Original Article

Increased Mortality and Morbidity Due to Acute Myocardial Infarction in a Public Hospital, in Feira de Santana, Bahia

Graça Maria Tavares de Melo Ferreira, Luis Cláudio Correia, Helena Reis, Carlos Brandão Ferreira Filho, Francisco Freitas, Guilherme Melo Ferreira, Ivan Júnior, Nelson Oliveira, Armênio Costa Guimarães

Escola Bahiana de Medicina e Saúde Pública (EBMSP) - Fundação Bahiana para o Desenvolvimento das Ciências (FBDC), Salvador, BA, Brazil

Summary

Background: Factors related to socioeconomic status and health care quality and management may influence mortality and morbidity rates due to acute myocardial infarction (AMI).

Objective: To compare mortality and morbidity in patients with AMI hospitalized in public and private hospitals.

Methods: An observational study, with comparison groups. Clinical evaluation on admission, and recording of diagnostic, therapeutic and evolution data until discharge or death. Comparison of clinical characteristics by univariate analysis followed by bivariate analysis, evaluating the combination of predictors with death and morbidity (Killip> I), SPSS, version 13.0.

Results: 150 patients were evaluated, 63 (42.0%) of private hospitals and 87 (58.0%) of public hospitals, with 63.1% and 62.1% of males, aged 61.1 ± 13.8 and 60.0 ± 11.6 years, respectively. The mortality from AMI was 19.5% in public hospitals *vs* 4.8% in private hospitals (p = 0.001), and morbidity (Killip class> I) was 34.3% in public hospitals *vs* 15.0% in private hospitals (p = 0.012). There was a significant difference between public and private patients, due to lower family income and education (70.1% with one to two salaries *vs* 19.0%, p <0.001, and 49.4% of illiterates *vs* 6.3%, p <0.001, respectively); late arrival at the hospital (HAT> 1 hour: 76.9% *vs* 48.6%, p = 0.003); and a longer period of time before being medicated (AMT ≥ 15 minutes: 47.1% *vs* 8.0%; p <0.001); ICU for 8% of the patients in public hospitals *vs* 94% in private hospitals; and thrombolysis for 20.6% *vs* 54.0%, respectively (p <0.001).

Conclusion: Mortality and morbidity were greater among public patients, which presented more serious conditions, arrived later at the hospital and received lower quality treatment. (Arq Bras Cardiol 2009; 93(2) : 92-99)

Key Words: Lethality; morbidity; myocardial infarction; health inequalities; health policy.

Introduction

Acute myocardial infarction (AMI) is the main complication of CAD[1]. The mortality and morbidity from AMI depends on factors related to the severity of the disease and the speed and quality of hospital care. If the patient receives appropriate hospital care within few hours after onset of the symptoms, the mortality worldwide is around 10%[2], similar to that observed in the hospitals of the cities of Rio de Janeiro (10.8%) and Niterói (12.3%)[3,4]. However, this percentage may not reflect the reality when there are factors such as delay between the onset of pain and arrival at the hospital, delay in the start of in-hospital treatment, restrictions on the use of myocardial protection measures, such as primary angioplasty and thrombolytics, and on access to intensive care unit[2,5]. In addition, the social strata of lower income and education show a more serious natural history of CAD, with the possibility of higher mortality and morbidity in the first 28 days post-AMI[6,7]. Although the reasons for this are not well defined, it is noteworthy that public health care units, such as hospitals and health care centers, do not always have a specialized staff for emergency cardiovascular care, there is scarcity of certain drugs, such as thrombolytics, and there are insufficient number of beds in ICU to meet local demand, and these are issues that have an important influence on the prognosis of the disease. Other factors like limited access to a specialized hospital or outpatient care unit of better quality, and limitations on the maintenance of appropriate preventive measures of primary or secondary type have also been considered[5-7].

In Bahia, there are serious limitations on high complexity cardiovascular care in the public system, which needs to be reviewed, aiming at a recasting of the system. The city of Feira de Santana, with 600,000 inhabitants, the largest city of inland Bahia State, has only one public hospital and three private hospitals with intensive care units, where all the cardiological care of the region takes place, creating favorable conditions for the study of these issues. Therefore, the assessment of the mortality and morbidity in the hospital phase of AMI, the coronary risk profile of public and private patients, and the quality of health care in that city can provide relevant data to help correct these serious distortions in the health care system.

Mailing address: Armênio Costa Guimarães •
Rua Guadalajara, 841 / 101, Morro do Gato - Ondina - 40140-460, Salvador - BA, Brazil
E-mail: armenioguimaraes@terra.com.br
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The objective of this study is to compare the mortality and morbidity from AMI in public and private hospitals, identifying key factors associated with the differences in their rates.

Methods

This was an observational study, with groups of comparison. We included patients over 18 years of age, with confirmed diagnosis of AMI, based on the type and duration of pain and electrocardiographic and enzyme changes, according to the criteria of the III Guideline on the Treatment of Acute Myocardial Infarction[8], all of whom had signed the informed consent form. We excluded patients who were not able to answer the questionnaire and to be properly examined and observed, or those who had not accepted to participate in the study.

Public patients were those admitted to the General Hospital Clériston Andrade, which has 200 beds, 60 in the Emergency Room, and 10 in the ICU; private patients were those admitted to the following hospitals: EMEC, with 67 beds, 6 in the ICU; São Matheus, with 53 beds, 6 in the ICU; and UNIMED, with 64 beds, 8 in the ICU. The patients underwent a clinical examination on admission, and also answered a questionnaire about demographics, risk factors and the time span between the onset of pain and arrival at the hospital (hospital arrival time - HAT) and the time span between arrival at hospital and the use of any specific medication (arrival medication time [AMT]). Self-reported weight and height[9,10] were used to calculate the BMI[11]. Abdominal waist was measured with the patient in upright posture[12], as soon as this position could be taken.

The laboratory parameters were the following: blood glucose, total cholesterol and fractions, and CK-MB, all performed by enzymatic methods; the reference values of CKMB were different for private and for public hospitals. Plasma troponin measurement was excluded because it is not available in public hospitals. The electrocardiographic interpretation of AMI, according to the guidelines of the Brazilian Society of Cardiology (SBC)[8], was done by the researcher and collaborators.

After inclusion, the patients were followed up until hospital discharge or death. Data on evolution, including the clinical classification of Killip-Kimbal[13], and the use of medications were obtained from the clinical file, with additional clarification from the attending physician. The sample consisted of patients with confirmed AMI, who were consecutively admitted to the private hospitals and the reference public hospital of Feira de Santana, from March 2006 to January 2007. There was no refusal among private patients in participating in the study, but among public patients there was one refusal.

The statistical analysis was based on a database created with the aid of the program SPSS, version 13.0. The data were presented comparatively between private and public patients. Initially an univariate analysis was conducted, comparing the demographic and the initial clinical profiles, as well as health care and evolution main data. Later, we conducted a comparison of primary outcomes, mortality and morbidity, the latter expressed by the percentage of patients in Killip class > I. The comparison was made between the two types of hospital, using the combined and the isolated outcomes. The significance of the association between predictors and outcomes (death and Killip class > I), isolated and combined, respectively, was subsequently assessed by bivariate analysis, using the variables that showed a statistically significant difference between private and public patients. Then, the independence of associations was assessed by multivariate logistic regression analysis, using the algorithm "backward". This project was approved by the Research Ethics Committee of the Bahia Foundation for the Development of Sciences (FBDC).

Results

150 patients were evaluated, 63 (42.0%) private, 40 (63.1%) male, aged 61.1 ± 13.8 years; and 87 (58.0%) public, 54 (62.1%) male, aged 60.0 ± 11.6 years. The demographics (Table 1) show significant differences in family income, with 19.0% of the private patients in the range of 1-2 minimum wages *versus* 70.0% of the public patients; and 43.0% in the range of 5-10 wages *versus* 4.0%, respectively ($p < 0.001$). A significant difference was found also in schooling, with 6.0% of private patients being illiterate *versus* 49.0% of the public patients, and 36.0% of the private patients with high school or higher education *versus* 3.4% of the public patients ($p < 0.001$).

The clinical characteristics of private and public patients were similar with respect to high prevalence of positive information on risk factors such as high blood pressure (hypertension), which was more prevalent among men (53/98 [54.1%] *versus* 45/98 [45.9%], $p = 0.003$); diabetes, which was more prevalent among women (24/41 [58.5%] *versus* 17/41 [41.5%], $p = 0.001$); smoking habit; overweight / obesity; physical inactivity; and personal history and family history of CAD. Dyslipidemia was an exception, being mentioned by 63.5% of the private patients *versus* 38.0% of the public patients ($p = 0.002$), as shown in Table 2. This similarity was also observed in the slightly higher mean values of waist circumference, BMI and blood pressure, and in a moderately high concentration of fasting plasma glucose. However, the prevalence of high total cholesterol was greater in public patients ($p = 0.037$). The mean CKMB values were not comparable, due to the use of techniques with different reference values, with a maximum normal value up to 25IU (international unit) in private patients, and as low as 6IU in public patients. However, using mean values, it was observed that for private patients the mean value was 3.8 times higher than the maximum reference value, while for public patients it was 15 times higher. There was no difference in the topography of AMI and in the type of ST change (Table 2).

The clinical course of patients with AMI (Table 3) was much more favorable for private patients (81% in Killip class I *vs* 18.6% in class > I) than for public patients (52.8% *vs* 47.2%; $p = 0.004$). The patients took longer to reach the public hospital after the onset of pain (HAT > 1 hour in 76.9% *vs* 48.6% $p = 0.003$) and were treated later (AMT ≥ 15 minutes in 47.1% *versus* 8.0%, $p < 0.001$). 59 (94.0%) private patients were admitted to the ICU, compared to 7 (8.0%) public patients. It is noteworthy that it was among the 80 public patients with no access to the ICU that occurred 17 of the 20 deaths (85.0%) observed in the total sample. As to the administration of medication, the use of thrombolytics, clopidogrel, beta-blockers and statin was significantly more frequent in private hospitals. Only heparin was used more frequently in the public hospital than in private hospitals (69.0% *versus* 46.0%, p = 0.013), noting that enoxparin was used in private hospitals and non-fractioned heparin was used in the public hospital. The absence of significant differences between genders in the distribution of these variables was noticeable.

As to the use thrombolytics, 101 (67.3%) patients were eligible for treatment (AMI with elevation of ST segment, Table 2). Among these, 17/101 (16.8%) lost their window of 12 hours for the application of thrombolytics: one private patient and 16 public patients. However, of the remaining 84 patients (42 private and 42 public), only about half (49.5%) were treated: 34/42 (81.0%) private and 16/42 (38.1%) public, p <0.001. The remaining 34 (40.5%) were not treated due to health care problems: 26 (76.5%) of these were public patients.

The mortality rate from AMI was 5.7 times higher among public patients than among private patients (17 [19.5%] *versus* 3 [4.8%], p = 0.001, Table 4), and mortality was predominant in women (12/56 [21.4%] *versus* 08/94 [8.5%], p = 0.028), with a prevalence ratio (PR) of 2.9. All deaths occurred in the group of patients in Killip class> I. The three deaths in the private hospitals were caused by cardiogenic shock, refractory left ventricular failure and AMI during the hemodialysis session, respectively. The deaths in the public hospital included 3 from sudden death, just a few hours after admission, 2 from ventricular arrhythmia, 4 from cardiogenic shock and 8 from left ventricular failure.

The morbidity of AMI, with a rating based on the percentage of non-fatal AMI in Killip class> I was also 2.7 times higher among public patients (24/70 [34.3%] *vs* 9 / 60 [15.0%], p = 0.012, Table 4). Regarding gender there was also significant difference: 22/33(66.7%) in men *versus* 11/33(33.3%) in women, p=0.014. As to the combined mortality and morbidity outcome, the difference between public and private remained significant (47.1% *versus* 19.0%, p <0.001).

After determining the differences in demographic, clinical and evolution profiles between private and public patients, we sought to verify, by bivariate analysis, the influence of these variables in mortality and morbidity. In Table 5, it is observed that a high combined mortality and morbidity rate was significantly associated with hospitalization in a public hospital, income less than 2 minimum wages, delay in the use of specific medication (AMT), non-admission to the ICU and non-use of thrombolytic. Bivariate analysis in relation to the use of beta-blockers and statins was invalidated by the fact that most patients in both hospitals used this type of drug: 100% in private hospitals and 87 and 88% in public hospitals, respectively. However, the bivariate analysis with individual outcomes showed a significantly higher mortality without the use of beta-blocker (54.5% *versus* 10.1%, p <0.001). As to

Table 1 - **Comparison between demographic data of patients with AMI treated in private and public hospitals in Feira de Santana, Bahia.**

n = 150 Variables	Hospital						p (*)
	Private n = 63			Public n = 87			
	n	(%)	Mean (SD)	n	(%)	Mean (SD)	
Age			61.1 (13.8)			61.0 (11.6)	0.965
Gender							
Male	40	63.1		54	62.1		
Female	23	36.0		33	38.0		0.859
Family Income							
1 to 2 wages	12	19.0		61	70.1		
3 to 4 wages	23	36.5		21	24.1		
5 to 10 wages	15	24.0		4	4.5		
Over 10 wages	12	19.0		0	0		<0.001
Education							
Illiterate	4	6.3		43	49.4		
Elementary	36	57.1		37	42.5		
High School	16	25.4		3	3.4		
College	7	11.1		0	0		<0.001

(*) Value of P calculated by the Student t-test for independent samples and by Pearson's Chi-Square for comparison of percentages.

Table 2 - **Comparison between key clinical variables of AMI patients of private and public hospitals, in Feira de Santana, Bahia**

n = 150 Variables	Hospital						p (*)
	Private n = 63			Public n = 87			
	n		(%)	n		(%)	
Risk factors							
High blood pressure	37		58.7	61		70.1	0.148
Diabetes mellitus	17		27.0	24		27.6	0.935
Dyslipidemia	40		63.5	33		38.0	0.002
Smoking habit	17		27.0	36		41.3	0.120
BMI > 25 K/M2 (Ow/Ob)†	41		65.1	45		51.7	0.161
Physically active	13		20.6	16		18.4	0.462
Family history of CAD	29		46.0	31		35.6	0.326
Previous CAD	18		28.5	34		39.0	0.182
Clinical measurements	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	
Mean waist measurement	63	95	8.7	84	93	10.6	0.335
BMI†	63	26	3.3	84	26	4.4	0.866
SBP	63	147	27.0	87	144	39.0	0.236
DBP	63	90	15.0	86	89	23.0	0.833
Heart rate	63	82	14.0	86	85	18.0	0.256
Laboratory measurements							
CKMB	63	119.2	84	83	90	69.0	§
Glucose	63	133.7	56.0	82	123	62.0	0.313
Total cholesterol	62	223	57.0	45	250	74.0	0.037
Infarction area	**n**		**%**	**n**		**%**	
Anterior AMI	25		40.0	36		41.3	-
Inferior AMI	14		22.2	22		25.2	-
Type of AMI							
AMI with STE	24		38.0	29		33.3	-
AMI without STE	43		68.3.	58		66.7	0.689

BMI - body mass index; CAD - coronary artery disease; Ow/Ob = overweight / obesity; SBP - systolic blood pressure; DBP - diastolic blood pressure; HR - heart rate; CKMB - creatine phosphokinase, MB fraction; AMI - acute myocardial infarction (heart attack); STE - elevation of ST segment. (*) Value of P calculated by the Student t-test for independent samples and the Pearson's chi-square to compare percentages. † IMC was calculated based on self-reported values of weight and height; § CKMB – private hospital: the mean value was 3.8 times higher than the maximum reference value of 25; public hospital: the mean value was 15 times higher than the maximum reference value of 6; Note: the mean values are not comparable because they were calculated using different techniques.

the use of statins, both morbidity and mortality were higher for non-use of the drug or medication, with a mortality rate of 40.0% *versus* 11.4% (p = 0.01) and a morbidity rate of 66.7% *versus* 23.4%, p = 0.017, respectively. It is also noteworthy that the isolated mortality outcome was significantly higher among women (21.4% *versus* 8.5% for men, p <0.001) and it tended to be higher among illiterate patients (21.3% *versus* 9.7%, p = 0.053). Regarding morbidity, it was more common among men aged ≥ 55 years (35.3% *versus* 11.4%, p = 0.013).

The multivariate logistic regression analysis was completed with three variables in the model: two independent ones, arrival medication time span (AMT) ≥ 15 minutes, with OR of 2.95 (95% CI 1.38-6.31, p = 0.005), and income less than 2 minimum wages, with OR of 2.92 (95% CI 1.37-6.23, p = 0.06), and the third one, the non-use of thrombolytic, in a threshold position, with OR of 2.35 (95% CI 0.998-5.52, p = 0.050).

Discussion

In this comparative study of mortality and morbidity of patients with AMI in private and public hospitals, in Feira de Santana, the great preponderance of public patients require review and reflection. While the mortality in private hospitals was markedly low (4.8%), comparable to that of countries with per capita income exceeding $ 9,000.00[12], mortality in the public hospital (19.5%) was well above the rate of 12.1% observed in countries with low per capita income (US$ <2,900.00)[12], the rate of 12.6% observed in public hospitals of the city of Niterói[4], Rio de Janeiro State, and the rate of 14.5% observed in a study conducted in Salvador[5], which included the six main private and public hospitals, respectively.

In addition to the individual biological characteristics, which determine the degree of severity of coronary heart disease, there are several other factors contributing to the severity of AMI, with direct reflection on in-hospital mortality and morbidity. Among these are the classic risk factors: hypertension, diabetes, overweight/obesity, dyslipidemia and smoking habit, and also adverse socioeconomic conditions, delay in arrival at the hospital and lower quality of hospital care[6,7,12-15]. In this study, the binomial low family income and low education influenced the higher mortality and morbidity in public patients with AMI[6,7,13]. Both these factors restrict the access and adherence to treatment of causal risk factors, allowing the occurrence of a coronary event of greater severity. This statement is consistent with the equitable distribution of the major risk factors for AMI among private and public patients[13,14], although more aggressively in public patients, in whom the limited possibility of appropriate control is one of the main constraints. The greater clinical severity of public patients is characterized by a high prevalence of patients in Killip class > I, which is 3 or 4 times higher than that found in private patients, and a higher value of CK in public patients. These indications of major losses of viable myocardium are in line with the significant higher mortality observed in public patients, with 70% of them dying from cardiogenic shock or refractory left ventricular failure.

In this scenario of greater severity of AMI in public patients, it is important to consider possible predictors among the demographic, clinical, laboratory, evolution, and therapeutical variables that showed significant differences between private and public patients and a significant association with morbidity and mortality (Table 5). The preponderance of female mortality was particularly striking, and it occurred at the expense of a high mortality rate in the public hospital network, 10 of a total of 12 female deaths, which represented 58.8% of deaths among public patients. This finding is independent of age, suggesting a greater tendency to premature mortality from AMI, in opposition to the biological curve of CAD mortality in women, which tends to increase, equaling the curve for men after menopause[16].

Table 3 - Evolution and health care main aspects of AMI patients in private and public hospitals, in Feira de Santana, Bahia

n = 150 Variables	Hospital				p (*)
	Private n = 63		Public n = 87		
	n	(%)	n	(%)	
KILLIP I	51	81.0	46	52.9	
KILLIP II	6	9.0	19	22.0	
KILLIP III	5	8.0	14	16.0	
KILLIP IV	1	1.6	8	9.2	0.004
HAT					
1 hour	28	51.0	17	22.0	
2-4 hours	16	28.0	35	40.2	
> 4-12 hours	15	14.3	11	10.3	0.003
> 12 hours	4	6.3	24	27.6	
AMT					
< 15 minutes	58	92.0	42	48.2	
≥ 15 minutes	5	8.0	41	47.1	<0.001
Hospitalization					
ICU	59	94.0	7	8.0	<0.001
Medication					
Thrombolytics	34	79.10	16	21.1	<0.001
Aspirin	63	100	85	98.0	0.226
Nitrates	63	100	85	98.0	0.226
ACEI	56	89.0	68	78.1	0.167
Clopidogrel	63	100	74	85.0	0.001
Heparin	29	46.0	60	69.0	0.013
Beta-blockers	63	100	76	87.0	0.014
Statin	63	100	77	88.0	0.005
Vasopressors	4	6.0	14	16.0	0.128
Diuretics	9	14.2	23	26.4	0.130
Digitalis	7	11.0	18	21.0	0.197
Antiarrythmics	8	12.6	20	23.0	0.184

Killip – classification for the clinical stratification of AMI; HAT – hospital arrival time: time between onset of pain and arrival at the hospital; AMT - time between arrival at the hospital and the first medication; ICU - intensive care unit; ACEI - angiotensin converting enzyme inhibitors; Heparin: unfractionated in public hospitals, and fractionated in private hospitals. (*) The value of P was obtained by Pearson's chi-square test or Fisher's exact test for tables with values <5.

Another aspect to be considered was the preponderance of significant history of diabetes in women, a factor that is associated with an increased CAD mortality[17]. However, this

Table 4 - Mortality, Morbidity,* and combined Mortality and Morbidity for AMI, in private and public patients, in Feira de Santana, Bahia

	Total		Hospital				p
			Private		Public		
	n	(%)	n	(%)	n	(%)	
Death	20/150	(13.3)	3/63	(4.8)	17/87	(19.5)	0.001
Killip > I	33/130	(25.4) †	9/60	(15.0)	24 /70	(34.3)	0.012
Death+Killip> I	53	35.3	12	19.0	41	47.1	<0.001

*Killip: classification for the clinical stratification of AMI. *Morbidity expressed by patients in Killip class >1. † Non fatal AMI.*

Table 5 - Comparison of percentages of combined outcomes (death and Killip class> I) in patients with AMI, according to the variables that showed a significant difference between private and public patients, in Feira de Santana, Bahia

Variables	n (%)	n (%)`	p
Private Hospital *vs* Public Hospital	12 (22.6)	41 (77.4)	<0.001
Income: 1-2 min wages *vs* > 2 wages	37 (69.8)	16 (30.2)	<0.001
Illiterate *vs* Literate	22 (41.5)	31 (58.5)	0.470
Gender male *vs* female	30 (56.6)	23 (43.4)	0.256
ICU* : yes *vs* no	12 (22.6)	41 (77.4)	<0.001
AMT* : <15 minutes *vs* ≥ 15 minutes	24 (45.3)	29 (54.7)	<0.001
Thrombolytics: yes *vs* no	10 (18.9)	43 (81.1)	<0.001
Beta-blocker: yes *vs* no	46 (86.8)	7 (13.2)	0.041
Statin: yes *vs* no	45 (84.9)	8 (15.1)	0.002

ICU – Intensive care unit; AMT – Time between arrival at the hospital and the administration of specific medication for the treatment of AMI.

does not explain the increased mortality of female patients in public hospitals, as the percentage of diabetic women did not differ among private and public patients.

The more severe clinical conditions of public patients due to constraints arising from the health care performance remain to be assessed. Thus, there was a significant association of mortality and morbidity with the time span between arrival at the hospital and medical care (AMT) ≥ 15 minutes, highly prevalent in public patients. This delay may have favored the extension of myocardial damage, especially if combined, as it happened, with two other important factors: restricted use of thrombolytic treatment and non-admission to the ICU (Table 5).

As to the use of thrombolytics, there were obvious problems in the public health care system, as only 38.1% (16/42) of the eligible patients with a satisfactory time window were properly treated, as opposed to 81.0% (34/42) in private hospitals. The non-use of thrombolytics in 26 eligible patients deserves consideration, and the most likely reasons were the lack of proper training in the use of the drug or its unavailability, both unjustifiable. It is noteworthy that 14 of the 17 deaths occurred among eligible public patients who did not receive thrombolytics. The limited number of beds in the ICU, which curbed the access to this type of treatment for 70% of AMI patients and changed the natural history of in-hospital AMI, shows another serious problem of health care management in the public network, which demands an immediate solution.

Also noteworthy is the fact that drugs such as beta-blockers, statins and clopidogrel, which have positive impact on morbidity and mortality from AMI, were used in 100% of the private patients and in a significantly lower percentage of the public patients, although in the range of 87, 88 and 85%, respectively[15]. In the context of these serious health care problems, it is important to note that there was no significant difference in the restrictions between men and women, which does not explain the higher female mortality.

In this study, factors such as a salary of less than two minimum wages and a time span to receive specific cardiovascular medication ≥ 15 minutes were independent predictors of mortality and morbidity from AMI. Thirdly comes the non-use of thrombolytics, whose odds ratio showed a threshold statistical significance, but its clinical significance is an actual fact. These three variables represent, in context, all other variables that were calculated by bivariate analysis, and, as already discussed, those which had an influence in the primary outcome of this study: increased mortality and morbidity from AMI in a public hospital of Feira de Santana. The socioeconomic status variable, in turn, represents the social inequality, which does not create conditions for appropriate health care, affecting the more serious cases of a pathology, and that does not allow the patients to choose the place where they will receive treatment. The second and third are representative of the shortcomings of the public health care system in general, which is unsatisfactory, starting on arrival at the hospital, which has overcrowded emergency units and personnel with inadequate training, and culminating with the inability to offer the intensive care treatment required by the disease in its acute phase. It is noteworthy that although admittance to a public hospital and restriction of treatment in the ICU have not appeared as independent variables in the final model of the logistic regression analysis, and the non-use of thrombolytics has not reached the level of significance that was compatible with its clinical importance, this does not diminish the value of these findings. In the multivariate logistic model, the degree of influence of these variables in relation to the outcome is analyzed in combination with the others, highlighting those whose performance is independent from the others. As to admittance to public hospitals and treatment in the ICU as risk variables, they do not survive in the presence of others that are directly related to the health care assistance, such as the delay in the administration of specialized care and the quality of treatment represented by the use of thrombolytics.

These findings are disturbing and indicate, in the scenario of this study, that low socioeconomic status is the greatest risk factor for AMI morbidity and mortality, from the conditioning of a more severe coronary artery disease to a precarious assistance, which is contrary to the basic standards in the treatment of the disease[2]. The fact that public patients were represented by a sole hospital in the second largest city in the state of Bahia, with 600,000 inhabitants, exposes even more clearly, the seriousness of the situation and the need for an urgent and efficient recasting of the health care for heart patients, in the state. Since the number of cardiovascular disease patients is growing in developing countries[1], a strategic plan is needed, with the deployment of a health care network that begins in primary care and culminates in the tertiary network, distributed in an appropriate manner. The diversity of basic conditions, in infrastructure and human resources, requires, for an efficient assessment of CAD patients, the use of computer technology capable of bringing to health care units a flexible and rapid solution to a variety of problems in diagnosis, treatment and prevention. The existing infrastructure, the SAMU and the PSF, can be very useful, if properly organized in its operation and availability of skilled human resources. However, the central figure of a Public Service of Cardiology in charge of that network is essential.

This study shows the importance of research in the evaluation of institutional performance in the fulfillment of their goals, indicating with scientific data which are the major operational problems to be solved. The study had the merit of confirming the hypothesis that the mortality and morbidity from AMI in the city of Feira de Santana were demonstrably higher in patients admitted to public hospitals, when compared to those admitted to private hospitals, indicating the main predictors of this fact. This study was not designed to identify the operational causes involved, which should be sought with other types of research, which, however, represent a fundamental step to be taken.

It is also noteworthy that the results found in Feira de Santana certainly apply to many public welfare institutions in Brazil, although they should not be generalized. As an example, there were similar results in a study conducted in the city of Niteroi, Rio de Janeiro[15]. The study involved 241 patients with AMI, selected from three public hospitals (159) and two private hospitals (82), with mortality rates of 12.6% and 12.3% respectively. In Feira de Santana, the mortality rate in public hospitals was 35.4% higher, and the mortality rate in private hospitals was 64.3% lower, and these findings are also relevant. In the comparison of mortality in the private network, emphasizing the difference in the treatment strategy is important: 68.3% of the patients in Niterói underwent invasive procedures (angioplasty in 46.3% and bypass graft surgery in 23.2%), compared to none of the patients in Feira de Santana. However, in the private hospital network of Feira de Santana, 87.2% of the eligible patients receive thrombolytics, as opposed to 10% of the eligible patients in the private hospital network of Niteroi. In public hospitals, the corresponding percentages were 31.0% in Feira de Santana and 38.8% in Niterói, both low[18-20].

Final remarks

From the aforementioned, it is evident that urgent measures need to be taken by health authorities to monitor the mortality and morbidity of cardiovascular diseases in public hospitals of the SUS, in a regular basis; this would ensure that their operation meets the basic guideline recommendations of the Brazilian Society of Cardiology, with the purpose of making sure that the rates of mortality and morbidity are not influenced, in any significant way, by operational institutional failures. Furthermore, a recasting of the cardiovascular public health care system is needed at national level, with the integration of primary, secondary and tertiary health care levels, in order to lower the prevalence and incidence of these diseases and to improve the efficiency of prevention and treatment procedures.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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