Epidemiological Profile and Trends in Hospitalizations for Acute Myocardial Infarction in Belém Do Pará (2019-2023): Implications for Public Health

ABSTRACT

Aims: This study aims to analyze the epidemiological profile of hospitalizations for acute myocardial infarction (AMI) in the municipality of Belém do Pará from 2019 to 2023, focusing on trends, demographic characteristics, and implications for public health strategies.
Study design: A quantitative, retrospective, descriptive, and ecological study was conducted, utilizing data from the Ministry of Health's Hospital Information System (SIH/DATASUS) through the TABNET platform.
Place and Duration of Study: The study was carried out in Belém do Pará, Brazil, covering a five-year period from January 2019 to December 2023.
Methodology: Data on hospitalizations for AMI, classified under ICD I21, were collected and analyzed. Key epidemiological variables included the number of hospitalizations per year, nature of care, gender, age group, race/color, and mortality rates. Descriptive statistical analysis was performed using absolute and relative frequencies.
Results: This study analyzes hospitalizations for acute myocardial infarction (AMI) in Belém do Pará from 2019 to 2023, focusing on trends, demographic characteristics, and implications for public health strategies. We observed a significant increase in AMI hospitalizations, with the highest peak in 2022. The most affected demographic was men of brown race/color in the 60-69 age group, highlighting the need for targeted prevention strategies.
Conclusion: The findings underscore the urgent need for targeted public health interventions aimed at prevention and health education, particularly for the most vulnerable populations. The study highlights the importance of implementing robust health policies to reduce the incidence and mortality associated with acute myocardial infarction, ultimately improving the quality of life for the population of Belém do Pará.

Keywords: *Acute Myocardial Infarction; Epidemiological Profile; Hospitalizations; Public Health Strategies.*

1. INTRODUCTION

Acute myocardial infarction (AMI) is a serious medical condition that occurs when blood flow to a part of the heart is interrupted, usually because the coronary artery is blocked by blood clots. This blockage prevents oxygen from reaching the heart muscle, causing damage or cell death. AMI is characterized by symptoms such as chest pain, shortness of breath and discomfort that can spread to the arms, back or jaw [1].

In Brazil, the incidence of AMI has shown a sudden increase, reflected by bad changes in people's lifestyles and in the prevalence of risk factors such as hypertension, diabetes, obesity and a sedentary lifestyle. AMI diagnosis rates are increasing, especially among vulnerable groups such as men and people over 60. In addition, differences in access to health services and differences in the quality of care contribute to poor clinical outcomes in different regions of the country [2].

The signs and symptoms of AMI can be very serious and vary from person to person. The most common symptom is chest pain, which is described as pressure or burning that can radiate to the arms, jaw, back or abdomen. In addition to pain, it can cause shortness of breath, excessive sweating, nausea, vomiting, fatigue or dizziness. In some cases, especially in women, the symptoms are less noticeable and can be confused with extreme fatigue and back pain [3].

Morbidity and mortality from AMI is a global concern and the disease is the leading cause of death in many regions. Every year, millions of people around the world suffer from heart disease, leading to significant morbidity and mortality and long-term complications such as heart failure and disability. Factors such as population aging, physical insufficiency and inadequate nutrition have contributed to the increase in the incidence of AMI, indicating the need for effective interventions to prevent this death [4].

In Brazil, the AMI situation is alarming and is responsible for a large proportion of cardiovascular diseases. Studies show that the incidence of AMI varies between the five regions of the country, reflecting differences in access to quality health care. The increase in risk factors, such as hypertension and diabetes, exacerbates the situation and calls for urgent prevention and treatment strategies [5].

In 2021, mortality from AMI in Brazil showed a significant difference between the country's five regions. The Southeast, with large cities and stronger health infrastructures, has few diseases, while the North and Northeast face alarming rates that indicate a high level of problems and difficulties in accessing adequate treatment. The South region also stood out for its lower rates, due to better living conditions and health services. On the other hand, the Midwest region presented an intermediate situation, with specific challenges in rural areas that hinder access to medical care. This disparity in mortality highlights the urgent need for a health policy that addresses local conditions and promotes uniform care for AMI patients across the country [6].

In the northern region of Brazil, the emergence of AMI is an alarming phenomenon characterized by high mortality and associated complications. Factors such as the prevalence of chronic diseases, limited access to health care and poor socioeconomic conditions contribute to worsening the situation. Difficulties in early diagnosis and rapid treatment lead to unfavorable clinical outcomes, indicating an urgent need for preventive and health promotion strategies [7].

Based on this, the general objective of this study is to build an epidemiological profile of hospitalizations for acute myocardial infarction in the municipality of Belém do Pará, in order to understand the magnitude and characteristics of this condition in the local population.

2. METHODOLOGY

This is a quantitative, retrospective, descriptive and ecological study based on the collection of data from the Ministry of Health's SIH/DATASUS (Hospital Information System/Department of Information Technology of the Unified Health System) through the TABNET platform, available at: <http://datasus.saude.gov.br/>.

Data from patients hospitalized for acute myocardial infarction were included, specifically cases corresponding to ICD I21 - Acute myocardial infarction, in Belém/PA, from January 2019 to December 2023. In order to demonstrate the current epidemiological scenario, data from the last 5 years was analyzed to provide the most reliable representation

of cases. Among the epidemiological variables selected were: number of hospitalizations per year, nature of care, gender, age group, race/color and deaths per year of care, all of which were analyzed within the time frame selected for this study.

The data was collected from the SIH/DATASUS/TABNET platform, and the TABWIN (DATASUS), Word 2013 and Excel 2013 platforms were used for analysis and graphical representations.

After tabulation, the data was analyzed descriptively, with absolute and relative frequencies. There was no need for the Research Ethics Committee (REC) to assess the data, as the secondary data was available in full and open to all, in accordance with Resolution 466/2012 of the National Health Council (CNS).

3. RESULTS AND DISCUSSION

Table 1 shows the total number of hospitalizations for AMI in Belém do Pará, segmented by year of care between 2019 and 2023. The data shows a gradual increase in hospitalizations over the years, with the peak in 2022, when 1,809 hospitalizations were recorded, representing 23.4% of the total. The total number of hospitalizations during the period analyzed was 7,730, indicating growing concern about the incidence of AMI in the region.

Table 1. Description of hospitalizations according to the year of care 2019 to 2023, number of hospitalizations (NI) and percentage (%).

Year of Service	Admissions	
		%
2018	346	4,5
2019	1.167	15,1
2020	1.323	17,1
2021	1.679	21,7
2022	1.809	23,4
2023	1.406	18,2
Total	7.730	100

Source: *adapted from SIH/DATASUS/TABNET (2024).*

Table 2 shows the distribution of hospitalizations for AMI in Belém do Pará, categorized by the type of care (elective and emergency) between 2019 and 2023. The data shows that the majority of hospitalizations were urgent, totaling 7,479 cases, which represents a clear predominance over elective hospitalizations, which totaled only 251 cases.

Table 2. Distribution of hospitalizations for acute myocardial infarction by type of care.

Service character	2019	2020	2021	2022	2023	Total	%
Elective	32	2	2	6	209	251	3,2
Urgency	1.127	1.379	1.590	1.800	1.583	7.479	96,8

Source: *adapted from SIH/DATASUS/TABNET (2024).*

Table 3 shows the distribution of hospitalizations by gender, revealing that the majority of hospitalizations (73.2%) were for men, while 26.8% were for women. These data highlight the gender disparity in the incidence of AMI and suggest the need for specific interventions for men's health, considering the associated risk factors.

Table 3. Distribution of hospitalizations due to acute myocardial infarction according to gender in Belém do Pará from 2019 to 2023.

Year of Service	Hospitalizations		Masculine		Feminine	
	N	%	N	%	N	%
2018	346	4,5				
2019	1.167	15,1	836	10,8	323	4,2
2020	1.323	17,1	1.012	13,1	369	4,8
2021	1.679	21,7	1.167	15,1	425	5,5
2022	1.809	23,4	1.340	17,3	466	6
2023	1.406	18,2	1.308	16,9	484	6,3
Total	7.730	100	5.663	73,2	2.067	26,8

Source: *adapted from SIH/DATASUS/TABNET (2024).*

After the gender data, we looked at the age group, with the most prevalent being 60 to 69 years old with 2,576 hospitalizations, followed by the 50 to 59 age group with 1,967 and the lowest number of hospitalization records in the 1 to 4 and 5 to 9 age groups with 2 hospitalizations in each age group (Table 4).

Table 4.Distribution of hospitalizations due to acute myocardial infarction according to age group in Belém do Pará between 2019 and 2023.

Age range	2019	2020	2021	2022	2023	Total	%
1 to 4 years	0	0	1	1	0	2	0,02
5 to 9 years	1	0	0	1	0	2	0,02
10 to 14 years	1	0	1	1	0	3	0,03
15 to 19 years	1	0	1	1	0	3	0,03
20 to 29 years	1	3	14	1	9	28	0,4
30 to 39 years	20	26	41	30	29	146	1,9
40 to 49 years	103	121	166	212	151	753	9,7
50 to 59 years	327	329	415	429	467	1.967	25,5
60 to 69 years	374	484	521	572	625	2.576	33,3
70 to 79 years	240	327	327	418	389	1.701	22
80 years and more	91	91	105	140	122	549	7,1

Source: *adapted from SIH/DATASUS/TABNET (2024)*

Table 5 shows the distribution of hospitalizations by race/color, showing that the majority of hospitalizations occurred among brown patients, with 4,391 cases. The table also reveals a low demand for hospitalizations among the indigenous population, with only one hospitalization recorded. This data is important for understanding racial disparities in health and access to medical care.

Table 5. Distribution of hospitalizations by race/color from 2019 to 2023.

Race/Color	2019	2020	2021	2022	2023	Total	%
White	21	121	87	117	38	384	5
Black	10	34	47	45	11	147	1,9
Brown	1.030	441	466	754	1.720	4.391	56,8
Yellow	0	0	3	0	0	3	0,03
Indigenous	0	0	0	1	0	1	0,01
No Information	98	785	1.009	889	23	2.804	36,3

Source: *adapted from SIH/DATASUS/TABNET (2024).*

Finally, Table 6 provides information on the number of deaths associated with AMI in Belém do Pará, segmented by year of service. The data shows an increase in mortality, with 140 deaths recorded in 2023. This table is crucial for assessing the severity of the condition and the effectiveness of the health system in responding to this growing demand.

Table 6. Description of deaths by year of care (2019 to 2023), number of deaths (NO) and percentage (%).

Year of Service	Deaths	
		%
2018	20	3,4
2019	86	14,7
2020	99	16,9
2021	128	21,8
2022	151	25,7
2023	103	17,5
Total	587	100

Source: *adapted from SIH/DATASUS/TABNET (2024).*

Within the global and national collective health scenario, cardiovascular diseases (CVD) are among the main causes of mortality and morbidity. Acute Myocardial Infarction, in turn, is characterized as the main exponent among all CVDs. In prevalence, AMI is a critical clinical condition, characterized by the sudden interruption of blood flow to a part of the heart, resulting in damage to the heart muscle. This pathology is predominantly caused by coronary obstruction, either by the formation of a thrombus or due to progressive narrowing of the coronary arteries, and is one of the most severe outcomes of ischemic heart disease [8].

In the municipality of Belém do Pará, analysis of the epidemiological profile of hospitalizations for AMI between 2019 and 2023 makes it possible to elucidate fundamental aspects of the trends and factors that influence the occurrence of this disease in the local population. The mapping of AMI cases in Belém do Pará reveals a dynamic behavior over the years studied, with an increasing incidence recorded, which reveals that the disease represents an important public health problem for the region [9].

In the period analyzed, this study found a significant increase in hospitalizations for acute myocardial infarction in 2022, compared to previous years. This increase can be explained by an ageing population, modern lifestyles, increased consumption of industrialized foods, and lifestyle habits that are detrimental to health, which have been on the rise over the years. One study also considers the effects of continuous stress, a common occurrence in urban environments, which affects most citizens and can increase the occurrence of acute cardiac events [10].

In addition, the evolution of these figures may also be associated with the COVID-19 pandemic, caused by the SARS-CoV-2 virus, which recorded high infection rates, as it is understood that COVID potentiates already installed comorbidities (such as advanced age and pre-existing organic dysfunctions), as well as being, in itself, a relevant factor associated with myocardial lesions [11].

During the pandemic period, there was a notorious paralysis in the search for primary medical care, which may have contributed to the late identification of cardiovascular complications, culminating in high emergency scores and worsening cases of AMI [11].

When analyzing hospitalizations for acute myocardial infarction (AMI) in Belém do Pará between 2019 and 2023 by type of care, we found that the majority of care was emergency care. This indicates the urgent need for more intensive care and more efficient strategic planning in the region's health network.

The urgency of hospitalizations for acute myocardial infarction (AMI) in Belém do Pará reflects the seriousness of the disease and the importance of rapid interventions to save lives. Most cases arrive at the hospital in critical condition, which suggests that many patients are not receiving adequate preventive care or are not aware of the warning signs. The low rate of elective admissions, which represents only 251 (3.2%) of the total, highlights the need to strengthen primary health care in the region. Lack of regular follow-up and inadequate management of risk factors such as hypertension, diabetes and high cholesterol contribute to the increase in the number of emergency cases [12].

Understanding the demand for emergency hospital care is essential for optimizing resources and ensuring quality care for patients with AMI, helping to reduce mortality and complications related to this disease [13] [14].

With regard to the sociodemographic criterion of gender, there is a higher prevalence of male hospitalizations due to AMI. This difference can be explained by biological factors, such as the cardiovascular protection provided by estrogen hormones in women, as well as risk behaviors that are more common among men, such as smoking, alcoholism, sedentary lifestyles and inadequate diet, which are strongly linked to the development of these conditions, increasing patient morbidity and mortality. This higher number of cases in men is linked to the low level of preventive health care, with most of them refusing to attend support groups, not adhering adequately to drug treatment and not seeking health care services to monitor their condition [15].

Age is one of the most important risk factors linked to the development of coronary artery disease (CAD). This is because it has a major influence on the deterioration of cardiovascular health. This finding is consistent with the literature, which points to advanced age as one of the main risk factors for the development of cardiovascular diseases. The prevalence of AMI in younger age groups was alarmingly low, with only 4 hospitalizations in children aged between 1 and 9 years (0.04%), which suggests that the condition is predominantly a public health concern among older adults [16].

The distribution of AMI hospitalizations by age group in Belém do Pará between 2019 and 2023 reveals significant patterns that deserve attention. The most prevalent age group for hospitalizations is the 60 to 69 age group, with 2,576 (33.3%) cases, followed by the 50 to 59 age group, which recorded 1,967 (25.5%) hospitalizations.

The data presented indicates that the incidence of AMI increases considerably with age, reflecting the well-documented association between aging and an increase in

cardiovascular diseases. The scarcity of hospitalizations in the younger age groups, such as 1 to 4 years and 5 to 9 years, which had only 2 hospitalizations each (0.04%), suggests that AMI is a condition predominantly associated with older adults, which may be an indication of the need for prevention strategies focused on older populations [4].

On the other hand, the results showing the distribution of hospitalizations for AMI according to race/color reveal a significant concentration of hospitalizations among the brown population, with 4,391 (56.8%) cases recorded between 2019 and 2023. This shows that the brown race may be more exposed to risk factors associated with AMI, such as hypertension, diabetes and a sedentary lifestyle, which are prevalent in populations with less access to health care and information on prevention. In addition, the “no information” category has a high number of 2,804 (36.3%) hospitalizations, which may indicate flaws in data collection or adequate documentation, making a more precise analysis of racial disparities difficult [17].

The data also shows a low demand for hospitalizations among the indigenous population, with only one hospitalization recorded over the period analyzed. This may reflect not only a lower incidence of AMI in this population, but also significant barriers to accessing health services, which can lead to underreporting or inadequate treatment of health conditions [18].

A critical overview of AMI-related deaths in Belém do Pará between 2019 and 2023 reveals a total of 587 (100%) deaths during this period. The data shows an upward trend in deaths, with a notable increase in 2020, when 99 deaths were recorded, representing 16.9% of the total. This rise can be attributed to several factors, including the greater severity of AMI cases, the possible lack of access to adequate medical care and the overload of the health system, especially in a pandemic context [19].

The analysis of deaths in relation to the total number of admissions suggests that although there are many admissions, the mortality rate is still worrying, indicating that many patients may be in critical condition when they are admitted.

Based on this, the analysis of the tables in this study shows the seriousness of acute myocardial infarction in Belém do Pará, with a high incidence of hospitalizations and a worrying mortality rate, especially among the elderly population. These data highlight the urgent need for public health strategies that not only treat the disease, but also promote education about risk factors and healthy habits.

4. CONCLUSION

Analysis of the epidemiological profile of hospitalizations for AMI in the municipality of Belém do Pará between 2019 and 2023 reveals a worrying scenario in relation to the cardiovascular health of the local population. The data indicates a significant increase in the number of hospitalizations over the years, with a notable peak in 2022, which suggests a growing incidence of this condition. The predominance of emergency admissions, which account for the vast majority of cases, highlights the seriousness of the situation and the need for immediate interventions.

The most vulnerable profile for AMI admissions in Belémdo Pará is characterized by men of brown race/color in the 60-69 age group, who seek urgent care. The growing incidence of AMI in this population highlights the urgent need for public health strategies focused on prevention, health education and the promotion of healthy habits, especially aimed at the groups most affected.

On the other hand, the epidemiological profile least vulnerable to hospitalization for AMI in Belém do Pará are children and adolescents, as well as women in general, who have a significantly lower incidence of the condition. The relative protection observed in women and the rarity of AMI in younger age groups highlight the importance of health strategies that promote education and prevention from childhood, with a view to maintaining healthy habits throughout life.

In conclusion, this study highlights the need for a more robust focus on health policies that not only treat AMI, but also promote health education and the adoption of healthy lifestyles. The implementation of prevention strategies is fundamental to reducing the incidence and mortality associated with acute myocardial infarction, thus contributing to improving the quality of life of the population of Belém do Pará.

Disclaimer (Artificial intelligence)

The authors declare that generative AI technologies were used during the process of writing and editing this manuscript. The technologies used were:

DeepL Translator (online version): AI-based machine translation tool used to translate parts of the text from Portuguese into English. The large-scale language model used is the property of DeepL GmbH.

DeepL Write (online version): Generative AI tool used to review and improve the wording of translated text. This tool offers suggestions for rewording and linguistic improvement, also developed by DeepL GmbH.

The input instructions provided to the aforementioned AI technologies included fragments of text in Portuguese related to safety protocols in the operating theatre during the COVID-19 pandemic, with the aim of obtaining translations and linguistic suggestions in English for international publication.

Details of the AI usage are given below:

1. Version 24.10

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