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Epidemiological Profile of Patients Suffering From Aortic Aneurysms and Dissections, Hospitalized Through SUS, in the Period 2010-2020 In The State Of Bahia

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Abstract

Introduction: *Aortic aneurysms are permanent and irreversible dilatations of the artery, involving the three layers of the vascular wall, the majority being asymptomatic and occasionally detected in imaging tests. However, when it becomes symptomatic, it usually suggests complications, including Aortic Dissection. Thus, they have high mortality rates, making it necessary to recognize the epidemiological profile of patients victimized by these diseases according to each territory, aiming to provide the necessary care and following, given the importance of early diagnosis.*

Objectives: *To trace the epidemiological profile of patients with Aortic Aneurysm and Dissection in Bahia from 2010 to 2020.*

Methods: *It is an observational, descriptive time series that will use secondary data with a quantitative approach from the Mortality Information System (SIM). The study population consisted of people who died due to aneurysm or aortic dissection, and the following variables were adopted: death by residence, sex, age group, race/color, macro-region of health.*

Results: There was a greater number of deaths from Aortic Aneurysms or Dissection in the 2915 East Macroregion (NRS – SALVADOR), resulting in a total of 1,178 (52.66%) deaths. In second place, the South and Center-North Macroregions were tied, representing 10.10% of deaths each. In the State of Bahia, there was a predominance of males, representing 57.66% of deaths, while females represented 42.29%. Regarding race/color, the most affected patients were self-declared brown, representing 54.67% of deaths. In second place, the white race/color represented 23.60% of the deaths, surpassed by the black color only in the East Macro-region. When evaluating by age group, the largest number of deaths were between 70 and 79 years old, obtaining 26.42% of the evaluated population.

Conclusion: Aneurysm and Aortic Dissection are serious conditions, linked to longevity and the deaths resulting from these diseases are influenced by the quality of health care and risk factors, which shows the importance of early diagnosis. Even with technological advances in diagnosis and treatment, they continue to be diseases with high mortality rates, representing an important number of deaths, especially in the male, brown and 70–79-year-old Bahian population.

Introduction

The aorta is a large vessel responsible for conducting oxygenated blood from the left ventricle to the organs. Anatomically, it is divided into the thoracic aorta - which extends from the aortic root coming out of the heart to the diaphragm, including the ascending aorta - and the abdominal aorta - extending from the diaphragm, including the suprarenal and infrarenal segments - to the level of the fourth lumbar vertebra where it bifurcates into the left and right iliacs1. Histologically, the wall of this large vessel is made up of three layers: tunica intima - thinner - the tunica media - with a more elastic muscular composition

- and the tunica adventitia - characterized as more external and fibrous. As well as conducting blood, the aorta plays an important role in vascular resistance and heart rate, with receptors located in its segments [1,2].

In line with its complexity, alterations to this vessel are very varied and can be classified as chronic or acute. Aortic diseases - in addition to atherosclerotic, traumatic and dysplastic diseases - are generally subdivided into thoracic aortic aneurysm (TAA), abdominal aortic aneurysm (AAA) and acute aortic syndromes - which includes acute aortic dissection (AAD) [1,3]. Despite the reduction in global cases of cardiovascular disease, the curve is still rising in developing countries, with thoracic and abdominal aortic diseases being important and extremely lethal, with a predominance of deaths and complications due to aneurysms and dissections [4].

Aneurysms are permanent and irreversible dilations of the artery, involving the three layers of the vascular wall (intima, media and adventitia) [5]. The most common cause is degeneration of the vessel wall due to atherosclerotic disease, but it can also occur due to infection, cystic necrosis of the tunica media, trauma and anastomotic degeneration [6].

Thoracic aortic aneurysms are classified according to the region of involvement and there is also a difference in prevalence: the root and ascending aorta account for 60% of TAAs, while 40% affect the descending aorta and 10% involve the aortic arch, which may involve more than one segment [7]. Studies suggest that the origin of TAA has a strong familial component, as well as occurring as part of a complex genetic syndrome, the most common being Marfan Syndrome [7-9].

Abdominal aortic aneurysm (AAA) is an important condition in the practice of vascular surgeons, with the most common location being the infra-renal, affecting up to 2.3% of the general population 5. The average normal diameter of the abdominal aorta is up to 3.0 cm, so a dilation of more than 50% of the vessel's normal diameter is classified as an aneurysm6. This pathology is more prevalent in males and whites - being negatively associated with blacks or Asians - and the mortality rate increases with advancing age [10,11]. As life expectancy increases, there is a higher incidence of abdominal aortic aneurysms, the prevalence of which reaches 6% over the age of 65 and progresses to around 10% over the age of 8011. Risk factors include smoking and a positive family history of AAA [12].

However, the majority of TAA and AAA are asymptomatic and are detected occasionally on imaging tests. However, when it becomes symptomatic, it usually suggests complications, including rupture and dissection [13,-15]. Aortic dissection is defined as a transverse lacerating rupture of the tunica intima or tunica intima and tunica media, leading to the creation of a cavity between these layers forming a false lumen in which a column of blood is lodged. The condition is more common in men aged between 40 and 60 and the main risk factor is systemic arterial hypertension. It is also related to genetic syndromes such as Marfan's, which generate systemic alterations in connective tissue [16,17].

In this scenario, in a country with a large territory and population, it is undoubtedly important to recognize the epidemiological profile of patients with pathologies that have complications with high mortality rates according to each state/municipality, so that the necessary care and monitoring can be provided, given the importance of early diagnosis. In this way, this study aims to outline the epidemiological profile of aneurysmal and dissecting aortic diseases in the state of Bahia.

Objective

General: To outline the epidemiological profile of patients suffering from aortic aneurysms and dissections in Bahia between 2010 and 2020.

Specific

- To describe the demographic characteristics of the patients
- To describe the temporal trend of the frequency with which Aortic Aneurysm and Dissection contributed to the total number of hospitalizations by the SUS in the place and period studied.

Study Methodology

- This is an observational, descriptive time series study using secondary data with a quantitative approach.

DataSUS was searched for the state of Bahia between 2010-2020.- The research spreadsheet will include data on patients who were victims of aortic aneurysm or dissection, hospitalized through the SUS in the state of Bahia during the period studied, notified by the Mortality Information System (SIM) with the ICD-10ª I 71 and I 71.0 (International Statistical Classification of Diseases and Related Health Problems), accessible through the TABNET BAHIA portal, at the access link http://www.tabnet.saude.salvador.ba.gov.br/.

Study Variables

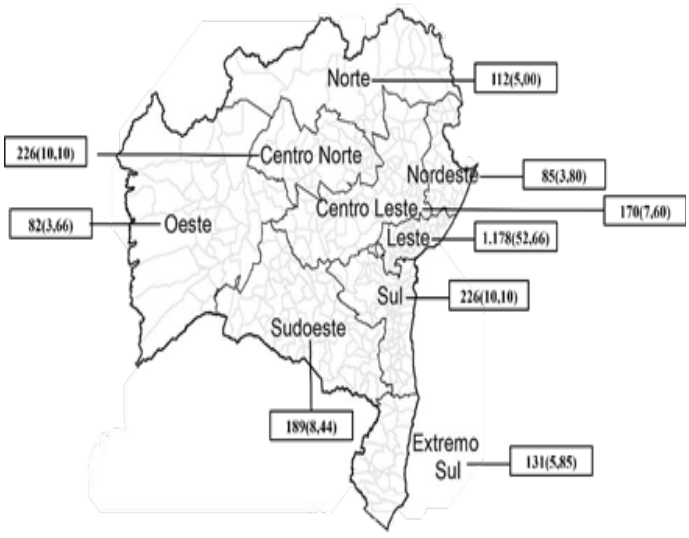
- Annual frequency
- Mortality rate.
- Race (white, black, brown, yellow, indigenous)
- Sex (male, female)
- Age group (20 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79, 80 years and over)
- Health macro-region

Microsoft Excel will be used to build and analyze the database. For descriptive analysis, categorical variables will be expressed through simple and relative frequency distribution, while continuous variables will be expressed as mean and standard deviation, mode and median.

This study did not need to be submitted to a Research Ethics Committee, as it used data made publicly available on SIM (Resolution 466/2012).

Results

In the period studied, between 2010 and 2020, 2,237 deaths from Aortic Aneurysms and Dissections were reported in Bahia. Based on an analysis of sociodemographic factors, such as gender, race/color and age group, in addition to the division by Health Macroregion, the highest number of deaths from Aortic Aneurysms or Dissections was observed in Macroregion 2915 East (NRS - SALVADOR), with a total of 1,178 (52.66%) deaths. This was followed by the South and Center-North Macroregions, tied at 10.10% of deaths each **(Figure 1).**



When evaluating by age group, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 and 80 and over were considered. In this scenario, the highest number of deaths was in the 70-79 age group, with 26.42% of the population assessed. This was followed by the 80 and over age group with 22.88% and the 60 to 69 age group with 22.35%. The 70 to 79 age group accounted for the majority of deaths by macro-region, while the latter age group only accounted for the majority in the South, Southwest and Center-East, with the same figure in the Center-North. The first two age groups account for around 4.8% of deaths **(Table 1).**

Características	Óbitos na Bahia por Macrorregião Residência N(%)
Sexo	**MC - SUL**
Masculino	139(61,50)
Feminino	86(38,05)
Ignorado	1(0,44)
Total	226(100)
Raça/Cor	
Branca	63(27,87)
Preta	24(10,62)
Parda	112(49,55)
Indígena	1(0,44)
Ignorado	26(11,5)
Total	226(100)
Faixa Etária	
20 a 29 anos	1(0,44)
30 a 39 anos	7(3,10)
40 a 49 anos	10(4,42)
50 a 59 anos	36(15,93)
60 a 69 anos	44(19,47)
70 a 79 anos	62(27,43)
80 anos e mais	66(29,20)
Total	226(100)

Table 1 - Percentage distribution of deaths due to Aortic Aneurysm and Dissection by Health Macroregion according to sex, race/color and age group - Bahia from 2010 to 2020

When evaluating by age group, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 and 80 and over were considered. In this scenario, the highest number of deaths was in the 70-79 age group, with 26.42% of the population assessed. This was followed by the 80 and over age group with 22.88% and the 60 to 69 age group with 22.35%. The 70 to 79 age group accounted for the majority of deaths by macro-region, while the latter age group only accounted for the majority in the South, Southwest and Center-East, with the same figure in the Center-North. The first two age groups account for around 4.8% of deaths **(Table 1).**

When analyzing the number of deaths in the period studied, an average of around 203.36 deaths/year was obtained. The lowest number was 163 (7.28%) in 2010 and the highest was 247 (11.04%) in 2017. For the entire period studied, there was an upward curve, with periods of greater stability from 2010 to 2012 and 2014 to 2016, as shown in Table 2. Looking at the incidence coefficient, 2017 and 2019 had the highest values (respectively 1.76 and 1.71 deaths/100,000 inhabitants), while the first two years of the study period, 2010 and 2011, had the lowest coefficients of the period: 1.16 and 1.20 deaths/100,000 inhabitants **(Graph 1).**

Discussion

The aorta is the main artery in the body. It runs from the heart through the thorax to the abdomen, at the level of the L4 vertebra, where it bifurcates into the iliac to irrigate the lower limbs. Its normal tissue structure has walls made up of tunica intima, media and adventitia, which contain muscle and epithelial cells, elastin, collagen and glycosaminoglycans [6].

Aortic aneurysms are the result of progressive changes in the arterial wall which generate degeneration, causing a continuous increase in diameter, defined as such when the vascular diameter exceeds 50% of the normal diameter of the aorta, mainly due to the accumulation of fat which initiates a chronic inflammatory process [10,12,18]. This condition weakens the vessel, making it susceptible to rupture and dissection. Despite its seriousness, aortic aneurysms are usually asymptomatic and develop silently, making it difficult to diagnose them early enough to improve prognosis1. Early diagnoses are usually incidental, in tests carried out for another purpose, but the earlier they are identified, monitored and treated, the lower the mortality rate and the risk of complications [18]. Surgical interventions are recommended for dilations with a diameter of 5.5cm or more, even for asymptomatic patients, due to the risk of rupture [7]. The appearance of symptoms such as chest pain, low back pain and the sensation of a pulsating mass are associated with cases of large dilatations, close to rupture or already ruptured, thus becoming an emergency. This disease is becoming more frequent as the population ages and screening techniques advance [6].

Under normal conditions, the diameter of the healthy thoracic aorta varies according to its subdivision - into aortic root, ascending aorta, aortic arch and descending aorta - gender, age, biotype and other factors [19]. The development of a TAA also varies according to these factors, with a higher frequency in the male population; however, women have a worse outcome, linked to a higher risk of rupture and dissection according to the reduction in oestrogen with the menopause. In addition, atherosclerosis is the most prevalent risk factor for aortic aneurysms, but TAAs are commonly associated with connective tissue diseases (Marfan Syndrome being the most frequent) or BAV (bicuspid aortic valve) 1.

TAA is a silent disease; before the case worsens, around 95% are asymptomatic, usually identified at this stage accidentally by performing imaging tests for other purposes. When it becomes symptomatic, surgical intervention is necessary, regardless of the size of the aneurysm. However, the Brazilian Society of Cardiovascular Surgery recommends intervention in asymptomatic cases of ascending and descending TAA in line with the end-diastolic diameter of the aorta, the presence or absence of syndromic conditions, familial TAA, BAV, patient size and expansion velocity. Repair can therefore be carried out using an open or endovascular surgical approach, or a combination - hybrid repair [9,13].

On the other hand, abdominal aortic aneurysms are associated with arteriomegaly and generalized ectasia, and are therefore a local representation of a systemic disease whose pathological process involves apoptosis, oxidative stress, inflammation and loss of the arterial wall matrix 10,12. Involvement of the abdominal aorta distal to the renal arteries classifies the aneurysm as infrarenal, which is the most common location for the condition to develop in this artery, especially near the aortic bifurcation. In 1991, the Society for Vacular Surgery and the International Society for Cardiovascular Surgery Ad Hoc Committee on Standarts in Reporting proposed a definition of AAA in which dilation results in an increase of 1.5 times the expected size of the vessel. However, it is necessary to take into account each individual and their characteristics such as gender and age [5,20]. In this sense, among the risk factors associated with the development of AAAs, the most relevant are advanced age, male gender, family history of AAA and smoking. The overall incidence is estimated at 5% in cases with no other associated disease and 12% if it is associated with smoking or systemic arterial hypertension (SAH). In males over 60, the incidence reaches 5.96% [12,21].

The diagnosis of an AAA is confirmed by clinical examination, preferably ultrasound because it is less expensive, easier to handle and does not pose any risks to the patient. Thus, clinical examination is insufficient due to the non-specific symptoms associated with the condition, in addition to the significant number of asymptomatic patients. USG is the main method of choice for screening patients at high risk of developing AAAs and for those who are symptomatic 12. It is vital to screen for and follow up AAAs, since if left untreated they can complicate, leading to rupture of the aneurysm and consequent blood loss, a highly lethal condition with an estimated mortality rate of 80% [22]. Among those with a ruptured abdominal aortic aneurysm (AAAr), around 1/3 die before receiving hospital care [23]. The rupture of an AAA can generate intense pain, either abdominal or in the back, and can quickly evolve into hemorrhagic shock, although it can also be asymptomatic. In these cases, the most common imaging finding is a retroperitoneal hematoma adjacent

to the affected aortic segment [15]. Therefore, due to its severity, treatment should be immediate, with the interventions of choice being open surgery or an endovascular aneurysm repair procedure (EVAR) [21].

Aortic dissection (AD) is a high mortality condition that requires immediate treatment. It occurs as a result of stress on the aortic wall and abnormalities in the tunica media which can lead to wall rupture and intramural bleeding 2. In this scenario, a false lumen is created by the cavity generated. Regarding the epidemiology of AD, there is a higher incidence in males and a worse prognosis in females. For women, the most common cause of AD is poorly controlled hypertension, while for men, the risk increases with age. This process is also favored by the presence of genetic syndromes (the most common being Marfan and Ehlers-Danlos), a positive family history, aortic or aortic valve disease, trauma, intravenous drug use and a history of heart surgery. The immediate mortality of AAD in the ascending aorta is around 40% [2,16].

The predominant clinical presentation of AAD is abrupt onset chest pain, but it can also present as back and abdominal pain. The sites of the pain are related to the type of dissection, respectively. In the Stanford classification, which specifies the extent of the dissection and the site of entry: Type A involves the ascending aorta with or without extending into the arch and descending aorta, while Type B involves the descending aorta only. While the DeBakey classification takes into account whether or not the descending aorta is involved: DeBakey I, II - involves the ascending - and III - involves only the descending. For patients with AD as well as those with AAT and AAA, treatment is performed surgically, using the more traditional open technique or endovascular surgery [2,24].

Open surgery is the most traditional way of correcting aortic aneurysms and dissections. It has been performed since 1951 and is considered definitive. To perform it, a transperitoneal or extraperitoneal access is used to replace the aortic segment with a prosthesis made of synthetic material. It is considered effective, but has significant morbidity and mortality rates and prolonged hospitalization. While the endovascular approach (EVAR) - developed in 1991 as an alternative for high-risk patients - is less invasive, consisting of two small incisions to expose the femoral artery so that a catheter and guide wire can guide the stent to the affected aortic portion, and is increasingly prioritized by professionals. However, the endovascular technique shows greater evidence of perioperative reinterventions and long-term mortality rates. For a ruptured abdominal aortic aneurysm (AAAr), for example, open surgery showed a post-operative mortality rate of 48.5%, so there are hypotheses that EVAR can benefit the patient because it is less invasive, although the morphology of the patient and the material required are often barriers to performing this technique [21,25].

Thus, both aneurysms and aortic dissection represent multifactorial diseases with many fatal outcomes that could be avoided and controlled by recognizing the risk factors and symptoms of the disease, to ensure early diagnosis and care for a better prognosis. It is therefore necessary to understand the local epidemiological profile of these diseases and target health education actions at this population. In view of this, the aim of this study is to outline the epidemiological profile of patients with aortic aneurysms or dissections in the state of Bahia, from 2010 to 2020, by counting mortality in the SUS.

This study characterized the epidemiological profile of deaths from aortic aneurysms and dissections in Bahia between 2010 and 2020. During this period, an increase in these deaths was observed from 2010 to 2015, and then oscillated between a fall and a rise until 2020, generally demonstrating an upward trend in the number of deaths.

In addition, this study showed that the epidemiological profile most affected was male, brown and aged between 70 and 79. Thus, overall mortality is strongly associated with the fact that these conditions are, in most cases, silent, diagnosed only at the moment of complication and urgency, so screening and early diagnosis is a great ally in reducing the number of deaths [11,18].

In a study carried out in São Paulo from 1998-2007, focusing only on thoracic aortic aneurysms, 58.1% of deaths were recorded in males and 41.9% in females, which is similar to what was found in this study. However, more males died from aortic dissection than females from aortic aneurysm. In relation to the age of those affected, the highest incidence is related to the over 70s, in line with, this can be explained by the increase in life expectancy among Brazilians and the fact that these diseases are closely linked to the longevity of the population. However, in the aforementioned study, thoracic aortic dissection was responsible for 78% of deaths, while thoracic aortic aneurysm accounted for 28%. [4].

The fact that the number of victims of AA or AD are mostly of "brown" race/color coincides with the increase in the number of self-declared as such, surpassing, in many regions, the self-declared white and black, who were previously in the majority;

thus differing from the epidemiological profile results found in other countries, which have a higher incidence of whites. This scenario is due to the miscegenation characteristic of Brazil and very present in Bahia, whose capital is the blackest city outside of Africa. As a result, it is precisely the Eastern Macroregion - which includes the capital Salvador and the metropolitan region - that has the highest number of deaths among the black population (according to the IBGE, the term "black" includes the black and brown population). In addition, the overall number of deaths per household is also higher compared to the other macro-regions, which is probably associated with a better health structure, with reference centers in contrast to the interior.

Aortic aneurysms and dissections are not only diseases of multifactorial etiology, involving underlying diseases and lifestyle habits, but we must also consider that prognosis, treatment and lethality depend on specific clinical factors, such as aneurysm diameter, rupture, dissection length, affected portion of the aorta, among others [13]. Thus, some of the limitations of this study are related to the type of data provided by DATASUS, which lacks important associated information, such as smoking, hypertension and clinical specificities. In addition, the information on aortic aneurysms and dissections is grouped together, so it is not possible to investigate the diseases separately.

Conclusions

Aneurysm and aortic dissection are serious conditions linked to longevity and the deaths resulting from these diseases are influenced by the quality of care and risk factors, which shows the importance of early diagnosis. Even with technological advances in diagnosis and treatment, these are still diseases with high mortality rates, representing a significant number of deaths, especially in the Bahian male population, brown and between 70-79 years of age. However, there is a scarcity of scientific studies on this issue, which contribute to the establishment of appropriate screening and prevention measures, so that there is a solid intervention in the health system to reduce this mortality.

Graphic 1 Source: MS/SVS/CGIAE - Mortality Information System - SIM; Estimated population based on the 2010 census.

Sexo	MC - SUDOESTE
Masculino	122(64,55)
Feminino	67(29,64)
Total	189(100)
Raça/Cor	
Branca	45(19,91)
Preta	18(7,96)
Parda	116(51,33)
Ignorado	10(4,24)
Total	189(100)
Faixa Etária	
20 a 29 anos	4(2,12)
30 a 39 anos	6(3,17)
40 a 49 anos	17(8,99)
50 a 59 anos	23(12,17)
60 a 69 anos	36(19,04)
70 a 79 anos	46(24,33)
80 anos e mais	57(30,16)
Total	189(100)

Sexo	MC – NORDESTE
Masculino	51(60)
Feminino	34(40)
Total	85(100)
Raça/Cor	
Branca	20(23,52)
Preta	12(14,11)
Parda	49(57,64)
Ignorado	4(4,70)
Total	85(100)
Faixa Etária	
20 a 29 anos	1(1,17)
30 a 39 anos	3(3,53)
40 a 49 anos	7(8,23)
50 a 59 anos	11(12,94)
60 a 69 anos	21(24,70)
70 a 79 anos	23(27,05)
80 anos e mais	19(22,35)
Total	85(100)

Sexo	MC - SUDOESTE
Masculino	122(64,55)
Feminino	67(29,64)
Total	189(100)
Raça/Cor	
Branca	45(19,91)
Preta	18(7,96)
Parda	116(51,33)
Ignorado	10(4,24)
Total	189(100)
Faixa Etária	
20 a 29 anos	4(2,12)
30 a 39 anos	6(3,17)
40 a 49 anos	17(8,99)
50 a 59 anos	23(12,17)
60 a 69 anos	36(19,04)
70 a 79 anos	46(24,33)
80 anos e mais	57(30,16)
Total	189(100)

Sexo	MC - SUDOESTE
Masculino	122(64,55)
Feminino	67(29,64)
Total	189(100)
Raça/Cor	
Branca	45(19,91)
Preta	18(7,96)
Parda	116(51,33)
Ignorado	10(4,24)
Total	189(100)
Faixa Etária	
20 a 29 anos	4(2,12)
30 a 39 anos	6(3,17)
40 a 49 anos	17(8,99)
50 a 59 anos	23(12,17)
60 a 69 anos	36(19,04)
70 a 79 anos	46(24,33)
80 anos e mais	57(30,16)
Total	189(100)

Sexo	MC – CENTRO - LESTE
Masculino	102(60)
Feminino	68(40)
Total	170(100)
Raça/Cor	
Branca	48(28,23)
Preta	16(9,41)
Amarela	1(0,59)
Parda	92(54,11)
Ignorado	13(7,64)
Total	170(100)
Faixa Etária	
30 a 39 anos	4(2,35)
40 a 49 anos	13(7,64)
50 a 59 anos	20(11,76)
60 a 69 anos	31(18,23)
70 a 79 anos	49(28,82)
80 anos e mais	53(31,17)
Total	170(100)

Sexo	MC – CENTRO - NORTE
Masculino	36(56,25)
Feminino	28(43,75)
Total	64(100)
Raça/Cor	
Branca	19(29,68)
Preta	9(14,06)
Amarela	1(1,56)
Parda	34(53,12)
Ignorado	1(1,56)
Total	64(100)
Faixa Etária	
20 a 29 anos	1(1,56)
30 a 39 anos	5(7,81)
40 a 49 anos	4(6,25)
50 a 59 anos	8(12,5)
60 a 69 anos	12(18,75)
70 a 79 anos	17(26,56)
80 anos e mais	17(26,56)
Total	64(100)

Sexo	MC – LESTE
Masculino	631(53,56)
Feminino	547(46,43)
Total	1.178(100)
Raça/Cor	
Branca	254(21,56)
Preta	259(21,98)
Amarela	1(0,08)
Parda	614(52,12)
Indígena	1(0,08)
Ignorado	49(4,16)
Total	1.178(100)
Faixa Etária	
20 a 29 anos	12(1,02)
30 a 39 anos	43(3,65)
40 a 49 anos	108(9,17)
50 a 59 anos	190(16,13)
60 a 69 anos	277(23,51)
70 a 79 anos	307(26,06)
80 anos e mais	241(10,46)
Total	1.178(100)

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