Original Article

Antibiotic Prophylaxis in Different Surgeries in an Academic Hospital

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ABSTRACT:

The prevention of infection in surgical patients undergoing operation is a major challenge. Inappropriate use of antimicrobials increases the cost thus causing economic burden on the patients which favours the emergence of resistance of bacteria although judicious antibiotic prophylaxis can reduce postoperative wound infections. A prospective study was done in various departments (Surgical allied) of Sher-E- Bangla Medical College Hospital, Barishal from Jan' 2015 to June' 2015. The study focused on pattern of prophylactic antibiotics in various surgeries in this hospital. A total one hundred (100) patients undergoing surgery admitted under various department were included in this study. Pretested proforma including information on patients characteristics, choice of antimicrobials, their route, timing and total duration of prophylaxis were completed. The appropriateness of antimicrobial prophylaxis was assessed as per Standard Guidelines (ASHP, SIGN). The study reveals that third generation cephalosporin were the most commonly prescribed antibiotic class. Although only 67% of cases required prophylaxis, it was utilized in 82% of procedures, showing unjustifiable in 15% of cases. Mean timing of antibiotic administration was 3.44 ± 1.02 hours before the surgical incision given and the patients were on postoperative antibiotics for a mean duration of 5 days during their hospital stay. The study found that antibiotic prophylaxis in surgical cases was inappropriate regarding choice of antimicrobials, timing of administration, total duration of administration in most of the cases and it is intended to emphasize on adoption of evidence based guidelines for antimicrobial prophylaxis in surgical treatment.

Keyword: *Antimicrobial prophylaxis, Surgery, Surgical wound infection.*

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INTRODUCTION:

Rational antibiotic usage reduces the incidence of postoperative surgical wound infection but its improper usage can further lead to excessive surgical wound infection and increased drug resistance which further complicates the problem.[1] Surgical site infection(SSI) is a common postoperative concern and a major cause of patient's morbidity and mortality. It also increases the treatment cost by many fold. SSIs are also the second commonest nosocomial infection accounting for approximately one quarter of 2 million hospital acquired infections (HAI) in USA annually.[2,3] Among an estimated 27 million surgical procedures, SSIs are reported in upto 500,000 cases each year.[4] It has been estimated that 2-5% of patients undergoing clean extra abdominal surgeries and upto 20% of patients undergoing intraabdominal procedures will develop a SSI.[5-10]

Postoperative surgical site infection is a more common complication, although preoperative antibiotic prophylaxis can reduce the rate at a lower level. Appropriate antimicrobial agents selection should be according to the pathogen most commonly causing infections. A single preoperative antibiotic dose is sufficient for operation lasting upto 4 hours.[11] Further antimicrobial doses may required to maintain drug levels in prolong surgeries. Timing of antibiotic prophylaxis is considered optimal if administered within 30 minutes prior to incision.[12] In case of fluroquinolone or vancomycin prophylactic dose should be administered 2 hours before the surgical skin incision. Some data suggest that nearly 30-50% of antibiotics used in hospitals are prescribed for surgical prophylaxis and 30-90% of these prophylaxis is inappropriate.[13] Antimicrobial agents are overprescribed, given at a wrong time or continued for a long duration.[13] Third generation cephalosporins (particularly ceftriaxone and cefotaxime) were the commonly prescribed antibiotics (80%) for all surgeries. However, in majority of cases antibiotics were prescribed for durations longer than recommended in guidelines.[14] Inappropriate use of antibiotics is associated with unnecessary increase in the cost of therapy and in the emergence of drug resistant bacteria.[15] Due to inadequate availability of information and guidelines for antimicrobial prophylaxis in surgical cases, generation of baseline data on the pattern of use of prophylactic antibiotic is of utmost importance. The objectives of our study were to assess the current use of perioperative antibiotics among the patients undergoing surgical procedure in a large academic hospital.

METHODS AND MATERIALS:

A prospective observational study was conducted in Sher-E-Bangla Medical College Hospital, Barishal in the departments of general surgery, orthopedic and traumatology, gynecology and obstetrics, ophthalmology and otorhinolaryngology.

Data were collected on a pretested case record form including information on patient characteristics, department under which the patient is admitted, type of procedure, antibiotics prescribed including route of administration, timing of administration before surgery. Follow up data included additional doses of antimicrobials, the total duration of prophylaxis, signs and symptoms of surgical site infections. Whenever more than one drug was prescribed for a single procedure, all parameters for each drug were evaluated separately.

Inclusion criteria

- Patients of different ages undergoing surgery (elective and emergency).
- Postoperative patients till discharge.

Exclusion criteria

- Patients with current infections prior to surgery.
- Any patient dies postoperatively before being discharged.
- Patient referred to higher centre.

Appropriateness of preoperative antibiotic prophylaxis was assessed as per guidelines of Scottish Intercollegiate guideline Network (SIGN) and American Society of Health-system Pharmacists (ASHP). [12-16] Both of the guidelines provide evidence based recommendations to the surgeons for rational antibiotic prophylaxis.

RESULTS:

A total of 100 (51 male & 49 female) patients were included having the mean age of patients was 32.86 ± 16.46 years (Range 6-78 years). Among them 80% of patients had an elective procedure and 20% were operated on an emergency basis. Majority of patients were admitted under general surgery department (30%) followed by orthopaedics department (26%)

Table I Department wise distribution of preoperative cases

Department	Number of cases
General Surgery	30
Orthopedics	26
Gynaecology and obstetrics	18
ENT	20
Ophthalmology	6

Number :100

The most frequent surgery was inguinal hernia (14 cases). Most commonly prescribed preoperative antibiotics in hernia repair surgery was co-amoxiclav. Co-amoxiclav with metronidazole was the most commonly prescribed preoperative combination in caesarian section (12 cases) followed by ampicillin alone. All patients undergoing open reduction and internal fixation (ORIF) for the treatment of closed fractures (14 cases) received ceftriaxone plus gentamicin as antibiotic prophylaxis. The study reveals that prophylactic antibiotics were administered to 86% patients although prophylactic antimicrobials were indicated in 60% of cases as per SIGN and ASHP guidelines. Showing inappropriate in 19% cases specially clean surgeries like tonsillectomy, herniorrhaphy and ocular surgeries.

A total number of 176 antibiotics were prescribed in our study. Mostly prescribed antibiotic classes were cephalosporins (52%) followed by penicillins (36%). Fifteen different combinations of antimicrobial drugs were used. 28% of patients received a single drug prophylaxis but 41% of patients received two drugs as prophylaxis. (19%) received three drugs and one received 4 drugs (cefotaxime, metronidazole, ampicillin & gentamicin) for prophylaxis. No preoperative prophylactic antibiotic was prescribed in 14 of 20 otorhinolaryngology cases.

Co-amoxiclav, a fixed dose combination of amoxicillin & clavulanic acid was the most commonly prescribed single agent for prophylaxis (12%) followed by ciprofloxacin (8%) and ampicillin (4%) [Table II]. Among the antibiotic combinations, commonly used regimens included cefotaxime and gentamicin (12 patients). Cefatoxime, gentamicin & metronidazole (12 patients) followed by co- amoxiclav & metronidazole(8 patients) [Table III].

Mean time of administration of prophylactic antibiotics was 3.22 ± 1.03 hours prior to surgery. Longest mean duration between drug administration & surgical skin incision was recorded for ampicillin (5 hrs) & shortest for gentamicin(1.5 hrs). 13% patients received antibiotics just before incision. All preoperative antibiotics were administered by intravenous route except in ocular surgeries where oral and topical antimicrobials were prescribed.

The study patients received post operative antibiotics for a mean duration of 5 days during their stay in hospital plus 6 days following discharge from ward/unit. Few patients (12%) complained of purulent discharge at incision site and surgical site infection was reported in 14 percent of cases. The use of antimicrobials in all the cases was empirical based on operating surgeon's clinical experience. One of the study patients who was prescribed a combination of ampicillin, amikacin and metronidazole experienced nausea. No other adverse drug reaction was reported in the study.

Table III Frequently used combinations of antimicrobial agents for surgical prophylaxis (N=58)

Combinations	No. of cases
1.Two drug combinations	*N = 41*
Co-amoxiclav + metronidazole	8
Cefotaxime + gentamicin	12
Ceftriaxone + metronidazole	6
Cefotaxime + metronidazole	5
Ciprofloxacin+ metronidazole	3
Ampicillin + metronidazole	3
Co-amoxiclav + gentamicin	2
Ceftriaxone + gentamicin	1
Amoxicillin + gentamicin	1
2. Three drug combinations	*N = 16*
Cefotaxime + metronidazole+ Gentamicin	12
Ciprofloxacin + metronidazole +Co-amoxiclav	1
Penicillin + metronidazole + amikacin	1
Ampicillin + amikacin + metronidazole	1
Cefotaxime + metronidazole + gentamicin	1
3. Four drug combination	*N = 1*
Cefotaxime + ampicillin+ gentamicin+metronidazole	1

DISCUSSION:

Role of preoperative antibiotic prophylaxis is well established. Surveys have shown that optimal practice isn't achieved in many hospitals.[17] The majority (86%) of patients received antibiotic prophylaxis prior to surgery. This figure is comparable to those reported in previous studies from Turkey,

Israel and Greece.[18-20] Among the study participants 58% received antimicrobial combinations. Combinations of antibiotics were used in all the surgical departments and 17% patients received three or more drugs together. Although the use of two or more antimicrobials in combination may have a certain advantages but indiscriminate use of them can have several negative impact. And these are the emergence of resistant bacteria, super-infection, the risks of toxic and allergic reactions and increased cost of therapy.

The study found inappropriate antibiotic selection in many of the cases operated for caesarean delivery and gall stone disease. None of the patients received cefazolin as recommended by ASHP guidelines. All patients undergoing hernia repair received preoperative antibiotics, though no such prophylaxis is recommended as per SIGN guidelines. Fourteen patients admitted under the ENT department, who underwent a 'clean' surgery, did not receive any antibiotic prophylaxis as recommended. Patients undergoing ophthalmic procedures received additional oral antibiotics while topical route is the primary mode of prophylaxis recommended in such patients.[20] Routine prophylactic use of systemic antibiotics is generally not recommended for cataract surgery.[21]The study reveals that, third generation cephalosporins were prescribed to almost half of all the patients who received preoperative antibiotics (42 of 86), which was inappropriate as per SIGN and ASHP guidelines. Thirty two percent of patients received cefotaxime and 10% received ceftriaxone prior to their surgery. For surgical prophylaxis it is important to select an antibiotic with narrowest antibacterial spectrum to reduce the emergence of resistance and also because broad spectrum antibiotics may be required later if patient develops serious sepsis. Therefore, it is recommended that the use of third generation cephalosporins such as ceftriaxone and cefotaxime be avoided in surgical prophylaxis.[21] According to SIGN guidelines, all antibiotic administration must be completed at time of surgical incision and not before 30 minutes. In our study antibiotics were administered at least 1 ½ hours prior to surgery**.** Only 13 percent of patients received antibiotics just before incision. One antibiotic dose is sufficient for operations lasting 4 hours or less.[11] Further doses may be required in prolonged surgeries. Results from two large studies highlight the fact that single dose antibiotic prophylaxis is not associated with an increased rate of SSI when compared to multiple dose regimens.[23-24] Persistence of tissue concentrations past the period of surgery and recovery from anaesthesia doesn't improve efficacy and increases toxicity and cost of therapy.[21] In our study, postoperative antibiotics were administered for a mean duration of 5 days during hospital stay and another 6 days following discharge, a period much longer than recommended. A mean duration of 6.4 days of antibiotic use has been reported in a study of Taiwanese patients.[25] Even though evidence from literature fails to support prolonged administration of

Antimicrobial agents (AMAs) in the hospitals, usage beyond 24 hours is common.[26] Longer courses of antibiotics are falsely believed to be a good preventive measure against SSIs. Various studies assessing the appropriateness of surgical antibiotic prophylaxis have shown variable results - 95% (Israel),[27] 75% (Brazil),[28] 5.9% (Iran)[29] and 0.8% (Korea)[30] in terms of appropriate antibiotic choice. Since preoperative prophylactic antibiotics take up a large part of prescribed AMAs in the hospitals, adherence to standard guidelines regarding the duration of antibiotic prophylaxis would keep costs to a minimum.

CONCLUSION:

The prospective study on surgical antibiotic prophylaxis in SBMCH, Barishal reveals that the SIGN and ASHP guidelines are not properly followed in this hospital. A single drug most commonly selected to provide prophylaxis rather than the two drug or three drugs combination. Among them Cephalosporin are not most commonly selected one.

Programes to improve antimicrobial prophylaxis, monitoring and feedback on pattern of use is a mandatory prerequisite. Various measures are needed to improve appropriateness of prescriptions and adherence include development of evidence based guidelines in collaboration with surgeons, increased outcome based research to document benefits of appropriate antibiotic use, continuing education to disseminate information to practitioners, surveys of antibiotic use and reassessment of prescribing practices over time and providing regular feedback and organizing group education and consensus meetings.

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