

Prevalence of neck and upper limb musculoskeletal disorders in artisan fisherwomen/shellfish gatherers in Saubara, Bahia, Brazil

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Abstract *This study was conducted in an artisanal fishing community. The main health complaints included musculoskeletal disorders (MSD) attributable to working conditions. The present work found a prevalence of neck and distal upper limb MSD among the artisan fisherwomen/shellfish gatherers in Saubara, Bahia, Brazil. This was a cross-sectional cohort epidemiological study involving 209 artisanal fisherwomen/shellfish gatherers. The Brazilian version of the Job Content Questionnaire (JCQ), the Nordic Musculoskeletal Questionnaire (NMQ) and a survey listing physical demands adapted to shellfish gathering were used for the study. The MSD values obtained in some part of the body, neck or shoulder, and distal upper limb were 94.7%, 71.3% and 70.3%, respectively. The shellfish gatherers were found to work long shifts despite the high prevalence of MSD. The factors that cause these women to keep performing such activities include the need to make a living and provide food for their families through the sale and consumption of seafood.*

Key words *Artisanal fisherwomen, Shellfish gatherers, Musculoskeletal disorders*

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Introduction

Few epidemiological studies assessing musculoskeletal disorders (MSDs) in artisan fishermen/shellfish gatherers have been published in the literature. Those workers mostly live in traditional communities and develop informal seafood trade and processing practices^{1,2}. Work-related MSDs were identified among the main demands of a community of artisan fisherwomen/shellfish gatherers in the course of a research study conducted in Saubara in the municipality of Baía de Todos os Santos (BTS), whose population lives almost exclusively on artisan fishing.

As BTS fishing communities are considered traditional communities, they are culturally differentiated groups who recognize themselves as such. They have their own forms of social organizational and occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition³.

Data reported in the Statistical Bulletin of Sea and Estuarine Fisheries of the State of Bahia (Boletim Estatístico da Pesca Marítima e Estuarina do Estado da Bahia)⁴ indicate that the total annual production estimated in 2003 for the group of 14 municipalities of Baía de Todos os Santos was 14,413.45 tons of fish, which corresponded to 33.22% of the production estimated for the State in the same year. In 2010, the Brazilian production of fish in Brazil was approximately 1,265,000 tons of fish, reaching 19th in the world rankings of fish production for this year⁵. Approximately 45% of the annual production comes from artisan fishing⁶. The vast majority (75%) of the fish produced in the Northeast comes from artisan fishing, according to the diagnosis of fishing in Brazil⁷.

Despite their large contribution to Brazilian fishing, artisanal fishing communities are generally among the poorest segments of the population, which may be explained by their dependence on exploiting a limited natural resource and the inherent uncertainty of the fishing profession⁸.

The shellfish gatherers of BTS may be characterized as artisan fisherwomen because they perform their work as a method of subsistence or for commercial purposes, simply and individually (autonomously) or as a type of family business (as opposed to an industrial company), with family support⁹, and are responsible for their work tools and all stages of the production

process¹⁰. The work of shellfish gatherers ranges from the preparation of materials for shellfish gathering to the final product for sale and is performed in dwellings, outbuildings and outside environments.

Shellfish gatherers have no vacations, weekly rest or paid holidays, according to Pena *et al.*¹⁰. Their illness may cause losses at work, compromising their food security.

The activities performed by shellfish gatherers, including the gathering of crustaceans and mollusks by hand, along the Brazilian coast may cause health problems to these workers, according to Rios *et al.*¹¹. They are subjected to muscle strain in the neck, shoulders, back, upper limbs and lower back and repetitive strain injury of the wrist. Thus, the activities performed by shellfish gatherers are an ergonomic risk for these workers¹⁰.

MSDs are found worldwide, in both industrial and non-industrial groups¹², and there is growing concern about their social and economic consequences, especially in the workplace¹³. Although their cause does not exclusively result from occupations or working conditions^{14,15}, MSDs comprise a key part of all work-related diseases recorded in many countries¹⁴. The National Research Council/Institute of Medicine¹⁶ reports that the onset of MSDs depends on the interaction of three main risk factors: individual factors, mechanical stressors (physical demands) and the psychological characteristics of individuals (psychological demands).

Some authors indicate the heterogeneity of MSDs^{12,14,17} because they involve different issues and body parts and are common problems in various occupations and work groups¹². These disorders include inflammatory and degenerative conditions that affect muscles, tendons, ligaments, joints, blood vessels, peripheral nerves and nerve roots in different body segments, according to Punnett & Wegman¹⁴.

The presence of MSD symptoms¹⁸⁻²¹ among fish industry workers^{22,23} and populations of rural workers²⁴ has already been reported among shellfish gatherers and fishermen in general.

Knowledge of characteristics of the environments in which shellfish gatherers live, the particularities of these groups of workers and their relationship with the work they perform becomes necessary to understand the factors that may affect neck and upper limb MSDs of these workers. Artisan fishing activity is important for Bahia and Brazil. Thus, MSDs may have impacts on the economy and food security of these populations.

Thus, the present study aims to identify the prevalence of neck/shoulder and distal upper limb MSDs and their main risk factors among artisan fisherwomen/shellfish gatherers in Saubara, Bahia, Brazil.

Methods

This study is included in a larger project titled "Health, Environment and Sustainability of artisan fishing workers" (*Saúde, ambiente e sustentabilidade de trabalhadores da pesca artesanal*). A literature search and epidemiological research were used in the present study. The literature search, performed in the PubMed Database until February 2014, aimed to identify all the national and international literature on neck and upper limb MSDs already published. The search for scientific articles was performed using the keywords "musculoskeletal disorders of the upper limbs" AND "occupation" AND "epidemiology". The following inclusion criteria were used: the issue was addressed preferably with women, the study was epidemiological and provided data on neck and upper limb MSD prevalence, the case definition was provided, and the full article was available at the journal website of the Coordination for the Improvement of Higher Education Personnel (Comissão de Aperfeiçoamento de Pessoal de Nível Superior, CAPES).

This cross-sectional epidemiological study was performed with 209 artisan fisherwomen/shellfish gatherers from the municipality of Saubara, Bahia. The Brazilian versions of the Job Content Questionnaire (JCQ) and the Nordic Musculoskeletal Questionnaire (NMQ) and a questionnaire addressing physical demands²⁵ adapted to the work of shellfish gatherers were used for this study. Informed consent forms were signed by the participating subjects, and the project was approved by the Research Ethics Committee (Comitê de Ética e Pesquisa, CEP) of the School of Medicine, Federal University of Bahia.

Population and area

Saubara is a city located 94 km from Salvador by highway and less than 20 nautical km, in the interior of BTS and near the mouth of the Paraguaçu River. The city covers an area of approximately 163 km² and consists of villages (Cabuçu, Bom Jesus dos Pobres and Araripe)²⁶. According to the 2010 census, it has a population of 11,201 inhabitants²⁷, including 48.9% men and 51.1%

women. The economically active population (EAP) of Saubara consists of 5196 people²⁷. Thus, the 568 artisan fishermen registered in the association of shellfish gatherers correspond to 11% of the EAP of Saubara. These data show the importance of artisan fishing for the municipality, which is considered one of the main economic activities.

Sampling and inclusion criteria

Sampling was performed randomly, simply and without replacement, and a drawing of individuals was performed based on the total number of shellfish gatherers registered in the Association of Artisan Fisherwomen/Shellfish Gatherers of Saubara (Associação de Pescadoras Artesanais/Marisqueiras de Saubara). A 50% prevalence, a 5% error and the total population (N) of 426 artisan fisherwomen registered in the association of shellfish gatherers were used to calculate the sample, according to the equation for determining sample size (n) based on the estimated population proportion. The final sample consisted of 209 shellfish gatherers, 3% over the expected minimum sample.

Being female, 18 years of age or older and active in shellfish gathering for at least one year were among the inclusion criteria to enter the study because this activity is primarily performed by women in this community. To minimize the healthy worker survival effect, workers who were drawn and were not working in shellfish gathering had the opportunity to participate if they explained that they left the profession because of diseases possibly related to MSDs.

Data were collected from April 10 to May 10, 2013. This was a primary source database. The questionnaire used included the main risk factors reported in the literature. The following items were included in the questionnaire: identification; sociodemographic characteristics; job information; current and past occupational history; time worked in shellfish gathering; daily work hours; lifestyle, including tobacco smoking, alcohol consumption, use of medication, and practice of physical activities; comorbidities; housework; musculoskeletal symptoms; and physical and psychosocial demands at work. Most data were self-reported, except for weight, height and waist circumference (WC), which were measured by trained interviewers. The weight and height measurements were assessed to calculate the body mass index (BMI), and WC was measured to assess the accumulation of fat in the abdominal region.

Physical demands at work were adapted to the work of artisan fisherwomen/shellfish gatherers from the questionnaire prepared by Fernandes²⁵. Physical demands were evaluated in this adaptation according to the stages of shellfish gathering (gathering, washing, transport, cooking and processing). The questions covered working postures (sitting, standing, walking, crouching, bending over at the waist, twisting the torso, holding the arms aloft), repetitive and precise hand movements, arm muscle strength, and cargo handling. The variables were measured using a 6-point (0 to 5) response scale regarding the frequency, intensity and duration.

Data on psychosocial demands assessed with scores for psychological demand, control and social support at work and job dissatisfaction were collected using the JCQ^{28,29}. Exposure to psychosocial demands was rated according to Devereux³⁰ as high and low exposure to psychosocial demands. Psychosocial demands were dichotomized by the medians. The shellfish gatherers with high exposure to these demands received a demand score higher than 34, the control score was equal to or lower than 66, and the social support score was equal to or lower than 13. Low exposure was rated as demand equal to or lower than 34, the control score was higher than 66, and the social support score was higher than 13. At least two of the criteria had to be met for the shellfish gatherer to be rated in each group. Job satisfaction was also analyzed using the median and was stratified as low job satisfaction (satisfaction > 0.40) and high job satisfaction (satisfaction ≤ 0.40).

The data on musculoskeletal symptoms were collected using the expanded version of the NMQ, an instrument used worldwide in research on musculoskeletal disorders. The presence of pain or discomfort in the previous 12 months in anatomical areas of the musculoskeletal system was also assessed, along with the severity, duration and frequency of these symptoms³¹. MSD was defined as pain in the last twelve months lasting at least one week or with a monthly minimum frequency, which motivated the individual to seek medical care or absence from work or to change jobs, with grade 3 or higher severity in a scale from 0 to 5. Shellfish gatherers who suffered acute trauma in the segment of interest were excluded from the MSD calculation.

Statistical methods

The measures of central tendency (means, medians) and dispersion (standard deviations) were calculated for continuous variables. Categorical variables were expressed as absolute values and percentages.

The statistical software programs Ri386 version 2.15.2 and Epi Info version 7.1.3.3 were used for the data analysis.

Results

Shellfish gathering in Saubara is a predominantly female activity encompassing 75% of the individuals registered as shellfish gatherers in the Association of Artisan Fisherwomen/Shellfish Gatherers of Saubara. The sample characteristics are described in Table 1.

The sample predominantly consisted of shellfish gatherers with little schooling and who self-reported as black or brown for ethnicity. The age of the respondents ranged from 21 to 68 years. Only 10.1% reported having children younger than two years of age. The income exclusively from shellfish sales ranged from R\$0.0 to R\$600.0, averaging R\$137.1 (SD = 104.7), corresponding to approximately 20% of the minimum wage at the time, which was R\$678.0³².

The experience of shellfish gatherers in the work they perform, their early age at the start of work and the high average daily working hours exclusively in shellfish gathering are notable among the occupational variables, which are outlined in Table 1. The average years of work was approximately 27 years (SD = 12.9). The average age at the start of work was approximately 13 years (SD = 7.2), with a minimum of 4 years and a maximum of 53 years. The average working hours was 8.7 hours (SD = 3.1). There was a high number of weekly hours dedicated to housework in addition to work hours, which was reported by most shellfish gatherers interviewed (76.6%), characterizing a double work shift. Some study participants (29.2%) reported working in another occupation at the time of the interview, although the vast majority (70.8%) only worked in shellfish gathering.

Among the compensation measures, most shellfish gatherers (78.9%) notably consumed alcohol at least once a week. Tobacco smoking was only found in 5.3% (n = 11) of the sample. Most shellfish gatherers (67.5%) reported practicing physical activity during their leisure time,

Table 1. Sociodemographic, work, lifestyle and clinical characteristics of a sample (n = 209) of shellfish gatherers from Saubara, Bahia (BA), 2013.

Continuous variables	Média	Desvio Padrão (DP)
Age in years	39.6	11.5
Monthly income from shellfish gathering	137.1	104.7
Age at start of work	12.8	7.2
Years of work	26.8	12.9
Daily working hours as a shellfish gatherer	8.7	3.1
Categorical variables	n	%
Birthplace:		
Saubara	106	50.7
Santo Amaro	42	20.1
Salvador	23	11.1
Cachoeira	9	4.3
Other locations	29	13.8
Age		
≥ 38 years	106	50.7
< 38 years	103	49.3
Ethnicity		
Black	125	59.8
Brown	76	36.4
White	8	3.8
Marital status		
Married/Cohabiting /Live-in partner	135	64.6
Single/Separated/Widow	74	35.4
Education*		
< Incomplete High School	156	74.6
≥ Incomplete High School	53	25.4
Children		
Yes	192	91.9
No	17	8.1
Age of children		
≤ 2 years	21	10.1
> 2 years	171	81.8
Years of work		
> 26 years	106	50.7
≤ 26 years	103	49.3

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including running, gymnastics, swimming, playing soccer, cycling, walking, and caring for their vegetable garden or backyard at least three times a week for at least 30 minutes at a time. Overweight (BMI ≥ 25 kg/m²) was identified in 70.3% (n = 147) and obesity (BMI ≥ 30 kg/m²) in 32.5% of the sample. Excess fat in the abdominal area (WC ≥ 80 cm) was present in 74.6% (n = 156) of workers.

Table 2 outlines the prevalence of pain or discomfort in the last twelve months and the MSDs

Table 1. continuation

Categorical variables	n	%
Daily working hours as a shellfish gatherer		
> 11 h		
≤ 11 h	37	18
Weekly hours of housework	169	82
> 7 h		
≤ 7 h	160	76.6
Current job	49	23.4
Yes		
No	61	29.2
Previous job	148	70.8
Yes		
No	120	57.4
Smoking habit	89	42.6
Yes		
No	11	5.3
Alcohol consumption	198	94.7
≥ Once a week		
< Once a week	165	78.9
Physical activity practiced during leisure time	44	21.1
Yes	141	67.5
No	68	32.5
Waist circumference (WC)		
≥ 80	156	74.6
< 80	53	25.4
Body mass index (BMI)		
≤ 24.9	62	29.7
25 – 29.9	79	37.8
≥ 30	68	32.5
Comorbidities		
Diabetes mellitus		
Yes	14	6.7
No	195	93.3
Rheumatoid arthritis		
Yes	22	10.5
No	187	89.5

* 4.8% (n = 10) were illiterate, and 18.2% (n = 38) only studied up to primary school.

in any body part (upper limbs, lower limbs or back), in the neck or shoulder, in the wrist or hand, in the forearm or elbow and in the distal upper limbs (wrist or hand or forearm or elbow).

The values of musculoskeletal symptoms in the last twelve months and MSDs detected in some body part were 97.6% (n = 204) and 94.7% (n = 198), respectively. High prevalence rates of neck or shoulder (71.3%) and distal upper limb (70.3%) MSDs were noted.

The physical demands at work (means \pm SD) are outlined in Table 3, according to the main stages of shellfish gathering.

The main demands identified in the gathering were, in descending order, performing repetitive hand movements (4.55 ± 1.07), using arm or hand muscle strength (4.05 ± 1.14), bending over at the waist (3.94 ± 1.51), physical pressure with hands on a work tool (3.92 ± 1.29) and crouched posture (3.53 ± 1.73). The walking (4.44 ± 1.13), holding the arms aloft (3.54 ± 1.78) and standing (3.22 ± 2.00) postures prevailed during transport, along with the use of arm and hand muscle strength (3.81 ± 1.42) and load lifting (3.60

± 1.46). The greatest physical demands in shellfish processing were the sitting posture (4.55 ± 0.99) and performing repetitive (4.54 ± 1.06) and precise and fine (3.70 ± 1.81) movements. The psychosocial demands and job satisfaction are outlined in Table 4.

High psychosocial demand was detected in 50.7% and low job satisfaction in 56% of the shellfish gatherers interviewed. Only eight of the 69 articles gathered in the literature review met the inclusion criteria (Table 5).

Table 2. Prevalence of pain and MSDs in any body part, in the neck or shoulder and in distal upper limbs in a sample* of shellfish gatherers from Saubara, BA, 2013.

Body part	Pain in the last twelve months		MSD	
	n	%	n	%
In any body part (upper limbs, lower limbs or back)	204	97.6	198	94.7
Neck or shoulder	165	78.9	149	71.3
Wrist or hand	149	71.3	120	60.9
Forearm or elbow	99	47.4	81	40.1
Distal upper limbs (wrist or hand or forearm or elbow)	187	89.5	147	70.3

* Shellfish gatherers who suffered acute trauma in the body part of interest were excluded from the MSD calculations. Therefore, the numbers of shellfish gatherers of the sample for wrist or hand and forearm or elbow MSDs were 197 and 202, respectively. The sample remained the same ($n = 209$) for the other ratings.

Table 3. Physical demands at work, according to the main work stages of a sample ($n = 209$) of shellfish gatherers from Saubara, BA, 2013.

Physical demand variables	Gathering	Transport	Processing
	Mean; \pm SD	Média; \pm DP	Média; \pm DP
Postures			
Sitting	1.58; 1.73	0.92; 1.36	4.55; 0.99
Standing	1.81; 1.77	3.22; 2.00	0.99; 1.35
Walking	2.84; 1.59	4.44; 1.13	0.68; 1.35
Crouching	3.53; 1.73	0.53; 1.19	1.00; 1.71
Bending over at the waist	3.94; 1.51	0.92; 1.54	2.46; 2.15
Twisting the torso	2.29; 1.96	0.59; 1.16	1.45; 1.16
Holding the arms aloft	0.71; 1.34	3.54; 1.78	0.50; 1.14
Repetitive hand movements	4.55; 1.07	1.33; 1.74	4.54; 1.06
Precise and very fine movements	2.98; 2.04	1.44; 1.87	3.70; 1.81
Muscle strength			
Arm or hand muscle strength	4.05; 1.14	3.81; 1.42	2.55; 1.82
Physical pressure with hands on a work tool	3.92; 1.29	2.76; 1.96	2.48; 1.88
Load handling			
Lifting	3.35; 1.67	3.60; 1.46	2.01; 1.85
Pulling	2.53; 2.01	1.07; 1.72	1.59; 1.87
Pushing	1.40; 1.88	0.87; 1.55	1.05; 1.61

Table 4. Psychosocial demands and job satisfaction in a sample (n = 209) of shellfish gatherers from Saubara, BA, 2013.

Psychosocial demands and job satisfaction variables	n	%
High psychosocial demand	106	50.7
Low psychosocial demand	103	49.3
High job satisfaction (satisfaction \leq 0.40)	92	44.0
Low job satisfaction (satisfaction $>$ 0.40)	117	56.0

Discussion

High prevalence rates of neck or shoulder and distal upper limb MSDs were assessed in artisan fisherwomen/shellfish gatherers. Almost all shellfish gatherers reported pain or discomfort in any body part in the last year. Only 2.9% (n = 6) of shellfish gatherers with symptoms had no MSDs when applying the severity-rating criterion (higher than or equal to 3 on a scale from zero to 5). This finding illustrates the importance of this painful condition for the population of shellfish gatherers in Saubara.

Lower prevalence rates than those reported in the present study were reported among all the studies assessed that evaluated shellfish gatherers²⁰, commercial fishermen²¹, fishing industry workers^{22,23}, workers from other branches^{30,33,34} and rural populations²⁴, according to MSDs in some body part, in the neck or shoulder or in the distal upper limbs. Symptoms retrieved from self-reported musculoskeletal pain, per body part, were rated and assessed differently from this study, which considered stricter case definition criteria. However, the high prevalence rates of musculoskeletal pain among shellfish gatherers from other continent, with different cultures, work regulations and hours, are highlighted²⁰.

Self-reported symptoms may often be more informative than physical examination, according to Punnet & Wegman¹⁴. The authors argue that objective measures are extremely useful in establishing a safer diagnosis, but subjective measures best capture the impact on the patient.

Some authors mention the difficulty of comparing upper limb MSD studies^{12,35,36}. The comparison difficulties compromise assessing the extent of the problems because the case definitions, diagnostic criteria^{12,36} and official statistics differ between studies¹². The shellfish gatherers of Saubara noticeably had higher MSD prevalence rates

than the other workers, from rural to industrial, even with the stricter MSD rating of the present study. The different MSD ratings and prevalence rates per body part are outlined in Table 5.

In a population of rural Greek workers, 82.6% of respondents reported at least one musculoskeletal problem during the previous year, and 48.1% of subjects reported limited activity because of their symptoms during the same time period²⁴.

The study by Andersen et al.³³ showed that nursing assistants and cleaning staff complained of pain in both functional units more than the other workers. The occurrence of pain among these workers was much lower than that found among the shellfish gatherers in Saubara, despite having considerable values.

Chiang et al.²² highlighted that the greater the use of strength and the performance of tasks involving repetitive movement, the more musculoskeletal symptoms would be reported. Attention was drawn to the shoulder disorders, which nearly tripled in group 2 compared to group 1 (Table 5). The prevalence rates of self-reported symptoms were highest in group 3 for all body parts assessed.

Shellfish gatherers are highly vulnerable to ergonomic hazards at all stages of shellfish gathering. Gathering, transport and processing were the stages considered more important because they require longer time dedicated to the task and greater volume and workload. The posture bending at the waist and/or crouched and performing repetitive movements is the most used in gathering. Hand and arm strength are also used when working with tools and lifting loads, in addition to posture, according to Pena et al.¹⁰:

The work of shellfish gatherers in sandy beaches and mangroves consists of walking, wherein dorsiflexion is sustained for extended periods of time. They roam and dig with fast-paced movements of the upper limbs, almost always in dorsiflexion, moving over rocks and sandy beaches, under the intense sun and with eyes fixed on the sand to identify seafood.

In transport, shellfish gatherers usually carry what they gather in overhead buckets, walking from their workplace to their homes. The posture of holding the arms a loft, standing and walking, the use of muscle strength and lifting loads were the physical demands with the highest means, which statistically demonstrate the characterization of this stage. In gathering, shellfish gatherers remain seated, performing repetitive and precise movements almost constantly until

Table 5. Prevalence and rating of the musculoskeletal symptoms or neck and distal upper limb MSDs from self-reports in epidemiological studies with various categories of workers.

Country; Workers; Type of Study; Authors (year)	Females (%)	Number of study subjects	Musculoskeletal symptom rating	Prevalence per body part and groups of workers (1), females (2) or total (3)	(%)
Denmark; Workers of service sectors (S1. administrative assistants, S2. nurses, S3. nursing assistants, S4. cleaning and cooking staff and S5. technical staff) and different types of industries (P1. administrative work, P2. skilled workers and P3. unskilled workers); Prospective Cohort; Andersen et al. (2007).	Data not shown in the article	4006*	Pain in the last 12 months, per functional unit, considering the severity higher than or equal to 4 on a scale with 7 categories ranging from no pain to extreme pain.	Neck or shoulder (1, 3) Distal upper limbs (1, 3)	S1: 43.0 S2: 29.0 S3: 44.0 S4: 46.0 S5: 32.0 P1: 32.0 P2: 22.0 P3: 38.0 Total: 37.0 S1: 17.0 S2: 11.0 S3: 21.0 S4: 28.0 S5: 13.0 P1: 12.0 P2: 17.0 P3: 22.0 Total: 18.0
Greece; Inhabitants of the island of Crete who perform rural work and sought one of the three rural Primary Care Centers (PCCs); Case-control; Antonopoulou et al. (2007).	57.2	455	Pain or discomfort in the last 12 months and affecting the daily activities at work or at home.	Neck (2) Shoulder (2) Elbow (2) Wristor hand (2)	43.8 35.0 15.0 25.8
United Kingdom; Delivery drivers, customer service and information technology workers and general office personnel; Cross-sectional Study; Devereux et al. (2002).	20.2***	720	Pain or discomfort during the 7 days preceding the completion of the questionnaire.	Neck (3) Shoulder (3) Elbow (3) Wrist our hand (3) Upper limbs (3)	34.0 35.0 17.0 35.0 55.0
United States (USA); Licensed commercial fishermen from 13 municipalities of the North Carolina coast; Prospective Cohort; Lipscomb et al. (2004).	11.6	215	Pain or discomfort in the last 12 months, seeking medical assistance related to the problem and affecting work.	Neck (3) Shoulder (3) Elbow or forearm (3) Wrist or hand (3)	6.0 15.0 14.0 15.0

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the end of this stage. Pena et al.¹⁰, in their study with shellfish gatherers from Ilha de Maré, Bahia, observed muscle overload in the neck, shoulders, back, upper limbs and lower back and repetitive strain injury of the wrist. According to Anders-

en et al., physical demands at work are related to worsened pain in specific areas³³.

Symptoms, injuries and disabilities have different meanings among individuals, determining a wide variety of psychological and social re-

Table 5. continuation

Country; Workers; Type of Study; Authors (year)	Females (%)	Number of study subjects	Musculoskeletal symptom rating	Prevalence per body part and groups of workers (1), females (2) or total (3)	(%)
India; Female workers from eight fish processing units; Case-control; Nag et al. (2012).	100.0	450	MSD prevalence in the last 12 months.	Neck (2) Shoulder (2) Hand (2) Some body area (2)	170 27.0 17.0 71.0
Spain; Shellfish gatherers from the Autonomous Region of Galicia; Cross-sectional Study; Rodriguez-Romero et al. (2012).	98.7	929	Musculoskeletal pain on the day of the interview, considering the pain intensity assessed from a verbal numeric scale ranging from 0 (no pain) to 10 (worst pain imaginable).	Neck or shoulder or upper back (3) Distal upper limbs (without the forearm) (3)	82.0 51.0
USA; Sewing machine operators from 13 clothing industries in Los Angeles, California; Cross-sectional Study; Wang et al. (2007).	64.4	520	Self-report of musculoskeletal symptoms in the last month, according to the minimum frequency of 1 day a week with pain intensity higher than or equal to 3 on a scale from 0 (no pain) to 5 (much pain) with anchors at the ends.	Neck or shoulder (3) Distal upper limbs (3)	24.0 15.8
China; Fish processing workers from eight small- to medium-sized factories on the outskirts of the Kaohsiung port in Taiwan. The sample was divided into 3 groups: G1. Low repeatability and low use of strength (managers, office personnel and specialists); G2. High repeatability and high use of strength (semiskilled workers working on conveyor belts, fish processing and packers); G3. High repeatability and strength (workers who cut, separated and rated the fish or seafood); Cross-sectional Study; Chiang et al. (1993).	G1. 47.5 G2. 75.4 G3. 78.6	207	Self-reported symptoms and clinical diagnosis during the last month**.	Neck (1) Shoulder (1) Elbow (1) Wrist (1) Hand (1)	G1: 6.6 G2: 13.6 G3: 21.4 G1: 14.8 G2: 44.1 G3: 50.0 G1: 18.0 G2: 19.5 G3: 35.7 G1: 8.2 G2: 17.8 G3: 25.0 G1: 13.1 G2: 21.2 G3: 32.1

* Only results and number of baseline subjects. ** Only data regarding symptoms are shown in the table. *** Percentage of women in the total number of individuals rated according to exposure (n = 564).

sponses¹⁶. The explanation for the involvement of psychosocial factors in the onset of MSDs relates to muscle tension secondary to stress^{37,38}.

The literature demonstrates that MSDs affect more women than men, and studies should consider the work demands according to gender^{24,39}.

The predominance of women in shellfish gathering activities has been measured or reported in other studies^{10,40-42}, except in an article with workers – mostly men (88.4%) – who performed fishing and shellfish gathering activities in the sea²¹.

Rheumatic disorders were the most reported comorbidities (17.2%) among the shellfish gatherers of Galicia²⁰. The prevalence of diabetes mellitus in the present study was higher than that reported for shellfish gatherers in Galicia, with the illness reported by 3.6% (n = 33) of the sample²⁰. Conversely, the prevalence of diabetes mellitus in the sample of shellfish gatherers was lower than the percentage of adults (35 years or older) who reported having diabetes in the year 2012, according to the total and the five Brazilian regions⁴³. The difficulty that shellfish gatherers from Saubara experience accessing healthcare services may contribute to the failure to diagnose these diseases. The values are substantial, even with this difficulty, indicating the importance of health actions for these communities.

The overweight and obesity prevalence rates of the study were much higher than the respective prevalence rates among Brazilian women aged 18 years or older (47.5% and 17.9%, respectively, in 2012)⁴³. “A striking level of overweight and obesity” was noted in the community of shellfish gatherers and artisan fishermen of Ilha de Maré, located in Baía de Todos os Santos. Many shellfish gatherers are obese but do not always feel sick⁴⁴. Overweight is described in the literature as a factor related to upper limb MSDs^{16,33}.

Although no report of the role of income in MSD development was found during the literature review, its importance for these populations is emphasized. According to Dias *et al.*⁴⁵, the average monthly income from the shellfish gathering activity was 108.00 Brazilian Reais per month, a value lower than the average income resulting from the sale of seafood in the present study. Pena *et al.*¹⁰ reported an even more extreme situation regarding income from shellfish gathering (approximately 50 Brazilian Reais per month). According to Pena *et al.*¹⁰, social misery imposes an intense work pace to generate more products for sale.

Similar to the study conducted by Pena *et al.*¹⁰, the shellfish gatherers of Saubara are also responsible for their work tools and for all stages of production. They have autonomy to decide on their work. However, these women perform their tasks even in the presence of pain to ensure the livelihood that comes from the sea. The shellfish gatherers of the present study noticeably used their production not only to gain income but also to ensure daily access to nutrients. Only the surplus production is sold to middlemen.

The way in which the shellfish-gatherer work is developed and the individual characteristics are important for MSD occurrence. These workers constitute the management forces for their own work and showed great experience in the activity. Although they have autonomy to perform their activities, these shellfish gatherers function for notably long working hours, even with high prevalence rates of MSDs, demonstrating that the need to ensure the livelihood and food security of their families by selling and consuming seafood is included among the determining factors of the permanence of these people in the activity.

Collaborations

IR Falcão, RCF Rêgo, PGL Pena, JS Müller, LLA Lino, MCBM Couto and WS Viana contributed to the literature review. IR Falcão, RCF Rêgo, IB Alves, JS Müller, LLA Lino, MCBM Couto and WS Viana contributed to the study design and collection. IR Falcão, RCF Rêgo, IB Alves and VMC Lima contributed in statistical analysis. All authors contributed to the interpretation and writing. All authors had access to all the data and have the responsibility in the final manuscript.

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