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Research Article

**RISK FACTORS FOR WOUND INFECTION; A CASE
CONTROL STUDY**¹Dr. Abdul Wasay, ²Dr. Afshan Fayyaz, ³Dr. Usbah Khalid^{1,2,3} Services Institute of Medical Sciences, Lahore, Pakistan.**Article Received:** March 2019**Accepted:** April 2019**Published:** May 2019**Abstract:**

Wound infections lead to prolonged hospital stay and increase treatment cost and treatment burden on in hospital settings. The mortality and morbidity rate increases. The risk factors responsible for wound infections are needed to be studied so that timely control can reduce the drastic outcome. A case control study was conducted on patients with colorectal surgery, they were admitted in postoperative ward on surgical floor. Two groups of patients were selected. One was labeled as case group; those who already had infected wound following colorectal surgery and other control group which included colorectal patients with healthy wounds.

There were 57 patients in case group, 57% underwent emergency surgery while elective surgery whether in the form of laparoscopy or open was performed on 88%, laparoscopy was later converted to open surgery in a few patients depending upon their surgical complications. High ASA grade was present in 40% patients. Obesity and open surgery was more commonly associated with wound infection. Duration of hospital admission following surgery was twice longer in patients with infected wounds than that of healthy wounds.

Increasing rate of laparoscopic surgeries and adopting modified wound care protocols for obese patients can help reduce the post-operative wound infections in colorectal patients and will result in lowering risk for long term morbidity and will reduce mortality and treatment cost.

Keywords: Colorectal surgery, laparoscopy, wound, infections, obesity, open surgery, treatment, factors.

Corresponding author:**Dr. Abdul Wasay,**

Services Institute of Medical Sciences, Lahore, Pakistan.

QR code



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INTRODUCTION:

The postoperative units are a common site for nosocomial infections, which can be reduced by improved hospital ventilation system, improved sterilization standards, proper wound care, patient handling, general patient hygiene, barriers etc. surgical site infections cause increased deaths and morbidities and prolong hospital stay[1]. Diabetes, preoperative white cell count, malignancy, immune-compromised state, type of wound its level of contamination preoperatively, postoperative drainage are various independent factors associated with increased rate of wound contamination [2].

Bacterial infection rate was studied in surgical wounds by performing wound cultures. The species detected on blood culture were Staphylococcus aureus, Pseudomonas aeruginosa and Klebsiella pneumoniae, the predominant isolates in all wound types exhibited a high preponderance of multidrug resistant strains. The more common causative factors behind increased rate of infection were improper sterilization of surgical instruments and poor water supply [3].

METHODS:

Retrospective data was collected from patients who underwent appendectomy or short bowel surgery from June to December 2013. This data was updated on weekly basis by nursing staff. Enhanced recovery program was applied to all the elective surgeries but emergency surgeries were done in routine way. Patients who suffered wound infection during hospital stay and those who were admitted after discharge due to wound infection were added in case group.

Wound infection was defined as discharge from wound or cellulitis needed to be treated by antibiotics

or opening, wound dehiscence. Cases were compared with controls having same operation period but with healthy postoperative wound.

Details like comorbidities, BMI, obesity (BMI> 30kg/m²), expertise of operating surgeon were recorded on a predesigned proforma. Details about surgery were also recorded, indication of surgery, urgency related to it, type of surgery, operating surgeon's expertise. Preoperative Hb and albumin level were estimated. Wound swabs were taken and culture was performed.

Univariate conditional logistic regression analysis was applied to compare risk factors in case and control group. Odds ratio with 95% confidence interval was calculated. multivariate analysis was done for factors responsible for wound infection to find independent association. Differences in both groups about hospital stay were analysed using regression analysis.

RESULTS:

There were 57 patients in case group, 57% underwent emergency surgery while elective surgery whether in the form of laparoscopy or open was performed on 88%, laparoscopy was later converted to open surgery in a few patients depending upon their surgical complications. High ASA grade was present in 40% patients. Obesity and open surgery was more commonly associated with wound infection. Duration of hospital admission following surgery was twice longer in patients with infected wounds than that of healthy wounds. Result about demographics, risk factors associated with different types of surgeries, univariate and multivariate analysis has been shown in tabular form.

Table 1

Study demographics and characteristics of patients with wound infection

Wound infections	56 (8.6%)
Gender	27 female (48%)
Median age	61 years (range: 19–86 years)
ASA grade	
1 and 2	33 (59%)
3 and 4	23 (41%)
BMI $\geq 30\text{kg/m}^2$	14 (25%)
Preoperative anaemia	21 (38%)
Preoperative albumin $<30\text{g/l}$	13 (23%)
Urgency of surgery	32 emergency (43%)
Surgical access	7 laparoscopic (13%)

ASA = American Society of Anesthesiologists;

BMI = body mass index

Table 2

Rates of wound infection by type of operation performed in 647 patients

Operation	Total performed	Wound infections
Abdominoperineal resection	14	5 (35.7%)
Hartmann's procedure	28	6 (21.4%)
Sigmoid colectomy	19	3 (15.7%)
Ileocolic resection	26	4 (15.3%)
Small bowel resection	34	4 (11.7%)
Appendectomy	81	7 (8.6%)
Subtotal colectomy	29	5 (8.5%)
Other laparotomies (eg adhesiolysis, stoma formation, trauma)	59	4 (6.7%)
Anterior resection	52	3 (5.7%)
Right hemicolectomy	75	4 (5.3%)

Table 3

Univariate analysis of risk for postoperative wound infection

	Odds ratio	95% CI	p-value
Gender	1.0	0.5–1.9	0.9
Old age (>75 years)	0.6	0.3–1.5	0.3
Anaemia	1.0	0.5–2.0	0.9
Low albumin (<30g/l)	1.1	0.5–2.3	0.8
Emergency operations	1.3	0.6–3.0	0.5
Level of supervision	1.1	0.3–4.0	0.8
Open surgery	4.5	1.6–12.2	0.003
Stoma formation	1.5	0.6–3.9	0.4
Obesity	4.8	1.7–13.5	0.003
High ASA grade (3 or 4)	2.5	1.1–5.5	0.02
Previous surgery	1.1	0.5–2.3	0.9
ICU admission	0.9	0.3–2.4	0.86
Cancer	0.4	0.1–1.0	0.05

CI = confidence interval;

ASA = American Society of Anesthesiologists;

ICU = intensive care unit

Table 4

Multivariate analysis of risk for postoperative wound infection

	Odds ratio	95% CI	p-value
Open surgery	3.83	1.13–11.17	0.014
Obesity	3.54	1.16–10.78	0.026
High ASA grade	1.54	0.61–3.85	0.356
Cancer	0.35	0.12–1.03	0.057

CI = confidence interval;

ASA = American Society of Anesthesiologists

DISCUSSION:

Wound infection is a very common postoperative complication seen on surgical floor in postoperative patients. It delays their cure rate and increases treatment cost. Various factors responsible for this complication include, patient related factors, any comorbidity like diabetes, cancer, White cell count, obesity, smoking, and ward related factors like poor sterilization, poor wound care, room temperature, poor ventilation of room where patient is kept postoperatively [4].

This wound infection rate is higher in Asian countries as compared to European countries due to better management facilities and well equipped hospitals and less doctor to patient ratio, availability of adequate nursing staff, perioperative care. All these facilities are lacking in third world countries like Pakistan. Thus, wound infections rate and associated mortality and morbidity rate is higher in developing nations. The identification of risk factors and timely management will help in reducing wound infection rate [5,6].

Surgical site infection rate is reported to fall between 0.1% to 50.4%, the median infection rate is 3.7%.the onset duration was 17 days in majority of patients, duration in longer in patients with orthopedic and transplant surgeries[7,8].

CONCLUSION:

Increasing rate of laparoscopic surgeries and adopting modified wound care protocols for obese patients can help reduce the post-operative wound infections in colorectal patients and will result in

lowering risk for long term morbidity and will reduce mortality and treatment cost.

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