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Original Article

Pak Armed Forces Med J 2017; 67(Suppl-2): S211-15

OUTCOME OF SEPSIS IN POST OPERATIVE ADULTPATIENTS OF CARDIAC SURGICAL INTENSIVE CARE UNIT

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ABSTRACT

Objective:To determine the frequency of sepsis and to evaluate the morbidity and mortality of patients subjected to cardiac surgery that developed sepsis during the in-hospital postoperative period.

Study Design: Descriptive cross sectional study.

Place and Duration of Study:Armed Forces Institute of Cardiology, Intensive Care Unit of Rawalpindi, from Oct2016 to Dec2016.

Material and Methods:Three hundred and twenty eight patients were included who underwent elective open heart surgery at intensive care unit of AFIC/NIHD. All the patients who were above 18 years of age and underwent elective coronary artery bypass graft (CABG) surgery during the specified study period were included. Patients with any infection and with infective endocarditis were excluded. Non-probability consecutive sampling technique was used.

Results: The frequency of immediate post surgical sepsis was found to be 55(17.0%). The mean age of patients was found to be 55 (53±14) years. Among these patients, 29(9.0%) were males and 26(8.0%) were females. 38 (12.0%) had coronary artery bypass graft (CABG) and 17 (5.0%) underwent valve replacement. Mean ICU stay was found to be 14.5 ± 10.1 days in males & 17.3 ± 12.4 days in females, surgical site infection rate 8 (2.3%), cardiac support 19 (34.5%), likewise mechanical cardiac support in males 10 (18.0%) and in females 2 (4.0%), mean mechanical ventilation timewas found to be (5.1±1.3 hours), post-op acute renal failure in males 6 (11.0%) and 1(2.0%) in females. Mortalityin males was found to be 5 (9.0%)and in females it was 6(11.0%). Haemocultures results of septic population showed that 15 patients were positive and of which 11 (73.0%) mainly comprised of the acinetobacter species.

Conclusion:Sepsis that occurs in the cardiac surgery post-operative period significantly contributes to patients' high morbidity and mortality. Moreover, further studies are essential to simplify the proper diagnosis, and risk factors that will help prevent sepsis.

Keywords: Cardiac surgery, Postoperative period, Sepsis.

INTRODUCTION

Sepsis, a syndrome of physiologic, pathologic, and bio-chemical abnormalities caused by infection, is a main public health concern, accounting for more than $20 billion (5.2%) of total US hospital costs in 2011[1,2]. Sepsis is linked with high rates of morbidity and mortality, responsible for as much as one of every two to three in-hospital deaths. Particularly, the mortality rates of sepsis amplified during the last decade, which is in contrast to the declining rates of all other major causes of death in the US[2]. Sepsis after cardiac surgery has been prescribed as a low-prevalence infectious complication with terribleresults. Patients who develop sepsis, regardless of the infectious focus present with high morbidity and mortality, which show a discrepancy from 17% to 65%[3]. Finding the incidence of sepsis is of great concern to both clinicians and public health officials, in order to calculate the load of the disease[4]. However, assessment of sepsis incidence is difficult, as it depends on the definition of sepsis, the method used to evaluate the condition, and the

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underlying population. Until 1992, no consensus existed on the terminology used to describe the presence and severity of sepsis, impairing comparison of studies on sepsis incidence and therapy outcomes[5]. This issue was addressed by The American College of Chest Physicians/Society of Critical Care Medicine (ACCP/SCCM) Consensus Conference in 1991, with the purpose to create a set of criteria for identifying and assessing the severity of sepsis[6]. The consensus proposal incorporated a introduction of the systemic inflammatory response syndrome (SIRS) criteria for early identification of sepsis, defining sepsis as 2 SIRS criteria in patients with known or suspected infection, and severe sepsis as sepsis associated with organ dysfunction, hypoperfusion, or hypotension. However, repeatedly criticised for being too sensitive[7,8] and of questionable prognostic value[9,10] these easily applied "Bone criteria" remained the clinical standard in many hospital guidelines even after the introduction of internationally agreed-upon, but more comprehensive, criteria[11-13]. A 2001 task force, identifyingboundaries with these definitions, extended the list of diagnostic criteria but did not suggest alternatives because of the lack of underneath evidence[14].and PIRO criteria was introduced. It was Recognized to reexamine the current definitions, the European Society of Intensive Care Medicine and the Society of Critical Care Medicine convened a task force of 19 critical care,infectious disease, surgical, and pulmonary specialists in January 2014[15]. In 2016 the definition of sepsis was rationalized to categorise sepsis as a life-threatening organ dysfunction caused by a dysregulated host response to infection (by The Third International Consensus Definitions for Sepsis and Septic Shock)[16].

Body mass index $\geq 40 kg/m^2$, haemodialysis in the preoperative period, pre-op cardiogenic shock, age ≥ 80 years, pre-op treatment with immunosuppressive agents, diabetes mellitus, mechanical circulatory support, 3 or more revascularized vessels are the most important predictors of infections in postoperative period[17].

Table-I: Demographics and basic clinical information.

Variables	Sepsis Cases
Gender, [n (%)]	
Male=245 (72.0%)	55 (17.0%)
Female=95 (28.0%)	
Hypertension, n (%)	
153 (45.0%)	30 (9.0%)
Diabetes mellitus, n (%)	
92 (27.0%)	19 (6.0%)
Type of surgery, n (%)	
CABG = 246 (72.0%)	38 (12.0%)
Valve = 60 (18.0%)	17 (5.0%)

Our study was conducted according to latest definition by the Third International Consensus Definitions for Sepsis and Septic Shock 2016, in which sepsis is defined as "a life-threatening organ dysfunction caused by a dysregulated host response to infection".

For clinical investigation, organ dysfunction can be represented by an increase in the Sequential (Sepsis-related) Organ Failure Assessment (SOFA) score of 2 points or more, which is associated with an in-hospital mortality greater than 10%.

MATERIAL AND METHODS

From October 2016 to December 2016, 328adult patients who underwent cardiac surgery were included in this study. Prophylactic antibiotic therapy was given according to the

protocol of our hospital, from the induction of anesthesiaup to ICU stay.Selection of patients was done by Armed Forces Nursing staff that were trained and informed about the inclusion and exclusion criteria. Sepsis in the postoperative period was defined as confirmation of infection linked with two or more criteria of systemic inflammatory response syndrome: body temperature >38°C or <36°C, leukocytes >12,000 cells/mm³, positive blood cultures, and respiratory rate >20/min, heart rate >100/min. According to new definition of sepsis, Organ dysfunction can be recognized as an acute change in total SOFA score>2 points consequent to the infection. The baseline SOFA score are supposed to be zero in patients not known to have preexisting organ dysfunction. ASOFA score<2 reflects an overall mortality riskof about 10% in a general hospital population with assumed infection. In our study, after diagnosis of sepsis, identified septic patients were analysed usingdescriptive statistical tests i.e.chi square and t-test. The assessed characteristics of the patients with sepsis were: age, gender, number of days spent in the ICU, surgical site infection rate, cardiac support, mechanical cardiac support,mechanical ventilation time, positive haemocultures, post-op acute renal failure and mortality.

RESULTS

There were 328 cardiac surgery patients subjected to cardiac surgery during the studyperiod, 246(75%) had CABG and 62(18%) underwent valve surgeries.Among these patients,245 (72.0%) were males and 95 (28.0%) were females. Demographics of patients are shown in table-I.

Fifty five(17%) developed sepsis during the in-hospital post-op period. There was a predominance of male patients with sepsis during the post-op period when compared to female patients (69% vs. 31%); the patients' mean age was 55 (53±13) years. Mean ICU stay was found to be 14.5 ± 10.1 days in males & 17.3 ± 12.4 days in females, surgical site infection rate 8 (2.3%), cardiac support 19 (34.5%), likewise mechanical cardiac support in males 10 (18.0%) and in females 2 (4.0%), mean mechanical

Table-II: Septic patients in cardio surgical icu with demographics and clinical findings.

Variables	Males n=29 (9.0%)	Females n=25 (8.0%)
Age (mean±SD)	55 (51±15)	60 (58±8)
ICU stay(mean)	14.5 ±10.1 days	17.3 ± 12.4 days
Cardiac supportn(%)	10(18.0%)	09 (16.0%)
Mechanical cardiac supportn(%)	10 (18.0%)	2(4.0%)
Mechanical ventilation time (median)	5 hours	5 hours
CRRT n(%)	6(11.0%)	1(2.0%)
Surgical site infection rate (SSI) n(%)	6(11.0%)	2(4.0%)
Mortality n(%)	05(9.0%)	6(11.0%)

Table-III: Isolated microorganisms from haemocultures of septic patients.

Isolated Microorganism	Number of patients with positive haemoculture (expressed as a percentage of total septic patients) (n=15)
Acinetobacter spp.	11 (73.0%)
Klebsiella pneumoniae	02 (13.0%)
E.coli	01 (7.0%)
Burkhuldoria cepacia	01 (7.0%)

ventilation time was found to be (5.1±1.3 hours), post-op acute renal failure in males 6 (11.0%) and 1(2.0%) in females. Mortality in males was found to be 5 (9.0%) and in females it was 6(11.0%). Haemocultures results of septic population showed that 15 patients were positive and of which 11 (73.0%) mainly comprised of the acinetobacter species (table-II).

Isolated microorganisms from haemocultures of septic patients are shown in table-III. All of them received antibiotic therapy according to antibiogram. Of all 55 septic patients 11 (3.3%) of them died during ICU stay. No Methicillin Resistant Staphylococcus Aureus (MRSA) was found.

DISCUSSION

The prevalence of infectious complications after cardiac surgery is up to 3.5% of patients. Cardiac surgery postoperative infections increase the morbidity and mortality, hospital cost and ICU stay duration[18] and it is similar with finding of our study i.e.frequency of sepsis in our study was 55 (17.0%).

Cardiac dysfunction is an important component of multiorgan failure that is caused by severe sepsis[19,20]. Regarding multi organ failure, continuous renal replacement therapy (CRRT) was performed on 7 (2%) patients.Patients with known organ failure disease who then become septic appear to have increased mortality. Overall mortalitycalculated in our study was 24 (7%). In which 11 (20.0%) were from sepsis group[20].These findings argue for the critical importance of early identification and aggressive response to sepsis in cardiac patients, given that they appear to be at increased risk for complications. In another study, the sepsis associated mortality is 27% but exceeds 50% in cases of septic shock[21,22].

Frequency of sepsis in our study was 55 (17.0%), which is associated with hospital cost and occurrence of sepsis . Toumpoulis et al[23]. Studied 3,720 patients submitted to cardiac surgery, with the objective of identifying risk factors for sepsis and endocarditis. The prevalence of sepsis in the post-op period was 1.2%; however, the in-hospital mortality was >70% and there was an increase in cost and time of hospitalization associated with the pace of sepsis[23].

The Surviving Sepsis guidelines additionally stress the importance of initiating antibiotics within an hour of identification of septic shock, with empiric therapy targeted to the suspected site of infection and responsible organisms, and then working to obtain infection source control as quickly as possible[24]. Overall surgical site infection rate during study time period was found to be 8 (2.3%). Out of this, 6 (62%) patients were from sepsis group and it was in accordance with the present study.

Results of a study reported by Stoeckle etal[25], conclude that relative frequency of bloodstream infections is found be more than 4 times higher in diabetic than in non-diabetic general inpatients. Diabetic population of our study was19 (35.0%). This finding was similar with previous literature.

According to the third international consensus definitions for sepsis and septic shock, the sequential onset of complications, that is, the occurrence of adverse events after the onset of sepsis, proposed that the patients with this disease are more vulnerable and thus present such high rates of complications. This lends to belief that the patient with sepsis has a higher chance of presenting with acute renal failure, heart failure. An added challenge is that infection is seldom confirmed microbiologically when treatment is started; even when micro-biological tests are completed, culture-positive “sepsis” is observed in only 30% to 40%of cases[16]. This is similar in the present study, only 15 microorganisms were isolated which are mentioned in table-III.

In spite of its low prevalence, sepsis that occurs in the cardiac surgery post-operative period significantly contributes to patients’ high morbidity and mortality. Therefore, the current recommendations for the treatment of severe

sepsis represent a strategy that is potentially capable of improving the outcome of such patients and needs to be evaluated concerning the sepsis that occurs after cardiac surgery.

CONCLUSION

Sepsis has always been a rare complication in the postoperative period of cardiac surgery. However, when observed, the result is catastrophic: 7% of the patients who presented such complication died during the hospitalization phase. Cardiac surgery, in most cases, is a clean surgery with a low rate of infectious complications; however, when these do happen, they contribute to patients' unfavorable outcome.The therapeutic measures suggested by the international guidelines for the treatment of sepsis must be functional to patients that present with sepsis after cardiac surgery, as they are potentially proficient of reducing morbidity and mortality.

Limitation of the Study

The study was conducted at single center with relatively small sample size. A multicenter study with larger sample size is needed.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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