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# STUDY TO DETERMINE THE EFFICACY OF RIFAXIMIN AS A PROPHYLACTIC ANTIBIOTIC FOR ILEOSTOMY CLOSURE AND TO COMPARE WOUND INFECTION RATES WITH THOSE OF OTHER CONVENTIONAL ANTIBIOTICS

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## ABSTRACT

**Aim:** The aim of this pilot study was to determine the efficacy of rifaximin as a prophylactic antibiotic for ileostomy closure and to compare wound infection rates with those of other conventional antibiotics.

**Methods:** A prospective pilot study was conducted in the Department of General Surgery, Baba Raghav Das Medical College, Gorakhpur. 50 (25 In Group A and 25 In Group B) were included in the study. After obtaining consent from the ethical committee and informed consent from the patients, patients with ileostomy were clinically examined and ileostomy reversal was done. All patients were selected into 2 groups.

**Results:** The percentage of male and female was 80.0% and 20.0% in group A and 68.0% and 32.0% in group B. On the basis of gender, both groups were comparable. The mean age was not significantly different in between group A and in group B. On the basis of present of wound Infection, both groups were comparable. On the basis of indication of ileostomy, both groups were comparable. The incidence of seroma, fever, not sterile culture report, and

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

redness were found more in group A as compared to group B, but not significantly different. The mean temperature, heart rate, tachypnea and WBC were not significantly different in between groups. The frequencies of normal and abnormal temperature, heart rate, tachypnea and white blood cell count were not significantly different in between group A and group B.
**Conclusion:** Patients using oral Rifaximin as a prophylactic antibiotic in ileostomy closure proved to be a non-inferior antibiotic.

**Keywords:** Rifaximin, Ileostomy, Conventional Antibiotics

## 1. INTRODUCTION

An ileostomy occurs when the lumen of the ileum (small intestine) is introduced via a surgical hole in the abdominal wall (created by an operation). This may be transitory or permanent, an end or a loop. The objective of an ileostomy is to remove faeces from the body via the ileum as opposed to the normal route, the anus. The output after an ileostomy consists of loose or porridge-like stool, similar to what would normally pass through the small intestine (as it is the large bowel that is responsible for making the stool more solid dependent upon water absorption). Ileostomies are commonly developed on the right side of the abdomen, with output ranging from 200 to 700 ml each day.[1] Ileostomies have the highest rate of complications compared to other ostomies, with stomal problems occurring between 21 and 70% of the time. Due to a high-output enterostomy, there is a substantial risk of fluid and electrolyte imbalance in the early phases after an ileostomy. In the latter stages, fistula-associated enteritis, also known as diversion colitis, may develop. Even after the ileostomy has been reversed, the patient faces complications such as a sluggish recovery and intestinal blockage. Consequently, it is essential to examine the pathology and physiology of ileostomy.[2] An ileostomy can reduce morbidity and mortality caused by anastomotic leaking in the colonic and small intestine anastomosis. Ileostomies can prevent morbidity in septicemic patients with ileal perforation due to typhoid fever, tuberculosis, trauma, or appendix rupture; however, complications (e.g., stomal obstruction, skin excoriation, dehydration due to high ileostomy output causing fluid and electrolyte loss) can occur in up to 16.9% of cases within 60 days. The average daily output of an ileostomy should not exceed 1500 ml. Ileostomy problems result in mucocutaneous suppuration, stoma separation, and peritonitis. Stoma necrosis can occur as a result of surgically-induced obstruction and decreased blood flow. When the stoma is displaced and the proximal bowel slides through the side of the stoma orifice, stoma prolapse develops. Obstruction of the bowel is a common problem that necessitates surgical intervention. Loop ileostomies have a high rate of complications, but they are not life-threatening. Leakage from an anastomosis can cause life-threatening complications; an ileostomy can avoid this. [3]
Rifaximin is an oral antibiotic with a broad spectrum of antibacterial action against Gram-positive, Gram-negative, aerobic, and anaerobic bacteria. Because it is poorly absorbed, its safety profile is extremely good. Rifaximin has demonstrated efficacy in treating traveler's diarrhoea, functional bloating and irritable bowel syndrome, small intestinal bacterial overgrowth, and preventing recurrent overt hepatic encephalopathy. The usage of rifaximin is associated with a low rate of spontaneous bacterial mutant formation or persistence. In addition, the development of significant drug resistance among extra-intestinal flora during rifaximin therapy is improbable due to little systemic absorption and low cross-resistance between rifaximin and other antimicrobials.[4] In colorectal surgery, loop ileostomies are typically performed to defunction distal enteric illness or anastomoses. Although the mortality rate following ileostomy reversal is between 0.1 and 4%, wound infection and small

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intestinal blockage continue to be the most prevalent and bothersome consequences. Specifically, difficulties increase medical expenses, inpatient duration, the requirement for outpatient care, and the likelihood of late complications such as incisional hernia. [5] In patients with ulcerative colitis with deranged renal function or hepatic function overall prophylactic antibiotic can be used such as oral rifaximin having no or minimal systemic side effects, gut localising action So oral antibiotic can be a boon to these patients.
The aim of this pilot study was to determine the efficacy of rifaximin as a prophylactic antibiotic for ileostomy closure and to compare wound infection rates with those of other conventional antibiotics.

## 2. MATERIALS AND METHODS

A prospective pilot study was conducted in the Department of General Surgery, Baba Raghav Das Medical College, Gorakhpur. 50 (25 In Group A and 25 In Group B) were included in the study. After obtaining consent from the ethical committee and informed consent from the patients, patients with ileostomy were clinically examined and ileostomy reversal was done. All patients were selected into 2 groups by envelope method and group A was given oral Rifaximin peri-operatively and group B was given other conventional parenteral antibiotics peri-operatively.
Group A-
In this group oral Rifaximin 550mg thrice a day 24 hours before ileostomy closure and after the ileostomy closure with a sip of water oral Rifaximin given and surgical site monitoring done up to 7th post-operative day.
Post-operative surveillance done by clinical evaluation and routine blood investigation (Hemoglobin, TOTAL LEUCOCYTE COUNT, SERUM ALBUMIN).
Group B-
In this group conventional parenteral antibiotic such as IV ceftriaxone 12 hourly or piperacillin tazobactam 8 hourly 24 hours before ileostomy closure and after the closure same antibiotic continued and surgical site monitoring done up to post-operative day 7th
.
Post-operative surveillance done by clinical evaluation and routine blood investigation (Hemoglobin, Total Leucocyte Count, Serum Albumin).
When there was wound infection in Group A and after sending culture and sensitivity these patients shifted to IV antibiotics like ceftriaxone or piperacillin tazobactam Or when sensitivity reports available antibiotic regimen changed accordingly.
In Group B Patients having wound infection in spite of using IV antibiotics shifted to higher class of antibiotics Such as imipenem or colistin etc according to culture and sensitivity reports and wound salvaged accordingly by dressings and hematological work up.

**INCLUSION CRITERIA**

- Patients having ileostomy
- Patient above 18 years of age

**EXCLUSION CRITERIA**

- Patient with parastomal hernia
- Patient having stomal obstruction

**DATA ANALYSIS**

- Age distribution of ileostomy patients
- Sex wise incidence

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

- Wound infection incidence in both the groups
- Compare the clinical and hematological criteria in both the groups by mean and incidence.
- Compare the incidence of wound infection by culture and sensitivity reports in both the groups.
- Compare the incidence of sirs in both the groups.

## 3. RESULTS

Table 1: Comparisons of frequencies of different gender, age groups and wound infection in between group A and group B

| | **Group A (n=25)** | | **Group B (n=25)** | | **Chi Sq.** | **p-Value** |
|---|---|---|---|---|---|---|
| Gender | **n** | **%** | **N** | **%** | | |
| Male | 20 | 80.0 | 17 | 68.0 | 0.42 | 0.519 |
| Female | 5 | 20.0 | 8 | 32.0 | | |
| | **Group A (n=25)** | | **Group B (n=25)** | | **t** | **p-Value** |
| Age (years) | **Mean** | **±SD** | **Mean** | **±SD** | | |
| | 42.76 | 17.42 | 36.00 | 12.41 | 1.58 | 0.121 |
| Wound Infection | **Group A (n=25)** | | **Group B (n=25)** | | **Chi Sq.** | **p-Value** |
| | **n** | **%** | **N** | **%** | | |
| Yes | 8 | 32.0 | 6 | 24.0 | 0.10 | 0.753 |
| No | 17 | 68.0 | 19 | 76.0 | | |

The percentage of male and female was 80.0% and 20.0% in group A and 68.0% and 32.0% in group B. On the basis of gender, both groups were comparable. The mean age was 42.76±17.42 years in group A and 36.00±12.41 years in group B. The mean age was not significantly different in between group A and in group B. Out of 25, total 8 (32%) patients in group A and 6 (24.0%) patients in group B had wound Infection. On the basis of present of wound Infection, both groups were comparable.

Table 2: Comparisons of frequencies of indication of ileostomy in between group A and group B

| **Indication of ileostomy** | **Group A (n=25)** | | **Group B (n=25)** | | **Chi Sq.** | **p-Value** |
|---|---|---|---|---|---|---|
| | **n** | **%** | **n** | **%** | | |
| Acute intestinal obstruction | 4 | 16.00 | 4 | 16.00 | 6.20 | 0.719 |
| Ileal perforation | 10 | 40.00 | 9 | 36.00 | | |
| Perforation peritonitis | 4 | 16.00 | 7 | 28.00 | | |
| Right obstructed inguinal hernia | 2 | 8.00 | 1 | 4.00 | | |
| Post d&c perforation | 0 | 0.00 | 2 | 8.00 | | |
| Sigmoid volvulus | 1 | 4.00 | 0 | 0.00 | | |
| Appendicular lump with liver abscess | 1 | 4.00 | 1 | 4.00 | | |
| Blunt trauma abdomen | 1 | 4.00 | 0 | 0.00 | | |
| Colonic perforation | 1 | 4.00 | 0 | 0.00 | | |
| Elsewhere operated case of ileostomy | 1 | 4.00 | 1 | 4.00 | | |

The percentage of acute intestinal obstruction, Ileal perforation, Perforation peritonitis, right obstructed inguinal hernia, Post d&c perforation, Sigmoid volvulus, Appendicular lump with

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

liver abscess, Blunt trauma abdomen, Colonic perforation, elsewhere operated case of ileostomy indications were16.00%, 40.00%, 16.00%, 8.00%, 0.00%, 4.00%, 4.00%, 4.00%, 4.00%, 4.00% in group A and 16.00%, 36.00%, 28.00%, 4.00%, 8.00%, 0.00%, 4.00%, 0.00%, 0.00%, and 4.00% in group B, respectively. On the basis of indication of ileostomy, both groups were comparable.

Table 3: Comparisons of frequencies of Seroma, Fever, Culture report, Redness and Wound dehiscence in between group A and group B

| | | Group A (n=25) | | Group B (n=25) | | Chi | Group A (n=25) |
|---|---|---|---|---|---|---|---|
| Seroma | | n | % | n | % | | |
| | Yes | 7 | 28.00 | 6 | 24.00 | 0.10 | 0.747 |
| | No | 18 | 72.00 | 19 | 76.00 | | |
| Fever | Yes | 7 | 28.00 | 3 | 12.00 | 1.13 | 0.289 |
| | No | 18 | 72.00 | 22 | 88.00 | | |
| Culture report | Not Sterile | 3 | 12.00 | 0 | 0.00 | 1.42 | 0.234 |
| | Sterile | 22 | 88.00 | 25 | 100.00 | | |
| Redness | Yes | 7 | 28.00 | 9 | 36.00 | 0.09 | 0.762 |
| | No | 18 | 72.00 | 16 | 64.00 | | |
| Wound dehiscence | Yes | 2 | 8.00 | 2 | 8.00 | 0.00 | 1.00 |
| | No | 23 | 92.00 | 23 | 92.00 | | |

The percentage of present of seroma, fever, not sterile culture report, redness, and wound dehiscence were 28.00%, 28.00%, 12.00%, 28.00%, and 8.00% in group A and 24.00%, 12.00%, 0.00%, 36.00%, and 8.00 % in group B, respectively. The percentage of present of seroma, fever, not sterile culture report, redness, and wound dehiscence were not significantly different in between groups. Moreover, the incidence of seroma, fever, not sterile culture report, and redness were found more in group A as compared to group B, but not significantly different.

Table 4: Comparisons of mean Temperature, Heart rate, Tachypnea and WBC in between group A and group B

| | Group A (n=25) | | Group B (n=25) | | t | p-Value |
|---|---|---|---|---|---|---|
| | Mean | ±SD | Mean | ±SD | | |
| Temperature | 36.98 | 0.43 | 36.75 | 0.49 | -0.808 | 0.423 |
| Heart rate | 85.12 | 11.04 | 87.24 | 7.09 | 1.746 | 0.087 |
| Respiratory | 18.84 | 1.37 | 18.72 | 1.65 | 0.280 | 0.781 |
| | Group A (n=25) | | Group B (n=25) | | t | p- Value |
| | Mean | ±SD | Mean | ±SD | | |

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

| | | | | | | |
|---|---|---|---|---|---|---|
| White blood cell count | 10348.00 | 4452.26 | 10220.00 | 2690.26 | 0.123 | 0.903 |

The mean temperature, heart rate and respiratory rate in group A were 36.98±0.43 85.12±11.04, and 18.84±1.37 while in group B the findings were 36.75±0.49, 87.24±7.09, and 18.72±1.65 respectively. The mean white blood cell count was 10348.00±4452.26 in group A and 10220.00±2690.26 in group B. The mean temperature, heart rate, tachypnea and WBC were not significantly different in between groups.

Table 5: Comparisons of frequencies of normal and abnormal temperature, heart rate, tachypnea and white blood cell count in between group A and group B

| | | **Group A (n=25)** | | **Group B (n=25)** | | **Chi Sq.** | **p-Value** |
|---|---|---|---|---|---|---|---|
| **Temperature** | | n | % | n | % | | |
| | Normal | 25 | 100.00 | 25 | 100.00 | - | - |
| | Abnormal (>38$^0$C or <36$^0$C) | 0 | 0.00 | 0 | 0.00 | | |
| **Heart rate** | Normal | 18 | 72.00 | 18 | 72.00 | 0.0 | 1.00 |
| | Abnormal (>90 beats/min) | 7 | 28.00 | 7 | 28.00 | | |
| **Respiratory rate** | Normal | 23 | 92.00 | 23 | 92.00 | 0.0 | 1.00 |
| | Abnormal (>20/min) | 2 | 8.00 | 2 | 8.00 | | |
| **White blood cell count** | Normal | 19 | 76.00 | 19 | 76.00 | 0.0 | 1.00 |
| | Abnormal (>12000 or <4000 mm3) | 6 | 24.00 | 6 | 24.00 | | |

The frequencies of normal and abnormal temperature, heart rate, tachypnea and white blood cell count were not significantly different in between group A and group B.

## 4. DISCUSSION

Abdominal surgical wound infections in patients having operations on the large intestine occur in about 40% of those who do not receive antibiotic prophylaxis.[6] When an infection does occur, it often involves more than simple drainage of subcutaneous pus and dressing changes at home. Indeed, the risk of death is doubled, intensive care unit admission is more likely and average hospital stay is lengthened by five days.[7] In 1981, an early systematic

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review that compared wound infection risk in elective colorectal surgery patients receiving antibiotic prophylaxis to those randomized to placebo or no treatment found that infection risk was so diminished with antibiotics that the review concluded that future studies in this field that included no treatment controls would no longer be ethical.[6] It was also stated that a gold-standard antibiotic should be established, so that in all future studies one arm of the study would include the gold standard as the acceptable benchmark from which to judge the new antibiotic. Since then, guidelines have been published that suggest an optimal choice of antibiotic and also dosage regimens.[8]

Surgical site infections (SSIs) are considered one of the most common and preventable health care problems[9] that correlate with high morbidity and mortality.[10] SSIs are associated with increased hospital and ICU readmission, long-term complications of the surgical site, and even death.[11] Previous studies identified many risk factors for SSIs in various types of surgeries such as diabetes, cigarette smoking, systemic steroid use, obesity, extremes of age, poor nutritional status, coincident remote site infections or Staphylococcus aureus nasal colonization, and perioperative transfusion of certain blood products. The type of antibiotic prophylaxis used is considered one of the most important methods to reduce the risk of SSIs.[12,13] Properly administered antimicrobials for prophylaxis reduce the occurrence of surgical site wound infections. The timing of antibiotics administration is one of the major factors that affect their efficacy. If an antibiotic is used for prophylaxis incorrectly, for example, due to wrong timing or overconsumption[14], this has been shown to increase the occurrence of the drug's side effects[15], treatment costs[16], super-infections, and the growth of new strains of microorganisms resistant to the effect of antimicrobial agents.[15,17] One of the main roles of preoperative antibiotics administration is to reduce the risk of postoperative wound site infections.[18] There is growing evidence that supports the routine use of antibiotic prophylaxis.

One of the reasons for the higher rate of CDI after ileostomy closure was anticipated to be the previous surgical procedure that the patients received before ileostomy closure that required antibiotic use.[19] Prior studies have also indicated that changes can occur in the bowel microbiome after stool diversion, which need to be considered.[20] With regard to patients who experienced anastomosis leakage after ileostomy closure, it is more difficult to determine in these cases whether CDI was the cause of the leakage. Colorectal anastomosis leak in patients with diverting ileostomy could be inapparent until ileostomy closure is performed when only then faecal material may cause clinical symptoms. Therefore, one should be cautious in suggesting CDI as the cause of leakage. However, there are increasing reports from various studies supporting this issue. One study reported a 6.69 per cent anastomosis leakage rate in patients with postoperative CDI versus 3.06 per cent in CDI-negative cases from a total study population of 56 631 patients who had undergone a colectomy.[21]

An ileostomy is an external opening constructed between the small intestine and the abdominal wall, usually using distal ileum but sometimes more proximal small intestine. Digestive waste then exits the body through an artificial opening called stoma. It is a surgical procedure which is frequently used nowadays in a various surgical condition. Stoma closure is associated with significant morbidity, the most common of which is wound infection. It is of utmost importance to control the infection rates so as to reduce morbidities.

## 5. CONCLUSION

According to our study both the groups compared and following inferences were made:
Incidence of wound infection rates in group A = 32%.
Incidence of wound infection rates in group B = 24%.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

Patients using oral Rifaximin as a prophylactic antibiotic in ileostomy closure proved to be a non-inferior antibiotic.

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