experience shift work sleep disorder and job stress with regard to the perceived Job Demands, Control and Support (JDACS) (23); the JDACS model has been adopted following the literature that highlighted the validity of the JDACS model in healthcare sector for nursing occupation because by its nature the nursing profession is associated with high job demands and needs high control (16, 39).

METHODS

A cross-sectional study was performed from September to November 2019, following the STROBE Statement. The authors invited 658 registered nurses (382 females) employed in three Departments of General Practice and Elderly Care Medicine, in Apulia, south-east of Italy, to complete anonymously the Italian version of the JCQ (31), the Bergen Insomnia Scale (BIS) (37) and the Epworth Sleepiness Scale (ESS) (21). The participants were given a period of seven days to complete the questionnaires and a closed box was left at the workplace so that respondents could place their completed questionnaires anonymously. After that period, the authors returned to collect the questionnaires. The inclusion criterion for the present study was the status of registered nurse employed in the Departments of General Practice and Elderly Care Medicine. The JCQ is based on the principle that the relationship between high job demands and low control leads to a state of perceived job strain. The JCQ is the most commonly used questionnaire in studies on work related stress, and many national versions exist (30,29,43). The complete version, translated and validated into Italian (31), is made up of 58 questions. The shorter ver-

sion, used in this study, comprises 17 questions, of which five relate to job demands, six to control and six to social support. Both the complete and short versions have been applied in comparisons between different occupations, where they provided identification of four working conditions: (1) high strain, i.e. high demands with low control; (2) passive, low demands with low control; (3) active, high demands with high control; (4) low strain, low demand with high control. Isostrain is a high level of strain (upper tertile) and a low level of social support (lower tertile).

The BIS (37) and the ESS (21) were used to assess insomnia and sleepiness, respectively. The BIS is a self-administered insomnia scale with symptom-related questions based on the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders-IV-text revision (DSM-IV-TR) (2). The scale has six items which are scored along an 8-point scale indicating the number of days per week for which a specific symptom is experienced (0-7 days, total scores ranging from 0 to 42). Scoring 3 or more on at least one of items 1-4, and 3 or more on at least one of items 5 and 6, of the BIS was considered as having insomnia. The scale has been validated and has a Cronbach's alpha ranging from 0.79 to 0.87 (37).

The ESS (21) describes eight situations, and respondents estimate the likelihood of dozing off in each of these situations using a 4-point scale, ranging from 0=would never doze to 3=a high chance of dozing. The total score can range from 0 to 24. The ESS scores of 11-24 (clinical cut-off ≥ 11) represent increasing levels of 'excessive daytime sleepiness' (EDS) (11-14=mild sleepiness, 15-17=medium sleepiness, 18-24=severe sleepiness).

The present study was performed as part of the obligatory evaluation of WRS required by Italian Legislative Decree 81/08 and needed no formal approval by the local ethics committee.

STATISTICAL ANALYSIS

Data were analyzed with the SPSS software package (Statistical Package for Social Sciences), version 14.0. Analysis of the frequency of individual variables was conducted using descriptive statistics. Univariate

ate analysis included the Student t-test for quantitative and the chi-square test for qualitative variables. Comparisons between groups were performed with the Mann-Whitney U test for nonparametric data in the case of two independent groups. The significance level was set at $p < 0.05$ for all analyses. In this study the relationship between the independent variables (social support and job strain) and the dependent variables (insomnia, excessive daytime sleepiness) were assessed by calculating the Beta coefficient and the significance level set at $p < 0.05$.

RESULTS

Five hundred and ninety-two questionnaires returned, of which 12 were discarded as being incomplete. Five hundred eighty questionnaires remained for this study and were analyzed by the authors. The response rate was 88.1%; 55.9% (324) were females, 48.1% (156) was in menopause. No significant differences were found between males and females in terms of age, years of work, job position, smoking habits, alcohol consumption and number of children (Table 1). The mean age was 48.9 years (SD 8.3)

Table 1 - Sample demographics

	Women	Men
Number* (%)	324 (55.9)	256 (44.1)
Age (mean \pm SD)	48.9 (8.3)	49.5 (8.8)
Years of work (mean \pm SD)	24.1 (7.2)	24.7 (6.8)
Years of shift work (mean \pm SD)	23.9 (5.1)	24.4 (4.8)
Position		
Temporary No (%)	61 (18.8)	51 (19.9)
Permanent No (%)	263 (81.2)	205 (80.1)
Smoking status		
Current smoker No (%)	51 (15.7)	42 (16.4)
Former smoker No (%)	15 (4.6)	12 (4.7)
Frequency of alcohol consumption		
\leq Once a month No (%)	89 (27.5)	62 (24.2)
2-4 times a month No (%)	105 (32.4)	85 (33.2)
$>$ Once a week No (%)	130 (40.1)	109 (42.6)
Number of children		
None No (%)	95 (29.3)	78 (30.5)
1-2 No (%)	202 (62.3)	159 (62.1)
\geq 3 No (%)	27 (8.3)	19 (7.4)

* Entire group No. 580 nurses

for females and 49.5 years (SD 8.8) for males. All the respondents worked on forward rotating shifts (morning, afternoon, night) and the length of shifts was: 6 hours (morning), 6 hours (afternoon), 12 hours (night); the mean number of nights worked in 2018 year was 65.1 (SD 4.5) for women and 65.5 (SD 4.4) for men. The subdivision of the sample by gender into categories of job content (high strain, passive, active, low strain), according to Karasek's JCQ (23), showed no significant differences between men and women (Tables 2,3). After splitting the variable job strain derived from the demand and control ratio and the variable social support into tertiles, significantly more women than men were in a situation of isostrain (18.7% vs 9.4% $p < 0.05$). Situations of low social support affected more women than men (37.9% vs 28.3%, $p < 0.05$), thus increasing the potential harm of WRS (Table 4).

The BIS (37) and ESS (21) showed that more women than men experienced insomnia ($p < 0.05$) and excessive daytime sleepiness ($p < 0.05$); after splitting excessive daytime sleepiness into three categories (mild, medium and severe), more women than men showed a condition of severe daytime sleepiness ($p < 0.05$) (Table 5). Among women the level of social support was significantly and negatively associated with insomnia and mild, medium and severe excessive daytime sleepiness; no significant association was found between high job strain and insomnia and excessive daytime sleepiness (Table 6).

DISCUSSION

To date no accordance exists about the link between job stress, social support and the occurrence of shift work sleep disorder (insomnia and/or excessive daytime sleepiness) in shift nurses. In the past some authors have investigated the role of social support for insomnia (1, 10, 48) or the buffering effect of job control and social support against insomnia (25, 40) without drawing strong conclusions. In fact some studies have associated social support but not job strain with insomnia, on the contrary, other studies did not show a buffering effect of social support and high job control on better sleep quality (29, 40). In line with the research of Lajoie et al. (26), the present study proved that female

Table 2 - Subdivision of the women into categories of job content according to Karasek's JCQ

		Demands			
			Low	High	Total
Control	Low	Number (%)	76 (23.5)	82 (25.3)	158 (48.8)
	High	Number (%)	77 (23.8)	89 (27.5)	166 (51.2)
Total		Number (%)	153 (49.1)	171 (50.9)	324 (100)

Table 3 - Subdivision of the men into categories of job content according to Karasek's JCQ

		Demands			
			Low	High	Total
Control	Low	Number (%)	59 (23)	61 (23.8)	120 (46.8)
	High	Number (%)	67 (26.2)	69 (27)	136 (53.2)
Total		Number (%)	86 (49.2)	96 (50.8)	256 (100)

Table 4 - Distribution of job strain and social support according to Karasek's job Content Questionnaire (women♀ vs men♂)

			Social support			
			Low	Intermediate	High	Total
Control	Low	(%)	4.8 7.4	6.9(*) 13.9	8.5(*) 13.9	20.2(*) 35.2
	Intermediate	(%)	14.4 11.5	10.2 9.9	15.1 15.7	39.7 37.1
	High		18.7(*) 9.4	12.9 9.2	8.5 9.1	40.1(*) 27.7
Total		(%)	37.9(*) 28.3	30 33	32.1 38.7	100 100

(*) p<0.05 compared to men

Table 5 - Distribution of insomnia and excessive daytime sleepiness (EDS) according to Bergen Insomnia Scale and Epworth Sleepiness Scale (N and %)

	Insomnia	Insomnia and EDS	EDS		
			Mild	Medium	Severe
Women	111 (34.3) *	101 (31.2)*	55 (17)	41 (12.6)	32 (9.9)*
Men	61 (23.8)	57 (22.3)	36 (14.1)	27 (10.5)	14 (5.5)

(*) compared to men, p<0.05

Table 6 - Relationship between social support, job strain and insomnia, EDS in women

	Insomnia	EDS		
		Mild	Medium	Severe
Social support	b=-0.131 p<0.05	b=-0.135 p<0.05	b=-0.291 p<0.05	b=-0.238 p<0.05
Job strain	b=0.079 p>0.05	b=0.091 p>0.05	b=0.064 p>0.05	b=0.070 p>0.05

nurses were at higher risk for increased job strain and shift work sleep disorder compared to their male counterpart, and a relationship was found between lack of social support and shift work sleep disorder in women, but not between high job strain and shift work sleep disorder.

In contrast with a number of investigations that have reported shift work sleep disorder due to job strain (18, 26, 34, 36, 38), in the present study no relationship was found between high job strain and shift work sleep disorder among men and women and, consequently, the areas of job demand/control did not appear eligible targets for improvement interventions aimed to minimize the occurrence of sleep disorders. These findings suggest the need for prioritizing interventions targeted on social support to better the sleep quality and to prevent daytime sleepiness in female shift-nurses. According to Karasek and Theorell, social support is "an overall level of helpful social interaction available on the job from both coworkers and supervisors" (24); social support by supervisors and colleagues helps workers to appreciate their own value and competencies and enables them to cope with upcoming demands and difficult situations. Many authors in the past suggested strategy involving the social support as protective factor that buffers the incidence of insomnia; in fact, individuals with less social support tend to take longer to fall asleep, exhibit more sleep fragmentation, report poorer subjective sleep quality (22, 44), and have significantly greater prevalence rates of insomnia compared to those with greater social support (33).

According to the research of Jarrin et al. (18) social support is a strategic way to mitigate the effect of job stress, which in turn can lead to more health benefits. In fact, social support is significantly higher among good sleepers than poor sleepers and is associated with fewer sleep complaints and higher perceived sleep quality. Prospective evidence also suggests that social support from a supervisor at work is a protective factor against the persistence of insomnia one year later in employees (17).

About the higher female susceptibility to job stress than males, the findings of this study are in line with a working context in which women often report lack of career progress and lower wages than

their male counterparts (11). Given this context, gender differences in the workplace is an important topic. In fact, less frequent promotions and consequently lack of career progress have been proved to be major sources of job stress for women and they have been associated with impaired health status and dissatisfaction at work. To date women are not satisfyingly integrated in many organizational systems, and there is evidence that they face a 'glass ceiling' within the work environment, with the 'glass ceiling' referring to a subtle but powerful barrier that limits women's career advancement to top management positions in big organizations (46).

According to the results here presented, further studies focused on job stress and shift work sleep disorder in nurses and including assessment of social support across the gender are needed. Moreover, longitudinal studies are required to evaluate the effectiveness of interventions targeted on social support to minimize the occurrence of insomnia and daytime sleepiness in shift nurses.

LIMITATIONS

This study suffers from some limitations. First, this study is cross-sectional rather than longitudinal or case-control and is based on a relatively small sample size of nurses; cross-sectional design of the present study limits the possibility of drawing conclusions about causal links between job stress and shift work sleep disorders. Therefore, caution should be taken in generalizing the findings. Furthermore, longitudinal research could determine whether the results are causative. Additionally, the findings could have been influenced by organizational factors intrinsic to the Italian occupational context and, consequently, particular to the departments included in this study and as such may not be true for all hospital departments. In particular, this study did not consider issues related to shift work schedules and to night shift work. Moreover the study did not consider the nurses' chronotype (diurnal or nocturnal) in the analysis of shift work sleep disorders. Finally, this study was based on subjective assessment of WRS without consequent objective analysis.

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