

Evaluation of rational use of antibiotics in intensive care unit of a tertiary care hospital in north India

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Abstract

Background: Overuse of antibiotics as well as the development of resistance in microbes is a global phenomenon. There are very few researches conducted in India on rational use of antibiotics in Intensive Care Unit. Thus, there is a need to conduct this study in Indian Scenario. **Aim:** To study the rational use of antibiotics in Intensive Care Unit of a tertiary care hospital in North India. **Materials and Methods:** It was a prospective observational study of antibiotic prescribing patterns in a 40-bedded ICU in a tertiary care hospital in northern India with approximately 1000 admissions per year. This study was conducted between December 2018 and April 2019. **Results:** It was observed that all the patients were administered antibiotics on the day of admission in ICU. Patients were administered broad spectrum antibiotics without undergoing any bacteriological investigation. In 68.6% patients the antibiotics were changed after 2-3 days for the better result of the patients. In 32% patients the initial antibiotics therapy were not discontinued and some new antibiotics were added to the therapy. **Conclusion:** There is a need to assess the rationality of prescribed antibiotics, its frequency and dosage.

Key Word: antibiotics.

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INTRODUCTION

Antibiotics are an essential tool of medical use in common medical procedures, such as transplantation and chemotherapy. The rational use of antibiotics is like any

other therapeutic intervention in daily practice and it should not be random. It requires reflection and thought and should be based on rules. The correct diagnosis, the patient's condition, the location of the infection, the severity of the microbial cause sensitivities to antibiotics, the pharmacokinetics and pharmacodynamics of antimicrobials, the side effects and cost are the main elements which must be supported in every decision for their use. The strategy of the administration of antibiotics should be taken into account. The overuse of antibiotics as well as the development of resistance in microbes is a global phenomenon. It concerns both the World Health Organization (WHO) and individual countries. There are documented studies that support, beyond doubt, that restricting the misuse of antibiotics reduces resistance. They all agree though, that the only way to reduce the

resistance of antibiotics is through proper use and reducing abuse. We also all agree that in order to reduce the overuse of antibiotics simultaneous training is needed for both doctors and patients. The only way for the proper use of antibiotics is through intervention programs by both doctors and patients. The purpose of this study is to highlight the rational use of antibiotics to achieve optimal outcome of the infection with minimization of toxicity and limitation of microbial resistance.¹ A study was conducted at a 72 bedded Intensive Care Unit of Deenanath Mangeshkar Hospital. Cases requiring critical care for diseases arising from infection as a primary cause was selected in this study. Data of 50 patients with a mean age of 62.2 years was analyzed. There was 37 survivals and 13 deaths in the group. The major finding was that colistin sensitivity was frequently reported in the culture reports and this resulted in significant increase in its use post culture reports.² Similar study was conducted for a period of 6 months in General Medicine and Pulmonology departments of 700 bedded multi-specialty hospital. 325 (16.62% n=1955) antibiotics was prescribed and the most commonly prescribed antibiotics was cephalosporins (ceftriaxone 15.38%), followed by quinolones (levofloxacin 6.76%). In fixed dose combinations, the most commonly prescribed antibiotics was cefepime+tazobactam (19.69%) followed by piperacillin+tazobactam (14.76%). The most commonly prescribed parenteral antibiotics was cefepime+tazobactam administered for a period of 6-7 days and ceftriaxone administered for a period of 4-5 days.³ Another study was conducted at a 395-bed hospital in Brasília, Brazil, with a 10-bed mixed medical/surgical ICU. The study sample included all patients aged 60 years or older, regardless of gender and all elderly patients not receiving antibiotics was excluded from the sample. It was found that there was a high rate of antibiotic misuse in the study sample and concluded that inadequate therapy was correlated with resistance to antimicrobial agents.⁴ There are very few researches conducted in India on rational use of antibiotics in Intensive Care Unit. Thus, there is a need to conduct this study in Indian Scenario.

METHODOLOGY

Study design: This was a prospective observational study of antibiotic prescribing patterns in a 40-bedded ICU in a tertiary care hospital in northern India with approximately 1000 admissions per year. This study was conducted between December 2018 and April 2019.

Study population: The hospital caters to both urban and rural population. Most of the patients belonged to lower and middle strata of the society.

Sampling method: All the patients on antibiotic prescription and willing to give consent were included in the study. The ICU was visited six days of the week and information regarding the patient demographics and antibiotic used was recorded in a semi structured Performa. All those patients were screened out who were not prescribed any antibiotic and the patients who refused to give consent were excluded from the study. The remaining patients were included in the study. All antibiotic were prescribed by the primary admitting team and there were no infectious diseases specialist or antibiotic prescription policy in place at the hospital during the study period. Baseline demographic variables on all patients, such as name, age, gender, clinical diagnosis was recorded. Other variables, such as duration of ICU admission, the total number of drugs prescribed on the day of admission, and the total number of antibiotics prescribed were also noted. Additional data were included such as the brand name, dose, duration, and route of administration of that particular prescribed antibiotic.

Ethical approval: The study was approved by the Institutional Ethics Committee of the University. The consent forms was made available in two languages (Hindi and English) and consent of each patient/guardian was taken.

Data analysis: The prescriptions were analyzed for the average number of antibiotics per encounter, percentage of encounters with an antibiotic prescribed, route of administration based prescription pattern, group wise prescription of antibiotics, percentage of antibiotics prescribed by brand name, outcome and cost analysis. The data was pooled and descriptive analysis was done. The result was presented using mean and percentages.

RESULTS AND DISCUSSION

The objective of the current study was to evaluate the appropriateness of the use of antibiotics with respect to diagnosed diseases and the bacteriological findings on patients in ICU in a tertiary care hospital in north India. The study was conducted between January and April 2019, patients who were on antibiotics in Medical ICU got enrolled for the study. To fulfil the purpose of the study, a sample of 60 random patients were selected from the entire admissions in MICU. The results of the study depicted that all the enrolled patients were prescribed antibiotics on the day of admission without any bacteriological examination. Too many medicines were prescribed per patients. Maximum patients were referred from PHC and other hospitals. Self-medication was also observed in the patients directly visiting the TCH. Among 60 patients who participated in the study, the age ranged between 14-87 years with an average of 53.38 years.

Maximum were from adulthood (36-65) years. 56% (n=28) were male and 44% (n=22) were female. All the patients were on antibiotics treatment. Department of General Medicine accounted for the highest number of admissions 34(56.66%) followed by Department of Respiratory {23(38%)} and cardiology. Most of the study populations were hospitalized for a period for 1-19 days with an average length of 5.58 days. Maximum patients were found suffering from respiratory problems as they had habit of smoking. In respiratory problems the patients were suffering from COPD, bronchial asthma, respiratory failure, pneumonia, shortness of breath etc. In general medicine cases of peptic ulcers, hypertension, pain abdomen, diabetes, meningitis and septicemia were depicted.

Sensitivity Pattern: In the study population, out of 60 patients only 28 patients had undergone their sensitivity tests. The results on the sensitivity tests depicted presence of the microorganisms such as *Streptococcus pneumoniae*, *E.coli*, *Staphylococcus aureus*, *Streptococcus pyogenes*, gram positive cocci in clusters, gram negative rods, *E.faecalis* were observed. The results of the culture sensitivity test can be false if the samples are taken after the initiation of the antibiotics therapy. All the samples for the culture sensitivity test were collected after the administration of the antibiotics.

TLC: White blood cells play an important role in our body's immune system, searching blood for invading viruses, bacteria and fungi. When a foreign virus or bacteria enters into blood, the WBCs or leukocyte recognizes and destroys the invading particle before it can cause disease. Since WBCs fight off infection, people tend to think that elevated levels are beneficial. A high WBCs count isn't a specific disease, but it can be an indication for another problem, such as an infection, stress, inflammation, trauma, allergy, or certain diseases. That's why a high WBCs count usually requires further investigation. The normal TLC range is between 4 - 11k cu/mm. On the day of admission in ICU, out of 60 patients, the TLC of 45% patients were within the normal range.¹ The TLC of 55% patients was higher than the normal range. On the date of discharge, 61.6% patients were having TLC in normal range and 38.3% patients were higher than the normal range. Out of 60 patients, 13 patients died. The average TLC range of expired patients were 13.4k cu/mm.⁵

Temperature: Fever also known as pyrexia (Axelrod and Diringer, 2008)⁶ is a common medical sign characterized by an elevation of temperature above the normal range of 36.5 -37.5°C (98- 100°F) due to an increase in the body temperature regulatory set point (Karakitsos and Karabinis, 2008)⁷. This increase in set point triggers increased muscle tone and shivering. Fever is a natural

reaction during a number of illnesses. In several cases, absence of the natural reaction is a more alarming sign than the presence of fever itself. Fever is usually accompanied by different general symptoms, such as sweating, chills, sensation of cold and other subjective sensations. Causes of fever include infections caused by parasites, viruses, bacteria, rickettsia, Chlamydia, immune reactions (including the defects in collagen, immunological abnormalities and acquired immunodeficiency).⁸ Only in 6.6% patients the incidences of temperature was found above 100°F. On an average body temperature of the patients were 99°F.

Recovery and mortality rate: The result of the study depicted that 21.6 % patients died. The recovery rates of the patients were 78.33%. 48% patients were shifted to the general ward of the hospital as they were recovered and many patients were shifted to the general ward as they were unable to pay the ICU bed charge. 8.3 % patients were referred to higher centre for the better treatment. 10% patients were discharged from the hospital as they recovered. 11.6% patients lie in category of LAMA as they got discharged on their own wish.

Antibiotics Prescribed: In this study it was observed that all the patients were administered antibiotics on the day of admission in ICU. Patients were administered broad spectrum antibiotics without undergoing any bacteriological investigation. In 68.6% patients the antibiotics were changed after 2-3 days for the better result of the patients. In 32% patients the initial antibiotics therapy were not discontinued and some new antibiotics were added to the therapy. 137 antibiotics were prescribed to the 60 patients and the most commonly prescribed antibiotics were cephalosporins (ceftriaxone 21.2%), followed by Azithromycin (16.0%) and Fluoroquinolones (levofloxacin 13.8%). Mostly 2nd generation fluoroquinolones (levofloxacin, ciprofloxacin, moxifloxacin, etc.) were prescribed for the treatment of pneumonias and chronic bronchitis. In fixed dose combinations, the most commonly prescribed antibiotics were ceftriaxone sodium+tazobactam (11.6%) followed by amoxycillin+clavulanic acid (8.2%). The most commonly prescribed parenteral antibiotic was ceftriaxone administered for a period of 5-7 days. All the prescribed antibiotics were supplied from the hospital pharmacy. 21.6% of prescription had 1 antibiotic followed by 48.3% of prescription had 2 antibiotics and on an average 2.28 antibiotics were prescribed. A similar study conducted by B. Rajalingam and reported that on an average 1.625 ± 0.804 of antibiotics were prescribed to the study population. Another study conducted by Abdel Salam Moahamed Elfaki and reported that 1.6 ± 0.95 of antibiotics were prescribed and also found that cephalosporins to be used in 1/3rd of the prescriptions.

especially ceftriaxone. In our study it was also found that the study population out of 137 antibiotics prescribed, 65.6% antibiotics were administered parenterally and 34.3% were administered orally. The most frequently prescribed parenteral antibiotics was ceftriaxone and it was administered for a period of 5-7 days. The most commonly prescribed oral antibiotic was levofloxacin and it was prescribed for a period of 2-3 days. Usually parenteral preparations are found more costly than the oral preparations which were given for longer duration and hospitalization is necessary when drug is given as parenteral. Also worldwide, it is estimated that over half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take their medicine correctly.⁹ Medicines are used rationally when patients receive the appropriate medicines, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost both to them and their community. Irrational use occurs when one (or more) of these conditions are not fulfilled.¹⁰

Inappropriate use of medicines are due to a lack of awareness of the scale of the problem and its economic and health costs because of the lack of knowledge of the decision makers about the most cost effective ways to tackle health problems.¹¹

Rationality assessment: The assessment of rationality is based on the spectrum of antibiotics, polypharmacy, frequency and dose of the antibiotics. WHO indicators were used as reference for the assessment of drugs rationality. Average antibiotics per prescription was 3. Percentage of drugs prescribed by generic name was. Percentage of antibiotics from essential drug formulary list was 69.7%. 72.2% broad spectrum antibiotics were prescribed on the day of admission. The dose of antibiotics of 22.4% patients were not appropriate. The course of treatment was not completed in 62% patients. The total prescribed drugs were 329 out of which 137 antibiotics were prescribed. The drugs dispensed to the patients were generic and the availability of prescribed drugs in hospital dispensary was 100%. A major step towards rational use of medicines was launched by WHO in 1977 of the 1st Model List of Essential Drugs, designed

to help countries formulate their own national lists.¹² In 1898, the International Network for the Rational Use of Drugs (INRUD) is formed to conduct multidisciplinary intervention research to promote the rational use of medicines. In 1993, WHO and INRUD developed and published a standard methodology for selected drug use indicators in health facilities.¹³

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