RISK FACTORS FOR RESPIRATORY INFECTION IN PATIENTS SUBMITTED TO CARDIAC SURGERY

FATORES ASSOCIADOS À INFECÇÃO RESPIRATÓRIA EM PACIENTES SUBMETIDOS ÀS CIRURGIAS CARDÍACAS

LOS FACTORES DE RIESGO PARA LA INFECCIÓN RESPIRATORIA EN PACIENTES SOMETIDOS A CIRUGÍA CARDÍACA

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ABSTRACT

Objective: To identify the incidence and factors associated with respiratory infection in patients undergoing cardiac surgery. Methods: Study quantitative, retrospective, analytical approach, which evaluated 460 patients who underwent surgery period 2005-2010, in a public teaching hospital. We conducted bivariate and logistic regression analysis using the Statistical Package for Social Sciences software. Results: It was found that 95 (20.7%) patients developed respiratory infection. Prolonged intubation time, the use of nasogástica tube, the age group (> 60 years), previous heart surgery history, duration of surgery (> 180 minutes) and a history of Chronic Obstructive Pulmonary Disease (COPD) were significantly associated with the outcome respiratory infection. Conclusion: The risk factors predictors for the occurrence of respiratory failure were: prolonged intubation time, use of nasogástica tube, age greater than 60 years, previous cardiac surgery, duration of surgery and history of COPD.
Keywords: Perioperative Nursing; Risk Factors; Cross Infection; Thoracic Surgery.

RESUMO

Objetivo: Identificar a incidência e os fatores associados à infecção respiratória em pacientes submetidos à cirurgia cardíaca. Métodos: Estudo de abordagem quantitativa, retrospectivo, analítico, avaliou 460 pacientes, submetidos a cirurgia cardíaca no período de 2005 a 2010, em um hospital público de ensino. Realizou-se a análise bivariada e regressão logística em software Statistical Package for the Social Science. Resultados: Verificou-se que 95 (20,7%) pacientes evoluíram com infecção respiratória. A intubação prolongada, o uso de sonda nasogástica, o grupo etário (> de 60 anos), história de cirurgia cardíaca prévia, duração da cirurgia (>180 minutos) e história de Doença Pulmonar Obstrutiva Crônica (COPD)

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apresentaram associação estatisticamente significativa com o desfecho infecção respiratória. Conclusão: Os fatores de risco preditores para infecção respiratória foram tempo de intubação prolongado, uso de sonda nasogástica, idade maior que 60 anos, cirurgia cardíaca prévia, duração da cirurgia e história de COPD.

Palavras-chave: Enfermagem perioperatória; Fatores de risco; Infecção Hospitalar, Cirurgia torácica.

RESUMEN

Objetivo: Identificar la incidencia y los factores asociados a la infección respiratoria en pacientes sometidos a cirugía cardíaca. Métodos: Estudio cuantitativo, retrospectivo, enfoque analítico, que evaluó a 460 pacientes que se sometieron a cirugía período 2005-2010, en un hospital público de enseñanza. Se realizó un análisis bivariante y regresión logística en el software Statistical Package for the Social Sciences. Resultados: Se encontró que 95 (20,7%) pacientes desarrollaron una infección respiratoria, intubación prolongada, uso de nasogástica sonda, el grupo de edad (> 60 años), antecedentes de cirugía cardíaca previa, duración de la cirugía (> 180 minutos) y una historia de la Enfermedad Pulmonar Obstructiva Crónica (EPOC) se asociaron significativamente con infección respiratoria resultado. Conclusión: Los factores de riesgo predictores de la aparición de insuficiencia respiratoria fueron: tiempo de intubación prolongada, uso de nasogástica sonda, la edad superior a 60 años, la cirugía cardíaca previa, duración de la cirugía y la historia de la EPOC.

Palabras clave: Enfermería Perioperatoria; Factores de Riesgo; Infección Hospitalaria Cirugía Torácica.

INTRODUCTION

Respiratory infection occurred in the postoperative period is the most common infection after cardiac surgery (CS), with a prevalence between 2% and 10%. It is associated with increased mortality up to 40% and increase in hospitalization costs.[1]

Among the known risk factors for respiratory infection in patients undergoing heart surgery it can be mentioned age, clinical status of the patient, general surgery, endotracheal intubation, use of mechanical ventilation (MV), nasogastric tube, occurrence of re-operations, incision in the upper abdomen and chest, surgeries longer than 180 minutes, prolonged preoperative hospitalization and smoking.[1-4]

The length of stay in the Intensive Care Unit (ICU), location where the post-cardiac surgery patients are transferred, has been associated with respiratory infection.[1,3]

High mortality associated with respiratory infection in patients undergoing cardiac surgery emphasizes the need to identify patients at risk with a view to prevention.[1]

We note an emphasis on studies that show risk factors for infection in patients undergoing cardiac surgery. However, we identify gaps in relation to studies on factors associated with respiratory

infections in this population. Knowing the risk factors for pulmonary infection in the postoperative period by the nursing staff is essential for the identification of potentially susceptible patients and to support actions for prevention and control of this complication.

By the above we propose to develop this study aiming to identify the incidence and factors associated with respiratory infection in patients undergoing cardiac surgery.

METHOD

This is a descriptive, analytical, quantitative, retrospective, longitudinal study, conducted in a public teaching hospital located in the city of Uberaba. The hospital has 290 beds and serves medical and surgical specialties.

Population consisted of patients undergoing cardiac surgery from July 2005 to July 2010, who met the inclusion criteria: age 18 years or older and who underwent cardiac surgery by longitudinal median sternotomy. Patients whose medical record numbers have not been located or identified, and those who died intraoperatively or within 48 hours after surgery, were excluded.

Data were collected from hospital infection reporting forms, provided by the Hospital Infection Control Commission (CCIH) of the hospital mentioned and from the medical records of patients undergoing cardiac surgery.

Respiratory infections were considered both those notified by CCIH and those diagnosed and recorded in the records by the medical team responsible for the patient.

For data collecting, we used an instrument elaborated for this purpose, consisting of socio-demographic data, such as gender, age, origin and clinical aspects, such as body mass index (BMI), according to World Health Organization; the Physical Status Classification System of the American Society of Anesthesiologists (ASA), type of surgery performed, surgery association and classification; data relating to perioperative, such as time of postoperative at ICU, total time of postoperative hospitalization, intubation time, reintubation, complications, receiving blood transfusion, isolated microorganisms, antibiotic use and patient outcomes.

Data were entered into a spreadsheet to Excel® for Windows® subsequently validated and exported to the Statistical Package for the Social Sciences (SPSS) version 19 for Windows, for processing and analysis.

Qualitative variables were analyzed using descriptive statistics through the

distribution of absolute and percentage frequency, while for quantitative variables descriptive measures of centrality (mean) and dispersion (standard deviation, minimum and maximum values) were used.

In order to identify the risk factors associated with respiratory infection it was initially done bivariate analysis using the chi-square test (x^2) and measures of association (relative risk and odds ratio). Statistically significant associations were considered, with $<p$ 0.05 level of significance. Subsequently, multivariate analysis by logistic regression was used. To do so, variables that presented $p<0.01$ in the bivariate analysis were considered. In multivariate analysis, the statistical significance level adopted was 0.05.

This study is part of a larger project entitled "Analysis of hospital infections in patients undergoing cardiac surgery." The development of the study met national and international standards of ethics in research involving human subjects; it was observed the approval of the protocol n°.1611 / 2010 of the Ethics Committee for Human Research of the Federal University of Triângulo Mineiro.

RESULTS

Of the 460 patients who underwent cardiac surgery 280 (60.9%) were male,

the mean age was 55.6 (± 12.9), ranging from 18 to 81 years and the majority came from the city of Uberaba – MG, 304 (66.1%).

Among the patients evaluated, 95 (20.7%) had respiratory infections and 41 (8.9%) had undergone previous heart surgery.

Concerning the clinical classification of patients according to the American Society of Anesthesiologists (ASA), it was observed that most patients, 248 (53.9%), did not have this information in their medical record. For the remaining patients, 115 (25%) had severe systemic disease, with P3 classification. It is noteworthy that the classification P1, healthy patient and classification P4, patients with severe systemic disease, that is a constant threat to life, were found in ten (2.2%) patients, respectively.

Regarding the comorbidities, 325 (70.7%) had systemic arterial hypertension (SAH); 105 (22.8%) Diabetes Mellitus, 52 (11.3%) suffered from Chronic Obstructive Pulmonary Disease (COPD), seven (1.5%) of Congestive Heart Failure (CHF).

The Body Mass Index (BMI) was found to be 25.6 kg / m² (+/- 4.2) with a minimum of 14.9 and a maximum of 40.3 kg / m². According to the BMI classification proposed by the World Health Organization (WHO), it was observed that 122 (26.5%) were

overweight and 114 (24.8%) were normal. It was not possible to calculate the BMI on 171 (37, 2%) records due to lack of information.

When talking about tobacco, 141 (30.7%) patients were smoking, 146 (31.7%) had never smoked and 106 (23%) were former smokers.

Coronary artery bypass graft (CABG) was the most performed surgical specialty, 218 (47.8%), followed by mitral valve replacement (MVR), 83 (18%), and aortic valve replacement (AVR) in 69 (15 %) patients.

Among the patients, 426 (92.6%) had no complications in the intraoperative period.

Previous focus of infection was found in 37 (8%) patients, with 30 (6.5%) having received preoperative antibiotics. Regarding the use of Extracorporeal circulation (ECC), most surgical procedures were performed using this mechanism, 449 (97.6%).

Mean duration of the surgeries was 3.8 hours (± 1.0), with a minimum of 1.8 hours and a maximum of nine hours, with an average CEC duration of 78 minutes (± 33.1), with variation from ten to 260 minutes.

Regarding the classification of the surgeries, most of them was elective (452 to 98.3%), with eight (1.7%) being classified as urgent.

As regards the aspects related to the postoperative period, it is found that the average length of ICU stay was 7.6 days (± 7.8), ranging from two to 70 days. The mean total postoperative hospital stay was 11.9 days (± 10.3), ranging from three to 76 days.

Patients had a mean time of endotracheal intubation of 26.1 hours (± 43.9), ranging from four to 469 hours. Of these, 62 (13.5%) patients underwent reintubation.

With respect to the use of a nasogastric tube, the majority used this device in the postoperative period, 319 (69.3%).

Regarding the evolution of the patients evaluated in this study, it was found that 407 (88.5%) progressed to hospital discharge, 52 (11.3%) died and one (0.2%) patient was referred to another hospital institution.

In the bivariate analysis, the variables that had a statistically significant association ($p < 0.01$) were intubation time ($p < 0.001$), use of nasogastric tube ($p = 0.005$), age group ($p = 0.006$), previous cardiac surgery ($p = 0.002$), duration of surgery ($p = 0.001$), COPD ($p < 0.001$) and surgery classification ($p = 0.001$), according to data in table 1.

Table 1. Association between risk factors for respiratory infection and the occurrence

of respiratory infection in patients undergoing cardiac surgery. Uberaba 2005-2010.

RESPIRATORY INFECTION

VARIABLES	YES N	%	NO N	%	RR* (IC)	OR† (CI)	p
Admission time							
> 3 days	47	20.4%	183	79.6%	0.98 (0.69-1.40)	0.97 (0.62-1.53)	0.908
< 3 days	48	20.9%	82	79.1%			
Intubation time							
24hours or more	59	39.3%	91	60.7%	3.39 (2.35-4.88)	4.93 (3.06-7.95)	<0.001
Less than 24 hours	36	11.6%	274	88.4%			
Use of nasograstric tube							
Yes	77	24.1%	242	75.9%	1.89 (1.18-3.03)	2.17 (1.24-3.80)	0.005
No	18	12.8%	123	87.2%			
Age group							
Elderly	50	27%	135	73%	1.65 (1.16-2.36)	1.89 (1.20-2.99)	0.006
Adult	45	16.4%	230	83.6%			
Previous heart surgery							
Yes	16	39%	25	61%	2.07(1.42-4.90)	2.75(1.40-5.40)	0.002
No	79	18.9%	340	81.1%			
Duration of the surgery							
>180min	85	24.2%	266	75.8%	2.64 (1.42-4.90)	3.16 (1.58-6.34)	0.001
<180min	10	9.2%	99	82.4%			
COPD							
Yes	23	44.2%	29	55.8%	2.50(1.73-3.63)	3.70(2.02-6.77)	<0.001
No	72	17.6%	336	82.4%			
Diabetes Mellitus							
Yes	26	24.8%	79	75.2%	1.27 (0.86-1.89)	1.36 (0.81-2.28)	0.236
No	69	19.4%	286	80.6%			
CHF							
Yes	7	17.9%	32	25.0%	0.86 (0.43-1.94)	0.83(0.35-1.72)	0.63
No	88	20.9%	333	79.1%			
Surgery rate							
Urgency	6	75.0%	2	25.0%	3.80(2.45-5.92)	12.23(2.43-61.64)	0.001
Elective	89	19.7%	363	80.3%			

◻COPD: chronic obstructive pulmonary disease. CHF: Congestive heart failure. RR: Risk Ratio. OR: Odds ratio (confidence interval).

In multivariate logistic regression analysis, intubation time, use of nasograstric tube, previous cardiac surgery, duration of surgery and COPD continued to show statistically significant association (p <0.05), according to data in table 2.

Table 2. Logistic regression analysis of risk factors to the occurrence of respiratory infection in patients undergoing cardiac surgery. Uberaba-MG, 2005-2010

RESPIRATORY INFECTION

VARIABLES	YES N	%	NO N	%	OR◻ (CI)	p
Intubation time						
24 hours or more	59	39.3%	91	60.7%	3.65 (2.15-6.17)	0.00
Less than 24 hours	36	11.6%	274	88.4%		
Use of nasograstric tube						
Yes	77	24.1%	242	75.9%	2.10 (1.13-3.90)	0.02
No	18	12.8%	123	87.2%		
Age group						
Elderly	50	27%	135	73%	1.40 (0.82-2.38)	0.20
Adult	45	16.4%	230	83.6%		
Previous heart surgery						
Yes	16	39%	25	61%	3.55 (1.64-7.23)	0.00
No	79	18.9%	340	81.		

	9	%		1%		
Surgery duration						
>180min	85	24.2%	266	75.8%	1.73 (1.03-2.91)	0.04
<180min	10	9.2%	99	82.4%		
COPD						
Yes	23	44.2%	29	55.8%	3.67 (1.85-7.23)	0.00
No	72	17.6%	336	82.4%		

The incidence of respiratory infection cases among patients with COPD was 23 (44.2%), while incidence for patients without the disease was 72 (17.6%). Incidence of infection was found in 59 (39.3%) patients with intubation time of 24 hours or more.

Among the factors related to occurrence of respiratory infection, patients who used a nasogastric tube, 77 (24.1%) developed this type of infection. Among the elderly, 50 (27%) were affected with the same clinical picture. Of the patients who were in second heart surgery procedure, 16 (39.1%) developed respiratory infectious process.

Of all cases of infection, 85 (24.2%) underwent surgery with a time longer than three hours (180 minutes).

DISCUSSION

It was found that most of the patients were male (60.9%) with a mean age of 55.6 years. Other studies have found similar data related to gender and age.[2,3]

Surgery rate						
Urgency	6	75.0%	2	25.0%	5.36 (0.90 – 31.10)	0.07
Elective	89	19.7%	363	80.3%		

COPD: chronic obstructive pulmonary disease. *OR: Odds ratio (confidence interval).

Studies indicate that with an age over 65 ± 11.3 the duration of MV, ICU stay and hospitalization are risk factors for mortality in the population undergoing cardiac surgery.[1-3,5-6]

The incidence of respiratory infection in the sample studied was (20.7%), with similar results identified in a study with a sample of 1,628 patients, in which (14.4%) presented pulmonary complications.[2] However, these values are lower in another study that evaluated 5,582 patients undergoing cardiac surgery, and of these (3.1%) developed respiratory infection.[1]

The mean duration of endotracheal intubation of this study was 26.1 hours. We observed a lower time in a study that evaluated 116 heart surgery patients, in which all of them remained under VM postoperatively, for a time of 15.5 hours.[3]

With regard to comorbidities, it was found that most of the patients had hypertension. It is observed that this condition was more prevalent in the elderly population conducted in the city under this

study.[7] This disease is associated with other chronic diseases, such as obesity, diabetes, congestive heart failure and COPD, with similar results found in other studies.[1,6,8]

The average BMI of the population studied was 25.6 kg/m2. However, there was a greater proportion of overweight patients according to BMI classification proposed by WHO.[9] Overweight is associated with intraoperative variables, which may impact on the appearance of pulmonary complications, such as respiratory infections.[10]

In this study the most frequently performed surgery was MRI (47.8%). This surgery was the most performed in (77.1%) among 8,112 patients[5] and (52%, 6) among 116 patients.[3] Coronary artery bypass surgery is considered a safe procedure performed worldwide with low rates of mortality and morbidity in the general population.[10]

In the studied population, most patients (97.6%) used CEC, with an average time of 228 minutes of surgery. One study linked the CEC time with the relative risk of death in 209% higher when it is above 115 minutes.[2]

In this study it was found that (11.3%) patients died, comparing this result with countries like the United States (2.9%) and Canada (1.7%).[11] In a hospital in Brazil (4.7%), in patients undergoing on-pump CABG[12], mortality is higher in the population of this study.

Risk of mortality has been associated with factors such as age > 65 years, use of cardiopulmonary bypass surgery.[1,2]

Lung infection was significantly associated with 2.1 times increased likelihood of death within 30 days after cardiac surgery when compared to patients without lung infection.[6] A review study shows that the most frequent infection related to health care was pneumonia (38.3%) and was associated with hospitalization, comorbidities, invasive procedures, nutritional conditions, decline in immune response as contributing factors for the occurrence of infections in the elderly.[13]

CONCLUSION

Results of this study suggest that patients who underwent surgery time longer than 180 minutes have 1.73 more chances of developing respiratory infection compared to surgeries with time less than 180 minutes. It showed a high prevalence of respiratory infections in the postoperative period of cardiac surgery. It was also identified variables such as long intubation time (higher than 24 hours), use of nasograstric tube, age group (older than 60), history of previous heart surgery, duration of surgery (> 180 min), and history of disease Chronic Obstructive

pulmonary disease (COPD) as factors associated with respiratory infection.

It is expected that the results shown in this study may support actions to prevent the occurrence of respiratory infection in this population, considering the risk factors identified.

As possible limitations of this research it can be considered the constraints of the group assessed in relation to the sample size, since it has been held in a single institution.

Studies like are suggested to be developed on an enlarged scope, preferably in a multicentric perspective.

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