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Musculoskeletal disorders of the upper and the lumbar region: demographic and occupational characterization, Universidad Nacional de Colombia, Bogotá 2001- 2009

Lesiones osteomusculares de miembros superiores y región lumbar: caracterización demográfica y ocupacional. Universidad Nacional de Colombia, Bogotá 2001- 2009

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Keywords: Musculoskeletal injuries; upper limbs; lumbar region; risk factor; occupational.

Palabras clave**:** lesiones osteomusculares; miembros superiores; región lumbar; factor de riesgo; ocupacional.

ABSTRACT

The aim of this study was to characterize demographic and occupational variables of cases of upper limb and lower back musculoskeletal injuries.

Methodology: In a descriptive, cross-sectional study, we searched and reviewed scientific literature to learn about occupational risk factors associated with musculoskeletal injuries of upper limbs, the lower back and to determine relevant variables. The demographic and occupational variables in musculoskeletal injury cases were obtained from records in the database designed by the National Occupational Health Division at Universidad Nacional de Colombia.

Results: We identified 99 records of workers with positive diagnosis of upper limb and lower back musculoskeletal injuries. The female gender and age group between 41 to 50 years reported 60% and 43.43% of the cases of musculoskeletal injuries respectively. The percentage of cases by occupational group for teachers and administrative workers showed a similar distribution of 28.28%. We found that repetitive movements of elbow, wrist, fingers for upper limbs and an extended position for lumbar region are the most common risk factors. In workers, wrist and lower back were the most prominent musculoskeletal injuries. Scoliosis and hyperlordosis were spinal disorders more frequent among participants. The improvement and / or disappearance of symptoms with rest and recurrence or worsening during the work time was the more representative criterion for considering the possible cases of occupational origin of musculoskeletal injuries to upper limbs and lower back.

Conclusion: The knowledge of these variables associated with musculoskeletal injuries allows for preventive interventions.

RESUMEN

Objetivo: Caracterizar variables demográficas y ocupacionales de casos de lesiones osteomusculares de miembros superiores y región lumbar.

Metodología: Estudio descriptivo, corte transversal. Se realizó búsqueda y revisión de literatura científica para conocer factores de riesgo laborales asociados a lesiones osteomusculares de miembros superiores, región lumbar y determinar variables relevantes. Las variables demográficas y ocupacionales en casos de lesiones osteomusculares, se obtuvieron de registros de la base de datos diseñada por la División Nacional de Salud Ocupacional de la Universidad Nacional de Colombia.

Resultados: Se identificaron 99 registros de trabajadores con diagnóstico positivo de lesiones osteomusculares de miembros superiores y región lumbar. El género femenino y grupo etáreo entre 41 a 50 años reportó 60% y 43.43% de casos de lesiones osteomusculares respectivamente. El porcentaje de casos según grupo ocupacional para docentes y otros administrativos presentó distribución similar 28.28%. Se encontró que movimientos repetitivos de codo, muñeca, dedos para miembros superiores y postura prolongada para región lumbar son factores de riesgo más frecuentes. En trabajadores los segmentos corporales más comprometidos con lesiones osteomusculares fueron muñeca y zona lumbar. Escoliosis e hiperlordosis fueron las alteraciones de columna vertebral con mayor frecuencia entre la población participante. La mejoría y/o desaparición de los síntomas con descanso y reaparición o agravamiento durante el trabajo fue el criterio más representativo para considerar posible origen laboral de casos de lesiones osteomusculares para miembros superiores y región lumbar.

Conclusión: El conocimiento de las variables asociadas a lesiones osteomusculares permite realizar intervenciones preventivas.

INTRODUCTION

The International Labour Organization (ILO), according to the report published in 2005 states that each day an average of 5,000 people die as a result of accidents or work-related ailments. The ILO estimates that this figure is 2 - 2.3 million men and women each year, of which 350,000 deaths are due to fatalities at work and 1.7 - 2 million deaths are caused by diseases contracted due to the nature of work, this report states that. Additionally, the world's workers suffer 270 million occupational accidents, and about 160 million are produced of cases of illness with non-fatal consequences. [(1)]

Regarding the musculoskeletal diseases, the International Labour Conference held in 2002, stated that there are those diseases caused by work activities or certain risk factors that are present in the work environment. [(2)]

In this regard it is worth mentioning that the report of occupational diseases in Colombia 2003 - 2005, [(3)] carpal tunnel syndrome (CTS) constitutes the leading cause of occupational morbidity. In 2004, 32% of occupational disease diagnosis corresponded to this pathology, with a steady increase.

Moreover, the back pain that is included within the musculoskeletal and ligamentous injuries in the table of occupational diseases still ranks the second in frequency of diagnosis of occupational diseases. For example, in 2004, 15% were diagnosed in this pathology, however, it is noteworthy that the diagnosis of lower back pain is a non-specific diagnosis and perhaps for this reason its incidence decreases in 2004 regarding the three previous years. In this context when grouping diagnoses by systems, it is observed that the musculoskeletal system it is the most affected and according to the report of occupational accidents and occupational diseases from the Ministry of Social Protection, it shows the steady increase in occupational musculoskeletal disorders (OMD), which increased from 65% in 2001, to 82% of all diagnoses in 2004. These OMD affect basically two body segments: upper limb and lower spine. [(4)]

It should be noted that among the many repercussions caused by musculoskeletal injuries among workers due to occupational risk factors, these are fundamentally different: the change in the quality of life of workers, changes in the individual psychosocial perspectives and attitudes, family and social, absenteeism, decreased productivity, and the increasing economic costs of health care.

The Universidad Nacional de Colombia as a public institution and obeying the laws in occupational health has defined as an occupational health policy the comprehensive protection of health, the prevention and the control of occupational hazards of the faculty staff, the staff, contractors and others. Likewise, the National Occupational Health Division is a unit attached to the National Personnel Division, which aims to direct its actions towards the prevention and control of occupational risk factors, promoting a safe working environment that facilitates and protects the health of the public servants of faculty and staff.[5]

Given that the comprehensive health protection is an occupational health policy defined by Universidad Nacional de Colombia, in this context, we designed and implemented the Occupational Surveillance System of Musculoskeletal Disorders and Injuries (SIVIGOTOM).

The SIVIGOTOM, used as the surveillance population to all workers at Universidad Nacional de Colombia – Bogotá headquarters, that included both the administrative workers and teachers who work in the facilities inside and outside the campus, had the purpose of describing the occurrence of musculoskeletal disorders among workers and suggest guidelines that aim to prevent the occurrence of such injuries. The decision to opt for these kind of health disorders was based on a previous diagnosis of health conditions and work of three groups considered at high risk for the occurrence of musculoskeletal alterations, corresponding to workers who do maintenance, general and secretarial services.[6]

It should be noted that low back pain is the leading cause of absence due to sickness and disability in working populations. It is believed that approximately 10 - 15% of the general population at some point in their lives report having low back pain; among workers it is considered that about 2% have to be absent from work because of back pain each year. Moreover the pain syndromes of the upper limb set the group of musculoskeletal injuries apart more frequently. The pathophysiology of these syndromes is not currently fully understood, there are considered five major occupational risk factors in the development of these types of entities: repetition, force, posture, stress, and vibration. [6]

From the application of the screening tests and physiokinetic evaluations for upper and lower back for a total of 2,117 workers at Universidad Nacional de Colombia- Bogotá headquarters from 2001 to 2009, it was identified that the prevalence of lower back pain was 18.79% and 61.40% for upper limb pain syndromes. [6] However, there is no information on the results of reports which have subsequently reported changes or modifications to this trend. Musculoskeletal injuries have been defined by the National Institute for Occupational Safety and Health (NIOSH) [7] as "a group of conditions that involve the nerves, tendons, muscles and supporting structures such as intervertebral discs." In turn, the World Health Organization (WHO) states that musculoskeletal injuries are part of a group of conditions related to work, because they can be caused by both occupational exposures as well as non occupational exposures. [8]

Clearly, the musculoskeletal injuries are a public health problem that stand and impose a huge burden on workers and society, affecting the quality of life, reduces productivity and profitability, produce temporary or permanent disability, it disables for tasks and increase workers' compensation costs.

In this framework, given that there is no information on demographic and occupational characteristics of identified cases of upper limb and lower back musculoskeletal injuries in this occupational group, the workforces should be identified according to the risk of exposure, and identify risk factors associated with recognized cases of screening tests.

The characterization of demographic and occupational variables of musculoskeletal injury cases and occupational risk factors is a fundamental principle for the analysis of working conditions and health in specific economic activities, because based on this information, we define the specific intervention measures that help to overcome the implications of musculoskeletal disorders, significantly influencing in the decline of occupational morbidity figures.

In this sense, the demographic and occupational characterization of musculoskeletal injury cases, will provide objective and specific information of vulnerable occupational groups, thus contributing to the planning of prevention, intervention and control according to the needs of this work group supporting the improvement of working conditions and health and therefore the quality of life and wellbeing of the population. The present study aimed to characterize the demographic and occupational variables of cases of upper limb and lower back musculoskeletal injuries, included in the Occupational Surveillance System of Musculoskeletal Disorders and Injuries (SIVIGOTOM) in the period from 2001 to 2009 and thus describing the significant variables of the person, time and place in the identified cases by the physiokinetics assessments in the study population, and to identify occupational risk factors.

MATERIALS AND METHODS

We performed a cross-sectional descriptive study aimed at characterizing demographic and occupational musculoskeletal injury cases identified by the screening test application through physiokinetic assessment of the administrative officials who work at Universidad Nacional de Colombia and that were included in Occupational Surveillance System and Musculoskeletal Disorders and Injuries (SIVIGOTOM) in the period 2001 to 2009.

The demographic and occupational variables in cases of upper limb and lower back of musculoskeletal injuries in workers at Universidad Nacional de Colombia- Bogotá Headquarters, are taken from the records of the database designed by the National Occupational Health Division of Universidad Nacional de Colombia for the Surveillance System for Occupational Musculoskeletal Disorders and Injuries (SIVIGOTOM).

We performed a review of 2669 records in the database of the workers included in the surveillance system of occupational musculoskeletal disorders and injuries. We excluded 552 records with incomplete or duplicated information. In the remaining 2117 records, 99 worker records were identified, through the screening test of physiokinetic assessment, showing a positive diagnosis of musculoskeletal injury of the upper and lower back.

For the analysis of the results, the frequency distribution and percentages of cases of upper limb musculoskeletal injuries and lumbar region were used with reference to age

group, gender, occupational group, length of service at the University, and exposure to occupational risk factors in upper and lower back.

A search and review was done of the literature in the PubMed database with the aim of knowing the occupational risk factors associated with musculoskeletal injuries of the upper and lower back, and to determine the relevant variables for the study.

For searching articles from 2005 to date, the following parameters were used: Full text, Humans. Type of article: Clinical Trial, Meta-analysis, Randomized controlled trial, Review, Journal Article. Descriptors: incidence, disorder, musculoskeletal, occupational, lumbar spine, upper limbs, secretaries, teacher, administrative staff, personal hygiene.

The results showed that about 150.209 articles (musculoskeletal injuries, occupational musculoskeletal injuries, incidence of musculoskeletal injuries, occupational musculoskeletal injury incidence) of these 98.64% were musculoskeletal injuries and only 0.60% to the incidence of these injuries.

Similarly 7.16% of papers about musculoskeletal injuries referred to lumbar spine injuries and 4.26% at the upper limbs. 1.8% and 32.88% of the papers concerning occupational musculoskeletal injuries accounted for lumbar spine and upper limbs, respectively. Of 914 papers with musculoskeletal injury incidence, 3.06% corresponded to the lumbar spine, 13.78% to upper limbs and finally the 42.56% was related to occupational incidence.

Moreover, 33% studied the relationship of gender musculoskeletal disorders, 42% occupational groups, 20% physical factors, 25% ergonomic conditions, and it is noteworthy that psychosocial factors corresponded to 66% of the papers found.

The corresponding Excel database was developed using codes.

Ethical aspects

We followed the guidelines of 008430, [9] where scientific standards, techniques and administrative rules are established for health research. According to this resolution it is classified as a safe research. The international ethical guidelines for biomedical research on human beings recommended by CIOMS were taken into account.[10] General data records were used, which guaranteed the confidentiality of the information due that there was not individualized musculoskeletal injury cases. It had the support of the ethics committee of the Faculty of Nursing at Universidad Nacional de Colombia.

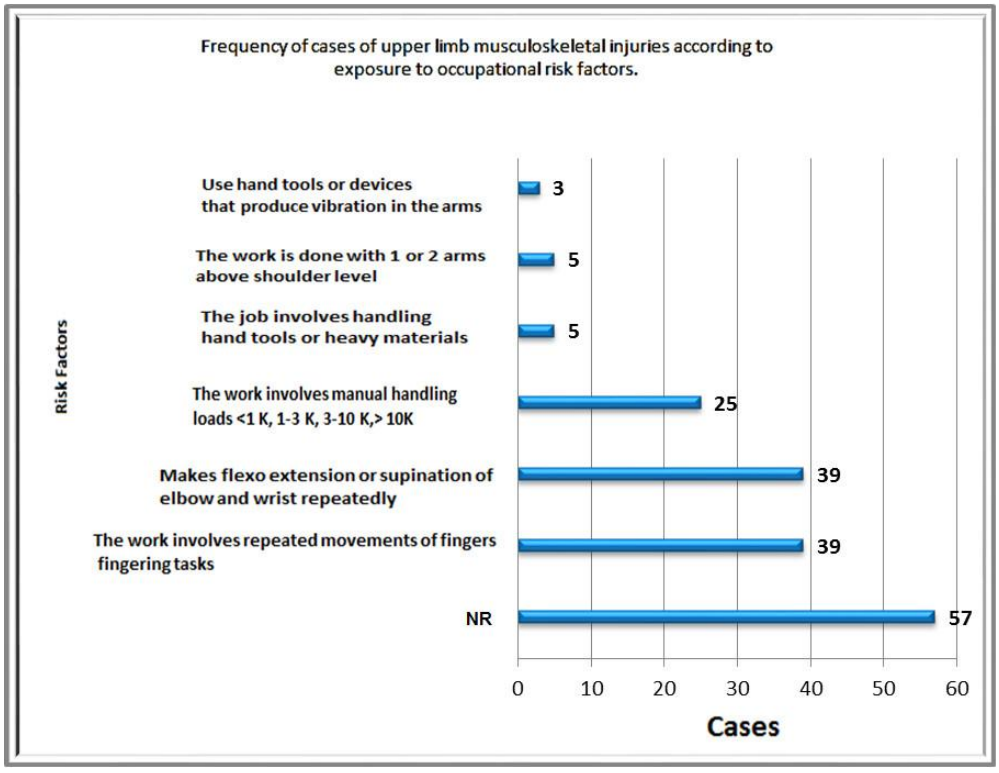
RESULTS

In the percentage distribution by age group of cases of upper limb musculoskeletal injuries and the workers lumbar region, it was observed that 43.43% of musculoskeletal injury cases were diagnosed between the age range of 41-50 years, in second place the cases were between the age range of 31-40 years, and 51-60 years with 26.26% respectively. The largest number of cases were identified in women.

It appears in a similar proportion the number of cases in teachers and other staff, followed by the laboratory workers group and directors, respectively.

The percentage distribution of musculoskeletal injury cases as occupational exposure before entering to the National University of Colombia, showed that 28.28% corresponds to a period between 1-5 years, followed by 6-10 years with a representation of 20, 20%. In occupational exposure within the University, it shows that the highest proportions of workers are linked for more than 16 years followed in order of frequency of those between 11-15 years. This means that over 60% of diagnosed cases have a bonding time over 11 years.

1. Frequency of cases of upper limb musculoskeletal injuries according to exposure to occupational risk factors



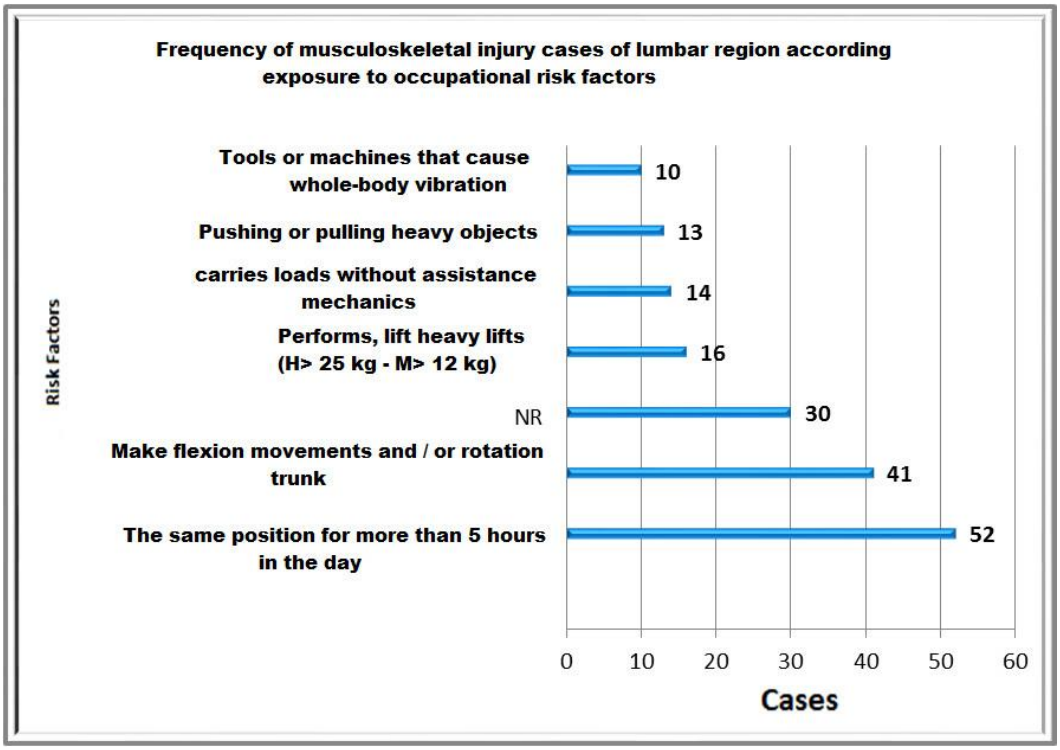
N= 173*

*** Workers could be exposed to more than one occupational risk factor**

Source: Surveillance System logs of Injuries and Musculoskeletal Disorders (SIVIGOTOM) of the Universidad Nacional de Colombia- Bogotá Headquarters.

Musculoskeletal injury cases of upper limb according to exposure to occupational hazards are presented in Figure 1. It is observed that repetitive movements of elbow, wrist and fingers is the risk factor most frequently presented, followed by the manual handling of loads, to a lesser extent the manipulation of hand tools and task performance above the level of shoulder.

Figure 2. Frequency of musculoskeletal injury cases of lumbar region according to exposure to occupational risk factors



N= 176*

*** Workers could be exposed to more than one occupational risk factor**

Source: Surveillance System logs of Injuries and Musculoskeletal Disorders (SIVIGOTOM) of the Universidad Nacional de Colombia- Bogotá Headquarters.

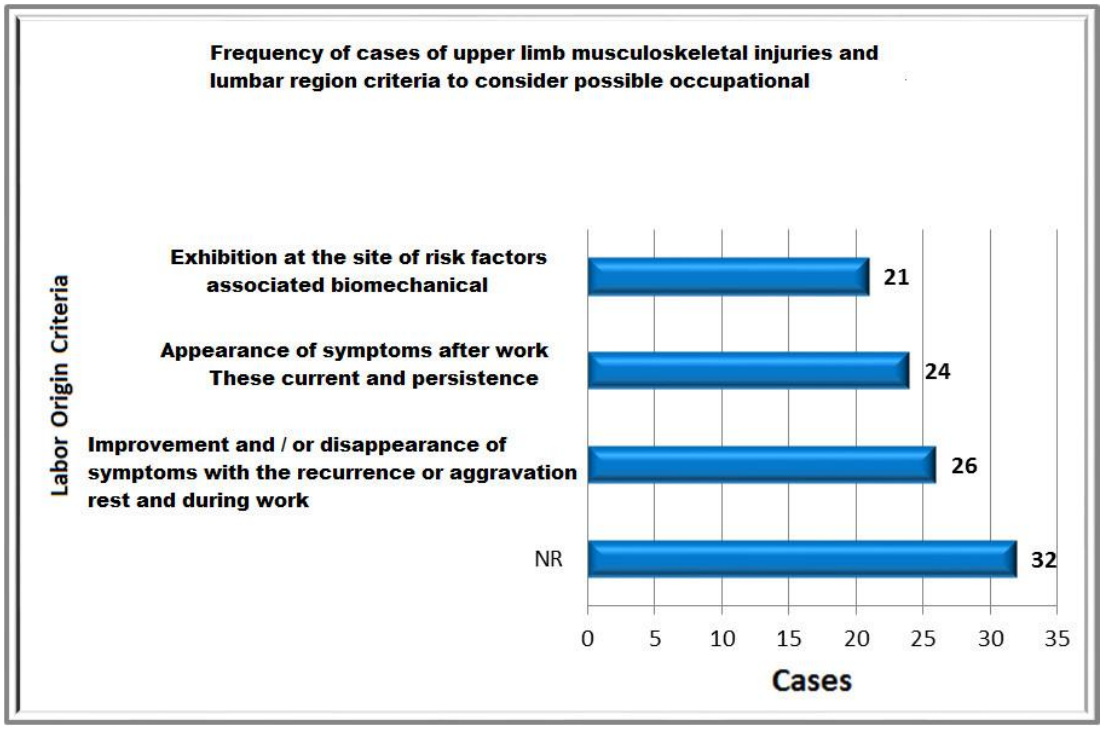
The frequency of musculoskeletal injury cases in the lumbar region according to exposure to occupational risk factors in Figure 2 shows that maintaining the same position for more than five hours in the day, is the risk factor most frequent to which the workers of the Universidad Nacional de Colombia are exposed, followed by flexion movements and / or rotation of the trunk and to a lesser extent the lifting and carrying of heavy loads.

In the percentage distribution of physical activity of musculoskeletal injury cases, it is seen that 53.54% of cases performed some kind of physical activity, compared to 46.46% that did not engage in any physical activity.

In cases of upper limb musculoskeletal injuries and lower back pain according to location, it is observed that the most involved body segments are the lower back, followed by the wrist and shoulder. In relation to pain intensity, it is evident that the data with the greatest proportion is the non-relevant record; however, the intensity of pain is at an average level for most of the cases.

In the frequency of cases of upper limb musculoskeletal injuries and lower back as postural alteration, it emphasizes that hyperlordosis and scoliosis are the most common postural abnormalities.

Figure 3. Frequency of cases of upper limb musculoskeletal injuries and lower back according to criteria to consider possible occupational origin



N= 103*
*** Workers could give more than one answer**

Source: Surveillance System logs of Injuries and Musculoskeletal Disorders (SIVIGOTOM) of the Universidad Nacional de Colombia- Bogotá Headquarters.

In relation to the criteria for considering possible occupational origin of musculoskeletal injury cases for upper and lower back, represented in Figure 3, we can see that the non-registration of this information is the highest percentage, likewise the improvement and / or disappearance of symptoms with rest and recurrence or aggravation during work was presented in 26 of the cases.

When comparing the percentage distribution of musculoskeletal injury cases according to gender by age group, it can be seen that there is a higher incidence of musculoskeletal injuries in women and men between the ages of 41-50 years old, in the same way it shows an equal number of cases of musculoskeletal injuries in both women and men between ages 31-40 years, and 51-60 years.

In the comparison of the percentage distribution of musculoskeletal injury cases according to gender by occupational group, there are a greater number of cases (25%) in women from the healthcare worker's occupational group and in equal proportion (25%) in men belonging to the group of teachers.

In comparison to the frequency of musculoskeletal injury cases according to gender and according to exposure to occupational risk factors for upper limbs, it appears that repetitive movements of elbows, wrists and fingers is the risk factor most exposed to both women and men.

In comparison to the frequency of musculoskeletal injury cases according to gender and according to exposure to occupational risk factors for lower back, it can be seen that women are more exposed to the risk factor keeping the same position for more than 5 hours in the working day, and men are more exposed to the risk factor of flexion movements and / or rotation of the trunk.

In comparison to the frequency of musculoskeletal injury cases according to occupational group and according to exposure to occupational risk factors for upper limbs, it appears that the cases belonging to the staff group, principals and teachers are the most exposed to the greatest risk factors such as: repetitive movements of fingers, flexion-extension and prono-supination of elbow and wrist in a repeatedly way and the manual handling of loads.

Finally, in comparison to the frequency of musculoskeletal injury cases according to occupational group and according to exposure to occupational risk factors for lower back, it is observed that the cases belonging to the staff group and faculty are exposed to flexion movements and / or trunk rotation, followed by holding the same position for more than 5 hours during the working day, in the same way it is appreciated that the group of the laboratory technicians is exposed to most of the risk factors for musculoskeletal injuries of lumbar region, such as heavy lifting, flexion movements and / or rotation of trunk, cargo without mechanical assistance and maintaining the same position for more than five hours in the workday.

DISCUSSION

The results of this research show the presence of musculoskeletal injuries especially in women and men aged 41-50 years, this finding is consistent with those reported by the Federation of Colombian Insurers (FASECOLDA) that in 2007 the proportion of occupational diseases by gender was 55.2% for women with a higher frequency of cases between the ages of 35-44 years, and 44.8% for men in the same age range. [11]

Note that the female gender is the most affected by the presence of musculoskeletal injuries, in this sense it is important to note that there are differences in exposure to risk factors by gender, men have jobs that usually require physical effort, and are exposed to a greater number of factors (chemical, physical, accidents, etc..), on the other hand, the most common risk factors in female workers are of psycho-social kind: the high level of demand, the monotony, physical inactivity, awkward postures, the need for speed and skill in the workplace, lack of qualifications and responsibilities, the accumulation of tasks, insecurity of maintenance of the position. [12, 13]

In Colombia, according to the Ministry of Social Protection in the occupational disease report 2003 - 2005, the prevalence of occupational disease in women was 56%, whereas in men was 37%. That is, unlike occupational accidents, occupational diseases affect more women workers, specifically through musculoskeletal disorders[3] Several studies have concluded that musculoskeletal injuries are more common among women than among men, and that the gender gap in musculoskeletal injuries has been solidified over the last decade. [14]

There are several explanations for gender differences in musculoskeletal injuries, among them are gender segregation in the labour market, conditions of work quality, likewise there is a sexual division of labour in the sphere of private life resulting in a "double burden", as well as reduced opportunities for rest and recovery in women after work. [15, 16, 17, 18]

Also, it was observed that the occupational groups with the highest number of cases of musculoskeletal injuries to upper limbs and lumbar region corresponded to teachers and other staff. The National Institute for Occupational Safety and Health (NIOSH) [7] states that risk factors for musculoskeletal disorders are related to the prolonged exertion, repetitive movements, prolonged awkward postures and vibration. The works or working conditions that combine risk factors increase the risk of musculoskeletal injury and the level of risk will depend on how long the worker is exposed to these conditions, how often they are exposed, and the exposure level.

However, Leijon, *et al*. [15] state that "none of the most common musculoskeletal disorders is explained solely by the risk factors at work." In general, there are considered four major risk groups: factors related to working conditions (physical load: a set of physical requirements to which it is subjected the worker during the workday, it is based on static and dynamic muscle work), organizational and psycho-occupational factors, factors related to the environmental conditions of jobs and work systems (temperature, vibration, etc.) and individual factors (worker's functional capacity, habits, background, psychological issues, etc.).

In this regard, it was observed that in workers belonging to the occupational group of teachers and other staff, there may be a link in the repetitiveness and monotony of tasks, prolonged postures, stress and work overload. [18,19,20] The relationship between musculoskeletal injuries and occupation has been investigated in numerous studies, traditionally these disorders have been linked to physical factors of the work environment, but in recent years, from day to day, this relationship between psychosocial factors and musculoskeletal injuries has drawn increasing attention[19], high psychological demands, stress, perceived health status, work overload, interpersonal relationships, loss of control over work, long hours worked, the introduction of technology in the production, organizational climate, loss of social support and many situational constraints of the work environment are involved as potential psychosocial factors for the development of musculoskeletal injuries. Similarly those aspects related to the sphere of private life, such as family and domestic responsibilities, restricted time for recreation and rest, are associated with an increased risk of musculoskeletal injuries in upper limbs and lumbar spine.[15,16, 17, 19,20,21,22,23]

This study identified that the occupational risk factors associated with the development of musculoskeletal injuries were the exposure of workers who had repetitive movements, transport and cargo handling and prolonged postures for both upper limbs to the lower back, thereby increasing the possibility of developing musculoskeletal injuries. In this respect, many international publications designate as occupational risk factors associated with development of musculoskeletal injuries by physical effort, the following tasks: repetitive movements and prolonged anti-gravity positions, lifting, carrying or moving loads and exposure to vibration, which can affect half of high-risk workers.[14,24,25,26,27] The incidence of musculoskeletal injuries in the upper limb is strongly associated with exposure to ergonomic stressors such as: repetitive movements, forced body postures, and intense exertions that are present especially in the office work. [17, 18, 20]

At national level, according to the first national survey of health and working conditions in the general system of occupational hazards (GSOH) it was found that occupational risk factors more frequently occurring were those related to the ergonomics conditions (physical load), followed by psychosocial risk factors.[28]

Finally, it was observed that as in the reporting of occupational accidents and occupational diseases in the Ministry of Social Protection, 2006, workers at Universidad Nacional de Colombia Bogotá headquarters, the more committed body segments with respect to musculoskeletal injury were the wrist and lower back. In Spain, Torada and Moreno [29] emphasize that the conditions generated by musculoskeletal injuries occur in different areas of the body in men and women, while the former are more affected in the lumbar region, women experience more neck discomfort, dorsal, lumbar and upper limbs.

CONCLUSION

The most important risk factor in cases of musculoskeletal injuries to upper limbs, without distinction for both genders, is the repetitive motion in elbow, wrist and fingers, which appears in the occupational groups as staff, officers and teachers. The most important risk factor in cases of musculoskeletal injury to the lower back is exposure to prolonged postures for females and flexion movements and / or rotation of the trunk in males as was identified in teachers, laboratory technicians and staff. The knowledge of the factors associated with musculoskeletal injuries of the upper and lower back, allows the health staff to perform preventive interventions among workers, taking into account their jobs tasks, as well as working conditions.

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