Relationship between musculoskeletal pain complaints and family agriculture work

Relação entre queixas de dor musculoesquelética e processo de trabalho na agricultura familiar

Marcelo Biazus[1], Cleide Fátima Moretto[2], Adriano Pasqualotti[3]

DOI 10.5935/1806-0013.20170107

ABSTRACT

BACKGROUND AND OBJECTIVES: Musculoskeletal pain is increasingly common in the field of workers' health. When the work is characterized by rudimentary activities, as in the case of family farming, which requires the use of manual labor, intense and prolonged working journey, exposure to physical, chemical, biological, mechanical and ergonomic risks, the worker is prone to develop musculoskeletal diseases, and consequently pain. The objective of this study was to investigate the prevalence of musculoskeletal pain in family farmers, as well as to identify the body segments mostly affected and evaluate the tools used in the working process that may influence the development of musculoskeletal diseases and pain.

METHODS: A research form that includes social-demographic data, the Nordic Musculoskeletal Questionnaire, and the visual analog pain scale were used. 150 farmers participated in the study. Statistical tests were applied to the data obtained, including the Fisher Exact. The H0 hypothesis was rejected for a significance level of p≤0.05, stipulating a confidence interval of 95%.

RESULTS: The results show a high prevalence of musculoskeletal pain in surveyed farmers, whose most affected regions were the lower back and shoulders. The pain reported by farmers is associated with the activities performed and the tools used, such as the hoe and the hand spray, used at work.

CONCLUSION: Farmers are susceptible to the development of work-related musculoskeletal disorders, and the prevalence of the referred pain is high.

Keywords: Agriculture, Musculoskeletal pain, Occupational hazards, Workload, Worker's health.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor musculoesquelética é cada vez mais frequente no âmbito da saúde do trabalhador. Quando o trabalho é caracterizado por atividades rudimentares, como no caso da agricultura familiar, que exige o emprego de força física, jornada intensa e prolongada, exposição a riscos físicos, químicos, biológicos, mecânicos e ergonômicos, o trabalhador fica propenso a desenvolver doenças de ordem musculoesquelética, e, consequentemente, dor. O objetivo deste estudo foi investigar a prevalência de dor musculoesquelética em agricultores familiares, bem como identificar os segmentos corporais mais acometidos e avaliar as ferramentas utilizadas no processo de trabalho que podem influenciar o desenvolvimento de doenças e dores musculoesqueléticas.

MÉTODOS: Utilizou-se um formulário de pesquisa que contempla dados sociodemográficos, o Questionário Nórdico de Sintomas Osteomusculares e a escala analógica visual para dor. Participaram do estudo 150 agricultores familiares. Aos dados obtidos foram aplicados os testes estatísticos, inclusive o Exato de Fisher. A rejeição da hipótese H0 foi realizada para um nível de significância de p≤0,05, estipulando um intervalo de confiança de 95%.

RESULTADOS: Os resultados apontam alta prevalência de dor musculoesquelética nos agricultores pesquisados, cujas regiões mais acometidas foram a parte inferior das costas e ombros. A referência de dor pelos agricultores está associada às atividades desempenhadas e ferramentas, como a enxada e o pulverizador manual, utilizadas no trabalho.

CONCLUSÃO: Os agricultores são suscetíveis ao desenvolvimento de distúrbios musculoesqueléticos relacionados ao trabalho e que a prevalência de dor referida é elevada.

Descritores: Agricultura, Carga de trabalho, Dor musculoesquelética, Riscos ocupacionais, Saúde do trabalhador.

INTRODUCTION

Family farming can be defined based on three essential characteristics, described as the management of the productive unit, workforce supplied by the family members and the ownership of the means of production[1]. In this group of workers prevail rudimentary activities, such as the intense and prolonged work flow, accumulation and overload of tasks, uncomfortable or ergonomically incorrect tool handling, exposure to adverse weather conditions (sun, rain, heat, cold), noise and vibrations, venomous animals, chemicals (fertilizers, pesticides), infectious

1. Universidade de Passo Fundo. Programa de Pós-Graduação em Envelhecimento Humano, Passo Fundo, RS, Brasil.
2. Universidade de Passo Fundo, Programa de Pós-Graduação em Envelhecimento Humano, Grupo Interdisciplinar de Estudos sobre Trabalho, Passo Fundo, RS, Brasil.
3. Universidade de Passo Fundo, Programa de Pós-Graduação em Envelhecimento Humano, Grupo de Pesquisa de Tecnologia de Informação em Saúde, Passo Fundo, RS, Brasil.

Submitted in May 16, 2016.
Accepted for publication in June 27, 2017.
Conflict of interests: none – Sponsoring sources: Taxa Capes/ppgeh/UPF.

Correspondence to:
Universidade de Passo Fundo
BR 285, Km 292. Bairro São José
99001-970 Passo Fundo, RS, Brasil.
E-mail: marcelo_biazus@hotmail.com

and parasitic[2], handling and transport of loads, intense or continuous physical and mental efforts, and stress arising from work and incorrect postures.

These characteristics of the family farming process can contribute to the development of musculoskeletal disorders, which risk factors are multifactorial. It can be of ergonomic nature when there is high repetitiveness of the same movement, the excessive effort of muscle groups, cold environment with vibration, improper furniture, which requires the adoption of incorrect postures, static postures, and others. Alternatively, of an organizational nature, which includes the execution of monotonous tasks that require repetitive movements, prolonged work hours, accelerated pace and absence of rest breaks, as well as multiactivity in the case of family farming and work overload.

Musculoskeletal disorders are the most frequent cause related to pain syndromes, which correspond to clinical manifestations characterized by the occurrence or not of concomitant symptoms of pain, paresthesia, feeling of heaviness and fatigue, insidious onset, usually affecting the upper limbs (UL). However, it can also affect lower limbs, as a result of the excessive use imposed on the musculoskeletal system, and the lack of time to recover[3]. Musculoskeletal disorders account for a variety of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, and synovium, such as tendinosis, bursitis, nerve compressions, low back pain and dorsalgia, among others[4], and can develop from the labor activity.

Worker's health is a vast area. However, the scientific literature is scarce concerning the agricultural worker, especially in familiar farming. This literature, which is already scarce, meets the potential and severe risks present in the agricultural sector, such as the use of pesticides and labor accidents, and little exploring the chronic problems such as the development of musculoskeletal disorders and, specifically, the musculoskeletal pain.

Pain syndromes related to the performance of labor activities belong to the field of physical therapy, which aims to promote the quality of life, prevent and warn about possible risks and the rehabilitation of work-related diseases. The physical force required by rural work and the excessive efforts are associated with an increased risk of development of inflammations in joints, tendons, chronic degenerative processes, intervertebral disc diseases and muscle cramps, causing the painful condition[5]. In this sense, the rural worker's health is an important field for physical therapy, and these professionals need to use appropriate handling techniques for pain management and relief, and guidelines to promote postural and ergonomic changes.

The objective of this study was to investigate the prevalence of musculoskeletal pain in family farming workers, trying to identify the most affected body regions, in addition to the possible causal factors and determining sociodemographic variables.

METHODS

Transversal study with descriptive and analytical approach. For data collection, it was used a survey form including 1) the adapted Nordic Musculoskeletal Questionnaire (NMQ); 2) the sociodemographic questionnaire and the visual analog scale (VAS). The NMQ was developed with the purpose of standardizing the measurement of reported musculoskeletal symptoms and facilitate the comparison of results among studies[5]. It includes multiple or binary choices questions related to the occurrence of symptoms in the different anatomical regions commonly referred, based on the symptoms observed in the last 12 months and seven days before the interview. Respondents must report the absence from their routine activities in the last year. As for the VAS, it is a unidimensional instrument for the evaluation of pain intensity, with a line with numbered ends from zero to 10, where zero represents "no pain" and the 10 "the worse pain imaginable." The answers between zero and 2 are considered mild pain; from 3 to 7, moderate and from 8 to 10, intense.

The sample had 150 family farming workers of both the genders, with age over 18 years, living in the rural area of the city of Floriano Peixoto (RS). The selection of the subjects met the criteria of randomness, taking into account the proportion of case by city location. The total population in the study was 1.726 people, corresponding to the total rural population of the city. The sampling procedure was the simple random type. The sample includes a maximum sampling error of 3% for a confidence interval of 95%.

The application of the form was in the houses of the selected farmers. After clarifying the purpose of the study, they signed the Free and Informed Consent Form (FICT). Data collection went from June to October 2015.

This study was approved by the Ethics Committee of the University of Passo Fundo, with the Report number 1.083.663.

Statistical analysis

The data were analyzed by the IBM SPSS Statistic Package 22. The results are presented in terms of relative frequency. The Fisher Exact test was also applied. The H0 hypothesis was rejected for a significance level of $p \leq 0.05$, stipulating a confidence interval of 95%.

RESULTS

150 individuals working in family farming were interviewed, and the detailed results reflecting the profile of these workers are shown in table 1.

The information presented in table 1 shows that the predominant age among the respondents was between 41 and 60 years (average of 48.37 years), corresponding to 64.0% of the total, of which, only 7 are between 20 the 30 years of age, and 5 are 71 or above. Gender prevalence showed no big differences, being 50.7% male and 49.3% female. As for the family situation, 88.7% of the respondents were married, 90.0% lived with the spouse and 47.3% with their children. Most of the respondents accumulated domestic functions (60.7%) with the functions in agriculture and cattle breeding (98.0%). Concerning the educational level, 87.3% did not conclude elementary school, with up to four years of study. No respon-

Table 1. Description of the sociodemographic variables (n=150). Passo Fundo/RS, 2015

Variables	n	%
Gender		
Female	74	49.3
Male	76	50.7
Marital status		
Married	133	88.7
Single	16	10.7
Divorced	1	0.7
Family composition/reside with		
Spouse	135	90.0
Children	71	47.3
Other relatives	20	13.3
Education		
Illiterate	2	1.3
Incomplete elementary school	131	87.3
Complete elementary school	8	5.3
Incomplete high school	2	1.3
Complete high school	6	4.0
Incomplete higher education	1	0.7
Years of school		
up to 4	133	88.7
More than 4	17	11.3

dent has retired due to disability, lives alone or perform other activities. In addition, the study showed the concentration of the workforce on the family members, since only 0.7% of respondents hired part-time employees to help, the vast majority of the workforce is the family members, spouse (82.0%) or children (40.0%).

Table 2 describes the use of work tools by family farmers, by gender.

As for the use of work tools shown in table 2, 63.3% of respondents used the hoe at least once a week, 56.0% used the shovel with the same frequency, 45.3% used the wheelbarrow, 39.3% backpack sprays, 64.0% cutting tools and 28.0% used mechanized equipment, as the tractor. However, personal protective equipment (PPE) was used by only 12.7% of the respondents, which leaves the worker even more exposed to accidents at work.

Table 2 also allows identifying distribution in the use of work tools by gender, where it is noticeable that the female workers use more the hoe; 86.5% of the respondents using this tool (p<0.000), whereas male workers use more the backpack sprayer, 52.6% (p=0.001), and the tractor, 51.3% (p<0.000). Other meaningful data relate to the use of PPE, and both genders are not supporters, however, although a smaller proportion of male workers demonstrate that use more (18.4%) than female (6.8%; p=0.048).

Figure 1 shows the results obtained with the application of the NMQ in the presence of pain and most involved body regions.

As for the prevalence of musculoskeletal pain, 121 respondents (80.7%) reported pain in last the 7 days, with intensity varying from mild to moderate, mentioned by 64.7% of the respondents, distributed as follows: 17.3% grade 3; 16.0% grade 4; 18.7% grade 5 and 12.7% grade 6. As for incapacity to work over the past 12 months due to musculoskeletal pain, 114 respondents (76.0%) reported this situation. In relation to the prevalence of pain, the most affected region was the lower back (lumbar), in 71.3% of respondents, followed by the shoulder (37.3%), wrists and hands (28.7%), knees (26.7%), neck (24.7%), hips and thighs (14.0%), elbows (14.0%), ankles and feet (8.7%) and upper back (3.3%). Table 3 shows the prevalence of pain by gender.

As shown in table 3, female workers reported more pain than male workers in the region of shoulders (48.6%; p=0.007), elbows (20.3%; p=0.035) and wrists/hands (36.5%; p=0.047), whereas male workers had a higher prevalence of pain in the lower back (86.8%; p<0.001). It is worth mentioning that female workers also have a high value for lower back pain, 55.4% of the respondents.

The results indicate that low back pain is more associated with the use of some tools, such as the wheelbarrow (79.3%, p=0.029), manual planter (73.8%; p=0.017) and the tractor (90.5%, p=0.001). Pain on the shoulders is related to

Table 2. Description of the use of work tools by farmers and family member, by gender, and total (n=150). Passo Fundo/RS, 2015.

Tool used at work	Gender		Total	p value
	Male	Female		
	n (%)	n (%)	n (%)	
Hoe	31 (42.0)	64 (86.5)	95 (63.3)	<0.000
Shovel	39 (51.3)	45 (60.8)	84 (56.0)	0.254
Wheelbarrow	30 (39.5)	38 (51.4)	68 (45.3)	0.189
Hand Sprayer	40 (52.6)	19 (25.7)	59 (39.3)	0.001
Cutting instrument	50 (65.8)	46 (62.2)	96 (64.0)	0.734
Manual planter	3 (3.9)	6 (8.1)	9 (6.0)	0.324
PPE	14 (18.4)	5 (6.8)	19 (12.7)	0.048
Tractor	39 (51.3)	3 (4.1)	42 (28.0)	<0.000

PPE = Personal protective equipment; Fisher's Exact test; Significant value for p≤0.05.

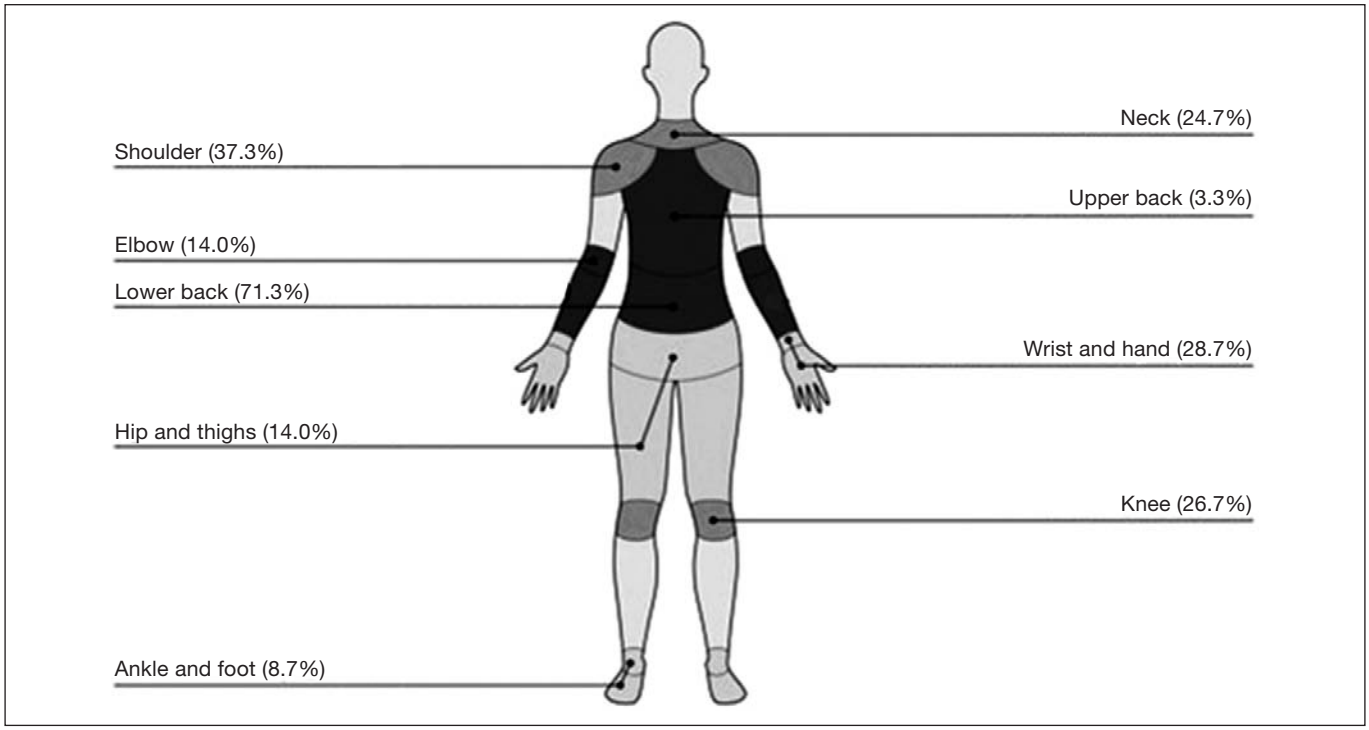

Figure 1. Prevalence of musculoskeletal pain reported to by farmers and most involved body regions (n=150). Passo Fundo, RS, Brazil 2015[7]

Table 3. Relationship between gender and musculoskeletal pain (n=150). Passo Fundo, RS, Brazil 2015

Site of pain	Gender		p value
	Female n (%)	Male n (%)	
Neck	20 (27.0)	17 (22.4)	0,572
Upper back (dorsal)	3 (4.1)	2 (2.6)	0,679
Shoulders	36 (48.6)	20 (26.3)	0,007
Elbows	15 (20.3)	6 (7.9)	0,035
Wrists/hands	27 (36.5)	16 (21.1)	0,047
Lower back (lumbar)	41 (55.4)	66 (86.8)	<;0.000
Hips/thighs	10 (13.5)	11 (14.5)	1,000
Knees	23 (31.1)	17 (22.4)	0,270
Ankles	7 (9.5)	6 (7.9)	0,779

Fisher's Exact test; significant value for p≤0.05.

the use of the hoe (23.6%; p=0.009); pain in the hip is related to the use of the shovel (22.7%; p=0.009); pain in the wrist to the use of sprayers (20.9%, p=0.010) and the use of manual planter is related to pain in the elbow region(12.1%; p=0.017). One of the factors that may affect the prevalence of pain is the presence of rheumatic disease. However, it was not reported on the information provided by the respondents. Although it is not directly related to the objectives of this study, the data concerning the use of PPE show important evidence. As already mentioned in table 2, of the 150 respondents only 19 said they wore PPE, corresponding to 12.7% of the studied population, reflecting its low use. Of them, 14 (18.4%) are male and 5 (6.8%) female (p=0.048). Due to the importance of this information, it was established a relationship between the use of PPE and the sprayer, as shown in table 4.

Table 4. Relationship between the sprayer and personal protective equipment (n=150). Passo Fundo, RS, Brazil

PPE	Sprayer		p value
At least once a week	84 (64.1)	47 (35.9)	0.042
Does not use	7 (36.8)	12 (63.2)	

PPE = Personal protective equipment; Fisher's Exact test; Significant value for p≤0.05.

According to table 4, the higher frequency of use of PPE is among rural workers who use sprayers, but less than once a week (n=84; p=0.042).

DISCUSSION

Family farming is essentially characterized by the management of the own production unit, family workforce, and ownership of the means of production. The results presented in this study reflect the high prevalence of musculoskeletal pain among the farmers interviewed, especially on the lower back and shoulders, indicating a relationship with the instruments used. It was found that male workers have a higher prevalence of pain on the lower back, and the most used tools were the backpack sprayer and the tractor, while female workers have a higher prevalence of pain on the shoulders, using more the hoe as a tool.

These results are in accordance with the ones of a global literature review that, using keywords for musculoskeletal disorders and agriculture, has identified a high prevalence of musculoskeletal disorders among farmers. The authors also identified that the spinal region is the most involved regarding musculoskeletal pain, followed by the UL, and then the lower extremities. It also confirms that farmers have higher prevalence rates of musculoskeletal disorders than the non-farmer controls, suggesting that farmers are at particular risk of developing musculoskeletal disorders compared to other occupations[8].

In a study conducted with farmers in the state of Kansas/USA, the results were similar, with a prevalence of low back pain (37.5%), followed by pain in the shoulders (25.9%), pain in the knees (23.6%) and pain in the neck (22.4%)[9]. Similarly, another study identified that low back pain has a higher prevalence of musculoskeletal pain in farmers (33.2%), followed by neck/shoulders (30.8%) and elbow, hands, and wrists (21.6%). The significant statistical associations related the work of repair and maintenance of equipment and the care of animals with low back pain; milking with pain in the neck and shoulder; and material handling with pain in the elbow, wrist, and hand[10]. The authors of a study with workers who grow cassava point out that the planting and extraction tasks of crop are related to discomfort and body pain complaints on the dorsal region (84%), lower back (84%), forearm (84%) and elbows (68%), identifying that the curvature of the trunk angle exceeds the recommended trunk flexion angles by the literature[11].

Corroborating the results on the relationship between site of pain and the task or tool used, three studies outstand. The first analyzed the complaints of musculoskeletal pain in farmers who use backpack sprayers in coffee plantations, identifying that 81.81% of the respondents complained of pain in the shoulders and 54.54% pain in the lower back, results that corroborate those found in this study[11]. Other studies have ergonomically analyzed farmers using the hoe and identified that the flexion of the arms and neck are exacerbated, which and can be stressful, requiring physical effort and use of greater force to keep the tool positioned above the shoulders[12,13]. Therefore, these considerations support the results for the pain in the shoulders and the use of the hoe, since the postures adopted to perform the task go beyond the physical limits. The misuse of the hoe forces farmers to adopt postures with an inclination of the trunk, which leads to the deterioration of intervertebral discs of the lower back region and can justify the painful condition that the worker reports when performing the weeding task[12]. This fact can justify, in this study, the high prevalence of low back pain in the subjects interviewed.

The relationship between musculoesqueléticos disorders and localized pain (neck, shoulders, back, knees, among others) with the work processes and the use of tools (weight lift, abrupt movements, exacerbated flexion of the trunk and limbs, inadequate posture, among others) are identified in some studies[8,11,14,15]. A study conducted with Irish farmers concluded that 56.0% of them had some kind of musculoskeletal discomfort in the previous year[16]. On the other hand, the present study shows even a higher prevalence, with 80.7% of the respondents with pain for at least in the last seven days, while 76.0% were prevented from working in the last year.

The scientific literature is poor when it comes to agricultural workers, and the majority of the studies approaches potential risks for the health, such as the use of pesticides and occupational accidents. The present study also obtained relevant information on the use of chemicals and lack of individual protection, data that corroborate other two studies[17,18]. The first study identifies that 42% of the studied population does not use PPE, justified by the discomfort and difficulty of locomotion with its use[18]. The second concludes that only 63% of the interviewees use the standard PPE (cap or hat, mask, overalls, gloves, and boots), 14.8% use only gloves and mask and 22% do not use any PPE[19].

CONCLUSION

The results of the study show a high prevalence of musculoskeletal pain and disorders in farmers. The most involved body segments are the lower back and shoulders, followed by wrists and hands, knees and neck.

REFERENCES

1. Paula MM, Kamimura QP, Silva JL. Mercados institucionais na agricultura familiar: dificuldades e desafios. Rev Política Agrícola. 2014;23(1):33-43.
2. Silva JM, Novato-Silva E, Faria HP, Pinheiro TM. Agrotóxico e trabalho: uma combinação perigosa para a saúde do trabalhador rural. Ciênc Saúde Coletiva. 2005;10(4):891-903.
3. Maeno M, Carmo JC, editor. Saúde do trabalhador no SUS: aprender com o passado, trabalhar o presente, construir o futuro. São Paulo: Hucitec; 2005.
4. Alencar MC. Distúrbios musculoesqueléticos e as atividades de trabalho em uma empresa de reciclagem: um enfoque em aspectos físicos. Rev Ter Ocup Univ São Paulo. 2009;20(2):126-34.
5. Corrêa DC, Melo M, Dohnert MB, Pavão TS. Alterações posturais e deformidades vertebrais em trabalhadores rurais de Morrinho do Sul - RS. Rev Bras Fisioter Trabalho. 2010;1(1):6-13.
6. Pinheiro FA, Troccoli BT, Carvalho CV. [Validity of the Nordic Musculoskeletal Questionnaire as morbidity measurement tool]. Rev Saude Publica. 2002;36(3):307-12. Portuguese.

7. Fernandes CA, Mannrich G, Merino GS, Teixeira CS, Gontijo LA, Merino EA. Queixas musculoesqueléticas e a atividade de agricultura familiar. EFDeportes.com. (Buenos Aires). 2014;19(193).
8. Osborne A, Blake C, Fullen BM, Meredith D, Phelan J, McNamara J, et al. Prevalence of musculoskeletal disorders among farmers: a systematic review. Am J Ind Med. 2012;55(2):143-58.
9. Rosecrance J, Rodgers G, Merlino L. Low back pain and musculoskeletal symptoms among Kansas farmers. Am J Ind Med. 2006;49(7):547-56.
10. Fethke NB, Merlino LA, Gerr F, Schall MC, Branch CA. Musculoskeletal pain among Midwest farmers and associations with agricultural activities. Am J Ind Med. 2015;58(3):319-30.
11. Freitas CS. Análise ergonômica da atividade com pulverizador costal manual na cultura do café no município de Caratinga-MG. Rev Funcional. 2009;1(1):1-58.
12. Costa CK, Lucena NM, Tomaz AF, Másculo FS. Avaliação ergonômica do trabalhador rural: enfoque nos riscos laborais associados à carga física. Rev GEPROS. 2011;6(2):101-12.
13. Martins AJ, Ferreira NS. A ergonomia no trabalho rural. Rev Eletrôn Atualiza Saúde. 2015;2(2): 125-34.
14. Rocha LP, Cezar-Vaz MR, Almeida MC, Piexak DR, Bonow CA. Associação entre a carga de trabalho agrícola e as dores relacionadas. Acta Paul Enferm. 2014;27(4):333-9.
15. Fernandes HA, Minette LJ, Juvêncio JF, Silva EP, Souza AP, Diniz CS. Fatores de risco para distúrbios osteomusculares nos ombros de trabalhadores envolvidos na colheita de café. Engenharia na Agricultura, Viçosa. 2008;16(3):318-28.
16. Osborne A, Blake C, McNamara J, Meredith D, Phelan J, Cunningham C. Musculoskeletal disorders among Irish farmers. Occup Med. 2010;60(8):598-603.
17. Soares WL, Freitas EA, Coutinho JA. Trabalho rural e saúde: intoxicações por agrotóxicos no município de Teresópolis – RJ. Rev Econ Sociol Rural. 2005;43(4):685-701.
18. Monquero PA, Inácio EM, Silva AC. Levantamento de agrotóxicos e utilização de Equipamento de Proteção Individual entre agricultores da região de Araras. Arq Inst Biol. 2009;76(1):135-9.
19. Pinheiro JQ, Borges LO. Estratégias de coleta de dados com trabalhadores de baixa escolaridade. Rev Est Psicol. (Natal). 2002;7(spe):53-63.