

## ORIGINAL ARTICLE

## ROLE OF PROPHYLACTIC ANTIBIOTICS IN CLEAN SURGERY

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**Background:** In general surgery postoperative wound infection is one of the expensive and underrated causes of patient morbidity and the advantages of using prophylactic antibiotics have not been proven. In this study use of prophylactic antibiotics was compared in terms of decreasing postoperative wound infection in clean cases of general surgery. **Methods:** This study was conducted at Abbas Institute of Medical Sciences (AIMS) Muzaffarabad, from July 2016 to January 2017. The study was approved by Ethical Committee of AIMS. The study involved one hundred patients. Sample size was calculated with WHO sample size estimator to be 93, and was rounded to 100 patients. For patient selection, convenience sampling method was used. All these patients went through clean general surgery operations. These patients were randomly placed in two groups, A and B with fifty patients in each group. All patients gave written informed consent. Injection cephadrine (1<sup>st</sup> generation cephalosporin) 1 g IV 30 minutes prior to operation was administered and continued for 24 hours postoperatively in Group A. On the other hand patients of group B received no antibiotics. **Result:** In Group A, one patient (2%) and in Group-B, three patients (6%) were found to have wound infection after surgery. According to Chi-square test this low frequency (1/50 vs 3/50) as compared between Group A and B respectively about postoperative wound infection was not statistically significant. **Conclusion:** Usage of prophylactic antibiotics in clean general surgery is not significantly associated with decreasing the incidence of wound infection after surgery.

**Keywords:** Clean general surgery, wound infection, antibiotics

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## INTRODUCTION

Antibiotics have a great role in the prevention of surgical site infection (SSI) in general surgery. Antibiotic (antimicrobial) prophylaxis refers to a brief course of an antimicrobial agent administered just before an operation begins in order to reduce intraoperative microbial contamination to a level that will not overwhelm host defences and result in infection.<sup>1</sup> Proper use of prophylactic antibiotics reduces the SSI and drug resistance incidence. It is important to share microbiological data and give education to reduce the antibiotic use and to establish a better and rational antibiotic consumption.<sup>2</sup>

Surgical site infections are grouped into incisional and organ/space. Incisional SSI include superficial incisional SSI involving only skin and subcutaneous tissue and deep incisional SSI involving deeper soft tissues of the incision. Organ/space SSI are those which can involve any organ or space of the body other than incised body wall layers, that was opened or manipulated during an operation like infection, abscess, peritonitis, etc.<sup>3</sup> Clean surgery is the one in which no inflammation is encountered and the respiratory, alimentary or genitourinary tracts are not entered. There is no break in aseptic operating theatre technique.<sup>4</sup> According to the Cruse statistics, wound infection incidence was about 1% in clean operative procedure.<sup>5</sup> Two to five percent of patients having clean extra-abdominal operations and 20% having intra-abdominal

operations develop SSI.<sup>6</sup> Nowadays peri-operative prophylactic antibiotics are very commonly used in clean operative procedures. The beneficial role of antimicrobial prophylaxis in the prevention of SSIs was established in the 1960s and since then it is being highlighted again and again.<sup>7</sup> The use of antimicrobial agents to prevent surgical infection has become a subject of controversy and disappointment in clinical practice. Despite advances in surgical science, infection still remains responsible for most of the postoperative morbidity and mortality.<sup>8</sup>

The basic surgical skills of preoperative preparation, excellent surgical technique, and fastidious wound care and postoperative management are cornerstones of infection prophylaxis.<sup>9</sup>

Antibiotics for prolonged period may be harmful to both individual and hospital economy whether they are given as prophylaxis or for therapy. This study was design to see the prophylactic role of preoperative antibiotic cover. Results of this study will serve as evidence for developing principles for the use of prophylactic antibiotics in clean elective general surgery cases.

## METHODOLOGY

It was an interventional study conducted at Surgical Department of AIMS, Muzaffarabad from July 2016 to January 2017. The study was approved by Ethical Committee of AIMS. Convenient sampling technique was used. Sample size was calculated using WHO

sample size estimator. Assuming anticipated population at 50% with 10% of required precision and with 95% confidence interval the sample size was calculated to be 93. Sample was rounded to 100 patients undergoing clean elective general surgery operations at AIMS Muzaffarabad. Written informed consent was taken from all patients in the study. These patients were divided randomly into two groups (Group A and Group B) with 50 cases in each group at the time of operation. In Group A, injection cephadrine (cephalosporin) 1 g IV was administered 30 minutes prior to operation and up to 24 hours postoperatively. On the other hand, patients in group B received no antibiotics. Selection of antibiotic was based on its broad spectrum coverage, effectiveness, safety and cost.<sup>5</sup>

Patients with following criteria were not included in the study:

- Patients younger than one year and older than 70 years
- Breach in aseptic technique (cases not done in elective theatres)
- Patients who are allergic to cephalosporins
- Patients with recent antibiotic therapy
- Patients having other co-morbid conditions like anaemia, jaundice, diabetes mellitus and uraemia
- Immunocompromised patients
- Patients who received blood transfusion prior to operation
- Individuals who already had some kind of infective focus in the body
- Duration of operations was more than two hours

For all these clean elective surgical procedures, World Health Organization guidelines for cleaning, disinfection and sterilization were strictly followed.<sup>10</sup>

Patients undergoing clean elective surgeries for excision of cysts, lipoma, lymph nodes and thyroid nodules, breast lump excision biopsy, trendelenburg and stab evulsion for varicose veins, low ligation and jubilee repair for varicocele and hydrocele, herniotomies and herniorrhaphies for hernia were included in the study. Data was analyzed using SPSS-21. The breakdown of operations in the two groups is depicted in Table-1.

**Table-1: Distribution of diseases in operated cases**

Operated Cases	Group A n=50	Group B n=50	Total 100
Excision of lymph nodes, cysts, thyroid nodules in Head & Neck	15	13	28
Breast lump excision biopsy	10	10	20
Surgery for varicose veins and lipoma excision on limbs	10	8	18
Low ligation for varicocele and jubilee for hydrocele	5	5	10
Herniotomies and herniorrhaphies for hernia	10	14	24

**RESULTS**

One hundred cases were grouped into group A and B having 50 cases each. In Group A (experimental group), age range was 1–63 years with mean age 35.60±16.17

years. In Group B (control group), the age range was 2–63 years with means age 36.94±15.78 years (Table–2). Most of the patients in both groups were male with male to female ratio 1.5:1 in Group A and 2.3:1 in Group B.

In Group A (with prophylactic antibiotics) 1 (2%) patient had postoperative wound infection, observed on 5<sup>th</sup> postoperative day whereas 3 (6%) patients in Group B (no prophylaxis) had postoperative wound infection observed on 4<sup>th</sup> postoperative day in 2 patients and on 6<sup>th</sup> postoperative day in 3<sup>rd</sup> patient (Table-3). According to Chi-square test this low frequency (1/50 vs 3/50) on comparison between Group A and B respectively about postoperative wound infection was not statistically significant.

Culture and sensitivity of pus from infected wound showed *Staphylococcus aureus* in 50% cases while *Escherichia coli* and *Pseudomonas aeruginosa* in 25% cases each (Table-4).

**Table-2: Age distribution of the patients**

Age in Years	Group A (n=50)	Group B (n=50)
1–10	4 (8%)	5 (10%)
11–20	5 (10%)	6 (12%)
21–30	11 (22%)	10 (20%)
31–40	12 (24%)	11 (22%)
41–50	9 (18%)	10 (20%)
51–60	6 (12%)	5 (10%)
60–63	3 (6%)	3 (6%)

**Table-3: Postoperative wound infection**

Wound infection	Group A	Group B	Total
Yes	1 (2%)	3 (6%)	4 (4%)
No	49 (98%)	47 (94%)	96 (96%)

**Table-4: Organisms from surgical site infection**

Organism	No	Percentage
<i>Staphylococcus Aureus</i>	2	50
<i>Escherichia Coli</i>	1	25
<i>Pseudomonas aeruginosa</i>	1	25

**DISCUSSION**

Clean surgery involves procedures where strict sterile technique is used and there is no surgical involvement of GIT, respiratory and genitor-urinary tracts.<sup>11</sup> There are several factors, which affect the frequency of postoperative wound infection.<sup>7,12</sup> Four main sources of infection are personnel, equipment used, the environment and patient’s risk factors.<sup>13</sup> A surgeon’s role is to prevent or reduce the risk of postoperative wound infection by controlling the factors involved in the development of postoperative wound infection.<sup>14</sup> Use of prophylactic antibiotics is no alternative for good surgical practice including strict aseptic technique.<sup>15</sup>

Under most circumstances antimicrobial prophylaxis is not required in a clean surgical procedure. However, prophylaxis should be considered in those situations where potential risk of infections is present such as in:

1. Implantation of a synthetic biomaterial device or prosthesis.
2. Clean surgeries in patients with compromised host defences.

3. Procedures in which infection would be disastrous, e.g., prosthesis placements, central nervous system operations, or cardiac procedures that use cardiopulmonary bypass.<sup>7,12</sup>

In clean surgeries like those involving body surface areas in the head, neck, trunk and limbs, inguinal herniorrhaphies, thyroid nodule resection, excision of benign breast lumps etc., prophylactic antibiotics are largely unnecessary.<sup>5</sup> On the other hand, where long duration is required for clean major surgery and they are invasive and patients have high risk factors of infection, prophylactic antibiotics are recommended.

Infection in a clean operation is always caused by exogenous bacteria, e.g., exogenous contact from breach in sterile technique by the operating team.<sup>3</sup> Patients with any breach in aseptic technique and with any risk factor for wound infection secondary to any other illness had been excluded from this study so they did not affect our study results.

In literature 1.5 and 4% wound infection rate is reported for clean wounds<sup>7,16</sup> which is nearly similar to that of our study, i.e., 2% and 6% with and without prophylactic antibiotics respectively. This 2% infection rate in Group A as compared to 6% in group B is not statistically significant so there is no beneficial role of prophylactic antibiotics in clean general surgery cases which is in accordance with most of the studies conducted in Pakistan<sup>11,14</sup> and abroad<sup>17</sup>.

It is, therefore, advisable that before the use of prophylactic antibiotics, both beneficial and harmful effects should be considered especially in case of clean elective surgery. Judicious use of prophylactic antibiotics in these cases should be checked as it can result in antibiotic resistance, severe hypersensitivity reactions and undermining the sign and symptoms of infection.

## CONCLUSION

Usage of prophylactic antibiotics in clean general surgery is not significantly associated with decreasing the incidence of wound infection after surgery. Role of antibiotic in surgery is just like a double edged sword. If the antibiotics are properly used, this can prevent postoperative infection and also reduces the cost of treatment. Improper usage of antibiotics, on the other hand, not only leads to drug resistance but also wastage of resources.

## RECOMMENDATIONS

For the usage of prophylactic antibiotics, the guiding

principles are not very strict and different treatment regimes do not involve these principles for every type of surgery. As a result the ratios of an inappropriate antibiotic usage and the antibiotic consumption are very high. It is need of the hour to establish treatment plan for prophylactic use of antibiotics with the help of Department of Microbiology and Surgery that should be according to the 'guiding principles for clinical application of antibiotics', in order to standardize the application of prophylactic antibiotics.

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