Fecal Immunochemical Test As A Screening Tool For Colorectal Cancer In The Riverside Population Of Lower São Francisco

Teste Imunoquímico Fecal Como Ferramenta De Rastreamento Do Câncer Colorretal Em Beiradeiros Do Baixo São Francisco

Prueba Inmunoquímica Fecal Como Herramienta De Detección Del Cáncer Colorrectal En La Población Ribereña Del Bajo São Francisco

RESUMO

Introdução: O câncer colorretal é o terceiro mais incidente no mundo e o segundo em mortalidade. Apesar de prevenível, barreiras como acesso limitado à saúde dificultam a detecção precoce em populações vulneráveis. O estudo avaliou o Teste Imunoquímico nas Fezes como ferramenta acessível para detecção de sangue oculto nas fezes para rastreamento do câncer colorretal em beiradeiros do Baixo São Francisco. Método: Este estudo transversal analisou 415 participantes em 9 municípios ribeirinhos durante expedições em 2022 e 2023, utilizando o Teste Imunoquímico nas Fezes. Resultados positivos foram encaminhados para colonoscopia e a análise estatística foi realizada. Resultado: O trabalho analisou 415 testes imunoquímicos fecais, com positividade de 12,45% em 2022 e 18,39% em 2023. Próspriá (SE) apresentou os maiores índices positivos em ambos os anos. Em 2022, a distribuição dos resultados positivos foi mais dispersa (DP=2,83) e não normal (p=0,004), enquanto em 2023, os dados foram mais uniformes (DP=1,51) e normalmente distribuídos (p=0,416). Conclusão: O Teste Imunoquímico nas Fezes foi eficaz no rastreamento, mas a falta de seguimento e colonoscopias limita a validação. Pesquisas futuras devem focar na padronização e melhorias no acesso a exames.

DESCRITORES; Câncer Colorretal; Programas de Rastreamento; Sangue Oculto; Saúde da População.

ABSTRACT

Introduction: Colorectal cancer is the third most common cancer in the world and the second most common cause of mortality. Although preventable, barriers such as limited access to healthcare make early detection difficult in vulnerable populations. The study evaluated the Fecal Immunochemical Test as an accessible tool for detecting occult blood in feces for screening colorectal cancer in riverside communities in the Lower São Francisco River. Method: This cross-sectional study analyzed 415 participants in 9 riverside municipalities during expeditions in 2022 and 2023, using the Fecal Immunochemical Test. Positive results were referred for colonoscopy and statistical analysis was performed. Result: The study analyzed 415 fecal immunochemical tests, with positivity of 12.45% in 2022 and 18.39% in 2023. Própriá (SE) presented the highest positive rates in both years. In 2022, the distribution of positive results was more dispersed (SD=2.83) and non-normal (p=0.004), while in 2023, the data were more uniform (SD=1.51) and normally distributed (p=0.416). Conclusion: The Fecal Immunochemical Test was effective in screening, but the lack of follow-up and colonoscopies limits validation. Future research should focus on standardization and improvements in access to tests.

DESCRIPTORS: Colorectal Cancer; Screening Programs; Occult Blood; Population Health.

RESUMEN

Introducción: El cáncer colorrectal es el tercero más incidente en el mundo y el segundo en mortalidad. A pesar de ser prevenible, barreras como el acceso limitado a la salud dificultan la detección precoz en poblaciOnes vulnerables. El estudio evaluó la Prueba Inmunoquímica en Heces como herramienta accesible para la detección de sangre oculta en las heces para el rastreo del cáncer colorrectal en las comunidades ribereñas del Bajo São Francisco. Método: Este estudio transversal analizó a 415 participantes en 9 municipios ribereños durante expediciones en 2022 y 2023, utilizando la Prueba Inmunoquímica en Heces. Los resultados positivos fueron derivados para colonoscopia y se realizó el análisis estadístico. Resultado: El trabajo analizó 415 pruebas inmunoquímicas fecales, con una positividad del 12,45% en 2022 y 18,39% en 2023. Própriá (SE) presentó los índices positivos más altos en ambos años. En 2022, la distribución de los resultados positivos fue más dispersa (DP=2,83) y no normal (p=0,004), mientras que en 2023, los datos fueron más uniformes (DP=1,51) y normalmente distribuidos (p=0,416). Conclusión: La Prueba Inmunoquímica en Heces fue eficaz en el rastreo, pero la falta de seguimiento y colonoscopias limita su validación. Investigaciones futuras deben centrarse en la estandarización y mejoras en el acceso a los exámenes.

DESCRIPTORES: Cáncer colorrectal; Programas de rastreo; Sangre oculta; Salud de la población.

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INTRODUCTION

Colorectal cancer is a global public health concern. According to the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO), more than 1.9 million new cases are estimated in 2022, making it the third most common tumor worldwide and the second leading cause of cancer deaths, with 900,000 deaths. [1] In Brazil, this type of cancer also occupies the third position among the most frequent types, with an estimated 45,630 new cases annually between 2023 and 2025, with incidence rates ranging from 7.05 to 28.88 per 100,000 inhabitants. [2]

Associated with behavioral, genetic and occupational risk factors, colorectal cancer represents a significant health challenge. [3-4-5-6] However, due to their high potential for prevention and early detection, screening strategies are opportunities for a major impact on mortality rates [2], including in people outside the age range commonly affected, which is over 50 years old, according to the World Health Organization (WHO) and the Brazilian Society of Coloproctology (SBCP - Sociedade Brasileira de Coloproctologia).

In this perspective, studies indicate that the implementation of screening strategies for detecting occult blood, which include the population over 45 years old, through a minimally invasive technique of high specificity, such as the Immunochemical Test in Feces (TIF), contribute to the prevention and early diagnosis of colorectal cancer. [4,7-8]

However, there are still significant barriers to its approach, especially in populations with limited infrastructure and access to health care, such as those living on the banks of the Lower São Francisco River. In these locations, low coverage of screening programs and insufficient awareness among the population about risk factors and warning signs, such as rectal bleeding, make it difficult to include individuals in preventive strategies. [9]

In this scenario, extension initiatives, such as those carried out in the fifth and sixth scientific expeditions of the Lower São Francisco of the Federal University of Alagoas, offer an opportunity to implement accessible tools, such as TIF, to promote awareness, prevention and early diagnosis of colorectal cancer in vulnerable populations. These expeditions sought to develop an important inter-institutional strategy aimed at contributing to the reduction of social bottlenecks by bringing research and extension actions to the region, among them the inclusion of participants in one of the screening strategies for colorectal cancer. [10-11]

Thus, this study aimed to analyze the Immunochemical Test in Feces as a tool for detecting occult blood for screening colorectal cancer among riverside residents in selected municipalities of the Lower São Francisco.

METHOD

This is a cross-sectional, descriptive and quantitative study, carried out during the 4th and 5th edition of the Lower São Francisco Scientific Expedition, in the months of November 2022 and 2023 respectively, in some riverside municipalities, nine municipalities in 2022 (Piranhas-AL, Pão de Açúcar-AL, Traipu-AL, Propriá-SE, São Brás-AL, Brejo Grande-SE Igreja Nova-AL, Penedo-AL, Piaçabuçu-AL) and eight municipalities in

2023 (Piranhas-AL, Pão de Açúcar-AL, Traipu-AL, Propriá-SE, São Brás-AL, Igreja Nova-AL, Penedo-AL and Piaçabuçu-AL).

The study included 241 participants in 2022 and 174 participants in 2023. The volunteers were selected by the municipal health departments and underwent a complete screening promoted by the expedition, one of which was colorectal cancer screening. The inclusion criteria for colorectal cancer screening were patients selected for the expedition screening who were 45 years of age or older, with no coloproctological complaints. The exclusion criteria were patients diagnosed with colorectal cancer or who had recently undergone a colonoscopy.

The participants signed the Informed Consent Form as established by the Declaration of Helsinki (466/2012) and the Resolution of the National Health Council of Brazil. The project was approved by the Human Research Ethics Committee of the Federal University of Alagoas: opinion No. 5,818,119 for the research in 2022 and opinion No. 6,524,679 for the research in 2023.

The data were statistically analyzed and presented as mean, median and standard deviation. The Shapiro-Wilk test was used to assess data normality. The significance level adopted was 5% ($P \leq 0.05$). All statistical procedures were performed using Jamovi 2.6.19 software.

For the Immunochemical Test in Feces, the stool samples were brought by the patients in an appropriate container and an immunological method was used, the principle of which uses anti-hemoglobin antibodies of high specificity (99.3%) to detect human hemoglobin in the feces. The technique used was the MedTest Occult Blood rapid test (MedLevensohn®), which consists of a chromatographic, lateral flow immunoassay for the qualitative detection of human occult blood in feces that does not require dietary or medication restrictions, bowel preparation, or sedation. The membrane, in the test line region, is pre-coated with anti-hemoglobin antibodies. During the test, the sample interacts with the particles coated with anti-hemoglobin antibodies. The mixture migrates through the membrane by capillary action to interact with the anti-hemoglobin antibodies on the membrane and generate a colored line. The presence of this colored line in the test line region indicates a positive result and its absence indicates a negative result. For the control procedure, a colored line will always appear in the control area of the test. The presence of this line indicates appropriate conditions for performing the test and adequate absorption by the membrane. [12]

The team of laboratory technicians read the tests. If the results were positive, the patients were referred to a coloproctologist who would request a colonoscopy. The results of the colonoscopies could not be collected due to the lack of control over the referrals, which were managed by the regulations for endoscopic examinations in the different municipalities.

RESULTS

The analysis of the Fecal Immunochemical Test as a cancer screening tool is an important step towards prevention and early diagnosis in a simple and fast way. Table 1 shows the relationship between the total number of tests performed in the expedition, the number of positive tests and the number of negative tests in each selected municipality. In the 2022 expedition, the sample consisted of 241 participants and in 2023 there were 174 participants. Of the total 241 immunochemical tests in feces, 30 (12.45%) were positive and of the 174 individuals, 32 (18.39%) were positive. These patients with positive Fecal Immunochemical Tests were referred to the Professor Alberto Antunes University Hospital of the Federal University of Alagoas for colonoscopy, however, regulation in the municipalities may have changed the referrals to other locations, and the patient may have performed it on his own.

In 2022, the city of Brejo Grande (SE) had a rate of 9.52% of positive tests, while Igreja Nova (AL) and São Brás (AL) had the lowest rates, with 2.33% and 4% of positive tests, respectively. On the other hand, Própriá (SE) had the highest rate of positive tests, with 28% of the results. The discrepancies can be justified by different samplings of the municipalities and by different epidemiological scenarios.

In 2023, the city of São Brás (AL) had a rate of 30.43% of positive tests, while Piaçabuçu had the lowest rate, with 11.11% of positive tests. In Própriá (SE) the highest rate was recorded, with 60% of positive test results. As previously highlighted, the variation in sampling of each municipality interfered in the assessment of the percentage of positivity in the municipalities, as can be seen in Table 1.

Table 1 – Results of the Immunochemical Test in Feces in riverside residents of selected municipalities in the Lower São Francisco in 2022 and 2023.

Occult Blood Test						
Municipality	2022			2023		
	Positive	Negative	Total	Positive	Negative	Total
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Piranhas	3 (16,67)	15 (83,33)	18 (100)	4 (17,39)	19 (82,61)	23 (100)
Pão de Açúcar	1 (14,28)	6 (85,71)	7 (100)	4 (12,50)	28 (87,50)	32 (100)
Traipu	1 (9,10)	10 (90,90)	11 (100)	5 (23,8%)	16 (76,2)	21(100)
Propriá	7 (28,00)	18 (72,00)	25 (100)	3 (60,00)	2 (40,00)	5 (100)
São Brás	1 (4,00)	24 (96,00)	25 (100)	7 (30,43)	16 (69,57)	23 (100)
Igreja Nova	1 (2,33)	42 (97,67)	43 (100)	4 (12,50)	28 (87,50)	32 (100)
Penedo	7 (13,73)	44 (86,27)	51 (100)	3 (15,00)	17 (85,00)	20 (100)
Piaçabuçu	7 (17,50)	33 (82,50)	40 (100)	2 (11,11)	16 (88,89)	18 (100)
Brejo Grande	2 (9,52)	19 (90,48)	21 (100)	-	-	-
Total	30 (12,45)	211 (87,55)	241 (100)	32 (18,39)	142 (81,61)	174 (100)

Source: Data collected during the 4th and 5th editions of the Lower São Francisco Scientific Expedition

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Table 2 shows the descriptive statistical analysis of the results of fecal immunochemical tests performed in 2022 and 2023. In 2022, the mean number of positive tests was 3.33, while the median was 2, indicating a right-side asymmetry in the distribution of these results. For negative tests, the mean was 23.4, with a median of 19, suggesting a greater concentration in values close to the center of the distribution. In 2023, the mean number of positive tests increased to 4, with the median also equal to 4, indicating a more balanced distribution in relation to positive tests. Negative results had a mean of 17.8 and a median of 16.5, indicating a slight reduction in central values compared to 2022.

Analysis of the standard deviation revealed greater variability in positive tests in 2022 (2.83) compared to 2023 (1.51), indicating that the results in the first year were more dispersed in relation to the mean. For negative tests, the standard deviation was 13.5 in 2022 and reduced to 8.19 in 2023, reflecting less variability in the data in the second year. This reduction in variability suggests that the results in 2023 were more uniform.

Shapiro-Wilk normality tests indicated that, in 2022, the positive results data (W=0.735, p=0.004) do not follow a normal distribution, while the negative results (W=0.929, p=0.473) are consistent with normality. In 2023, both the positive results (W=0.918, p=0.416) and negative results (W=0.861, p=0.124) indicated that the data can be considered normally distributed.

Table 2 – Descriptive Statistics of the Results of the Immunochemical Test in Feces in Riverside Residents of Selected Municipalities of the Lower São Francisco in 2022 and 2023.

Descriptive Statistics				
	2022		2023	
	Positive	Negative	Positive	Negative
Mean	*3.33*	*23.4*	*4.00*	*17.8*
Median	*2*	*19*	*4.00*	*16.5*
Standard Deviation	*2.83*	*13.5*	*1.51*	*8.19*
Shapiro-Wilk W	*0.735*	*0.929*	*0.918*	*0.861*
Shapiro-Wilk p	*0.004*	*0.473*	*0.416*	*0.124*

Source: Own authorship with the help of Jamovi 2.6.19 software[13].

DISCUSSION

The results of the Fecal Immunochemical Test carried out in municipalities in the Lower São Francisco region show important differences between the years 2022 and 2023, both in the positivity rate and in the general characteristics of the samples. The test has proven to be a useful tool for the search for occult blood, especially in riverside communities, where access to preventive health services can be limited. [9]

In 2022, the overall positivity rate was 12.45%, with an average of 3.33 positive tests per municipality and greater variability, as indicated by the standard deviation of 2.83. In 2023, the positivity rate increased to 18.39%, accompanied by greater consistency in the results, with a standard deviation reduced to 1.51. The median of the results also showed changes: while in 2022 half of the municipalities recorded up to 2 positive tests, in 2023 the value rose to 4, reflecting a significant increase in the positivity rate.

Negative tests also showed a reduction between the years analyzed. The average fell from 23.4 in 2022 to 17.8 in 2023, accompanied by a smaller dispersion of the data (standard deviation from 13.5 to 8.19). This reduction may indicate an improvement in the detection of positive cases, either due to greater adherence to the test or changes in the characteristics of the screened population. [14]

The discrepancies observed between municipalities are notable, such as the high positivity rate in Própriá (SE), which reached 28% in 2022 and rose to 60% in 2023. On the other hand, São Brás (AL) showed a significant increase in positivity, from 4% in 2022 to 30.43% in 2023. In contrast, Piaçabuçu had the lowest rate in 2023, with 11.11%. These differences can be attributed to factors such as variation in sample sizes, local epidemiological characteristics, access to health services and population lifestyle habits.[15]

> “The reduction in the variability of results between years, especially in positive tests, can be interpreted as an advance in the standardization of collection and analysis procedures. [16]”

However, differences between municipalities highlight the need to standardize sample selection and improve access to testing, particularly in less-favored regions. In addition, it is essential to ensure that patients with positive results are appropriately referred for confirmatory tests, such as colonoscopy, minimizing delays and optimizing early cancer detection. [17]

The results obtained in this study have a significant impact on the formulation of health policies aimed at the prevention and control of colorectal cancer in the Lower São Francisco region, making evident the lack of endoscopic examinations in the region, which prevents the evaluation of the effectiveness and validity of colorectal cancer screening, but also for the diagnosis of other digestive system disorders, such as gastritis. [4, 17-18]

Identifying potential obstacles encountered during the implementation of the

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Immunochemical Test in Feces is crucial to improve the effectiveness of the screening program.

> "Logistical issues, such as limited access to health services in remote areas, training of community health workers, lack of awareness about the importance of colorectal cancer screening, and cultural barriers, may influence the performance of the tests and the adherence of the riverside population. [19]"

For future analyses using the Immunochemical Test in Feces in the region, the number of individuals undergoing the test should be the same in all selected municipalities, which will allow for the different behaviors of epidemiological scenarios, represented by different socioeconomic characteristics and access to medical care in each municipality. Ultimately, this will allow for a more comprehensive understanding of the challenges and public health needs of the riverside population in relation to colorectal cancer screening, providing reliable data for decision-making by health management.

Therefore, by addressing these obstacles and implementing corrective measures, it is possible to increase the effectiveness of colorectal cancer screening and, consequently, reduce the prevalence and mortality rate from this disease in the Lower São Francisco region. [4, 17-18-19]

CONCLUSION

The study showed that the Immunochemical Test in Feces is an effective tool for detecting occult blood in feces, standing out for its simplicity and feasibility in riverside communities in the Lower São Francisco. The results showed an increase in the positivity rate between 2022 and 2023, with a reduction in variability, suggesting advances in the standardization of procedures and greater effectiveness in detecting positive cases. Discrepancies between municipalities revealed the influence of local factors, such as access to health services and epidemiological characteristics, reinforcing the need for standardization in sample selection and increased access to the test.

However, the study identified important gaps, such as the lack of standardized follow-up for patients with positive tests, limited by the absence of colonoscopies for diagnostic confirmation and logistical and cultural barriers. These limitations compromise the complete validation of the screening strategy in the region.

Future research should focus on standardizing the number of samples per municipality, analyzing in detail the local socioeconomic and structural conditions, and evaluating the effectiveness of combined strategies, such as educational campaigns and improving the infrastructure for conducting confirmatory tests. Such initiatives will allow a broader understanding of public health needs, optimizing early detection and contributing to reducing colorectal cancer mortality in the region.

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