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Musculoskeletal symptoms in shellfish pickers

Sintomas musculoesqueléticos em catadoras de marisco

Abstract

Objective: to estimate the prevalence of musculoskeletal disorders and their main risk factors in shellfish pickers from a fishing community in the state of Bahia, Brazil. *Methods*: cross-sectional descriptive epidemiological study, with data collected in 2017 and a descriptive statistical analysis. *Results*: we interviewed 139 women, aged 44.3 on average: 66.9% were married, 89.2% had brown[parda]/black skin color, 93.5% had children, 57.6% did not conclude elementary school, and had an average monthly income of R$ 234.00 (less than US$ 60.00). They had been working for up to 30 years in this occupation (58.3%), with a daily working time of up to 6 hours (54.0%), without lunch break (89.9%), carrying up to 25kg during a working day (57.6%), for up to 60 minutes (73.5%). They rated their working conditions as very bad or bad (60.4%). All of them reported musculoskeletal pain, especially in the back region. The risk factors evidenced were: excessive movement, long working hours with overburden of the upper limbs, lack of rest and fast-paced work. *Conclusion*: shellfish pickers are exposed to risk factors that predispose them to repetitive strain injuries and work-related musculoskeletal disorders, which may explain the high prevalence observed.

Keywords: public health surveillance; occupational health; musculoskeletal system; working women; epidemiology, descriptive.

Resumo

Objetivo*: estimar a prevalência de distúrbios musculoesqueléticos e de seus principais fatores de risco em catadoras de marisco em uma comunidade na Bahia. Métodos: estudo epidemiológico transversal descritivo, com dados coletados em 2017 e análise estatística descritiva. Resultados: foram entrevistadas 139 mulheres, com idade média de 44,3 anos: 66,9% casadas, 89,2% pardas/pretas, 93,5% com filhos, 57,6% com escolaridade até o fundamental incompleto, e com renda mensal média de R$ 234,00 (menos de US$ 60). Predominaram trabalhadoras que exerciam a ocupação por um período ≤30 anos (58,3%), com carga horária diária de até 6 horas (54,0%), sem pausa para almoçar (89,9%), que carregavam até 25 kg em um dia de trabalho (57,6%), por um período ≤60 minutos (73,5%), e que avaliaram as condições de trabalho como muito ruim/ruim (60,4%). Todas relataram dores musculoesqueléticas e as principais queixas foram na região das costas. Evidenciaram-se como fatores de risco: excesso de movimento, muito tempo de trabalho com sobrecarga nos membros superiores, falta de descanso e ritmo de trabalho acelerado. Conclusão: as catadoras de marisco estão expostas a fatores de risco que as predispõem a lesões por esforço repetitivo e doenças relacionadas ao trabalho, o que pode explicar a alta prevalência constatada.*

Palavras-chave: *vigilância em saúde pública; saúde do trabalhador; sistema musculoesquelético; mulheres trabalhadoras; epidemiologia descritiva.*

Introduction

Fishing activities are economically and socially relevant, since they are an important income and subsistence source for a part of the population[1].

In Brazil, artisanal fishing is a relevant work category. According to data from a 2019 survey performed by the Brazilian Ministry of Fishing and Aquaculture (MPA), there are more than 833,205 artisanal fishermen in the country. However, this figure is believed to be more than a million[2].

This activity is performed throughout a vast part of the Brazilian territory, and the largest number of artisanal fishermen act in the Northeast. The fishing industry focuses on two main activities: fishing and shellfish picking, in which there is a clear gender division. In other words, while men get engaged in fishing, women and children pick shellfish. There are 105,455 artisanal fishermen in Bahia, with a comprehensive part of them being committed, partially or exclusively, to the artisanal collection of shellfish[3].

We define a shellfish picker as an informal worker who subsists from the collection and sale of shellfish[4]. Although the term "shellfisher" [marisqueira] is commonly used to designate this type of artisanal worker, it is a colloquialism. This way, we adopted the term shellfish picker, since it is the appropriate technical term.

Artisanal fishing is fundamentally characterized by the family work of men, women and children, preserving the main practices for a long time. It is based on the empirical knowledge acquired by the family and orally transmitted by older community members. It also stems from an individual productive activity, with low technical division of labor, in which the craftsman or artisan usually owns his labor instruments and subsists from selling his labor products, not his labor force[3].

Even though the communities which survive from artisanal fishing are inserted in a financially well-organized sector, they are still in a socio-economically vulnerable situation. This may be associated with the labor activity itself, since they do not only depend on a limited natural resource, but also operate in an unstable working environment, and their selling power is much lower when compared to industrial fishing[5].

The labor activities to which shellfish pickers are exposed generate joint and muscle overburden in several parts of the body, which may lead to musculoskeletal disorders. Besides, some shellfish picking tasks consist of repetitive movements, which is a determining factor for Repetitive Strain Injuries (RSI) and Work-related Musculoskeletal Disorders (WMSD). Therefore, shellfish picking might damage the health of these workers[6].

Musculoskeletal disorders are a crucial public health problem that has been increasing recently. They comprise the most frequent occupational diseases, compromising the workers' life quality and, consequently, their employability. In addition, they are also responsible for functional disability and absenteeism[7].

According to Social Security data, in Brazil, musculoskeletal disorders related to labor activities were the most frequently reported disorders in recent years, affecting more intensely the upper limbs and spine[8]. They are a problem that occurs in varied work activities, in addition to being inflammatory and degenerative conditions that affect different types of structures, such as: muscles, nerves, ligaments and different joints, among which the most affected are those with greater degrees of amplitude[9].

Musculoskeletal disorders are caused by multiple factors. However, studies that jointly investigate the individual, labor, physical and psychosocial aspects of work are rare[10].

Studies have been developed to understand labor activities and musculoskeletal complaints. Nevertheless, it is necessary to consider the lack of scientific literature about such disorders in informal work, including the labor process of shellfish picking[6,11,12].

Thus, the objective of this study was to estimate the prevalence of musculoskeletal disorders and their main risk factors in shellfish pickers from the Jiribatuba community, in the municipality of Vera Cruz, Bahia, Brazil.

Methods

This is a descriptive, cross-sectional epidemiological study conducted with shellfish pickers of the Jiribatuba island community, in the municipality of Vera Cruz, Bahia, Brazil.

Since this activity is predominantly undertaken by women, we focused on female subjects aged 18 or older, working for at least one year as a shellfish picker, and who had cognitive abilities that allowed them to be included in the study.

The number of shellfish pickers residing in Jiribatuba (n = 150) was obtained from local leaders, since no census data were found showing the total number of shellfish pickers in the locality. We invited all the pickers we found to take part in the survey.

One researcher carried out the field research. A pilot study was conducted in June, 2017, with 15 shellfish pickers from the community of Barreiras de Jacuruna, in the municipality of Jaguaripe, Bahia, Brazil.

After that, the data were gathered in Jiribatuba between August 14 and November 3, 2017, through

interviews guided by a three-block questionnaire: (i) sociodemographic aspects; (ii) occupational information; and (iii) work pace[11]. In addition, we used an endorsed questionnaire to evaluate musculoskeletal symptoms[13].

We considered the following sociodemographic variables: age group (≤22, 23-43, and ≥44 years old); marital status (married, not married); schooling level (incomplete elementary school, complete high school); race/skin color (white, black, brown [parda], others); with children (yes/no); number of children (<3, ≥3); childbirth type (natural, C-section, natural and C-section); registration as fisherwoman in the village (registered/ not registered); inclusion in a governmental social assistance program (included/not included); the main source of income (shellfish picking, fishing, governmental social assistance program, another source); body mass index (BMI)[14] (normal weight <25, overweight/obesity ≥25); abdominal circumference (AC: <80 cm, ≥80 cm).

The variables related to occupational aspects and working conditions were: having another type of activity (yes/no); how long they have been in this occupation (≤30 years, >30 years); working conditions (very good/good, normal, very bad /bad); level of job satisfaction (very satisfied/ satisfied; neither dissatisfied, nor satisfied; not satisfied/dissatisfied); daily work hours (≤6 hours, >6 hours); weekly work hours (≤40 hours, >40 hours); lunch break (yes/no); formal/hired worker (yes/no); ownership of a boat for picking shellfish (yes/no); sick leave (yes/no); types of shellfish collected (≤6 types, >6 types); manual handling of loads per working day (≤25 kg, >25 kg); manual handling of loads - time per working day (≤60 min, >60 min); number of shellfish picked up per minute (≤17, >17); and repetitive movements per minute (≤10 movements, >10 movements).

Most of the data were collected through self-reporting, except for the person's weight (in kilograms), height (in meters) and abdominal circumference (AC, in centimeters). We calculated the BMI using the formula: weight / height^2.

We rated the physical labor demands clarified at the work pace questionnaire block according to the shellfish picking tasks, such as collection, transport, washing and cleaning, boiling and extraction from shell. In this block, we assessed the following working postures: sitting, standing, walking, squatting, with the torso tilted forward, with rotated torso and arms above shoulder height, as well as the repetitive movements, fine motor skills, and muscle strength involved in the work execution and load handling. The interviewees could rate such variables on a scale from 0 to 5 according to: pressure, with 0 being nonexistent pressure and 5, unbearable pressure; pace, with 0 being slow, and 5, very fast; pause, with 0 being never, and 5, when necessary; posture and load handling, with

0 being never, and 5, all the time; strength, with 0 being very weak, and 5, very strong.

We used the Nordic Musculoskeletal Questionnaire (NMQ) to appraise musculoskeletal symptoms. The interviewees answered simple questions (yes or no) about pain and discomfort faced before the survey (in the 12 months prior to the survey) and/or currently (in the 7 days prior to the survey). On top of that, they reported any occurring functional disability and/or if they sought professional health care assistance due to musculoskeletal symptoms in the previous 12 months. We considered as carriers of musculoskeletal disorder all the women who depicted any of the symptoms associated with one of the following severity items: degree of severity ≥3, on a scale of 0 to 5 (0 being absence of discomfort, and 5 being unbearable discomfort), seeking professional assistance due to the problem, missing or changing work due to a health restriction[13].

We analyzed the data by calculating descriptive statistics with SPSS, version 21.0, such as: absolute and relative frequencies for categorical variables and central tendency measurement (mean) and dispersion (standard deviation, SD) for quantitative variables.

The study was approved by the Research Ethics Committee of the Faculdade Adventista da Bahia, Cachoeira campus, under the report nr. 2.064.056, on May 15, 2017. We explained the research to all participants and they signed the Informed Consent Form.

Results

Of the 150 addressed shellfish pickers, 139 took part in the study. One of the pickers lacked of adequate cognitive conditions to understand the study and ten of them refused to participate.

All participants lived in Jiribatuba, and most of them (54%) were from the island. They were aged between 21 and 70, being 44.3 years old in average (standard deviation 11.3). Married workers (66.9%) with incomplete elementary school (57.6%) predominated, of which 6.4% lacked formal education. As for race/skin color, 44.6% of the women reported as being brown [parda] or black, in the same proportion. The average monthly income declared was R$ 234.00 (amplitude 200-500, standard deviation 71.4).

With respect to having children, 93.5% answered "yes", with a predominance of up to three children (59.7%), mostly born of natural childbirth (65.4%). On average, they lived with four other people (standard deviation 2) in their own masonry houses, with a rudimentary cesspool-type sanitation system. Many of

these workers (78.4%) were registered as fisherwoman in the village of Jiribatuba (which included shellfish pickers). Regarding inclusion in a social assistance program, 62.6% of them received some support. The majority (55.4%) of these workers subsisted with the money earned through shellfish picking and 57.4% of them reported that this income was sufficient to support their family (**Table 1**).

Of the shellfish pickers, 69.8% presented BMI ≥25 and 59.7% AC ≥80 cm, being considered overweight/obese[14] (**Table 1**), according to the World Health Organization.

Table 1   Sociodemographic characterization of shellfish pickers of Jiribatuba, Vera Cruz, Bahia, Brazil, 2017

Variables	n (139)	%
Age group		
Up to 22 years old	4	2.9
23 to 43 years old	67	48.2
≥44	68	48.9
Marital status		
Married	93	66.9
Not married	46	33.1
Schooling level		
Incomplete Elementary Education	80	57.6
Complete High School	59	42.4
Race/color		
Black	62	44.6
White	4	2.9
Brown [parda]	62	44.6
Others	11	7.9
Children		
Yes	130	93.5
No	9	6.5
Number of children		
≤3	83	59.7
>3	56	40.3
Childbirth type (n=130)		
Natural	85	65,4
C-section	15	11,5
Natural and C-section	30	23,1
Registration as fisherwoman in the village		
Yes	109	78.4
No	30	21.6
Inclusion in a governmental social assistance program		
Yes	87	62.6
No	52	37.4
Main income source		
Shellfish picking	77	55.4
Fishing	10	7.2
Social assistance program	8	5.7
Others	44	31.7
Body Mass Index - BMI		
Normal weight (BMI < 25 kg / m^2)	42	30.2
Overweight/obesity (BMI ≥ 25 kg / m^2)	97	69.8
Abdominal circumference		
<80 cm	56	40.3
≥80 cm	83	59.7

We noticed a prevalence of shellfish pickers who were in this occupation for ≤ 30 years (58.3%), worked up to six hours a day (54.0%), and up to 40 hours a week (81.3%), had no lunch break (89.9%) and never worked in a formal employment (84.2%) (**Table 2**).

The majority (60.4%) of these workers declared that their working conditions were very bad or bad and that they were very satisfied or satisfied being shellfish pickers (56.1%), in addition to having a history of sick leave (59.7%) (**Table 2**).

Most of the shellfish pickers didn't have their own boat (77.0%), collected up to six types of shellfish (79.1%) by picking up 17 shells per minute (61.2%), with as far as ten repetitive movements per minute (74.8%); most of them handled a load of 25 kg per working day (57.6%) for a period ≤ 60 minutes (73.5%) (**Table 2**).

Table 2 Occupational aspects and working conditions of shellfish pickers of Jiribatuba, Vera Cruz, Bahia, Brazil, 2017

Variables	n (139)	%
Have another activity		
Yes	13	9.4
No	126	90.6
Time in this occupation		
≤30 years	81	58.3
>30 years	58	41.7
Opinion about the working conditions		
Very good/good	11	7.9
Normal	44	31.7
Very bad/bad	84	60.4
Job satisfaction		
Very satisfied/satisfied	78	56.1
Neither dissatisfied, nor satisfied	20	14.4
Not satisfied/dissatisfied	41	29.5
Working hours / day		
≤6 hours	75	54.0
>6 hours	64	46.0
Working hours / week		
≤40 hours	113	81.3
>40 hours	26	18.7
Lunch break		
Yes	14	10.1
No	125	89.9
Formal/hired worker		
Yes	22	15.8
No	117	84.2
Ownership of a boat to pick shellfish		
Yes	32	23.0
No	107	77.0
History of sick leave		
Yes	83	59.7
No	56	40.3
Types of shellfish collected		
≤6 types	110	79.1
>6 types	29	20.9
Manual handling of loads per working day (n = 99)		
≤25 kg	57	57.6
>25 kg	42	42.4
Manual handling of loads - time per working day (n = 102)		
≤60 Minutes	75	73.5
>60 Minutes	27	26.5
Shellfish collection per minute		
≤17	85	61.2
>17	54	38.8
Repetitive movements per minute		
≤10 movements	104	74.8
>10 movements	35	25.2

Table 3 depicts the physical labor demands (mean; standard deviation) according to the tasks of shellfish picking. The utmost demands reported by the shellfish pickers at the collection task occurred during the repetitive hand movements and fine control and dexterity movements, that is, movements of fine motor skills (4.96; 0.43), with a muscular strength requirement in the arms or hands (4.71; 0.85), and physical pressure with the hands when using the working tools (4.06; 0.72).

During the shellfish transport task, the highest demands were the muscular strength requirement in the arms or hands (4.71; 0.93), and the physical pressure with the hands when using the working tools (3.95; 0.96). In the shellfish washing and cleaning task, the most expressive physical demands occurred during movements that need greater dexterity and control (4.80; 0.94); in repetitive hand movements (4.78; 1.02) and in the standing posture (3.01; 2.11). During the boiling task, the greatest demand was at the standing posture (4.65; 1.00), while in the extraction from shell task, the greatest physical demands occurred in repetitive hand movements, fine motor skills (4.89; 0.72) and the sitting position (4.82; 0.86) (**Table 3**).

Table 4 shows the prevalence of musculoskeletal complaints per body segment in the 12 months prior to the survey and/or in the seven days preceding it. The most commonly reported complaints in the last 12 months concerned the lower back (83.6%), upper back (84.2%), hip/thighs (79.1%), shoulders (77%), knees (75.5%) and wrists/hands (74.8%).

As for the inability to perform normal activities due to these complaints, such as work, domestic or leisure activities, we noticed a higher percentage of affirmative responses in all body segments, especially fists and hands (69.2%). Complaints in all segments led the majority of the pickers to seek professional health assistance, especially pain in the elbow (73.0%) and fists/hands (68.3%). Regarding problems in the previous seven days, we observed a higher discomfort in the back, both in the upper (61.2%) and in the lower (60.4%) region (**Table 4**).

Table 3 Physical demands according to the main work tasks performed* by the shellfish pickers of Jiribatuba, Vera Cruz, Bahia, Brazil, 2017

Physical demand variables	Collection Mean; SD**	Transport Mean; SD**	Washing and cleaning Mean; SD**	Boiling Mean; SD**	Extraction from shell Mean; SD**
Postures					
Sitting	1.07; 1.59	2.19; 2.33	0.29; 0.96	0.24; 1.02	4.82; 0.86
Standing	0.94; 1.47	0.58; 1.47	3.01; 2.11	4.65; 1.00	0.08; 0.43
Walking	1.33; 1.65	2.95; 2.25	0.10; 0.61	0.70; 1.23	0.03; 0.33
Squatting	3.58; 1.29	0.08; 0.53	2.22; 1.94	0.02; 0.18	0.24; 0.96
With the torso tilted forward	3.79; 1.23	0.09; 0.60	0.50; 1.32	0.04; 0.35	0.19; 0.89
With rotated torso	0.24; 0.95	0.06; 0.49	0.07; 0.52	0.04; 0.30	0.08; 0.55
Arms above shoulder height	2.65; 1.86	1.68; 2.05	0.00; 0.00	0.02; 0.25	0.04; 0.42
Repetitive hand movements	4.96; 0.43	0.23; 1.02	4.78; 102	0.17; 0.85	4.89; 0.72
Precise and very fine motor skills	4.96; 0.43	0.24; 1.04	4.80; 0.94	0.15; 0.84	4.89; 0.72
Muscular strength					
Muscular strength in the arms or hands	4.71; 0.85	4.71; 0.93	2.04; 0.83	1.71; 0.86	2.42; 0.81
Physical pressure with the hands when using working tools	4.06; 0.72	3.95; 0.96	2.43; 1.10	1.55; 1.05	2.68; 0.76
Load handling					
Lifting	3.47; 0.60	3.36; 0.65	2.16; 1.00	1.10; 0.74	2.01; 0.88
Pulling	3.27; 0.72	3.22; 0.68	2.06; 0.93	1.14; 0.75	1.99; 0.91
Pushing	3.31; 0.71	3.21; 0.69	2.06; 0.93	1.07; 0.71	1.99; 0.91

* Classified on scale of 0 to 5. In the variables posture and load handling, 0 represents never, and 5, all the time. In the variable muscle strength, 0 represents very weak, and 5, very strong. ** SD: standard deviation.

Table 4 Prevalence of musculoskeletal complaints, by body segment, in shellfish pickers from Jiribatuba, Vera Cruz, Bahia, Brazil, 2017

| Body segment | Problems in the 12 months prior to the survey | | | | | | Problems in the seven days prior to the survey | |
| | Pain/tingling/numbness | | Inability to perform activities | | Sought health assistance | | | |
	n (139)	%	n (*)	%	n (**)	%	n (139)	%
Neck								
Yes	99	71.2	63	63.6	61	62.2	53	38.1
No	40	28.8	36	36.4	37	37.8	86	61.9
Shoulders								
Yes	107	77.0	73	68.2	71	66.4	61	43.9
No	32	23.0	34	31.8	36	33.6	78	56.1
Upper back								
Yes	117	84.2	78	67.2	74	64.3	85	61.2
No	22	15.8	38	32.8	41	35.7	54	38.8
Elbows								
Yes	62	44.6	41	66.1	46	73.0	45	32.4
No	77	55.4	21	33.9	17	27.0	94	67.6
Wrists/hands								
Yes	104	74.8	72	69.2	71	68.3	59	42.4
No	35	25.2	32	30.8	33	31.7	80	57.6
Lower back								
Yes	120	86.3	81	67.5	77	64.7	84	60.4
No	19	13.7	39	32.5	42	35.3	55	39.6
Hip/thighs								
Yes	110	79.1	71	64.5	68	62.4	67	48.2
No	29	20.9	39	35.5	41	37.6	72	51.8
Knees								
Yes	105	75.5	70	66.7	68	65.4	66	47.5
No	34	24.5	35	33.3	36	34.6	73	52.5
Ankles/feet								
Yes	95	68.3	63	66.3	63	66.3	54	38.8
No	44	31.7	32	33.7	32	33.7	85	61.2

Missings: *inability to perform activities: neck (n = 40); shoulders (N = 32); upper back (n = 23); elbows (n = 77); wrists/hands (n = 35); lower back (n = 19); hip/thighs (n = 29); knees (n = 34); ankle and foot (n = 44). ** sought health assistance: neck (n = 41); shoulders (n = 32); upper back (n = 24); elbows (n = 76); wrists/hands (n = 35); lower back (n = 20); hip/thighs (n = 30); knees (n = 35); ankle and foot (n = 44).

Discussion

As observed in this study, shellfish picking is a predominantly female activity. A study conducted in another city in Bahia revealed that 75% of the formally registered shellfish pickers were female[11]. The predominance of women in this activity is not restricted to Brazil, since a study conducted in Galicia, Spain, showed that 93.5% of the people who performed this activity there were also female[15].

Regarding the demographic profile, the age and race/skin color distributions of the participants were similar to that found in a study conducted with shellfish pickers who were treated at an occupational health service in Salvador, Bahia: the fact that black women are the majority among shellfish pickers reinforces the historical context surrounding this activity, since most of these communities are of indigenous descent or derive from former quilombos (settlements formed by people of African origin)[16].

Low education and having a partner seem to be a reality for these workers, as stated also by a study conducted in five fishing communities located in Todos os Santos Bay, Bahia, Brazil. Shellfish picking is mainly characterized by being an artisanal, traditional, low-paying and low-schooling activity[2].

The average monthly income of the participants was higher than that found in two other studies[2,11].

However, it should be noted that it is still low, corresponding to 25% of the in force minimum wage during data collection (R$ 937.00)[17]. The situation is worse when we note that these workers live, on average, with four other people, support their households with money that comes from shellfish picking and say that this income is sufficient to support the family.

Low income forces female workers to undergo situations of socioeconomic vulnerability and, above all, hampers them from adopting preventive measures, such as using a Personal Protective Equipment (PPE) and Collective Protective Equipment (CPE), which could reduce health risks[18].

All of them lived in their own masonry houses, with a rudimentary cesspool-type sanitation system. Basic sanitation ranges from the infrastructure and operational facilities for drinking water supply to sanitary sewage networks. In Brazil, the access to basic sanitation is a right guaranteed by the 1988 Federal Constitution, and its universalization and integrality is advocated[19]. However, the coverage limitation of some of these services is evident, especially in the North and Northeast[20].

Poor sanitation conditions make populations ill. A study states that inefficient basic sanitation services, such as the persistence of a rudimentary cesspool-type sanitation system, lead to a significant number of hospitalizations and deaths, especially with regard to infecto-parasitic diseases[21]. Besides, this situation puts the shellfish at risk, as they are traditionally washed, cooked, extracted and sold in a domestic environment. This creates a context that contributes to the fish contamination, resulting in products with inadequate microbiological and physico-chemical food safety standards[22].

As for the time in the occupation, daily and weekly work hours, lunch break and formal work registration, similar findings were observed in an analogous study, also carried out in Bahia[11].

Regarding working conditions, our results show that, although they recognized the hazards to which they were exposed, these workers also pointed out the need to ensure the subsistence of their family and they establish a relationship of gratitude with nature, as it provides them with this resource. The higher the need for survival, the greater the work overload[23].

Remaining at certain postures during a long time, repetitive movements and using muscle strength were also evidenced by other authors who studied the shellfish picking work process. In a study conducted in the fishing community of the Maré Island, it was observed that workers performed approximately 70 thousand movements per workday, apart from cleaning the shellfish[24]. The Brazilian Labor Regulatory Standard Nr. 17 recommends that, in activities that require repetitive hand movements, such as typing activities, the number of repetitions should not exceed 8 thousand touches per hour, per six-hour work day, with a rest period of 10 minutes every 50 minutes of work[25].

As for load handling, the Brazilian Consolidation of Labor Laws (CLT), in article 198, sets the limit of 60 kg for men and 25 kg for women for manual load handling[26]. Nonetheless, we observed that a part of the workers carried a load greater than this limit.

Load handling for prolonged periods is directly related to musculoskeletal impairments. In the case of shellfish collectors, this handling is associated with several other risk factors. These women usually stand while they carry their shellfish, performing, in order to maintain the balance, a static muscular work of the anterior and posterior spine chain, without the correct recruitment of the column stabilizers to support the bucket, that weighs on average 24.3 kg. They usually support this bucket up on their head and walk for 30 to 60 minutes, raising up their shoulders to hold the bucket there. Therefore, they force their trapezius and levator scapulae to work against gravity[27].

Working as a shellfish picker involves a muscle/joint overload and repetitive movements, favoring the emergence of RSI/WMSD. This situation is aggravated when considering that workers start early in this activity, and interrupt it late in life[28].

Therefore, these women are subject to ergonomically-related risks while working. We must list three parameters to define RSI/WMSD risk factors according to the literature. The first parameter concerns the excessive movement of both gross and fine motor skills. The second one refers to the work overload with an overburden of the upper limbs. Finally, the third parameter is the absence of rest and the fast-paced work derived from socioeconomic conditions[2].

Other studies conducted with comparable populations revealed similar results regarding repetitive movements and the muscular strength use, especially in the upper limbs[4,11,23,24,28].

Regarding the musculoskeletal symptoms by body part, the findings here differ from those in the study conducted in Galicia, Spain, in which the authors found a higher prevalence of complaints about the neck (70.9%), followed by the lumbar region (65.5%) and the shoulders (45.8%)[15].

The complaints about the spine region are consistent with these women's labor process biomechanics, who mostly work at a bent-over upper body posture. Most of the pain complaints in the thoracic region of the spine is due to a posture with cervical flexion and/or anteriorization during long periods. At the same time, the pain in the lumbar region occurs mainly due to the loss of physiological lordosis, increasing the sacral angle and leading to a posterior arch stress, with consequent vertebral instability[29].

The fists and hands were the body segments where pain most hindered normal activities. Perhaps, this is due to their prehensile function, which is essential for carrying out daily activities and daily instrumental activities.

Besides, previous studies have shown that, even suffering from regional pain, these workers must work to keep their monthly income and, consequently, guarantee their families' livelihood[2,30].

Social vulnerability imposes an intense work pace on these women, forcing them to pick shellfish more quickly, thus gathering more products for sale. Although the work pace is self-imposed, the more they need income, the more their workload increases, even in conditions of physical limit, as evidenced by pain complaints. This need makes their work pace exhausting, repetitive and constant, leading to important risks of acquiring RSI/WMSD[31].

This study was conducted with a virtually inaccessible population of shellfish pickers. The pickers worked in the informal sector and under precarious working conditions, with very specific work characteristics that influenced their health conditions. We also focused on describing the prevalence of musculoskeletal symptoms and their known risk factors, without testing associations between exposures and outcomes.

Conclusion

The assessed shellfish pickers are exposed to the main ergonomically-related risks for developing RSI/WMSD and depict a high prevalence of musculoskeletal disorders. Musculoskeletal complaints in the upper and lower regions of the spine prevailed. We observed limitations to perform daily activities due to wrist/hand pain.

Musculoskeletal disorders affect individuals' ability to produce strength for labor. Thus, it is plausible to assume that they have a considerable impact on the socioeconomic conditions of shellfish pickers and their families, as these workers depend on good physical conditioning to keep working.

Authors' contributions

Silva RA and Nery AA contributed to the research design, data collection and analysis, writing and critical review of the manuscript. Pena PGL, Rios MA and Paula R participated in writing and critical review of the manuscript. All authors agreed with the published final version and assume full responsibility for its content.

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