

PRESCRIBING PATTERN OF ANTIBIOTICS IN WOUND INFECTION IN SURGERY DEPARTMENT

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Abstract: Wound is a disruption of the anatomic structure and function in any body part. It includes burns, bone fracture, ulcers, skin break, muscle tear etc. The infection of a wound can be defined as the invasion of organism through tissues following a breakdown of local and systemic host defences leading to local and systemic presentation. Infection is also due to tissue infestation by microorganism with inflammation response. Antibiotics agents are the most as often as possible recommended medication for prevention of bacterial infection. Antibiotic are effective against various microorganism and the susceptibility to reduce adverse effect. Wound infections have a huge impact on patient quality of life. Rational use of antibiotics is important because the emergence of resistance has become a global threat. Antibiotics resistance is the ability of the microorganism to withstand the effect if any antibiotics, the microorganism changes in a way that reduces the effectiveness of the drug. **Objective:** To analyze the Prescribing pattern of antibiotics in wound infection and the resistance of microorganism in surgery department. **Methodology:** This was an observational study carried out over a period of 6 months among inpatient in the department of Surgery. The entire patient admitted in the Surgery ward meeting our inclusion criteria and exclusion criteria in this study were included. All the documented data were evaluated by applying appropriate statistical analysis like mean and standard deviation. **Results:** A total number of 130 patients was enrolled in our study performed in surgery department. From our study, the majority of study population were male (77.69%) and female were (22.30%). The high number of people belongs to group age of 56-65 years was 38 peoples. In wound infection, Diabetic foot (43.07%) was found to be a major problem followed by gangrene (28.84%) and cellulitis (12.31%). In our study, out of 130 cases, culture sensitivity test was performed for 95 cases and no culture sensitivity performed for 35 cases. Several samples such as Pus (53), wound swab (37) were collected. With reference to the culture sensitivity test, the major organisms isolated were categorized under gram negative such as E. Coli 22, Pseudomonas Aeruginosa 31. It can be observed that out of 130 patients included in our study 127 received antimicrobial therapy empirically while 3 patients did not received. Total of 18 different antibiotics were prescribed from which the most commonly prescribed were Metronidazole, Ceftriaxone and also the combination of ceftriaxone +metronidazole or Ceftriaxone + Metronidazole + Amikacin / Meropenem. **Conclusion:** The most antibiotics prescribed in the surgery department regarding wound infection were Metronidazole, Ceftriaxone and slightly Amikacin. The judicious use of antibiotic prophylaxis and reporting can be the most effective means to reduce the wound infection rate. Antimicrobial resistance in bacterial pathogens is a significant challenge that has a high morbidity and mortality.

Keywords: Wound infection, antimicrobial resistance, antibiotics agents, Ceftriaxone, Amikacin, Diabetic Foot.

I. INTRODUCTION

Wound represents the loss of skin integrity following the exposure of subcutaneous tissue which provides suitable environment for microbial growth and colonization. Wound includes burns, bone fracture, ulcers, skin break, muscle tears etc. Wounds can be surgical or due to trauma. Traumatic wounds can be the result of a fall, accident, fight, bites or weapon.

Wound infection is the invasion and multiplication of microorganisms within the wound area leading to cell injury and tissue damage. In a wound infection, germs penetrate through the broken skin and can cause infection in one particular area, an edge or may spread. It is the most common nosocomial infection in surgical patients, and it accounts for significant patient morbidity, prolonged hospital stays, and increased costs. Wound healing is a natural salubrious response to tissue injury. This is a multiplex and highly regulated process that can be compromised by both endogenous factors (pathophysiological) and exogenous factors (micro-organisms). Healing is the interaction of complex cascade of cellular events that generates resurfacing, reconstitution and restoration of the tensile strength of the injured skin.

Pathogens are specially adapted to infect a host, bypass the host's immune responses, reproduce within the host, and escape from the present host for transmission to another host. The most common pathogens that can be isolated are gram negative and gram-positive bacteria.

- Gram negative bacteria: *Pseudomonas aeruginosa*, *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumoniae*, *Cyanobacter*, *enterobacter*.
- Gram positive bacteria: *Staphylococcus aureus*, streptococcus species, *Methicillin Résistant Staphylococcus aureus (MRSA)*.

Antimicrobial agents are drugs that used to treat microbial infection. Antimicrobial medicines can be grouped according to the microorganisms they act primarily against. Antibiotics are used for prevention of bacterial infections.

Antibiotic resistance is the ability of bacteria to resist the effects of an antibiotic. Antibiotic resistance occurs when bacteria change in a way that reduces the effectiveness of drugs, chemicals, or other agents designed to cure or prevent infection. Infections with resistant organisms are difficult to treat, requiring costly and sometimes toxic alternatives.¹²Bacteria find ways of resisting the antibiotics developed by humans, which is why aggressive action is now needed to prevent the development of new drug resistant forms and to keep control over already existing resistant strains.

If AMR is not controlled, studies suggest that by 2050 the mortality rate of cancer and AMR will be equivalent. It is observed that antimicrobial resistance is more common in some parts of the world; for instance, in 2013, 214000 neonatal deaths were reported which globally attributed to resistant strains of sepsis, in commonwealth countries such as India, Pakistan and Nigeria.

An adverse drug reaction (ADR) is an unwanted or harmful reaction experienced following the administration of a drug under normal conditions of use and is suspected to be related to the drug. An ADR will usually require the drug to be discontinued or the dose to be reduced.

A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is under the control of the health care professional, patient or the consumer. Such events may be related to professional practice, health care products, procedures, and systems including prescribing order, communication, product labelling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use.

Drug-drug interactions are potentially observed when the patient is administered with more than one medication. Most of the interactions take place at the absorption stage whereby drugs such as antacids and antidiarrhea tend to reduce the absorption of antibiotics. Drug-drug interactions may be pharmacokinetic or pharmacodynamic. Pharmacokinetic interactions relate to absorption, distribution, metabolism and excretion of the drug. Pharmacodynamic interactions refer to the relationship between drug concentration at the site of action and the resulting effect on the body.

II. RESULTS

In accordance with the inclusion and exclusion criteria, a total of 130 patients were selected for the study from the surgery department, in that males (101) outnumbered females (29). Each patient varies according to diagnosis, age and antibiotic received.

AGE WISE DISTRIBUTION

From the cases collected most of the patients were found in the age group of 56-65 (27.7%) and least were observed in the age group of 76-85 (2.3%)

SAMPLE DISTRIBUTION

Various samples were collected for the performance of culture sensitivity tests which denotes and determines the presence and availability of pathogen. Several samples are normal swab (1), wound swab (37) (diabetic foot and diabetic wound), pus (53), urine (2).

CULTURE SENSITIVITY TEST DONE

A culture is attest to find germs (such as bacteria or fungus) that can cause an infection. A sensitivity test checks to see which antibiotic will work best for the treatment of an infection.

Out of 130 cases 95 cases culture sensitivity test was performed and 35 cases no culture sensitivity was performed

PATHOGEN ISOLATED

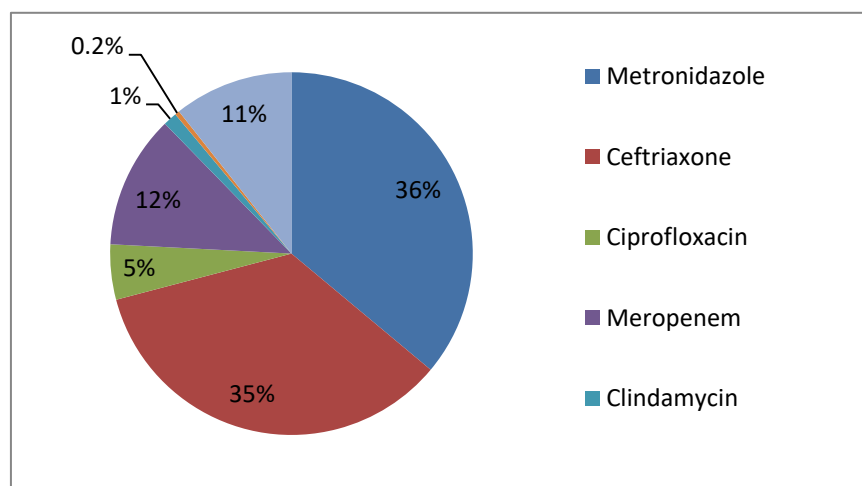
Pathogen is an infectious thing such as virus, bacteria, fungi or parasite which can causes disease.Out of 130 cases there were 95(73.07%) cases where culture sensitivity tests was performed and 35(26.92%) cases in which no culture sensitivity tests was performed. Bacteria isolated are basically categorized into gram negative (75%) and gram positive (25%). The pathogen isolated from each sample varies. The pathogens highly isolated from pus were pseudomonas aeruginosa and escherichia coli. The pathogens isolated from wound were pseudomonas gemginesia and Escherichia coli. In this study the pathogen isolated from Urine were Escherichia Coli and Pseudomonas Aeruginosa.

Other samples are normal swab in which coagulase negative staphylococcus was isolated.

The sensitivity and resistance pattern of different antibiotics were tested with particular pathogen which elaborates the efficiency of the antibiotics with the particular pathogen isolated.

PRESCRIBING PATTERN OF ANTIBIOTICS: *Emperical therapy*

Out of 130 patients included in the study, 97.7%patients received an antimicrobial therapy empirically and 2.3% patients received non empirical treatment.Of these, Metronidazole 25.73% was the most commonly used antimicrobial for empirical treatment followed by Ceftriaxone 24.85%.



PRESCRIBING PATTERN OF ANTIBIOTICS: *After culture sensitivity test was performed.*

The most commonly used antibiotics for treatment after culture test was Amikacin 44 (12.86%).

DRUG INTERACTION DISTRIBUTION

Drug-drug interactions are potentially observed when the patient is administered with more than one medication. There are several drug interactions that were observed which should be reduced or eliminated for better quality of life of patients. A total of 64 potential drug interactions were noted and of this 58% were moderate interactions and all the severe interactions were reported.

III. DISCUSSION

This study was 6 months long from 1st November 2017 to 30th March 2018, observational study performed in In-patient ward of the department of surgery in ESIC-MC PGIMSR & MH Hospital, which is a 500 bedded multispecialty tertiary care teaching hospital in Bangalore. A total of 130 patients were enrolled in the study, based on various inclusion and exclusion criteria. Patients were prescribed with different class of antibiotics, identified in the surgery wards.

Male preponderance was seen in the study. Out of 130 study patients included in our study, the majority of patients were males 78% which outnumbered females 22%, which is similar to the study done by **Peter L.N. et al.**, where the gender distribution was more in male 64.5% to that of female 35.5%.

From the cases collected most of the patients were found in the age group of 56-65(27.7%) and least were observed in the age group of 76-85(2.3%). The same study was done by **Peter L.N. et al.**, where most of the patient were found in the age group of 59-68 (23.6%) and least were observed in the age group more than 78 (8.1%).

Various samples were collected for conducting culture sensitivity tests. The various samples collected were from pus 55% followed by wound swab 39% etc. A similar study was done by **Bastola R. et al.**, in which, 77.7% samples were pus aspirates and 22.3% were wound swab.

On the basis of the pathogen isolated from the culture test, the most common was *Pseudomonas aeruginosa* 30.09% followed by *Escherichia coli* 21.36%. This is in contrary to the study done by **Kurhade A. et al.**, where *Staphylococcus aureus* 26.51% was the highest followed by *Pseudomonas aeruginosa* 18.18% and **Adegoke A.A.** where *Staphylococcus aureus* was the predominant bacteria 25% followed by *Pseudomonas aeruginosa* 20% .

In the present study it was found that the gram negative bacteria were 75% and the gram positive bacteria were 25%. A similar study was done by **Goswami N.N. et al.**, where 68.85% isolated were bacteria gram negative.

The patients were diagnosed with different infections of which diabetic foot had the highest number of patients 46.7% followed by cellulitis 13.3% whereas in a study conducted by **Peter L.N. et al.**, majority was diabetic foot ulcer 38% followed by wound sepsis 29%.

From the diagnosis obtained various surgical procedures were done which enhanced the wellbeing of the patient. The surgical procedures were amputation 14.6%, wound debridement 10.8% and wound disarticulation 10% in comparison to study performed by **Chalya P.L. et al.**, where lower limb amputation 56.7% was the most commonly surgical procedure observed.

On the basis of antibiotic distribution triple therapy was the most preferred regimen. 52.3% patients received triple antibiotic therapy where Ceftriaxone+Metronidazole+Amikacin/ Amoxicillin-clavulanic acid was the major combination. In contrast, the study conducted by **Peter L.N. et al.**, 65.6% patients received dual therapy where Metronidazole+ Amikacin/Ceftriaxone was the major combination.

Out of 130 cases the most commonly used antibiotic class was Cephalosporin 26.01% followed by Nitroimidazole 23.9%, Aminoglycoside 10.8% and Penicillin 7.5%. A similar study was done by **Raut A. et al.**, where Cephalosporin 28.33% followed by Penicillin 23.50% was the most prescribed medication.

From the culture sensitivity report it was observed that *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* were highly resistant to amoxicillin-clavulanic acid 26%, 17% and 7.36% respectively whereas *Pseudomonas aeruginosa* shows high resistance to cotrimoxazole 6.31%. On the contrary, a study done by **Pfaller M.A. et al.**, *Staphylococcus aureus* shows high resistance to Oxacillin 25.1%, *Pseudomonas aeruginosa* to Ceftazidime 1.9% and *E. Coli* to Ciprofloxacin 1.1%.

Out of 342 antibiotics, the most preferred and used route of administration was intravenous route 94% to that of oral 6% in our study, in contrast with the study done by **Baktygul K. et al.**, where intravenous administration was (16.4%) lesser to that of oral (34.4%).

Out of 130 patients, the mean days of hospitalization were 7.65±2.29 in comparison with study done by **Shankar P.R. et al.**, where the mean period was ranging from 4-7 days. A total of 130 patients were taking an average of 2.59±1.03 antibiotics where Metronidazole 25.73% and ceftriaxone 24.85% were most commonly prescribed.

The results obtained after DDD calculations were found as 84.2% prescribed as normal dose, 9.3% as under dosed and 6.5% prescribed as over dosed, which is similar to the study done by **Gube A.A. et al.**, where 90.5% were normal dose and 7% with inappropriate dose.

Across the study, out of 130 patients 97.7% received antimicrobial therapy empirically unlike the study done by **Patel K.P. et al.**, where only 26.70% were prescribed with empirical regimen.

Each patient received medications other than antibiotic which were essential in the improvement of quality of life of the patients. Drugs for supportive care given were analgesics & antipyretic 20.8% followed by antacids 20.5%, in contrast the study done by **Pinnamraju J. et al.**, where the major drug prescribed was vitamin supplement 20.81% followed by analgesics 16.29%

There were several drug interactions that were observed in this study which should be reduced. A total of 64 potential drug interactions were noted and of this 58% were moderate interactions while the study conducted by **Pinnamraju J. et al.**, showed 39.3% with major interactions.

IV. CONCLUSION

As a result of the study that was performed within the given limited period of time, data analysis and interpretations made under the supervisions of our project guide we came to the following conclusions. The abundance of gram negative bacteria is more than the gram positive as well as other microbes with highest distribution of *Pseudomonas aeruginosa* and *Escherichia coli*.

More number of microbes are resistant to Amoxicillin-clavulanic acid followed by Amikacin and Ciprofloxacin.

We came across highest number of wound/infections that were: diabetic foot > gangrene > cellulitis > PVD > non-healing ulcer > necrotizing fasciitis and CLW of left dorsum.

The highest number of antibiotic prescribed for infections / post-surgical infections were Metronidazole followed by Ceftriaxone, Amikacin, Amoxicillin-clavulanic acid, Meropenem, Colistin, Imipenem, Ciprofloxacin etc.

In Monotherapy, Taxim and Ceftriaxone was preferred, whereas in dual and triple therapy highly preferred with varied combinations of Ceftriaxone and Metronidazole, Amikacin and Meropenem, Imipenem, Colistin.

According to the antibiotic classification Cephalosporines and Nitroimidazole were highly prescribed antibiotic drug classified for infections followed by aminoglycosides, carbapenem and penicillin with Beta-lactamase inhibitor. The average duration of stay was 7.65 ± 2.29 days for the patients.

The daily doses were prescribed according to the degree of infections with 97.7% receiving empirical therapy. As to achieve greater efficacy and successful treatment with controlled side-effects patients were commonly prescribed with Antacids, Analgesics, antipyretics, vitamin supplements, anti-emetic etc.

Drug interaction being the major problem in the recent era, there was an availability of drug interaction in our study; major, moderate and minor drug interactions were observed.

Hence, antibiotic treatments are found to be more complex and require sound medico-analytical skill to overcome side-effects, drug-interactions as well as maintaining steady efficacy rate to facilitate treatment successful. The quick and accurate diagnosis through culture and isolation is highly helpful and should be considered as priority before writing an antibiotic prescription.

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