Levels of Capillary Cortisol and Risk Behaviors in Hospital Nursing Staff

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Abstract

Objective: To associate the levels of capillary cortisol and the risk behavior factors in hospital service nursing staff.

Methods: Descriptive-analytical, cross-sectional, quantitative study, carried out in a hospital institution with 164 nursing staff members, using a self-completion questionnaire to obtain personal and professional profiling data. Staff members' hair samples were collected for capillary cortisol analysis. The data were entered into an MS-Excel spreadsheet, the statistical analysis was carried out by determining the sample size, with the prevalence value of 50%, which results in a sample size that contemplates any value of P. The software used for sample calculation was the R software and the statistical tests used for the analysis consisted of the Pearson's Chi-Squared test. The study was approved by the Research Ethics Committee.

Results: 38.4% of the staff members evaluated were undergoing treatment or using some type of medication, 22.5% were away from work, 18.3% were smokers, 60.4% consumed alcoholic beverages, 57.3% did not practice physical activities and 47.6% had difficulty falling asleep. Regarding cortisol, its levels were above normal among smokers, those who consumed alcoholic beverages, those who led a sedentary lifestyle and those who had difficulty falling asleep. According to statistical analysis, it can be stated that there was no significant association between the variables tested and the results of cortisol levels.

Conclusion: Risk behaviors are present in the clinical service nursing team, but they did not exhibit an association with the levels of capillary cortisol.

Keywords: *Nursing; Hydrocortisone; Occupational Health; Tobacco Use Disorder; Alcohol Consumption*

Introduction

A person's emotional and social well-being can be expressed by the way he/she develops good habits that can affect his/her quality of life and interfere in his/her work activities [1]. In nursing, it is known that the work process is frequently defined by the fast work routine resulting from the absence of an adequate number of staff members, which leads to an activity overload. Other factors are the lack of

autonomy and little recognition and professional appreciation, which can lead to health problems and aggravation, of both physical and psychic nature due to the stress experienced routinely [2].

Population studies often measure cortisol as a stress marker, and the excess of this hormone is associated with increased mortality [3]. Physiologically, it is known that one of the pathways that mediate the associations between stress and physical and mental health involves the known Hypothalamus-Hypophysis-Adrenal (HPA) axis, along with glucocorticoid (GC) cortisol (CORT), a hormone manifested as an end-product [4]. The CORT is regulated by the HPA axis and influenced by blood glucose levels [5].

There is consistent evidence of a relationship between CORT and anthropometric measures related to stress and some hemodynamic measures, such as blood pressure (BP) values; furthermore, people with a higher Body Mass Index (BMI) exhibited high CORT values; as for BP, only systolic was related to CORT, while the association with diastolic BP was not significant [6]. In a study that analyzed the relationship between the dimensions of psychosocial stress and the salivary CORT in military police officers, it was found that the variation of these GC values was influenced by individual, psychosocial, and work-related variables [7]. An investigation that aimed to identify in the literature the circumstances of the existence of an association between systemic arterial hypertension (SAH) and CORT and the clinical methods used for this relationship, found the existence of SAH related to the increase of CORT starting at the age of 62, with the increase of sodium intake in their diet, the habit of not having breakfast, the increase of caffeine consumption, the metabolic syndrome, the occurrence of obesity, the excess of catecholamines and some types of biomarkers [8].

In alterations such as Metabolic Syndrome (MS), there is a direct relationship between stress and the CORT. Released at times of chronic stress by the HPA axis, this GC in excess causes a homeostasis imbalance and triggers a series of diseases such as dyslipidemia, diabetes mellitus type 2 (DM), obesity, and SAH [9]. The CORT can then be detected in blood [10], saliva [11], urine [12] and hair [13].

In the field of healthcare, nursing staff members are exposed to factors that can trigger stress in the work environment; in critical care units, psychosocial elements related to mental load can affect nurses' work routine [14]. Poor working conditions, strain, physical and mental fatigue [15], high demands, emotional pressure, and lack of professional recognition [16] also contribute to this issue. Despite the social relevance of this profession, to date, it is poorly recognized and there has been little change in the behavior and attitude of nurses, which still presents a context of subordination and acceptance of orders from other practitioners [17].

There are complex work-related situations concerning the nursing team's work process and daily routine, in such a way that health behaviors can be influenced by social determinants, such as socioeconomic, family, environmental and cultural conditions, besides genetic and emotional characteristics [18].

These factors may be associated with risk behaviors, such as obesity and lack of physical activities that are related to the higher occurrence of accidents in the workplace [19]. Still in this context, it is worth noting that risk behaviors are present in workers' daily work routine and tend to favor health alterations; there is an association between alcohol and tobacco consumption in which the occurrence may be facilitated by environments where work conditions are stressful [20]. The abusive use of alcohol present in society can be evaluated by the binge pattern, defined as five or more doses in a single occasion for men and four doses or more for women [21].

These situations generate dissatisfactions, conflicts in professional relationships, suffering in the physical and mental spheres, and can limit work activities, damaging them in their lives. The levels of GC CORT may be altered in these individuals and particularly in the most stressed ones.

In addition, there is a limited number of national and international studies that evaluate the levels of CORT in nursing staff members' hair. It is then justified to carry out this study that had the following guiding question: "Is there an association between the levels of CORT present in hair and the risk behaviors among nursing staff members?".

With this in mind, this study aimed to associate the levels of capillary cortisol and the risk behavior factors in hospital service nursing staff.

Methods

This is a descriptive-analytical, cross-sectional, exploratory study, with a quantitative approach, carried out in a hospital institution in a city of the state of São Paulo, Brazil, with nursing assistants, technicians, and nurses. The hospital where these staff members worked was medium-sized, being a reference center for the site, with procedures of medium and high complexity. There was a total of 245 nursing staff members at the moment of data collection.

This study included staff members of both sexes assigned to sectors such as Isolation (I), Intensive Care Unit (ICU), Coronary Care Unit (CCU), Accident and Emergency Department (A&E) and Medical Clinic Unit (MCU). Those not found at the time of data collection were excluded, for any reasons of absence from work, including illness, accidents, vacations, or breaks.

The sample was obtained by using the Stratified Random Sampling method, with proportional allocation by strata, formed by the sectors previously described. As the prevalence of the variables of interest was unknown in the target population, the criterion that recommended the parameters of relative errors of 20, a significance level of 5% and a prevalence of 50% in each stratum was used. Thus, in the end, a total of 164 nursing staff members became participants, consisting of 35 nurses, 102 nursing technicians, and 27 nursing assistants.

The data collection took place in the first quarter of 2017 as follows: an instrument was used for the personal and professional profiling of staff members, which had already been used in another survey with this type of population, adapted by the authors and composed of structured and semi-structured questions, directed at variables that aimed at both the identification of staff members and their professional fields [22]. This questionnaire contained the following variable questions: date of the interview, the function performed by the staff member (nursing assistant, nursing technician, or nurse), date of birth, sex, marital status, type of contract with the institution (temporary, effective), time of professional performance, date of admission in the unit, number of jobs on the date of data collection (inside and outside nursing), weekly workload, and, in the other job, hospital sector where he/she worked, work shifts, work on weekends, treatment and use of some medication, time off from work, presence of habits such as smoking and alcohol consumption, physical activity, sleeping hours and difficulties to sleep. The instrument was self-filled by the nursing staff members during their work routine in the morning, afternoon and at night, whereas the first author of this study remained at the disposal for the clarification of eventual doubts brought forth by the respondents.

The questionnaire and the hair collection for the CORT analysis were obtained on the same day. For the hair samples, the guidelines of Paza., *et al.* (2017) were followed, obtaining 164 samples with at least 30 milligrams (mg) of hair per participant, which were packed in specific envelopes and boxes to avoid contamination and sent to the laboratory for the CORT analysis. The reference values used were: CORT below normal up to 16 picograms of cortisol/milligrams of hair (pg/mg), normal from 16 to 84 pg/mg, and above normal values higher than 84 pg/mg [23].

The procedures used to measure the cortisol levels were performed in a clinical analysis laboratory, following the instructions contained in the specific Cortisol ELISA Kit (Enzyme-Linked Immunosorbent Assay) for saliva (KAPDB290), validated for hair samples [23].

All data collection was carried out in a private environment within the hospital institution, seeking not to interfere in the work routine and activities performed by the study participants.

To elaborate the database and insert the variables, including those of hair analysis, the information was entered into an MS-Excel spreadsheet, version 2010 and checked, after double typing. The statistical analysis was carried out by determining the sample size, with

the prevalence value of 50%, which results in a sample size that includes any value of P. The sample calculation software used was the R version 3.1.2. The statistical test used for the analysis was Pearson's Chi-Squared test, using the significance level of 5%.

The study followed all the ethical and legal precepts in accordance with the national recommendations and was approved by the Research Ethics Committee, with the legal opinion number 1.880.815, CAAE protocol: 55839216.5.0000.5393.

Results

When analyzing the nursing staff members' personal and professional profile, it was found that 80.0% of them were female, 46.3% were married/living with a partner, 53.7% were single, widowed, and divorced, 57.9% were 31 to 50 years old, 76.2% had been working for up to 10 years in this profession, 84.7% had a single job in nursing, 94.5% did not work in another job simultaneously, and 88.4% worked for 42 hours a week.

The majority of them did not work overtime weekly (55.0%); 13.4% worked from 1 to 22 hours overtime/week and 1.2% worked more than 30 hours; among those who had a workload in another job, 10.9% worked for more than 36 hours a week. Most participants were nursing technicians (62.2%), followed by nurses (21.3%) and nursing assistants (16.5%) who worked in the following sectors: Hospitalization (48.2%), Accident and Emergency Department (20.7%), ICU-CCU (14.6%), adult ICU (12.8%), and Isolation (3.7%); 52.4% of them worked during the day shift, 42.6% worked during the night shift and 4.8% worked during both shifts; 93.9% worked during weekends.

Regarding medication use, 61.5% of them did not use any medication; those who did undergo some form of treatment and used medication were classified as follows: treatment for emotional disorders, chronic diseases, hormonal treatment and others.

Most staff members have not requested time off from work. Those who did have been withdrawn due to the following factors: Mental disorders (depression/panic disorder), surgeries (bile/renal calculus/ hysterectomy/spinal column/spontaneous abortion/maternity license), orthopedic disorders (bone fracture/dislocation/Repetitive Strain Injuries (RSI)/Work-Related Musculoskeletal Disorders (MSD)/disc/column herniations/Low Back Pain (LBP)), traffic collisions/workplace accidents and other types of absences (bereavement/ kidney colic/pulmonary embolism/labyrinthitis/ Urinary Tract Infection (UTI)).

Some of the respondents' risk behaviors are presented below (Table 1).

Variables	f	%
Smokers		
Yes	30	18,3
No	134	81,7
Total	164	100,0
Alcohol consumption		
Yes	65	39,6
No	99	60,4
Total	164	100,0
Consumption quantity (alcoholic beverages) times/week		
No consumption	99	60,4
1	39	23,8
2	5	3,0
3	7	4,3
4	0	0,0
5	1	0,6
6	0	0,0
7	2	1,2
No answer	11	6,7
Total	164	100,0

Table 1: Distribution of nursing staff according to smoking, alcohol consumption, and consumption quantity. State of São Paulo, Brazil, 2017 (n = 164).

The minority of them reported being a smoker and consuming alcoholic beverages; although 6.7% of them had admitted consuming alcohol, they did not answer on the number of times they did so. (Table 1).

Physical activity practice and difficulty falling asleep are demonstrated below (Table 2).

Variables	f	%
Physical activity practice		
No	94	57,3
Yes	70	42,7
Total	164	100,0
Number of times/week (physical activity)		
0	94	57,3
1	4	2,4
2	15	9,1
3	36	22
4	8	4,9
5	4	2,4
6	1	0,6
7	2	1,2
Total	164	100,0
Difficulty falling asleep		
Yes	78	47,6
No	86	52,4
Total	164	100,0

Table 2: Nursing staff distribution according to physical activity practice and difficulty falling asleep. State of São Paulo, Brazil, 2017 (n = 164).

When analyzing these variables, it was found that most nursing staff did not practice physical activities and the minority of them reported difficulty falling asleep.

The evaluation of CORT concentration according to the following variables: category, marital status, hospital work sector, and work shift (Table 3) can be found below. The n = 161 is observed since three hair samples were insufficient and could not be accounted for in the study.

CORT concentration by pg/mg*								
Operational category	**Below**		**Normal**		**Above**		**Total**	
Nursing Assistant	4	14,8%	11	40,7%	12	44,4%	27	100%
Nursing Technician	10	9,9%	42	41,6%	49	48,5%	101	100%
Nurse	8	24,2%	9	27,3%	16	48,5%	33	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Sex	**Below**		**Normal**		**Above**		**Total**	
Female	20	15,4%	50	38,5%	60	46,2%	130	100%
Male	2	6,5%	12	38,7%	17	54,8%	31	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Marital status	**Below**		**Normal**		**Above**		**Total**	
Single	9	14,8%	18	29,5%	34	55,7%	61	100%
Married/Living with a partner	8	11,1%	29	40,3%	35	48,6%	72	100%
Divorced	2	11,1%	9	50,0%	7	38,9%	18	100%
Widowed	2	28,6%	4	57,1%	1	14,3%	7	100%
Other (cohabiting)	1	33,3%	2	66,7%	0	0,0%	3	100%

Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Hospital work sector	**Below**		**Normal**		**Above**		**Total**	
Hospitalization Unit	13	16,5%	31	39,2%	35	44,3%	79	100%
ICU** adults	3	15,8%	10	52,6%	6	31,6%	19	100%
Accident and Emergency	2	5,9%	6	17,6%	26	76,5%	34	100%
Isolation	2	33,3%	3	50,0%	1	16,7%	6	100%
ICU – CCU***	2	8,7%	12	52,2%	9	39,1%	23	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Work shift	**Below**		**Normal**		**Above**		**Total**	
Night	8	11,8%	31	45,6%	29	42,6%	68	100%
Day	14	16,3%	26	30,2%	46	53,5%	86	100%
Both	0	0,0%	5	71,4%	2	28,6%	7	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%

***Table 3:** Cortisol concentration (CORT) among hospital nursing staff according to the operational category, marital status, hospital work sector, and work shift. State of São Paulo, Brazil, 2017 (n = 161).*
*: Cortisol picograms/hair milligrams (pg/mg).
: ICU=Intensive Care Unit; *: CCU= Coronary Care Unit.

According to table 3, it is noted in the variable "professional category" that the values of CORT in all workers investigated were above normal, exceeding 40.0%. In the nursing technicians, this concentration above the reference levels covers almost 50.0% of these staff members. However, according to the statistical analysis and application of the Pearson's Chi-Squared test, with a p-value of approximately 27% (test statistic value of 5,218), it can be assumed, at the significance level of 5%, that there was no significant association between the staff members' categories in relation to the cortisol level.

Regarding the "sex" variable, both were found to have CORT values above those considered normal. With the application of the Pearson's Chi-Squared test with a p-value of approximately 39% (test statistic value of 1.857), it indicated that at a 5% significance level, there was no significant association between the staff members' sex in relation to the cortisol level.

Regarding marital status, single and married/living with a partner presented CORT values above normal. According to the Pearson's Chi-Squared test application, with a p-value of approximately 27.4% (statistical test value), it can be stated, at a 5% significance level, that there was a significant association between the staff members' marital status and the cortisol levels. But the test was not conclusive, since one of the assumptions (less than 20% of expected frequencies) was not met.

Regarding the hospital sector where the practitioners work, it can be noted that both in the internment and in the emergency room the CORT value is above normal, being expressive in the emergency room; however, these values are normal in both ICU and Isolation. Regarding the shift, it is noted that during the daytime the CORT values were above normal (53.5%). In the statistical analysis, with the application of the Pearson's Chi-Squared test with a p-value of 11.4% (test statistic value of 7451) with the significance level of 5%, it was deemed as not being significant; it is concluded, then, that there was no significant association of the cortisol levels between the work shifts.

Despite the percentage variations in relation to the CORT (Table 3), it can be noted that in the sums of each of the variables investigated (in the totals lines), the concentration of this GC was higher than the values considered normal.

Regarding the concentration of Cortisol (CORT) according to the variables "works on weekends", "undergoes treatment and uses medications", "time off from work", "smoker", "alcohol consumption", "practices physical activity", "has difficulty falling asleep ", the data are presented in table 4, below.

Variables	CORT concentration by pg/mg*							
Works on weekends	**Below**		**Normal**		**Above**		**Total**	
Yes	19	12,6%	60	39,7%	72	47,7%	151	100%
No	3	30,0%	2	20,0%	5	50,0%	10	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Undergoes treatment and uses medication	**Below**		**Normal**		**Above**		**Total**	
Yes	7	11,3%	21	33,9%	34	54,8%	62	100%
No	15	15,2%	41	41,4%	43	43,4%	99	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Time off from work	**Below**		**Normal**		**Above**		**Total**	
Yes	3	7,3%	19	46,3%	19	46,3%	41	100%
No	19	15,8%	43	35,8%	58	48,3%	120	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Smoker	**Below**		**Normal**		**Above**		**Total**	
Yes	4	13,3%	13	43,3%	13	43,3%	30	100%
No	18	13,7%	49	37,4%	64	48,9%	131	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Alcohol consumption	**Below**		**Normal**		**Above**		**Total**	
Yes	10	15,4%	26	40,0%	29	44,6%	65	100%
No	12	12,5%	36	37,5%	48	50,0%	96	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Practices physical activity	**Below**		**Normal**		**Above**		**Total**	
Yes	10	14,3%	23	32,9%	37	52,9%	70	100%
No	12	13,2%	39	42,9%	40	44,0%	91	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%
Has difficulty falling asleep	**Below**		**Normal**		**Above**		**Total**	
Yes	13	16,7%	31	39,7%	34	43,6%	78	100%
No	9	10,8%	31	37,3%	43	51,8%	83	100%
Total	22	13,7%	62	38,5%	77	47,8%	161	100%

Table 4: Cortisol concentration (CORT) among hospital nursing staff according to the variables "works on weekends", "undergoes treatment and uses medications", "time off from work", "smoker", "alcohol consumption", " practices physical activity", "has difficulty falling asleep ". State of São Paulo, Brazil, 2017 (n = 161). pg/mg* = Cortisol picograms/hair milligrams.

According to table 4, all the variables listed, with the exception of smokers and those who suffered workplace accidents (whose CORT percentages indicated that they were equal between the values considered normal and those above normal) presented values of this GC above those considered normal. However, at the 5% significance level, none presented a significant association with the CORT level, as described above.

The variable "undergoes treatment and uses medication" and its relationship with the CORT concentration, according to Pearson's Chi-Squared test, with a p-value of approximately 36.5% (test statistic value of 2.016), at the significance level of 5%, demonstrated no significant association between those who used medication with those who did not and the GC values.

The same conclusion was reached regarding the variables: - time off from work (Pearson's Chi-Squared test, a p-value of approximately 27.5% - test statistic value of 2.579; - smoker (Pearson's Chi-Squared test, a p-value of approximately 82.6% - test statistic value of 0.381); - alcohol consumption (Pearson's Chi-Squared test, a p-value of approximately 76.6% - test statistic value of 0.534); - practices physical activity (Pearson's Chi-Squared test, a p-value of approximately 42.4% - test statistic value of 1.718); - difficulty falling asleep (Pearson's Chi-Squared test, a p-value of approximately 44.4% - test statistic value of 1.626).

Discussion

The participants' demographic profile indicated that most of them were female nurses, with ages ranging from 31 to 50 years, who were married or living with a partner, were permanent employees, had been working in the profession from 0 to 10 years, were assigned to the medical clinic, during the daytime shift, and who worked on weekends.

These results corroborate the findings of other studies, which found the prevalence of females in the category of nursing technicians and assistants and married/living with a partner. Moreover, it is noted that the presence of women in this profession represents the great majority [24-26].

Regarding treatments or medication use, it was analyzed that 61.59% of the interviewees answered that they do not use any medication or undergo any treatment. Of those who undergo some type of treatment, 21.95% answered that they use medication or undergo treatment for chronic diseases (SAH and DM), 9.15% undergo some type of treatment or use some medication for emotional disorders (anxiety and depression), 9.15% undergo hormonal treatment, and 3.05% undergo other types of unspecified treatments. The literature lacks studies on the relationship between mental disorder symptoms and the use of psychoactive substances by nursing staff [24].

However, in relation to depression, a national study with a cross-sectional approach carried out in a general hospital, with 416 participants, described that 21.3% of the investigated practitioners presented symptoms suggesting depression [25]. Also, this same study noted that the use of sedatives was associated with feelings of hopelessness and sadness, lack of interest and pleasure and an increased risk for their use in subjects with signs and symptoms of depression [25].

Regarding the participants' difficulty falling asleep, the literature corroborates with the same findings. Chronic insomnia is highly prevalent and associated with significant morbidity, offering risk for hypertension and psychiatric disorders such as depression [27]. Thus, sleep disorders have been found to be highly prevalent among general hospital nurses in mainland China; among the associated factors is the prevalence of occupational stress, which is an important factor in the development of sleep disorders [28].

Currently, as the world is experiencing the COVID-19 pandemic, a systematic review carried out by researchers from Greece and the United Kingdom totaling 33,062 participants, demonstrated that out of five studies, almost four out of ten healthcare practitioners have difficulty falling asleep and/or insomnia, and the prevalence of insomnia was estimated at 38.9% [29].

Concerning the abusive consumption of alcohol, it has not been different among other groups of the population, and it has been an issue, especially in the category of healthcare practitioners [25]. A national, cross-sectional study, carried out with 112 nursing practitioners of the Family Health Strategy (FHS) team, used screening instruments to evaluate the abusive use of alcohol and other drugs and a scale that evaluates symptoms of depression, stress and anxiety. The results indicated that 44.6% of these practitioners consumed alcohol in the binge pattern, most of them were male, 16.2% of them presented symptoms of depression, 15.2% of them presented symptoms of stress and 23.2% of them presented symptoms of anxiety [24].

In Korea, it was found that, among employees, women are more fragile than men in terms of the effects of nighttime work, even presenting a higher frequency of alcohol use disorders and a worse quality of life concerning their health than those who work during daytime [30].

In Brazil, alcohol consumption and the presence of other risk behaviors among the hospital nursing team members were evaluated; the participants were 416 practitioners and it was found that those who consume alcohol and/or other drugs (such as tobacco) in a problematic manner presented higher levels of harmful behaviors, such as not practicing physical activities and consuming alcoholic beverages above the recommended daily limit [18].

Alcohol use reduces reflexes and balance, which can cause accidents, especially in manual activities, regarding smoking, it may cause disturbances in sleep and in cognitive development, it may also cause fatigue, and so on [19]. Alcohol consumption has been positively associated with work conditions, daily habits, family life and social life and in some cases, excessive consumption can interfere with work [20].

Another study proved that 35.8% of the participants consumed alcoholic beverages in the binge pattern and 21.2% of them abused alcohol or were likely addicted to it. Moreover, 6.6% of the participants were active smokers. This phenomenon draws attention, as the abusive use of psychoactive substances by healthcare practitioners is no different from the abusive use of these substances by the general population [25].

As for smoking, a study carried out in India with 306 employees, including nurses and cleaning staff of a tertiary care center, indicated that tobacco consumption among healthcare staff is higher compared to the general population; when people are responsible for providing care to others, these care providers develop unhealthy habits and varied risk factors, assuming that such factors can further increase the magnitude of these problems [31].

Research has confirmed the association among dissatisfaction in the workplace, quality of life, and smoking, besides the tasks present in the care provided to care-dependent patients, the low social support, and the tasks considered active and of high demand [32].

Research with nursing staff who work at the Intensive Care Units of a Teaching Hospital in Brazil analyzed the existence of an association between alcohol and tobacco consumption. In this research 160 nursing practitioners from 4 Intensive Care Units participated, tobacco consumption presented statistical association, indicating that emotional exhaustion, reduction of professional accomplishment, and depersonalization can lead to increased tobacco consumption as a form of escapism [20].

However, resuming the objective of associating the levels of capillary cortisol and the risk behavior factors in hospital nursing staff, as previously described, in this study it was not possible to evidence this significant association, through the application of statistical tests, among the several variables considered and the levels of capillary CORT. However, the levels of CORT were above normal among smokers, those who consumed alcoholic beverages, those who were sedentary, and those who had difficulty falling asleep. Even these variables do not present a statistical association with capillary cortisol, it is worth discussing below some aspects that are linked in this context.

Therefore, it is noteworthy that daily stress leads to the development of harmful health habits and the concentration of capillary cortisol is an important biomarker for chronic stress [33]. Factors such as the consumption of alcohol, nicotine, certain types of food, changes in glucose and oxygen levels in the blood, besides physical exercises and acute lesions have been noted to alter the secretion of cortisol in the body [6].

A study analyzed the relationship among the "smoking", "coffee consumption" and "contraceptive use" variables and noted that there was no increase in capillary cortisol levels. Likewise, age or consumption of tobacco derivatives does not allow for predictions on increases of capillary cortisol levels to be carried out. On the other hand, the consumption of alcoholic beverages allows for predictions that

identify the significant levels of capillary cortisol to be carried out, so that the higher the levels of alcohol consumption, the higher the levels of capillary cortisol capillary cortisol in correlation [33].

In the context of the "physical activity practice and sedentary lifestyle" variable, it is worth exemplifying these contextual factors with a study that aimed to investigate the association between the common types of sedentary behavior and the stress measured by the levels of cortisol in hair, among women. During the years 2012 and 2013, 72 women who lived in socioeconomically underprivileged neighborhoods and reported sedentary behavior (watching TV, computer use, general sitting time) participated in this study and provided hair samples. Hair cortisol levels were measured by immunoenzymatic testing. Linear regression models examined cross-sectional associations between sedentary behavior and capillary cortisol levels. These models found as results that there was no association between any kind of sedentary behavior mentioned and the levels of capillary cortisol. It was concluded that sedentary behavior may not be related to the level of capillary cortisol in women living in socioeconomically underprivileged neighborhoods [34].

In the variable "difficulty falling asleep", it is noted that changes in circadian secretion of cortisol (HPA axis), is one of the main neuroendocrine substrates responsible for conditioned wakefulness and physiological hyperarousal (insomnia). However, studies in this field are ambiguous due to methodological variability, which makes it difficult to present more concrete conclusions [27].

The present study had limitations since it was carried out in a single hospital with a cross-sectional design, and with nursing staff from a specific population. However, it moves towards new knowledge in the fields of nursing and workers' health, since there was no evidence of Brazilian studies on risk behaviors among those who work in the field of nursing and their relationship with capillary cortisol. Thus, this research can represent a contribution to new research with the nursing staff of other institutions, be they public or private, hospital or not, and that can involve other staff in the field of healthcare, which is usually a noticeably stressful field. This research can also contribute to the improvement of public policies in healthcare directed to this field of activity, as well as in the role of managers so that they provide an adequate work environment for their healthcare staff, which can favor the greatest satisfaction of these employees, reflecting upon the assistance provided to patients.

Conclusion

With the results presented in this study, it is noted that the risk behaviors are present in the nursing team of the hospital service investigated. It is noteworthy then that the levels of cortisol are above normal among staff members who are smokers, who consume alcoholic beverages, who are sedentary, and among people who have difficulties to sleep, although the application of the statistical test has not shown a significant association between these variables tested and the level of capillary cortisol of the population studied.

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Declaration of Interest

The authors state that there is no conflict of interest.

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Volume 3 Issue 3 March 2021