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How shift work influences anxiety, depression, stress and insomnia conditions in Italian nurses: an exploratory study

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Abstract. *Background and aim of the work.* Evidence suggest that the nursing profession is a very complex profession. The aim of the present study is to investigate how nursing shift work influences nurses' health, particularly if shift work impacts on anxiety, depression, stress and insomnia conditions *Methods.* An on-line cohort observational study has been conducted during May 2022 and 408 nurses have been enrolled. *Results.* Most of the nurses recruited are employed also during the night shift (73.3%) and are very young ($p<0.001$), as ageing less than 30 years (29.2%) and between 31-40 years (29%). Significant difference has been reported in smoking habit, as nurses who are employed also during the night shift report higher smoking habit than the other comparing groups ($p=0.020$). No further significant differences according to sex, age, work experience, nursing education, nursing activity, BMI and shift have been found. Finally, no differences have been assessed between anxiety, depression, stress and insomnia conditions according to shift work typologies. *Conclusions.* The present study highlights research results already explored in the current literature; however, it collects further information and assesses additional differences, in order to defibe a more complete picture of the nursing profession. (www.actabiomedica.it)

Key words: Anxiety, Depression, Insomnia, Nurse, Shift, Stress, Work.

Introduction

It has been recognized that the nursing profession is a very complex healthcare profession. Cook, Render, and Woods (1) suggest that the major gap in developing safety and quality is the failure to appreciate the complexity of work in the nursing profession, in all its healthcare settings. Evidence highlight the complexity of nursing, by considering both the invisible, cognitive nursing activity in all its actual care situations, such as: the multifactorial work-environments in which nurses should provide care, contributing to patient safety, quality of care, and healthy work environments (2).

Nurses are human beings with their own bio-psycho-social tri-dimensional life perspectives. This equilibrium may be modified by several stressors which are intrinsic of the nursing profession, such as shift, more specifically night shift. The confusion in biological rhythms experienced by shift nurses influences them inducing several unhealthy life behaviors, such as: smoking, poor diet, and sedentary lifestyle (3). For example, several studies have been showed that overweight and obesity are more numerous in night shifters than their daily colleagues, respectively (4-6). In addition, night shift work has been linked to an increased risk in developing other metabolic diseases,

such as: insulin resistance (7-10), diabetes (11-13), dyslipidemias (14-18), food intake alteration (19,20) and metabolic syndrome (21,22). Therefore, nurses, who are employed both in a very heavy workload and night shift, may also undergo alterations in the quality of their circadian rhythms and their rests. In this regard, literature report how insomnia or a decreasing in quality of rest may induce endocrinological alterations among nurses (23-25). In fact, the irregular assumption of unhealthier snacks, inevitably causes an increasing in their body weights and a consequential increasing in their Body Mass Index (BMI) scores. The strong association between poor rest quality and increasing in unhealthier food assumption, above all during night shift, has been highlighted (26,27). At the same time, evidence suggest an increasing trend in smoking habits among nurses, especially night-shift nurses (28,29). This condition seems to be also connected with the increasing in the BMI scores (30,31) and tends to be more frequent among individuals developing a psychological disorder. In this regard, literature highlights how individuals suffering from anxiety, depression or stress may increase smoking habits than general population (32-34). During the Covid-19 pandemic, researchers highlight that nurses seriously suffering from anxiety (35-37), depression (25,26) and stress (38,39), and also smoking habit seem to be directly associated to smoking habit, also among nurses (40). However, very few studies consider all the conditions abovementioned, which may determine an unbalanced equilibrium in nurses' health.

Aim of the study

By considering all the aspects above mentioned for the nursing profession, the aim of the present study is to investigate how nursing shift work influences nurses' health, particularly if shift work impacts on anxiety, depression, stress and insomnia conditions.

Materials and Methods

Study design

An on-line cohort observational study has been conducted during May 2022, by recruiting nurses though some nursing social pages in Facebook and Instagram socials.

Participants

All Italian nurses belonging to different care settings at the enrollment moment of the interview are potentially involved in the present study. The minimum statistically significant sample size was assessed through the Cochran formula (41). By considering that in Italy there are a total of about 360,000 nurses employed and by fixing 95% as the confidence level and 5% as the confidence interval, the representative sample size of the Italian nursing population is 384.

Measures

The questionnaire has been created "ad hoc" containing three different sections. In the first part, data collect information regarding:

- sex, if the respondent is female or male;
- age, divided into groups, specifically: under 30 years, 31-40 years, 41-50 years, 51-60 years and over 61 years;
- years of work experience, divided into subgroups as: less or equal to 5 years, 6-10 years, 11-15 years, 16-20 years, 21-25 years, 26-30 years and more than 30 years;
- shift work, if the nursing work occurred only during the morning, or during the morning and the afternoon or also during the night shift;
- nursing educational level, divided into three groups, namely: up to 3 years of academic instruction, from 4 to 5 years, and over 5 years, by considering the academic instruction levels provided for Italian nurses;
- smoking habits, if the participant declared to smoke or not;
- weight, expressed in kilograms (Kg), and height, expressed in meters (m); the BMI value has been calculated as weight divided by height squared. BMI has been classified according to current literature (42), as follows: for BMI values below 18.49, an underweight condition has been assigned; values between 18.50 and 24.99 have been classified as normal weight conditions; for BMI scores between 25 and 29.99 an overweight condition has been identi-

fied; finally, for values over 30 an obesity condition has been identified;

The second part of the questionnaire includes the Depression, Anxiety and Stress Scale - 21 Items (DASS-21) (43), consisting in a set of three self-report scales designed to assess negative emotional conditions in depression, anxiety, and stress, respectively. Each of the three DASS-21 scales includes 7 items, divided into subscales with similar content. The Depression scale measures dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The Anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The Stress scale measures levels of chronic non-specific arousal, by assessing difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive and impatient. Participants have been asked to answer each item associating to a Likert scale indicating how often the situation described occurr, from 0 (the mentioned situation never happened) to 3 (the mentioned situation happened almost always). Finally, by summing items no. 1,6,8,11,12,14,18 and multiplying the total score by 2, the stress condition has been assessed. By summing items no. 2,4,7,9,15,19,20, and multiplying the total score by 2, the anxiety condition has been defined (44). Finally, by adding items no. 3,5,10,13,16,17,21, and multiplying the total score by 2, the depression condition has been calculated (44). All the three conditions assessed have been classified into five groups, as: normal, mild, moderate, severe, and extremely severe (45). The overall score for DASS-21 including all the three domains is α =0.943. The alpha coefficients for the depression subscale is: αDepression = 0.912, for anxiety subscale: αAnxiety = 0.854 and stress subscale: αStress =0.890.

Finally, in the third part of the questionnaire the Insomnia Severity Index (ISI) (46) has been administered, including a total of seven items exploring sleep quality. For each item a Likert value has been associated which varies from zero, as "not at all" to 4, as "very much". By summing the total items scoring a total value has been obtained which refers to: values from zero to 7: a no clinically significant insomnia, values 8-14: a subthreshold condition, values 15-21: moderate level and values 22-28: severe insomnia condition. The alpha coefficient for the insomnia score is: α = 0.748.

Data analysis

All data have been collected in a data sheet and then processed with the Statistical Package for the Social Sciences (SPSS), version 20. All variables have been presented as categorical variables and explained in frequencies and percentages. *Chi square* tests have been performed both for all sampling nurses' characteristics and anxiety, depression, stress, insomnia conditions and shift nursing work. All p-values < 0.05 has been considered as statistical significant.

Ethical considerations

In the first part of the questionnaire, there is a clear explanatory note of the research study, containing its purpose, as well as the possibility of joining and consenting to the processing of the data provided or not. All participants who do not give their consents are excluded for further steps of the study.

The study has been approved by the Ethical Committee of Polyclinic in Bari, Italy, with protocol no. 0040/56/02/05/2022.

Results

A total of 408 nurses have been on-line recruited. Sampling characteristics collected have been presented according to shift nursing activity declared (Table 1). Most of the nurses recruited are employed also during the night shift (73.3%) and are very young (p<0.001), as ageing less than 30 years (29.2%) and also between 31-40 years (29%), too. Additionally, significantly difference has been reported in smoking habit, as nurses employed also during the night report higher smoking habit than the others (p=0.020). No further significant differences according to sex, age, work experience, nursing education, nursing activity, BMI and shift work have been performed.

By considering anxiety, depression, stress and insomnia conditions according to the nursing shift activity, non-significant difference has been reported among participants, as showing in the Table 2.

Table 1. Sampling characteristics according to shift work among nurses enrolled (n=408).

Sampling characteristics	Shift work			p-value
	Morning (42;10.3%)	Morning, Afternoon (66;16.3%)	Morning, Afternoon, Night (297;73.3%)	
Sex				
Female	35(8.6)	52(12.8)	220(54.3)	0.349
Male	7(1.7)	14(3.5)	77(19)	
Age				
Up to 30 years	8(2)	21(5.1)	119(29.2)	>0.001*
31-40 years	15(3.7)	12(2.9)	110(27)	
41-50 years	10(2.5)	2084.9)	51(12.5)	
51-60 years	9(2.2)	1082.5)	19(4.7)	
≥ 61 years	1(0.2)	380.7)	0(0)	
Work experience				
Until 5 years	11(2.7)	18(4.4)	108(26.7)	0.738
6-10 years	12(3)	1383.2)	70(17.3)	
11-15 years	681.5)	11(2.7)	43(10.6)	
16-20 years	581.2)	982.2)	26(6.4)	
21-25 years	481)	3(0.7)	1684)	
26-30 years	280.5)	5(1.2)	17(4.2)	
Over 31 years	2(0.5)	7(1.7)	17(4.2)	
• **Nursing educational level**				
• Up to 3 years	35(8.6)	51(12.6)	220(54.3)	0.477
• 4-5 years	2(0.5)	9(2.2)	35(8.6)	
• Over 5 years	5(1.2)	6(1.5)	42(10.4)	
• **Occupation**				0.722
• Full-time	38(9.4)	59(14.6)	274(67.7)	
• Part-time	4(1)	7(1.7)	23(5.7)	
Smoking habit				
Yes	14(3.5)	37(9.1)	115(28.4)	0.020*
No	28(6.9)	29(7.2)	182(44.9)	
• **BMI values**				
• ≤ 18.49: Underweight	2(0.5)	4(1)	12(2.9)	0.236
• 18.50-24.99: Normal weight	25(6.1)	33(8.1)	177(43.4)	
• 25.00-29.99: Overweight	13(3.2)	24(5.9)	69(16.9)	
• ≥ 30: Obese	3(0.7)	5(1.2)	41(10)	

*p<0.05 is statistical significant.

Discussion

The aim of the present study is to investigate how nursing shift work influence nurses' health, particularly if shift work impacts on anxiety, depression, stress and insomnia conditions.

Surely, the present research aims to explore numerous variables, however, very interesting differences have been found and also contradictory in their significances according to the current literature.

From our records, most of the nurses recruited are employed also during the night shift (73.3%) and are very young (p<0.001), ageing less than 30 years (29.2%) and between 31-40 years (29%). Additionally, significant difference has been reported in smoking habit, as nurses employed also during the night report higher smoking habit than the other groups comparing (p=0.020). In this regard recent research in the smoking behavior among nurses are very limited. Therefore, it is very difficult to assess any important conclusions

Table 2. Anxiety, Depression, Stress and Insomnia levels according to shift work among nurses enrolled (n=408).

Sampling characteristics (reference value)	**Shift work**			**p-value**
	Morning	**Morning, Afternoon**	**Morning, Afternoon, Night**	
Anxiety				
Normal (0-7)	14(3.5)	29(1.2)	78(19.3)	0.228
Mild (8-9)	4(1)	5(1.2)	24(5.3)	
Moderate (10-14)	9(2.2)	882)	64(15.8)	
Severe (15-19)	6(1.5)	6(1.5)	37(9.1)	
Extremely Severe (>20)	9(2.2)	18(4.4)	94(23.2)	
Depression				
Normal (0-7)	14(3.5)	32(7.9)	109(26.9)	0.082
Mild (8-9)	1(0.29	9(2.2)	26(6.4)	
Moderate (10-14)	15(3.7)	11(2.7)	65(16)	
Severe (15-19)	7(1.7)	681.5)	39(9.6)	
Extremely Severe (>20)	5(1.2)	8(2)	58(14.3)	
Stress				
Normal (0-7)	9(2.2)	24(5.9)	73(18)	0.103
Mild (8-9)	12(3)	10(2.5)	45(11.1)	
Moderate (10-14)	5(1.2)	12(3)	80(19.8)	
Severe (15-19)	10(2.5)	14(3.5)	58(14.3)	
Extremely Severe (>20)	6(1.5)	6(1.5)	41(10.19	
• **Insomnia**				
• Absent (0-7)	14(3.4)	17(4.2)	90(22.1)	0.451
• Subthreshold (8-14)	22(5.4)	31(7.6)	140(34.3)	
• Moderate (15-21)	6(1.5)	18(4.4)	58(14.2)	
• Sever (22-28)	180.2)	0(0)	11(2.7)	

*p<0.05 is statistical significant.

in this issue (47), also considering that smoking behavior has been connected to a large number of psychopathological conditions, including depression, anxiety, and attention-deficit/hyperactivity disorder (47-49). Fluharty et al. (50) report that baseline depression or anxiety may be associated to the smoking beginning (50), by highlighting strong associations with depression and anxiety (48,49). Additionally, no further significant differences according to sex, age, work experience, nursing education, nursing activity, BMI has been found. In this regard, the present data are in disagreement with the current literature, as reporting in a recent study in the nursing staff conducted in Australia, New Zealand, and the United Kingdom, which reports 17%-37% higher obesity prevalence among nurses than the general population (51). Factors leading to increase BMI values are very intricate and multifactorial. However, the increasing BMI level has been immediately associated to the raised level in high-calorie food consumption without an adequate increasing in physical activity practice (52). Additionally, obesity among nurses significantly raises with the increasing number of years of experience, mostly rotating-shifts (53). This trend decreases among nurses who are part-time employed or work only during daily shifts, for example during the morning and the afternoon (54,55). In this aspect also the present data show an overlapping trend, without any statistical significance. The reason of this trend may be explained by the impact of unsocial work programs on eating habits, for example: disadvantageous work timetables which limit the access to fresh food and interferes with eating arrangements, which negatively influences metabolism (56,57). Tiredness and stress from prolonged working shifts and hours may impact on the increased assumption on high energy snacks or fast food (58). Above all, night shift workers are particularly at risk to assume less regular meals including the impact of unsocial work schedules on eating behaviors: unfavorable work schedules limit access to fresh food and disrupt

eating patterns, which in turn adversely affect metabolism, by often skipping full meals, also breakfast (57), frequently replaced by impulsive snack intakes (25-26;59-61). Finally, as regards differences between anxiety, depression, stress and insomnia levels with sampling characteristics, there are no significant differences according to shift. In this aspect the present data are in disagreement with the current literature, as reporting in a recent review highlighting the influence of shift work and stress on eating habits among nurses (62) and evidence that shift work may be considered as a professional risk factor in nurses both for obesity and unhealthy diet conditions. The link between stressful working conditions, obesity and eating behaviors is very hard to reach, due to the availability of scarce evidence to assess stress. Furthermore, shift work may influence mental conditions, including anxiety and depression (63), especially among females (64): workers employed more than 5 years in night work shift had more than a 6-time increase the risk to suffer from a depressive disorder, comparing to employers with less than 5 years of work experience who are not employed during the night shift (65).

Conclusions

The present study discusses research results already highlighted in the current literature; however, it collects further information and assesses additional differences to provide a more complete picture of the nursing profession.

According to the existing evidence, nursing has been considered as one of the most susceptible healthcare occupations, due to several risk factors, by recognizing it as a very heavy profession, also influencing by shift and sleep deprivation, which may influence regular meal assumptions and, consequently, BMI scores. However, our data are contradictory in this sense.

However, the study has some limitations. First of all, data collection is a delicate point, as participants have been recruited only by publicizing the questionnaire on-line, and this method may influence both the statistical significance of the sample and the answers given. Secondly, the study has been carried out during the Covid-19 pandemic and literature suggest (25,26) how the pandemic negatively impacts the participants' psychological conditions, by reporting high anxiety, depression, stress and insomnia levels.

Therefore, more specific and intensive assistance for the promotion of healthy lifestyle should be provided to nurses, who seem to be seriously at risk for professional work-related diseases. The repercussions on their health are numerous, including: the risk of fatigue, burnout and a great propensity to leave the profession (66), bringing out a new phenomenon of nursing staff resignation (67).

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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