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Factors associated with musculoskeletal disorders in artisanal fishers from traditional community in Todos-os-Santos Bay, Bahia, Brazil

Fatores associados aos distúrbios musculoesqueléticos em pescadores de comunidade tradicional na Baía de Todos-os-Santos, Bahia, Brasil

Abstract

Introduction: Musculoskeletal disorders (MSD) are one of the leading causes of pain and disability at work, affecting various professional categories, including multipurpose/artisanal fishing workers . **Objective:** To analyse the factors associated with the prevalence of musculoskeletal disorders, characterized according to occupation, and to draw up a profile of fishermen and shellfish gatherers. **Methods:** Cross-sectional study with a probabilistic sample of artisanal fishing workers from the municipality of Cachoeira (BA). The Nordic Musculoskeletal Questionnaire was used, in addition to a structured questionnaire. Multiple correspondence analysis and Poisson regression were used. **Results:** 248 workers participated, n = 78 fishermen and n = 170 shellfish gatherers. The prevalence of MSD was 89.7% among fishermen and 95.3% among shellfish gatherers, with no differences between these groups (prevalence ratio = 1.06). Among the shellfish gatherers, were predominant women aged ≤ 37 years, with children under two years old, incomplete secondary education, who had another activity, with long hours in a squatting position, walking while handling loads and pushing fish. Among the fishermen, the profile was the opposite, they reported taking pain medication and long hours in a sitting position. **Conclusion**: There was a high prevalence of generalized MSD among multipurpose/artisanal fishers, regardless of gender. This could be explained by the high exposure of both groups to adverse occupational factors and by the sociodemographic profile of the community studied.

Keywords: Musculoskeletal Diseases; Occupational Diseases; Artisanal Fishers; Occupational Health.

Resumo

Introdução: Distúrbios musculoesqueléticos (DME) são uma das principais causas de dor e incapacidade no trabalho, afetando diversas categorias profissionais, incluindo pescadores polivalentes/artesanais. **Objetivo:** Analisar os fatores associados à prevalência de DME, conforme a ocupação de pescadores e marisqueiras. **Métodos:** Estudo transversal, com amostra probabilística de pescadores do município de Cachoeira (BA). Utilizou-se o Questionário Nórdico de Sintomas Osteomusculares, além de questionário estruturado. Empregou-se análise de correspondência múltipla e regressão de Poisson. **Resultados:** Participaram 248 trabalhadores, n = 78 pescadores e n = 170 marisqueiras. A prevalência de DME foi de 89,7% entre pescadores e de 95,3% entre marisqueiras, sem diferenças entre esses grupos (razão de prevalência = 1,06). Entre as marisqueiras, predominaram mulheres com idade ≤ 37 anos, com filhos menores de dois anos, ensino médio incompleto, que tinham outra atividade, com longas jornadas na postura agachada, deambulando com manuseio de carga e empurrando o pescado. Entre os pescadores, o perfil foi oposto, eles referiram medicamento para dor e longas jornadas na posição sentada. **Conclusão:** Houve elevada prevalência de DME generalizado entre os pescadores polivalentes/artesanais, independentemente do gênero, isto pode ser explicado pela alta exposição de ambos os grupos aos fatores ocupacionais adversos e pelo perfil sociodemográfico da comunidade estudada.

Palavras-chave: Doenças Musculoesqueléticas; Doenças Profissionais; Pescadores Polivalentes; Saúde do Trabalhador.

Introduction

Musculoskeletal disorders (MSD) are characterized as inflammatory and degenerative conditions that affect the musculoskeletal system and its components[1]. They are a work-related phenomenon, with damage resulting from the overuse of the musculoskeletal system, as well as the lack of time for recovery[2]. The range of diseases classified as MSD is vast and should be analyzed using specific protocols[1,3].

In Brazil, MSD account for 30% or more of all occupational diseases reported to official bodies and are the leading cause of pain and disability in the workplace[4]. For informal workers, which includes multipurpose fishermen[f], it is clear that there are no structured and permanent occupational health surveillance actions aimed at this professional category[5].

Multipurpose fishermen, who are characterized as artisanal fishing workers, carry out subsistence fishing and are a traditional category around the world, and are therefore considered an important type of work[5] with distinct characteristics in their fishing activities. In Brazil, according to data from the 2024 General Fishing Activity Register, there are 1,650,247 registered fishing workers, 99.76% of whom are registered as artisanal fishing workers[6] and approximately 38 million people in the world are engaged in this activity on a full or part-time basis[7].

Artisanal fishing (AF) in Brazil can be subsistence or commercial and can be defined as a simple, low-tech enterprise, carried out individually or as a family, most often by the owner (fisherman), although in certain circumstances the boats may belong to fish traders or outside investors, and they may also rely on family support[5]. Despite their high share of fish production, AF workers are among the poorest groups in the population[8].

AF workers are invisible to the Brazilian health system[9]. Recognition and monitoring of the worsening of MSD and their causal relationship is still incipient in Brazil, due to the persistent weakness of the epidemiological technical nexus (NTEP); this fact perpetuates the difficulty in diagnosing these diseases[4], pointing to the need to include this professional contingent among the social groups most at risk for the occurrence of MSD[10].

The symptoms of MSD and their associated factors in Brazilian artisanal fishing workers have already been described[11-14], characterized by their severity and occurrence in numerous body regions, although little has been elucidated in male artisanal fishing workers . Among the main factors triggering MSD are aspects of the work process, cognitive demands, and organizational/psychosocial factors[3]. It is also worth noting that variables such as age, gender, length of time working in the profession, and schooling can be factors associated with MSD, as well as economic activity and occupation[15].

It is not yet possible to have a worldwide estimate of the prevalence of MSD and its associated factors among artisanal fishing workers as a whole, although there is already evidence of the magnitude of the occurrence of the condition among professional fishermen[16]. Therefore, this article aims to analyze the factors associated with the prevalence of MSD, according to the occupation of fishermen and shellfish gatherers, in a traditional fishing community in northeastern Brazil.

Methods

Study design and context

This is a cross-sectional study carried out in 2017 with artisanal fishing workers living in Santiago do Iguape, in the municipality of Cachoeira in the state of Bahia. The initiative to investigate informal workers emerged from the principle of community-based participatory research[17].

[f] In this study, the standardized CBO term "multipurpose fishermen" (Code 6310 in the 2002 CBO) was adopted, which includes shellfish gatherers (Code 6310-10), called "*mariscador*" or "*marisqueiro*", and fish and shrimp fishermen (Code 6310-20). In Brazilian publications, multipurpose fishermen are recognized as artisanal fishing workers.

This geographical area is part of the Baía do Iguape Marine Extractive Reserve (RESEX), which is located on the shores of Baía do Iguape, and fishing is the population's main source of livelihood[18].

Study size

To characterize the fishing population, official RESEX data for 2017 was used. For the sample calculation, a prevalence of MSD of 50% was adopted[12-14], with an alpha error of 5% in a total population (N) of 537, calculating a margin of loss or refusal of 10%, resulting in a final sample of 248 artisanal fishing workers, 170 of whom were shellfish gatherers and 78 fishermen.

Participants

The inclusion criteria were: being aged 18 or over, having been working in artisanal fishing for at least a year, and agreeing to take part in the study by signing the Free and Informed Consent Form (FICF).

Exclusion criteria

Artisanal fishing workers were drawn using a random number table for a probabilistic sampling approach, stratified by gender and without replacement.

In this study, we started from the historical assumption of recognizing the centrality of women in shellfish gathering and men in sea fishing with small boats, according to a study carried out in Baía de Todos-os-Santos[9].

Data collection

A questionnaire was used for data collection, which took place between May and July 2017. The first block of the questionnaire, which included questions related to the environment, work organization, and individual factors, was used in previous studies[11-14]. Questionnaires used in previous studies and validated instruments[19,20] on the physical demands of work[21-23] and MSD symptoms were also used to assess work-related physical factors. The expanded, translated, and validated Brazilian version of the Nordic Musculoskeletal Questionnaire (NMQ)[20] was used.

Variables

The variables related to individual factors were: age (in years) dichotomized from the median (< 37, ≥ 37); schooling (complete elementary school, complete or incomplete secondary school)[13]; marital status (married or single)[12]; children aged two years or less (presence or absence); self-reported comorbidities (diabetes, hypertension, rheumatoid arthritis, hypothyroidism, and headache - presence or absence of at least one)[24]; smoking (current smoker and current non-smoker)[25]; alcohol consumption (frequency of alcohol consumption greater than or equal to once a week, less than once a week)[26]; and body mass index - BMI (obesity/overweight, normal weight, underweight)[27].

The variables related to the work environment and organization were: carrying out activities related to fishing (yes, no)[13]; weekly hours dedicated to AF (> = 20 hours, < 20); and taking breaks during work activity (yes, no).

The definition of an MSD case was based on reports of pain or discomfort in the last 12 months, lasting more than a week or at least monthly, not caused by an acute injury and with a severity ≥ 3, on an ordinal scale from 0 to 5, with verbal qualifiers at the extremities: 0 = no pain, 5 = unbearable pain, or determining seeking medical attention, or official or unofficial absence from work or change of job, motivated by at least

pain or discomfort in one of the following regions: neck, shoulder, elbow, forearm, wrist/hand, upper back, lower back, thigh, knee, leg, ankle, and foot[2]. Generalized MSD was characterized as the presence of cases in which the number of affected regions was greater than or equal to 1, similar to the criteria used in other studies with artisanal fishing workers[14].

To characterize the physical demands of fishing workers, the following items were analyzed: posture, muscle strength, load handling, and physical pressure. These variables were measured on a 6-point scale (0 to 5), in terms of frequency, intensity, and duration, with an arbitrary cut-off point of less than 3 (non-existent) and equal to or greater than 3 (unbearable).

Data analysis

The analyses were carried out using the R statistical package version 3.6.3 and multiple correspondence analysis (MCA) was used. At first, all the variables listed were included in the correspondence map and, after analyzing the bivariate correlations, with a cut-off point above 0.23 (half of the highest value of the correlations) and their contributions, the potentially collinear variables were removed.

After the MCA stage, Poisson regression was used to analyze the association between the presence of MSD and individual and occupational characteristics. Crude and adjusted prevalence ratios (PR) were calculated, confidence intervals were estimated, and p-values were calculated from the robust standard error, obtained from the consistent heteroscedasticity covariance matrix of the model coefficients. The goodness-of-fit of the model was assessed using the Akaike Information Criterion (AIC) and residue analysis. To assess the assumption of non-overdispersion, the ratio of the Deviance residuals to the corresponding degrees of freedom was calculated. Even though there was no violation of this assumption, we opted for a robust estimate of the standard errors of the entire model.

Finally, the MCA was performed again on the individuals with MSD to describe the profiles associated with the occupation. Based on this procedure, it was possible to create three zones (profiles) on the map, namely: profile of shellfish gatherers' occupation variables; profile of fishermen's occupation variables; and common profile. To this end, the minimum distance between the points corresponding to the levels of the variables was arbitrarily set at 1.5 cm as a strategy to define the relevance of the finding in this analysis.

Ethical considerations

This study was approved by the Research Ethics Committee of the Bahia School of Medicine, Federal University of Bahia, Opinion 1.711.010, on September 3, 2016. All participants signed an informed consent form.

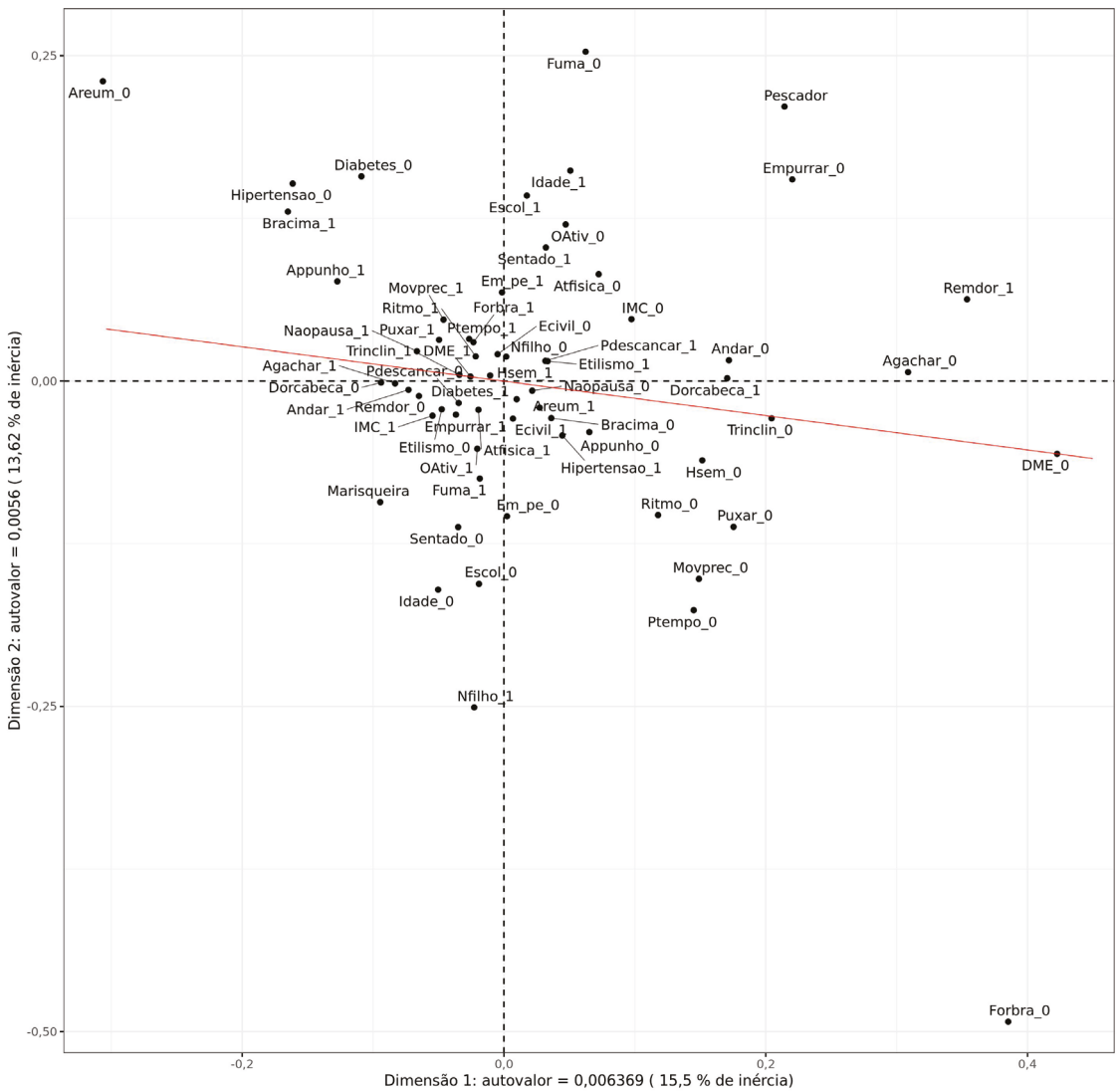
Results

Characterization of the sample

The artisanal fishing workers from Santiago do Iguape investigated in this study comprised 248 individuals, 170 of whom were shellfish gatherers and 78 were fishermen. The sociodemographic characteristics included an average age of 36.7 years (SD = 10.5 years) for shellfish gatherers and 43.3 years (SD = 11.8 years) for fishermen. The average number of hours worked per day was 8.8 hours (SD = 1.9) for shellfish gatherers and 9.1 hours (SD = 3.0) for fishermen. In both occupations, they started work at an average of around 11 years old. The average weekly income ranged from R$ 57.00 (SD = 35.7) to R$ 94.60 (SD= 55.9). There was also a predominance of black/brown self-declared race/ethnicity (96.4% and 94.9%) in both occupations and marital status categorized as single/separated or widowed. In terms of schooling, both groups had incomplete

primary education, approximately 30% of the sample studied. More details on the characterization of the sample can be found in a previous study[28].

The MCA was carried out according to the graphic representation on the map in **Figure 1**, showing the joint assessment between the variables listed in this study in a two-dimensional plane. Thus, there was no association between MSD and occupation, i.e. the occupations of shellfish gatherer and fisherman on small boats were located on the map with similar proximities to the centroid presence of MSD which, in turn, has a coordinate on the map with values close to zero for the first and second dimensions (-0.026 and 0.003), indicating that the presence of MSD is not discriminatory in favor of any variable, including occupation. However, the centroid with no MSD is excessively outside the map's point cloud (coordinate pair equal to 0.423 and -0.056, for the first and second dimensions, respectively), indicating that it is an outlier.



Legend:

Individual factors:
Age
Idade_0: less than or equal to 37 years
Idade_1: over 37
Education
Escolaridade_0: Complete high school
Escolaridade _1: Incomplete high school

Physical demands of the job
Time pressure (due to tide and/or money)
Ptempo_0: almost non-existent pressure
Ptempo_1: almost unbearable pressure
Work pace (speed at which you perform tasks)
Ritmo_0: slow speed
Ritmo_1: fast speed

Continue

Continuation

Marital status
Estado civil_0: Single
Estado civil_1: Married; Friend / Living together
Number of children
Nfilho_0: No children aged 2 years or younger
Nfilho_1: With children under 2 years of age
Occupation
Marisqueira: shellfish gatherer, predominantly female fishing activity
Pescador: fisherman, predominantly male fishing activity
Physical Activity
Atfisica_0: physical activity
Atfisica_1: no physical activity
Body mass index
IMC_0: normal weight and underweight
IMC_1: overweight and obese
Smoking
Fuma_0: non-smoker
Fuma_1: smoker
Alcohol consumption
Etilismo_0: drinking alcohol less than once a week
Etilismo_1: drinking alcohol more than once a week
Musculoskeletal disorders
MSD_0: no musculoskeletal disorders
MSD_1: one or more body regions with musculoskeletal disorders
Self-reported hypertension
Hipertensão_0: no hypertension
Hipertensão_1: hypertension
Self-report of rheumatoid arthritis
Areuma_0: no rheumatoid arthritis
Areuma_1: rheumatoid arthritis
Self-reported diabetes
Diabetes_0: no diabetes
Diabetes_1: diabetes
Self-reported headache
Dorcabeça_0: no headache
Dorcabeça_1: headache
Uses medication to control pain
Remdor_0: no pain medication
Remdor_1: pain medication
Factors related to the work environment:
Weekly hours spent fishing
Hsem_0: dedicated 20 hours or less a week to fishing
Hsem_1: dedicates more than 20 hours a week to fishing
Works in other activities
Oativ_0: does not work in another activity
Oativ_1: works in another activity concurrently with artisanal fishing
Taking a break
Não pausa_0: does not take a break during the working day
Não pausa_1: takes a break during the working day
Rest break
Pdescansar_0: takes a rest break when needed
Pdescansar_1: never takes a rest break
Sitting position
Sentado_0: always remains in a sitting position
Sentado_1: never remains in a sitting position
Standing position
Em_pe_0: never stands upright
Em_pe_1: always standing the whole time
Walking position
Andar_0: never stands in a walking position
Andar_1: stays in the walking position all the time
Squatting position
Agachar_0: never remains in the squatting position
Agachar_1: always remains in the squatting position
Resting on fist
Appunho_0: never rests on the fist
Appunho_1: always rests on the fist
Torso tilted forward position
Trinclin_0: never stands with the torso tilted forward
Trinclin_1: always stands with the torso tilted forward
Arms above shoulder height position
Bracima_0: never stands with arms above shoulder height
Bracima_1: always stands with arms above shoulder height
Making precise and very fine movements position
Movprec_0: never makes precise and very fine movements
Movprec_1: always makes precise and very fine movements
Arm and hand muscle strength
Forbra_0: no muscle strength in arms and hands
Forbra_1: very strong muscle strength in arms and hands
Load handling with the act of pulling
Pull_0: never performs the act of pulling
Pull_1: always performs the act of pulling
Load handling with pushing
Push_0: never performs the act of pushing
Push_1: always performs the act of pushing

Figure 1 Multiple correspondence analysis of musculoskeletal disorders by occupation, including all the non-collinear variables listed in this study, among artisanal fishing workers from Santiago do Iguape, Bahia, 2017
Source: Prepared by the authors.

Also as shown in **Figure 1**, it is clear that all the points of the variables included are close to the presence of generalized MSD (DME_1), thus considering the generalized MSD variable as the centroid of this MCA. The absence of MSD (DME_0) in this context appears as an outlier, evidenced by the distance in the graphical representation.

Another important analysis refers to the spatial projection of fishing occupations in opposite quadrants, thus demonstrating the differences in the profiles of artisanal fishing workers in Santiago do Iguape. In addition, the Poisson regression technique was used to model the association between occupation and MSD, adjusted for all the variables in the map in **Figure 1**.

Table 1 shows all the PRs, confidence intervals, and p-values for all the covariates in the study for the adjusted model. The crude PR between occupation and MSD found was 1.06, close to the adjusted PR of 1.04, coinciding with the absence of an association between occupation and MSD reported by the MCA and objectively indicating the lack of contribution of the covariates to the main association.

Table 1 Complete Poisson regression model of the association between occupation and musculoskeletal disorders among artisanal fishing workers in Santiago do Iguape, Bahia, 2017

Variable	PRaj	95% CI	p-value
Occupation			
Shellfish gatherer	1.04	0.96;1.14	0.3261
Fisherman	1	-	
Age			
Median age greater than or equal to 37	0.99	0.95;1.04	0.7678
Median under 37	1	-	
Education			
Incomplete high school	1.01	0.95;1.07	0.7943
Complete high school	1	-	
Marital status			
Married	0.94	0.88;0.99	0.0327
Single	1	-	
Number of children			
Children under 2 years of age	0.89	0.74;1.06	0.1870
No children aged 2 or under	1	-	
Currently works at other activities			
Yes	1.02	0.95;1.09	0.6231
No	1	-	
Takes breaks during work activity			
Yes	1.06	0.98;1.13	0.1271
No	1	-	
Uses pain control medication			
Yes	0.80	0.69;0.94	0.0076
No	1	-	
Medical diagnosis for diabetes (report)			
Yes	1.01	0.95;1.07	0.8157
No	1	-	

Continue

Continuation

Medical diagnosis for hypertension (report)			
Yes	0.99	0.93;1.06	0.8235
No	1	-	
Medical diagnosis for rheumatoid arthritis (report)			
Yes	1.00	0.96;1.04	0.9876
No	1	-	
Headache (report)			
Yes	1.02	0.96;1.09	0.4849
No	1	-	
Smoking			
Smoker	1.02	0.93;1.11	0.6677
Non-smoker	1	-	
Alcohol consumption			
Frequency of alcohol consumption greater than or equal to once a week	0.99	0.93;1.04	0.6217
Frequency of alcohol consumption less than once a week	1	-	
Physical activity			
Yes	0.94	0.86;1.02	0.1225
No	1	-	
Body mass index (BMI)			
Obesity and overweight	1.03	0.96;1.10	0.3714
Normal weight and underweight	1	-	
Working time pressure*			
Unbearable	0.94	0.86;1.03	0.2095
Nonexistent	1	-	
Work pace			
Very fast	1.04	0.95;1.14	0.4465
Slow	1	-	
Takes a break from work			
Never	1.01	0.95;1.07	0.7597
When needed	1	-	
Sitting position at work			
Never	0.99	0.94;1.04	0.7436
Always	1	-	

Continua

Continuation

Standing position at work			
Always	1.03	0.98;1.10	0.2626
Never	1	-	
Walking position at work			
Always	0.99	0.93;1.06	0.8035
Never	1	-	
Squatting position at work			
Always	1.02	0.93;1.11	0.6790
Never	1	-	
Resting on the wrist while working			
Always	1.06	1.00;1.12	0.0688
Never	1	-	
Torso tilted forward while working			
Never (values less than 3)	1	-	
Always (values equal to or above 3)	0.92	0.85;1.00	0.0423
Arms above shoulder height			
Never (values less than 3)	1	-	
Always (values equal to or above 3)	1.01	0.95;1.07	0.6713
Precise and very fine movements			
Never (values less than 3)	1	-	
Always (values equal to or above 3)	1.05	0.95;1.15	0.3526
Muscle strength in arms and hands during work			
Nonexistent (values less than 3)	1	-	
Very strong (values equal to or above 3)	1.06	0.88;1.27	0.5670
Load handling - pulls the fish while working			
Never (values less than 3)	1	-	
Always (values equal to or above 3)	1.04	0.96;1.12	0.3432
Handling the load - pushes the fish while working			
Never (values less than 3)	1	-	
Always (values equal to or above 3)	0.99	0.90;1.08	0.7970
Weekly working hours with artisanal fishing			
Greater than or equal to 20 hours	0.92	0.85;1.00	0.0413
Less than 20 hours	1	-	

Note: Confidence intervals (CI) and p-values calculated from the robust standard error, estimated using the heteroscedasticity-consistent covariance matrix of the model coefficients. Akaike Information Criterion (AIC): 549.5. Goodness-of-fit test for the Poisson model (residual deviance: RD): 0.11258 (p = 1.000).

* Physical demand analysis criteria described in the method.

PRaj: Prevalence Ratio adjusted for all study covariates; 95% CI: Confidence Interval for PR.

Source: Prepared by the authors.

The covariates marital status, torso tilted forward, and weekly working hours showed PRs of less than 1 and a probability of less than 5% that these negative associations were the result of the study's random selection. There was also a good fit of the estimated Poisson model, with a small AIC and residual deviation close to zero.

The prevalence of MSD among the fishing workers reached a significant 93.5%, with the presence of MSD in at least one body region. Therefore, almost all the artisanal fishing workers studied had generalized MSD and, as a result, it was possible to draw up a profile for each occupation and common aspects of artisanal fishing workers affected by MSD, as illustrated in **Figure 2**.

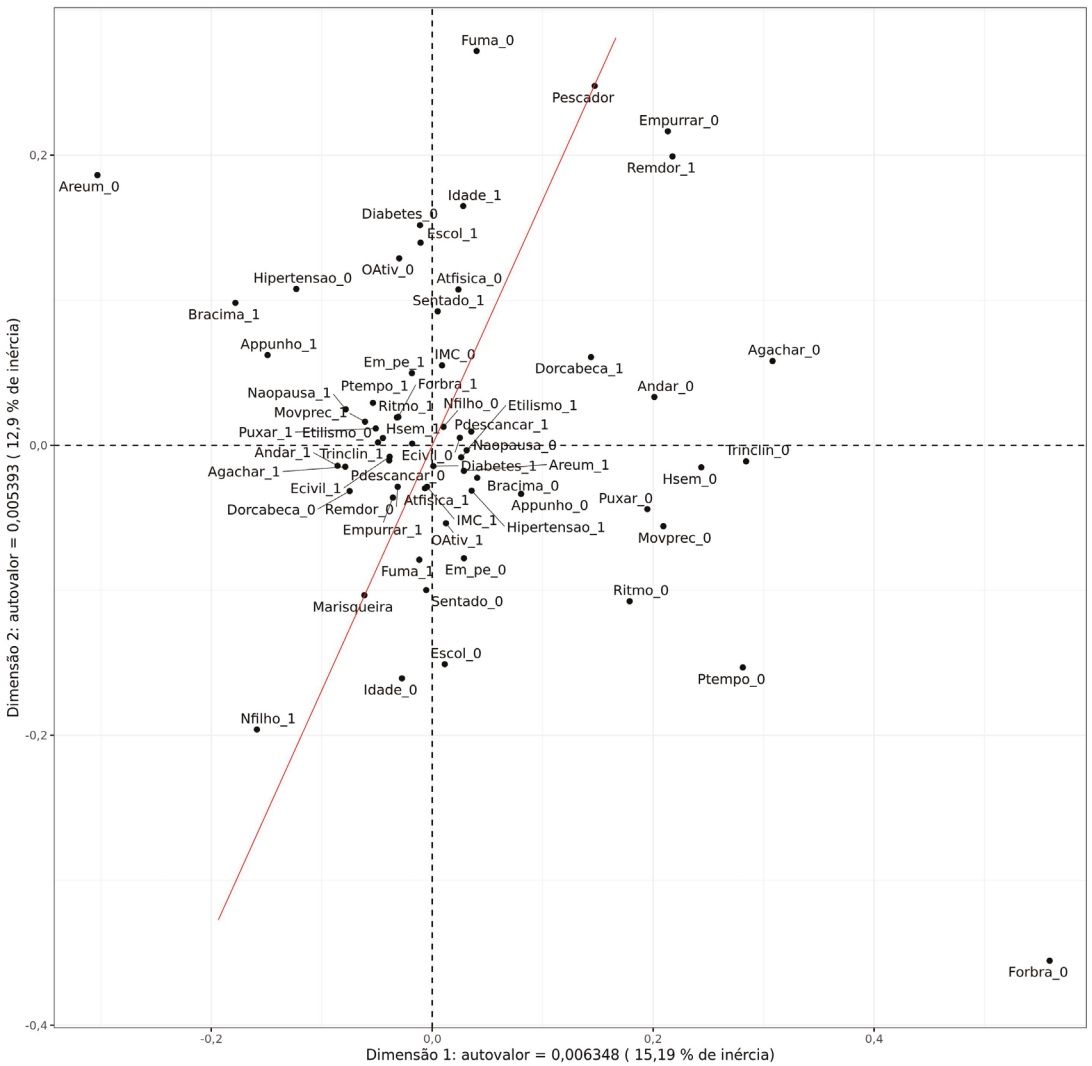


Figure 2 Multiple correspondence analysis of musculoskeletal disorders characterized by occupation, according to study covariates, among artisanal fishing workers from Santiago do Iguape, Bahia, 2017
Source: Prepared by the authors.

Figure 2 also shows the location of the Cartesian pairs corresponding to the occupations, occupying the odd quadrants in spatial opposition, with the shellfish gatherers' Cartesian pair located in the 3rd quadrant and the fishermen's in the 1st quadrant, showing profiles that are not similar.

The greatest distances between the points of the levels of each variable were also evaluated from the line of occupation **(Figure 2)**. It should be noted that some distances were very close, confirming the non-variability of these findings and therefore not belonging to any profile.

When observing the variables associated with the profile of artisanal shellfish gatherers who had generalized MSD, the following individual factors were associated: young women under 37 years of age, with children under two years of age, incomplete high school education, practicing physical activity, smokers, absence of headaches and, despite reporting musculoskeletal pain, not using medication to control the pain and self-reporting comorbidities such as diabetes; physical factors related to fishing work were associated: carrying out another work activity concurrently with shellfish gathering, handling loads with the act of pushing the fish throughout the work activity, with a squatting position also throughout the work activity, as well as walking all the time and never using the sitting position during the work activity.

In the group of artisanal fishing workers, made up of men, who had generalized MSD, the following individual factors were associated: older fishermen aged 37 years or more, without children aged two years or more, with complete high school, not practicing physical activity, not smoking, having a headache and using medication to control the pain, and without diabetes comorbidities. Physical factors were associated with: not doing another work activity together with fishing, never handling the fish load by pushing it during work, never in the squatting position, never walking during work and always in the sitting position down during work.

For both occupations, the individual factors relating to BMI and self-reported comorbidities, hypertension, and rheumatoid arthritis, were similar. Regarding the work environment, the factors in common were the hours dedicated to fishing and the physical demands related to it: working in a standing position, with the torso leaning forward and with arms above shoulder height. Muscle strength in the arms and/or hands, time pressure and the pace of work were also similar.

Discussion

The fundamental finding of this article is the high prevalence of MSD in artisanal fishing workers in the target community, with no distinction between men (small boats fishermen) and women (shellfish gatherers). It was also observed that the occurrence of MSD and musculoskeletal pain is frequent in more than one body region.

The locality studied is a typical example of fishing communities in the Recôncavo region of Bahia. In these communities, AF is one of the survival strategies of low-income families in an exclusionary and crisis-prone economic system[29], exacerbating poverty and the occurrence of occupational diseases due to the absence and/or very few therapeutic and preventive measures, primarily due to the lack of identification of the condition by the Brazilian health information system and also due to the invisibility of the main health surveillance demands specifically for artisanal fishing workers[30].

The results found suggest, in an unprecedented way, that there is no difference in the occurrence of MSD between the occupational categories of shellfish gatherer and small boat fisherman. This result diverges from previous studies, in which women were more affected by MSD than men[31,32]. This was due to the high occurrence of the condition, which affected almost all the artisanal fishing workers in this study.

It is therefore very likely that all artisanal fishing workers in this traditional community have similar MSD in all body regions, so this finding demonstrates the seriousness of the problem, which can culminate in situations of permanent functional incapacity. Another aspect to consider is that artisanal workers cannot be measured only by the occurrence of MSD in just one anatomical site, as there is already evidence that workers subjected to high levels of physical demand in the workplace, including manual handling of materials and the adoption of strenuous positions, influence the occurrence of MSD and pain in several anatomical areas concomitantly[32]. Moreover, the type of work activity requires maintaining health for survival, which is a factor that differentiates this professional category, but this knowledge is sparse and lacks due attention for informal workers, especially in Brazil.

Regarding the factors associated with the exclusive occupation of shellfish gatherers in Baía de Todos-os-Santos, a previous study[13] showed the presence of MSD in the lumbar region, associated with working time in fishing of more than 26 years, sitting with torso flexion during work, and manual movement and muscle strength with the

arms; and MSD in the neck/shoulder and distal upper limbs, associated with daily working time of more than 11 hours and performing another work activity concomitantly with AF[33].

However, the results of a systematic review[16] showed that there is very little current evidence on the factors associated with the onset of MSD in fishing workers, in the case of industrial fishermen, with the only consistent evidence found being working part-time during the day.

In Brazil, the profile of individuals affected by MSD[4] unfortunately does not include informal workers but highlights that economic activity and occupation can be determining variables for the development of this disorder[1]; thus, it is noteworthy that artisanal fishing workers are among the poorest labor occupations in the world population[7].

Various scientific studies have revealed numerous factors associated with the onset and worsening of MSD and their main anatomical sites of occurrence, with the physical demands of work being constant evidence in epidemiological studies in a wide range of professional categories[1,23,34-36]. Therefore, the profile of artisanal fishing workers with MSD in this study made it possible to analyze these factors, given the gap and fragility of knowledge about this professional category. It should also be noted that the analysis of the physical demand of work is recognized in the context of studies with populations of workers, especially in studies on MSD and their predictors[23]. According to Fernandes[22], the description of the physical demand of this work and its particularities effectively demonstrates individual information, work experience, and its variable demands, and is especially relevant in the most dynamic occupations.

The results revealed the following profile of shellfish gatherers affected by MSD: younger women, with young children, incomplete secondary education, who do other work concurrently with fishing, squatting, walking for long hours, and handling loads by pushing the fish. This information highlights the variety of factors that can interfere in the occurrence and worsening of MSD.

Associations between the physical demands of work and MSD symptoms have been studied since the 2000s[1,37]. In the exclusive analysis of the physical demands of work, related to the occupation of shellfish gatherer, it is worth noting that, in addition to individual factors, associations were found in the physical factors arising from the three dimensions of the instrument applied, such as: general posture (walking), segmental posture (squatting), and load handling (pushing). These dimensions are similar to those found in a study of shellfish gatherers from Ilha de Maré-BA[11], who also had abnormal postures and long walking times during their fishing activities.

Regarding the profile of fishermen with MSD, different characteristics were found, such as: older fishermen, no children under the age of two, complete high school education, no physical activity, non-smokers, presence of headaches and use of medication to control pain. Regarding physical factors, there was only one association found, and that was always sitting during work, so the physical demands of the job were only associated with one dimension: segmental posture.

The profiles of shellfish gatherers and small boats fishermen with MSD showed differences in both individual aspects and those related to the physical demands of the job. The study by Maneschy and collaborators[37] reports that the main differences between the genders in fishing are: subordination, the invisibility of women in the activity, and the historical change that has been taking place since the 1980s, with the need to include fisherwomen in policies to empower them and guarantee their social rights.

One of the hypotheses for these findings historically reflects the role of women in these traditional communities, who usually combine different types of activities in their daily lives, with double/triple working hours, and use the product obtained from fishing partly for family consumption and partly for resale and to generate income for the family. It is therefore understandable that there is a greater musculoskeletal burden on these workers and difficulty in changing their reality, given that maternal, household, and income-generating responsibilities are almost inseparable in these communities, which have very little infrastructure and a lack of health and education management.

The profile of small boats fishermen comprised males, with a higher age range (> 37 years) and no young children, thus suggesting that fishing customs are maintained among older people or due to a lack of opportunities in other work activities. In terms of the physical demands of the job, the result found reinforces the difference between fishermen with MSD and women, given that the work activity in this community is related to the use of small, rustic boats (*camboas*), with sitting prevailing most of the time. In a study of industrial workers[38], for example, occupational exposure was insufficient to explain the higher occurrence of MSD in women than in men.

Considering the common profile of the two occupations, we highlight the physical factors associated with working in a standing position, with the torso tilted forward, and arms above shoulder height, as well as exacerbated muscle strength in the arms and/or hands and the pressure of time and the constantly fast pace of work. It should be noted that the torso tilted forward position is associated with lumbar dysfunctions and there is a relationship between increased flexion amplitude and the level of discomfort, as well as rotational movements, factors that can become a biomechanical risk for this region[38].

Thus, individual factors, inappropriate postures, and high force intensities, such as those identified in this study, can cause physical and metabolic overload in the tissues and exceed the limits of stress, causing tissue macro-injuries[39] and favoring the occurrence and worsening of MSD, given its multi-causal nature. It is also worth noting that exposure to individual and work-related predictors of AF begins in childhood and adolescence, when work plays a cultural and social role.

Finally, the importance of demonstrating the seriousness of the occurrence of widespread MSD in both occupations is highlighted, as well as characterizing the profile of these workers. Therefore, there is a clear need for in-depth studies into all aspects of the work environment and its conditions, to strengthen the urgent need to recognize MSD, improve reporting and understanding of predictors, while ensuring health care and decent work for this important contingent of Brazilian workers.

Conclusion

The study revealed a high prevalence of MSD among artisanal fishing workers, with no differences between the categories of shellfish gatherers and small boat fishermen. It also made it possible to characterize the profiles of artisanal fishing workers with MSD in the locality in question. The difference in the profiles of these workers was demonstrated. The shellfish gatherers are: younger, with young children, incomplete high school education, they do other work concurrently with fishing, with a squatting working position, and long hours of walking, as well as handling loads by pushing the fish. As for the fishermen: they were older, had no young children, had completed high school, did not practice physical activity, were non-smokers, had headaches and used medication to control the pain, and were always seated while working.

The results indicated a high prevalence of generalized MSD among artisanal fishing workers, regardless of gender. This can be explained by the high exposure of both groups to adverse occupational factors and by the sociodemographic profile of the community studied.

The study has some limitations, such as: the cross-sectional nature of the research, which prevents us from determining the temporal relationship between the independent variables and the outcomes analyzed; the data collection based on participants' self-reports, which may be subject to information bias; and, finally, the restriction of the sample to a specific community, limiting the generalization of the results to other regions and contexts of AF.

It is suggested that longitudinal studies be carried out to better understand the evolution of MSD over time and their relationship with working conditions in the fishing industry, as well as research involving the analysis of preventive strategies and interventions to minimize the impact of MSD on artisanal fishing workers. Finally, there is a need for public policies aimed at the occupational health of workers in the fishing industry, with a view to improving the working conditions and quality of life of this historically neglected professional group.

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