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Clinical variables considered risk factors for the metabolic syndrome: a cross-sectional study

Variáveis clínicas consideradas fatores de risco para a síndrome metabólica: um estudo transversal

Variables clínicas consideradas factores de riesgo para síndrome metabólico: un estudio transversal

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ABSTRACT

Objective: To identify the main risk factors for metabolic syndrome and its relationship with the perception of quality of life in Brazilian fishing colonies. **Methods:** We included 77 participants aged > 18 years. Metabolic syndrome and quality of life were the main study outcomes. We considered a significance level < 0.05 and all procedures were approved by the ethics committee. **Results:** Most participants are male, single, economic class D-E, working hours of 6 to 8 hours, length of service from 1 to 5 years, and dedicated exclusively to fishing. **Conclusion:** Abdominal perimeter and blood pressures were the most frequent criteria and the greatest contribution to metabolic syndrome. Although quality of life had a higher score for the social relationship domain, in this study, the physical domain was the only one associated with another observation, in which we observed a significant correlation with systolic blood pressure.

Keywords: Health Policy; Anthropometry; Public Health; Quality of Life; Vulnerable Populations.

RESUMO

Objetivo: Identificar os principais fatores de risco para a síndrome metabólica e sua relação com a percepção da qualidade de vida em colônias pesqueiras brasileiras. **Métodos:** Incluímos 77 participantes com idade > 18 anos. Síndrome metabólica e qualidade de vida foram os principais desfechos do estudo. Consideramos nível de significância < 0,05 e todos os procedimentos foram aprovados pelo comitê de ética. **Resultados:** A maioria dos participantes é do sexo masculino, solteiros, classe econômica D-E, carga horária trabalhada de 6 a 8 horas, tempo de serviço de 1 a 5 anos e dedicados exclusivamente à pesca. **Conclusão:** Perímetro abdominal e pressão arterial foram os critérios mais frequentes e de maior contribuição para a síndrome metabólica. Apesar de a qualidade de vida apresentar maior escore para o domínio relações sociais, neste estudo, o domínio físico foi o único associado a outra observação, na qual observamos correlação significativa com a pressão arterial sistólica.

Palavras-chaves: Política de Saúde; Populações Vulneráveis; Saúde Pública; Síndrome Metabólica; Qualidade de Vida.

RESUMEN

Objetivo: Identificar los principales factores de riesgo del síndrome metabólico y su relación con la percepción de la calidad de vida en las colonias pesqueras brasileñas. **Métodos:** se incluyeron 77 participantes mayores de 18 años. El síndrome metabólico y la calidad de vida fueron los principales resultados del estudio. Se consideró un nivel de significancia <0.05 y todos los procedimientos fueron aprobados por el comité de ética. **Resultados:** La mayoría de los participantes son hombres, solteros, clase económica D-E, jornada laboral de 6 a 8 horas, antigüedad de 1 a 5 años y dedicados exclusivamente a la pesca. **Conclusión:** La circunferencia de la cintura y la presión arterial fueron los criterios más frecuentes y la mayor contribución al síndrome metabólico. Aunque la calidad de vida tuvo una puntuación más alta para el dominio de relaciones sociales, en este estudio, el dominio físico fue el único asociado con otra observación, en la que observamos una correlación significativa con la presión arterial sistólica.

Palabras clave: Calidad de Vida; Poblaciones Vulnerables; Política de Salud; Salud Pública; Síndrome Metabólico.

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INTRODUCTION

Noncommunicable diseases are responsible for 38 million deaths worldwide, 16 million occur between 30-70 age, 85% in developing countries. In Brazil, they are related to high morbidity and mortality rates and 70% of health expenditures; among them is a metabolic syndrome, abdominal obesity (verified via the perimeter in cm), dyslipidemia, dysglycemia, and hypertension,[1] with the prevalence of 20 to 35% and more observed in males.[2,3]

Unfavorable conditions, socioeconomic and demographic vulnerabilities (such as inaccessibility to health services, drinking water, and sanitary sewage) are related to various diseases and cause impacts on the quality of life.[4] These susceptibility conditions are present in communities inhabited by artisanal fishermen (workers who earn income from extractive fishing followed by the fish trade); these fishermen are exposed to factors that weaken health and affect the quality of life, such as: precarious work environments, excessive workload, occupational stress, sleep disorders, and high energy expenditure.[4]

However, there is a scarcity of studies on metabolic syndrome and quality of life in vulnerable populations, and this makes it difficult to design health policy to promote, protect and/or recover the health of this population; itis in this perspective that the justification for conducting this study is supported. Our aim was to identify the main risk factors (Glycemia, Blood pressure, Triglycerides, HDL-cholesterol, Abdominal perimeter, Body Mass Index) for metabolic syndrome and its relationship with the perception of quality of life in Brazilian fishing colonies.[5]

METHODS

A cross-sectional epidemiological study conducted according to the guidelines of the STrengthening the Reporting of OBservational studies in Epidemiology.[6] Sociodemographic characteristics were used as exposure variables and metabolic syndrome was the outcome variable.[7]

In the state of Tocantins (northern Brazil), there are 36 fishing colonies registered with the Institute of Rural Development of the State of Tocantins. Among them, the colonies were selected "Z22" and "Porto Real", located in the vicinity of the Tocantins River basin—the second largest river in Brazil (172.828km^2).[5]

We held meetings with the presidents of the fishermen's colonies (2019) and explained the details of the research. We started the collection (abdominal perimeter, blood pressure, fasting glycemia, triglycerides and HDL serum cholesterol, body mass index, WHOQOL-bref and sociodemographic questionnaire) only after signing the free and informed consent form of each participant. The study is in accordance with the Declaration of Helsinki and all procedures were previously approved by the ethics committee for research with human (Resolutions 196/1996 and 466/2012) beings of a higher education institution (graduate and postgraduate) in Brazil (number: 3219733). All artisanal fishermen were invited ≥ 18 years registered in the selected colonies: 132 fishermen (men and women, 77 of the Z-22 colony, located in the municipality of Ipueiras-TO and 55 in the Porto Real colony,

located in the city of Porto Nacional-TO). Participation in the study was voluntary.

Metabolic syndrome and quality of life were the main outcomes of this study; additionally, we verified the presence of metabolic disorders (abdominal obesity, hypertriglyceridemia, dyslipidemia, low HDL, hypertension, and fasting hyperglycemia), and according to the National Cholesterol Education Program-Adult Treatment Panel III.[8] The perception of quality of life was evaluated through the World Health Organization Quality of Life(WHOQOL-bref).

We considered socioeconomic, demographic, anthropometric data (abdominal perimeter and BMI), biochemical analyses (glucose, HDL-cholesterol, and triglycerides), blood pressure, and WHOQOL-bref scores. Metabolic syndrome and perception of quality of life are outcome variables; the others are exposure variables.

To determine metabolic syndrome, the diagnostic criteria established by the National Cholesterol Education Program-Adult Treatment Panel III (Table 1), which defined the presence of three of the five components adopted and that do not distinguish ethnicity, making them convenient for the sample studied. BMI was classified according to the world health organization: low weight (≤ 18.5), recommendable (18.5-24.9), overweight (25-29.9), obesity I (30-34.9), obesity II (35-39.9), and obesity III (≥ 40).[9]

WHOQOL-bref instrument comprises 26 facets (one item per each facet) clustered into four domains:[10] (i) Physical Health (7 facets, pain and discomfort; energy and fatigue; sleep and rest; mobility; activities of everyday life; dependence on medication or treatments; work capacity), (ii) Psychological (6 facets, positive feelings; thinking, learning, concentration memory; self-esteem; body image and appearance; negative feelings; spirituality/religion/personal beliefs), (iii) Social Relationships (3 facets, personal relationships; sexual activity; social support), and (iv) Environment (8 facets, physical security and protection; home environment; financial resources; health and social care: availability and quality; opportunities to acquire new information and skills; participation in recreation/leisure opportunities; physical environment: pollution/noise/climate; transport),[11] and 2 items of a general nature: (i)

Table 1. Diagnostic criteria for metabolic syndrome (NCEP-ATP III).

Variables	Values
Triglycerides (mg/dL)	> 150
HDL-cholesterol (mg/dL)	
Man	< 40
Woman	< 50
Blood pressure (mmHg)	≥ 130/85
Abdominal perimeter (cm)	
Man	≥ 102
Woman	≥ 88
Glucose (mg/dL)	≥ 110

Source: elaborated by the authors

first, an item asking how the respondent would rate his/her quality of life (labeled as "overall QOL"), and (ii) second, an item asking how the respondent would rate his/her satisfaction with his/her health (labeled as "overall health"). All WHOQOL-bref facets are measured using a five-point Likert scale (1 to 5), with the F1.4, F11.3 and F8.1 measured on an inverted scale.[12] The main characteristics of the WHOQOL-bref instrument are as follows: (i) it is cross-cultural; (ii) it can be applied to individuals living in different contexts; (iii) it is capable of capturing individuals' own views of their well-being; and (iv) it should be self-administered if participants reveal enough reading skills.[13]

The characterization of socioeconomic status was performed through the Brazilian Economic Classification questionnaire;[14] we added questions of characterization of the participants (gender and age). Biochemical measurements were collected by venous puncture and after fasting from 8 to 10 hours, 5 mL of blood in a tube without anticoagulant, glucose measurement by colorimetric enzymatic method, and triglyceride HDL cholesterol measurement by colorimetric enzymatic method with automated spectrophotometer reading.[15,16]

All participants had a diagnosis of arterial hypertension issued by medical report, also, we measured blood pressure using an aneroid sphygmomanometer and stethoscope, according to the recommendations of the VII Brazilian Hypertension Guideline; the abdominal perimeter by means of anthropometric tape, according to the recommendation of the World Health Organization (between the last rib and the iliac crest); height with a Dry Wall Stator 206; and body mass with an Omron HBF 514.

To minimize the bias of data collection and tabulation, all measurements were performed by a previously trained team and the database was filled out with independent double typing and validation by a third independent researcher.

There were no studies that estimated the prevalence of metabolic syndrome in artisanal fishermen, considering as a parameter to calculate the sample size the variation in prevalence (14.9 to 65.3%) found by Vidigal et al.[17] in a systematic review on the prevalence of metabolic syndrome in adults, we, therefore, estimated a minimum sample size of 50 participants.

We used the Shapiro Wilk test to verify the normality of the data, in which the quantitative ones were presented by means and standard deviation. We used the Pearson test to verify the relationship between metabolic syndrome and the perception of quality of life ($\alpha = 0.05$).

RESULTS

We included 132 participants, however, there was a sample loss of 55 participants who did not agree to: collect biochemical samples, answer the questionnaires, sign the free and informed consent form, attend on the day of collection. The final sample consisted of 77 artisanal fishermen registered in the Z-22 colonies, located in the municipality of Ipueiras-TO, and Porto Real colony, located in the city of Porto Nacional-TO.

Most of the participants were male, single, economy class D-E, workload worked from 6 to 8 hours, the service time of 1 to 5

years, dedicated exclusively to fishing. Table 2 presented the details of demographic and economic characteristics.

We observed that: abdominal perimeter and blood pressures were the most frequent criteria and the greatest contribution to the diagnosis of metabolic syndrome (Table 3); and the perception

Table 2. Demographic and economic characteristics of the sample – Brazilian fishermen residing in the state of Tocantins (n = 77).

Variables	n	%
Sex		
male	47	61.04
female	30	38.96
Companion (not)	44	59.46
Son (total)*		
0	10	13.89
1	6	8.33
2	11	15.28
≥ 3	45	62.50
Economic class		
B2	4	5.19
C1	10	12.99
C2	29	37.66
D-E	34	44.16
Workload (hours)*		
6-8	27	40.91
10-12	18	27.27
> 12	21	31.82
Rest (hours)*		
0	15	21.13
1	32	45.07
2	24	33.80
Service time (years)*		
< 1	14	18.92
1-5	23	31.08
6-10	21	28.38
11-19	10	13.51
> 20	6	8.11
Workplaces*		
1	57	82.61
2	11	15.94
3	1	1.45

Source: elaborated by the authors
* Observation in which only a part of the sample responded to the variable.

of quality of life had the highest score in the social relations domain (Table 4).

In addition (Table 5), we observed a significant correlation between the physical domain and systolic blood pressure (weak correlation magnitude).

Table 3. Variables of risk factors for the onset of metabolic syndrome – Brazilian fishermen residing in the state of Tocantins (n = 77).

Variables	n	%	Mean (SD)
Glycemia (mg/dL) #			109.62 (43.42)
Ideal	49	74.24	
Risk	17	25.76	
Blood pressure (mmHg)			124.65 (16.50); [a] 78.66 (12.70) [b]
Ideal	41	53.25	
Risk	36	46.75	
Triglycerides (mg/dl) #			148.93 (94.34)
Ideal	49	66.22	
Risk	24	33.78	
HDL-cholesterol (mg/dl) #			47.20 (10.58)
Ideal	46	62.16	
Risk	28	37.84	
Abdominal perimeter (cm)			96.83 (10.85)
Ideal	39	50.65	
Risk	38	49.35	
Body Mass Index (kg/m²)			27.31 (4.92)
Low weight	1	1.30	
Lean	27	35.06	
Overweight	30	38.96	
Obesity	19	24.68	

Source: elaborated by the authors
SD: Standard Deviation. # Observations with sample loss – the absence of the participant in the collection of blood samples; [a] Systolic Blood Pressure; [b] Diastolic Blood Pressure.

DISCUSSION

By estimating the prevalence of metabolic syndrome and analyzing the factors associated with metabolic syndrome in artisanal fishermen, we found a prevalence of metabolic syndrome of 32.47%, being more prevalent in males, and who have only family income from fishing. Regarding the risks of developing the metabolic syndrome, 74.24% had ideal glycemic values, 49.35% had their abdominal perimeter at risk and 46.75% had a risk for arterial hypertension. Regarding the perception of quality of life, we found that the social relationship was better evaluated by fishermen and the environment had the lowest score. We observed a positive and statistically significant relationship between the physical domain and systolic blood pressure when relating quality of life to the risk of developing metabolic syndrome.

Metabolic syndrome is a serious public health problem affecting about 25% of the world population, its presence is associated with the development of cardiovascular problems, accounting for 7% of mortality and 17% of deaths related to chronic diseases.[18] The overall prevalence of metabolic syndrome found in this study was 32.47%, higher than the overall prevalence.

The population of fishermen registered in The Z22 Colonies located in Ipueiras and Porto real in Porto Nacional, Tocantins, presented a moderate risk (32.47%) for the development of cardiovascular diseases, according to the classification adopted by the NCEP-ATP. The prevalence can, therefore, be altered according to the classification criteria used (this shows the fragility of the evidence in this context, which leaves room for different interpretations).

Although few studies have evaluated the metabolic syndrome in artisanal fishermen, a study conducted in the Pontal da Barra community, in the municipality of Maceió-AL conducted with fishermen, had a prevalence of 49% of the population studied with metabolic syndrome, using the same criteria used in the present study.[19]

Social determinants, especially poverty, have a great correlation with the frequency and intensity of risk factors for non-communicable diseases and diseases, being an important risk factor in the evolution of cardiovascular diseases in the most vulnerable populations.[1] The high prevalence of metabolic syndrome

Table 4. Descriptive data of the quality-of-life domains of the sample – Brazilian fishermen residing in the state of Tocantins (n = 77).

Domains	Mean	SD	Minimal	Maximum
Physical (score)	15.51	2.19	7.43	20.00
Psychological (score)	15.63	2.12	10.40	19.33
Social relations (score)	15.92	2.37	9.33	20.00
Environment (score)	13.01	2.13	9.50	18.50
Self-assessment (score)	14.63	2.49	10.00	20.00
Overall quality of life (score)	14.72	1.81	8.17	18.77

Source: elaborated by the authors
SD: Standard Deviation.

Table 5. Relationship between risk factors for the onset of metabolic syndrome with quality of Life – Brazilian fisherman residing in the state of Tocantins (n = 77).

Variables	Physical		Psychological		Social relations		Environment		Self-assessment	
	r	p*	r	p	r	p	r	p	r	p
Glycemia	-0.544	0.6669	0.0173	0.8912	-0.006	0.9584	0.1344	0.2857	0.0708	0.5754
Triglycerides	0.1002	0.4199	-0.0297	0.8115	-0.0910	0.4673	0.0726	0.5591	-0.0649	0.6016
HDL	0.0278	0.8231	0.0545	0.6616	-0.0319	0.7993	-0.2096	0.0887	0.1098	0.3763
SBP	0.2705	**0.0235**	0.1413	0.2432	0.0887	0.4685	0.0317	0.7945	0.0346	0.7760
DBP	0.2010	0.0952	-0.0018	0.9880	-0.0815	0.5057	0.0235	0.8469	-0.0161	0.8947
BP	-0.0020	0.9868	-0.0815	0.5025	0.1652	0.1748	0.2142	0.0749	-0.1997	0.0974
BMI	-0.0131	0.9144	-0.1032	0.3952	0.1820	0.1344	0.1878	0.1196	-0.1234	0.3087

Source: elaborated by the authors
SBP: Systolic Blood Pressure; **DBP:** Diastolic Blood Pressure; **BP:** Blood Pressure; **BMI:** Body Mass Index. **r:** Pearson test; ***** Significance level (p < 0,05).

in this study may be justified in part by the socioeconomic and demographic vulnerability to which they are exposed, as well as low schooling and difficult access to health services, conditions that directly influence the development of diseases.

Variables with the highest prevalence, in this study, were: increased abdominal perimeter (man ≥ 102; woman ≥ 88), high blood pressure (≥ 130/85), low HDL-C levels (Man < 40, woman <50), and increased triglyceride level (>150). Eating habits may be related to the nutritional context of this population, which is, therefore, something that deserves further studies.[20]

BMI and abdominal perimeter of the fishermen are altered. It was observed that the abdominal perimeter was the variable with the highest predicting power for the development of metabolic syndrome. Abdominal fat contributes to the high risk of myocardial infarction and has been the most prevalent indicator in the diagnosis of metabolic syndrome.[21]

In a study conducted by Pires et al.[22] in northern Angola, high BMI and central obesity have been strongly associated with cardiovascular diseases. These authors reinforce the importance of strategies for prevention, early diagnosis, and access to drug treatment for cardiovascular comorbidities. The increase in the circumference/perimeter of the abdomen (central obesity) is related to socioeconomic and cultural changes around the world (those caused significant changes in food consumption and in the number of activities, with a predominant increase in sedentary women).[23]

Metabolic syndrome is firmly correlated with social determinants because it influences food, physical activity, and unhealthy lifestyle habits, and may contribute to the onset of chronic diseases.[24] This fact can be explained by the high prevalence of pre-obesity and obesity found in this study, corroborating the fact that obesity is a triggering factor of metabolic syndrome in this population.

We observed that hypertension had a considerable prevalence (46.75%), and this finding corroborates a study carried out by Barbosa et al.[19], with fishermen, as it showed that 38% of

the studied population were hypertensive and 32% were pre-hypertensive. Considered one of the most prevalent diseases in the world population, hypertension configures itself as a public health problem, being the main risk factor for cardiovascular morbidity and mortality and its consequences represent a high frequency in emergency services in Brazil and is a challenge for primary care the health.[25]

Although the Brazilian Society of Diabetes describes that diabetics are at high risk for chronic diseases, in our study, the low percentage of diabetics (25.76%), as well as in the study by Barbosa et al.[19] (5%), diabetes does not seem to represent one of the important findings as a risk factor for metabolic syndrome.

However, central obesity seems to be the preponderant factor for the development of metabolic syndrome, which in turn is related to the development of type II diabetes mellitus and changes in blood pressure, which reflects on the quality of life of the population and, therefore,, attention is needed for the search for ways that can prevent or minimize the damage caused by this morbidity.[26]

Regarding the lipid profile of fishermen, 66.22% had triglycerides within the normal range. When analyzing HDL cholesterol, 62.16% presented a value within the desirable range. These findings can be justified by the eating habits of this population, who have a fish-based diet, which has a low saturated fat content.

As for the perception of quality of life of artisanal fishermen, we found that the scores in the social relation's domain had higher evaluation (15.92) and the environment domain, which concerns physical safety, home environment, financial resources, health care among others had a lower rating (13.01). These results can be explained, in part, by the oscillation of living conditions throughout the year linked to the fishing period, working conditions, and commercialization of fish.[27] Also, the quality of life of this population is affected in different ways, e.g., fishermen spend a lot of time working (on the river), their homes have a precarious

environment (poor safety and hygiene), and health care is difficult to access.[5]

When evaluating the correlation between the risk factors for metabolic syndrome and the quality of life domains, only a low correlation was obtained with blood pressure and the physical domain of quality of life. The physical domain comprises the facets of pain and discomfort, energy and fatigue, sleep and rest, mobility, activities of daily living, dependence on medication or treatment, and ability to work.[28]

Although the occupation of artisanal fishermen is among the oldest professions, there is a gap in the literature on studies that assess the health conditions of these individuals. The results obtained in this study are important for a better understanding of fishermen's health and allow for a reorientation of public health promotion policies for similar populations.

When considering the indicators for metabolic syndrome, predominantly associated with lifestyle, it is observed that, despite artisanal fishermen being considered a rural, traditional, riverside population, their lifestyles seem to have changed over the years, favoring the development of non-communicable diseases and conditions, so commonly observed in large urban centers, especially those related to: food consumption, physical exercise, and sedentary behavior.

CONCLUSION

The extrapolation of these results should be viewed with caution; it is recommended to consider, in addition to socio-cultural aspects, the possibility of migration of habits and lifestyles over the years. The implications of these findings for clinical practice support the use of health indicators (body composition, body proportionality, and hemodynamic/metabolic variables) to monitor patients.

The limitations of this study are related to the sample for convenience, absence of information on diet pattern and food consumption and with regard to losses due to non-attendance at any of the stages of the research; in addition, we believe that abdominal perimeter is a limited variable (despite being the most used in studies on metabolic syndrome), as it does not consider body proportionality (i.e., shorter individuals have smaller perimeters, which does not mean lower risks). Finally, we recommend further studies, in this context, that include measurements of central obesity considering height, in order to individualize the body proportionality of each participant (e.g., the waist-to-height ratio).[29–35]

In conclusion, abdominal perimeter and blood pressures were the most frequent criteria and the greatest contribution to the diagnosis of metabolic syndrome. Although quality of life had a higher score for the social relationships domain, in this study, the physical domain was the only one associated with another observation, in which there was a significant correlation with systolic blood pressure.

AUTHOR'S CONTRIBUTIONS

Study design. Allana Lima Moreira Rodrigues. Marcele Pereira Silvestre Gotardelo. André Pontes-Silva. Fernando Rodrigues Peixoto Quaresma. Erika da Silva Maciel.

Data collection or. Allana Lima Moreira Rodrigues. Marcele Pereira Silvestre Gotardelo. André Pontes-Silva. Fernando Rodrigues Peixoto Quaresma. Erika da Silva Maciel.

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Interpretation of results. Allana Lima Moreira Rodrigues. Marcele Pereira Silvestre Gotardelo. André Pontes-Silva. Fernando Rodrigues Peixoto Quaresma. Erika da Silva Maciel.

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Responsibility for all aspects of the content and the integrity of the published article. Allana Lima Moreira Rodrigues. Marcele Pereira Silvestre Gotardelo. André Pontes-Silva. Fernando Rodrigues Peixoto Quaresma. Erika da Silva Maciel.

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