Work activities and non-specific chronic low back pain in nursing workers

Atividades de trabalho e lombalgia crônica inespecífica em trabalhadores de enfermagem

Actividades de trabajo y lumbalgia crónica inespecífica en trabajadores de enfermería

Zulamar Aguiar Cargnin[1]
Dulcinéia Ghizoni Schneider[1]
Mara Ambrosina de Oliveira Vargas[1]
Ione Jayce Ceola Schneider[1]

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Descriptores
Dolor de la región lumbar; Dimensión del dolor; Ergonomía; Enfermeras practicantes

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Abstract
Objective: To determine work activities associated with non-specific chronic low back pain in nursing workers.
Métodos: Cross-sectional study with 90 workers, including nursing assistants, nursing technicians and nurses. Two instruments were used: Work-Related Activities that may Contribute to Job-Related Pain and/or Injury and Visual Numeric Scale. Data were descriptively and analytically analyzed, compared using Chi-square or Fischer's exact tests, Pearson's or Spearman's correlations and the Mann-Whitney U test. The significance level adopted was $p < 0.05$.
Results: The work activities with higher risk and associated with low back pain involved poor postures, bending and twisting of the spine, uncomfortable positions, physical efforts such as weight lifting and movement, continuing to work even with pain and at the physical limit, characteristics of the work environment and the activities performed. The mean pain intensity was moderate and it was statistically associated with some activities.
Conclusion: Ergonomic activities that predispose to low back pain should be considered in order to guide workplace changes.

Resumo
Objetivo: Determinar as atividades laborais associadas à dor lombar crônica inespecífica em trabalhadores de enfermagem.
Métodos: Estudo transversal com 90 trabalhadores entre auxiliares, técnicos e enfermeiros. Dois instrumentos foram utilizados: o *Work-Related Activities that may Contribute to Job-Related Pain and/or Injury* e Escala Visual Numérica. Os dados foram analisados de forma descritiva e analítica, comparados por meio dos testes Qui-quadrado ou exato de Fischer, correlações de Pearson ou de Spearman e o Teste U de Mann-Whitney. O nível de significância adotado foi $p<0,05$.
Resultados: As atividades laborais com maiores escores de risco e associadas à dor lombar envolveram posturas inadequadas com flexão e torção da coluna e posições desconfortáveis, esforços físicos, como carregamento e movimentação de peso, condição física de continuar trabalhando mesmo com dor e no limite físico, relacionadas às características do ambiente de trabalho e teor da tarefa. O nível médio de intensidade da dor foi moderado e com associação estatisticamente significativa a algumas atividades.
Conclusão: Deve-se dar atenção a atividades ergonômicas que predispõem à ocorrência de dor lombar para guiar mudanças nos postos de trabalho.

Resumen
Objetivo: Determinar las actividades laborales asociadas al dolor lumbar crónico inespecífico en trabajadores de enfermería.
Métodos: Estudio transversal con 90 trabajadores entre auxiliares, técnicos y enfermeros. Se utilizaron dos instrumentos: el *Work-Related Activities that may Contribute to Job-Related Pain and/or Injury* y la Escala Visual Numérica. Los datos fueron analizados de forma descriptiva y analítica, comparados mediante la prueba χ^2 de Pearson o la prueba exacta de Fisher, correlación de Pearson o de Spearman y la prueba U de Mann-Whitney. El nivel de significación adoptado fue $p>0,05$.
Resultados: Las actividades laborales con mayor puntuación de riesgo y asociadas al dolor lumbar incluyeron posturas inadecuadas con flexión y torsión de la columna y posiciones incómodas, esfuerzos físicos, como carga y movimiento de peso, condición física de continuar trabajando con dolor y al límite físico, relacionadas con las características del ambiente de trabajo y el tipo de tarea. El nivel promedio de intensidad del dolor fue moderado y con asociación estadísticamente significativa con algunas actividades.
Conclusión: Se debe prestar atención a las actividades ergonómicas que predisponen episodios de dolor lumbar para orientar cambios en los puestos de trabajo.

Corresponding author
Zulamar Aguiar Cargnin
http://orcid.org/0000-0002-2731-5323
E-mail: zulamar.aguiar@gmail.com

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[1]Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil.
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Introduction

Nursing is one of the professions associated with greater risk of lower back pain.[1-3] This may be related to actions such as lifting and transporting patients, repetitive movements and inappropriate postures. High biomechanical load on the spine, especially in the lower back, can exceed the functional capacity and individual limitations of the worker.[4,5] Ergonomic factors decrease muscle strength and power; reduce stability and coordination; impair trunk motor control; increase stress on intervertebral discs and ligaments; and, consequently, can lead to injury and/or pain.[6] These overloads lead to physiological stress, impair musculoskeletal function and are, therefore, a health concern in nursing practice.[1]

Low Back Pain (LBP) or lumbar spine pain is defined as pain below the costal margin of the 12th rib and above the inferior gluteal folds.[7] It causes pain, discomfort, fatigue and muscle stiffness in the lower third of the spine, with varied duration and intensity. Its etiology is not well defined and about 30 to 40% of people with this condition develop chronic low back pain (CLBP),[8] which lasts for at least three months.[9] Only 10% of low back pain cases have a specific cause, and most of them are classified as non-specific and are related to an imbalance between the effort required in an activity and the capacity to perform it.[10]

The cases classified as CLBP are frequent and lead to absenteeism, high treatment costs, lower productivity and reduced quality of life. They involve multiple causes that include physical, individual, organizational, sociocultural, and psychosocial factors. CLBP is a public health problem because of its high prevalence, because it affects all age groups and socioeconomic levels and require promotion, prevention and education, and not just health rehabilitation.[8,11,12] In addition, pain causes psychic suffering, stress, dissatisfaction and affect work ability.[5]

Determining work activities associated with pain based on workers' own reports can contribute to the ergonomic analysis of work activities, prevent musculoskeletal disorders, and enable comparison of results across countries. In this sense, the assessment of risk tasks as pain predictors can serve as parameter to minimize the risks of low back pain and may constitute an instrument for surveillance, analysis and prevention by early detection of the disease, favoring its resolution.[6,13] Thus, the objective of this study was to determine the work activities associated with non-specific CLBP in nursing workers.

Method

Cross-sectional quantitative study conducted with nurses, nursing assistants and nursing technicians in a public hospital of medium and high complexity, in the south of the country. The non-probabilistic intentional sample included 90 nursing workers. The participants were recruited in all sectors of the hospital, through an individual approach in all work shifts. The sample was selected among those who reported LBP and chronicity was established based on the duration, frequency and intensity of pain. LBP was characterized by pain in the lumbar region, below the costal margin of the 12th rib and above the gluteal fold, lasting at least for one day and considered non-specific, due to not being related to severe spinal disease.[7,10] A picture was used to help participants determine the area affected. Pain was bad enough to interfere with their daily activities or change their routine for one day.[14] Chronicity was established based on the question: "how long does your LBP lasts?"; the non-specific classification was based on the question "is there a medical diagnosis of your condition?". The definition of LBP should include the location of pain, symptoms, duration, frequency and severity.[10]

The inclusion criteria were professionals with LBP for more than three months, with at least two points in the numerical pain scale and a minimum frequency of 2 to 3 times a month, and who worked exclusively in nursing.[14] Professionals with other causes of low back pain, such as spondylolisthesis, herniated disc, spinal canal stenosis, infectious diseases of the spine, spinal tumors, fractures and others were excluded. Data was collected from August to October 2017.

Socio-demographic and work variables include gender (male, female), age (continuous variable), age group (28 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 62 years), professional category (assistant/technician/nurse), time working in the institution (up to four years, four to eight years, nine to 14 years, over 14 years), work shift (day, night), working hours (six hours, eight hours and 12 hours), overtime at the institution (yes, no), other employment (yes, no). Clinical data regarding LBP include duration (in years), frequency (times/month) and intensity of pain (1 to 10).

The questionnaires were self-administered. In addition to the socio-demographic questionnaire, the data collection form contained two more instruments: Work-Related Activities that may Contribute to Job-Related Pain and/or Injury (WRAPI) and the Visual Numeric Scale (VNS).

The WRAPI is a validated questionnaire[13] composed of 15 situations that predispose to musculoskeletal disorders, according to the workers' perspective. It has a scale from zero to ten, where zero means a problem not difficult at all and ten an extremely difficult problem, showing the contribution of each factor in the occurrence of musculoskeletal symptoms. Each item can be analyzed separately using the 0-10 scale.[13] It evaluates repetitive movements, vicious positions, prolonged periods in the same position at work, weight bearing, insufficient breaks, physical conditions, characteristics of the environment and lack of training. Responses were categorized from 0 to 1, indicating a simple problem (not difficult), 2 to 7, a moderate problem, and 8 to 10, a difficult problem.[6]

Finally, the 10-point VNS was used to measure pain intensity. In this scale, 0 means no pain and 10 means the worst possible pain. The participants selected the intensity of their worst pain in the last three months. The cut-off point ≥ 5 (significant pain) was established to determine disability and decline in functionality due to pain[11]. Pain was classified as mild (1 to 2), moderate (3 to 7). and severe (8 to 10).

The database was inserted in Excel and then transported to the Statistical Package for Social Sciences, version 23, where the data were processed and analyzed. Descriptive analysis was applied, with absolute and relative frequency of categorical variables and mean and standard deviation (SD) of continuous variables. The Mann-Whitney U Test was used to compare WRAPI factors with the medians of the group with significant pain (≥5 in the EVN) and the group with non-significant pain (<5 in the EVN). The significance level was set at $p < 0.05$. The correlations between the variables pain intensity and WRAPI factors were analyzed by applying the Pearson or Spearman coefficient with the following classification: less than 0.4 (weak correlation), 0.4 to 0.74 (good/moderate correlation) and ≥ 0.75 (strong correlation).[15]

The research was approved by the Research Ethics Committee involving Human Beings, protocol N. 2.081.192/2017 and CAAE. 64164717.1.0000.0121, and followed the recommendations of Resolution 466/12 of the National Health Council.

Results

The sample consisted of 90 professionals with non-specific CLBP, selected among nursing assistants, nursing technicians and nurses, in a population of 353 members of the nursing staff who returned the completed questionnaires and corresponded to 76.7% of the total population.

Regarding socio-demographic characteristics, the mean working time in nursing was 17.37 years (SD 8.7). Among the 90 participants, 28 (33.3) were working in the institution for up to four years, thirteen (15.5%) between four and eight years, 19 (22.6%) between 9 and 14 years and 24 (28.6%) for over 14 years. Most were females, with 74 participants (82.2%) and nursing technicians/assistants, with 78 (86.7%). The mean age was 42.8 years (SD 9.15). Most are in the age group of 31 to 50 years; nine (10%) are between 28 and 30 years, 31 (34.5%) between 31 and 40 years, 29 (32,2%) between 41 and 50 years, and 21 (23.3%) between 51 and 62 years. A total of 67 (74.4%) work overtime, and 29 (32.2%), less than half, have another employment. As for work hours, 77 (85,6%) have

12 hours shifts and 57 (63.3%) work during the day.

The average duration of the condition was 5.43 years (SD 4.21), with a minimum of six months and a maximum of 20 years, showing that some participants had been living with the condition for a long time. The analysis of the monthly frequency of the symptom showed that pain can occur every day, with a mean of 11.07 (SD 9.44), a minimum of three times a month and a maximum of 30 times a month. Most participants, 87 (96.7%), associate LBP with their work.

The intensity of low back pain reported by the nursing staff varied, with a mean of 6.27 (SD ± 1.79), indicating moderate intensity. Regarding the categories of pain intensity, 2.2% presented mild pain, 76.7% moderate pain and 21.1% severe pain. The mean pain intensity was 6.34 for women and 5.94 for men; 6.35 for nursing assistants/technicians and 5.75 for nurses; those are also considered moderate values. The cut-off point used (≥ 5), in which pain intensity is associated with a higher risk of disability, was reached by 90 (81.1%) of the participants.

The overall mean of WRAPI factors was 6.43 (± 1.45), indicating moderate problem regarding the occurrence of LBP. The classification of the level of problem of each activity is presented in table 1.

Table 1. Classification of work activities for low back pain symptoms among nursing professionals of a public hospital

WRAP* Occupational Activities	Mean/SD†	Classification
Performing the same task over and over	6.59 (±2.57)	Moderate
Working very fast for short periods (lifting, grasping, pulling, etc.)	7.78 (±2.39)	Moderate
Having to handle or grasp small objects	1.30 (±2.09)	Not difficult
Insufficient breaks or pauses during the work day	5.94 (±3.35)	Moderate
Working in awkward or cramped positions	7.98 (±2.17)	Moderate
Working in the same position for long periods (standing, bent over, sitting, kneeling, etc.)	8.00 (±2.40)	Difficult
Bending or twisting your back in an awkward way	8.02 (±2.42)	Difficult
Working near or at your physical limits	7.54 (±2.58)	Moderate
Reaching or working over your head or away from your body	6.29 (±3.19)	Moderate
Hot, cold, humid, wet conditions	5.52 (±4.04)	Moderate
Continuing to work when injured or hurt	8.57 (±1.84)	Difficult
Carrying, lifting, or moving heavy materials or equipment	8.91 (±1.75)	Difficult
Work scheduling (overtime, length of workday)	6.71(±3.31)	Moderate
Using tools (design, weight, vibration, etc.)	1.44 (±2.77)	Not difficult
Training on how to do the job	5.91 (±3.70)	Moderate

*WRAPI- *Work-related activities that may contribute to job-related pain and/or injury*; †SD – Standard deviation

The comparison of pain intensity and WRAPI factors showed that some activities had higher and statistically significant medians (Table 2).

Table 2. Comparison of WRAPI* factors and significant and non-significant pain in nursing workers of a public hospital

Occupational activities	Non-significant pain (n=17) Median (Interquartile Range)	Significant pain (n= 73) Median (Interquartile Range)	*p-value*†
Performing the same task over and over	5(4)	7(3)	0.462
Working very fast for short periods (lifting, grasping, pulling, etc.)	8(3)	8(3)	0.685
Having to handle or grasp small objects	0(5)	0(2)	0.935
Insufficient breaks or pauses during the work day	4(5)	7(6)	0.160
Working in awkward or cramped positions	7(3)	9(2)	0.037
Working in the same position for long periods (standing, bent over, sitting, kneeling, etc.)	9(7)	9(2)	0.441
Bending or twisting your back in an awkward way	6(6)	9(2)	0.004
Working near or at your physical limits	6(5)	9(3)	0.002
Reaching or working over your head or away from your body	6(5)	7(4)	0.268
Hot, cold, humid, wet conditions	7(9)	7(9)	0.239
Continuing to work when injured or hurt	7(5)	10(2)	0.008
Carrying, lifting, or moving heavy materials or equipment	8(3)	10(1)	0.019
Work scheduling (overtime, length of workday)	6(6)	8(5)	0.120
Using tools (design, weight, vibration, etc.)	0(2)	0(2)	0.685
Training on how to do the job	7(5)	7(9)	0.971

*WRAPI- *Work-Related Activities that may Contribute to Job-Related Pain and/or Injury*; †P-value: level of significance p<0.05 in the Mann-Whitney U Test

There were correlations between pain intensity and WRAPI factors. The duration of pain showed a strong significant positive correlation with the frequency of pain (r=0.984; p=0.002), indicating a relationship between duration of pain and its frequency during the month.

Spearman's coefficient showed positive but weak correlations between pain intensity and some activities that contributed to pain (Table 3). There were positive, strong and directly proportional correlations between activities, such as between "Carrying, lifting, or moving heavy materials or equipment" and "Bending or twisting your back in an awkward way" (r=0.596; p<0.001), and between "Continuing to work when injured or hurt" and "Working near or at your physical limits" (r=0.571; p<0.001).

Table 3. Association between WRAPI* and VNS† in nursing workers with non-specific CLBP

Occupational activities	*rho*‡	*p-value*§
Performing the same task over and over	0.113	0.288
Working very fast for short periods (lifting, grasping, pulling, etc.)	0.141	0.186
Having to handle or grasp small objects	0.128	0.229
Insufficient breaks or pauses during the work day	0.086	0.420
Working in awkward or cramped positions	0.215	0.041
Working in the same position for long periods (standing, bent over, sitting, kneeling, etc.)	0.232	0.028
Bending or twisting your back in an awkward way	0.365	<0.001
Working near or at your physical limits	0.266	0.011
Reaching or working over your head or away from your body	0.091	0.392
Hot, cold, humid, wet conditions	0.128	0.229
Continuing to work when injured or hurt	0.238	0.024
Carrying, lifting, or moving heavy materials or equipment	0.266	0.011
Work scheduling (overtime, length of workday)	0.137	0.199
Using tools (design, weight, vibration, etc.)	0.139	0.191
Training on how to do the job	0.140	0.187

* WRAPI- *Work-Related Activities that may Contribute to Job-Related Pain and/or Injury;* † VNS- Visual Numeric Scale; ‡Rho- Spearman Correlation Coefficient; §P-value- level of significance p< 0.05

Discussion

Work activities that predispose the occurrence of CLBP were classified as moderate risks. A study that addressed low back pain using the WRAPI instrument found compatible results and mean values equal to or above eight, with higher concentration of responses also in moderate risk factors. The instrument was considered an excellent surveillance tool, since the highlighted factors are consistent with the literature and professionals with and without low back pain identified the same risk factors.[6]

Activities that had high scores were related to posture and physical effort ("Carrying, lifting or moving heavy materials or equipment", "Bending or twisting your back in an awkward way", "Working in the same position for long periods – standing, bent over, sitting, kneeling, etc.") or physical condition ("Continuing to work when injured or hurt"). Poor postures and excessive physical load are a reflection of the characteristics of the work environment and tasks performed, and highlight the role of physical effort at work.

Other studies have shown that poor posture, excess weight and repetitive movements may be associated with musculoskeletal pain.[2,3,5,16-19] A study that found a prevalence of LBP of 69.6% among nurses showed that the chances of developing any musculoskeletal pain were significantly higher among those that reported working in poor positions for long periods.[17] Another study with a high prevalence of LBP (63.1%) showed a relationship between this condition and working in standing or sitting position, working with trunk leaning forward or rotated, applying force with hands or fingers, and making repetitive movements.[3] In intensive care, it was found that the most common ergonomic risks for musculoskeletal pain were turning the patient and bending over.[18]

In the evaluation of musculoskeletal discomfort, ability to work and residual fatigue in nursing professionals working in a hospital environment, the prevalence of LBP was explained by the performance of activities that require constant effort, such as transporting and handling patients, giving bed baths, moving hospital beds and performing procedures with asymmetrical postures.[5] Another study that assessed nurses' perceptions of musculoskeletal disorders identified as risk factors: working in the same positions for long periods (93.1%), handling an excessive number of patients in one day (81.2%) and working in awkward and cramped positions (78.6%).[19]

Work-related musculoskeletal symptoms vary in different sectors, hospitals and even countries and depend on occupational activities; however, the activities are similar in the way they are performed. For example, the act of moving patients always requires mobilization of the trunk in sudden postures. The frequency of the activity should also be taken into consideration. A study showed that statistically significant work activities that increased the possibility of low back pain were performed more than 10 times a day.[4] The present study demonstrates that the professionals work longer hours, due to the large percentage of participants who work overtime, which leads to increased frequency of activities.

Regarding the intensity of LBP, the results indicated moderate pain. The greater pain intensity found among technicians and assistants is related to the performance of direct activities with the patient, such as moving and transporting patients, which require higher and repetitive physical effort.[16,20] On the other hand, it is important to emphasize that pain intensity does not only depend on physical factors or

high demand for work, since perception of and reaction to pain are specific to each person and should be evaluated considering physical, psychic, social and spiritual aspects.[21] This fact was evidenced in a study in which its participants, even when dealing with constant pain, suffered in silence, tried to minimize their pain and had difficulty determining if their pain or discomfort was significant.[19]

The relationship between pain intensity and WRAPI activities showed some relevant associations by the Mann-Whitney U Test; however, Pearson or Spearman's correlations showed weak associations. "Bending or twisting your back in an awkward way" and "Working in awkward or cramped positions" presented a statistically significant association. A proper posture should be comfortable and vary over time; it also needs to be brief, as its harmful effect is related to the time it is maintained.[22] A study that evaluated the time spent in awkward postures found a higher median time among workers in orthopedic and intensive care units, who also worked with greater trunk flexion angles. This fact may be associated with the high physical exertion when handling and transferring patients and the consequent increased exposure to poor posture.[23] A significant association between work time spent with trunk flexion over 45º and the occurrence of LBP (frequency and duration) was also evidenced, indicating that, in the long term, maintaining improper postures for 20 minutes or more can lead to physical and mental fatigue.[23]

It is not advisable to "Continue working when injured or hurt". In addition to individual physical implications, working with pain or while injured decreases productivity and quality of care.[6] The factors "Working near or at your physical limits" and "Carrying, lifting, or moving heavy materials or equipment" were significantly associated with pain intensity and may be related to high demand in the work environment and heavy physical work. Weight bearing and excessive physical exertion are clearly associated with LBP, especially in repetitive activities that lead to overload of the spine, and also when coupled with improper posture.[24] During an eight-hour shift, nursing workers can handle a total weight of 1.8 tons. Compression and shear loads are high during patient handling activities; even if weights are light, they still exceed the capacity of the spine or the parameters for safe weight lifting.[25]

The high frequencies of pain can confirm the level of physical demands of heavier and repetitive work activities. Also, pain lasting more than 48 months was present in most of the sample, which is a warning for the chronicity of LBP and a reflection of poor pain management.[21] As pain can be insidious or have a late effect, it can prevent professionals from establishing a cause/effect relationship between pain and work activities.[3]

Among the study limitations are the cross-sectional design, which analyzes cause and effect at the same time; having workers from various sectors of the hospital and with specific work characteristics, which may affect outcomes – however, regardless of the work sector, perceptions were similar; and the research carried out only in a single hospital unit, which limits its external validity.

Conclusion

The occupational activities associated with CLBP with higher scores involved posture, physical effort, physical condition and characteristics of the work environment These activities represented moderate problem for the development of LBP. The assessment of pain and related work activities may also help diagnosing and managing pain, based on the reality found in rehabilitation programs. It is believed that this study contributed to the understanding of certain variables involved in the chronicity of LBP. Other studies that contribute to the improvement of the working conditions of nursing professionals should be conducted, extending and deepening the theme and with emphasis on the direct observation and analysis of the participants' movements during their work activities.

Colaborations

Cargnin ZA, Schneider DG, Vargas MAO and Schneider IJC contributed with project design,

analysis and interpretation of data, critical review of content and approval of the final version.

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