



Original article



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## Profile of individuals with acute myocardial infarction undergoing hemodynamic intervention in southern Brazil

## Perfil de indivíduos com infarto agudo do miocárdio submetidos à intervenção hemodinâmica no Sul do Brasil

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**ABSTRACT | INTRODUCTION:** To analyze the sociodemographic and clinical characteristics of adult and elderly patients with acute myocardial infarction undergoing hemodynamic intervention. **METHOD:** Cross-sectional study, with data from 117 medical records of patients treated at a hospital in southern Brazil, from January 2016 to December 2017. The variables sociodemographic characteristics, signs and symptoms and risk factors reported/confirmed in the initial care, and the type of hemodynamic intervention to which the patient was submitted were analyzed in the comparison between the groups (adult and elderly). The chi-square test was used for bivariate analysis, considering significance  $p < 0.05$ , through the Statistical Package for Social Sciences® (SPSS), version 20.0. **RESULTS:** Predominated male (34.2%), complete elementary school (59%), Caucasian (88%). Among the study participants, chest pain was predominant (31.6%), as well as previous AMI (24.8%); and the risk factors systemic arterial hypertension (16.2%); diabetes mellitus (10.3%) and smoking (10.3%) prevailed. As for the intervention, most performed angiography with a stent (65%). In the comparison between adult and elderly patients, male prevalence was evidenced in both groups ( $p=0.039$ ); and smoking predominated in adults ( $p=0.037$ ). **FINAL CONSIDERATIONS:** Male prevalence was observed in both groups, and smoking was the most prevalent risk factor for AMI among adults. Thus, strategies to prevent injuries and promote man's health should be implemented.

**KEYWORDS:** Myocardial Infarction. Health Profile. Sociological Factors. Hemodynamics.

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**RESUMO | INTRODUÇÃO:** Analisar as características sociodemográficas e clínicas de pacientes adultos e idosos com infarto agudo do miocárdio submetidos à intervenção hemodinâmica. **MÉTODO:** Estudo transversal, com dados de 117 prontuários de pacientes atendidos num hospital do Sul do Brasil, no período de janeiro de 2016 a dezembro de 2017. As variáveis características sociodemográficas, sinais e sintomas e fatores de risco relatados/confirmados no atendimento inicial, e o tipo de intervenção hemodinâmica ao qual o paciente foi submetido foram analisadas na comparação entre os grupos (adulto e idoso). O teste de qui-quadrado foi utilizado na análise bivariada, considerando significância  $p < 0,05$ , através do software *Statistical Package for Social Sciences®* (SPSS), versão 20.0. **RESULTADOS:** Predominou sexo masculino (34,2%), ensino fundamental completo (59%), caucasianos (88%). Dentre os participantes do estudo, a dor no peito foi predominante (31,6%), bem como o IAM prévio (24,8%); e os fatores de risco hipertensão arterial sistêmica (16,2%); diabetes mellitus (10,3%) e tabagismo (10,3%) prevaleceram. Quanto a intervenção, a maioria fizeram angiografia com um *stent* (65%). Na comparação entre pacientes adultos e idosos, evidenciou-se prevalência do sexo masculino em ambos os grupos ( $p=0,039$ ); e domínio do tabagismo em adultos ( $p=0,037$ ). **CONSIDERAÇÕES FINAIS:** Observou-se a prevalência do sexo masculino em ambos os grupos; e o tabagismo foi o fator de risco para o IAM mais prevalente entre os adultos. Assim, estratégias de prevenção de agravos e promoção à saúde do homem devem ser implementadas.

**PALAVRAS-CHAVE:** Infarto do Miocárdio. Perfil de saúde. Fatores Sociológicos. Hemodinâmica.

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## Introduction

Acute Myocardial Infarction (AMI) is a condition of global impact, with high mortality and high costs for treatment and health care. It is defined as an abrupt ischemic condition that reflects the death of cardiac myocytes, caused by an imbalance between supply and demand of oxygen to the myocardium, consequent to the obstruction of coronary flow, and may be transient or permanent.<sup>1</sup> The predominant symptom of AMI is chest pain, which manifests in 75% to 80% of patients, and may be accompanied by other clinical manifestations, such as: dyspnea, nausea, sweating and vomiting.<sup>2</sup>

In Brazil, 1,103,858 hospitalizations for AMI were recorded between 2012 and 2021, with statistical similarity between Brazilian regions. The main epidemiological characteristics of these patients are male (63.6%) and the age group between 60 and 69 years (30.2%).<sup>3</sup> Advanced age is one of the main non-modifiable risk factors for the development of AMI, and is associated with the wear and tear of cardiovascular function imposed by aging, as well as with longer exposure to risk factors, difficulty in adhering to prophylactic treatments, and access to health services.<sup>4-6</sup> In addition, comorbidities that trigger oxidative stress are common among the elderly, including diabetes mellitus and systemic arterial hypertension, diseases that also contribute to the patient's complex condition and poor prognosis.<sup>3,7</sup>

Although AMI predominates among elderly patients, it is important to note that approximately 25% of patients who had AMI in Brazil between 2012 and 2021 were adults aged between 50 and 59 years.<sup>3</sup> The increase in cases in this age group warns of the magnitude of other modifiable risk factors for AMI associated with lifestyle, especially smoking, overweight, dyslipidemia and sedentary lifestyle.<sup>8</sup>

In addition, it is important to highlight that, for all age groups, the treatment and complications associated with AMI represent one of the greatest challenges and impact on the health system in Brazil.<sup>3</sup> The treatment of AMI has a high cost, as it involves complex diagnostic and therapeutic procedures, with advanced technology, through pharmacological therapy and hemodynamic intervention.<sup>9-13</sup>

Therefore, considering the complexity of AMI and associated conditions, it is pertinent to analyze the sociodemographic and clinical characteristics of these patients to deepen the knowledge of contexts of cardiovascular disease. The emphasis on risk factors for this disease, in the comparison of the prevalent age groups, adults and the elderly, allows us to understand the development of AMI and the identification of strategies for prevention and treatment efficiently. Thus, we aimed to analyze the sociodemographic and clinical characteristics of adult and elderly patients with acute myocardial infarction undergoing hemodynamic intervention.

## Method

This is a cross-sectional study based on the documentary analysis of medical records of patients with AMI undergoing hemodynamic intervention from January 2016 to December 2017. The study is part of the matrix research entitled "Financing and cost of care for patients with acute myocardial infarction in a high complexity service of the Unified Health System", approved by the Research Ethics Committee (CEP, in Portuguese) on May 28, 2019, under opinion number 3,352,470, CAAE 12236819.0.0000.5323.

The study scenario was a hospital in southern Brazil, with an installed capacity of 230 beds, which serves

the population with statewide coverage of the Brazilian Health System (SUS, in Portuguese) and private care. At the time of the study, the institution had a high-complexity cardiology service, including a hemodynamics service that offered 280 beds at the time.

The study population consisted of 218 patients diagnosed with and treated for AMI. Convenience sampling consisted of 117 patients diagnosed with AMI, based on those available for analysis in the Medical Archive and Statistical Service (SAME, in Portuguese), and who met the inclusion criteria: patient hospitalized with a diagnosis of AMI, from January 2016 to December 2017; who underwent hemodynamic intervention (catheterization, and/or coronary angioplasty with implantation of two stents; and/or coronary angioplasty with implantation of one stent; and/or primary coronary angioplasty and/or other procedures with sequential surgeries), subsidized by SUS. Patients whose medical records were not available during the data collection period were excluded. Thus, the study sample represented 53.6% (n=117) of the study population.

Data were collected from patients' medical records using a structured instrument developed by the researchers, considering scientific evidence on the epidemiology of AMI. The instrument sought to retrieve variables representing sociodemographic characteristics (gender, age in full years, education, ethnicity, profession/occupation, and religion). We also investigated signs and symptoms and risk factors reported/confirmed in the initial care, and the type of hemodynamic intervention to which the patient was submitted.

These variables were defined based on the structure of information available in the patient's medical

records, aiming to achieve the objective proposed in this study. However, the classification of AMI (with or without Supra ST) was not considered as a variable due to the incompleteness of this information in the medical records. In addition, the ethnicity variable was used to characterize the sociocultural aspects of the patients, since race and color are unavailable information in the patients' medical records.

The Statistical Package for Social Sciences® (SPSS) software, version 20.0, was used for the quantitative treatment. Descriptive analysis was performed, with distribution of absolute and relative frequencies for clinical and sociodemographic characteristics. Bivariate analysis was also performed to compare the groups (adult and elderly), using the chi-square test, considering statistical significance when  $p < 0.050$ . Stratified analysis according to age group, adult, and elderly. Thus, the cut-off point for the age division of the groups was considered: patients aged  $< 59$  years were classified as adults, and patients aged  $\geq 60$  years as elderly, according to the classification provided by the Brazilian Institute of Geography and Statistics (IBGE, in Portuguese).

## Results

Table 1 shows the sociodemographic characteristics, with a predominance of males (34.2%; n=40), complete primary education (59%; n=69), Caucasians (88%; n=103), retired (24.8%; n=29) and Catholics (30.8%; n=36). The mean age of the patients was 61 years (SD $\pm$ 10.3), with a maximum age of 88 years and a minimum of 38 years. There was also a significant amount of missing sociodemographic data in the medical records: education (28.2%; n=33); profession (28.2%; n=33); and religion (56.4%; n=66).

**Table 1.** Sociodemographic characteristics of patients with acute myocardial infarction undergoing hemodynamic procedure. Uruguaiana, Brazil. 2021. (n=117)

Variables	n	%
<b>Gender</b>		
Female	40	34.2
Male	77	65.8
<b>Education</b>		
Illiterate	1	0.9
Incomplete Elementary School	4	3.4
Complete Elementary School	69	59.0
Complete High School	8	6.8
Higher Education Complete	2	1.7
Data not recorded	33	28.2
<b>Ethnicity</b>		
Caucasian	103	88.0
African descent	14	12.0
<b>Profession</b>		
Retired	29	24.8
Self-employed	7	6.0
Unemployed/Household	11	9.4
Data not recorded	33	28.2
Other	37	31.6
<b>Religion</b>		
Evangelical	9	7.7
Catholics	36	30.8
Data not recorded	66	56.4
Illegible data	3	2.6
Other	3	2.6

Source: the authors (2023).

Analyzing the clinical characteristics, presented in Table 2, it was observed that chest pain was the most predominant symptom in patients (31.6%; n=37); and most of the medical records analyzed did not contain the record of signs and symptoms in the initial hospital care (80%; n=68.4%).

Among the most frequent risk factors, the following stand out sequentially: previous AMI (24.8%; n= 29); systemic arterial hypertension (16.2%; n= 19); diabetes mellitus (10.3%; n= 12) and smoking (10.3%; n= 12). There was also a high percentage of medical records that did not show records on the presence of risk factors for AMI (42.7%; n=50).

Regarding hemodynamic intervention, the prevalence of angiography with a stent was observed (65%; n=76). The type of stent (drug-eluting or non-pharmacological) used in hemodynamic interventions was not differentiated.

**Table 2.** Clinical characteristics of patients with acute myocardial infarction undergoing hemodynamic intervention. Uruguaiiana, Brazil. 2021. (n=117)

Clinical characteristics	n	%
<b>Signs and symptoms</b>		
Chest pain	37	31.6
Dyspnea	1	0.9
Syncope	1	0.9
Vomiting	2	1.7
Hypotension	1	0.8
Data not reported/recorded	80	68.4
<b>Risk Factors</b>		
Previous AMI	29	24.8
Systemic Arterial Hypertension	19	16.2
Diabetes Mellitus	12	10.3
Dyslipidemia	3	2.4
Obesity	2	1.6
Illicit drugs	3	2.7
Sedentary lifestyle	2	1.6
Tobacco use	12	10.3
Data not recorded	50	42.7
<b>Hemodynamic interventions</b>		
Angioplasty with one stent	76	65.0
Angioplasty with two stents	34	29.1
Primary angioplasty	3	2.6
Cardiac catheterization	4	3.4

Source: the authors (2023).

Table 3 shows the comparison between adult patients (59 years old or less) and elderly patients (60 years old or more), considering risk factors and clinical characteristics. It is noteworthy that most of the medical records analyzed were of elderly patients (52.9%; n=62).

Comparing adult and elderly patients, it was observed that both in the first group and in the second group, men predominated, that is, there is a higher prevalence of AMI in male patients, regardless of age group, with statistical significance for this association ( $p = 0.0391$ ). Smoking is a risk factor that predominated among adult patients ( $p = 0.037$ ).

However, chest pain (31.7%; n= 37) was the main clinical manifestation of AMI among adult patients, while previous AMI (24.8%; n= 29), hypertension (16.2%; n= 19) and diabetes mellitus (10.3%; n= 12) were the most common risk factors in elderly patients.

**Table 3.** Comparison of sociodemographic and clinical characteristics between elderly and adult patients with acute myocardial infarction undergoing hemodynamic procedure. Uruguaiiana, Brazil. 2021

Variables	Adults		Elderly		p
	n	%	n	%	
<b>Gender</b>					
Male	34	61.8	43	69.4	.039*
Female	21	38.2	19	30.6	
<b>Sign and symptom</b>					
Chest pain	20	36.4	17	27.4	.299
<b>Risk Factors</b>					
Previous AMI	14	25.5	15	24.2	.875
Hypertension	8	14.5	11	17.7	.640
Diabetes Mellitus	5	9.10	6	9.7	.914
Tobacco use	9	16.7	3	4.8	.037*
<b>Diagnosis</b>					
AMI	51	92.7	57	91.9	.087
AMI recurrent	4	7.30	5	8.1	

\*Chi square test.  
Source: the authors (2023).

## Discussion

This study showed a predominance of male patients among adult and elderly patients, a result that follows the national and international trend regarding the hegemony of cardiovascular diseases among men, with prevalence in all age groups. Another population study, which developed a national analysis, showed a percentage of 62.50% of men, confirming the higher prevalence of AMI in all age groups.<sup>13</sup>

Regarding the level of schooling, in a study conducted in Rio Grande do Norte, patients with AMI with incomplete elementary school (32%) and non-literate (29.7%) predominated, diverging from the present study.<sup>14</sup> However, it can be stated that a low level of schooling prevails among patients with AMI, since low socioeconomic conditions imply less access to healthy habits, contributing to an increased risk of cardiovascular disease.

Regarding the analysis of ethnicity among patients with AMI, the regional diversity of Brazil is observed. In the present study, Caucasians prevailed, which is consistent with another study carried out in the South Region, which showed white ethnicity in 82% of patients.<sup>15</sup> However, another study, carried out in the Northeast region of Brazil, showed that brown ethnicity prevailed in 52.7% of patients.<sup>14</sup> According to the Brazilian Institute of Geography and Statistics (IBGE), in 2016, in northeastern Brazil, approximately 26.4% of the population was characterized as white and 73% as brown-black. In the South, the percentage of whites was 76.7% and blacks-browns 22.5%, justifying this regional difference.<sup>16</sup>

The characterization of the profession is a variable rarely explored in studies on the clinical and epidemiological profile of patients with cardiovascular diseases, as well as religion. One of the few studies that analyzed profession showed that 51.8% of patients were classified in categories of other/undefined occupations.<sup>14</sup> In the present study, retired and Catholic patients prevailed.

Regarding clinical characteristics, a study conducted in a hospital in Goiás, identified that chest pain was reported by 98.44% of patients. In the present study, precordial pain was also the predominant symptom. However, it was only recorded in the evaluation of a little more than one-third of the patients. This specific difference may be associated with the incompleteness of the medical records analyzed in the present study, when compared

to the study in Goiás, in which the evaluation of this symptom was recorded in 100% of the medical records.<sup>13</sup>

Previous AMI appeared as the most prevalent comorbidity. One study, which evaluated the relationship between comorbidities and hemodynamic interventions, such as endarterectomy and angioplasty, concluded that previous AMI had a significant influence on new cardiovascular events.<sup>17</sup> Another national survey showed that 21.5% of patients who underwent primary angioplasty and 55% of patients who underwent elective angioplasty had previous AMI.<sup>14</sup>

The literature shows that there are several risk factors for AMI. In this study, systemic arterial hypertension, diabetes mellitus and smoking were the most prevalent factors, results that corroborate other studies.<sup>4,18</sup> In addition, the risk for AMI increases even more due to the lack of adherence to the treatment of these comorbidities and to healthy lifestyle habits. Thus, the lack of control of risk factors, it is projected that, by 2030, the number of deaths due to cardiovascular diseases will have a significant increase at the national and international level.<sup>19</sup>

In the present study, the most performed hemodynamic intervention was angioplasty with a stent. Despite all the advances in interventional cardiology, both for diagnosis and therapy, the global epidemiological scenario shows high rates of cardiovascular diseases, in which AMI stands out due to its high incidence, morbidity and mortality. In Brazil, according to the Department of Informatics of the Unified Health System (DATASUS), AMI is the leading cause of death from heart disease, reaching 14,680 deaths registered in 2022 with a higher incidence in the southeast region.<sup>17,20</sup>

Considering the risk factors for AMI in adults and the elderly, there is a lack of description of the comparison between these groups in the literature. However, in relation to chest pain, the main clinical manifestation of AMI, a predominance of this symptom was observed among adult patients. Since, in the age group of 60 years or more, the presence of several

comorbidities is common, which can interfere in the perception of cardiovascular symptoms, such as depression, dementia, medications that interfere with the central nervous system, diabetes, and analgesics, or even modify the symptomatology, demonstrating the difficulty of diagnosing AMI in this population, which can lead to delay or under treatment.<sup>21</sup>

Also, in the analysis of risk factors for AMI among adults and the elderly, it was observed that previous AMI, systemic arterial hypertension, and diabetes mellitus are more prevalent in elderly patients. These individuals have a longer time of exposure to risk factors relevant to the aging process, in addition to the natural organic frailty of senility. Smoking is a predominant factor among adult patients. Studies prove the high consumption by this population, which in addition to the use of conventional cigarettes, also uses electronic cigarettes and hookahs.<sup>8,22</sup>

## Conclusion

The most prevalent sociodemographic characteristics in patients with AMI undergoing hemodynamic intervention were complete primary education, Caucasian, retired and Catholic. Regarding clinical characteristics, chest pain was the most prevalent sign, and previous AMI, systemic arterial hypertension and diabetes mellitus were the main risk factors presented by patients. Angioplasty with stent placement was the most common hemodynamic intervention performed in patients with AMI.

Considering the comparison between the group of adult and elderly patients, there was a prevalence of males in both groups, and smoking was more prevalent among adults. Thus, it is concluded that the sociodemographic and clinical characteristics of adult and elderly patients with acute myocardial infarction undergoing hemodynamic intervention follow the same trend presented in the literature and the comparison between the groups suggests a higher risk for men, regardless of age group, with smoking being associated with the group of adult patients.

The lack of completeness in the recording of information in the patient's medical record implies numerous losses and, in the present study, may represent a limitation in the analysis of signs and symptoms, risk factors and comorbidities. There was a high percentage of medical records that did not present records on the presence of risk factors for AMI. In addition, the failure in the medical records implies the safety of the patients treated in the service, and in the administrative processes that imply the costs, billing and financing of hemodynamic interventions. The lack of classification of AMI (with or without Supra ST), an important variable, is also considered a limitation of the study, the sample size also implies the representativeness of the results.

### Authors' contributions

Muniz AG and Busanello J participated in the conception of the research question, methodological design, search and statistical analysis of research data, interpretation of results, writing of the scientific article. Garcia RP, Harter J, Franco MS, Cabral TS participated in the interpretation of the results of the scientific article and writing of the scientific article. All authors have reviewed and approved the final version and agree with its publication.

### Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, companies, and private foundations, etc.) have been declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.)

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