Cogitare Enfermagem

ORIGINAL ARTICLE

OCCUPATIONAL STRESS, SALIVARY CORTISOL AND MUSCULOSKELETAL PAIN IN HEMATO-ONCOLOGY NURSES

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ABSTRACT

Objective: to verify the correlation between occupational stress, salivary cortisol concentration and musculoskeletal pain in hematology-oncology nurses. Method: cross-sectional study with 28 hematology-oncology nurses from an institution in southern Brazil. The Job Stress Scale and the Nordic Musculoskeletal Symptoms Questionnaire were used for data collection, and Salivette® tubes were used for saliva collection and salivary cortisol analysis on three moments during a workday, and on two moments during a day off. Descriptive statistics and Spearman's Correlation test were used. Results: there was a significant and positive correlation between cortisol at the beginning of the day off with control. Cortisol values with occupational stress and musculoskeletal pain were not significant. Conclusion: the results contribute to the understanding of the health-disease process of hematology-oncology nurses, highlighting the need for concomitant physiological and psychological assessments for better evaluation and definition of strategies.

DESCRIPTORS: Hydrocortisone; Oncology Nursing; Musculoskeletal Pain; Occupational Stress; Occupational Health.

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INTRODUCTION

Currently, workers are increasingly expected to present a minimum of characteristics, among them, leadership, competence, diversity of skills and good psychic structure, generating a pressure that can cause distress and psychological suffering[1]. In the nursing area, nurses are the professional team leaders, and it is up to them to play this role and meet many demands, which can lead them to develop occupational stress.

Occupational stress can be understood as the result of the interaction between demands and control at work that, when disproportionate (high demands and low control), can lead to worker illness. The demands are psychological pressures, such as the time required to perform the job, and the control refers to the task control, intellectual ability, and autonomy that the worker must perform his or her job. This definition is known as the Demand-Control Model (DCM) of occupational stress[2].

The DCM is based on the way professionals perceive their work, divided into four quadrants: high exposure to psychological demands at work and little control over them corresponds to the High Demand job, which can lead to damage to health; low psychological demands and high control make up the Low Demand job, less harmful to health. When high psychological demands are combined with high control of the professional, we have a positive effect, the Active Work. On the other hand, if psychological demands in the work environment are low and control is also low, there is demotivation and gradual loss of skills, that is, Passive Work[2-3].

The DCM is one way to assess stress in the work environment, but stress can also be assessed by physiological measures, such as through cortisol, recognized as the stress hormone. The secretion of cortisol is physiological, therefore, expected, and its concentration can be measured in saliva. In recurrent and chronic stress, the concentration of cortisol is high, and may indicate damage to health[4].

Occupational stress can also be related to other diseases, such as musculoskeletal pain (MSP), one of the main stressors for workers[5]. Professionals who report MSP are more likely to feel stressed and vice versa, possibly because the pain makes them less tolerant to the psychological demands of the job[5]. MSP is the main complaint of nursing professionals and is a common cause of disability in nurses[6].

Among the several areas in which nurses work, oncology has been identified as a stressful one. Nurses who work in this area cultivate emotional involvement with patients[7] and often experience terminality and the process of death with those who are beyond therapeutic possibilities of cure, as well as need to act in defense of patients' rights, which represents a high emotional burden[8].

The DCM has already been used in studies that seek to describe the association between stress and MSP[9-10]. However, there are gaps in the literature as to the assessment of occupational stress by means of the DCM quadrants and cortisol values, as well as the specificity of hematology-oncology workers[11].

In view of the above, the objective of this study was to verify the correlation between occupational stress, salivary cortisol concentration, and musculoskeletal pain in hematology-oncology nurses.

METHOD

This is a cross-sectional study, carried out with nurses from the hematology-oncology unit of a public hospital in southern Brazil. This unit encompasses inpatient (pediatric, adult and bone marrow transplant) and outpatient (chemotherapy and radiotherapy) sectors.

The research population comprised 37 nurses. The inclusion criteria were being a nurse and working the day shift. Excluded were those with a disease that affects cortisol production (identified, by self-report, as Cushing's Syndrome, Addison's disease, Adrenal Insufficiency, among others); those who used glucocorticoids, steroids, beta blockers, antidepressants or any psychoactive medication (which influence the functioning of the Hypothalamus-Pituitary-Adrenal axis); self-reported periodontal disease or gingival/oral bleeding; those with less than one mL of saliva in the sample, in two attempts, according to laboratory particularities; smokers and drinkers or with a history of excessive use of alcoholic beverages in the last five years; those who were pregnant, as this condition influences the production of cortisol in the body; and those away from work, for any reason, during the period of data collection.

Of the population (n=37), four did not accept to participate in the research, three were on glucocorticoids, one had Cushing's Syndrome, and another did not reach the minimum of one mL of saliva for analysis in two attempts. Therefore, we obtained a final sample of 28 nurses.

The research protocol included the validated Job Stress Scale (JSS)[12] and the Nordic Musculoskeletal Symptoms Questionnaire (NMQ)[13], as well as an instrument for sociodemographic, work and health profile characterization, with questions such as gender, age, marital status, time of training and work, sector, satisfaction in working in their sector, work shift, questions regarding saliva collection: collection time and sample of the work or day off.

From the JSS[12], on a Likert scale, five questions about psychological demands and six questions about control were analyzed. The response options vary from "frequently" (1 point) to "never or almost never" (4 points). The scores were obtained by summing the scores of the questions in each dimension: the demand dimension ranges from five to 20 points and contains a question with reverse direction, the control dimension from six to 24 points, also with a question with reverse direction. The level of psychological demand was dichotomized according to the medians into "high demand" and "low demand" and the degree of control into "low control" and "high control", and then divided into four quadrants: low demand, passive work, active work, and high demand.

The Nordic Musculoskeletal Symptoms Questionnaire (NMQ) allows the identification of the presence and location of musculoskeletal symptoms, with dichotomous choices (yes or no), in nine anatomical regions, among them: spine, upper limbs and lower limbs, comprising the period of one year and the last seven days. For a more detailed interpretation of the MSP, a numeric pain scale was added to the NMQ, in which the nurses indicated a score from zero to 10 about MSP in the last seven days, in which zero represents no pain and 10 is the worst pain.

Saliva collection for cortisol analysis was performed using Salivette® tubes (dry cotton swab in a plastic tube) on three occasions on the last working day of the week: upon awakening, at the beginning of the shift and at the end of the shift, with a tolerance of one hour after the start time and one hour before the end; and on two occasions on the subsequent day off: one corresponding to the start time of the shift and the other to the end of the shift. The saliva collection procedure was performed by the nurses themselves, therefore, verbal, and written instructions were provided as to care and five Salivette® tubes were given to each one, supplied by the analysis laboratory, a polystyrene box and reusable ice for transportation.

The orientations given were: 24 hours before the collection does not drink alcoholic beverages and do not undergo dental treatments, two hours before the collection avoid brushing the teeth and eating (except water), immediately before the collection do a light

mouth rinse with water. At the time of collection, no oral lesions with active or potential bleeding, no fever and/or acute illness. Open the Salivette® and remove the swab - place the swab in the mouth stimulating salivation - keep the swab for three minutes or if necessary to feel that it is saturated with saliva - return the swab to its initial position in the Salivette® and close it firmly, store it under refrigeration until it is delivered to the author (maximum three days). The orientations were carried out personally by one of the authors, delivered also in written format along with the explanation of the procedure and, on the day of collection, text messages were sent to the participants with the same recommendations.

Subsequently, when delivered, the saliva samples were sent to the reference laboratory, centrifuged for five minutes at 2500 rpm, and kept under refrigeration from 2 to 8°C. The analysis method used was electrochemiluminescence. The results obtained were expressed in µg/dL. Salivary cortisol values were compared with the reference in the literature: morning, between six and 10 hours: less than 0.736µg/dL; afternoon, between 16 and 20 hours: less than 0.252µg/dL; and night, between 23:30 and 00:30 hours: less than 0.274µg/dL[14].

For data analysis, we used the statistical program PASW Statistics® (Predictive Analytics Software, of SPSS Inc.) 17.0. Descriptive statistics were used, with frequency distribution and measures of position and dispersion, depending on the distribution of normality verified by the Shapiro-Wilk test. Student's t test and ANOVA were performed for symmetrical distributions, and Mann-Whitney and Kruskal-Wallis tests for asymmetrical distributions.

Correlations were tested by Spearman's test, also considering the distribution of data, using the following classification values: 0.1 to 0.29 weak correlation; 0.3 to 0.49 moderate correlation, and above 0.5 strong correlation[15]. Values with $p < 0.05$ were adopted as significant.

The study was approved by the local Research Ethics Committee under opinion number 2,447,277.

RESULTS

Twenty-eight nurses, 28 women, with a median age of 37 (IIQ 34-44) years old, participated in the study, and 21 (75%) had a partner. They had a median of 12.92 (IIQ 9.42-18) years old of education and a median of 10 (IIQ 3.58-12) years old of work in the institution. As for the work sector, 13 (46.4%) were from outpatient units and 16 (57.1%) from inpatient units, with a median working time in these sectors of 3.75 (IIQ 3.33-6) years old. All of them reported being satisfied to work in their sectors. Eleven nurses (39.2%) worked in the morning shift, nine (32.1%) in the afternoon shift, and nine (32.1%) in mixed shifts (morning and afternoon).

Regarding the DCM, 17 (60.7%) nurses were in low demand and 19 (67.8%) were in low control, as the JSS had a median of 12 (IIQ 10.25-14) points for Demand and 11 (IIQ 10-12) for Control. Descriptive measures of the JSS are presented in Figure 1. The highest frequency of nurses was in the Passive Work and High Demand quadrants.
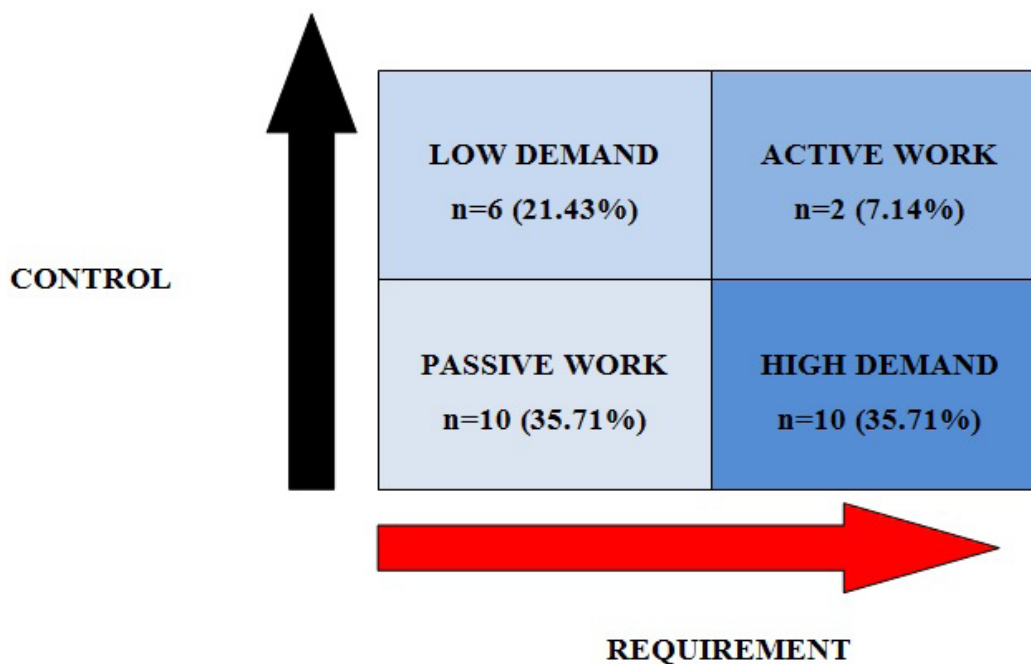
Figure 1 - Stress of nurses in a hemato-oncology service according to the Demand-Control Model. Santa Maria, RS, Brazil, 2018

The salivary cortisol values obtained are described in Table 1. The highest values were on awakening with 0.470 μg/dL and on and off duty, with 0.250 μg/dL and 0.277 μg/dL, respectively.

Table 1 - Descriptive measures of salivary cortisol concentration values of nurses of a hemato-oncology service. Santa Maria, RS, Brazil, 2018

Schedules	n	Cortisol concentration (μg/dL)
Upon awakening	28	0,470±0,211 [†]
Start of Duty	28	0,250 (0,175-0,384) [‡]
End of Duty	28	0,119 (0,102-0,145) [‡]
Start of slack	24	0,277±0,128 [†]
End of slack	24	0,126 (0,076-0,200) [‡]

†Mean/Standard Deviation; ‡Median (Interquartile Range). Source: Authors (2018)

As for the NMQ, it is observed that the MSP in the spine was the most disturbing for the nurses in the last year, and in the last week, in the lower members. The descriptive measures of the NMQ and numerical scale are presented in Table 2.

Table 2 - Frequency and intensity of musculoskeletal pain in nurses of a hematology-oncology service. Santa Maria, RS, Brazil, 2018

	Pain or discomfort in the last year n (%)	This problem got in the way of doing something last year n (%)	Pain or discomfort in the last seven days n (%)
Frequency			
Vertebral Column	27 (96,43)	14 (50)	18 (64,28)
Upper Members	16 (57,14)	2 (7,14)	4 (14,28)
Lower Members	21 (75)	10 (35,71)	28 (100)
Intensity			
Painless			5 (17,85)
Mild pain			10 (35,71)
Moderate pain			12 (42,86)
Severe pain			2 (7,14)
Very severe pain			0

Source: Authors (2018)

The median of MSP intensity was three (IIQ 1-5), with a minimum of zero and a maximum of seven. Most of the nurses felt Moderate Pain, followed by Mild Pain, in the last seven days.

Table 3 shows the MSP and salivary cortisol measurements in the four quadrants of the DCM.

Table 3 - Measures musculoskeletal pain in the last week and salivary cortisol values divided by quadrants of the Demand-Control Model. Santa Maria, RS, Brazil, 2018 (continues)

DCM* quadrants (n)	Body Regions	Presence of MSP	Saliva collection times (n)	Cortisol
Passive Work (10)			Awakening (9)	0,464±0,193 [†]
	CV	6 (60)	Beginning of duty (9)	0,310±0,165 [†]
	MS	1 (10)	End of duty (9)	0,131±0,043 [†]
	MI	10 (100)	Start of slack (8)	0,272±0,165 [†]
			End of slack (8)	0,147±0,571 [†]
Low Demand (6)			Awakening (6)	0,428±0,305 [†]
	CV	4 (66,6)	Beginning of duty (6)	0,274±0,141 [†]
	MS	1 (16,6)	End of duty (6)	0,116 (0,108-0,129)[‡]
	MI	6 (100)	Start of lack (6)	0,345±0,101 [†]
			End of slack (6)	0,236±0,186 [†]

Active Work (2)			Awakening (2)	0,528±0,201 †
	CV	1 (50)	Beginning of duty (2)	0,223±0,389 †
	MS	0	End of duty (2)	0,177±0,636 †
	MI	2 (100)	Start of lack (2)	0,256±0,912 †
			End of slack (2)	0,132±0,025 †
High Demand (10)			Awakening (10)	0,492±0,178 †
	CV	7 (70)	Beginning of duty (10)	0,244(0,168-0,322)‡
	MS	2 (20)	End of duty (10)	0,119±0,060 †
	MI	10 (100)	Start of lack (7)	0,220±0,103 †
			Awakening (7)	0,073(0,070-0,152)‡

†Mean/Standard Deviation; ‡Median/Interquartile Range. Source: Authors (2018)

The DCM quadrants that got the highest frequency of MSP in the three body regions were the two highest frequency stress quadrants, i.e., High demand and Passive work. All nurses experienced MSP in the IIMs regardless of the DCM quadrant. As for salivary cortisol, it is identified that their values were within the reference values.

No associations were found by Student's t test and ANOVA for symmetrical distributions, and Mann Whitney and Kruskal-Wallis tests for asymmetrical distributions, with p value considered significant when $p<0.05$. Finally, Spearman's correlation analysis tested the variables psychological demand, control, pain level, and salivary cortisol concentration at the different times, in which there was only a significant and positive correlation between cortisol from the beginning of slack with control ($r=0.446$ and $p=0.029$), described in detail in Table 4, suggesting that the higher the cortisol concentration, the higher the control was.

Tabela 4 - Correlação das demandas psicológicas, controle, nível de dor e concentração de cortisol salivar nos enfermeiros de um serviço de hemato-oncologia. Santa Maria, RS, Brasil, 2018

	Level of Pain	Cortisol on awakening	Cortisol starting on duty	Cortisol at start of slack	End-of-duty cortisol	Cortisol from the end of slack	Psycho-logical demands	Con-trol
Level of pain	1							
Cortisol on awaking	0,024	1						
Cortisol starting on duty	-0,171	-0,299	1					
Cortisol from off start	0,249	0,034	0,282	1				
End-of-duty cortisol	0,032	-0,177	0,441	0,451	1			
End-of-off cortisol	0,117	-0,21	0,141	0,146	0,174	1		
Psychological demands	0,154	0,106	-0,103	-0,383	-0,031	-0,015	1	
Control	-0,036	-0,315	0,113	,446†	0,201	0,365	-0,292	1

†p=0,029. Source: Authors (2018)

DISCUSSION

When the variables were analyzed individually, it was observed that most of the nurses were in the quadrants of High Demand and Passive Work, considered to be those of higher risk for the development of occupational diseases, because in High Demand work, high psychological demands and little control result in psychological wear and diseases, and in Passive Work, by not presenting challenges to the worker, he/she may gradually lose the skills already acquired[3].

This data agrees with the stress situation in nurses from other public hospitals, who were found in these same quadrants[16]. Another study also reveals that it is highly likely that nurses' stress is associated with the managerial and care activities they develop, including team coordination and supervision of activities[1].

Nurses' stress may also be related to their work process in the hematology-oncology sector, since patients with hematology-oncological diseases demand high workloads from the nursing team, compared to those with non-malignant diseases[8]. Moreover, death, clinical worsening and suffering of these patients are common characteristics in oncology, which may interfere in the satisfaction of workers and in their perception about work[17].

In this sense, the characteristics of the hematology-oncology sector psychologically demand a lot from the professionals, identified by the High Demand quadrant; however, it is interesting that the Passive Work quadrant, which shows low demand and low control, was also identified as one of the most prevalent. These nurses do not see their work as challenging or demanding. This demonstrates how there are differences among professionals in the way they view the same work.

Although the nurses were in quadrants of occupational stress of higher risk for diseases, the salivary cortisol values showed no changes. Thus, it is identified that, possibly, these professionals are in high levels of psychological stress due to work, but it is not chronic yet, not reflecting in cortisol values[4].

As for MSP, the sites identified with the highest prevalence of pain were spine in the last year and lower limbs in the last seven days, with intensities ranging from mild to moderate. Most hospital nursing professionals have already presented signs and symptoms of Repetitive Strain Injury/Work-Related Musculoskeletal Disorders[18]. Jordanian nurses also reported back pain, especially those who stood for a long time and who had more than eight years of work time, having absenteeism as an impact of pain[19].

The MSP recognized as moderate and mild intensity may reflect the onset of this symptom, which demonstrates this to be an opportune time for interventions to prevent the worsening of the occupational stress picture and to promote psychological improvement.

Regarding MSD and stress, the nurses who reported higher frequency of MSD were in the quadrants of higher stress, High Demand and Passive Work, with emphasis on pain in MMII and VC. This result is consistent with the literature, which identifies a relationship between stress and MSD in nursing professionals, with a positive association between high psychological demands and MSD[6].

When considering the set of variables under study, that is, occupational stress, salivary cortisol concentration and MSP, only one significant and positive correlation was identified involving the value of the cortisol concentration on the day off with the control factor, indicating that possibly the nurses feel more in control of the psychological demands of the job during the day off, that is, they have greater control and autonomy over their activities at the time that corresponds to the beginning of the work shift.

A study conducted with Brazilian nurses reports that among the beneficial effects of resting during work is the reduction of sleepiness. In addition, resting during the workday

enables better performance and reduced sleepiness and fatigue at the end of the shift. In addition, rest may facilitate readjustment to schedules during the days off, since individuals who did not rest during the shift complain more about poor quality of sleep on days off when compared to those who rested[20].

Finally, in view of the findings, we emphasize the importance of developing coping strategies, which can be defined as a set of behavioral responses that the individual emits when facing a stressful situation, to modify the environment to adapt as best as possible to the stressful event, to reduce or minimize its aversive character. This study has limitations involving the small sample size. In addition, the cross-sectional design does not allow inferences of cause and effect.

CONCLUSION

In the present study, a significant and positive correlation was identified involving the cortisol concentration value of the day off with the control factor, which demonstrates the importance of the day off for the professional, perhaps because this way he/she can organize and make decisions, improving his/her control in the activities to be developed at work. Relating stress and MSD, it was observed that the nurses who were in the quadrants of higher stress mentioned a higher frequency of MSD in the spine and lower limbs, with moderate to light intensity.

In view of the above, it is necessary to evaluate the working conditions, including the physical and cognitive aspects and the organization of work, to create a healthier work environment and promote integral care for the professional. Thus, it is possible to correct or prevent musculoskeletal disorders, reduce stress and, consequently, improve their ability to perform their work.

This study contributes to a better understanding of the work of nurses in hemato-oncology in a public hospital, with psychological and physiological data, given the lack of studies on the psychological and physical health analyzed together in this population. These are health aspects that deserve attention, since they can promote professional absenteeism and, consequently, increased workload for other workers.

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