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Wound Infections following Emergency Gastrointestinal Surgery

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ABSTRACT

Introduction: *Postoperative wound infection still causes considerable morbidity and high cost of healthcare system. The main determinants of infection are agent, host and environment. The objective of this study is to identify the underlying factors responsible for postoperative wound infection following emergency GI surgery and also to explore the causative organism including their antibiotic sensitivity.* ***Methods:*** *This study was carried out in the department of surgery, Rajshahi Medical College Hospital, Rajshahi during the period of July 2012 to December 2012 where 142 patients were selected randomly. These patients were admitted for emergency surgery.* ***Results:*** *In this study, 142 patients with emergency GI surgery were included among which acute appendicitis was 62 (infection rate 8.0%), burst appendix 12 (infection rate 33.3%), DU perforation 15 (infection rate 13.3%), small intestinal obstruction 30 (infection rate 13.3%), ileal perforation 19 (infection rate 42.1%), sigmoid volvulus 2 (infection 50%) and obstructed inguinal hernia 2 with no infection, The infection rate is high (18.3%) where operation was done by assistant registrar/IMO and nil where operation done by Professor. The infection rate is high 47.36% in dirty operation and low 5% in clean operation. Wound infection rises with COPD (28.5%), DM (33.3%) and anaemia (45.8%). Organisms isolated from infected wound swab were Escherichia coli 45.5%, Staphylococcus aureus 37.5%, Klebsiella pneumoniae 8.5%, Pseudomonas aeroginosa 8.5% out of total 24 culture positive cases. Regarding antibiotic sensitivity all the above mentioned organisms were 100% sensitive to Imepenem, Klebsiella pneumoniae and Pseudomonas aeroginosa were 100% sensitive to ceftriaxone, but other antibiotics like ciprofloxacin, cephradin were sensitive to 50% only.* ***Conclusion:*** *The incidence of postoperative wound infection in emergency GI surgery is bound to come down with only minimal use of antibiotics when there are provisions of well-equipped surgical ward with sterile environment, a planned operation theatre and isolation facilities for infected patients.*

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INTRODUCTION

Surgical wound infection still causes considerable morbidity and high cost to the health care system and is becoming increasingly important in medicolegal aspects.[1] Infections increase the discomfort and disability experienced by patients following surgical procedure and in their most severe form may endanger life.[2] The main determinants of infection are the microorganism, the environment and the host defense mechanism and there is continuous interaction between these three factors. The purpose of this study was i) to identify the different underlying factors/agents responsible for postoperative wound infection following emergency GI surgery, ii) prevention of that factors/agents and also to identify the causative organisms and iii) determination of antibiotic according to the culture sensitivity report of wound swab. In abdominal surgery, the source of bacteria may be endogenous(from the patients viscera 98% and skin), contamination from the air in the operation theatre, direct contamination from surgeon's hands wearing punctured gloves.[3]

On the basis of contamination surgical wound is classified into four categories: clean wound where infection rate is 1.5-2%, clean contaminated wound (Infection rate 5 to 7%) contaminated wound (Infection rate 15.2 to 20%) and dirty wound where infection rate is up to 40%.

Usually postoperative wound infection appears between 3rd to 5th postoperative days but it may appear as early as in the 1st day of surgery and even after the patient has left the hospital. Classically, the presence of postoperative wound infection has been confirmed by documenting the typical clinical signs of inflammation along with drainage of purulent or culture positive materials from the wound.

Early diagnosis by clinical features and isolation of organism from the wound by culture and sensitivity of the isolates using most appropriate antibiotic, the morbidity and mortality due to postoperative wound infection specially following emergency GI surgery can be reduced.

METHODS

This study was a prospective one where 142 patients were selected randomly from surgery department of Rajshahi Medical College Hospital, Rajshahi, during the period of six months (July 2012 to December 2012). All the patients studied were admitted for emergency surgery for acute appendicitis, perforated peptic ulcer, ileal perforation, acute intestinal obstruction, burst appendix, volvulus of sigmoid colon, obstructed inguinal hernia.

For bacteriological study, wound swabs were collected from infected postoperative wound, aseptically. The specimens were sent to the department of microbiology laboratory after proper labeling.

RESULTS

Out of 142 patients with emergency Gastro-intestinal surgery in this series, 62(43.7%) cases were acute appendicitis, 12(8.5%) cases were burst appendix, 15 (10.6%) cases were duodenal ulcer Perforation, 3 cases were small intestinal obstruction 19 cases were ileal perforation, 2 cases each were sigmoid volvulus and obstructed inguinal hernia. Wound infection rate of specific type of operation shown respectively in the TableI and Figure 1. The overall wound infection rate was 16.9%.

Table I: Wound infections according to diseases (n-142)

Name of disease	Name of operation	No.(%) of operation	No.(%) of infection among cases	Total No. (%) of infections
Acute appendicitis	appendectomy	62 (43.7%)	5 (8.1%)	20.8 %
Burst appendix	appendectomy with peritoneal toileting	12 (8.4%)	4 (33.3%)	16.6%
Duodenal ulcer perforation	Repair of perforation with thorough peritoneal toileting	15 (10.6%)	2 (13.3%)	8.3%
Small intestinal obstruction due to band and adhesion	Laparotomy with division of band and adhesion	18 (12.7%)		
Small intestinal obstruction needs resection and anastomosis	Resection and anastomosis	12 (8.4%)	4 (33.3%%)	16.6%
Ileal perforation	Repair and peritoneal toileting	19 (13.9%)	8 (33.3%)	42.1%
Volvulus of sigmoid colon	Resection and Anastomosis	2 (1.4%)	1 (4.1%)	50.0%
Obstructed inguinal hernia	Herniotomy and herniorraphy	2 (1.4%)	0 (0%)	0%
Total		**142**		

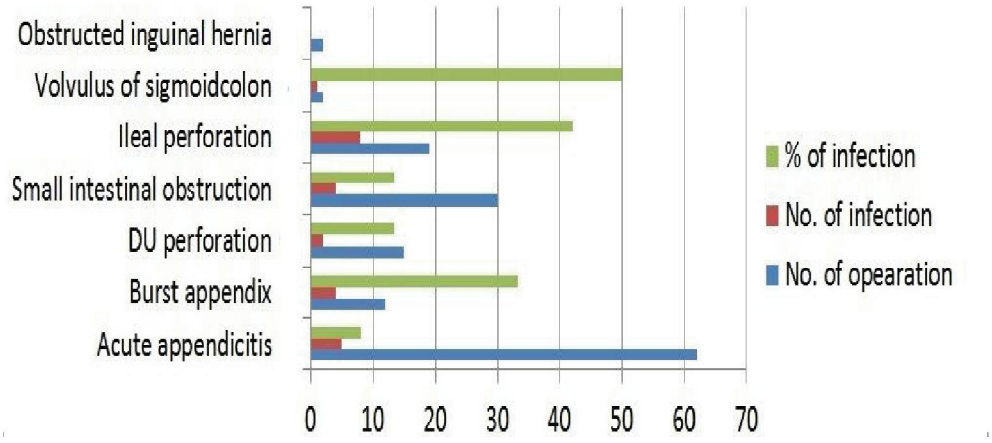

Figure 1: Bar diagram of rate of wound infection.

Table II and Figure 2 shows that infection rate is higher (18.33%) where the operation were done by assistant registrar/indoor medical officer and relatively lower (12.50%) where it was done by registrar and nil (00%) where operations were done by Professor.

Table II: Surgeon and infection

Types of surgeon	No of operation	No. (%) of infection
Professor	6	0 (0%)
Registrar	10	2 (12.50%)
Assistant Registrar/IMO	120	22 (18.33%)

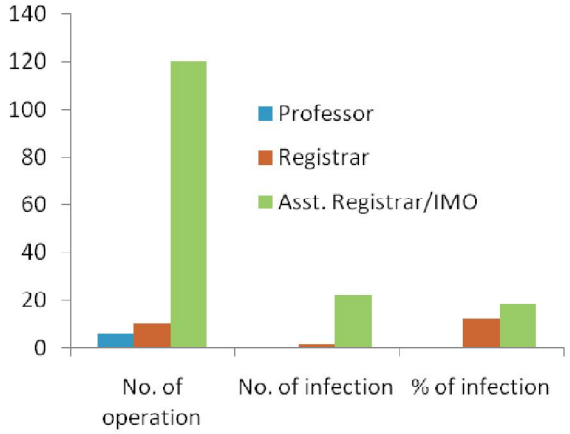

Figure 2: Bar Diagram of surgeon and infection rate

Infection rate varies with duration of operation. Up to 1 hours, it was 7.3% whereas operations taking more than 1 hour, infection rate is higher and it is 30% (Table III).

Table III: Duration of operation and wound infection rate.

Duration of operation (In hours)	No of cases	No. (%) of wound infection
upto 1 hour	82	6 (7.3%)
More than 1hour	60	18 (30%)

In this series, the rate of infection of clean wound was 5%, clean contaminated wound was 19.37%, contaminated wound was 26.90% and dirty wound was 47.36% (Table IV & Figure 3)

Table IV: Analysis of infection rates related to wound types.

Types of wound	No of cases	No. (%) of wound infection
Clean	20	1 (5%)
Clean contaminated	64	7 (19.3%)
contaminated	29	7 (26.9%)
Dirty	19	9 47.3%)

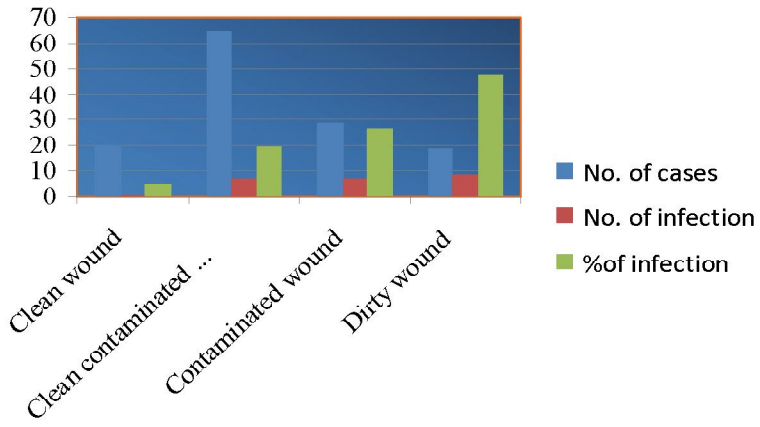

Figure 3: Bar Diagram of wound infection in various wound type

Table V shows that wound infection rate rises with chronic obstructive pulmonary disease (28.5%), diabetes mellitus (33.3%), medical jaundice (50%), aneamia (45.8%) (Hb%<60%).

Table V: Host conditions and wound infection rate

Host conditions	No of cases	No. (%) of infection
Anaemia	24	11 (45.8%)
Chronic obstructive pulmonary disease	7	2 (28.5%)
Medical jaundice	2	1 (50.0%)
Diabetes mellitus	6	2 (33.3%)

Total number of causative pathogens detected were 24, of which 11 (45.8%) were *Escherichia coli,* 9 (37.5%) were *staphylococcus aureus,* 2 (8.3%) were each of *Klebsiella* and *Pseudomonas aeruginosa.* No growth found in 2 cases (Table VI & Figure 4)

Table VI: Character of discharge or pus and organisms cultured

Character of discharge	No of cases	Organisms cultured
Serosanguiuous	1	No growth
Thick creamy pus	9	*Staphylococcus aureus*
Muddy, thin & odourless	11	*Escherichiacoli*
Blue green pus	2	*Pseudomonas aeruginosa*
Yellow fishy odour	2	*Klebsiella*

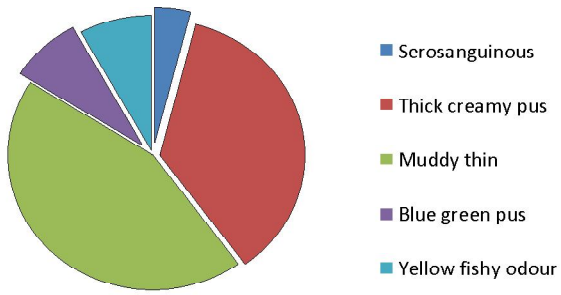

Figure 4: Pie chart of Character of discharge

Total number of infected wound shows *Escherichia coli* (45.5%), *Staphylococcus aureus* (37.5%), *Klebsiella* and *Pseudomonas* (8.5%) each (Table VII).

Table VII: Frequency of organism cultured from the postoperative infected wounds.

Total no. of infected wound	Isolated organism	Total no. of single isolated bacteria
24	*E. Coli*	11 (45.5%)
	Staph. aureus	9 (37.5%)
	Kl. Pneumonia	2 (8.5%)
	P. aeruginosa	2 (8.5%)
Total		24

E. coli, S. aureus, Kl. pneumoniae and *P. aeruginosa* all were sensitive to Imepenem but 72.7%, 88.9%, 100% and 100% sensitive to ceftriaxone. *E. coli* were 45.5%, 54.5%, 45.5% and 9.09% sensitive to ciprofloxacin, cephradine, cotrimoxazole and nitrofurantoin respectively. *S. aureus* were 44.4%, 44.4%, 55.5% sensitive to ciprofioxacin, cephradine and flucloxacillin respectively. *K. pneumoniae* were 50% sensitive to cephradine and cotrimoxazole each. *P. aeruginosa* is also 50% sensitive to ciprofloxacin and nitrofurantoin each (Table VIII).

Table VIII: Antibiotic sensitivity of the cultured organisms from infected wound.

Name of Organisms	Name of sensitive antibiotics & percentage (%)						
	Ciprofloxa-cin	Cephradin	Cotrimo -xazole	Flucloxacin	Nitofuran-toin	Ceftria-xone	Imepenam
E. coli	45.5	54.5	45.5		9.1	72.7	100
S. aureus	44.4	44.4		55.5		88.9	100
Kl. pneumoniae		50	50			100	100
P. aeruginosa	50				50	100	100

DISCUSSION

Surgical infection as was studied by Louis Pasteur and Joseph Lister, hundreds of years ago, is still a subject of controversy and problem all over the world.[4] In this study 142 cases were included and operative treatment was carried out for different acute abdominal conditions.

The findings of this study were compared with the results of the studies made by Rasul G, Ashraf SA et al,[5] Cruse PJE, Frood R[6], Saha SC, Zaman MA and Khan MR et al.[7]

Surgeons and infection

In this series wound infection is higher where the operation is done by assistant registrar/medical officer (22/120 i.e. 18.3%) in comparison to the registrar (2/16 i,e 12.5%) and Professor (0/6 i,e 0%) through the registrar and assistant registrar dealt with most of the contaminated case.

There is a relation between the length of operating time and infection rate. In this series the rate of wound infection is four times more when the duration is two times more. Other studies also show a rise in infection rate associated with prolongation of the operation time.[8]

Wound infection rate varies according to the types of operation. Infection rate is known to be higher in emergency surgery as compared to elective procedure.[9-11] In this series, wound infection was detected in 24 patients (16.9%). The wound infection rate in clean cases was 5% (1 in 20), clean contaminated cases was 19. 3% (7 in 64), contaminated cases 26.90% (7 in 29) and in dirty cases 47.3% (9 in 19 cases). The rate of infection is higher as compared with the studies done by Cruse PJE and Frood R, who reported among 62939 wounds infection rate was 1.5% in clean wounds, 7.7% in clean contaminated wounds, 15.2% in contaminated wounds and 40% in dirty wounds.[12]

Another study on 696 operations by Renvall et al showed that the overall wound infection rate was 9.8%, where infection among clean wound was 4.2%, clean contaminated wound 9.1%, contaminated wound 14.4% and dirty wound 28.8%.[13]

In the present study, wound infection rate increased with clinically anaemic to 45.8%, chronic obstructive pulmonary disease 28.5%, diabetes 33.3%.[14] Another study showed clean wound infection rate rises with diabetes to 10.7% ,anaemia to 16.6%.[15]

This study revealed that out of 142 cases wound infection were found in 24 (16.9%). Causative pathogens detected were *E. coli* in 11 cases (45.5%), *S. aureus* in 9 cases (37.5%), *Klebsiella* in 2 cases (85%), Pseudomonas in 2 cases (85%).This findings showed similarities with the work of Ashraf and Matin.[16-17]

In all cases, antibiotics were used in both preoperative and in the postoperative period as therapeutic or prophylactic measures. Antibiotics mostly used were ciprofloxacin, ceftriaxone, cephalosporin, gentamycin and metronidazole. Rasul and Ashraf did not used any antibiotic in 65

selected cases. There was not a single incidence of infection. The results of recent clinical trials of perioperative antibiotic therapy after emergency abdominal surgery support such policies.[18]

CONCLUSION

This study indicates that this high 9 (47.36%) in dirty operations and low (5%) in clean operations. The study also showed that infections are more common in patients with COPD, DM and anaemia. If we had a well-equipped surgical ward with clean environment and adequate resuscitative facilities, a planned operation theatre, isolation facilities for septic patients and overall health consciousness of the patient, the incidence of postoperative wound infection in emergency GI surgery is bound to come down with only minimal use of antibiotics.

Conflict of Interest: None

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