



## ORIGINAL ARTICLE

## A study of Microorganisms causing wound infections after Elective laparotomy

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## ABSTRACT

Any purulent discharge from a closed surgical incision, after surgery, together with signs of inflammation of the surrounding tissue should be considered as Post operative (post-op) wound infection. There are two types of wounds in elective laparotomy: clean and contaminated wound **Objective:** To find out most causative microorganism involved in post-op wound infection in elective laparotomy cases at the Children Hospital and The Institute of Child Health Sciences, Lahore Pakistan. **Methods:** It was a prospective observational study conducted on patients who developed wound infection after elective laparotomy. This study was conducted in the surgical Units I and II of Children Hospital Lahore, Lahore, Pakistan. The duration of the study was 11 months from January 2019 to November 2019. 150 patients were included in this study. Data was collected by convenient sampling technique. It was a hospital-based study in which patients from both genders were included. Data was obtained by a questionnaire. Patients were asked for wound condition and surgery details were taken to find out the reasons of wound infection. The data selected was analyzed using SPSS version 21.0. **Results:** Out of total 150 patients who underwent elective laparotomy, 40% patients were identified with *Escherichia Coli*, 13.3% patients identified with *Pseudomonas species*, 13.3% patients had *klebsiella*, 6.7% patients had *Pseudomonas Florescence*, 6.7% people had *Acinetobacter*, 6.7% had *Staphylococcus aureus*, 13.3% did not show any growth. **Conclusions:** It was concluded that most abundant microorganism isolated from patients who underwent elective laparotomy was *Escherichia coli*. The most common reasons for wound infection were increase in number of surgeons and increase in duration of illness.

## INTRODUCTION

Clean wound is a type of post-operative wound infection [1] in elective laparotomy [2], with no infection encountered, no signs of inflammation and don't involve the respiratory [3], Gastrointestinal tract or genitourinary tract, and

in which aseptic techniques are maintained, for example laparoscopic surgeries, surgeries involving skin (such as biopsies) Etc. The second type of wound infection is Clean Contaminated Wound that is created with a higher risk of infection, in which hollow viscous or organs normally containing bacteria are opened but no

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contents are spilled [3, 4]. For example, any wound opened to remove Pins or Wires, chest procedures, ear surgeries etc [4].

Wound infections are caused mainly by bacteria originating either from skin and other parts of body, pus, poor dressing technique [3, 5]. Infected wounds clinically present with pus or cloudy fluid from wound, redness/swelling around wound, pain, [5] swelling and fever [3]. In a cross-sectional study conducted in 2015, there were 14.2% post-operative fever and 4.7% post-operative nausea and vomiting/wound infection. No case of septicemia or mortality was seen [6]. Risk factors of post-operative wound infections are preexisting illness, time of surgery, [7] microbial pathogens, number of surgeons involved, proper sterilization of operation theatre environment and supplies, local wound environment, host defense mechanism [5]. Garibaldi found that 30 or more colony forming unit (CFU) of bacteria cultured from a wound are predictive of a wound infection. The risk of wound infection has repeatedly been shown to be proportional to the duration of the operative field [5]. As time of Surgery increases, chances of infection also increase because of increasing time of exposure of surgical field [8].

There are many Causative microorganisms; most commonly are Staphylococcus Aureus, Escherichia Coli, Bacteroides, Pseudomonas Species, Klebsiella, Acinetobacter [9]. Other microorganisms involved in wound infection are Streptococci, Pseudomonas aeruginosa, Hemophilus influenza, Staphylococcus pneumoniae, Bacteroides and Aerobic gram-negative Bacilli [10]. The best way of diagnosis of microorganisms involved in wound contamination at the end of an operation and the risk of developing infection is to take pus sample for culture and sensitivity [8]. Theoretical degree of contamination relates well to infection rates. Heavily contaminated wounds are at higher risk [11]. Prophylactic antibiotic reduces the potential of infection. From National Nosocomial Infection Surveillance System (USA), It is revealed that most common pathogens for SSI (surgical site

infection) are Staphylococcus aureus [12], Enterococcus especially coagulase negative staphylococcus, Enterobacteriaceae, Pseudomonas specially and anaerobes [13].

Laparotomy is a surgical procedure involving a large incision through the abdominal wall to [14] gain access into the abdominal cavity. There are two types of laparotomy. Elective laparotomy is done when surgery is pre planned. It is done when there is tumor, liver enlargement, liver cirrhosis, blockage in urinary tract, spleen enlargement, endometriosis, ectopic pregnancy, inflammation of pancreas, appendicitis, damage to any organ and any gut problem. Other general reasons are infection such as old abscess, tumor and adhesions in inflammation. There are further two types of Elective Laparotomy [15], Clean Elective Laparotomy, in which we open abdomen but gut is not involved, Clean Contaminated, [16] in which we also open gut.

Complications of elective laparotomy are [17] fever, pain, hemorrhage, wound infection, blood clotting, damage to organ, large scar, reaction to anesthesia, nausea, vomiting and incisional hernia. Some factors that increase the risk of post op complications are previous abdominal surgery, diabetes, heart or lung disease, weak immune system, blood factors, smoking and alcohol abuse etc. [18]. Surgeries involved in elective laparotomy [19] are liver tumor, liver biopsy, lymph Node biopsy, will's tumor, neuroblastoma, laparoscopy, ovarian cyst, redo Colostomy/Ileostomy, pneumoperitoneum, biliary Atresia, choledochal Cyst and splenectomy. The objective of this study is to find out most causative microorganism involved in post op wound infection in elective laparotomy cases at the Children Hospital and The Institute of Child Health Sciences, Lahore, Pakistan.

## M E T H O D S

A Purposive observational study was conducted in the Surgical Units I and II of Children's Hospital, Lahore for a period of eleven months from January 2019 to November 2019. 150

cases were included in this study; A Convenient Sampling Technique was applied to collect data. Cases of Wound infection after Elective Laparotomy were included in our study, rest all the cases were in the exclusion criterion. The confidentiality was maintained during the whole process of research. Ethical approval was taken from the IRB (Institutional Review Board) of the parent teaching institute. Data is presented in tables analyzed by using Statistical Package for the Social Sciences (SPSS) software computer program version 21.0.

## RESULTS

Table 1 shows that 38.3% people with less than age 5 years were detected with *E. coli* in their wound, while 61.6% of *E. coli* was detected in the people whose age were between 5-10 years old, Furthermore, we did not detect any *E. coli* presence in the people whose age were greater than 10 years old.

Age in Years	<i>E. Coli</i>
<5	23 (38.3%)
5-10	37 (61.6%)
>10	00

**Table 1:** Percentage of *E. coli* in relation to age of patients

Table 2 shows the Pre-operative history and clinical findings of patients who undergone Elective Laparotomy, results showed that out of 150, 80% people showed the history of Pre-operative abdominal distension while 20% did not. 53.3% people complain of pre-operative vomiting while 46.7% did not complain vomiting. 33.3% people experienced fever while 66.6% did not. Only 20% showed perforation at the site of disease while 80% did not. 20% People showed adhesions while 80% did not show any kind of adhesion. 53.3% people detected with Mass/Cyst while 46.7% not. 40% of the people showed the symptoms of Pallor while 60% did not. Table 3 shows that after performing the Elective Laparotomy, 100% patient's experienced wound infection. 40% people were diagnosed with fever while 26.7% did not and 33.3% felt fever off and on. 100% people experienced Discharge from drain. 100% people showed redness, 100% people showed Swelling. Table 4 shows that from a population of 100%, 40% people were detected with *E.coli* in their Wound infection after Elective Laparotomy, 13.3% people were detected with *Pseudomonas*, 13.3% people detected with *klebsiella* pathogen, 6.7% people were identified with *Pseudomonas fluorescence*, 6.7% people were detected with *Acinetobacter*, 6.7% people were identified with *Staphylococcus aureus*, 13.7% people did not show any bacterial growth.

Patient's history & findings	Yes	No	Total
Pre op abdominal distension	120 (80%)	30 (20%)	150
Pre op vomiting	80 (53.3%)	70 (46.7%)	150
Pre op fever	60 (33.3%)	90 (66.7%)	150
Perforation at the site of disease	30 (20%)	120 (80%)	150
Adhesions	30 (20%)	120 (80%)	150
Mass or Cyst	60 (53.3%)	90 (46.7%)	150
Pallor	60 (40%)	90 (60%)	150

**Table 2** Frequency and Percentage of Pre-operative History and Clinical Findings

Post-op Wound Nature	Yes	No	On & Off	Total
Wound infection	150 (100%)	0	0	150 (100%)
Fever	60 (40%)	40 (26.7%)	50 (33.3%)	150 (100%)
Discharge from drain	150 (100%)	0	0	150 (100%)
Redness	150 (100%)	0	0	150 (100%)
Swelling	150 (100%)	0	0	150 (100%)

**Table 3:** Frequency and Percentage of Post-operative Wound Nature

Micro Organism	Frequency (%)
Escherichia coli	60 (40.0)
Pseudomonas	20 (13.3)
Klebsiella	20 (13.3)
Pseudomonas fluorescence	10 (6.7)
Acinetobacter	10 (6.7)
Staph aureus	10 (6.7)
No Growth	20 (13.3)
Total	150 (100)

**Table 4:** Frequency and Percentage of Causative Micro Organisms

## DISCUSSION

The current study is conducted to find out the prevalence of causative microorganisms involved in wound infection after Elective laparotomy and data is collected from the surgical ward of Children Hospital and The Institute of Child Health, Lahore. In the present study 150 infected patients were selected undergoing elective laparotomy and it is concluded that (40%) of the patients had causative microorganism *E. coli* followed by (13.3%) of the patients with *klebsiella*. The similar study on elective laparotomy was conducted by a group of researchers in United States of American, the sample size consisted of 300 patients, it was also a hospital-based study, [20] and they found that the most abundant microorganisms isolated were *E. coli* and *Klebsiella* among other pathogens.

A study of laparotomy wound infection had done in M.G.M Hospital, Navi Mumbai. Total 75 had taken from surgical wards and studied prospectively. The study included both elective & emergency laparotomies. This study shows the presence of *E. coli* (50%) [21] and other microorganisms in wound infection after laparotomy. Another study was done on 200 patients who underwent elective and emergency laparotomy. Discharge from all wounds was subjected to microbiological analysis. The incidence of SSI following laparotomies was 25% [22]. Risk factors being emergency laparotomy, dirty wound, male sex, increased age, smoking, diabetes mellitus, obesity, hemoglobin < 10 gm %, albumin < 3gm/dl, duration of surgery > 2hrs. Most common organism isolated was *E. coli*. A Prospective study was done on 100 patients. Swabs from Subcutaneous tissue were collected after closing the fascia of abdomen during their colon surgery. From 100 swabs, 52 were marked as sterile with no specific wound infection, while 10 swabs were considered as dirty, causing wound infection by the colonic microorganisms/pathogens and nosocomial microorganisms. From the 100 swabs, 52 swabs did not show any growth, out of remaining 48, 21 showed aerobic bacterial growth, 13 showed anaerobic bacterial growth, 14 showed a complex of anaerobic and aerobic bacteria. The results concluded that in the growth of Aerobic bacteria, *Escherichia Coli* was the most common to be found in 18 swabs, *Streptococcus spp.* were found

in 8 swabs. While in Anaerobic growth, *Bacteroides fragilis* was found in 17 swabs [23].

In this study, the samples of patients with infected wound discharge were delivered for cultural sensitivity tests, the results pinpointed that after observing all the sterile techniques applied for prevention of wound infection, the incidence of superficial infection was quite lower, the results concluded that *E. coli* was the most common pathogen to be found in the wounds of patients. A study conducted on patients who undergone Laparotomy surgeries (Emergency & Elective) in India. A sum of 400 cases were studied in this prospective study, while mentioning about the incidence of SSI, it was 9.75%. The elective cases had an incidence of 5% while emergency had 24%. Many cases detected SSI on their 3<sup>rd</sup> Post-operative day. The rates of infection gone up from clean to contaminated wounds. It was found out that *E. coli* was the popular pathogen to be present.

## CONCLUSIONS

It is concluded that rate of microorganisms and wound infection increased with the increase in the duration of surgery, because the exposure of wound with the environment increases that results in wound infection and ultimately growth of microorganisms. The most common reasons of wound infection in elective laparotomy were increase in duration of surgery and number of surgeons involved in surgery and it was concluded that most abundant microorganism isolated was *E. coli*.

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