

Association between pain and agricultural workload

Associação entre a carga de trabalho agrícola e as dores relacionadas

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Keywords

Occupational health nursing; Workload; Pain; Public health nursing; Agriculture/manpower; Workers; Agricultural workers' diseases

Descritores

Enfermagem do trabalho; Carga de trabalho; Dor; Enfermagem em saúde pública; Agricultura/recursos humanos; Trabalhadores; Doenças dos trabalhadores agrícolas

Submitted

February 10, 2014

Accepted

June 10, 2014

Abstract

Objective: To analyze the association between workload of farm work and pains attributed by farm workers.
Methods: This cross-sectional study included 259 farm workers from two rural scenarios. A validated research instrument was used to assess the workload.

Results: Two pairs, sale of products and sore feet and also tillage and low back pain, showed the highest values for association. Farm workers who had pain had high workload. In addition, workload was significant for farm workers who exhibited stress, anxiety, and disorder in the sleep-wake cycle.

Conclusion: Workload arising from the process of farm work influence farm workers health and may lead them to show emotional and physical wear, causing pain and possible work-related disorders and diseases.

Resumo

Objetivo: Analisar a associação entre a carga de trabalho agrícola e as dores atribuídas pelos agricultores.

Métodos: Estudo transversal que incluiu 259 agricultores de dois cenários rurais. Utilizou-se instrumento de pesquisa validado para a avaliação da carga de trabalho.

Resultados: As associações com maior magnitude ficaram entre a comercialização dos produtos e a dor nos pés e o preparo do solo associado às lombalgias. Os agricultores que apresentaram dores evidenciaram maior carga de trabalho, assim como a carga de trabalho foi significativa para os agricultores que apresentaram estresse, ansiedade e transtorno do ciclo vigília-sono.

Conclusão: As cargas de trabalho oriundas do processo de trabalho agrícola exercem influências na saúde e podem levar ao desgaste físico e emocional do agricultor, ocasionando dores e possíveis distúrbios e doenças relacionadas ao trabalho.

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DOI

<http://dx.doi.org/10.1590/1982-0194201400056>

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Conflicts of interest: there is no conflict of interest to declare.

Introduction

Agriculture comprises production of food products, from planting to marketing, through harvest, including use and maintenance of farm machinery, tools, and facilities.⁽¹⁾ Farm workers develop their work in specific conditions of the farm work process, which produces workload, such as different weather, intensive routine work in certain periods of the year, and various other tasks that the farmer needs to perform, including weeding, treatment of crops, harvesting, transport of goods, etc.

Activities developed by farm workers expose them to contact with venomous animals, which can cause stings, bites, infection, and plants, which can cause poisoning, allergies, etc. Most of them are arduous and require high energy demand from the human capacity, such as muscle strength and permanence in exhausting environmental conditions and work. Moreover, they require staying in uncomfortable body positions for a long time, high rate of work, repetitive movements, use of work tools that expose farm workers to continuous workload, with a potential to generate injuries, illnesses, and accidents.⁽¹⁾

It is considered that workloads result from the relationship between elements of the work process and their effects on the worker's body, which can be translated into pain, injury, and illness as a biopsychic causal nexus. In this sense, the specific work process must be analyzed to better understand its characteristics and thus investigate the workload and its outcome.⁽²⁾

Much evidence related to other health problems, which arise from the work process developed by the farmer, has been identified. Health of farm workers on hot days, muscle and eye injuries, and falls triggering dislocation and fractures in the workplace caused concern and have been studied.⁽³⁾

The National Center for Farmworker Health highlights the hard physical work and that one with heavy machines as promoters of musculoskeletal injuries in the farm work.⁽⁴⁾ Initially, le-

sions may appear as pain and evolve into bigger problems such as Repetitive Strain Injury (RSI) and Work-Related Musculoskeletal Disorders (WRMSD), two of the biggest health problems in agriculture in European countries.⁽⁵⁾

Therefore, contribution of nurses to the production of knowledge about occupational health and their action in the care of these farm workers in their production processes is necessary, with the perspective of prevention, surveillance, and health promotion. Thus, to investigate the relationships in the health-work-environment process with focus on the workload is an important contribution to the knowledge in the area of occupational nursing.

This study is justified because nurses attention to farm workers health requires knowledge about the nature of their work, their social and environmental aspects, and implications for their health. Thus, the aim of this study was to analyze the association between farm work and pain attributed by farm workers to their workload.

Methods

This cross-sectional study involved the participation of 259 farm workers from two rural environments, Island of Sailors (129) and rural area of Uruguaiiana (130), State of Rio Grande do Sul (RS, Brazil). Residing in one of these environments, be aged at least 18 full years, and cultivating horticultural products were the criteria for selection of farm workers. Those who did not work in agriculture in the period of data collection were excluded.

Due to the lack of information about the number of farm workers in official sources, the subjects were selected using non-probability sampling procedures (intentionally, for convenience). Sample size was calculated using the StatCalc tool (EpiInfo, version 3.5.2.), to which the total number of inhabitants in rural regions was inserted (confidence level: 95%). Thus, a sample calculation of 369 subjects was obtained for Ilha dos Marinheiros (Island of the Sailors; 179) and rural area of Uruguaiiana (190).

Consistently with the inaccuracy in the number of farm workers, we sought strategies to achieve the greatest possible number of subjects. Contacting official agencies linked to farm workers assistance in the state and municipality, such as the Union of Agricultural Workers, Company of Technical Assistance and Rural Extension, and Municipal Secretary of Agriculture was our first initiative. In addition to the strategies for tracking subjects, house-to-house searches were conducted, and farm workers and their homes were located by indication of the interviewees. Regarding inaccessible rural areas and farm workers who were not found (after at least five attempts of contact on visits to their homes), a total of 26 refusals and 36 losses occurred.

Data were collected from March to October 2013 using a semi-structured questionnaire with mixed questions to characterize farm workers, the work process, work implications for health, and strategies to alleviate symptoms. A diagram with front and back images of the human body was used to facilitate location of painful areas and analyze work-related pains. In this study, the following definition of pain was used taking into account individual subjectivity: unpleasant sensory (therefore also emotional) experience associated with either actual or potential tissue injury.⁽⁶⁾

The NASA-TLX instrument (developed by the National Aeronautics and Space Administration) was used to measure the work loads. It is a multidimensional procedure that allows to evaluate six different demands: mental, physical, and temporal demands, and levels of total effort, performance, and frustration. The assessment procedure involves two steps: in the first one, the farm workers indicate with two anchors (rates) at the low and high ends of a non-numeric, twenty-point continuous scale how much the demand contributes to the workload. In the second, fifteen different pairs of combined demands are presented to the farm workers; in each pair, the demand that contributes most to the load (weight) is indicated.^(7,8)

The Statistical Package for Social Sciences software (version 20.0) was used for descriptive

analysis, which was based on the percentages indicated in the responses. The Chi-square Pearson test (χ^2) was used to identify possible associations between variables related to pain in body regions of the farmer and agricultural activities undertaken by him. From significant associations, the Cramer's V coefficient was calculated to determine whether the magnitude of the association effect could be considered small ($r < 0.3$), moderate ($0.4 < V < 0.5$), or large ($r > 0.5$). The weighted average of demands (rates x weights) and the weighted total rate of each subject interviewed were calculated to analyze the workload. The Mann-Whitney test was then performed to relate the workload variable with the occurrence of pain, assistance to farm workers at work, and disorders of the nervous system. The significance level of $\alpha < 0.05$ was considered in all tests.

The study was conducted in accordance with national and international standards of ethics in research involving human beings.

Results

The study involved 148 male (57.1%) and 111 female (42.9%) workers, with an overall average age of 51.2 years. The results for the characteristics of farmers work are shown in table 1.

According to the Mann-Whitney test ($p=0,262$), there was no significant difference between the workloads of farm workers who had to those who did not have assistance during their work.

The association relationship (V) between the variables related to the process of farm work and pains attributed by farm workers is shown as follows. In table 2, sale of products and sore feet ($V=0.176$), and soil preparation and low back pain ($V=0.164$) were the pairs with the highest values for associations.

Culture treatment was shown to be associated with pain in the calf region ($V=0.158$). Headache ($V=0.123$) and sore feet ($V=0.122$) were associated with the production management. Sore feet ($V=0.127$) also showed significant association with production planning. On the other side, sore hands

Table 1. Characteristics of the farm work processes

Variables	n(%)
Activities developed in the agriculture	
Production planning	217(83.8)
Product selling	189(73)
Production management	194(74.9)
Soil preparation	214(82.6)
Planting	248(95.8)
Culture treatment	238(91.9)
Harvesting	253(97.7)
Assistance availability	
No	26(10.1)
Yes	232(89.6)
Assistant persons	
Husband or wife	180(69.5)
Son or daughter	72(27.8)
Brother(s) or sister(s)	21(8.1)
Employee(s)	20(7.7)

had a low association among workers who planned production ($V=0.026$).

It was found that farm workers who complained of pain due to completion of the work ($n=221$) showed a higher workload (median=15.60; $p=0.002$) as compared with those who did not complained of pain (median=12.53). From the definition of pain used in this study, analysis of workload indices in relation to work-related mental and nervous system disorders is understood as necessary. Thus, a significant difference was identified between workloads of farm workers who had and those who did not have stress ($n=98$; 37.8%, $p=0.006$; median: 16.40), anxiety ($n=94$; 36%, $p=0.007$; median: 16.49), and disorder of the sleep-wake cycle ($n=70$; 26.9%, $p=0.025$; median: 16.46). Other work-related disorders such as depressive episodes ($n=38$; 14.6%) were also cited.

Strategies to minimize pains were also observed among the farm workers ($n=221$). Their strategies included self-medication (124; 77%) or body care through walking or resting (120; 77.7%). They also went to the Basic Health Unit (49; 57%), to

Table 2. Association between activities undertaken by farm workers and report of pains related to their work

Variables	Production planning n(%)	Product selling n(%)	Production management n(%)	Soil preparation n(%)	Plantation n(%)	Culture treatment n(%)	Harvesting n(%)
Head	18(6.9)	15(5.8)	17 (6.6)****	16(6.2)	18(6.9)	16(6.2)	18(6.9)
Neck	12(4.6)	9(3.5)	9(3.5)	9(3.5)	12(4.6)	12(4.6)	12(4.6)
Shoulders	42(16.2)	40(15.4)	41(15.8)	45(17.4)	52(20.1)	48(18.5)	52(20.1)
Chest	9(3.5)	9(3.5)	8(3.1)	8(3.1)	9(3.5)	9(3.5)	9(3.5)
Spine Cervical/Toracic	74(28.6)	65(25.1)	68(26.3)	73(28.2)	88(34)	87(33.6)	94(36.3)
Spine Lumbar/Sacral	123(47.5)	110(42.5)	116(44.8)	116(44.8) ²	142(54.8)	135(52.1)	138(53.3)
Arms	22(8.5)	19(7.3)	19(7.3)	24(9.3)	28(10.8)	26(10)	26(10)
Elbows	15(5.8)	13(5.0)	13(5.0)	14(5.4)	15(5.8)	15(5.8)	15(5.8)
Forearms	11(4.2)	10(3.9)	9(3.5)	11(4.2)	11(4.2)	11(4.2)	10(3.9)
Wrists	5(1.9)	5(1.9)	5(1.9)	5(1.9)	5(1.9)	5(1.9)	5(1.9)
Hands	8(3.1)*	8(3.1)	8(3.1)	10(3.9)	12(4.6)	11(4.2)	12(4.6)
Abdomen	8(3.1)	8(3.1)	9(3.5)	3(1.2)	10(3.9)	9(3.5)	10(3.9)
Thighs	23(8.9)	21(8.1)	20(7.7)	26(10)	30(11.6)	28(10.8)	30(11.6)
Knees	33(12.7)	28(10.8)	28(10.8)	35(13.5)	37(14.3)	37(14.3)	40(15.4)
Legs	18(6.9)	17(6.6)	17(6.6)	21(8.1)	23(8.9)	21(8.1)	23(8.9)
Calves	25(9.7)	22(8.5)	21(8.1)	22(8.5)	29(11.2)	24(9.3) ³	29(11.2)
Ankles	18(6.9)	18(6.9)	18(6.9)	20(7.7)	21(8.1)	20(7.7)	22(8.5)
Feet	12(4.6)**	8(3.1)***	10(3.9) ¹	14(5.4)	17(6.6)	18(6.9)	17(6.6)

* $\chi^2=4.985$; $p<0.026$; $V = 0.026$; ** $\chi^2=4.172$; $p<0.041$. $V = 0.127$; *** $\chi^2=7.983$; $p<0.005$; $V = 0.176$; **** $\chi^2= 3.929$; $p<0.047$; $V = 0.123$; ¹ $\chi^2=3.852$; $p<0.050$; $V = 0.122$; ² $\chi^2 = 6.953$; $p<0.008$; $V = 0.164$;

³ $\chi^2=6.440$; $p<0.011$; $V = 0.158$

a specialist (40; 51.7%). Other farm workers had massage with an infusion or ointment (19; 33.1%), went to the emergency room (18; 32.7%), did not do anything (10; 19.3%), took homemade medication (9; 18.9%), and used the prescribed drug therapy (8; 18.5%).

Discussion

The limitation of the results of this study is related to its cross-sectional design, which does not allow to establish a cause-effect relationship. In addition, the subjective characteristic of the pain variable and lack of analysis on their intensity and frequency, as well as their summing sensory characteristics are also limiting.

The results of this study indicate the need for planning health actions, seeking to prevent pain, injuries, and disorders related to the workload of farm workers. Our findings potentially contribute to promoting health interventions grounded in Occupational Nursing.

Analysis of results showed that workload in agriculture is not changed by assistance of another person, suggesting that it is maintained according to the nature of the work process. In the present study, it was verified that most farmers are assisted by the family. This is a characteristic of the family farming, which is considered the main social and economic activity in rural areas.⁽⁹⁾

Process analysis of the work developed by farmers, identified several activities mainly planting, culture treatment, and harvesting. This can be explained by the need for a greater workforce given the particularity of the production process and its relationship with the workload required. These steps of the farm work are mentioned in a study with farm workers in New Zealand.⁽⁹⁾ The workload of farm activities is also highlighted in countries such as Holland, France, and the UK in its relationship with the onset of symptoms generated by musculoskeletal disorders associated with poor posture, long periods of standing, extreme temperatures, and prolonged working hours.⁽⁵⁾

Significant associations of agricultural activities with localization of pain were identified. They included association of product selling with sore feet, soil preparation with low back pain and pain in the sacral region, culture treatment with pain in the region of the calves, and farm management with headache and sore feet. This can be linked to the body requirement by working process depending on the positions assumed by the worker, which usually are or become inadequate due to the work routine or pain acquired. Lifting heavy loads and excessive repetition also cause dorsal or low back pain, and inflammation of muscles, tendons, and joints.^(5,10)

Painful symptoms in farmers are linked to the activities they develop, as is the case of manual tasks (planting, pruning, application of chemicals, harvesting, inspection and packaging of products, loading and transport of goods, etc). Regarding such activities, there are several possible implications for health, including general fatigue, cumulative trauma disorder, spasm, pain and injury in the cervical and lumbar as well as joint and musculoskeletal regions, upper and lower members, and injuries in hands and wrists.⁽¹¹⁾ In addition, the effort generated by the workload in different activities associated with exposure to environmental factors (such as high temperature) can lead farm workers to heat stress by electrolyte imbalance, causing headache and syncope related to organic changes caused by inadequate fluid replacement.⁽¹⁾

The relationship between musculoskeletal disorders, dorsal and low back pain, pain in the neck, shoulders, upper limbs, knees, hands, and feet with the work process and conditions, such as weight lifting, sudden movements, flexion and poor posture at work are reported in studies with farm workers.^(4,9-11)

In this study, we identified that farm workers with complain of pain perceive the same workload as high as compared to those without pain. Confirming our findings, a study involving Irish farmers who were followed during one year showed a high rate of musculoskeletal injuries, as evidenced by pain in different body regions, such as the back, shoulders, neck, elbows, wrists, hands, hips, knees,

ankles, and feet. Such aspects were associated with the daily working hours and years of cultivation.⁽¹²⁾ Workload comprehends all working conditions, including the time spent by workers and postures required to develop their tasks (long periods in standing position, on curved and/or squatting), as in the case of farm workers.

Evidence of diagnosis of dorsal pain highlights a concern with the growth in the number of workers out of work by undefined WRMSD. Among the professional categories with the sickness benefit, rural workers have prevailed with a mean of 23.0% along three years.⁽¹³⁾

A significant association was identified between work-related mental and nervous system disorders and workload among workers suffering from stress, anxiety, and disorders of the sleep-wake cycle. Depressive symptoms in Latino farm workers were observed in North Carolina (USA), and pace of work was one of the situational stressors.⁽¹⁴⁾ This study shows a relationship between depressive symptoms and musculoskeletal disorders in those farm workers.⁽¹⁵⁾ Another study identifies high daytime sleepiness in addition to depression among farm workers, which suggests disorder in the sleep-wake cycle.⁽¹⁶⁾

Self-medication, body care, and home medication were among the strategies utilized by farm workers to minimize their pains. This fact was reported in other studies involving farm workers, relating their difficulty in accessing health services and treatment to distance and time to start treatment.^(9,10,17) Thus, our study allows health professionals to reassess the relationship between actions directed at farm workers and their access to guidance and proper health treatment.

The fact that farm workers care their own bodies only with walking and rest is confirmed by a study that characterizes such workers as resilient. They relate their pains to workload and tend to ignore their health problems as a way to face them, because they feel they have to continue their work and so many of them become accustomed to their pains.⁽⁹⁾

Farm workers must make choices on how to do their work and adapt techniques as suggested

by the Occupational Health Nursing to minimize workload.

Conclusion

Workload can influence health and can lead to emotional and physical wear of farm workers, causing pain and possible work-related disorders and diseases.

Acknowledgements

The authors acknowledge the National Council for Scientific and Technological Development (CNPq) for funding the study "Human nature of female workforce: a study involving female farm workers in two rural areas in Rio Grande do Sul." (Process n° 405285/2012-4). To EMATER (Municipality of Uruguaiana, RS) for their partnership and welcoming during the fieldwork.

Collaborations

Rocha LP and Cesar Vaz-MR contributed to the design and development of the study, analysis and interpretation of data, drafting the first manuscript, relevant critical review of its intellectual content, and approval of the final manuscript. Almeida MCV, Piexak DR, and Bonow CA collaborated to the development of the study, drafting the first manuscript, relevant critical review of its intellectual content, and approval of the final manuscript.

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