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Morbidity and mortality rate among men and women diagnosed with myocardial infarction

Taxa de morbimortalidade entre homens e mulheres com diagnóstico de infarto agudo do miocárdio

Tasa de morbimortalidad entre hombres y mujeres diagnosticados con infarto agudo del miocardio

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ABSTRACT
Objective: to identify any difference in morbidity and mortality rate between men and women diagnosed with acute myocardial infarction. **Method:** this quantitative, descriptive, cross-sectional study, involving a sample of 647 medical records, compared risk factors, and sociodemographic and hospitalization-related data. **Results:** of 647 patients, 415 were men and 232 women aged from 61 to 80 years. Risk factors included 74.96% of both sexes were hypertensives. Percentages of hypertension, diabetes, and dyslipidemia were higher in women. Mortality rates were 17.24% in women and 9.64% in men. The most significant risk factors for mortality were arterial hypertension, followed by diabetes and dyslipidemia. **Conclusion:** prevalence of myocardial infarction was higher in men, but morbidity and mortality rates were higher in women.
Descriptors: Morbidity; Mortality; Men; Women; Myocardial Infarction.

RESUMO
Objetivo: verificar se existe diferença na taxa de morbimortalidade entre homens e mulheres com diagnóstico de infarto agudo do miocárdio em um hospital de ensino. **Método:** estudo transversal, descritivo e quantitativo, com amostra de 647 prontuários, comparando-se fatores de risco, dados sociodemográficos e referentes à internação hospitalar. **Resultados:** de 647 pacientes, 415 eram homens e 232 mulheres, com idade variando entre 61 e 80 anos. Dos fatores de risco, 74,96% eram hipertensos em ambos os sexos, sendo que o percentual de hipertensão, diabetes e dislipidemia foi maior no sexo feminino. A taxa de mortalidade foi de 17,24% nas mulheres e 9,64% nos homens. Dentre os fatores de risco relacionados ao óbito, o mais significante foi a hipertensão arterial, seguido de diabetes e dislipidemia. **Conclusão:** houve maior prevalência de infarto do miocárdio no sexo masculino, entretanto, a taxa de morbidade e mortalidade foi maior no sexo feminino.
Descritores: Morbidade; Mortalidade; Homens; Mulheres; Infarto do Miocárdio.

RESUMEN
Objetivo: verificar si existe alguna diferencia en la tasa de morbimortalidad entre hombres y mujeres diagnosticados con infarto agudo de miocardio en un hospital universitario. **Método:** se trata de un estudio transversal, descriptivo y cuantitativo, que involucró una muestra de 647 historias clínicas, comparando factores de riesgo, datos sociodemográficos y relacionados con la hospitalización. **Resultados:** de 647 pacientes, 415 eran hombres y 232 mujeres con edades comprendidas entre 61 y 80 años. En cuanto a los factores de riesgo, el 74,96% era hipertenso en ambos sexos. El porcentaje de hipertensión, diabetes y dislipidemia se mostró superior entre las mujeres. La tasa de mortalidad fue del 17,24% en mujeres y del 9,64% en hombres. Entre los factores de riesgo relacionados con la muerte, el más significativo fue la hipertensión arterial, seguido de la diabetes y la dislipidemia. **Conclusión:** hubo una mayor prevalencia de infarto de miocardio entre hombres, sin embargo, la tasa de morbilidad y mortalidad fue más alta entre mujeres.
Descriptores: Morbilidad; Mortalidad; Hombres; Mujeres; Infarto del Miocardio.

INTRODUCTION

Acute Myocardial Infarction (AMI), also called heart attack, consists of the interruption of blood flow for a certain time, causing injury or death of the heart muscle cells[1,2]. It is part of cardiovascular diseases (CVD), responsible for approximately 30% of deaths in the world and considered one of the main causes of death[1,3-5]. Thus, heart diseases are considered a public health problem, in addition to generating high costs related to hospital admissions in Brazil[6,7].

In the United States, 53% of the causes of death are due to heart disease, with approximately 782 thousand cases of infarction per year in Americans over 65 years old[8]. In Brazil, according to the IT department of the Unified Health System (DATASUS), in 2013, there was an increase of 48% of deaths from AMI between 1996 and 2011, and only in 2010 there were approximately 79 thousand deaths related to this disease[9,10]. According to the same department, a total of 2028 deaths from AMI were recorded in the state of Sao Paulo, only in August 2013[11].

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Among the diseases related to cardiovascular system problems are heart failure, stroke, AMI, systemic arterial hypertension (SAH) and arrhythmia as some of the best known. Risk factors, when untreated and controlled, trigger heart disease, so in general, in addition to periodic examinations and correctly following professional guidelines, it is necessary to adopt a healthy lifestyle that combines a balanced diet with physical exercise, controlling weight, not smoking or drinking alcohol in excess and avoiding stress, improving quality of life and increasing survival[14].

Some risk factors related to AMI are intrinsic, such as gender, genetics, race and age[12,13]. Severe chest pain and tightness that radiates to the shoulders, back, jaw, neck and arms, feeling faint, shortness of breath, stomach pain, dry and constant cough, in addition to nausea, vomiting and sweat, usually after physical exercise, are some of the signs and symptoms of AMI[14].

Of the CVDs, AMI has a higher incidence and deserves special attention, because it causes 6.5 times more deaths than all infections and kills ten times more than breast cancer[15,16]. The myth persists in society that CVDs are just diseases that affect men[15].

The complications of AMI in women can be even greater than in men, due to the greater fragility of female structures. The greater the extent of the infarction, the more frequent and serious the complications will be. In women, estrogen production falls during menopause, which also facilitates changes in blood pressure and cholesterol, factors that lead to AMI. The use of birth control pills, poor diet, obesity and even double working hours, increase the number of deaths among women[14].

In the age group over 40, women who suffer a heart attack accumulate more risk factors such as diabetes, hypertension and high cholesterol rates. Therefore, there is a need to improve awareness of heart disease, especially among women, through information aimed at encouraging the adoption of healthy habits, avoiding not only CVD, but also aggravating factors[14].

Thus, a research that identifies the prevalence of AMI is important, and if there is a difference between men and women in relation to the rate of morbidity and mortality, relating risk factors, sociodemographic data and referring to hospitalization, to provide greater guidance and awareness, especially of women, about the importance of promoting and preventing CVD and the early diagnosis and treatment of AMI. Therefore, the aim of this study was to verify whether there is a difference in the morbidity and mortality rate between men and women diagnosed with AMI in a teaching hospital.

METHOD

Cross-sectional study, with descriptive design and quantitative approach, carried out through electronic medical records of patients of both genders, over 18 years old, who were hospitalized in the cardiology sector diagnosed with AMI, in a teaching hospital in the countryside of Sao Paulo, between May 2016 to May 2018 (24 months total).

Information was collected from 647 patient records, here treated as a sample of an existing population of 720. A total of 73 incomplete records or those that were transferred to other sectors and cities were excluded from the study.

The data were analyzed, comparing the characteristics of this population, according to risk factors, such as smoking, dyslipidemia (DLP), SAH, DM, family history and body mass index (BMI). Sociodemographic data (gender, marital status, age, color, education, religion and profession) were correlated with those related to hospitalization (need for surgery, length of stay in the hospital, type of health insurance, origin of hospitalization, discharge or death). The study was approved by the institution's Research Ethics Committee in accordance with Resolution #466/12.

The sample profile was characterized by descriptive analysis, including the analyzed variables and their consequences. The data were replicated in an absolute and relative way in this first part.

In the inferential analysis, the statistical analysis outlined the analysis of independence and prediction among the variables proposed in the scope of the study. For this, we used, within the expected standards, the Poisson Regression and Mann-Whitney U tests.

The results of independence between the proposed variables were provided by the analysis of the P value (significance). All analyzes were obtained using the SPSS Statistics Software (Version 23) linked to the features of the Excel tool (version 2016).

In the analysis of the inferential part of the statistical crosses, the results of the normality test of the variables were analyzed. The methods chosen to approach the analysis of variation of results between the groups analyzed verified the relationship between them, in which one of the variables was parameterized as being dependent and the other as independent, aiming at the prediction analysis between both.

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For all analyzes, a value of P<0.05 was considered statistically significant, characterizing the significance between the groups studied. All tests included an alpha error of 5% and reliability of 95%.

Normality was tested with the Kolmogorov-Smirnov test. Differences between medians were assessed using non-parametric tests, using the Poisson regression model, which analyses the data in the form of proportions or counting reasons, that is, it takes into account the total number of people with a certain disease.

Hypothesis tests were performed, using the Poisson and Mann-Whitney U method, in which the behavior of the correlations between the analyzed variables and the degree of explanation of the dependent variable in relation to the independent variables of the sample were analyzed.

RESULTS

A sample of 647 electronic medical records of patients over 18 years old, admitted to the cardiology sector with a diagnosis of AMI, was considered between May 2016 and May 2018 in a teaching hospital in the city of Sao Jose do Rio Preto, Sao Paulo. Paulo. The sample consisted of 415 men (64.14%) and 232 women (35.86%), and 52.40% were aged between 61 and 80 years old (mean=64 years old), with 57.76% (n=134) being female and 49.40% (n=205) male. In addition, 90.73% were white, 57.50% married, followed by widowers (17%), 41.58% had complete elementary school (1st to 4th grade). Most men were active in their professions, while most women were inactive.

In the analysis of risk factors versus male and female gender, it was found that 74.96% of the patients were hypertensive, with a percentage of 84.48% (n=196) of hypertensive women and 69.64% (n=289) of hypertensive men. Still, 60.43% were diabetic, 52.16% women and 32.53% men, and 28.44% (n=184) were smokers, 22.10% were ex-smokers, 20.87% (n=135) had dyslipidemia, 6.34% (n=41) had someone in their family who had AMI, 37.09% (n=240) were overweight and 19.78% (n=128) were obese. The percentage of hypertension, diabetes and dyslipidemia was higher in women. Men had a higher number of ex-smokers and smokers. Table 1 shows the sociodemographic variables and significant risk factors regarding the sample.

TABLE 1: Analysis of sociodemographic data and risk factors versus male and female gender. Sao Jose do Rio Preto, SP, Brazil. 2019.

	Female		Male		Total	
Variable	**N**	**%**	**N**	**%**	**N**	**%**
Marital status p<0,000*						
Married	118	50.86	254	61.20	372	57.50
Separated	6	2.59	14	3.37	20	3.09
Divorced	9	3.88	22	5.30	31	4.79
Unidentified	0	0.00	2	0.48	2	0.31
Single	12	5.17	38	9.16	50	7.73
Stable union	14	6.03	48	11.57	62	9.58
Widowed	73	31.47	37	8.92	110	17.00
Education p=0,009*						
Illiterate	49	21.12	44	10.60	93	14.37
Literate Only	1	0.43	2	0.48	3	0.46
Elementary school - 1st to 4th grade	89	38.36	180	43.37	269	41.58
Elementary school -5th to 8th grade	46	19.83	88	21.20	134	20.71
High school	37	15.95	65	15.66	102	15.77
Higher education	10	4.31	34	8.19	44	6.80
Specialization	0	0.00	2	0.48	2	0.31
Profession p<0,000**						
Inactive	177	76.29	50	12.05	227	35.09
Active	55	23.71	365	87.95	420	64.91
Diabetes p<0,000**						
Yes	121	52.16	135	3.53	256	60.43
No	111	47.84	280	67.47	391	39.57
Ex-Smoker p=0,012**						
Yes	35	15.09	108	26.02	143	22.10
No	197	84.91	307	73.98	504	77.90
TOTAL	**232**	**100**	**415**	**100**	**647**	**100**

*Mann-Whitney test; **Poisson Regression Analysis

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Regarding the length of hospital stay and diabetes, 18 patients were hospitalized for more than 30 days; of these, 10 were women and 8 men. Analyzing sociodemographic data and risk factors versus deaths, it was noticed that the number of deaths was small between genders, with the percentage of 17.24% (n=40) women and 9.64% (n=40) men. Of the patients who died, 72.50% (n=58) were between 61 and 80 years old, 41.25% elementary school from the 1st to the 4th grade, 25% were illiterate, 56.25% were inactive, 52.50% (n=42) were overweight and 10% (n=8) were obese. Among the deaths, 59 (73.75%) were hypertensive, that is, it was the main cause of mortality, and in 37 (46.25%) of the deaths, diabetes was the main comorbidity, as shown in Table 2.

TABLE 2: Analysis of sociodemographic data and risk factors versus discharges and deaths. Sao Jose do Rio Preto, SP, Brazil. 2019.

Variable	Discharge		Death		Total	
	N	%	N	%	N	%
Gender p= 0,945*						
Female	192	82.76	40	17.24	232	35.86
Male	375	90.36	40	9.64	415	64.14
Education p=0,001**						
Illiterate	73	12.87	20	25.00	93	14.37
Literate Only	2	0.35	1	1.25	3	0.46
Elementary school - 1st to 4th grade	236	41.62	33	41.25	269	41.58
Elementary school -5th to 8th grade	118	20.81	16	20.00	134	20.71
High school	93	16.40	9	11.25	102	15.77
Higher education	43	7.58	1	1.25	44	6.80
Specialization	2	0.35	0	0.00	2	0.31
Profession p= 0,022*						
Inactive	182	32.10	45	56.25	227	35.09
Active	385	67.90	35	43.75	420	64.91
Hypertension p=0,016*						
Yes	426	75.13	59	73.75	485	74.96
No	141	24.87	21	26.25	162	25.04
TOTAL	**567**	**100**	**80**	**100**	**647**	**100**

*Poisson Regression Analysis; **Mann-Whitney test

The analysis of data on hospitalization showed that in 66.92% (n=433) of patients, the length of stay was between 1 and 10 days, 81.45% (n=527) were attended by the Unified Health System – *Sistema Único de Saúde* (SUS), 72.02% (n=466) had the emergency room as the gateway and 73.11% (n=473) underwent invasive procedures such as myocardial revascularization or coronary angioplasty.

Regarding the data analysis on hospitalization versus deaths, the length of stay from 1 to 10 days had a higher number of deaths (n=31/38.75%), followed by the length of stay less than 1 day-24 hours (n=23/28.75%). Most deaths were in SUS patients (93.75%), 82.50% referred by the emergency department. Table 3 shows that 50% of the patients who died, needed some surgery/procedure (myocardial revascularization or coronary angioplasty).

TABLE 3: Data analysis on hospitalization versus discharge and deaths. Sao Jose do Rio Preto (SP), Brazil. 2019.

VARIABLE	Discharge		Death		Total	
	N	%	N	%	N	%
SUS or Health insurance p=0,007*						
SUS	452	79.72	75	93.75	527	81.45
Health insurance	115	20.28	5	6.25	120	18.55
Origin of care p=0,011**						
SUS Outpatient Clinic	2	0.35	0	0.00	2	0.31
SUS Emergency	29	5.11	4	5.00	33	5.10
SUS emergency care	400	70.55	66	82.50	466	72.02
SUS hospitalization	22	3.88	5	6.25	27	4.17
Health insurance Emergency	90	15.87	3	3.75	93	14.37
Health insurance hospitalization	24	4.23	2	2.50	26	4.02
Surgeries p<0,000*						
No	134	23.63	40	50.00	174	26.89
Yes	433	76.37	40	50.00	473	73.11

*Poisson Regression Analysis; **Teste de Mann-Whitney

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Among the 80 deaths recorded, 33 had elementary school from the 1st to the 4th grade and 15 were women and illiterate, as well as the 5 deaths in men. In addition, 36 women who died were inactive in their professions, while 31 men who died were active. Among the patients who died, with diabetes as the main comorbidity, 22 were women and 15 were men. Regarding hypertension, 35 women and 24 men died.

DISCUSSION

Among the 647 patients, most were men and aged 61 to 80 years old. A study that compared the regions of Brazil showed that in the Southeast region, the average age among patients hospitalized with AMI was 63.1 years old, with 66.4% men[17]. In the Northeast region, there was also a predominance of men, with a small increase in age, which may be directly related to genetic and cultural factors[18]. Another study showed that the age range of 60 ± 10 years old, had a higher occurrence of AMI[19]. This corroborates with this study, since the prevalence of AMI was higher in men and the age group above 61 years old.

As for risk factors, 74.96% were hypertensive, 60.43% were diabetic; 20.87% had dyslipidemia and the prevalence of smokers and ex-smokers was higher in men. Other studies have shown that, in the Southeast region, 70.9% of the patients had SAH and 34.6% had dyslipidemia (DLP), and in 55.4% of the cases, there were current or previous smokers[17]. A study showed that during hospital admission, 2/3 of the patients were hypertensive and diabetic[20]. Sedentary lifestyle, obesity and family history are other risk factors prevalent in the older adults population[3].

In this study, there was a prevalence of SAH and DM in patients diagnosed with AMI, that is, they are risk factors that need control, medical monitoring and adherence to treatment by the population. The diabetes risk factor was significant with $p<0.000$ and according to the V Guideline of the Brazilian Society of Cardiology on the treatment of AMI with ST segment elevation, it is a complex metabolic disorder that promotes the development of atherosclerosis. Thus, diabetes patients progress more easily to the development of ischemic heart disease, and consequently to a greater morbidity and mortality[14].

In a literature review, the most prevalent risk factors for AMI were SAH, DM and smoking[21]. SAH was the most prevalent factor in most of the studies in this review, except for one conducted in Chile, in which the prevalence of the smoking factor was higher, with rates varying between 20% in Brazil and the USA, reaching alarming rates of 36.5% in Chile. It is important to highlight that smoking is influenced by cultural factors and can vary consumption according to the region[22]. The most prevalent risk factor in this study was SAH, followed by DM and also smoking with 28.44%. According to the guidelines of the cardiology society, prevention secondary to smoking recommends medical advice and, if necessary, referral to the smoking cessation program and the use of pharmacological agents, including nicotine patches[14].

In this study, it was found that the prevalence of infarction was higher in men. However, the mortality rate was higher in women (17.24%). One of the possible explanations is since women have different cardiovascular characteristics from men, such as thinner arteries and veins, which makes the obstruction by atherosclerotic plaques more severe. Another reason is the presence of the estrogen hormone, which is a protective factor for women, as its vasodilator function prevents the accumulation of LDL. However, during menopause, this hormone decreases, making a cardiac episode worse in women[20,23].

The results of the studies mentioned above corroborate the increase in the rate of morbidity and mortality in women evidenced in this study, mainly after menopause and with advancing age (a non-modifiable risk factor for cardiovascular diseases). The guideline of the cardiology society reinforces the benefits of statin treatment in dyslipidemia, such as reducing the number of deaths from coronary artery disease (CAD)[14].

Symptoms such as back pain, nausea and stomach burning are not always related to the heart by women. Generally, they are associated with orthopedic and gastrointestinal problems, and consequently, end up delaying the search for medical help[23]. Sometimes, pain in the stomach, in the back and rising to the nape of the neck, are also some of the symptoms of AMI that deserve attention[14]. Thus, health education and knowledge of the population about the symptoms of AMI is very important, so that they immediately seek the nearest health service.

The prevalence of hypertensive and diabetic patients was higher in women, aged between 61 and 80 years old, in both genders. One study shows that AH and DM were the most prevalent risk factors in women than in men, which corroborates with this study. In addition to women seeking health services later, they are older than men by 6.3 years old and, as a result, end up with more comorbidities and high lethality[24].

Rapid service impacts the mortality rate. Because of the COVID-19 pandemic, many people have been slow to act when they feel ill, which has caused the increase in deaths at home across the country. In the city of Sao Jose do Rio

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Preto - SP, deaths at home due to cardiovascular causes increased by 64% during quarantine, compared to 2019. There was a 57% reduction in deaths from AMI observed in hospital emergencies according to data from the Association of the Natural People Registrars of the State of Sao Paulo (Arpen-SP)[14].

Regarding risk factors versus male and female gender, 37.09% were overweight and 19.78% were obese. A study showed that obesity is also a risk factor for the development of chronic diseases[25]. The diagnosis of overweight corresponds to a BMI (Body Mass Index) ≥ 25 kg/m^2 and <30 kg/m^2 and of obesity, BMI ≥ 30 kg/m2, modifiable risk factors that can be monitored in primary care, by adhering to treatment, in addition to encouraging a balanced diet and physical activity[14].

As for the data on hospitalization versus deaths, 28.75% of patients died in less than 24 hours. It was shown in a study that the hospital infrastructure is a predictor of the outcome of AMI, that is, the time for hospital admission is on average 4 hours, which ends up influencing the patients' clinical outcome[26]. Thus, the early recognition of symptoms, the immediate search for emergency services and admission are factors that impact the mortality rate as identified in this study.

Analyzing risk factors versus deaths, it was identified that 73.75% were patients with AH. In a study carried out in the Emergency sector, in Bahia, it showed that SAH was the most prevalent risk factor and showed an expressive mortality rate[5]. According to the guidelines of the cardiology society, SAH contributes to ventricular remodeling, acceleration of atherosclerosis and heart failure. Thus, the control goal established is numbers <140/90 mmHg, along with adherence to drug treatment[14].

The female and male death rate was 17.24 and 9.64%, respectively. It was confirmed in another study that the morbidity and mortality rates due to AMI in Brazil are still high. One of the probable factors is the difficulty of accessing specialized services after the first symptoms and the lack of adherence and delay in treatment at the level of primary care[27]. In addition to health education by professionals, it is necessary to understand and raise awareness in the population, since among the deaths, the predominant education level was incomplete elementary school (41.25%), followed by illiterates (25%).

A study showed that, between 2008 and 2016, there were 21398 cases of deaths from AMI occurring in Brazil among men and women aged 30 to 59 years old. In most regions, men had a higher number of reported deaths with 13 587 deaths, which may be related to this younger age group, since 57.76% of the women in this study were aged between 60 and 80 years old[16].

In this study, it is possible to observe the importance of health education, prevention and promotion in primary care, since several risk factors are significant for AMI and that despite men being hospitalized more, women had a higher mortality rate, comorbidities (SAH and DM) and older age. In addition, adherence to cardiac rehabilitation programs after AMI is important for cardiac patients to return to productive life, prevent progression or reverse the atherosclerotic process, control risk factors (hypertension, diabetes, dyslipidemia, obesity, among others), reduce cardiovascular morbidity and mortality and improve symptoms of angina, and the prescription of physical activity is according to the involvement and physical characteristics of each individual[14]

Due to the use of electronic medical records, the lack of some data related to the patient, such as stressors or anxiety levels, was a limiting factor for the study.

CONCLUSION

The rate of morbidity and mortality of patients with AMI was different between men and women, since the prevalence was higher in men and the mortality rate was higher in women. That is, it was found that men were hospitalized more than women during the period of data collection, however, more women died.

As for the profile of patients with AMI, the age group with the highest mortality was between 60 and 80 years old, with a hospital stay of less than 10 days and SAH was the most significant risk factor in relation to death, with a higher prevalence in women, followed by the DM. There was a higher percentage of smoking and ex-smoking in men.

Knowing the profile of men and women who have suffered AMI promotes the development and strengthening of prevention strategies at both the hospital and outpatient level. Some examples are: training of the health team on scientific evidence regarding CVD and the profile of the affected population to propose actions for more effective care; educational actions for health promotion and prevention on the importance of adherence to drug treatment and the control of risk factors such as SAH, DM, smoking, obesity, stress and the encouragement of healthier lifestyle habits, such as balanced diet and physical activity, in addition to monitoring consultations and routine exams and training the

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team and the population on emergency care in the basic life support model (BLS). However, there is a need for further studies relating risk factors, sociodemographic variables and referring to hospitalization in men and women with AMI.

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