Study of Prescribing Pattern of Antimicrobial Agents in Medicine Intensive Care Unit of a Teaching Hospital in Central India

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Abstract

Objectives: Intensive care unit (ICU) is a setting where large numbers of drugs are administered to patients and where the cost of hospitalization and drug treatment are high. The primary objective was to evaluate the current usage of anti-microbial agents in the Medical Intensive Care Unit (MICU) of a teaching hospital in central India.

Methods: The study was a prospective study for a period of six months from May 2010 – December 2010. Prescription and patient records are reviewed and analyzed. Rationality of drug usage was also evaluated by analyzing the drug prescriptions.

Results: In intensive care unit cefotaxime was the most commonly used AMA by 32 % patients, followed by metronidazole 24% patients and ampicillin by 17.29% patients. 77% patients were given 1- 3 AMAs, 23 % patients were given 4 – 8 AMAs. Most common indication for the antimicrobial therapy was infection. According to evaluation use of antimicrobial therapy was rational in only 30% patients. Average numbers of drugs per patients were 7.5 drugs.

Conclusion: interventional programme should focus on infection control with rational antibiotic prescription aimed at minimizing unnecessary cost, adverse drug reaction and emergence of bacterial resistance.

Introduction

Antibiotics are the most frequently prescribed drugs among hospitalized patients especially in intensive care and surgical department. Programs designed to encourage appropriate antibiotic prescriptions in health institutions are an important element in quality of care, infection control and cost containment.1,2

Several authors3,4 have reported concern about the continuous indiscriminate and excessive use of antimicrobial agents that promote the emergence of antibiotic-resistant organisms. Monitoring of antimicrobial use and knowledge of prescription habits are some of the strategies recommended to contain resistance to antimicrobials in hospitalized patients. Antimicrobial resistance substantially raises already-rising health care costs and increases patient morbidity and mortality.

The ICARE study established the high incidence of antibiotic resistance in an intensive care unit in comparison to the community.5 It was demonstrated in the ICARE study that an infectious disease specialist intervention brought about a 45% decrease in antibiotic expenses.

Available literature on antimicrobial use abroad and in India bears testimony to the widespread concern about the appropriate use of these agents.6 Prescribing drugs is an important skill which needs to be continuously assessed and refined accordingly. It not only reflects the physician’s knowledge of pharmacology and pathophysiology but also his/her skill in diagnosis and attitude towards selecting the most appropriate cost-effective treatment.7

The study of prescribing patterns seeks to monitor, evaluate and suggest modifications in practitioners’ prescribing habits so as to make medical care rational and cost effective. Information about antibiotic use patterns is necessary for a constructive approach to problems that arise from the multiple antibiotics available.6 India reports on antibiotic utilization at an institutional level include both cross-sectional and longitudinal studies of prescribing patterns.8

With this state of affairs of antimicrobials, we had planned to study the antimicrobial agents prescribed and administered to the patients admitted in medical ICCU of Indira Gandhi govt. medical college and Hospital Nagpur which is a tertiary care level hospital 665 bedded hospitals.

Material and Methods

A prospective study was undertaken 10 bedded MICU of Indira Gandhi Govt. Medical College and hospital, Nagpur over a period of six months.

The demographic and clinical treatment data of 480 patients was collected in the following format:

- Age and sex of patient.
- Diagnosis of patients.
- Percentage of AMAs prescribed in the order of preference.
- Average no. of drugs per patients.
- Dose and route of AMAs.
- Rationality.
C. Therapy was considered questionable when insufficient clinical or laboratory data was present to enable the therapy to be classified as clearly rational or irrational e.g. patient of congestive heart failure having cough but do not know that cough is due to CHF or infection then treatment with antimicrobial agent considered questionable.

Results

During study period total 480 patients were evaluated, consisting 275 (57.29%) male patient and 205 (42.7%) females. The mean age of patients was 50 years. 316 (66%) patients were aged more than 40 years of age. The most common diagnosis which warranted admission to ICU was ischemic heart disease (42%), followed by congestive heart disease (13.75%), chronic obstructive pulmonary disease (11%).

Table 1 shows that in ICU cefotaxime was the most commonly used AMA by 32 % patients, followed by metronidazole 24% patients, and ampicillin by 17.29% patients.

Other antibiotics used were injection meropenem, amoxicillin + clavulanic acid levofloxacin, ceftriaxone, vancomycin, ciprofloxacin, linezolid and amikacin.

Figure 1 shows number of AMAs used in patients of MICU.

Drug therapies were categorized according to indication for the antimicrobial use. Three usage groups were essentially defined by the physician according to the way they treated the patients.9

1. Infection was considered as the indication if clinical and/or laboratory data gave evidence of infection.
2. The therapy is considered as prophylactic if there was no evidence of infection and the agent was employed to prevent infection (e.g. catheterization).
3. Indication considered as symptomatic if no evidence of prophylaxis could be found and records shows the same symptoms being treated e.g. treatment of fever in absence of specifically suspected infection.

Rationality9

A. The therapy was considered rational if the antimicrobial use and its route of administration, dose, frequency and duration of use were considered appropriate for infection.

B. Therapy was considered irrational if the antimicrobial was used without indication, prophylaxis under circum stances of unproven efficacy or by clearly inappropriate route, dose or preparation for that indication.

Table 1: Commonly prescribed antimicrobial agents

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Drugs</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cefotaxime</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>metronidazole</td>
<td>24.2</td>
</tr>
<tr>
<td>3</td>
<td>ampicillin</td>
<td>17.3</td>
</tr>
<tr>
<td>4</td>
<td>meropenem</td>
<td>9.5</td>
</tr>
<tr>
<td>5</td>
<td>amoxicillin + clavulanic acid</td>
<td>8.1</td>
</tr>
<tr>
<td>6</td>
<td>levofloxacin</td>
<td>7.5</td>
</tr>
<tr>
<td>7</td>
<td>azithromycin</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><strong>Sr.</strong> Drugs</td>
<td><strong>% of patients</strong></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>ceftriaxone</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>vancomycin</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>ciprofloxacin</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>linezolid</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>amikacin</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>gentamicin</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>co-trimoxazole</td>
</tr>
</tbody>
</table>

Table 2: Indications for antimicrobial use

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</thead>
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<tr>
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<td>Infection</td>
<td>45%</td>
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<td>2</td>
<td>Prophylactic</td>
<td>31%</td>
</tr>
<tr>
<td>3</td>
<td>Symptomatic</td>
<td>24%</td>
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Fig. 1: No. of antimicrobial agents per patients

Table 3: Evaluation of antimicrobial therapy

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>No. of patients</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rational</td>
<td>146</td>
<td>30.4</td>
</tr>
<tr>
<td>Irrational</td>
<td>281</td>
<td>58.6</td>
</tr>
<tr>
<td>Questionable</td>
<td>53</td>
<td>11</td>
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Fig. 2: Percentage of patients receiving number of drugs
- 77% patients were given 1-3 AMAs, 23% patients were given 4-8 AMAs.

Table 2 shows indication for antimicrobial use the common indication was infection (64.9%) to patient followed by symptomatic 24% prophylactic 11%.

Table 3 shows rationality of AMAs according to the use of AMAs, in 30% patient the antimicrobial therapy considered rational, in 59% patient therapy considered irrational while in 11% patient it is questionable.

Figure 2 depicts 70% patients received 6-10 drugs, followed by 1-5 drugs by 16.5% patients. Average numbers of drugs per patients were 7.5 drugs.

Discussion

The present study was done in the patients of Medicine ICU where common diagnosis was ischemic heart disease. Patients had been administered variety of cardiovascular drugs and AMAs. Hanssens et al.10 reported that 74% of patients admitted to a medical intensive care unit were treated with antimicrobial medications. A prospective antibiotic utilization survey performed in two different medical departments showed that 35.3% and 39% of the acute admitted patients had at least one antimicrobial exposure.11

The commonest AMA prescribed was cefotaxime, this is in accordance with similar study where ceftriaxone was prescribed in patients (57%) as initial therapy,18 where as ampicillin, amoxycillin, metronidazole, ciprofloxacin and crystalline penicillin were the 5 most commonly prescribed antibiotics in the study conducted by Shankar et al.12

In ICU patients are always in critical condition so they receive parental route to combat the emerging life threatening situation. In our study infection was the common indication for antimicrobial therapy; this supported by similar study where 76% patients were treated for presumed or proven infections and received antibiotics.10 A high percentage of patients i.e. 83% patients was prescribed at least one antibiotic which was in accordance with study done by Hanssens Yet al (76%) 19 and Shankar et al (92%)10 in teaching hospital of western Nepal but contrary to van der Meer JW et al14 shows 30% were prescribed antibiotics during the study period. Similarly study done by Bosu et al19 again showed the variation in average percentage of patients receiving at least one antibiotic, which was 41%, 45%, 79% and 98% in different health centers. It is not possible to draw any firm conclusion since the patients are not matched socio-economically.

In our study patients received more than one AMA on number of occasion. As these patients were suffering from mixed infections therefore they receive one AMA for gram +ve, other for gram-ve and 3rd one for anaerobic infection. Many instances patients received alternate antibiotics one by one when first one is not effective without doing culture sensitivity tests.

In this study 30% of AMAs were rational, 60 % irrational and 11% questionable. Using a different set-up, it has been demonstrated that the intervention of a physician specialist in Clinical Pharmacology was effective in reducing antibiotic costs by 51% when a prescription-point prevalence analysis was performed for comparison between two internal medical departments.11 The common indication for use of antibiotic was infection (64.9%) followed by symptomatic 24%, prophylactic 11%. The percent of patients treated for infections was 45% which less than reported by other studies.16 The percent of prophylactic treatment prescribed is 11% which is in accordance with 13% and 10.3% reported in previous studies.14,15

In our study average number of drugs prescribed in the ICU was 7.5. In another study the number was 12.1 ± 7.6.19 The average number of drugs in our study was less than or comparable to that reported in other studies. Average number of drugs per person is an important index of prescription audit. It is preferable to keep the mean number of drugs per prescription as low as possible, since higher figures always lead to increased risk of drug interaction, development of bacterial resistance, increased hospital cost.20

So, measures should be taken care to avoid the inappropriate use of antibiotics. Physicians must have a clear understanding of therapeutic use of antibiotics, they must be aware of the prevalence of various pathogens and resistance patterns in their hospital and exercise good judgment in selection empirical antibiotic regimes.10

Conclusion

Antibiotic resistance is increasing at an alarming rate leading to increasing morbidity, mortality and treatment cost. A key factor in the development of an antibiotic resistance is inappropriate use of antibiotics. The medical fraternity needs to understand that antibiotics are precious and finite resources. And unless conscious efforts are made to contain the problem of drug resistance, multidrug resistant organism untreatable by ever known antibiotic may emerge reversing the medical progress by ranking and returning as back to pre-antibiotic. Thus the responsible personal are doctors, patients, government, drug companies. Doctors either over prescribe / under prescribe and patients are not satisfied unless some medicines are prescribed to them. Remedy of this situation requires regulation, education, and voluntary agency taking care of the society.

Thus requisite tools and insight necessary to predict or suppress microbial virulence are at hand. We have to use antibiotics ‘RATIONALLY’.

Acknowledgement

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References

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