RESEARCH ARTICLE OPEN ACCESS

Nonspecific low back pain and functional capacity of workers of the Nursing Service of a University Hospital

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ABSTRACT :*Background:* Nonspecific low back pain is one of the most common occupational health problems in the world. Nursing workers have a high prevalence of this condition. One of the ways to prevent or treat this condition is to improve the functional capacity of the affected individuals. *Objective:* To measure the functional capacity of nursing staff in a university hospital and to relate it to the prevalence of low back pain in this population. *Study Design:* Cross-sectional. *Methods:* 135 individuals (Nurses, Nursing Assistants and Nursing Technicians), answered questionnaires to assess pain (VAS) and work ability (WAI) and underwent a physical test to measure minimum muscular functional capacity for autonomy (SRT). *Results:* Correlations between the pain scale and the functional capacity tests presented significant correlations, but of moderate magnitude (-0.393) for EVA and ICT, and weak for ICT and SRT (0.225). The correlation between SRT results and data such as age, weight and BMI presented moderate magnitude (-0.381, -0.454, and -0.521 respectively). We have yet to find data suggesting that workers who remain longer in the orthostatic position accuse more low back pain than those who sit longer (p = 0.041). *Conclusion:* Most of the participants had good functional capacity (91.82% for SRT, 80,80% for good and excellent for ICT).We also identify that those individuals who predominantly act in the "orthostatic" position report that they suffer more back pain than those who predominantly act in the "sitting" position. No correlation was found between functional capacity test and pain scale, at least in this sample.

Keywords **-** Non-specific low back pain, functional capacity, nurses, midwives, nursing workers

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Date Of Submission: 24-01-2019 Date Of Acceptance:08-02-2019

I. INTRODUCTION

Work-related musculoskeletal disorders (WRMD), affects a large number of professionals in the most diverse areas. Among them, complaints related to low back pain (LBP) has an important prominence in occupational diseases [1].

Chronic nonspecific LBP is one of the most common health problems found in the world and it is considered the main manifestation of musculoskeletal pain in human beings [2]. It is estimated that between 15 to 20% of adults present LBP [3]. However, it is believed that about 80% of the world population will be affected by LBP with at least 1 episode of acute crisis, with the possibility of an occurrence of a new episode of pain in 90% of these cases [4].

The hospital environment represents a place of occupational risk, particularly for those with

a career in nursing tasks [5]. Andersen *et al*. [6] present the expectation that 50% of workers register 1 or more days of absence due to work

related musculoskeletal pain. Future dislocations, motivated by recurrent low back

pain, occur more frequently than any other health condition. In a study carried out at the Hospital de Clínicas of Porto Alegre, low back pain was found to be prevalent in 52% of the nursing staff in the surgical sector and was the major cause of labour withdrawal in this population [7].

According to the *World Health Organization*, preventive actions for cases of non-specific LBP involve improvement in the ergonomics of the work environment and also the increase of the physical capacity of workers [8]. Andersen *et al*. [9] suggest that a higher functional capacity is positively related to an

increase in the amount of work performed or even lower energy expenditure when performing certain tasks. In a study conducted with hospital nurses and home care professionals, Larsson *et al*. [10] concluded that a good musculoskeletal condition is an important factor that contributes to a better capacity for work. Furthermore, the risk of LBP is high if the physical demands of work and functional capacity are not balanced [11]. LBP sufferers not only suffer from physical discomfort, but also from functional limitation, which causes incapacity and impairment in the quality of life [12].

The literature shows that individuals with higher functional capacity have a lower frequency of musculoskeletal disorders, such as low back pain. However, the relationship between these variables still requires more research, especially in health workers, such as nursing. Thus, our study aimed to identify whether there is a relationship between functional capacity and low back pain reported by nursing workers in a university and tertiary hospital.

II. METHODS

An analytical cross-sectional study, conducted from January to August / 2016, with the nursing staff of the Hospital de Clínicas de Porto Alegre.

Inclusion criteria: Nurses, Nursing Technicians and Nursing Assistants, male and female, with no limitation on age or length of service.

Exclusion criteria: advanced pregnant women, those with lower limbs prostheses, subjects with balance issues (eg. labyrinthitis), on vacation or away from service due to illness or who, for any reason, were unable to perform the physical test.

A list of potential participants was provided by the *General Coordination of Persons* (GCP) of the hospital. We identified 45 sectors with 8 or more employees. Those who were allocated in sectors with less than 8 employees, were grouped and named "others" sector. The employees of each sector were numbered, with the purpose of promoting a simple random sampling of 8 workers per sector, by lottery, through the online application "sorteador.com.br".

After the draw in all sectors, contact was established with the workers to present the research project and to do an invitation to participate. The research was well accepted with only 3 refusals. The steps of obtaining the sample are illustrated in the flowchart below. When accepting to participate in the study, a more convenient date was scheduled for data collection, where the tests were applied at the same time and in the following order: Demographic questionnaire, Visual Analogue Scale (VAS), Work Ability Index (WAI) and Sitting Rising Test (SRT).

The study was approved by the local ethics committee under the number CAAE 39791614.6.0000.5327 and all the participants signed the Free and Informed Consent Form before their participation.

This research identified mainly quantitative variables. We considered the variable "Non-specific Lumbar Pain" as a predictor, measured by the VAS and the variable "Functional Capacity" as dependent, measured by the SRT and the WAI.

Data were collected through the following instruments:

- Visual Analogue Scale for Pain (VAS Pain).

A scale consisting of a ruler divided into eleven equal parts, successively numbered from 0 to 10. The individual refers to the equivalence between the intensity of his pain and a numerical classification, where 0 corresponds to the classification "No Pain" and 10 to "Maximum Pain".

- Work Ability Index (WAI).

Evaluation protocol that allows to evaluate the capacity for work based on the worker's own perception, including the self-assessment about his health and capacity for work, consisting of a directed questionnaire. This protocol is the result of research developed in Finland as a support to maintain the capacity for work, destined for use in Occupational Health services [13].

This instrument was translated into the Portuguese language by Fisher [14], allowing to diagnose the early loss of the capacity to work and the aid in prevention, maintenance and health promotion through occupational health programs of the worker.

- **Sitting-Rising Test – (SRT).**

Test for simplified evaluation and quick execution of the minimal functional muscular aptitude for autonomy [15]. The test is performed in a space of 3 or 4m^2, with flat ground and non-slippery floor. To perform the test, the evaluated should be barefoot and wearing clothes that did not restrict mobility. In the first phase of the test the individual should sit on the ground (mat), and in the second phase must rise from the ground. During instructions, the evaluator clearly explains that the movements should be performed with the least usage of support possible. The speed of the movements is not specifically measured, but the individual is not allowed to "throw himself" back into the sitting movement. Usually the test runs twice, but if the evaluator thinks performance may improve, retries are allowed. The evaluator should always encourage for an improvement in the test score. For measurement, one point is deducted for each support the evaluate uses (ex: hand on the floor, knee on the floor, hand on the knee), and 0.5 point for each situation of imbalance. The notes are assigned separately for the sit and stand movements, and the maximum score for each movement is 5. The best result obtained for each of the acts must be chosen.

- **Demographic Questionnaire**

For all participants, a socio-demographic questionnaire was applied with the purpose of identifying information such as sex, marital status, time of profession, among others.

Statistical Planning:

The data were initially analyzed in a descriptive way. The Shapiro-Wilk test was used to evaluate the normality of the continuous variables. The Spearman correlation test was used between the pain scale and the functional capacity scales. Confounding variables *weight*, *age* and *BMI* were controlled through a regression analysis. Mann-Whitney U test, and Kruskal-Wallis for independent samples (to compare pain according to functional capacity classification) were also used. A significance level of 0.05 was considered. The IBM® Statistical Package for Social Sciences (version 18.0) was used.

Sample size:

For the calculation of the sample size, the study by Walsh, *et al*. [16] was used, which verified an average difference of 6.7 points between individuals with and without low back pain on the functional capacity scale of the WAI, low back pain prevalence of 14, 6%, and standard deviations in the WAI scale of 6.6 and 4.0 in the groups with low back pain and without back pain respectively. The WinPepi program recommended, considering 5% of significance and 80% of power, a minimum sample of 62 individuals. Thus, of 1714 registered nursing workers distributed in 45 sectors, it was decided to select 3 workers per sector, totalling a sample of 135 individuals.

Results

The characteristics of the sample are described in table 1. In addition to these data, we collected information regarding the predominantly adopted position during the working day, where the average of those who remained longer in the orthostatic position was 6.38 ± 2.16 hours; and in the sitting position of 4.03 ± 1.31 hours. Still, 64.44% of the subjects in this sample work on a weekly workload of 36 hours / week, while 25.18% work 30 hours / week and 10.37% work for 44 hours / week.

Table 1: Sample characteristics

Variable		n.(%)	average (SD)	Median [q1 - q3]	min-max
Gender	Female	114 (84.4%)			
Age (years)			44,21 (9,01)		
Profession	Nursing	48 (35.6%)			
	Nursing Technician	70 (51.9%)			
	Nursing Assistant	17 (12.6%)			
Career Length				216 [156 - 336]	47 - 477
Time in the Ins.				132 [56 - 243]	5 - 477
Pred. Posture	Standing	109 (80.7%)			
	Sitting	26 (19.3%)			
Marital Status	Married	58 (43.0%)			
	Single	33 (24.4%)			
	Divorced	20 (14.8%)			
	Living with partner	21 (15.6%)			
	Widowers	3 (2.2%)			
Weight (Kg)			72.60 (13.30)		
Height (cm)			164,28 (7,99)		
BMI (Kg/m^2)			26.86 (4.41)		

Table 2 shows the absolute and relative frequency of the participants according to the

BMI classification. There was no significant difference (p= 0.12) between subjects who were normal weight or below normal weight, and those who were above normal weight categories, in relation to the averages obtained with the pain scale.

Table 2: Frequency according to BMI Class.

Classification	BMI	N	%
Low weight	≤ 18,5	2	1,48%
eutrophy	18,6 - 24,9	51	37,77%
overweight	25,0 - 29,9	50	37,03%
obesity I	30,0 e 34,9	26	19,25%
obesity II	35,0 e 39,9	5	3,70%
obesity III	≥ 40,0	1	0,74%

BMI - Body Mass Index

Table 3 presents the descriptive results of the classification obtained in the applied tests.

Table 3: Classification of functional capacity and pain scale tests

Variable	Categories	n (%)	median [q1 - q3]	min-max
VAS			3 [0 - 5]	0 – 10
	Light (0-2)	59 (43,7)		
	Moderate (3-6)	52 (36,51)		
	Intense (7-10)	24 (17,77)		
WAI			41 [38 - 44]	24 - 49
	Weak (7-27)	2 (1,5)		
	Moderate (28-36)	24 (17,8)		

Table 4: Spearman correlations between functional capacity and pain scale tests

Correlation	VAS	WAI	SRT
VAS	1	-,393**	-0.088
WAI	<0.001	1	0,225**
SRT	0.311	0.009	1

Upper Triangle: Spearman correlation; #Bottom Triangle: *p* value.

The results for the correlation tests are presented in Table 4 and 5. Significant correlations were observed, moderate negative for the results obtained between the VAS and the WAI (-0.393), and a weak positive correlation between the WAI and the SRT (0.225).

Table 5: Spearman correlations between demographics and applied tests

	VAS	WAI	SRT
	r (p)	r (p)	r (p)
Age	-0.198* (0.021)	-0.101 (0.244)	-0.381** (<0.001)
Career length (months)	-0.172* (0.046)	-0.066 (0.450)	-0.296** (<0.001)
Time in the institution (months)	-0.122 (0.157)	-0.087 (0.315)	-0.293** (0.001)
Workload/week	0.021 (0.810)	-0.004 (0.960)	0.145 (0.094)
How long can keep posture (hours)	0.110 (0.205)	0.018 (0.839)	-0.066 (0.444)
Weight	0.096 (0.269)	-0.081 (0.348)	-0.454** (<0.001)
Height	0.019 (0.830)	0.083 (0.338)	0.039 (0.653)
BMI	0.107 (0.215)	-0.136 (0.116)	-,521** (0<0.001)

* Correlation is significant at level of 0.05 (bi-flow). ** Correlation is significant at level of 0.01 (bi-flow). **Correlation is significant at level of 0.01 (bi-flow).

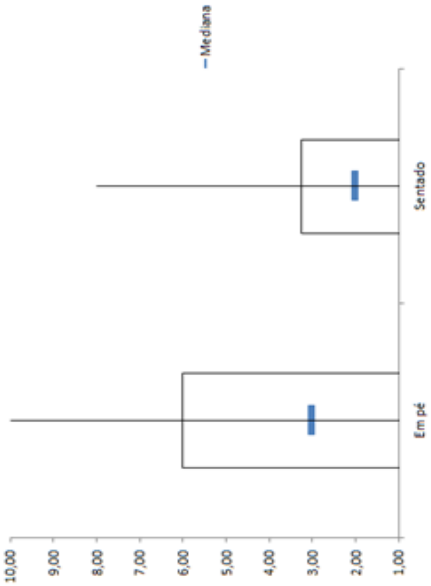
The variable *age* had significant negative, weak and moderate correlations with the results of VAS and SRT respectively (-0.198 and -0.381); the variable *career length* showed significant negative correlations, but weak with the results of EVA and SRT (-0.172 and -0.296); whereas the variable *time in the institution* showed a weak negative significant correlation only with SRT results (-0.293); and the variables *weight* (-0,454) and *BMI* (-0.521) presented a moderate negative significant correlation, however with the highest correlation values, with the SRT results.

The results found above show that the variables *weight*, *BMI* and *age* can influence the SRT result, defining them as confounding variables. In order to control these factors, a regression association assessment was performed, with control of the variables *age* and *BMI*, resulting in an increase in the correlation between SRT and WAI tests (from r = 0.225 to r = 0.606, p <0.001).

To verify the possibility of difference among groups, the non-parametric Mann-

Whitney and Kruskal-Wallis tests were carried out for the tests and the categories of the sample. The relationship among VAS, WAI and SRT was tested for male and female gender, for those who live with partners or without partners, for those who work predominantly standing or predominantly seated, and finally for Nursing professionals, Nursing Technicians or Nursing Assistants.

A significant (p = 0.041) result was found between VAS and prevailing posture, suggesting that those workers who remain longer in the orthostatic position report more low back pain than those who remain seated for longer periods of time. (Figure 2).



III. DISCUSSION

The results of the functional capacity tests have shown that the majority of professionals in the study presented good functional capacity, both on the SRT (good and great = 91,82%) and in the WAI (good and great = 80.80%). Similar results for WAI were found in the studies by Raffone, Padula, and Monteiro [17, 18, 19], both when applied on nursing professionals as well as in professionals from other areas. In relation to SRT, Brito *et al*. [20] in a large study with more than 4000 subjects, found similar results in the test relations with *age*, *weight* and *BMI* variables, where we found moderate negative correlations, but with higher values (-0.381, -0.454 and -0.521, respectively), concluding that such variables have the power to influence the SRT test results.

The result found with the VAS meets the expectation, according to the information of Stevens [21], which reports about the prevalence of nonspecific LBP to be between 15-20%, and Hayashi [22], whose study reported having found prevalence of LBP ranging from 18.6% to 57.4%, due to the fact that we could consider only those subjects who reported severe back pain (17.77%), or even the sum of those with severe pain and moderate pain (54, 28%).

Nonetheless, there was the expectation of finding stronger correlations between the variables of functional capacity and pain scale tests. Although the correlation between WAI and VAS was negative and moderate and the correlation between WAI and SRT positive and weak, the correlation between VAS and SRT was non-existent. One hypothesis for such results could be the fact that individuals, when answering a questionnaire about functional capacity or even a scale that measures pain, within their work environment, show an interest in not valuing their deficiencies and try to hyper-value their functional capacity. Furthermore, it may occur that pain referred to in VAS does not influence SRT performance, at least in this sample. Another possibility could be the fact that nonspecific LBP presents a high prevalence and a high estimate of impairment in the population, which affects even individuals with good functional capacity, given that even athletes suffer from this condition [23].

Another of our findings is that workers, whose occupation is predominantly in the "orthostatic" position, present more LBP than those where the predominant working position is seated. Although historically the science informs that the sitting position tends to be more detrimental due to thesmaller base of support for the spine, increasing the compressive force on the vertebral bodies of the low back region [24], Jadranka's study [25] has already shown that nursing workers who routinely carry weights heavier than 10kg have an increased chance of developing LBP and those who within their work activities remain for at least 2 hours a day involved with computer activities have less chance of developing it. Wilke [26], in 1999, presented results showing that the compressive force is

greater when the individual is in the orthostatic position with trunk flexion ahead and carrying some overload.

Limitations

We opted for simple instruments and quick application, because the data collection would be conducted during the rest period of professionals during the work day.

IV. CONCLUSION

We did not show a correlation between the VAS and the SRT in the studied nursing group. The results obtained allow us to conclude that nursing workers who work predominantly in the orthostatic position present a higher prevalence of low back pain than those who work longer in the sitting position. And although we found a prevalence of low back pain similar to that found in the general population, the majority of our sample had good results in functional capacity tests.

Funding Statement
This study was funded by FIPE – HCPA – CNPq.

Conflict of Interest Statement
No conflict of interest has been declared by the author(s).

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XXX" Nonspecific low back pain and functional capacity of workers of the Nursing Service of a University Hospital" International Journal of Engineering Research and Applications (IJERA), vol. 9, no.2, 2019, pp 24-30