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Analysis of the risk factors that interfere in the health of shellfish gatherers on a beach on the south coast of Pernambuco

Análise dos fatores de riscos sanitários que interferem na saúde das marisqueiras em uma praia do litoral sul de Pernambuco

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Abstract

Objective: To collect and analyze data on health risk factors and their problems in shellfish gatherers on a beach on the south coast of Pernambuco. **Methods:** This cross-sectional study was conducted with data from a face-to-face questionnaire applied to shellfish gatherers between October 2022 and March 2023. Data were analyzed using the Excel 2021 software. In addition, we performed a qualitative and quantitative analysis of fecal coliforms (totals and *Escherichia coli)* from the Maracaípe river and the local supply network, both using the multiple tube method. **Results:** The shellfish gatherers were evaluated regarding their health condition: 60.00% reported symptoms, such as diarrhea, nausea, and vomiting, which correlated with parasitosis or bacteriosis; of these, 44.44% cleaned food only with water. In the analysis of the water, the coliform group was present in the Maracaípe river, inferring that the samples did not meet the potability standards established by the Ordinance GM/MS No. 888 of May 4, 2021, which defines the standards of potability of water for human consumption. **Conclusion:** Shellfish gatherers are subjected to precarious conditions of basic sanitation and health services and are still at risk of waterborne diseases as they consume the water and shellfish collected.

Keywords: Neglected diseases; Parasitic diseases; Health risk; Environment.

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Resumo

Objetivo: Coletar e analisar dados sobre os fatores de riscos sanitários e seus agravos nas marisqueiras de uma praia do litoral sul de Pernambuco. **Métodos:** Foi realizado um estudo descritivo transversal com dados de um questionário presencial aplicado em mulheres marisqueiras, entre outubro de 2022 e março de 2023, e analisados pelo programa Excel 2021. Foi realizada a análise de água qualitativa e quantitativa dos coliformes fecais, totais e *Escherichia coli* do rio Maracaípe e da rede de abastecimento local, ambos pelo método de Múltiplos Tubos. **Resultados:** Foram avaliadas pescadoras artesanais quanto a sua condição de saúde, dentre as quais 60% referem sintomas como diarreia, náusea e vômito correlacionados a parasitose/bacteriose; destas, 44,44% realizam a higienização dos alimentos apenas com água. Na análise da água, revelou-se a presença do grupo coliformes no rio Maracaípe, inferindo que as amostras não atendem aos padrões estabelecidos pela legislação vigente conforme a portaria GM/MS Nº 888 de 04 de maio de 2021, que define os padrões de potabilidade de água para consumo humano. **Conclusão:** O estudo verificou que as marisqueiras se encontram em condições precárias de saneamento básico, carência de serviços de assistência à saúde e há ainda risco de doenças de transmissão de veiculação hídrica visto que a água e os mariscos coletados são ingeridos pela população.

Palavras-chave: Doenças negligenciadas; Doenças parasitárias; Impacto ambiental; Risco sanitário.

INTRODUCTION

According to data from the Brazilian Ministry of Fisheries and Agriculture, about one million artisanal fishermen are registered, whose work results in 45.00% of annual fish production. In addition, the Northeast is the largest producer of fish, accounting for 31.70% of national production[1]. Studies have documented a visible gender and social division of labor in artisanal fishing, in which men practice deep-sea fishing, and women take care of land-based tasks; the latter represents 50.00% of the total workers with shellfish harvesting activities operating in all phases of product handling (i.e., from collection to commercialization)[2].

Within this context, the shellfish gatherers emerged, who were historically conditioned to master the art of cooking[3]. Thus, artisanal fishing became important to these women since this work increased their family income and subsistence. The Maracaípe river, the location of shellfish harvesting activity conducted by these women, is practically urban, facilitating the presence of fecal or thermotolerant coliforms associated with the poor sanitary conditions in this area, which can directly affect the health of this population[4].

Escherichia coli is among the main etiological agents identified in outbreaks of foodborne diseases in Brazil. The *Escherichia coli* infection is typically transmitted by consuming contaminated water or food, such as undercooked meat products and raw milk. Thus, its presence indicates fecal contamination, probably due to a lack of hygiene during food handling or the use of

contaminated water (or both)[5]. In addition, the increasing prevalence of multidrug-resistant coliforms is concerning since it makes antibiotic therapy fail in many cases[6].

Other microorganisms that can be transmitted to humans via the fecal-oral route include *Cryptosporidium* spp. and *Giardia* spp. In 2016, 4,786 foodborne and waterborne outbreaks were reported in Europe, of which 0.40% were due to parasites *Cryptosporidium*, *Giardia*, and *Trichinella*[7]. However, this number may be underestimated due to the large number of outbreaks caused by an unknown agent (36.00%). Contaminated water to wash fruit and vegetables and poor hygiene conditions during food processing or preparation may be among the causative agents. Therefore, shellfish gatherers are exposed to constant sanitary risks, and they are part of a less favored social group, being victims of a lack of health care and social invisibility[8].

The health conditions of shellfish gatherers highlight a more precarious situation than the urban population because of the deficiency in the area of environmental sanitation, which is one of the most important social determinants of health[9]. In this context, this study aimed to evaluate the health indicators of shellfish gatherers by the application of questionnaires and analyzing total coliforms, thermotolerant coliforms, and *Escherichia coli* in the water of the Maracaípe river and the local supply source.

METHOD

This cross-sectional study used data from questionnaires applied in person and the collection occurred between October 2022 and March 2023. The questionnaires were designed based on the epidemiological discussion and risk factors related to the context of the shellfish gatherers, and the sample acquisition process was probabilistic. The questionnaire included questions about the socioeconomic characteristics, sanitary conditions, health status, and access to primary health services among the shellfish gatherers of Maracaípe/Porto de Galinhas.

The participants were invited to participate in the study spontaneously after the explanation of the research topic. Those who agreed to participate signed the informed consent form. The inclusion criteria considered women shellfish gatherers aged over 18 years.

The data were calculated and tabulated considering valid responses from the collected information no information was lost. Researchers applied 44 questionnaires, and the results were presented as tables and graphs with their respective absolute frequencies. The analysis of the obtained data was organized and performed using Word 2020 and Excel 2021 softwares.

Two 500mL samples of water were collected: one from the Maracaípe river and the other from the local watter supply. Samples were analyzed using the multiple tubes methodology, following the Consolidation Ordinance No. 5 of the Ministry of Health (MS) from October 3, 2017[10].

RESULTS

The study involved women who worked as shellfish gatherers; their mean age was from 20 to 29 years (42.20%), and most were brown (53.30%). Regarding educational level, the predominant category was incomplete elementary education (35.56%); most (97.77%) had an income of up to 1 minimum wage, and 40.00% had more than four children (Table 1).

Most (51.11%) shellfish gatherers reported walking barefoot all day, and about 20.00% did not have a sewage system in their households. Moreover, 60.00% have heard of good food hygiene practices, but 44.44% of them cleaned food using only water or water and soap (24.44%) (Table 1).

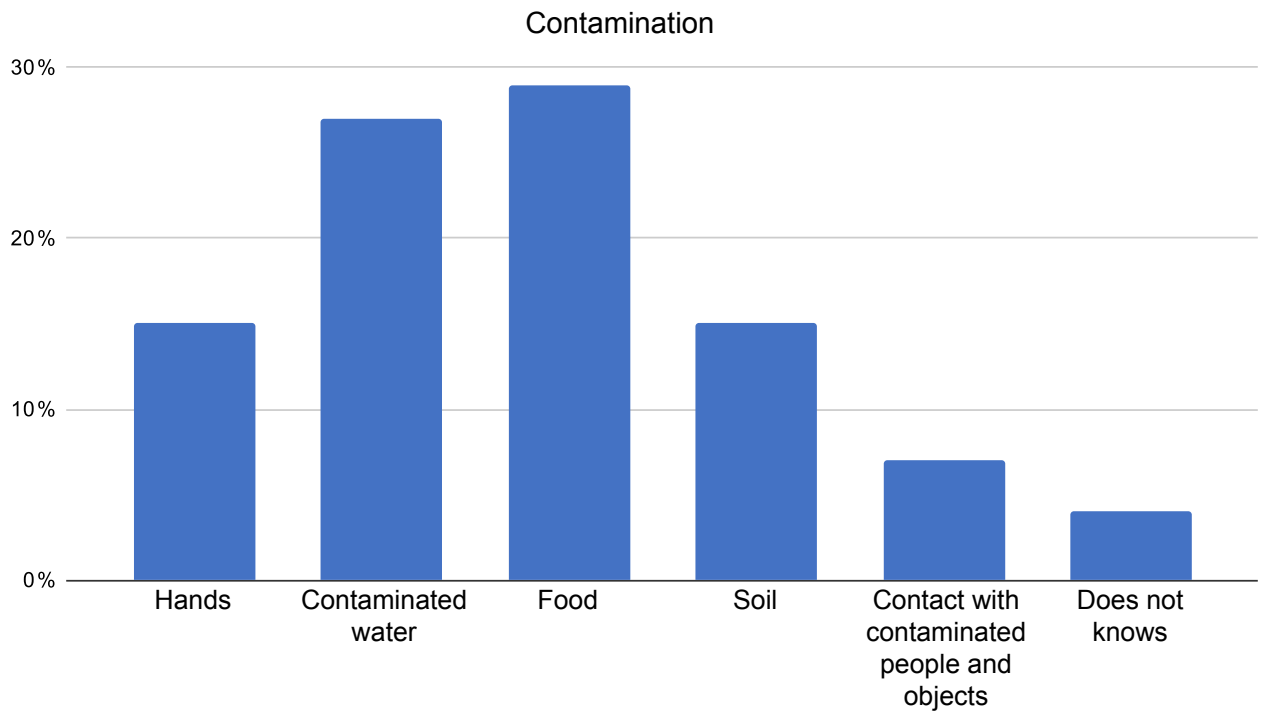
Table 1. Sociodemographic data and health and sanitary conditions of shellfish gatherers - Ipojuca, Pernambuco, Brazil, 2023

AGE	**N**	**%Total**
20–29	19	42,22%
30–39	12	26,67%
40–49	9	20,00%
50–59	5	11,11%
SKIN COLOR		**%Total**
Brown	24	53,33%
Black	13	28,89%
White	6	13,33%
Yellow	2	4,44%
EDUCATION LEVEL		**%Total**
Elementary school incomplete	16	35,56%
Complete elementary school	2	4,44%
High school complete	14	31,11%
High school incomplete	7	15,56%
Never studied	6	13,33%
NUMBER OF CHILDREN		**%Total**
0	3	6,67%
1	6	13,33%
2	9	20,00%
3	9	20,00%
≥4	18	40,00%
INCOME		**%Total**
= 1 minimum wage	44	97,77%
> 1 minimum wage	1	2,20%
SANITARY SEWAGE		**%Total**
Yes	36	80,00%
No	9	20,00%

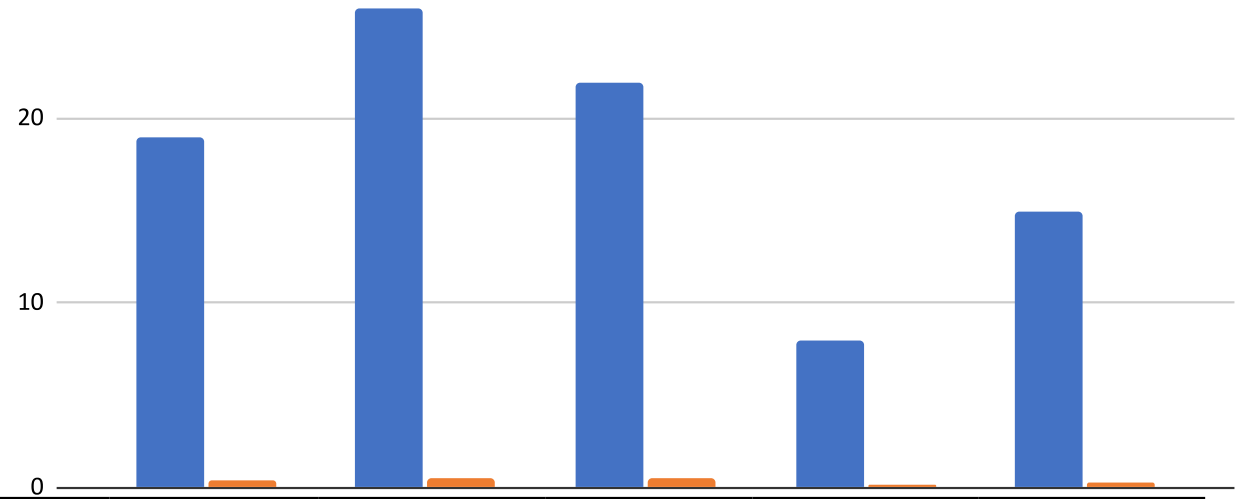
WALK BAREFOOT		**%Total**
Yes	23	51,11%
No	22	48,89%
UNDERSTANDS FOOD HYGIENE		**%Total**
Yes	27	60,00%
No	18	40,00%
HOW TO SANITIZE FOOD		**%Total**
Water	20	44,44%
Soap and water	11	24,44%
Bleack	14	31,11%
CONTACT WITH PARASITOSIS OR BACTERIOSIS		**%Total**
Yes	30	66,67%
No	15	33,33%
SYMPTOMS OF PARASITOSIS OR BACTERIOSIS		**%Total**
Diarrhea, nausea, and fever	27	60%
Does not know	18	40%
ACCESSIBILITY TO HEALTH SERVICES		**%Total**
Good	4	8,89%
Fair	9	20,00%
Unsatisfactory	25	55,56%
Non-existent	7	
NUMBER OF MEDICAL APPOINTMENTS		**%Total**
Every month	16	35,56%
1 to 2 times a year	12	26,67%
Only in emergencies	17	37,78

Hence, a significant portion of the participants reported knowing the means of transmission of parasites or bacterial diseases: most mentioned contact with contaminated water and food, and few referred to contaminated soil and contact with contaminated people and objects (Figure 1).

Most participants (66.67%) had contact with any parasitic or bacterial disease, but most were not diagnosed by a doctor, and 55.56% reported unsatisfactory access to the health system. Furthermore, 60.00% of shellfish gatherers reported symptoms associated with parasitosis or bacteriosis, such as diarrhea, nausea, and vomiting (Table 1). Also, 37.78% of the participants had medical appointments only in emergencies (Table 1).



Regarding treatment, Participants reported having treated possible parasitosis or bacteriosis with a “single dose”, referring to “Albendazole”, or having treated it with teas, homemade oral rehydration solution, and “mangaba milk” (57.68%) (Figure 2).



	“Single dose”	Tea, herbs and “mangaba milk”	Prescribed by the doctor	Neighbor or friend taught	I know how to treat
N	19	26	22	8	15
T (%)	42.22%	57.68%	48.88%	17.77%	33.33%

Figure 2. Answers of the shellfish gatherers on knowledge of parasitosis or bacteriosis treatment. Ipojuca, Pernambuco, Brazil, 2023

Considering the contact with possible sources of parasitic contamination, the water was analyzed. All samples from the Maracaípe river revealed the presence of the coliform group using qualitative and quantitative analysis (Table 2).

The quantitative result of the analysis was expressed as the most probable number (MPN) of microorganisms, and the test estimated the density of viable microorganisms present in the sample, revealing a result of more than 23 in 100 milliliters. Thus, the samples did not meet the potability standards of water for human consumption, considering the GM/MH Ordinance No. 888 of May 4, 2021.

Table 2. Analysis of water samples collected from the Maracaípe river and the Piped Network. Ipojuca, Pernambuco, Brazil, 2023

ANALYZED CONTENT	QUALITATIVE RESULTS	QUANTITATIVE RESULTS
Total coliforms **(river)**	Presence in 100/mL	> 23NMP/100mL
Thermotolerant coliforms **(river)**	Presence in 100/mL	> 23NMP/100mL
*Escherichia coli (**river)***	Presence in 100/mL	> 23NMP/100mL
Total coliforms **(plumbed network)**	Presence in 100/mL	<1,1NMP/100mL
Thermotolerant coliforms **(plumbed network)**	Presence in 100/mL	<1,1NMP/100mL
Escherichia coli **(rlumbed network)**	Presence in 100/mL	<1,1NMP/100mL

NMP = most probable number.

The main water samples met the standards established by current legislation in accordance with GM/MH Ordinance No. 888 of May 4, 2021, revealing the absence of the coliform group in qualitative and quantitative analysis (Table 2).

DISCUSSION

The present study leads to a discussion on the analysis of public policies in Maracaípe, PE, especially regarding the improvement in access of shellfish gatherers to an efficient primary healthcare policy. Most of these women were young, earned low salaries, and had a low educational level. These data corroborate the literature, which shows that most shellfish gatherers started working as shellfish gatherers in childhood, had a family income of less than one minimum wage, and worked a mean of 40 hours a week without ever having a formal job. These findings corroborate our results, in which most participants were between 20 and 29 years old and started working in childhood[11,12].

Men are likely to be fishermen or boatmen in fishing communities. Historically, women

have come to be recognized as shellfish gatherers; however, they also did the art of fishing. Thus, women have to work in extracting, preparing, and selling shellfish. In addition, studies showed that shellfish gatherers have a triple workload, performing in fishing activities, domestic work, and being caregivers for children, men, and older people in their families[13,14].

This study showed that the shellfish gatherers of Maracaípe (Pernambuco) have been living in precarious sanitary conditions, with open-air garbage, no sewage system, and little instruction in hygiene measures, which are important for disease prevention. These findings corroborate the literature that evidences precarious working conditions, such as physical overload and precarious healthcare conditions for people working in inhospitable and polluted fishing areas[15].

The workloads present in the work process of shellfish gatherers involve weight overload, long working hours, unhealthy postures, and repetitive movements. They also work in contact with waters contaminated by industrial pollution, pesticides, and other agents. Understanding this work in the health-disease process and the social determinants surrounding the lives of these workers allows the understanding of the vulnerability and precarious working conditions in which they are inserted[15,16].

Water for human consumption is for ingestion, food preparation and production, and personal hygiene, regardless of its origin. Thus, this water must meet potability standards to avoid risks to human health. Among the parameters for evaluating potability, the legislation establishes the presence of total and thermotolerant coliforms(preferably *Escherichia coli*) and the count of heterotrophic bacteria[17].

The present study found that the water consumed by the shellfish gatherers presented high levels of microbiological contamination (i.e., the presence of total coliforms, fecal coliforms, and *Escherichia coli)*. However, the water distributed by the *Companhia Pernambucana de Saneamento* (COMPESA) was within the potability standards required byOrdinance 888/2021 of the Ministry of Health[10,18].

The ingestion of untreated or contaminated water may cause several diseases because of the presence of pathogenic microorganisms. According to the World Health Organization, many of these diseases cause acute diarrhea, leading to dehydration. This disease ranks ninth among causes of death worldwide and is the second leading cause of death in children under five years, resulting in 361,000 deaths per year in this age group. In addition, most acute diarrhea cases (80.00%) are the result of drinking water that is unfit for consumption[19].

The consumption of unsuitable water where the basic sanitation system is precarious or absent, and hygiene practices are scarce directly affects the lives of the population[20]. Although the analysis of COMPESA water was within parameters, the water of the Maracaípe river, where shellfish gatherers work, is also used for human consumption; therefore, its contamination can directly affect the health of the population. However, the population is not instructed on these

risks, according to the questions about local healthcare[17]. In this context, guidance on alternative methods for household water treatment (e.g., chlorination and filtration) can be provided by cleaning the reservoir periodically and adding two drops of sodium hypochlorite/L (concentration of 2.50%); the water can be ingested after 30 minutes. This simple measure is effective in reducing total bacteria, total coliforms, and thermotolerant coliforms.

Furthermore, parasites, protozoa, and bacteria are often isolated from fish, shrimp, bivalve mollusks, and crabs. Although these animals are part of the human diet, they can be pathogenic to humans[20], including the shellfish gatherers who use fishing for sale and consumption. Moratal et al.[21] identified the presence of protozoan parasites *Cryptosporidium* spp., *Giardia* duodenalis, and *Toxoplasma gondii* in aquatic environments contaminating shellfish, which presents a new potential risk of protozoan infections transmitted by the consumption of marine animals. These parasites can cause diarrhea, weight loss, and poor food absorption, and affect the liver, heart, intestines, and brain. These health consequences bring socioeconomic losses to the population.

Pena and Gomez[22] evidenced that the epidemiological data on shellfish gatherers are scarce, and their work-related diseases are underreported, making it unfeasible to conduct actions aimed at these women.

The results of this study show that these women, who depend on shellfish fishing, need more public health policies to cover this territory effectively. Therefore, the results provide support for the discussion on primary care coverage in Maracaípe, as well as managers and researchers. Full health coverage for this population is only possible with government funding that makes it possible to offer access to health comprehensively and efficiently, increase the number of teams in local primary care, and conduct the activities inherent in the health system.

CONCLUSION

The present study allows us to infer that the shellfish gatherers of Maracaípe live in precarious conditions of basic sanitation and lack healthcare services based on the needs of the community, including actions to promote, prevent, and treat parasitic diseases.

In addition, the Maracaípe river was contaminated with fecal and total coliforms and *Escherichia coli*. This result is in disagreement with the microbiological standards established by Brazilian legislation for human consumption, which may lead to the transmission of waterborne diseases and the contamination of shellfish used for consumption, directly contributing to the morbidity of this population.

CONFLICT OF INTEREST

Nothing to declare

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AUTHOR CONTRIBUTIONS:

LSP: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project management, Resources, Validation, Writing - original draft. **MAL and MVA:** Conceptualization, Data curation, Investigation, Methodology, Resources, Validation, Writing - revision and editing. **KAF:** Data curation, Formal analysis, Methodology, Resources, Writing - review and editing. **AEM:** Conceptualization, Data curation, Writing - original draft, Project management, Resources, Supervision, Writing - review and editing. All authors approved the final version.

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