

THE IMPACT OF SHIFT WORK ON PSYCHOSOCIAL FUNCTIONING AND QUALITY OF LIFE AMONG HOSPITAL-EMPLOYED NURSES: A CROSS-SECTIONAL COMPARATIVE STUDY

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SUMMARY

Background: Approximately 20% of the European labour force is involved in some type of shift work, with nurses being on the forefront. In Bosnia and Herzegovina, a specific work scheme is pervasive in the health care arena, where all nurses involved in shift work are committed to eight night shifts per month – unlike other European countries that restrict the number of night shifts. Accordingly, we aimed to investigate whether such shift work significantly affects psychosocial functioning and the quality of life of hospital nursing personnel in this country.

Subjects and methods: A comparative cross-sectional study design was applied on a total of 157 hospital nursing professionals at the University Clinical Hospital Mostar during 2019. Subjects were divided into two groups: a total of 51% study subjects worked in specific shifts (12-hour day shift / 24 hours off / 12-hour night shift / 48 hours off), while 49% subjects worked in accordance with the regular 7-hour daily schedule. Standard Shiftwork Index (SSI) questionnaire was used, alongside comprehensive socio-demographic and quality of life appraisal. Descriptive and inferential statistical methods were applied, and statistical significance was set at $p < 0.05$.

Results: This study demonstrated increased amounts of stress, reduced coping abilities and reduced levels of life enjoyment in shift work nurses in comparison to day work nurses. Furthermore, increased anxiety, stress, psychoorganic symptoms and sleep disturbances were significantly more common in shift work hospital nursing staff. In our study, nurses that worked in shifts have experienced negative externalities such as decreased social functioning, as well as reduced family and leisure time. Conversely, significantly higher satisfaction rates with shift work were only shown in regards to compensation.

Conclusions: Our results reveal many detrimental effects of shift work and contribute to the field of research that is still laden with gaps in understanding its exact impact on the overall health of nursing personnel. Going forward, prospective (and even interventional) studies will be needed to disentangle the exact interplay between work-related factors in various health care systems and subsequent psychosocial disorders in health personnel.

Key words: shift work - nursing - hospital - psychosocial functioning - quality of life

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INTRODUCTION

In the recent decades the working patterns have changed substantially, and the '24-hour society' lifestyle gave rise to a social structure where time constraints no longer represent a limit to human necessities and quotidian activities (Buja et al. 2013). Recently it was reported that approximately 20% of European workers are partaking in some type of shift work, with nurses being on the forefront as one of the pivotal forces in the health care system (Parent-Thirion et al. 2007).

Such shift work (and night shifts in particular) can pose a negative influence on worker's health and well-being, as human biology is highly adapted to synchronized light-dark cycle (Reppert & Weaver 2002, Savic et al. 2019). It is known that shift work disrupts the

coexisting relationship between our internal clock and the environment (Berger & Hobbs 2006). Negative consequences include overall health deterioration, disrupted circadian rhythms of physiological functioning, disturbed dietary and sleeping patterns, but also a panoply of more severe disorders that affect cardiovascular, gastrointestinal and neurophysiological functioning (Caruso 2014, Booker et al. 2018, Buchvold et al. 2019, Mokarimi et al. 2019, Savic et al. 2019).

Accordingly, nurses are continually burdened with potential shiftwork-related problems (Saksvik-Lehouillier et al. 2013). Studies have demonstrated that shift work in nurses correlates with lower job satisfaction, increased levels of absenteeism, as well as lower psychosocial and functional abilities (Booker et al. 2018, 2019, Savic et al. 2019). Problems such as physical and mental fa-

tigue, anxiety, depression and even cognitive difficulties are pervasive (Saksvik-Lehouillier et al. 2016, Weinmann et al. 2018, Booker et al. 2019). In addition, shift work has been associated with nervousness, irritability and mental distress in nursing personnel (Berthelsen 2015). Finally, physiologic effects include changes in body's core temperature and immune functioning, varying hormonal levels, as well as disrupted activity-rest cycles (Berger & Hobbs 2006).

What is even more important, nurses are at increased risk of shift work disorder that can be linked to chronic disruptions of sleep-wake schedules and sleeping disturbances (Wright et al. 2013, Booker et al. 2019), as well as uncontrolled sleepiness that impacts upon their performance and well-being (Barger et al. 2012). When psychosocial stress and general social jet lag are concerned, shift work may potentially also affect work-life balance with significant social/familial constraints and consequences. Even certain lifestyle factors (particularly those relating to exercise, smoking and alcohol consumption) can be affected (Buchvold et al. 2019).

However, the debate is far from over, as there are a substantial number of studies that have generated results apparently in conflict with those delineated above. For example, a study conducted in Iceland found that nurses assigned to shift work were rather satisfied with their jobs without any disruptions in their circadian cycle (Sveinsdóttir 2006). Moreover, a prospective study of nurses from Denmark showed that shift work was associated with higher vitality and improved mental health when compared to day work (Nabe-Nielsen et al. 2011). In short, despite the growing body of literature, the consensus cannot be reached yet and further studies on the topic are needed.

In Bosnia and Herzegovina there is a specific work scheduling in health care where all nurses in shift work are obliged to do eight night shifts per month, which is different from other European countries that restrict the number of night shifts. This created a perfect setting to achieve the aims of our study, primarily to appraise whether the shift work significantly affects psychosocial functioning and the quality of life of hospital nursing personnel in Bosnia and Herzegovina. We hypothesized that shift work schedules that include night work have an adverse impact on several psychosocial and lifestyle factors in comparison to schedules without such characteristics.

SUBJECTS AND METHODS

This comparative cross-sectional study was conducted at the University Clinical Hospital Mostar during the time frame between February 1st and July 14th 2019. A total of 157 subjects have participated in the study; more specifically, 135 (86%) female and 22

(14%) male hospital nursing professionals were included. The average age of study subjects was 33.3 years (min=20, max=54, SD=8.033). Subjects were divided into two groups: the first study group consisted of 80 (51%) subjects who worked in shifts (12-hour day shift / 24 hours off / 12-hour night shift / 48 hours off) and the second group consisted of 77 (49%) subjects who worked according to the regular daily (day) schedule, comprising seven hours of work (from 7:30 AM to 2:30 PM). Consent was given by the Ethical Committee of the University Clinical Hospital Mostar and the study was conducted according to the guidelines of Helsinki Declaration. All subjects participating in this study were previously informed of the purpose of the study, study aims, confidentiality and secrecy of personal information, and provided their written consent.

Subjects of both groups filled out a total of 6 scales from the *Standard Shiftwork Index (SSI)* questionnaire and questions related to general socio-demographic data (Barton et al. 1995). The results follow a subscale of *psychological functioning* which consists of 6 items. The questions related to emotions in the last few weeks, where subjects gave their assessments on the scale from "not at all" or "less than usual" to "more than usual" and "much more than usual". A higher average result on 6 items points to a weaker psychological functioning. The results on an *anxiety* subscale were also shown, where a higher score points to a higher expression of somatic or cognitive anxiety symptoms.

A subscale of social and family situation, consisting of 4 items, has also been included in order to appraise: satisfaction with the time provided by the work schedule for certain social activities (sport activities, partners, children, hobbies, outings, excursions, household duties, religious activities etc.). The total result on the scale represents general satisfaction with social and family functioning, whereas factor result analysis (under the model of maximum fit) confirmed a one-factor structure. The higher result on the scale indicates greater satisfaction with social and family functioning. Another subscale consists of 7 items and relates to *shift work issues*, used to assess: influence of work on problems related to sleep, social and family life, work efficiency and organizational problems at work.

A scale that was also applied in this study (KVŽ-90-3(Žs) KVM-90-3 (Ms)) (Krizmanić & Kolesarić 1992), and which is used to test the quality of life, consists of 21 items – the results are shown on a so-called predictor variables (15 items) which are related to individual areas of life, for example, satisfaction with the family's origin, emotional relationships, sexual life. In order to check the factor structure of predictor variables, an exploratory factor analysis was conducted through a method of main components with varimax rotation. The significance of correlation matrix was determined by a

Bartlett test, and suitability of correlation matrix for the factorization was determined by a Kaiser-Meyer-Olkin sampling adequacy test. According to Gutman-Kaiser criteria, four factors with significant characteristic origins were obtained, and a total of 54.47% of variance was explained by extracted factors. Although the factor analysis clearly shows the existence of four factors, their designation is not simple; their description is possible through scale designations. The first factor would relate to the factor of intimate life, the second factor would relate to the factor of determination, the third factor would relate to social environment and the fourth factor would relate to material status.

The data were collected into MS Excel database (version 11; Microsoft Corporation, Redmond, WA, USA), and statistical software SPSS 20.0 was used for statistical analysis (IBM Corporation, Armonk, NY, USA). The data were processed by methods of descriptive statistics; categorical variables were shown as frequencies and percentages, while continuous variables were shown as arithmetic means and standard deviations. Chi-square test was used for testing of differences between categorical variables, while one-way analysis of variance (ANOVA) and t-test for independent samples were used for testing of differences among continuous variables. Statistical significance was set at $p < 0.05$ (two-sided).

Table 1. A comparison of self-evaluation in individual segments of psychological functioning and total psychological functioning between the two groups of hospital nursing professionals (daily schedule vs. shift work)

	Group	M	SD	t	df	p
Concentration	daily schedule	2.90	0.852	0.229	155	0.819
	shift work	2.86	0.978			
Sense of usefulness	daily schedule	1.87	0.496	1.388	149	0.167
	shift work	1.75	0.609			
Stress frequency	daily schedule	2.49	0.941	-2.064	155	0.041*
	shift work	2.80	0.920			
Enjoying in daily activities	daily schedule	2.17	0.785	-2.356	155	0.020*
	shift work	2.45	0.710			
Strategies of confrontation	daily schedule	2.08	0.602	-2.081	155	0.039*
	shift work	2.29	0.660			
Self-confidence	daily schedule	1.49	0.681	-1.320	155	0.189
	shift work	1.65	0.797			
Total psychological functioning	daily schedule	2.17	0.406	-1.867	154	0.064
	shift work	2.30	0.491			

* denotes statistical significance

Table 2. A comparison of individual symptoms of anxiety and total somatic/cognitive symptoms between the two groups of hospital nursing professionals (daily schedule vs. shift work)

	Group	M	SD	t	df	p
Sweating	daily schedule	2.350	1.365	-1.425	155	0.156
	shift work	2.660	1.377			
Heart palpitations	daily schedule	2.380	1.288	-2.504	155	0.013*
	shift work	2.910	1.389			
Concerns	daily schedule	3.170	1.390	-1.859	155	0.065
	shift work	3.580	1.348			
Whole-body nervousness	daily schedule	2.580	1.351	-2.827	155	0.005*
	shift work	3.210	1.429			
Diarrhea	daily schedule	1.860	1.254	0.101	155	0.920
	shift work	1.840	1.185			
Anxiety images	daily schedule	1.770	1.180	0.358	155	0.721
	shift work	1.700	1.141			
Stomach tension	daily schedule	2.360	1.356	-1.982	155	0.049*
	shift work	2.810	1.476			
Somatic symptoms of anxiety	daily schedule	2.307	1.034	-2.431	155	0.016*
	shift work	2.688	0.928			
Cognitive symptoms of anxiety	daily schedule	2.468	1.062	-1.049	155	0.296
	shift work	2.638	0.968			

* denotes statistical significance

RESULTS

This study revealed statistically significant differences between the two subject groups in stress frequency, decreased possibility of normal daily activity enjoyment, as well as the inability to cope with their own problems. When compared to subjects who work in accordance to the regular daily schedule, subjects who work in shifts report greater stress, decreased possibility of confrontation, as well as decreased possibility of enjoying everyday activities. Conversely, differences in decreased concentration, perception of uselessness at the work place, as well as loss of confidence between two groups of subjects were not statistically significant. Also, differences in total psychological functioning between two groups were not statistically significant (Table 1). Differences in responses to individual items of anxiety scale, as well as total results on factors of somatic and cognitive symptoms of anxiety, were not statistically significant.

Statistically significant differences in experiencing heart palpitations, whole-body nervousness and stomach tensions between two groups have been found. The aforementioned symptoms were significantly more expressed in subjects who work in shifts in contrast to subjects who work according to the regular day schedule. Also, differences in total somatic symptoms of anxiety between two groups were found to be statistically significant, with more pronounced symptoms in

subjects who work in shifts. The differences in expression of other individual symptoms, as well as total cognitive symptoms, between two groups were not statistically significant (Table 2).

Subjects who work according to the regular day schedule are, on average, more satisfied with social and family life than subjects who work in shifts. Subjects included in shift work believe that shift scheduling scheme interferes with their leisure time activities and family obligations, in contrast to subjects who only work during regular daily working hours (Table 3).

Significant differences in assessments of work-induced problems in individual fields were determined; more specifically, subjects who work in shifts report more work-induced sleep problems, problems with social and family life and work efficiency in comparison to subjects who work regular daily hours (Table 4).

The comparison of differences regarding satisfaction on individual factors has shown that there are significant differences in assessments of social environment satisfaction – more specifically, subjects working during regular day scheme have shown, on average, higher satisfaction assessment in contrast to subjects working in shifts. Furthermore, differences were significant for compensation assessment, where subjects who work in shifts reported, on average, higher satisfaction rates in this segment. Finally, differences in factors covering intimate life and determination were not statistically significant (Table 5).

Table 3. A comparison of satisfaction with social and family life and the extent of work system disruption on individual activities between the two groups of hospital nursing professionals (daily schedule vs. shift work)

	Group	M	SD	t	df	p
Total satisfaction with life	daily schedule	3.13	1.142	2.061	130	0.041*
	shift work	2.81	0.743			
Work-induced disruption of free time	daily schedule	2.06	1.080	-7.370	155	<0.001*
	shift work	3.35	1.104			
Work-induced disruption of family obligations	daily schedule	2.12	1.038	-7.112	155	<0.001*
	shift work	3.33	1.088			

* denotes statistical significance

Table 4. A comparison of work-induced problems in individual areas between the two groups of hospital nursing professionals (daily schedule vs. shift work)

	Group	M	SD	t	df	p
Problems with sleep	daily schedule	2.71	1.441	-7.701	136	<0.001*
	shift work	4.25	1.013			
Problems with social life	daily schedule	2.32	1.240	-6.426	143	<0.001*
	shift work	3.46	0.954			
Problems with family life	daily schedule	2.40	1.300	-5.831	143	<0.001*
	shift work	3.49	1.006			
Problems with work efficiency	daily schedule	2.23	1.202	-5.475	149	<0.001*
	shift work	3.21	1.027			

* denotes statistical significance

Table 5. A comparison of factor satisfaction assessment between the two groups of hospital nursing professionals (daily schedule vs. shift work)

	Group	N	M	SD	t	df	p
Intimate life	daily schedule	60	3.12	0.349	0.563	102	0.574
	shift work	44	3.08	0.395			
Determinations	daily schedule	77	2.19	0.533	0.188	155	0.851
	shift work	80	2.17	0.557			
Social environment	daily schedule	75	3.92	0.599	2.507	150	0.013*
	shift work	77	3.64	0.738			
Material prosperity	daily schedule	77	1.76	0.634	-2.548	155	0.012*
	shift work	80	2.06	0.828			

* denotes statistical significance

DISCUSSION

The present study aimed to investigate psychological issues caused by the type of nursing work (either regular day work or shift work). This is a first research endeavour that explores specific shift work rhythm (12-hour day shift / 24 hours off / 12-hour night shift / 48 hours off) of hospital-employed nurses in Bosnia and Herzegovina. In short, our research has shown that the shift work may indeed exert significant psychological and psychoorganic changes, with a substantial impact on family life of nursing personnel included in the study. Hence, we can rightly pose the question – is nursing becoming an inherently unhealthy profession?

It has already been shown in the literature that the nursing profession is burdened with high levels of stress (Neuberg et al. 2017, 2019). Our findings have demonstrated increased amounts of stress and reduced coping abilities/life enjoyment in shift work nurses in comparison to day work nurses. This can be compared to a recent study by Leyva-Vela et al. from Spain (2018) where it was shown that shift work increases psychosocial risks, eating disorders and trait anxiety; conversely, nursing personnel working only during the day exhibited greater high regard in comparison with those involved in shift work (Leyva-Vela et al. 2018).

As evidenced by our study, sleep disturbances are highly related to shift work. This is corroborated by a recent systematic review analysing the influence of shift work on nurses' health (Rosa et al. 2019). A longitudinal cohort study conducted in Norway (Bjorvatn et al. 2015) has shown that parasomnias (most notably nightmares and confusional arousal) were more commonly reported by nurses in shift work when compared to nurses working only daytime, presumably linked to sleep deprivation and the misalignment of the circadian rhythm.

We have also found increased anxiety and psychoorganic symptoms in shift work nursing staff. These findings are in line with those of Greek authors that have shown cognitive and somatic anxiety in female nurses in shift work, which was especially pertinent to

those with chronic diseases, older age and a myriad of domestic responsibilities (Korompeli et al. 2014). However, a recent integrative review exploring the impact of shift work on psychological functioning and resilience of nurses did not find evidence that anxiety is more common in shift work nurses (Tahghighi et al. 2017). Hence, more longitudinal research endeavours will be necessary for more precise insight into this issue.

Family and social life also has to be taken into account. In our study, nurses that worked in shifts have experienced negative externalities such as decreased social functioning and reduced family time. This is in line with the aforementioned study from Spain (Leyva-Vela et al. 2018). Other issues include insufficient time for home duties (or even themselves) (Phiri et al. 2014), while in certain instances their spouses were against their career choice due to continuous work problems and persistent stress that they take back home (Nasrabadi et al. 2009).

Akin to the shift work patterns explored in our study, many healthcare institutions worldwide have organized care provision into 12-hour work shifts. Although somewhat different than shift schedule in our research, studies have shown that nursing staff involved in them is burdened with increased amount stress, which is more pronounced in younger nurses with less professional experience (Hoffman & Scott 2003). Furthermore, a study from Poland has shown that 12-hour shift system is less strenuous physically, but carries increased mental load (Makowiec-Dabrowska et al. 2000).

Our results definitely contribute to the field that is still laden with gaps in understanding about the exact impact of shift work on health of nursing personnel. Moreover, this is an area of research where more standardization is definitely warranted, as results from different research groups are often fragmented. The main 'critical points' that have to be considered in study-to-study comparisons are shift length, number of nights and rest days, work starting and ending times, shift rotation frequency, as well as regularity/predictability of shift schedules (Rosa et al. 2019).

Study limitations and special considerations

Due to the small number of male respondents in our sample, summative results for all study subjects were presented, and gender differences were not compared. Also, the obtained data is based subjective evaluations, i.e. no objective assessment of physical/psychological overload has been pursued. Although sample size is adequate, one of the drawbacks is that the study is monocentric in nature, partly hindering the generalisability of study findings.

Result distributions for main outcome measures are normal for some variables, while for others they deviate significantly from the normal distribution. Specifically, the distribution of scores on the job satisfaction scale and the overall psychological functioning scale does not deviate significantly from normal in both groups. Conversely, the distributions of scores for certain factors on the life satisfaction subscale and somatic anxiety symptoms are normally distributed only in the shift work group. The distributions of scores on certain quality of life factors deviate significantly from the normal distribution; for intimate life, social environment and overall instant gratification factors the distribution is negatively asymmetric; while for material factors and perceptions of future satisfaction it is positively asymmetric (shifted to lower values).

Nevertheless, such asymmetric results are not unusual in the case of quality of life tests, and do not represent an obstacle to the use of parametric tests, but merely describe the nature of the phenomenon under study (Gamst et al. 2008). In support of this, Petz et al. (2012) state that the use of parametric statistics is possible even in cases of deviation from the normal distribution, provided that the distributions are regular (i.e. not bimodal or U-shaped), that the samples are similar in size and that we expect population deviation from normal distribution.

CONCLUSIONS

Nursing is definitely a demanding profession inherently associated with a certain level of psychological distress. The answer on how to turn the tide and revive nursing as a generally healthy profession once again may be interventions with an aim of enhancing the organizational climate and supervisor support. This exact issue was recently highlighted by Australian researchers as a potential path towards mitigating adverse health outcomes that are experienced by shift workers (Dehring et al. 2018).

In any case, before any significant interventions can be undertaken (especially in the developing countries), more useful data for improved understanding of all the negative consequences brought on by shift work is needed – not only to describe the burden of this public-health issue, but also to inform preventative efforts. Our

research is exactly along those lines. Going forward, prospective (and even interventional) studies will be necessary to disentangle the exact interplay between work-related factors in healthcare systems and subsequent psychosocial disorders.

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Contribution of individual authors:

Ivona Ljevak & Marijana Neuberg outlined the methodological approach and were responsible for the study concept, paper composition, theoretical explanations, data interpretation and literature appraisal.

Ivan Vasilj is the project coordinator; he participated in the study concept, and also contributed to the write-up and the final appearance of the paper.

Marina Ćurlin & Nikolina Šaravanja contributed to the data interpretation and manuscript write-up and English language proofreading.

Tomislav Meštrović & Josip Šimić conducted the literature search, interpreted the obtained results, as well as critically drafted and revised the manuscript.

All authors provided their approval for the final version of the manuscript.

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