ORIGINAL ARTICLE

The impact of nurses' shift work on the fatigue level

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ABSTRACT

Aim To analyze the presence and level of fatigue in nurses and assess the impact of shift work on fatigue level.

Methods This cross-sectional study was conducted among 120 nurses employed at the Clinical Centre of Vojvodina, Serbia, who were divided into two groups according to the involvement in the shift work. Two questionnaires were used as a survey instrument. The first one, included demographic and sociological data of individual participants, while the standardized questionnaire, Piper Fatigue Scale (PFS), was used to collect data on the subjective assessment of the fatigue level. The sample was randomly selected.

Results The majority of respondents, 105 (87.5%) were females. Shift workers 51 (85%) belonged to the younger age group in comparison to non-shift workers ($p<0.001$). Non-shift workers 47 (74.60) belonged to categories of workers with more years in service ($p<0.01$). Thirty seven (61.7%) non-shift workers, and 18 (30%) shift workers are married ($p<0.001$). Subjectively perceived fatigue level among shift workers was significantly higher on each item of the questionnaire than non-shift workers ($p<0.001$). Involvement in work shifts positively correlated with 21 PFS questionnaire items ($p<0.001$). The fatigue intensity of shift workers affected their state of sleepiness most, while in non-shift workers fatigue most intensely reflects on the disruption of social life.

Conclusion It is necessary to develop appropriate patterns of working schedule to reduce problems related to the dynamic of rotation and length of shifts.

Key words: questionnaire, work schedules, subjective perception, exhaustion.

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INTRODUCTION

The terms shift work and night shift are not a modern phenomenon. During the civilization development, man has lived and worked following his activity cyclic changes of day and night (1,2). Modern industrial society, the introduction of artificial lighting, continuous technology processes and shift work disrupted this natural rhythm (3). One of biological rhythms is a circadian rhythm, which means the overall activity of the body within 24 hours. Working activity during the night, when psycho-physiological functions, general alertness and efficiency are greatly reduced, has particular detrimental effect on the circadian rhythm (3,4).

Functioning of the health sector is nearly impossible without a shift pattern of working schedule, due to fact that population health care covers the period of 24 hours a day, 356 days a year. Shift work of nurses is one of the critical issues in hospital inpatient care, making it vitally important to understand the functioning and efficiency of health care and its impact on health of employees (2). As members of healthcare teams, nurses tend to be exposed to extreme loads and handling complicated dynamic phenomena under severe time pressure (4). Shift work is obviously a potential problem for health (5,6), mental and social well-being, work performance (7,8) and patient safety (9).

Fatigue is a complex concept and it is not easy to define. However, fatigue is generally multicaused, multidimensional, non-specific and subjective phenomenon, and a consequence of prolonged actions of physiological, psychological and socio-economic factors (6). Despite the high prevalence and high rate of morbidity, symptoms of fatigue are underestimated, both from clinical as well as from research point of view (6,7). Fatigue is common complaint in both general population (11) and in working population (12). The prevalence rate of fatigue among employees is between 7% and 45%, depending on survey instruments and professional orientation of the respondents (13). Many symptoms of fatigue are unpleasant, but as such they have a purpose in normal functioning of human beings (14). Grandjean defined fatigue (thirst, hunger and similar sensations) by a simple observation that has been recognized as one of the protective mechanisms of nature. Fatigue may discourage and demotivate through excessive strain, but also could be a reminder for saving time to start a recovery process (14).

Fatigue is divided into acute, chronic, physical and mental. Mental fatigue occurs in emotional and cognitive sphere (8,15). According to Duncan's study as many as 16.5% of nurses identified fatigue as a reason for failure in the administration of medication (16). Fatigue is associated with frequent injury of nurses (7,8) and road trauma (especially after a night shift) (17).

Despite the social changes of the 21st century, women continue to take the lead at home (housework, birth, upbringing of children, spousal roles), but also in their workplace. The combination of paid and unpaid work responsibilities of a modern woman, results in double working hours, and provides little opportunity for recovery from work-related mental, emotional and physical fatigue. As a result, women are more likely to develop maladaptive chronic fatigue, and many of the somatic and mental health disorders (18).

In our region, so far no study has been conducted to provide a true epidemiological picture of the correlation between shift work and fatigue level among nurses. The aim of this study was to analyze the presence and level of fatigue of nurses and to assess the impact of shift work on fatigue level. Our results should provide a better epidemiological picture of the presence and fatigue level among nurses at the Clinical Center of Novi Sad, Serbia.

EXAMINEES AND METHODS

This prospective cross-sectional study was conducted at the Emergency Center of the Clinical Center of Vojvodina in Novi Sad, Serbia, from December 2012 to February 2013. The study was approved by the Ethics Committee of the Clinical Center of Vojvodina, Serbia.

The sample was randomly selected, and consisted of 120 nurses and technicians, all of them being employees of the Emergency Center of the Clinical Center of Vojvodina. All exami-

nees signed voluntary informed consent forms to join the study.

The number of processed and distributed questionnaires was 120. The examinees were divided into two groups: a study group consisted of 60 nurses engaged in shift work and a control group consisted of 60 nurses with the eight-hour day-time working hours during the week. The survey was conducted using personal contacts with the respondents in order to avoid logical errors.

Two questionnaires were used as survey instruments. The first one included demographic and sociological data of individual respondents (gender, age, years of service, engagement in shift work, marital status, parental role**,** satisfaction with material and social life), and it was originally made for the purpose of this study. For standardized questionnaire, Piper Fatigue Scale (PFS; α=0.85), data were collected on subjective assessments of the level of fatigue (19). Piper Fatigue Scale consists of 22 questions and provides answers to the ten-point scoring scale, which best describe the quality and intensity of fatigue felt in the past seven days (19). Higher score indicated a higher intensity of fatigue. The respondents were divided into three categories according to the length of service: 0-10 years, 11-21 years, and >21 years. They were also divided into two categories according to age: 20-35 years and 36-50 years. Variables as gender, age, years of service, engagement in shift work, marital status, number of children, satisfaction with material and social life, were statistically analyzed. The collected data were computer processed.

Absolute numbers and percentages, measures of central tendency (mean, median, mode, standard deviation), χ^2 test and Pearson's linear correlation test were used for statistical analyses. For statistically significant results the confidence level of $p<0.05$ was used.

RESULTS

In terms of demographic and sociological characteristics (Table 1), female accounted for the majority of shift subjects 51 (85%) ($p<0.001$), and most of non-shift subjects, 54 (90%) ($p<0.001$). More than half of respondents, 73 (60.83%) were in the age group of 20-35 years, and 47 (39.16%) were in the age group 36-50 years. The group of shift workers were generally younger, 51 (85%), compared to group of non-shift workers, 22 (36,7%) ($p<0.001$). Shift workers had fewer years of service than non-shift workers in all three categories of

Table 1. Distribution of respondents according to demographic and sociological characteristics

	N/ (%) of respondents					
	Shift workers N=60		Non-shift workers N=60		Total N=60	
Gender						
Female	51	(85)	54	(90)	105	(87.5)
Male	9	(15)	6	(10)	15	(12.5)
Age						
20 – 35*	51	(85)	22	(36.7)	73	(60.83)
36 – 50*	9	(15)	38	(63.3)	47	(39.16)
Length of service						
1 – 10*	44	(73.3)	13	(21.7)	57	(47.5)
11 – 20*	15	(25.0)	36	(60.0)	51	(42.5)
> 21*	1	(1.7)	11	(18.3)	12	(10.0)
Marital status						
Married*	18	(30.0)	37	(61.7)	55	(45.83)
Not married*	36	(60.0)	16	(26.7)	52	(43.33)
Divorced	6	(10.0)	7	(11.7)	13	(10.83)
Parental role*						
Yes	14	(23.33)	38	(63.33)	52	(43.33)
No	46	(76.66)	22	(36.66)	68	(56.66)
Material satisfaction						
Yes	9	(15.0)	3	(5.0)	12	(10.0)
No	51	(85.0)	57	(95.0)	108	(90.0)
Social satisfaction*						
Yes	9	(15)	24	(40.0)	33	(27.5)
No	51	(85)	36	(60.0)	87	(72.5)

* statistical significance level $p<0.001$

Table 2. Mean values and statistical differences among respondents according to Piper Fatigue Scale

	Piper Fatigue Scale				
	Shift workers		Non-shift workers		p
	M	SD	M	SD	
1.	7.05	1.407	4.68	1.334	<0.001
2.	6.93	1.483	4.32	1.672	<0.001
3.	7.22	1.415	5.12	2.043	<0.001
4.	7.08	1.660	4.80	1.793	<0.001
5.	7.12	1.403	5.33	1.875	<0.001
6.	7.45	1.443	5.30	1.825	<0.001
7.	7.47	1.546	4.95	1.789	<0.001
8.	7.28	1.474	4.82	1.846	<0.001
9.	7.15	1.325	4.92	1.720	<0.001
10.	7.32	1.308	5.02	1.535	<0.001
11.	7.23	1.332	4.97	1.461	<0.001
12.	7.38	1.415	5.08	1.740	<0.001
13.	7.67	1.398	5.05	1.512	<0.001
14.	7.45	1.395	5.00	1.687	<0.001
15.	7.65	1.233	5.02	1.672	<0.001
16.	7.53	1.255	5.03	1.677	<0.001
17.	7.20	1.219	4.98	1.610	<0.001
18.	7.25	1.230	4.30	1.680	<0.001
19.	7.25	1.271	4.58	1.769	<0.001
20.	7.25	1.188	4.63	1.636	<0.001
21.	6.93	1.133	4.58	1.465	<0.001
22.	6.38	1.277	3.83	1.509	<0.001
Total	**7,24**	**0,862**	**4,83**	**0,874**	<0.001

M, mean values; SD, standard deviation

service (Figure 1) (p<0.01). In relation to marital status, 18 (30%) shift and 37 (61.7%) non-shift workers were married (p<0.001). Thirty six (60%) shift and 16 (26.7%) non-shift workers were not married (p<0.001). Six (10%) shift and seven (11.7%) non-shift workers were divorced (p>0.05). Parenting was more common among non-shift workers 38 (63.33%) than shift workers, 14 (23.33%) (p<0.0001). Both groups of respondents were dissatisfied with the financial status, shift workers, 51 (85%), non-shift workers, 57 (95%) (p>0.05). Non-shift workers, 24 (40%) were

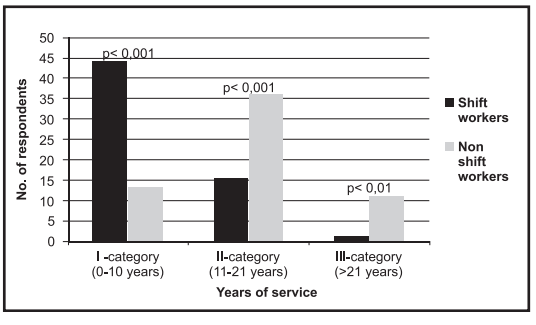

Figure 1. Distribution of respondents by years of service

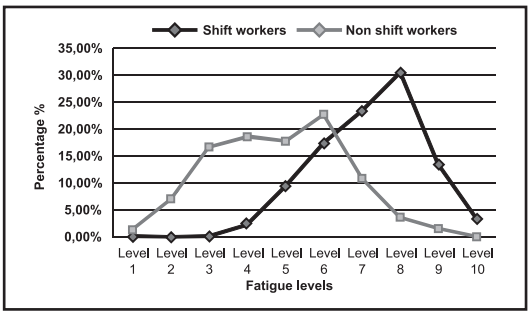

Figure 2. Perception of respondents' fatigue level in relation to shift work

more satisfied with their social life than shift workers, 9 (15%) (p<0.01) (Table 1).

The perception of fatigue level of shift workers was significantly higher on each of the 22 questionnaire items, compared to non-shift workers. The total level/intensity of fatigue of shift nurses (M=7.24; SD=0.862) was higher than the level of fatigue of nurses who were not engaged in shift work (M=4.83; SD=0.874) (p<0.001) (Table 2).

Shift workers reported that fatigue (felt in the past seven days) had the greatest influence on their state of increased sleepiness (M=7.67; SD=1.398), while in non-shift workers the level of fatigue reflected most intensely on the disruption of their social life (socializing, entertainment and recreational activities) (M=5.33; SD=1.875). Non-shift workers often perceived subjective fatigue at the level 1-6, while the perception of fatigue of shift workers often observed fatigue levels 6-10 (Figure 2).

Differences in the perception of the fatigue level between the two groups were statistically significant at all levels of fatigue. The biggest difference between the groups of respondents was recorded in the perception of fatigue at level 8 (p<0.001) (Table 3). Involvement in work shifts positively correlated with 21 PFS questionnaire items (p<0.001) (data not shown).

DISCUSSION

The primary objective of this study was to identify and analyze the presence and level/intensity of fatigue in nurses of the Emergency Center of the Clinical Center of Vojvodina and their correlation with shift work.

Emergency rooms involve particularly stressful

Table 3. Frequency of respondents' answers according to fatigue level

	Fatigue level (Piper Fatigue Scale)									
	1*	**2***	**3***	**4***	**5***	**6***	**7***	**8***	**9***	**10***
No (%) of shift workers	1 (0.08)	0	2 (0.15)	29 (2.20)	124 (9.39)	230 (17.42)	308 (23.33)	403 (30.53)	178 (13.49)	45 (3.40)
No (%) of non-shift workers	17 (1.29)	93 (7.05)	220 (16.67)	245 (18.56)	234 (17.73)	300 (22.73)	143 (10.83)	48 (3.64)	20 (1.52)	0
Total	18 (0.68)	93 (3.52)	222 (8.54)	274 (10.38)	358 (13.56)	530 (20.07)	451 (17.08)	451 (17.08)	198 (7.5)	45 (1.70)

*statistical significance level p<0.001

working environment and frequency of specific tasks and unique working time models, where medical professionals cope with acute and chronic stress every day (20,21). For this reason, it is not surprising that an increasing number of employed nurses leave their jobs, access to vocational retraining and search for posts outside the health system (22). Buchanan et al reported in their research that as many as 50% of Australian nurses who leave the profession, or are considering to leave, stated that the main factors in their decision to leave were high working requirements, market conditions, chronic fatigue, and increased levels of stress (23). A survey conducted by the Canadian Nurses Association, stated that 25.8% of nurses resigned due to symptoms of fatigue in the workplace, 20.2% retired, and as many as 25.6% of them changed the profession for the same reason (22). Our research, like researches of most authors (24-26), confirmed the fact that the nurses, during their professional careers, are excessively exposed to stressful situations and hard-working patterns as an integral part of their daily routine (27,28).

Our study involved 120 nurses divided into two groups according to the involvement in shift work. Response rate to the survey was 100%, and questionnaires were completed correctly, so all 120 entered the final treatment. The high survey response, in our study, could be interpreted as a great interest of nurses to identify the problem of professional fatigue, but also as an appeal to find the answers and measures for resolving it.

Taking into account the fact that the survey was conducted among nurses, it is not surprising that among respondents female workers represented a majority. Furthermore, the majority of shift workers belonged to a younger age group, within the category of fewer years of service, while non-shift workers were mainly in the older age group. More than a half of non-shift workers were married, parenting was more common among non-shift workers. According to material satisfaction, respondents were homogeneous, i.e. both groups of respondents were dissatisfied with the financial situation. According to a similar survey in Croatia, Golubić et al reported that three quarters of the doctors and two-thirds of nurses also estimated to have inadequate salary and consider it a source of intense stress associated with the work, and fatigue that occurs after occupational commitments in the workplace can be triggered by social and financial rewards (29). Results of our study show that, despite inadequate income, non-shift workers were more satisfied with the social life than shift workers. Our results have shown that the perceived level of fatigue of shift workers was significantly higher for each item of the questionnaire than in non-shift workers, and the involvement in work shifts was positively correlated with 21 PFS questionnaire items. Libus et al in their study of 155 healthy women also used PFS as an instrument for measuring the perception of the intensity of fatigue, and they found that the level of fatigue was correlated with the regime of rest, lack of sleep and complicated work schedule (30).

As a support to our respondents' claim that fatigue affects their state of drowsiness most, is a research by Silvae et al. research, in which 45% of nurses reported intense sleepiness associated with shift work and fatigue (9). Dorrian et al. stated that the lack of sleep among nurses was a significant predictor of the occurrence of errors in their work (31). It seems that women have more complaints about sleepiness

after the work shift, but the physiological basis for such a claim is difficult to prove (8). Some of women's inconveniences could be connected with their commitments in the family and household, as well as the general claim that women tend to report more health symptoms than men (3,8).

In this study, both groups of respondents reported that the intensity of fatigue affects their ability of sound reasoning the least. We emphasize that these results are products of subjective perception, and that the exact parameters of such a claim have not been established (the question was whether a person who is overtired is able to be realistic in self-assessment of cognitive, emotional or physical status). The fatigue is more prevalent and intense among shift nurses (8,9,18,32). The results of our research are consistent with results of previous studies, different instruments to measure the perception of fatigue were used.

It is necessary to develop strategies for creating more adequate forms of work schedules of nurses for the purpose of resolving problems related to the dynamics of shifts rotation, frequency and length of shifts (33). Promotion and implementation of the model of active rest during breaks in working hours between shifts would help reduce mental and physical fatigue of nurses.

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Uticaj smenskog rada medicinskih sestara na nivo umora

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SAŽETAK

Cilj: Izvršiti analizu prisustva i nivoa umora medicinskih sestara i proceniti uticaj smenskog rada na nivo umora.

Metode: Studija preseka je sprovedena među 120 medicinskih sestara Kliničkog centra Vojvodine u Srbiji, podeljenih u dve grupe u odnosu na angažovanost u smenskom radu. Kao instrument istraživanja korišćena su dva upitnika. Prvi upitnik je uključivao demografske i sociološke podatke ispitanika, dok se za prikupljanje podataka u vezi sa subjektivnom procenom nivoa umora, koristio standardizovani upitnik Piper Fatigue Scale. Ispitanici su izabrani metodom slučajnog izbora.

Rezultati: Većinu ispitanika 105 (87,5%), činile su osobe ženskog pola. Smenski radnici 51 (85%), pripadali su mlađoj starosnoj kategoriji u odnosu na nesmenske radnike ($p<0,001$). Nesmenski radnici 47 (74.60), pripadali su kategorijama sa dužim radnim stažom ($p<0,01$). Trideset sedam (61.7%) nesmenskih radnika i 18 (30%) smenskih radnika se nalazi u braku ($p<0,001$). Subjektivno percipiran nivo umora smenskih radnika je bio signifikantno viši po svakom ajtemu upitnika od nesmenskih ($p<0,001$). Angažovanost u smenskom radu pozitivno korelira u 21. ajtemu PFS upitnika ($p<0,001$). Intenzitet umora smenskih radnika je najviše uticao na njihovo stanje pospanosti, dok se kod nesmenskih radnika umor najintenzivnije odražavao na ometanje socijalnog života.

Zaključak: Potrebno je razviti adekvatnije obrasce radnog rasporeda sa ciljem kupiranja problema vezanih za dinamiku rotiranja i dužinu smene.

Ključne reči: upitnik, radni raspored, subjektivna percepcija, iscrpljenost.