Work-related accidents, musculoskeletal pain, and health-related quality of life among Pantanal farm workers in Brazil and ganaderos in Mexico

Acidentes de trabalho, dor musculoesquelética e qualidade de vida relacionada à saúde entre peões pantaneiros do Brasil e ganaderos do México

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ABSTRACT | Introduction: The agricultural and livestock production of Brazil and Mexico stand out in the global scenario. In this context, this economic activity is one of the most vulnerable, presenting alarming incidence and prevalence rates of work-related accidents and diseases. Objectives: This study characterized and compared the occurrence of occupational accidents and musculoskeletal pain, as well as the health-related quality of life of Pantanal farm workers (pantaneiros) in Brazil and their equivalents in Mexico — the ganaderos. This study included 100 farm workers of the Brazilian municipality of Aquidauana, state of Mato Grosso do Sul, and the Mexican municipality of Atemajac the Brizuela, state of Jalisco. Methods: The research instruments used in this study were the Nordic Musculoskeletal Questionnaire, a questionnaire on occupational accidents in rural areas, a sociodemographic and occupational questionnaire, and the Medical Outcomes Study 36-Item Short-Form Health Survey. Results: Among the participants, 84% of the Brazilians and 90% of the Mexicans suffered some type of accident; 48% of the Brazilians and 28% of the Mexicans reported lower back pain; and 36% of the Brazilians and 42% of the Mexicans reported knee pain. Both the Brazilian and Mexican workers had the best score (90.6) for emotional aspects of health-related quality of life, in contrast with their worst scores: pain (19.4 for Brazilian workers, 13.8 for Mexican workers). Conclusions: These indicators imply that these workers are exposed to risks of accidents, pain, and illnesses that interfere with their health-related quality of life. Keywords | occupational accidents; quality of life; occupational health; rural health; Pantanal.

RESUMO | Introdução: O Brasil e o México são países que se destacam na produção agropecuária mundial. Neste contexto, essa atividade econômica é uma das mais vulneráveis, pois apresenta preocupantes taxas de incidência e prevalência de acidentes e enfermidades relacionadas ao trabalho. Objetivos: Este estudo caracterizou e comparou a ocorrência de acidentes de trabalho, dor musculoesquelética e qualidade de vida relacionada à saúde de pantaneiros do Brasil e de seus equivalentes do México — os ganaderos. Foram incluídos um total de 100 trabalhadores rurais do município brasileiro de Aquidauana, estado do Mato Grosso do Sul, e do município mexicano de Atemajac do Brizuela, estado de Jalisco. Métodos: Utilizaram-se como instrumentos de pesquisa o Nordic Musculoskeletal Questionnaire, o Questionário de Acidentes de Trabalho em Ambiente Rural, o Questionário Sociodemográfico e Ocupacional e o The Medical Outcomes Study 36-Item Short-Form Health Survey. Resultados: Entre os participantes, 84% dos brasileiros e 90% dos mexicanos sofreram algum tipo de acidente; 48% dos brasileiros e 28% dos mexicanos reportaram dor lombar; e 36% dos brasileiros e 42% dos mexicanos apontaram que sentem dor nos joelhos. Brasileiros e mexicanos obtiveram, em qualidade de vida relacionada à saúde, o melhor escore (90.6) em aspectos emocionais, contrastando com o pior deles, a dor (19.4 brasileiros; 13.8 mexicanos). Conclusões: Os indicadores obtidos sinalizaram que esses trabalhadores estão expostos a riscos de acidentes, dor e enfermidades que interferem na qualidade de vida relacionada à saúde. Palavras-chave | acidentes de trabalho; qualidade de vida; saúde do trabalhador; saúde da população rural; Pantanal.

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INTRODUCTION

All workers are at risk of some type of occupational accident (OA) as a direct consequence of their job; they may lose their work capacity, experience disabilities and even death. OAs can be “typical,” when they occur at the workplace during working hours, or “commuting,” when they happen during the worker’s normal commute. In 2014, the International Labor Organization (ILO) estimated that OAs and occupational diseases (OD) caused more than 2.3 million deaths per year worldwide, mainly considering the increase in musculoskeletal disorders (MSD) and mental disorders, especially stress, anxiety, and depression. OAs are currently responsible for health problems in 860 thousand workers a day in the world. In 2013, 3.1 million non-fatal accidents were reported in Europe, leading to leaves of absence of at least 4 days, and 3,674 fatal accidents were reported in the member states of the European Union. According to the Brazilian Social Security, 612,6 thousand accidents were reported in 2015 in Brazil, with 2,500 deaths, placing the country in fourth place worldwide in the number of accidents.

A study performed by the ILO in 2015 revealed that, worldwide, more than 10% of the cases of disability corresponded to the occurrence of MSD, which have multifactorial etiology; risk factors include OA, repetitive motion, painful and tiring positions, heavy lifting, and other work activities that are common among rural workers. Data from the Brazilian Social Security indicate that MSD were one of the main work-related health problems between 2011 and 2013, both in the number and the monetary value of the granted sickness benefits.

According to the 2010 Demographic Census, Brazil is one of the main agricultural countries worldwide, with approximately 13,000,000 rural workers (around 14.2% of the economically active population). The country is among the 5 main producers of beef (especially the Pantanal region), pork, poultry, and dairy. The United Mexican States also stands out for their livestock production, with approximately 28,415,337 head of cattle. In the country, 86% of the production units perform agricultural and livestock production, which differentiates it from the Pantanal region in the Brazilian state of Mato Grosso do Sul, which is more dedicated to beef cattle farming. Agricultural and livestock production is one of the most vulnerable sectors worldwide, with a high incidence of OAs, including in Europe. In 2014, the Brazilian agricultural and livestock sector was responsible for 17,008 typical accidents, 1,210 commuting accidents, and 3,865 cases of OD. The Mexican agricultural and livestock production recorded 7,916 cases of OAs, 1,315 commuting accidents, and 631 cases of OD for this economic activity in 2015 and 2016, only among men.

According to the Brazilian Occupational Classification System (Classificação Brasileira de Ocupações [CBO]), “pantaneiros” are farm workers from the Pantanal region who mainly work with beef cattle. “Ganaderos” are Mexican farm workers who work with dairy and beef cattle, as well as with agriculture. Considering the reality of both countries, this study thus aimed to characterize and compare the occurrence of OAs and musculoskeletal pain, as well as analyze the health-related quality of life (HRQoL) of pantaneiros from Aquidauana, state of Mato Grosso do Sul, Brazil, and ganaderos from Lagunillas and Tierra Blanca, municipality of Atemajac de Brizuela, state of Jalisco, Mexico.

METHODS

DESIGN

This is an exploratory, descriptive, cross-sectional, comparative, and quantitative study.

PARTICIPANTS

We used nonprobability sampling, comprising 50 Brazilian pantaneiros (Br) and 50 Mexican ganaderos (Mx), totaling 100 participants. All of them were male, aged 18 years or older, and agreed to participate in the study.

METHODS

Data collection was initially performed in Brazil, then in Mexico. An initial visit was performed in
both locations for explaining the research objective to the participants and requesting their cooperation; a new date was then set for the application of the questionnaires. In Brazil, data collection was performed in 6 farms in the municipality of Aquidauana, state of Mato Grosso do Sul. In Mexico, we had the support of the Cattle Association of Lagunillas and Tierra Blanca (Asociación Ganadera de Lagunillas e de Tierra Blanca), in Atemajac de Brizuela; data were collected during the association’s meetings.

INSTRUMENTS

One of the most widely used tools worldwide for identifying musculoskeletal symptoms is the Nordic Musculoskeletal Questionnaire (NMQ), which was adapted and validated to Spanish in 2010.\textsuperscript{11} The Questionnaire on Occupational Accidents in Rural Areas (Questionário de Acidentes de Trabalho em Ambiente Rural [QATAR]) is an instrument comprising 9 closed-ended questions regarding accidents and fractures, and the Sociodemographic and Occupational Questionnaire (Questionário Sociodemográfico e Ocupacional [QSDO]) comprises 21 closed-ended questions. Both questionnaires were elaborated by the authors.

The Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) is a generic questionnaire used for assessing HRQoL; it was adapted and validated to Brazil in 1997\textsuperscript{12} and validated to the Mexican context in 1999.\textsuperscript{13}

ETHICAL ASPECTS

This study was approved by the Research Ethics Committee of Universidade Católica Dom Bosco, Campo Grande, Mato Grosso do Sul, opinion No. 1,663,646.

STATISTICAL ANALYSIS

Data were tabulated and analyzed using SPSS software, version 22. Our analysis used descriptive statistics, hypothesis testing (chi-square and Student’s \textit{t}-test for independent variables), and means and frequencies according to the type of variable; \( p \leq 0.05 \) was considered significant.

RESULTS

The participants’ mean age was 40 years for Br workers and 58.9 years for the Mx workers (standard deviation [SD] ± 11 and 14.7, respectively). The ages and age distributions were statistically different between samples (\( p = 0.00001 \)). The most frequent age group among pantaneiros was 31–40 years (42%), whereas among ganaderos it was 71 years or older (30%). As for their marital status, 76% of the ganaderos were married and 2% were cohabiting; among the pantaneiros, 42% were married and 42% were cohabiting (\( p = 0.00004 \)), with a significant difference between married pantaneiros and ganaderos.

When analyzing their schooling level, 18% of the Br were illiterate, as opposed to 14% of the Mx; 70% of the Br workers finished elementary school, in comparison to 30% of the Mx. In Mexico, 14% of the participants had finished high school, as opposed to 2% of the Brazilian participants; 8% of the Mx had higher education, whereas none of the Brazilian workers had a higher education degree. Schooling levels were low in both groups, especially among the pantaneiros (\( p = 0.00025 \)): 10% had not completed their secondary education, while 30% of the ganaderos had finished elementary school (Table 1).

Regarding occupational aspects, we verified that the group of participants who had worked with cattle for 21 years or more was larger among the Mx (68%) than the Br (46%). We did not find statistically significant differences between workers of both countries (\( p = 0.0853 \)) (Table 1).

Statistically significant differences were observed in their weekly working hours (\( p = 0.0033 \)). It is important to note that 10% of the Mx worked for less than 40 hours a week, whereas no Br had this workload. Pantaneiros who worked for 40 hours a week represented 12% of the group, as opposed to 20% of the ganaderos; on the other hand, 74% of the Br worked for 48 hours a week while 40% of the ganaderos were in this group. Among pantaneiros, 14% worked for more than 48 hours a week, as opposed to 30% of the ganaderos. Among Mx, 98% said that they owned their land; 40% of the Br had some type of property, mostly houses in the city (Table 1).
As for the type of accident (Table 2), cattle handling represented 32% of the accidents among ganaderos and 12% among pantaneiros. Still, 30% of the ganaderos and 28% of the pantaneiros suffered accidents caused by horseback riding falls. The ganaderos reported accidents with poisonous animals in 28% of the cases, in contrast with 2% of the pantaneiros. Among ganaderos, 90% have suffered some type of OA; among pantaneiros, 84%. When categorizing accidents between Br and Mx, typical accidents were present in much higher percentages (96.4% and 86.8%, respectively) than commuting accidents (3.4% and 13%, respectively).

Among pantaneiros, 32% reported fractures due to accidents, in comparison with 26% of the ganaderos. Still considering these fractures, 52% of the workers in both countries went through at least one occurrence, with significant differences when compared to Table 1.

Table 1. Sociodemographic and occupational characteristics of the Brazilian pantaneiros and Mexican ganaderos (n = 100)

| Variable/category                        | Countries                      | χ² p-value p ≤ 0.05 |
|------------------------------------------|--------------------------------|---------------------|
|                                          | Brazil (n = 50)               | Mexico (n = 50)     |                     |
|                                          | n    | %    | n    | %    |                     |
| Age (years)                              |                                |                     |
| 20 to 30                                 | 10   | 20.0 | 2    | 4.0  |                     |
| 31 to 40                                 | 21   | 42.0 | 3    | 6.0  |                     |
| 41 to 50                                 | 10   | 20.0 | 12   | 24.0 |                     |
| 51 to 60                                 | 7    | 14.0 | 10   | 20.0 |                     |
| 61 to 70                                 | 1    | 2.0  | 8    | 16.0 |                     |
| 71 or older                              | 1    | 2.0  | 15   | 30.0 |                     |
| Marital status                           |                                |                     |
| Single                                   | 5    | 10.0 | 5    | 10.0 |                     |
| Married                                  | 21   | 42.0 | 38   | 76.0 |                     |
| Separated                                | 3    | 6.0  | 4    | 8.0  |                     |
| Cohabitating                             | 21   | 42.0 | 1    | 2.0  |                     |
| Schooling                                |                                |                     |
| Illiterate                               | 9    | 18.0 | 7    | 14.0 |                     |
| Incomplete elementary education          | 5    | 10.0 | 15   | 30.0 |                     |
| Complete elementary education            | 35   | 70.0 | 15   | 30.0 |                     |
| Incomplete secondary education           | -    | -    | 1    | 2.0  |                     |
| Complete secondary education             | 1    | 2.0  | 7    | 14.0 |                     |
| Complete upper secondary education (Preparatoria) | -    | -    | 1    | 2.0  |                     |
| Complete higher education                | -    | -    | 4    | 8.0  |                     |
| Time working with cattle (years)         |                                |                     |
| 1 to 5                                   | 9    | 18.0 | 8    | 16.0 |                     |
| 6 to 10                                  | 3    | 6.0  | 3    | 6.0  |                     |
| 11 to 15                                 | 8    | 16.0 | 2    | 4.0  |                     |
| 16 to 20                                 | 7    | 14.0 | 3    | 6.0  |                     |
| 21 or more                               | 23   | 46.0 | 34   | 68.0 |                     |
| Weekly working hours                     |                                |                     |
| Less than 40                              | -    | -    | 5    | 10.0 |                     |
| 40                                        | 6    | 12.0 | 10   | 20.0 |                     |
| 48                                        | 37   | 74.0 | 20   | 40.0 |                     |
| More than 48                              | 7    | 14.0 | 15   | 30.0 |                     |
accidents with cattle ($p = 0.016$), poisonous animals ($p = 0.000$), and vehicles ($p = 0.008$).

As for the answers to the NMQ, we evaluated 4 questions from this instrument: 1) Have you at any time during the last 12 months had trouble such as ache, pain, discomfort, or numbness? 2) During the last 12 months, have you been prevented from carrying out normal activities (eg. job) because of this trouble? 3) During the last 12 months, have you at any time seen a health care professional (physician, physiotherapist) for this condition? 4. During the last 7 days, have you had any trouble such as pain?

When answering these questions, the Br and Mx reported 1) pain in the lower back (48% Br; 28% Mx), knees (36% Br; 42% Mx), and shoulders (14% Br; 30% Mx); 2) the workers described that they were prevented from carrying out their normal activities, including their job, due to pain in the knees (0% Br; 18% Mx), shoulders (4% Br; 16% Mx), and neck (6% Br; 16% Mx); 3) health care professionals were seen

Table 2. Distribution of the frequencies of occupational accidents among Brazilian pantaneiros and Mexican ganaderos (n = 100)

| Variable/category          | Countries          |          |          | χ² p-value | p ≤ 0.05 |
|----------------------------|--------------------|----------|----------|-----------|----------|
|                            | Brazil (n = 50)    | Mexico (n = 50) |          |           |          |
| Typical accidents          | n | % | n | % |          |           |          |
| Horseback riding falls     | 14 | 28.0 | 15 | 30.0 | 0.826 |          |
| With cattle                | 6 | 12.0 | 16 | 32.0 | 0.016 |          |
| With wild animals          | 1 | 2.0 | 1 | 2.0 | 1.000 |          |
| Electrical accidents       | - | - | 3 | 6.0 | 0.000 |          |
| With cold weapons          | 3 | 6.0 | 2 | 4.0 | 0.046 |          |
| With poisonous animals     | 1 | 2.0 | 14 | 28.0 | 0.000 |          |
| With firearms              | 1 | 2.0 | 2 | 4.0 | 0.058 |          |
| With equipment and others  | 2 | 4.0 | 7 | 14.0 | 0.001 |          |
| Commuting accidents        | 1 | 2.0 | 9 | 18.0 | 0.008 |          |

Table 3. Distribution of answers* to the Nordic Musculoskeletal Questionnaire regarding pain in various body regions

| Anatomical areas          | Countries          |          |          | χ² p-value | p ≤ 0.05 |
|---------------------------|--------------------|----------|----------|-----------|----------|
|                            | Brazil (n = 50)    | Mexico (n = 50) |          |           |          |
| Neck                      | 8 | 16.0 | 11 | 22.0 | 0.044 |          |
| Shoulders                 | 7 | 14.0 | 15 | 30.0 | 0.053 |          |
| Upper back                | 12 | 24.0 | 13 | 26.0 | 0.151 |          |
| Elbows                    | 3 | 6.0 | 10 | 20.0 | 0.037 |          |
| Wrists and hands          | 8 | 16.0 | 11 | 22.0 | 0.444 |          |
| Lower back                | 24 | 48.0 | 14 | 28.0 | 0.039 |          |
| Hips and thighs           | 6 | 12.0 | 6 | 12.0 | 1.000 |          |
| Knees                     | 18 | 36.0 | 21 | 42.0 | 0.059 |          |
| Ankles and feet           | 3 | 6.0 | 9 | 18.0 | 0.068 |          |

* Values referring to the first question: “Have you at any time during the last 12 months had trouble such as ache, pain, discomfort, or numbness in these body areas?”
for pain in the neck (0% Br; 20% Mx), lower back (4% Br; 12% Mx), and ankles and feet (0% Br; 10% Mx). During the previous 7 days, troubles in the upper back (4% Br; 18% Mx), the elbows (0%, Br; 10%, Mx), and the ankles and feet (6% Br; 14% Mx) were reported as the most frequent. Notably, out of the results obtained for the first question of the NMQ (the highest pain indices reported), significant differences were observed for elbow pain (p = 0.037) and lower back pain (p = 0.039), according to Table 3.

Table 4 shows the results of the physical (PC) and mental (MC) components and the HRQoL domains among pantaneiros and ganaderos. The PC (60.9 pts Br; 56.6 pts Mx) encompasses the domains of functional capacity (90.4 pts Br; 79.1 pts Mx), general health status (44.6 pts Br; 45.2 pts Mx), bodily pain (19.4 pts Br; 13.8 pts Mx), and physical functioning (89.5 pts, Br; 88.5 pts Mx); whereas the mental component (MC) (62.1 pts Br; 62.3 pts Mx) encompasses the domains regarding vitality (51.1 pts Br; 50.5 pts Mx), social functioning (49.8 pts Br; 46.5 pts Mx), mental health (56.9 pts Br; 61.8 pts Mx), and emotional aspects (90.6 pts Br; 90.6 pts Mx).

Overall, the pantaneiros presented better results than ganaderos in the PC of HRQoL, but this assessment was inferior for the MC. Pantaneiros had better scores for functional capacity, physical functioning, social functioning, and vitality, whereas ganaderos had better scores for general health status and mental health. Workers in both countries obtained similar and satisfactory scores for the emotional aspects domain (90.6 pts) and the worst score for the bodily pain domain (19.4 pts Br; 13.8 pts Mx), indicating a compromised HRQoL.

The Student’s t-test for independent samples suggested an association between the PC of the Br and Mx workers (p = 0.013), functional capacity (p = 0.007), and mental health (p = 0.025).

**DISCUSSION**

Researching and establishing comparisons between these workers regarding health and quality of life allow a better understanding of the lives of these populations beyond borders for contributing to the HRQoL of workers in both countries. Among the age groups of Br, most were aged between 31 and 40 years. In this group, individuals presented more vitality, strength, and energy for performing their job. Ganaderos, on the other hand, were mostly aged between 71 and 80 years, which differs from what was found among pantaneiros. However, an estimate by the Brazilian Institute of Geography and Statistics (IBGE) indicates that the proportion of rural workers aged 60 years or more increased 57.3% in

| Components/domains         | Countries |  |  | Student’s t-test p-value |
|----------------------------|-----------|---------------|---------------|--------------------------|
|                            | Brazil (n = 50) | Mexico (n = 50) |               |                          |
| Physical component         | 60.9      | 76            | 566           | 93                       | 0.013                    |
| Functional capacity        | 90.4      | 161           | 791           | 240                      | 0.007                    |
| General health status      | 44.6      | 134           | 45.2          | 140                      | 0.828                    |
| Bodily pain                | 19.4      | 20.3          | 13.8          | 17.2                     | 0.041                    |
| Physical functioning       | 89.5      | 226           | 88.5          | 272                      | 0.842                    |
| Mental component           | 62.1      | 93            | 62.3          | 102                      | 0.897                    |
| Emotional aspects          | 90.6      | 261           | 906           | 252                      | 0.997                    |
| Mental health              | 56.9      | 84            | 61.8          | 12.5                     | 0.025                    |
| Social functioning         | 49.8      | 10.4          | 46.5          | 16.2                     | 0.234                    |
| Vitality                   | 51.1      | 91            | 50.5          | 15.9                     | 0.821                    |

* Values (scores) presented as points (pts).
SD = standard deviation
1991 and continued growing, reaching 10.8% in 2010, indicating an increasing trend within this population.

The workers in Brazil and Mexico were mostly included in the 41–60 years age group. The Mexican Secretariat of Labor and Social Welfare (Secretaria del Trabajo y Previsión Social) reported that the highest proportion of people over 45 years of age worked in the agriculture and livestock sector. Regarding marital status, the Br and Mx present similar results when combining the number of individuals who were married or cohabiting: 78% among Mx and 84% among Br, and no statistically significant differences were observed between countries.

When analyzing their schooling levels, 18% of the Br were illiterate, as opposed to 14% of the Mx; 70% of the Br had finished elementary school, in comparison with 30% of the Mx. On the other hand, 30% of the Mx had secondary education, when compared to only 10% of the Br. The number of illiterate Br was higher, but a higher percentage of them had finished elementary school. Therefore, low schooling was observed among workers from both countries. Mexico and Brazil are seen among farm workers: 77.9% and 79.6%, respectively, had elementary education. These statistics are reflected as difficulties in preventing OAs, consequently affecting the workers’ health and quality of life.

Regarding occupational aspects, we verified that the Mx (68%) had worked with cattle for longer (21 years or more) than the Br (46%). This could be related to the older age of Mx workers when compared to the Br and to the fact that they started this profession early in life. On the other hand, among those who had worked with cattle for 11 to 20 years, we noticed a predominance of Br (30%) when compared to Mx (10%), which was attributed to pantaneiros who leave to make a living in the city, especially the younger ones. However, many of them return to Pantanal to work as pantaneiros.

It is possible to infer that many ganaderos become farm workers after returning from the United States, where they acquire capital and invest in livestock. Moreover, obstinacy is a characteristic of these workers, according to a study where 52.6% of the participants had worked in the agricultural and livestock sector for more than 10 years; this result may explain the Mexican and Brazilian results.

When considering the category of those who worked for more than 48 hours a week, ganaderos (30%) presented higher percentages than pantaneiros (14%). This result can be understood by the need to make the land productive and bear fruit, because some of the ganaderos have mixed activities (agriculture, beef and dairy cattle), differing from the pantaneiros, which mainly work with cattle. Conversely, we observed that excess working hours and overwork can cause physical and/or mental problems, affecting the immune system and making the worker more susceptible to diseases. These stressors are named psychosocial risk factors at work and can lead to OAs, becoming a social and public health problem.

Among the pantaneiros, 74% worked for 48 hours a week, which was higher than the percentage observed in ganaderos (40%). Most of the Mx owned their own land, differently from the Br, who were employees. This can partially explain the fact that the Mx worked for less hours than the Br in this category. We also highlight the extent of the land traveled by these workers at their job. In Mexico, the ganaderos work in properties of 100 to 200 hectares, on average, and many of them work with family agriculture. The extent of the land where pantaneiros work, on the other hand, is far greater, and farms can reach more than 40,000 hectares.

Pantaneiros usually work for more than 10 hours a day, on a horse, exposed to the sun and the rain; these conditions are similar to those for the ganaderos, considering the occupational wear and tear and long working hours in inhospitable environments. This activity requires ability and resistance. The greatest difference is seen in their workplace: while pantaneiros work in places far from the farm’s main house, named “retreats” and required for feeding cattle in different pastures, ganaderos work in smaller ranches and spend less time on a horse (4 to 5 hours a day, on average) for herding cattle. Nevertheless, this pattern can lead to a result of lower back pain for these workers.

The rates of OAs in rural areas for ganaderos and pantaneiros were considered high (84% Br; 90% Mx) when compared to the survey made by branches of the Brazilian National Social Security Institute (Instituto Nacional do Seguro Social [INSS]) in the state of São Paulo, which identified 70.4% of OAs in the rural area.
In this study, 28% of the Mx and 2% of the Br workers suffered accidents with poisonous animals, which can be explained by the environment where ganaderos work: an area where snakes are considered endemic, especially those of the Crotalus genus (rattlesnakes).

The results of this study indicate that 18% of the accidents happened with other pieces of equipment, encompassing 14% of those in Mexico and 4% of those in Brazil. This finding is probably due to the fact that agriculture is more frequent among Mx, requiring the use of machinery and tools. The most striking result was seen in a study on typical OAs in a rural area of Santa Maria, in the Brazilian state of Rio Grande do Sul, where 37.3% of the occurrences were due to handling of machinery and equipment.

Both countries in this study presented high rates of typical accidents (96.4% Br; 86.8% Mx) in comparison with commuting accidents (3.4% Br; 13% Mx). Brazil recorded, in 2014, mortality rates due to typical accidents (7.2%) and commuting accidents (1.8%) that placed rural activities in third place and this occupation among the 20 with the most worker deaths. Regarding fractures caused by accidents, most pantaneiros and ganaderos reported at least one severe incident, referring to occupational disability, which has a high social and economic cost.

When it comes to the NMQ, we observed the following results between pantaneiros and ganaderos: lower back pain (24% Br; 26% Mx), shoulder pain (14% Br; 30% Mx), neck pain (16% Br; 22% Mx), and pain in the hands and wrists (16% Br; 22% Mx). These results can be explained by the daily work milking cows and the cattle numbers in the Mexican ranches and Brazilian farms, which overload workers and trigger more localized pain.

A prevalence survey performed in India regarding musculoskeletal problems among farm workers, expressive results were observed: lower back pain (60%), knee pain (39%), shoulder pain (22%), and neck pain (10%). A study with dairy farm milkers, dairy farmers, and farm workers in Sweden (SE) and Germany (DE) mainly noticed lower back pain (49% SE; 61% DE), shoulder pain (47% SE; 52% DE), neck pain (38% SE; 53% DE), and pain in the hands and wrists (32% SE; 42% DE). Both teams of researchers sought educational, health care, and occupational safety measures for solving the problems of workers and working conditions.

Overall, the highest indices found in this study were for lower back pain (48% Br) and knee pain (42% Mx). In the case of pantaneiros, back pain can be attributed to age, sequelae from accidents, the time spent working and riding horses daily, separating herds for hoof trimming, branding, and vaccination, and taming horses. Moreover, still to this day pantaneiros move cattle from one farm to another with cattle drives (comitivas), which many times requires crossing local rivers.

As for ganaderos, the following were considered the causes of back pain: riding horses, sequelae from accidents, age, and milking, which requires an uncomfortable sitting position with flexed knees for hours and repetitive movements that require strength from the hands and elbows. This position predisposes workers to diseases related to the muscles, circulation, and nerves, as well as repetitive strain injuries acquired with the time spent working in agriculture and cattle handling.

The PC and MC, together with the HRQoL domains, indicated a better quality of life in the PC of pantaneiros, which could be related to age; however, ganaderos presented better indices for the MC. For a good evaluation of the PC, the individual should have no physical limitations and a high energy level, with health that can be rated “excellent.” On the other hand, on a poor evaluation, the participant presents physical limitations for social and self-care aspects, impaired body function, severe bodily pain, and exhaustion; his or her health is thus considered “poor.” For a poor result on the MC, the assessment should identify emotional distress, limitations in social activities, and impaired emotional functioning. For a good evaluation, the individual should neither present emotional distress/anguish, nor have limitations in social activities due to emotional problems, obtaining an “excellent” score.

Therefore, considering the results, our sample cannot be considered to have a good evaluation, because although pantaneiros and ganaderos reached HRQoL scores above 50%, the PC and MC values did not separately reach values above 63%. These data are presented on Table 4.

The rural workers in Brazil and Mexico obtained some good HRQoL scores: functional capacity (90.4% Br;
79.1% Mx) and physical functioning (89.5% Br; 88.5% Mx). However, these results are inferior to those obtained in a study with rural workers in The Netherlands,28 which indicated results of 93% for functional capacity and physical functioning.

Both countries in this study presented higher numbers of reasonable/bad scores in the general health status (44.6% Br; 45.2% Mx), mental health (56.9% Br; 61.8% Mx), social functioning (49.8% Br; 46.5% Mx), and vitality items (51.1 Br; 50.5 Mx). These values are comparable to those found among rural workers in Canada, who had diseases such as asthma,29 in a study that found the following scores: general health status (58.7%), vitality (51.0%), social aspects (68.7%), and mental health (74.6%). These results are superior to those found in Brazil and Mexico, except for the vitality of pantaneiros.

Br and Mx workers presented the same result for the emotional aspects domain (90.6%), reaching a satisfactory level. This domain is a part of the MC of the SF-36 and its results are considered relevant regarding the mental health of workers. The emotional health of a person is linked to genetic and environmental factors, including work, which when interrelated will determine the individual's response to adverse events.30 A person with an impaired emotional health becomes vulnerable and predisposed to stress, anguish, depression, and diseases, thus hindering his or her health care.30 Considering these approaches, we considered that both pantaneiros and ganaderos displayed the capacity of maintaining mental balance and tranquility when facing life's obstacles.

The domain with the worst score, in this study, was pain (19.4% Br; 13.8% Mx), indicating serious impairments of health and nearing a HRQoL score categorized as poor.27 Changes in the pain domain are a sign of a quality of life that is compromised by physical and/or mental diseases related to inadequate lifestyle habits such as long working hours, few hours of sleep, and poor working conditions, among other factors.30

The Br and Mx participants presented high indices of OAs. On the NMQ, the most striking result refers to the question verifying whether the workers had reported any pain in the previous 12 months. The highest scores were reported for lower back pain and knee pain, which could indicate a relationship between pain, their work activity, and sequelae of accidents suffered on the job. Regarding the HRQoL, the PC and MC of workers presented results that ranged from regular to good, mainly due to the low score obtained in the pain domain (19.4% Br; 13.8% Mx).

**CONCLUSIONS**

This study illustrated the existence of an association between the PC, the functional capacity domain, and mental health in both countries, which relates to different realities experienced by the workers, the climate, the daily work activities, the hours worked per day, and the more physically demanding activities performed — presenting changes in the PC, consequently in functional capacity. Mental health, on the other hand, can vary according to different cultures, times, and authors. However, in this study, the mental health score of workers in both countries was considered good.

Finally, the observed indicators reveal a susceptibility of this occupation to risks of accidents and illnesses. More attention is required by public health and occupational safety authorities in these countries, especially when searching for educational strategies that allow these farm workers to have access to whole health care and achieve a better HRQoL.

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**Author contributions**

EEFJ was the main responsible for the study (Doctoral Thesis article), participating in all stages from conceptualization, investigation, data curation and formal analysis in Brazil and Mexico, to writing — original draft. LAMG was the supervisor and participated in study conceptualization, investigation, and data analysis, as well as in writing — original draft and review & editing. ERL was the Mexican coordinator, actively participating in the study, as well as in investigation and data curation, writing — review and editing, and provided the necessary resources for developing research in Mexico. However, this author passed away before the publication of this study. FST participated in the data curation, formal analysis, and methodology of the study.
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