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Demographic and clinical characteristics of patients undergoing coronary artery bypass graft surgery and their relation to mortality

Características clínico-demográficas de pacientes submetidos à cirurgia de revascularização do miocárdio e sua relação com a mortalidade

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Abstract

Objective: **To describe the demographic and clinical characteristics of patients undergoing coronary artery bypass graft surgery (CABG) and to test their relation to mortality.**

Methods: **This study was a retrospective medical record review of 655 consecutive patients undergoing CABG from May 2002 to April 2010.**

Results: **Of the 655 patients, 12.1% died during the hospital stay. Mortality was significantly (p<0.05) higher in females (17.3%), aged < 70 years (22.8%), in emergency surgery (36.4%), in cases of readmission to the intensive care unit (ICU) (33.3%), when the stay in the ICU was < three days (16.3%), undergoing longer cardiopulmonary bypass (CPB), and with more comorbidities (15.4%). Predictor variables of death identified with logistical regression analysis were: female (OR=2.04), age > 70 years (OR=2.69), emergency surgery (OR=15.43) and urgency (OR=3.81), performance of CPB (OR=2.19) and readmission to the ICU (OR=4.33).**

Conclusion: **Variables such as female sex, increased age, type of surgery, readmission to the ICU, ICU stay, comorbidities, and duration of CPB influence the outcome death in patients undergoing CABG. Thus, such aspects should be considered to reduce hospital mortality in patients undergoing such surgery.**

Descriptors: **Coronary Artery Bypass; cardiovascular diseases; medical records; hospital mortality.**

Resumo

Objetivo: **Descrever as características clínico-demográficas e testar sua relação com a mortalidade hospitalar em pacientes submetidos à cirurgia de revascularização do miocárdio (CRM).**

Métodos: **Estudo retrospectivo conduzido a partir dos prontuários de 655 pacientes submetidos à CRM, no período de maio de 2002 a abril de 2010.**

Resultados: **A mortalidade hospitalar foi de 12,1%. A mortalidade foi significativamente (*P*<0,05) maior em indivíduos do sexo feminino (17,3%), com idade igual ou superior a 70 anos (22,8%), em cirurgias de emergência (36,4%), nos casos de reinternação na unidade de terapia intensiva (UTI) (33,3%), quando a permanência foi inferior a três dias na UTI (16,3%), submetidos a maior tempo de**

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Abbreviations, acronyms & symbols

CPB	cardiopulmonary bypass
POC	Prosthesis and Orthosis Centre
CABG	coronary artery bypass graft surgery
CVD	cerebrovascular diseases
DM	diabetes mellitus
SD	standard deviation
COPD	chronic obstructive pulmonary disease
RD	renal disease
SAH	systemic arterial hypertension
HDSRH	Hans Dieter Schmidt Regional Hospital
AMI	acute myocardial infarction
OR	odds ratio
MSTS	Medical and Statistics Treatment Service
SPSS	Statistical Package for the Social Science
ICU	intensive care unit

circulação extracorpórea (CEC) e com maior número de comorbidades (15,4%). As variáveis preditoras de óbito identificadas pela análise de regressão logística foram: sexo feminino (OR=2,04); idade ≥ 70 anos (OR=2,69); cirurgias em caráter de emergência (OR=15,43) e de urgência (OR=3,81); realização de CEC (OR=2,19) e reinternação na UTI (OR=4,33).

Conclusão: **Sexo, idade, tipo de cirurgia, reinternação na UTI, permanência na UTI, comorbidades e tempo de CEC influenciaram no desfecho óbito do paciente submetido à CRM. Dessa forma, tais aspectos devem ser considerados para diminuir o óbito hospitalar em pacientes submetidos a esse tipo de cirurgia.**

Descritores: **Revascularização miocárdica. Ponte de artéria coronária. Mortalidade hospitalar.**

INTRODUCTION

CABG is a widely used therapeutic modality in the treatment of atherosclerotic coronary artery disease [1]. In Brazil, 63,272 CABGs were conducted from 2005 to 2007, which represents 340 CABGs per million inhabitants. The mortality rate for this type of surgery in Brazil (6.2%) [2] contrasts with that in developed countries such as Portugal (1.2%) [3], Canada (1.7%) [4], and the United States (2.9%) [5].

The high prevalence of cardiovascular risk factors among patients undergoing CABG in Brazil seems to account for the high rate of postoperative mortality in this population. The incidence of cardiovascular risk factors among Brazilian patients is significantly higher compared to that among patients in developed countries (prevalence of systemic arteral hypertension (SAH) [90.7% vs. 60.0%], acute myocardial infarction (AMI) [23.5% vs. 2%], and diabetes mellitus (DM) [37.2% vs. 29.0%]). It is likely that the higher frequency of these risk factors has resulted in longer hospital length of stay (12.7 days) [7] for Brazilian patients undergoing CABG than the average hospital length of stay in countries such as Portugal (7.6 days) [3] and Canada (6.7 days) [4].

In Southern Brazil, there is a lack of information about specific perioperative complications associated with CABG. This study aims to describe the clinical and demographic characteristics of patients undergoing CABG in a public hospital and a reference center in Southern Brazil, and to assess the relationship of these characteristics with mortality.

METHODS

This is a retrospective, descriptive study of patients who underwent CABG in a public hospital in Southern Brazil. The study included medical records of all the patients who underwent CABG alone from May 2002 to April 2010. Patients whose medical records were unavailable or did not meet minimum requirements for the collection of information for reasons such as poor maintenance, illegibility or incompleteness were excluded from the analysis

Data collection

Data were collected from two sources: the Prosthesis and Orthosis Centre (POC) and the Medical and Statistics Treatment Service, (MSTS), both based at the Hans Dieter Schmidt Regional Hospital (HDSRH) in Joinville-SC. Information obtained from the POC included the date of surgery, the patient's record number, the patient's name, the type of surgical procedure, the patient's city of origin and the name of the medical team that performed the surgery. Using the record number and the name of the patient undergoing CABG, the researcher collected data from the patients' medical records at MSTS.

Data collected retrieved from the medical records included sex, age, marital status, presence of comorbidities, history of prior CABG, surgical team A/B or C, emergency/ urgent or elective status of the surgery, number of coronary grafts, use of cardiopulmonary bypass (CPB), CPB duration, aortic clamping duration, direct and indirect costs associated with the procedure, length of ICU stay before and after CABG, readmission to the ICU, and patient outcome of discharge or death.

In order to assess the relationship of clinical and demographic variables to mortality, the analysis was performed using Microsoft Office Excel® 2007.

Statistical analysis

Statistical analysis was performed using Statistical

Package for the Social Sciences (SPSS Inc., version 16.0, Chicago, IL) software. Continuous variables were presented as mean and standard deviation (SD). To investigate the association between mortality and the predictor variables, we used the Chi-Squared test or Fisher's exact test when necessary. To compare two means with normal distributions, Student's *t-test* for independent samples was employed. For comparison of more than two means, one-way ANOVA was used. In cases of non-normal distributions, the Mann-Whitney test was used for comparisons of two samples, and the Kruskal-Wallis test was used for comparisons of more than two samples. Normality was verified using the Kolmogorov-Smirnov test.

Bivariate and multivariate analyses were performed with unconditional logistic regression. A bivariate analysis was used to assess the crude effect of each independent variable on the outcome studied. The Enter method, following the theoretical model and respecting the hierarchical levels, was used in a multivariate analysis to observe the effects of the variables adjusted to each other within each block. The block of demographic variables was considered as the first level, and the inclusion of other variables was performed in the second block. To avoid the exclusion of possible confounding factors, any variables with $p<0.20$ at any level were maintained in the model until the end, regardless of whether significance was lost with the introduction of other variables from a lower hierarchical level.

The quality of the bivariate model fit was evaluated with the 2 Log Likelihood test. The crude and adjusted odds ratios (OR) were estimated, as well as the 95% confidence intervals of variables that remained in the model. All tests were considered significant when $p<0.05$.

Ethical aspect

The study met the requirements of Resolution 196/96 of the National Health Council/Ministry of Health, which regulates research involving human subjects. The project was approved by the Ethics Committee of HDSRH, Case No. 09023/2009.

RESULTS

Of 672 medical records of patients exclusively undergoing CABG during the study period, 17 (2.5%) were excluded from the analysis: eight were incomplete and nine were not found. The final sample consisted of 655 records. The mean number of CABG per year was 72.8 (SD=35.7).

Table 1 describes the general characteristics of the individual undergoing CABG in relation to the outcome: patient discharge or death. According to the 655 medical records analyzed, 12.1% (n=79) of the patients died, and the incidence of death was significantly higher in females (female: 17.3% vs. male: 9.8%, $p<0.008$). Among the patients who died, 70.1% were male, their ages ranging from 50 to 59 years (34.0%), 97.3% were Caucasians, and subjects married

Table 1. General characteristics of 655 patients undergoing CABG according to the rates of hospital discharge and death. Joinville-SC, Brazil, 2010.

Characteristics	Outcome				Total		*P*
	Discharge		Death		(n=655)		
Sex	n	%	n	%	n	%	<0.008
Male	414	90.2	45	9.8	459	70.1	
Female	162	82.7	34	17.3	196	29.9	
Age (years)							<0.002
≤ 39	12	85.7	2	14.3	14	2.2	
40 - 49	86	92.5	7	7.5	93	14.2	
50 - 59	204	91.5	19	8.5	223	34.0	
60 - 69	179	88.6	23	11.4	202	30.8	
≥ 70	95	77.2	28	22.8	123	18.8	
Ethnic group							0.628
White	560	87.9	77	12.1	637	97.2	
Other	16	88.9	2	11.1	18	2.8	
Marital status							0.082
Married/Consensual union	445	89.2	54	10.8	499	76.2	
Other	131	84.0	25	16.0	156	23.8	
	Mean	SD	Mean	SD	n	%	
Age (years)	59.2	9.9	64.4	11.4	655	100	<0.003

SD: Standard deviation

or living in a consensual union (76.2%) were predominant. The rate of mortality was significantly higher (p<0.002) in patients older than 70 years (22.8%). The mean age of patients who died was 64.4 years (SD=11.4), significantly higher (*P*<0.003) than the age of survivors. Although the difference was not significant (p=0.082), individuals who were married or in a consensual union were predominant (16.0%) among the group whose outcome was death (Table 1).

In Table 2, the clinical characteristics of patients undergoing CABG are grouped according to whether the outcome was patient discharge or death. The largest number of surgeries (42.3%) was performed by surgical team A. Elective surgeries were the most frequent (49.6%), although the mortality rate was significantly higher in subjects who underwent emergency surgery (36.4%). Only six (0.9%) patients underwent a prior CABG. Three or more grafts were required in 58.8% of the CABG performed. CPB was performed in 81.4% of the cases and it was used for 90 or more minutes in 59.7% of cases. The mean CPB duration was significantly higher (*P*<0.003) in patients who died (105 min, SD=40.5 min). Aortic clamping lasted for more than 60 minutes in 64.8% of patients. A gradual but insignificant decrease in mortality was observed as a reduction in the duration of this procedure. The presence of comorbidities was predominant, with three or more types present at admission for 52.5% of the individuals; this number of comorbidities was significantly (*P*=0.022) more frequent in subjects who were discharged (84.6%). However, the mean number of comorbidities was significantly (*P*<0.008) higher in the patients who died (2.9, SD=1.0). Smoking was observed in 46.6% of all cases.

Table 2. Clinical characteristics of patients undergoing CABG according to the rates of hospital discharge and death. Joinville-SC, Brazil, 2010.

Characteristics	Outcome				Total		*P*
	Discharge		Death				
	n	%	n	%	n	%	
Surgical team*							0.671
Team A	241	87.0	36	13.0	277	42.3	
Team B	150	89.8	17	10.2	167	25.5	
Team C	185	87.7	26	12.3	211	32.2	
Surgery status*							<0.001
Emergency	7	63.6	4	36.4	11	1.7	
Urgency	267	83.7	52	16.3	319	48.7	
Elective	302	93.0	23	7.0	325	49.6	
History of prior CABG*							0.539
No	571	88.0	78	12.0	649	99.1	
Yes	5	83.3	1	16.7	6	0.9	
Number of coronary grafts*							0.703
1 - 2	239	88.5	31	11.5	270	41.2	
≥ 3	337	87.5	48	12.5	385	58.8	
Use of CPB*							0.078
No	113	92.6	9	7.4	122	18.6	
Yes	463	86.9	70	13.1	533	81.4	
CPB duration (min)†							0.171
< 90	192	89.3	23	10.7	215	40.3	
≥ 90	271	85.2	47	14.8	318	59.7	
Aortic clamping duration (min)†							0.755
< 30	13	92.9	1	7.1	14	2.6	
30 - 60	153	87.9	21	12.1	174	32.6	
> 60	297	86.0	48	14.0	345	64.8	
Number of comorbidities*							0.022
< 2	72	91.1	7	8.9	81	12.1	
2	213	91.8	19	8.2	232	35.4	
≥ 3	291	84.6	53	15.4	344	52.5	
Smoking*							0.959
No	308	88.0	42	12.0	350	53.4	
Yes	268	87.9	37	12.1	305	46.6	
	Mean	SD	Mean	SD	n	%	
CPB duration (min)†	92.2	30.2	105,0	40.5	533	100	<0.003
Number of comorbidities*	2.6	0.9	2,9	1.0	655	100	<0.008

*CPB: Cardiopulmonary bypass; SD: Standard deviation; *: (n=655); †: (n=533)*

Table 3. Hospital length of stay of patients undergoing CABG according to the rates of hospital discharge and death. Joinville-SC, Brazil, 2010.

Characteristics	Outcome				Total		*P*
	Discharge		Death				
	n	%	n	%	n	%	
Readmission to the ICU*							<0.002
No	560	88.7	71	11.3	631	96.3	
Yes	16	66.7	8	33.3	24	3.7	
Length of ICU stay (days)*							<0.003
< 3	252	83.7	49	16.3	301	46.0	
≥ 3	324	91.5	30	8.5	354	54.0	
Pre-operative stay (days)*							0.147
< 3	145	91.2	14	8.8	159	24.3	
≥ 3	431	86.9	65	13.1	496	75.7	
Postoperative stay (days)*							0.591
< 3	406	87.5	58	12.5	464	70.8	
≥ 3	170	89.0	21	11.0	191	29.2	
Total hospital stay (days)*							0.067
< 10	148	84.1	28	15.9	176	26.9	
≥ 10	428	89.4	51	10.6	479	73.1	

*ICU: Intensive Care Unit; *: (n=655); †: (n=533)*

Table 4. Results of simple and multiple logistical regression analyses comparing the outcome variables of hospital discharge and death in 655 patients undergoing CABG. Joinville, SC-Brazil, 2010.

Variable	Bivariate analysis			Multivariate analysis		
	ORb	CI95%	*P*	ORa	CI95%	*P*
Sex			<0.007			<0.030
Male	1.00			1.00		
Female	1.93	1.194 - 3.123		2.04	1.188 - 3.522	
Marital status			0.083			0.730
Married/Consensual union	1.00			1.00		
Other	1.57	0.942 - 2.626		1.10	0.617 - 1.992	
Age (years)			<0.001			<0.007
≤ 49	1.00			1.00		
50 - 59	1.01	0.443 - 2.323		0.83	0.350 - 2.009	
60 - 69	1.39	0.623 - 3.142		1.28	0.545 - 3.029	
≥ 70	3.20	1.439 - 7.159		2.69	1.151 - 6.322	
Surgery status			<0.001			<0.001
Emergency	7.50	2.046-27.519		15.43	3.599- 66.220	
Urgency	2.55	1.524 - 4.291		3.81	2.091 - 6.971	
Elective	1.00			1.00		
Use of CPB			0.083			<0.050
No	1.00			1.00		
Yes	1.89	0.920 - 3.915		2.19	1.008 - 4.769	
Readmission to the ICU			<0.003			<0.004
No	1.00	-		1.00		
Yes	3.94	1.629-9.545		4.33	1.628 -11.522	
Total hospital stay (days)			0.069			<0.001
< 10	1.00	-		1.00		
≥ 10	0.63	0.383 - 1.036		0.26	0.143 - 0.494	
Number of comorbidities			<0.030			<0.050
< 2	1.00	-		1.00		
2	0.91	0.370 - 2.272		0.92	0.353 - 2.410	
≥ 3	1.87	0.817 - 4.293		1.86	0.774 - 4.489	

CPB: Cardiopulmonary bypass; ICU: Intensive Care Unit

Although it was not a significant difference, the mortality rate was also higher among patients of surgical team A (13.0%) who also underwent prior CABG (16.7%), who underwent three or more CABGs (12.5%), who underwent CPB (13.1%), whose duration of CPB was > 90 minutes (14.8%), whose duration of aortic clamping was > 60 minutes (14.0%), whose pre-operative stay was longer than three days (13.1%), whose postoperative stay was shorter than three days (12.5%), whose total length of stay was shorter than ten days (15.9%), and who were smokers (12.1%).

The hospital length of stay of patients undergoing CABG grouped by hospital discharge and death outcomes can be seen in Table 3. The patients were not readmitted to the ICU in 96.3% of cases; of these, 11.3% died, a significantly (p<0.002) lower percentage than that of those discharged from the hospital (88.7%). The majority of the patients (54.0%) remained in the ICU for three or more days; of these, most of them (91.5%) were discharged from the hospital. The percentage of patients discharged from the hospital was significantly higher (p<0.003) than that of those who died (8.5%). The pre-operative stay was shorter than three days for 75.7% of subjects, but 29.2% of patients remained hospitalized for three or more days after surgery. The total hospital length of stay was at least ten days for 73.1% of the patients (Table 3).

Table 4 presents the results of the crude and adjusted analyses of the predictor variables associated with the outcome of hospital death. In the analysis of the first block, three demographic variables were included according to the statistical criteria previously established. In the second block, five variables were included. The variable of marital status was maintained in the model, although it did not demonstrate a significant association (*P*=0.083) in the analysis of the first block. The variables corresponding to the clinical variables and associated with patient hospitalization were evaluated at the second level of the theoretical model. The following predictor values were significantly associated with hospital death: female gender (OR=2.04, *P*<0.030), age > 70 years (OR=2.69, *P*<0.007), emergency surgery (OR=15.43, *P*<0.001) and urgent surgery (OR=3.81, *P*<0.001), performance of CPB (OR=2.19, *P*<0.050), and readmission to ICU (OR=4.33, *P*<0.004). A total hospital stay longer than 10 days was protective of (OR=0.26, *P*<0.001) hospital mortality, even after adjustment. Although the risk was attenuated by adjusted analysis, an age of more than 70 years constituted a risk factor for hospital death (OR=2.69; *P*<0.007).

Table 5 shows the association between comorbidities and patient discharge and death outcomes of those undergoing CABG during the study period. Hypertension, renal disease (RD), and cerebrovascular diseases (CVD)

Table 5. Comorbidities associated with discharge and death outcomes in 655 patients undergoing CABG. Joinville-SC, Brazil, 2010.

Comorbidities	Outcome				*P*
	Discharge		Death		
	n	%	n	%	
Heart disease					0.857
No	32	88.9	4	11.1	
Yes	544	87.9	75	12.1	
Diabetes Mellitus					0.219
No	390	89.0	48	11.0	
Yes	186	85.7	31	14.3	
Hypertension					<0.050
No	102	93.6	7	6.4	
Yes	474	86.8	72	13.2	
Dyslipidemia					0.423
No	467	87.5	67	12.5	
Yes	109	90.1	12	9.9	
Renal disease					<0.001
No	563	88.7	72	11.3	
Yes	13	65.0	7	35.0	
COPD					0.185
No	447	88.9	56	11.1	
Yes	129	84.9	23	15.1	
Cerebrovascular disease					<0.030
No	556	88.5	72	11.5	
Yes	20	74.1	7	25.1	

COPD: Chronic obstructive pulmonary disease

were individually and significantly associated with an outcome of death. Individuals who died also had higher frequencies of heart disease, diabetes mellitus, and chronic obstructive pulmonary disease (COPD) (12.1%, 14.3% and 15.1%, respectively) although these frequencies were not significantly higher.

DISCUSSION

CABG is considered the gold standard treatment for coronary artery disease. It is the main choice to improve the quality of life and increase survival in patients suffering from this condition. This benefit, however, may be limited by several clinical, demographic and structural aspects. The findings of this study indicated that the hospital mortality of patients undergoing CABG was high and that there is a clear association between mortality and several clinical and demographic characteristics discussed below.

The global mortality rate of 12.1% among the population studied was considerably higher than the national average mortality rate (6.2%) and the international average mortality rate (1.2 to 2.9%) [2-6]. A careful analysis of the aspects supporting these data is required in this situation. Vogt et al., in a German multicenter study in 2000, observed that the mortality rates related to all types of heart surgery ranged between 0.9% and 10.7%. Although higher rates of mortality can be an evidence of poor quality of care, this interpretation cannot be conclusive because some specific demographic and clinical aspects may influence the outcome [6].

The number of people over the age of 65 has doubled in the last 30 years ranging from 7% to 14% of the world population. This older population includes potential candidates for coronary artery disease and, consequently, for CABG. Similarly, the number of patients over the age of 65 years undergoing cardiac surgery has substantially increased as well [7]. In this study, this older population represented more than 40% of the sample, which may partially explain the high mortality rate observed. The mortality rate related to CABG and observed in studies restricted to the elderly population tends to be higher (9.3% to 16.3%) [8-10]. In studies of more heterogeneous populations, the mean age of the non-survivors is usually significantly higher [3,11-14]. These data corroborate the results presented here, where an age over 70 years old is associated with a 2.7-fold increase in the risk of a hospital death after CABG.

Treatment of elderly patients is challenging, considering the high risk for surgery caused by their lower physiological reserves, the increased prevalence of comorbidities and a higher likelihood of symptoms. These conditions can result in urgent or emergency surgery, another factor that influences the rate of mortality [6-9].

In this study, surgery classified as emergency or urgent surgery was also identified as a predictor of hospital death. Of the 79 patients who died during hospitalization, the majority (56) underwent emergency or urgent surgery. Apparently, the large number of urgent and emergency cases observed in this study had a negative impact on the overall mortality rate. These findings partially support the results of other similar studies, in which a higher mortality rate is observed in urgent and emergency CABG compared with elective CABG. However, the hospital mortality rate associated with non-elective surgeries observed in these studies is quite variable (3.1% to 27.3%) [6,11,15,16]. The mortality rate associated with elective CABG (7.0%) is high compared with that observed in most of the international studies (1.2% to 2.9%) [3-5,7]. Nonetheless, it approaches the values observed in Brazilian studies (5.4% and 6.2%) [2-6,18]. The variability in mortality rates observed in different studies of patients undergoing emergency and urgent CABG, as well as the higher mortality rates observed in Brazil (compared with that in other countries) suggests that other aspects associate to mortality are involved, such as the small number of CABGs performed and underlying problems.

The low number of surgical procedures (72.8, SD=35.7 CABG/year) performed at the hospital where the study was conducted may have increased the effect of urgent and emergency surgery status on the rate of mortality. Noronha et al. (2004) demonstrated that the less the surgeries performed in a hospital, the greater the rate of mortality [19]. Hannan et al. (2003) found a mortality rate of 2.9% in a hospital with as low as 100 surgeries/year, whereas in hospitals with up to 800 surgeries/year, the mortality rate was 2.1% [5]. An analysis of 439 North American hospitals revealed that the performance of a low number of surgeries was associated with higher rates of mortality (3.5%) compared with hospitals where the number of surgeries performed was higher (2.4%) [20]. Regarding infrastructure, Sá et al. (2010) reported that higher rates of in-hospital mortality were associated with CABGs performed in public institutions than with those performed in private hospitals [21]. This observation may be related to both the underlying problems of the institutions where the surgical procedure was performed and to infrastructure, which are difficulties frequently observed in public institutions. Hindered access to services and delays in services, whether basic or more complex health services, may result in the worsening of coronary artery disease and possible comorbidities, resulting in patients with limited physiologic reserves [6,7,21].

Among the comorbidities evaluated, a history of hypertension, RD and CVD influenced the outcome. In contrast, other comorbidities influenced the mortality when present in combination. These findings are corroborated

by other studies in which the presence of preexisting comorbidities such as hypertension, RD, CVD, previous AMI, diabetes, and COPD in patients undergoing CABG was associated with a higher incidence of pulmonary, renal, and brain-vascular complications. These variables are predictive of hospital readmission and are directly related to mortality [5,16,18,22-24].

Although it is the gold standard, CABG performed with CPB has been questioned because of the deleterious effects of the CPB. In this study, an individual who underwent CPB was 2.19 times more likely to die than those not undergoing this procedure. Moreover, CPB of longer duration activates the immune system and clears inflammatory mediators, resulting in several organ dysfunctions. As a result, postoperative complication is more likely to increase along with the duration of CPB [12,25,26]. In this study, the association between a longer CPB duration and an increased mortality rate was observed, confirming the reports of other authors that the duration of CPB was significantly longer in the non-survivor group. Similarly, Brito et al. (2009) observed that CPB duration longer than 115 minutes is a risk factor for postoperative complications [22]. Anderson et al. (2011) revealed that the duration of CPB was significantly longer among non-survivors than among survivors [27].

The number of women in the sample was smaller than the number of men, and the risk observed was almost twice as high among women. These findings, as well as the proportion of women within the sample, resemble the results of other studies. Elucidating the aspects that lead to this difference in the mortality rate for women undergoing CABG has been the goal of many researchers. The most accepted theory for this gender gap is that women who require CABG are patients with more risk factors. The fact that they tend to be older, with lower body mass and smaller coronary arteries, causes technical difficulties during surgery. Women also present with more comorbidities, such as DM (female: 44% vs. male: 32.5%), valve abnormalities (female: 14.9% vs. male: 8.9%), unstable angina (female: 11.3% vs. male: 7.9%) and hypertension (female: 71.0% vs. male: 49, 0%) [4,6,7,10,14,28-31].

The limitations of this study are somewhat inherent in its design; retrospective studies are subject to biases associated with the quality of the original data collection. Moreover, although it is impossible to confirm either the duration between a procedure and the point at which it was indicated or the reason for any waiting, increases in waiting time may be caused by the obvious shortcomings of the local health system; these same shortcomings lead to poor access to outpatient services and hospitalization. The lack of surgical risk stratification for specific scores in the data set poses another limitation to the study, given that the severity of cases can influence the rate of mortality.

CONCLUSION

The results indicate that female sex, increased age, emergency surgery status, readmission to the ICU, ICU admission, duration of CPB and the presence and number of comorbidities were the main clinical and demographic characteristics associated with an increased mortality rate. The growing number of elderly patients in the population increases the likelihood that these characteristics occur together in a single patient and results in an additive effect of their likely negative effects on mortality rates. Therefore, to minimize post-surgical risks, it is essential that older patients and those with comorbidities be carefully monitored to avoid late indications of CABG.

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