Relationship between Mental Workload and Musculoskeletal Disorders in Nurses Working at Day and Night Shifts in the State Hospitals

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ABSTRACT

Aims Most of the occupational tasks, in addition to physical work, have a part in mental and cognitive processing. The aim of this study was to evaluate the relationship between mental workload and musculoskeletal disorders in nurses working at day and night shifts in the state hospitals.

Instruments & Methods The present descriptive-analytical study was conducted among 152 nurses, working at day and night shifts in state hospitals in Neishabur in 2017. These samples were selected by simple random sampling method. The Nordic Demographic Questionnaire and the NASA-TLX Standard Questionnaire were used to measure the prevalence of musculoskeletal disorders and mental load. The data were analyzed by SPSS 20 software, using descriptive statistics and Pearson correlation coefficient, Chi-square, and independent t-test.

Findings There was an increase in the mean score of mental labor and musculoskeletal discomfort, especially in the waist and knee area. A significant relationship was found between the variables of labor with musculoskeletal discomfort ($p<0.05$). Likewise, there was a significant relationship between musculoskeletal disorders and workload ($p=0.002$).

Conclusion Mental workload and musculoskeletal disorders in neck, elbow, upper back, waist, and knee in shift work is higher than day care workers. Also, there is a relationship between musculoskeletal disorders and workload.

Keywords Nurses; Mental Workload; Musculoskeletal Disorders

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CITATION LINKS

[1] Survey of Relationship between Nurses Shift and Personality Characteristics in Private Hospitals in Tehran City [2] Mental health status, shift work, and occupational accidents among hospital nurses in Japan [3] Sleep disorders, health, and safety in police officers [4] Assessing the Status of Managers' Leadership Style and Its Relationship with Mental Health Staff of Hospitals Affiliated to Tehran University of Medical Sciences in 2014 [5] Analytical Survey on Relation Between Workload With Occupational Burnout Dimensions In ICU Nurses [6] Measuring workload of ICU nurses with a questionnaire survey: the NASA Task Load Index (TLX) [7] Assessment of the prevalence of musculoskeletal disorders in nurses [8] Determination of the usage of body mechanics in clinical settings and the occurrence of low back pain in nurses [9] Course of low back pain among nurses: a longitudinal study across eight years [10] BStandardised Nordic questionnaires for the analysis of musculoskeletal symptoms [11] The relationship between musculoskeletal disorders, stress and fatigue in the food industry employees [12] Workplace interventions for increasing standing or walking for preventing musculoskeletal symptoms in sedentary workers [13] NASA-task load index (NASA-TLX); 20 years later [14] Designing questionnaire of assessing mental workload and determine its validity and reliability among ICUs nurses in one of the TUMS's hospitals [15] Assessment of mental workload and relationship with needle stick injuries among Isfahan Alzahra hospital nurses [16] Relationship between mental workload and musculoskeletal disorders among Alzahra Hospital nurses [17] The relationship between observational–perceptual heat strain evaluation method and environmental/physiological indices in warm workplace [18] A study on work ability index and physical work capacity on the base of fax equation VO2 max in male nursing hospital staff in Isfahan, Iran

Introduction

Today, due to the development of societies, population growth, industrialization of countries and the need for some jobs, a significant percentage of employees are working with a shift program. Work shift is considered today as a health threat, which can have adverse effects on various aspects of human life [1].

One of the working groups that are shifting according to the job requirement is the health care team, especially the nurses. In our country, 80% of the health care workers are nurses. Nurses are in the first line of providing health care services that are required to provide patients with all day and night work. Nurses may work in shifts in the morning, afternoon, and night, and therefore are more exposed to psychological stress than other care providers [2]. Occupational accidents and work burdens and burnout in night work nurses are more than nurses working in morning and evening shifts [3].

Nurses are also affected by various stressors due to the responsibility of providing comfort and treatment to patients [4]. Depending on the type of occupation, there is a concept called workload, which is a general concept in ergonomic literature. The burden is a multidimensional, complex, subset of cognitive ergonomics that is a structure for describing the extent of the amount of physical and cognitive resources involved in a particular activity and is subjected to the external demands of organizational, psychological, perceptual, and cognitive factors. High-level work is known as a major concern in health care, which can have a negative impact on these services [6, 5].

Musculoskeletal inflammation is one of the most important occupational health issues in the world today, especially in the nursing profession, and it can be a major contributor to stress in individuals. Sometimes, these factors may lead to dissatisfaction, career abandonment, and misrepresentation of service to the referral. The nursing profession in the hospital is due to the nature of work, including occupations, in which work-related musculoskeletal disorders are highly prevalent [7].

So far, various studies have been conducted in the world on musculoskeletal disorders in hospital personnel, especially nurses [8]. Low back pain that is often experienced in nursing can cause problems in mental health and reduce job performance. A study in this regard showed that 11% of nurses resigned from their job because of back pain. In addition to back pain, shoulder pain disorders are 53.43% and neck pain with a prevalence of 48.30% is in the next rank [9].

It is hoped that the results of the research could provide the necessary framework for assessing the various dimensions of subjective workload among nurses and planning for interventions to increase the efficiency and effectiveness of nurses' activities in hospitals, helping managers and health decision makers to reduce mental retardation, prevention and reducing the prevalence of musculoskeletal disorders and patient satisfaction from staffing services, which ultimately leads to an increase in the productivity of these individuals and the hospital.

The aim of this study was to evaluate the relationship between mental workload and musculoskeletal disorders in nurses working at day and night shifts in the state hospitals.

Instrument and Methods

The present descriptive-analytical study was conducted among nurses, working at day and night shifts in state hospitals in Neishabur in 2017. In this study, 180 people were selected by simple random sampling method. 152 people of nurses (84.4%) completed the questionnaires. They were divided into 2 groups; the day work group (n=62) and the night work group (n=90).

A questionnaire was used to collect information, which included several sections. In the first part, the demographic data, which included age, work history, height, weight, and history of individuals, were asked. As a result, individuals were asked to use anonymous questionnaire and the volunteers participated in the study with their consent.

The second part of the study was to determine the prevalence of musculoskeletal disorder symptoms from the Nordic Questionnaire [10] for recording 9 symptoms of the body (neck, shoulders, upper back and lower back, elbows, left and right hand, thighs, knees, ankles, and legs); the validity of the questionnaire was evaluated in a study in Iran and correlated with 0.91 and was used in various studies to evaluate musculoskeletal discomfort [11, 12]. In this section, there were people who had a second job, leading to musculoskeletal disorders, and those who suffered from an accident or any other reason other than the desired job. Musculoskeletal disorders were excluded.

The NASA Task Load Index (NASA-TLX) questionnaire was also used to determine the subjective burden of the individuals. The questionnaire was designed by Sandra Hart in 1998 at the National Aeronautics and Space Administration of the United States to assess the mental load in using a flight simulator [13]. This is a multi-dimensional approach that provides an overall score of workload based on the weighted average of 6 subscales, including mental need, physical need, time pressure, effort, level of performance, and frustration. Each of the variables of this method was considered on a visual analog scale of 0 to 100, and each participant had to choose an emotion based on each of these

dimensions and, to guide the participants, the definitions of these 6 subscales were placed next to the scale. The labor privilege is divided into 4 levels of low workload (0-25), moderate (26-50), high (51-75), and very high workload (76-100).

In Mohammadi's study, Cronbach's coefficient was estimated 0.897 for NASA's questionnaire and the Intraclass Correlation Coefficient (ICC) was estimated 0.831 and the Cronbach's alpha coefficient was more than 0.70 for all domains [14]. The questionnaires were provided by the researcher to all individuals under study and they were collected after a specified deadline

The data were analyzed by SPSS 20 software. In descriptive analyzes, quantitative, mean, standard deviations, and range variables were determined. Chi-square, and independent t-test were used to examine the relationship between data variables.

Findings

152 people of nurses (84.4%) completed the questionnaires. The mean age of the population was 30.03±11.50 years, the mean BMI of the subjects was 23.47±3.18 kg/m² and the mean of the working experience was 4.97±4.17 years. 18.4% of studied subjects had master's degree and higher, 77.6% of them had bachelor's degree and 4.0% had diploma. About BMI, 67.0% of subjects were in the normal group and 29.0% were overweight. In demographic variables, there was no significant difference between the work day group and the night work group (p>0.05; Table 1).

Table 1) Demographic variables in the day work group (n=62) and the night work group (n=90)

Variables	Night work group	Day work group
Age (years)	30.40±5.20	29.51±4.98
Work experience (years)	4.41±3.78	5.35±4.39
BMI (kg/m²)	23.83±4.32	22.95±3.10
Sex		
Male	21 (23.3%)	11 (17.7%)
Female	69 (76.6%)	51 (82.3%)
Marital status		
Single	34 (37.8%)	24 (38.7%)
Married	56 (62.2%)	38 (61.3%)
Level of education		
Diploma	6 (6.7%)	0
Bachelor	67 (74.4%)	51 (82.3%)
Masters degree and higher	17 (18.9%)	11 (17.7%)
Accidents		
Yes	49 (54.4%)	27 (43.5%)
No	41 (45.6%)	35 (56.5%)

The mean score of the subjective burden of the subjects was calculated according to the weight and degree of each of the 6 scales (62.83±12.44) which were in high level and the highest score in the six-fold scale of labor load was related to the

performance requirement score with 66.18±14.77. The score for mental load was 58.55±18.27.

The mean of the six-dimensional workload subclasses was found in day work and night work personnel. Regarding the results of the day, the highest score was related to the performance and the lowest score for physical pressure and for shift staff, the highest score was for performance and the lowest score was for mental pressure.

Table 2) Average results of six and three-dimensional scales NASA-TLX in the studied nurses

Variables	Day work group (n=62)	Night work group (n=90)	p value
Mental pressure	54.27±14.90	61.33±20.60	0.001
Physical pressure	53.71±14.14	65.72±22.24	0.001
Time pressure	54.11±15.90	69.66±15.33	0.361
Performance	57.50±12.73	72.16±16.19	0.001
Attempt and effort	57.41±12.37	67.44±14.93	0.080
Frustration	57.25±15.80	63.00±11.23	0.001
Total	57.14±11.18	68.52±13.32	0.008

By comparing workload scales between day work and night work groups, we achieved the results that the scores of the six and the scales in shift workers were higher than the working day, and there was a significant relationship between most cases (Table 2).

The most disturbances among nurses were related to the waist, knee, upper back, and neck with a frequency of 86.2%, 63.2%, 61.2%, and 55.9%, respectively. The lowest amount was related to thigh and elbows with a frequency of 10.5% and 13.8%, respectively (Table 3).

Table 3) Frequency of musculoskeletal disorders in different areas of the body in the day work group (n=62) and the night work group (n=90)

Musculoskeletal disorders	Day work group	Night work group	p value
Neck	31 (50.0%)	54 (60.0%)	0.014
Shoulder	32 (51.6%)	35 (38.9%)	0.083
Elbow	4 (6.5%)	17 (18.9%)	0.023
Hand .Wrist	25 (40.3%)	38 (42.2%)	0.474
Upper back	41 (66.1%)	52 (57.8%)	0.019
Waist	60 (96.8%)	71 (78.9%)	0.001
Thigh .buttocks	4 (6.5%)	12 (13.3%)	0.137
Knee	40 (64.5%)	56 (62.2%)	0.045
Leg .Ankle	12 (19.4%)	20 (22.2%)	0.414

The most disturbances in day work group were in the waist, upper back, and knee regions and among shift staff, were waist, knee and neck areas. There was a significant relationship between neck, elbow, upper back, waist, knee in day care workers and shift work (p<0.05; Table 3).

Also, there was a significant relationship between musculoskeletal disorders and workload (p=0.002).

Discussion

In terms of cognitive ergonomics, usually, incidents caused by human error, especially in intellectual works, do not occur due to individual ignorance, but the inaccuracy and concentration of the individual in a moment decreases in such a way that the same thing as he or she knows studying or even engaging in actions that have been done several times does not interfere with their decision.

In some occupations, such as medical, nursing, etc., it is more evident than in cognitive ergonomics, these situations are interpreted as mental labor [15]. This study showed that the subjective burden of the work of the prenatal score and the 6 scales in the shift nurses was greater than the daily working time, so that among the 6 scales of the NASA load factor index, the highest and lowest scores obtained were respectively performance and physical pressure levels in shift work nurses as well as nocturnal nurses were the highest scores in terms of performance and the lowest score in mental stress. Some of the reasons for this may be due to the sensitivity of the nurse's duties in the workplace. This means that the occurrence of any errors may lead to irreparable events and events for the patient so that it can indirectly affect the patient's safety [16].

Also the low back pain among nurses was the highest incidence. This was consistent with a study conducted by Habibi *et al.*, which indicated that occupational stress and work load among nurses cause physiological responses in the form of muscular tension and ultimately discomfort in the lumbar region, which can be attributed to reduced support from superiors, colleagues and others, as well as increased ill-treatment of clients (their patients and their families) and exposure to patients is ill [17, 18].

The study of occupational health of nurses and the implementation of supportive programs, including paying more attention to planners and decision-makers, the difficulty of working conditions and considering incentive incentives and welfare services, are recommended to reduce the burden of these individuals. Also, nurses 'familiarity with teamwork through effective workshops and the proper definition of personnel responsibilities will be effective in reducing workload and reducing nurses' failure. Obviously, the benefits of such interventions are both for the individual themselves and for achieving the ultimate goals of the implementing organization, including increasing productivity, creativity, reducing absenteeism, costs of treatment and the severity of employees, and ultimately increasing general public health.

Limitations of the study include:

Not cooperating with some staff due to their high level of work and incomplete filling of questionnaires.

Conclusion

Mental workload and musculoskeletal disorders in neck, elbow, upper back, waist, and knee in shift work is higher than day care workers. Also, there is a relationship between musculoskeletal disorders and workload.

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