Incidence of low back pain according to physical activity level in hospital workers

Ocorrência de lombalgia segundo o nível de atividade física em trabalhadores hospitalares

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ABSTRACT

BACKGROUND AND OBJECTIVES: Hospitals integrate several risks posed by physical, chemical, psychosocial and ergonomic factors, which may be noxious for different healthcare professionals. This study aimed at evaluating the level of physical activity, the presence of musculoskeletal risk factors and the incidence of low back pain among nursing professionals of a hospital Materials and Sterilization Center.

METHODS: Sample was made up of 56 individuals of both genders, working for the *Associação Beneficente de Campo Grande/MS-Hospital Santa Casa*. Participants were divided in two groups: G1 (insufficiently active, n=27) and G2 (sufficiently active, n=29). In addition to the level of physical activity, anthropometric data, incidence of pain and functional incapacity, flexibility and muscle resistance were evaluated.

RESULTS: The incidence of low back pain was lower in G2 (13 cases; 44.8%) as compared to G1 (24 cases; 88.9%). Body mass index, pain intensity and functional incapacity index were lower for G2. Time of physical activity was lower in G1. Abdominal muscles resistance was higher in G2.

CONCLUSION: In nursing professionals, the level of physical activity influences the presence of low back pain, pain intensity and functional incapacity index.

Keywords: Low back pain, Musculoskeletal, Nursing, Risk factors, Workers' health.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O ambiente hospitalar integra uma série de riscos decorrentes de fatores físicos, químicos, psicossociais e ergonômicos, que podem ser prejudiciais a diferentes profissionais da área de saúde. Este estudo teve por objetivo avaliar o nível de atividade física, a presença de fatores de risco musculoesqueléticos e a ocorrência de lombalgia em profissionais de enfermagem de Centro de Materiais e Esterilização hospitalar.

MÉTODOS: A casuística integrou 56 indivíduos de ambos os gêneros, trabalhadores da Associação Beneficente de Campo Grande/MS-Hospital Santa Casa. Os participantes foram alocados em dois grupos: G1 (insuficientemente ativos, n=27) e G2 (suficientemente ativos, n=29). Além do nível de atividade física, foram realizadas análises antropométricas, de ocorrência de dor e incapacidade funcional, flexibilidade e resistência muscular.

RESULTADOS: A ocorrência de lombalgia foi menor em G2 (13 casos; 44,8%) que em G1 (24 casos; 88,9%). Índice de massa corporal, intensidade da dor e índice de incapacidade funcional foram menores em G2. O tempo de atividade física foi menor em G1. Resistência dos músculos abdominais foi maior em G2.

CONCLUSÃO: Em profissionais de enfermagem, o nível de atividade física influencia a ocorrência de lombalgia, intensidade de dor e índice de incapacidade funcional.

Descritores: Dor lombar, Enfermagem, Fatores de risco, Musculoesquelético, Saúde do trabalhador.

INTRODUCTION

Low back pain is a major public health problem, reaching epidemic levels among general population, affecting economically active people and considered the most important reason for medical leave[1]. Pain is multifactorial, involving individual, psychosocial, occupational, genetic, and biomechanical factors. Among intrinsic risk factors there are age, gender, body mass index, muscle imbalances and sedentary life[2]. Low back pain induced by mechanical-postural conditions is responsible for a large part of back pain referred by population[1]. Postural stress may change several musculoskeletal system structures, generating imbalances and decreasing muscle strength. Loss of flexibility, regardless of cause, may also induce pain and decrease muscle strength[1,2].

Extrinsic factors, such as labor-related functional overload[1], may also contribute for low back pain development and

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worsening. Hospital environment poses several risks caused by physical, chemical, psychosocial and ergonomic factors, which may be noxious to the health of professionals of the area[3]. Among professionals working in hospitals, nurses are professionals more often affected by low back pain, with high incidence rate and prevalence per year[3]. Their work is not limited to direct patients' assistance, but rather is extended to indirect assistance by means of Central Materials and Sterilization Department (CMSD). This is a technical support sector, mostly made up of nurses and aimed at receiving contaminated materials, decontaminating them, preparing and sterilizing them, as well as at preparing and sterilizing clean clothes coming from the laundry and storing such materials for future distribution[4].

Considering the high incidence of low back pain among nurses and the scarcity of CMSD-related studies, this study aimed at evaluating the level of physical activity, the presence of musculoskeletal risk factors and low back pain among nurses of a hospital CMSD. Additionally, the association between these potential risk factors and the incidence of low back pain was investigated.

METHODS

Observational and cross-sectional study with nurses of both genders, working in the CMSD of the Associação Beneficente de Campo Grande – Hospital Santa Casa, Campo Grande/MS. Inclusion criteria were minimum age of 18 years and minimum experience of six month on the job.

Participants have signed the Free and Informed Consent Term (FICT) and were allocated in groups, according to the level of physical activity, which was evaluated by the International Physical Activity Questionnaire (IPAQ), reproduced and validated in Brazil by the Centro de Estudos do Laboratório de Aptidão Física de São Caetano do Sul[5]. To characterize subjects, demographic data such as age, gender, job or function were collected by means of interviews. To evaluate body mass, a digital scale, gauged and checked (model Glass 3 Control, G-TECH) was used. Height was measured with a flexible measuring tape, with 3m length and resolution of 0.1cm, fixed on the wall.

Individuals were asked about the presence or not of low back pain, being it defined as pain and discomfort below the costal margin and above inferior gluteal sulcus, followed or not by lower limb pain[6]. Pain intensity in the lumbar region was evaluated by means of the visual analog scale (VAS). Functional incapacity was measured with the application of Roland-Morris (RM) questionnaire, as used in previous study[7].

Posterior thigh muscles flexibility was evaluated with Sit and Reach in the Wells bench test. Individuals' performance was classified, according to *Canadian Standardized Test of Fitness* (CSTF), in: excellent, above average, average, below average and poor[8]. Thomas test was used to evaluate hip flexors extensibility[9]. Muscle resistance was evaluated with Maximum Repetition test in one minute for abdominal muscles[10].

Based on studied population, with 87 individuals, to determine sample size, prevalence of 90% of professionals with history of occupational low back pain was established[1,3], with significance level of 95% and admitting sample error of 5%. With this, minimum of 54 participants were obtained to develop the study.

This study was approved by the Research Ethics Committee, Universidade Federal de Mato Grosso do Sul, opinion 545.584.

Statistical analysis

Results are presented in descriptive format. Student *t* test for parametric data and Mann Whitney test for non-parametric data were used to compare between groups. Goodman test was used for proportion analyses. Significance level was 5%.

RESULTS

Study sample was made up of 56 individuals who agreed to participate in the survey. From these, 43 were nursing technicians (76.8), 11 were nursing assistants (19.6%) and 2 were nurses (3.6%). With regard to shift, 22 (39.3%) worked in the morning, 18 (32.1%) in the afternoon and 16 (28.6%) in the evening. As to weekly workload, 43 (76.8%) worked 42 weekly hours and 13 (23.2%) had double jobs, in a total of 74 to 84 weekly hours. Among individuals with double jobs, 69.2% (n=9) worked as nursing technician, 15.4% (n=2) as elderly caregivers and 15.4% (n=2) in other jobs.

Group 1 (G1) was made up of 27 individuals considered insufficiently active, while group 2 (G2) was made up of 29 subjects classified as sufficiently active. No subject was considered very active. Considering the level of professional qualification, 17 G1 subjects (63%) were nursing technicians and 10 (37%) were nursing assistants. In G2, 26 (89.7%) were nursing technicians, 2 (6.9%) were nurses and 1 (3.4%) was nursing assistant. With regard to working shift, 12 G1 participants (44.5%) worked in the morning, 6 (22.2%) in the afternoon and 9 (33.3%) in the evening. In G2, 10 (34.5%) worked in the morning, 12 (41.4%) in the afternoon and 7 (24.1%) in the evening.

With regard to workload, in G1, 19 (70.4%) worked 42h/week, 7 (25.9%) 84h/week and 1 (3.7%) 82h/week. In G2, 24 (82.8%) worked 42h/week, 3 (10.4%) 84h/week, 1 (3.4%) 82h/week and 1 (3.4%) 74h/week. Groups were homogeneous in gender ($p>0.05$) being G1 made up of 26 (96.3%) females and 1 (3.7%) male, while G2 was made up of 26 (89.7%) females and 3 (10.3%) males.

Table 1 shows demographic and anthropometric variables. There has been no significant difference between groups for height and body mass index (BMI). Age and BMI were lower for G2. As to low back pain, after fixing the group, there has been significant difference in G1, with predominance of individuals with low back pain. In G2 there has been no difference between presence and absence of low back pain. There has also been difference between groups with regard to the incidence of low back pain, being the number of positive cases

higher in G1 and the number of negative cases higher in G2. With regard to low back pain duration, there has been no difference between groups [G1: 36.0 (12.0 – 96.0); G2: 36.0 (3.0 – 48.0) months; p>0.05].

Table 1. Demographic and anthropometric variables according to the level of physical activity

Variables	G1 (n=27)	G2 (n=29)	p value
Age (years)	47.6 ± 10.8	40.1 ± 7.3	0.003
Height (m)	1.58 ± 0.07	1.61 ± 0.07	0.064
Body mass (kg)	76.8 ± 12.0	73.1 ± 11	0.228
BMI (kg/m²)	30.9 ± 4.6	28.2 ± 4.0	0.020

G1 = group of insufficiently active individuals; G2 = group of sufficiently active individuals; BMI = body mass index; data in mean ± standard deviation; Student *t* test.

Table 2. Proportion of low back pain cases according to the level of physical activity

Low back pain	G1 (n=27)	G2 (n=29)
Absence	3 (11.1%) Aa	16 (55.2%) Ab
Presence	24 (88.9%) Bb	13 (44.8%) Aa

G1 = group of insufficiently active individuals; G2 = group of sufficiently active individuals; Goodman test; A, B: for vertical comparisons; a, b: for horizontal comparisons; different letters mean significant difference (p<0.05).

Table 3 shows data on time of physical activity practiced per week, musculoskeletal risk factors for low back pain, low back pain intensity and functional capacity index, according to group. G2 had longer total physical activity time per week as compared to G1. In addition, pain intensity and functional incapacity index were higher in G1 as compared to G2. With regard to musculoskeletal risk factors for low back pain, the number of repetitions performed during maximum repetition test for abdominal muscles was higher for G2 as compared to G1. However, there has been no significant difference between groups for values of the sit and reach and Thomas tests for lower limbs.

With regard to sit and reach test, individuals were classified by the level of flexibility and both groups had values compatible just with classifications "below average" and "poor". In G1, 3 individuals (11.1%) were considered below average and 24 (88.9%) with poor performance. In G2, 4 individuals 13.8%) were considered below average and 25 (86.2%) with poor performance. At Goodman test, when fixed the group, the number of individuals with poor performance in the sit and reach test was significantly higher than the number of individuals with performance below average in both groups. However, there has been no difference in the number of cases of hip flexors shortening (Table 4).

Table 3. Physical activity practiced per week, low back pain intensity, functional incapacity index and musculoskeletal risk factors for low back pain, according to the level of physical activity.

Variables		G1 (n= 27)	G2 (n=29)	p value
Time of physical activity (min/week)		60 (0 – 232.5)	720 (247.5 – 1320)	<0.001
Incapacity index (Roland Morris)		9 (4.25 – 13.75)	0 (0 – 11.25)	0.010
Pain (visual analog scale)		6 (5 – 8)	0 (0 – 7)	0.005
Abdominal test (number of repetitions)		24 (15.75 – 28.75)	31 (22.5 – 37)	0.037
Sit and reach (cm)		15.8 ± 5.2	18.1 ± 6.0	0.121
Thomas test RLL (levels)	MA	12 (10 – 14)	12 (8 – 5)	1.000
	BA	100 (96 – 112.5)	114 (101 – 118)	0.058
Thomas test LLL (levels)	MA	12 (8.5 – 15.75)	10 (8 – 12.75)	0.225
	BA	102 (98 – 113.5)	102 (98 – 112.5)	0.934

Data in mean ± standard deviation of median (percentile 25-75%); Student *t* or Mann-Whitney test. G1 = group of insufficiently active individuals; G2 = group of sufficiently active individuals; RLL = right lower limb; LLL = left lower limb; MA = monoarticular; BA = biarticular.

Table 4. Number of cases of hip flexors shortening according to the level of physical activity

Modified Thomas test		Condition	Groups	
			G1 (n=27)	G2 (n=29)
RLL	Monoarticular	Absence	4 (14.8%) Aa	3 (10.3%) Aa
		Presence	23 (85.2%) Ba	26 (89.7%) Ba
	Biarticular	Absence	1 (3.7%) Aa	2 (6.9%) Aa
		Presence	26 (96.3%) Ba	27 (93.1%) Ba
LLL	Monoarticular	Absence	4 (14.8%) Aa	4 (13.8%) Aa
		Presence	23 (85.2%) Ba	25 (86.2%) Ba
	Biarticular	Absence	2 (7.4%) Aa	2 (6.9%) Aa
		Presence	25 (92.6%) Ba	27 (93.1%) Ba

G1 = group of insufficiently active individuals; G2 = group of sufficiently active individuals; RLL = right lower limb; LLL = left lower limb; Goodman test; A, B = for vertical comparisons; a = for horizontal comparisons; different letters mean significant difference (p<0.05).

DISCUSSION

CMSD is a technical support sector, primarily made up of nursing professionals, which works around-the-clock to supply the demand of different hospital sectors[4]. Among CMSD-related ergonomic risks there are accelerated working rhythm, information flow, job organization, upright or static posture for long periods, repetitive upper limbs movements and hard work[11].

The exposure of people to extrinsic and intrinsic risk factors promotes acute body response, characterized by fatigue, discomfort and pain for prolonged periods. In addition, there may be adaptation mechanisms or the development of chronic effects, peaking with Work-Related Musculoskeletal Disorders (WRMD), such as low back pain[1-3]. Although being considered multifactorial, low back pain etiology is frequently associated to sedentary life, reflecting the combination of deficient musculoskeletal fitness and lumbar region overload[1].

In our study, the incidence of low back pain was higher in the insufficiently active group. Adequate fitness levels may contribute to maintain body posture during routine functions with lower energy waste, without exceeding tolerable musculoskeletal limit.

Physical activity also attenuates major risk factors involved with low back pain syndrome, such as muscle weakness, especially in the abdominal region, and poor joint flexibility of dorsum and lower limbs[12]. Petersen & Marziale[13] have observed lower frequency of low back pain in nurses practicing sports. Interestingly in our study, not only low back pain but also pain intensity was lower in the sufficiently active group.

In the biochemical context, trunk muscles weakness is a major risk factor for low back pain. Especially abdominal muscles play a critical role in spine and pelvic girdle stabilization. When there is abdominal weakness, there is hip instability, allowing the psoas muscle to anteriorly traction lumbar vertebrae, leading to pelvic anteversion and increased lumbar lordosis[9,12,14]. It is worth reminding that the sufficiently active group had better abdominal muscles fitness. Macedo, Debiagi & Andrade[14] have also observed association between low back pain and poor abdominal muscle resistance in young females.

Conversely, the level of physical activity has not influenced muscle flexibility. Previous studies have also not shown relationship between flexibility abnormalities and low back pain[3,15]. Nevertheless, Puppin et al.[15] have shown important relationship between muscle shortening and nonspecific chronic low back pain. Polito, Maranhão Neto & Lira[12] have evaluated fitness components of 328 individuals aged from 18 to 81 years and just muscle flexibility was associated to the prevalence of low back pain.

It is possible that part of the differences found between some studies is due to the way flexibility was evaluated. Although being easy to apply with high reproducibility, sit and reach test is considered an indirect and linear test characterized for expressing results in a distance scale. Linear tests have as weakness the incapacity of giving a global vision of individual's flexibility and the possible interference of anthropometric variables on tests results[12].

As to demographic and anthropometric variables, sufficiently active individuals had younger age and lower BMI. Chronological age is associated to physical activity decline, thus increasing the risk for low back pain[1,10]. In addition, it is well established that aging is associated to degenerative changes in lumbar spine structures, which may cause pain, decreased flexibility and muscle weakness[10]. Overweight may be considered independent low back pain factor because it increases abdominal circumference worsening pain and may associate it to lumbar spine changes. According to Heuch et al.[2] low back pain is associated to BMI and pain intensity increases as the level of obesity progresses. In addition, CMSD workers carry heavy objects every day during work, which may lead to anterior gravity center shift, generating pelvic anteversion and consequently increased lumbar lordosis.

CONCLUSION

Among nurses working in a hospital CMSD, the level of physical activity influences the incidence of low back pain, pain intensity and functional incapacity. In addition, sufficiently active individuals have better abdominal muscles resistance.

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