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A CLINICAL STUDY ON POSTOPERATIVE SEPSIS AFTER EMERGENCY ABDOMINAL SURGERIES

General Surgery

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ABSTRACT

Background: Postoperative sepsis is a severe complication which often worsens the clinical outcomes and remains a significant cause of morbidity and mortality. Aim of this study was to find out the incidence, influencing factors, microbiology and mortality of postoperative sepsis after emergency abdominal surgeries. **Methods:** A Prospective observational study was conducted over a period of 12 months (from 1st June 2021 to 31st May 2022) in Department of General Surgery in Silchar Medical College and Hospital, Assam. A total of 120 patients who underwent emergency abdominal surgeries were selected and followed up for the study and various factors were recorded and analysed using SPSS statistical software version 22. **Results:** The incidence of postoperative sepsis was 35%. History of smoking/alcohol intake, T2DM, Hypertension and Chronic illness, Leukocytosis, Anemia, Abnormal KFT, RBS, Serum Electrolytes, ECG/CXR, Late presentation, Avoidance of prophylactic antibiotics, Tachycardia, Tachypnoea, Fever and Increased stay in hospital were significantly associated with postoperative sepsis. Most common organism encountered was S. aureus (47.6%). The mortality of postoperative sepsis was 1.7%. **Conclusion:** Adequate preparation of patient, use of prophylactic antibiotics in the perioperative period and strict adherence to antisepsis protocol especially during intraoperative and postoperative period are of paramount importance in emergency surgeries. The trend of increasing resistance of the organisms to commonly used antibiotics is a matter of concern. Judicious and rational use of antibiotics should be considered as per the prevailing antibiogram.

KEYWORDS

Postoperative sepsis, Emergency abdominal surgery, Prophylactic antibiotics

INTRODUCTION

Emergency abdominal surgery is a common surgical procedure nowadays. Patients presenting for emergency abdominal surgery are heterogenous and present with diverse pathology, resulting in challenges for the surgical, anaesthetic and critical care team that manage them[1]. Postoperative sepsis is a severe complication of surgery, which often worsens the clinical outcomes and remains a significant cause of morbidity and mortality. It increases the cost of treatment and is associated with lost work productivity, disruption of normal life and unanticipated stress to patients in general[2,3]. The complex deregulated host response to infection includes uncontrolled inflammation and immune suppression. At its most basic level overt clinical infection represents a shift of balance of forces comprising defence and microbial invasion. Over the time, the virulence of infection, amount of microbial inoculum and host defence has occupied the interests of surgeons in their fight against infection[4].

Numerous studies have evaluated postoperative sepsis, but because of the complexity of the problem, some reports have limitations which prevent meaningful interpretation. Some overlook the necessity of rigorous statistical control to discriminate between the random effects of chance and relevant clinical factors determining the incidence of postoperative sepsis. Other reports bulk together widely diversified surgical experience so that conclusions in regard to sepsis rates may be confounded by alterations in the case material from time to time. Such changes will affect calculated sepsis rates by the inclusion of various cases in different periods with greater or lesser propensities to develop postoperative sepsis[5,6]. Commonly a precise definition of surgical sepsis or the details as to the methods employed with appropriate checks are omitted[7,8]. While the surgical procedure itself is frequently the source of infection, many other admission related factors can contribute to the development of postoperative infections and sepsis. The low incidence of postoperative sepsis following clean surgery, in the order of one to five per cent, requires that many cases be collected to permit meaningful interpretation of the statistics.

The complex interdependence of the factors contributing to the development of postoperative sepsis makes it extremely difficult to extract any one factor as the critical one among several hundred that could be responsible for a change in the incidence. In the present study various preoperative, intraoperative and postoperative and their influence on postoperative sepsis have been studied in patients who underwent emergency abdominal surgeries[9]. The aims and objectives of present study were to study the incidence of postoperative sepsis following emergency abdominal surgeries in all surgical units in Silchar Medical College and Hospital, the various preoperative, intraoperative and postoperative factors influencing postoperative sepsis, the microbiology of infection and the mortality of postoperative sepsis

MATERIALS AND METHODS

This study was conducted in Department of General Surgery in Silchar Medical College and Hospital, Assam over a period of 12 months (from 1st June 2021 to 31st May 2022) after getting approval from ethical committee. A total of 120 patients were selected for the study who undergone emergency abdominal surgeries during this period in all the units of General Surgery Department. Every patient was enrolled for this study based on the inclusion and exclusion criteria and after getting informed written consent from the patients

Patient details like age, sex, history of diabetes mellitus/hypertension/ any other chronic illness, smoking and alcohol history, BMI, diagnosis, investigations, the surgical procedure done, wound class, intraoperative findings, postoperative period, prophylactic antibiotics and follow up period were recorded during the study period.

Study Design

Prospective observational study.

Inclusion Criteria

1. Patients undergone emergency abdominal surgeries in General Surgery Department with valid consent

Exclusion Criteria

1. Patients below 12 years of age
2. Patients undergone elective abdominal surgeries
3. Patients undergone emergency surgery in other hospitals
4. Patients lost to follow up for a period of one month from date of surgery
5. Intra operative mortality
6. Mortality within 24 hours of surgery
7. Reoperation of an already diagnosed case of postoperative sepsis during the same course of hospital stay

RESULTS AND OBSERVATION

Statistical Analysis

All the data collected were coded and entered in Microsoft Excel sheet which was re-checked and analysed using SPSS statistical software version 22. Quantitative variables were summarised using mean and standard deviation (SD). Categorical variables were represented using frequency and percentage.

Independent sample t test was used to test statistical significance of difference between means of variables among different independent groups. Pearson Chi-square test was used for comparing categorical variables between groups. A p value of <0.05 was considered statistically significant.

Table 1: Characteristics of study subjects (N=120)

Age-years	
Mean ± SD	35.06±14.69
Median(IQR)	32(23-45)
Age-no(%)	
≤20 years	20(16.7)
21-30 years	35(29.2)
31-40 years	28(23.3)
41-50 years	17(14.2)
51-60 years	15(12.5)
>60 years	5(4.2)
Sex-no(%)	
Male	89(74.2)
Female	31(25.8)
Diagnosis-no(%)	
Acute appendicitis	36(30)
Appendicular perforation	19(15.8)
Duodenal perforation	14(11.7)
Antral perforation	9(7.5)
Jejunal perforation	7(5.8)
Traumatic hemoperitoneum	6(5)
Small bowel obstruction	6(5)
Obstructed inguinal hernia	6(5)
Ileal perforation	5(4.2)
Splenic injury with hemoperitoneum	3(2.5)
Appendicular abscess	3(2.5)
Pyloric perforation	2(1.7)
Caecal perforation	1(0.8)
Sigmoid perforation	1(0.8)
Midgut volvulus	1(0.8)
Sigmoid volvulus	1(0.8)
Emergency surgery done-no(%)	
Open appendicectomy	58(48.3)
Graham patch closure	14(11.7)
Primary repair with omental patch closure	11(9.2)
Resection and anastomosis	10(8.3)
Primary repair	9(7.5)
Adhesion release	4(3.3)
Splenectomy	3(2.5)
Open hernioplasty	3(2.5)
Open herniorrhaphy	2(1.7)
Primary repair with loop ileostomy	1(0.8)
Resection and anastomosis with loop colostomy	1(0.8)
Repair of volvulus	1(0.8)
Hartmann procedure	1(0.8)
Clot evacuation with suprapubic cystostomy	1(0.8)
Resection and anastomosis with herniorrhaphy	1(0.8)
Wound class-no(%)	
Class II	14(11.7)
Class III	44(36.7)
Class IV	62(51.7)
Any sign and symptom of post-operative sepsis-no(%)	
Yes	42(35)
No	78(65)
Culture-no(%) (N=42)	
S aureus	20(47.6)
Klebsiella species	7(16.7)
E coli	5(11.9)
Pseudomonas species	2(4.8)
Acinetobacter species	2(4.8)
No growth	6(14.3)
Temperature-no(%)	
Afebrile	79(65.8)
Febrile	41(34.2)
Pulse rate-no(%)	
Normal	78(65)
Tachycardia	42(35)
Respiratory rate-no(%)	
Normal	85(70.8)
Tachypnea	35(29.2)
Systolic BP-mm Hg	
Mean ± SD	113.58±17.28
Median(IQR)	110(110-120)
Diastolic BP-mm Hg	
Mean ± SD	71.67±10.07
Median(IQR)	70(70-70)
TLC	
Mean ± SD	10951.50±4635.95
Median(IQR)	10420(7072.50-14070)
Hemoglobin-gm/Dl	
Mean ± SD	12.13±2.73
Median(IQR)	12.05(10.60-13.87)
Platelet-in lakhs	
Mean ± SD	2.22±0.71
Median(IQR)	2.20(1.80-2.60)
RBS	
Mean ± SD	118.39±61.71
Median(IQR)	101(92-125.75)
KFT-no(%)	
Normal	100(83.3)
Abnormal	20(16.7)
Serum electrolytes-no(%)	
Normal	86(71.7)
Abnormal	34(28.3)
ECG/CXR-no(%)	
Normal	91(75.8)
Abnormal	29(24.2)
BMI	
Mean ± SD	22.50±2.70
Median(IQR)	21.88(20.51-23.80)
History of type 2 diabetes mellitus-no(%)	
Yes	21(17.5)
No	99(82.5)
History of hypertension-no(%)	
Yes	16(13.3)
No	104(86.7)
History of any chronic illness-no(%)	
Yes	16(13.3)
No	104(86.7)
History of smoking /alcohol-no(%)	
Yes	53(44.2)
No	67(55.8)
Duration between symptom onset and admission-days	
Mean ± SD	1.80±0.96
Median(IQR)	1(1-3)
Pre op/intraop antibiotics taken-no(%)	
Yes	89(74.2)
No	31(25.8)
Duration of hospitalization-days	
Mean ± SD	8.47±5.57
Median(IQR)	7(4-12)
Outcome-no(%)	
Uneventful	78(65.0)
Sepsis	31(25.8)
SIRS	7(5.8)
Septic shock	2(1.7)
Death	2(1.7)

Table 2: Association of various factors with post-operative sepsis

Variable	Any sign and symptom of post-operative sepsis		P value
	Yes (N=42)	No (N=78)	
Age			
Mean ± SD	38.67±16.40	33.12±13.40	0.048*
Age			
≤20 years	6(14.3)	14(17.9)	0.379
21-30 years	10(23.8)	25(32.1)	
31-40 years	8(19)	20(25.6)	
41-50 years	9(21.4)	8(10.3)	
51-60 years	6(14.3)	9(11.5)	
>60 years	3(7.1)	2(2.6)	
Sex			
Male	31(73.8)	58(74.4)	0.948
Female	11(26.2)	20(25.6)	
Diagnosis			
Acute appendicitis	4(9.5)	32(41)	0.006*
Appendicular perforation	6(14.3)	13(16.7)	
Appendicular abscess	2(4.8)	1(1.3)	
Duodenal perforation	6(14.3)	8(10.3)	
Antral perforation	2(4.8)	7(9)	
Pyloric perforation	2(4.8)	0(0)	
Jejunal perforation	4(9.5)	3(3.8)	
Ileal perforation	4(9.5)	1(1.3)	
Caecal perforation	1(2.4)	0(0)	
Sigmoid perforation	1(2.4)	0(0)	
Midgut volvulus	0(0)	1(1.3)	
Sigmoid volvulus	0(0)	1(1.3)	
Traumatic hemoperitoneum	3(7.1)	3(3.8)	
Small bowel obstruction	2(4.8)	4(5.1)	
Splenic injury with hemoperitoneum	3(7.1)	0(0)	
Obstructed inguinal hernia	2(4.8)	4(5.1)	
Emergency surgery done			
Open appendicectomy	12(28.6)	46(59)	0.008*
Graham patch closure	6(14.3)	8(10.3)	
Primary repair with omental patch closure	4(9.5)	7(9)	
Resection and anastomosis	8(19)	2(2.6)	
Primary repair	3(7.1)	6(7.7)	
Primary repair with loop ileostomy	1(2.4)	0(0)	
Resection and anastomosis with loop colostomy	1(2.4)	0(0)	
Repair of volvulus	0(0)	1(1.3)	
Hartmann procedure	0(0)	1(1.3)	
Clot evacuation with suprapubic cystostomy	1(2.4)	0(0)	
Adhesion release	1(2.4)	3(3.8)	
Splenectomy	3(7.1)	0(0)	
Open hernioplasty	1(2.4)	2(2.6)	
Open herniorrhaphy	0(0)	2(2.6)	
Resection and anastomosis with herniorrhaphy	1(2.4)	0(0)	
Wound class			
Class II	0(0)	14(17.9)	0.001*
Class III	12(28.6)	32(41)	
Class IV	30(71.4)	32(41)	
Temperature			
Afebrile	1(2.4)	78(100)	<0.001*
Febrile	41(97.6)	0(0)	
PR			
Normal	1(2.4)	77(98.7)	<0.001*
Tachycardia	41(97.6)	1(1.3)	
RR			
Normal	7(16.7)	78(100)	<0.001*
Tachypnea	35(83.3)	0(0)	
Systolic BP			
Mean ± SD	112.86±28.39	113.97±5.66	0.737
Diastolic BP			
Mean ± SD	71.90±16.26	71.54±3.97	0.850
TLC			
Mean ± SD	14731.67±4356.98	8916.03±3334.02	<0.001*
Hemoglobin			
Mean ± SD	10.86±3.34	12.81±2.06	<0.001*
Platelet			
Mean ± SD	2.20±0.95	2.24±0.54	0.763
RBS			
Mean ± SD	152.17±92.89	100.21±18.27	<0.001*
KFT			
Normal	26(61.9)	74(94.9)	<0.001*
Abnormal	16(38.1)	4(5.1)	
Serum electrolytes			
Normal	13(31)	73(93.6)	<0.001*
Abnormal	29(69)	5(6.4)	
ECG/CXR			
Normal	14(33.3)	77(98.7)	<0.001*
Abnormal	28(66.7)	1(1.3)	
BMI			
Mean ± SD	23.13±3.85	22.16±1.73	0.061
History of type 2 diabetes mellitus			
Yes	21(50)	0(0)	<0.001*
No	21(50)	78(100)	
History of hypertension			
Yes	14(33.3)	2(2.6)	<0.001*
No	28(66.7)	76(97.4)	
History of any chronic illness			
Yes	16(38.1)	0(0)	<0.001*
No	26(61.9)	78(100)	
History of smoking /alcohol			
Yes	32(76.2)	21(26.9)	<0.001*
No	10(23.8)	57(73.1)	
Duration between symptom onset and admission			
Mean ± SD	2.50±0.94	1.42±0.74	<0.001*
Pre op/intraop antibiotics taken			
Yes	14(33.3)	75(96.2)	<0.001*
No	28(66.7)	3(3.8)	
Duration of hospitalization			
Mean ± SD	14.29±4.96	5.33±2.53	<0.001*
Outcome			
Uneventful	0(0)	78(100.0)	<0.001*
SIRS	7(16.7)	0(0)	
Sepsis	31(73.8)	0(0)	
Septic shock	2(4.8)	0(0)	
Death	2(4.8)	0(0)	

*statistically significant

In this study of 120 cases of emergency abdominal surgeries, 42 cases had postoperative sepsis and among them 31(73.8%) were males and 11(26.2%) were females. The incidence of postoperative sepsis was 35%.

In the study population, most common diagnosis was acute appendicitis (30%) followed by appendicular perforation (15.8%) and duodenal perforation (11.7%). The most common emergency surgery done was open appendicectomy (48.3%) followed by Graham patch closure (11.7%).

Most common age group affected was 21-30 years (23.8%) followed by 41-50 years (21.4%). The rate of infection was found directly proportional to the amount of contamination. Highest rate was seen in patients with class 4 surgical wounds (71.4%) followed by class 3 (28.6%). Out of the 42 cases, 23 patients had superficial SSI, 16 had deep SSI and 3 had organ space SSI. Culture showed that most common organism encountered was S. aureus (47.6%) followed by Klebsiella species (16.7%) and E. coli 11.9%) with 14.3 cases of no

growth obtained.

Preoperative patient related factors which was significantly associated with postoperative sepsis were history of smoking/alcohol intake, history of T2DM, history of hypertension and history of any chronic illness in the past. Leukocytosis, anemia, abnormal KFT, increased blood sugar level, abnormal serum electrolytes and abnormal ECG/CXR were also significantly associated with sepsis according to our study. Platelet count and BMI had no significant relation. Other factors associated with postoperative sepsis were late presentation, not taking prophylactic antibiotics and inadequate preparation of patient. Most common organism encountered was S. aureus (47.6%).

Postoperatively sepsis was associated with tachycardia, tachypnea, fever and increased stay in hospital. Out of the 120 patients in the study population, 78 had no signs and symptoms of postoperative sepsis and had uneventful outcome. Among the other 42 patients with sepsis 2 had septic shock. The mortality of postoperative sepsis was 1.7% in the present study.

DISCUSSION

This study was conducted in Department of General Surgery in Silchar Medical College and Hospital, Assam over a period of 12 months (from 1st June 2021 to 31st May 2022). A total of 120 patients were selected for the study who underwent emergency abdominal surgeries during this period in all the units of General Surgery Department to study the incidence of postoperative sepsis, the various preoperative, intraoperative and postoperative factors influencing postoperative sepsis, the microbiology of infection and the mortality of postoperative sepsis. It was observed that the incidence of postoperative sepsis after emergency abdominal surgeries was 35% which is higher comparing to similar studies.

In a study conducted by Ze Li et al[10], the incidence of postoperative sepsis after emergency abdominal surgery was 7.5%. In a study conducted by Xin Xu et al[11] it was 22.2%, and by Sulfil Gogoi et al[12] it was 21.43%. In our study we have observed an incidence of 35% of sepsis which is higher than other studies.

In the original studies of S. Ajay Venkadesh et al[13] and B. D. Dhaigude et al[14] the most common age group affected with sepsis were 31-40 years and 41-50 years respectively. In the present study it was 21-30 years. Most common diagnosis was acute appendicitis by the studies conducted by Ze Li et al[10] as well as S. Ajay Venkadesh et al[13] which was similar to our study.

In the studies of both Ze Li et al[10], Xin Xu et al[11] and B. D. Dhaigude et al[14] BMI of patient had no significant association with sepsis. In our study also patient's BMI has no significant association with sepsis postoperatively. Both Xin Xu et al[11] and S. Ajay Venkadesh et al[13] denoted significant association of postoperative sepsis and fever. In our study also sepsis and fever had significant association.

In the study by Sulfil Gogoi et al[12] patients with class 4 surgical wound developed postoperative sepsis mostly (55%). In our study we have also noticed the same. Postoperative sepsis occurred mostly in patients with class 4 surgical wounds (71.4%).

In the original study of Ze Li et al[10] it was noted that increased blood sugar (mean 144 mg/dL) and low haemoglobin (mean 12.5gm/dL) were significantly associated with postoperative sepsis. In our study also increased blood sugar (mean 152.17 mg/dL) and low haemoglobin (mean 10.86gm/dL) were significantly associated with postoperative sepsis.

According to the study conducted by Xin Xu et al[11] abnormal KFT was associated with development of sepsis postoperatively which is same as our finding with a statistically significant P value. The study of Ze Li et al[10] noticed increased duration of hospitalization in patients with postoperative sepsis (mean 13 days). In our study we have also observed it (mean 14.29 days) and are comparable.

The study of Ze Li et al[10] showed that organism mostly responsible for postoperative sepsis was E. coli (52%). But in the study conducted by S. Ajay Venkadesh et al[13] the most common organism encountered was S. aureus (48.5%). In the study by Sulfil Gogoi et al[12] also it was S. aureus (55%). In our study also it was S. aureus that caused maximum sepsis (47.6%). In the study of Xin Xu et al[11] the duration between symptom onset and admission in patients with postoperative sepsis was 2 days which was comparable to our study in which it was 2.5 days.

In the study of Ze Li et al[10] history of T2DM had a significant association with postoperative similar to our study but history of hypertension had no association which also had a significant association with sepsis according to our study. According to the study of Xin Xu et al[11] the mortality of postoperative sepsis was 50% which was extremely high. But in the study conducted by Ze Li et al[10] the mortality was 3% which was comparable with our study in which mortality was 1.7%.

CONCLUSION

Postoperative sepsis is a severe complication of surgery, which often worsens the clinical outcomes and remains a significant cause of morbidity and mortality. When sepsis occurs after a surgical procedure or during the post-operative hospital stay, it is typically called postoperative or surgical sepsis. Sepsis following an emergency surgery is a severe, yet relatively common complication associated with worse post-operative outcomes, prolonged hospitalization, and up to 25-fold higher mortality rates. Similarly, hospital costs are estimated to be at least three times higher for post-operative patients if sepsis develops. After the initial recovery and discharge, postoperative sepsis remains associated with many long-term detrimental effects. The majority of preventative measures must be taken to reduce contamination of wounds during the intraoperative and postoperative periods because the breadth of SSI prevention in the preoperative period is constrained in emergency surgery.

It was observed that the incidence of postoperative sepsis after emergency abdominal surgeries was 35% which is higher comparing to similar studies. The causes for the sepsis might include the ward environment, contaminated theatre and patients with low immunity status and non-adherence to aseptic techniques both in the theatres and the wards. An emergency abdominal surgery poses a great risk to developing intra-abdominal sepsis and as such surgeons should enforce the use of prophylactic antibiotics in the perioperative period. Prescribing full course of antibiotics in the postoperative period is unjustified. Strict adherence to antisepsis protocol especially during intraoperative and postoperative is of paramount importance in emergency surgeries. The trend of increasing resistance of the organisms to commonly used antibiotics is a matter of concern. It necessitates continuous evaluation of organism profile and their sensitivity pattern. Judicious and rational use of antibiotics should be considered as per the prevailing antibiogram.

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