

## STUDY OF ANTIMICROBIAL USAGE IN INTENSIVE CARE UNIT

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**ABSTRACT**

**Background:** Antimicrobial agents (AMAs) form an important aspect of ICU either for prevention or control of infections, as critically ill patients are more susceptible for infection due to immobilization, invasive procedures, (i.e., ventilators, catheters, etc.), compromised immune status and exposure to cross infections. **Objectives:** To evaluate the pattern and Criteria for selection of AMA's used in ICU and to identify any adverse drug reactions, related to the AMA's administered. **Methods:** A Prospective, observational study was conducted in 300 patients admitted Medical Intensive Care Unit at Rajarajeswari Medical college and Hospital. Data was collected from case records of patients admitted in ICU in a preformed proforma.

**Results:** Respiratory tract infection (42%) was the most common reason for ICU admission. Ceftriaxone (52%) was the preferred AMA followed Amoxicillin+Clavulnic acid (34%). Amoxcillin + Clavulinic acid + Gentamycin (16%) was most commonly used drug combination. Only 1% of the patients got single antimicrobial therapy where as 3 drug combination in 55% and 4 drug combination in 26% and even 5 drug combination in 3% of the patients. **Conclusion:** This Study shows multiple drug combination therapy being widely used which is irrational.

**KEYWORDS:** Antimicrobial agent, ICU, Infection.

**INTRODUCTION**

The intensive care unit [ICU] is for critically ill patients who need constant medical attention and highly specialized equipment to control bleeding, to support breathing, to control

toxemia and to prevent shock. They either come from recovery rooms of the operation theatre, from wards or from the admitting section of hospital. <sup>[1]</sup> Antimicrobial agents (AMAs) form an important aspect of ICU either for prevention or control of infections, as critically ill patients are more susceptible for infection due to immobilization, invasive procedures, (i.e., ventilators, catheters, etc.), compromised immune status and exposure to cross infections.

AMAs include the various natural and semisynthetic antibiotics and synthetic antimicrobials effective against various pathogens like bacteria, fungi, protozoa; etc. The choice of AMAs in ICM is usually empirical based on the prevalent strains of pathogens, and seeking laboratory evidence for susceptibility only in the event of inadequate response or resistance. <sup>[2,3]</sup>

Widespread use of broad-spectrum antibiotics, crowding of patients into geographically confined areas and greater number of critically ill patients may be factors favoring the emergence and spread of resistant organisms. <sup>[4]</sup>

Only few detailed studies exist on infections and antibiotic use in ICUs. [5,6] As a result, little is known about the indications for antibiotic therapy for different patient populations within a general ICU. The objective of our study was to evaluate the pattern and Criteria for selection of AMA's used in ICU and to identify any adverse drug reactions, related to the AMA's administered.

## **MATERIALS AND METHODS**

After taking clearance from Institutional Ethics Committee a Prospective, observational study was conducted in 300 patients admitted Medical Intensive Care Unit at Rajarajeswari Medical college and Hospital. Data was collected from case records of patients admitted in ICU in a preformed proforma which included demographic profile of patients, disease data, investigations conducted, drug history- current and past, the AMAs used during the ICU---the formulation, the dose, route, frequency and duration of administration, tolerability, adverse reactions and drug interactions if any. The criteria used for AMA selection and combination will also be evaluated.

### **Inclusion Criteria**

Patients aged between 18 to 70 years of either gender admitted to the ICU, and receiving AMAs.

**Exclusion Criteria:** Patients not receiving any AMAs.

### Statistical Method

The data collected was analyzed statistically using descriptive statistics. Wherever necessary, the results are depicted in the form of percentages and graphs.

### RESULT

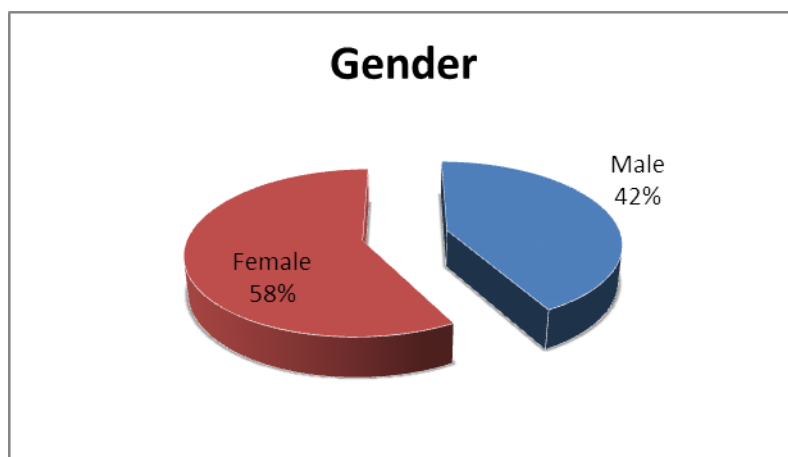
Out of 300 patients, 174(58%) are female and 126(42%) male. The mean age of patient admitted is 55 years where in the age group of 61-70 years with 93(31%) was most admitted followed by 78(26%) patients in 51-60 years. Respiratory tract infection (42%) was the most common reason for ICU admission followed by Abdominal infection (24%), Poisoning (18%) and Fever (11%).

Ceftriaxone (52%) was the preferred AMA followed Amoxicillin+Clavulinic acid (34%), Piperacillin/Tazobactam (31%), Metronidazole (29%).

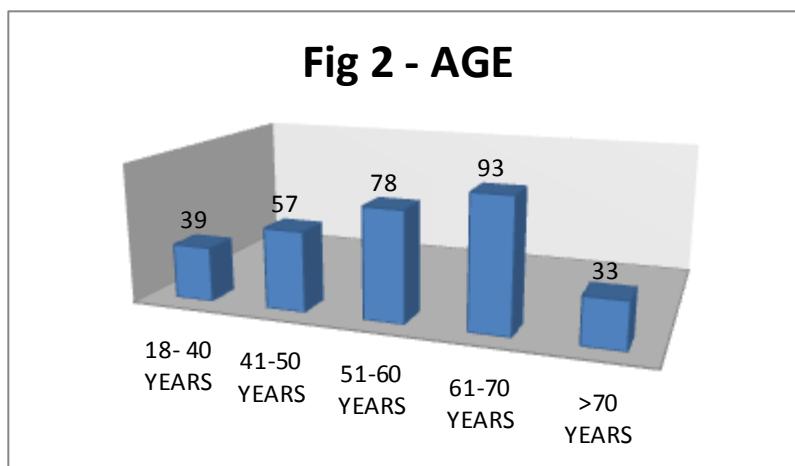
Only 1% of the patients got single antimicrobial therapy where as 15% received 2 drug combination, 3 drug combination in 55% and 4 drug combination in 26% and even 5 drug combination in 3% of the patients.

Amoxycillin+Clavulinic acid + Gentamycin (16%) most preferred drug combination followed by Ceftriaxone + Metronidazole (14%) and Piperacillin+ Tazobactam + Amikacin (13%).

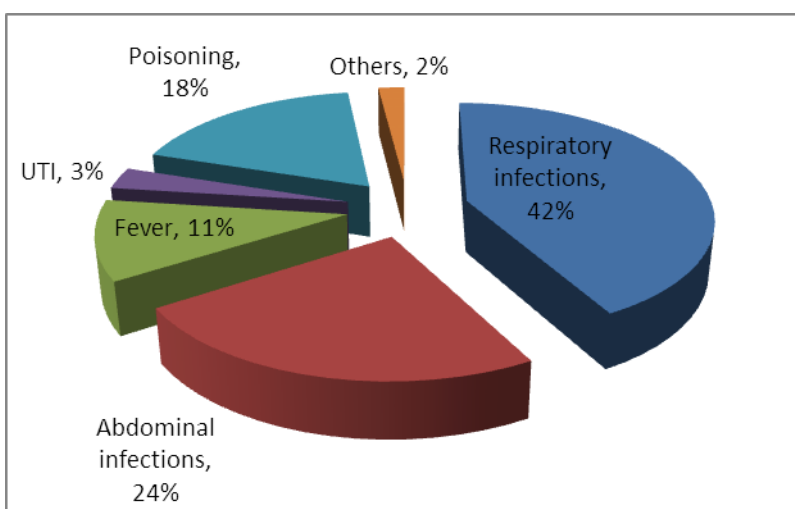
78% of the ICU admitted patients were shifted to wards while 18% were referred to other centres. Adverse drug reactions was seen in 4% of the patients which include Nausea, Vomiting, Rashes, headache and pain abdomen.



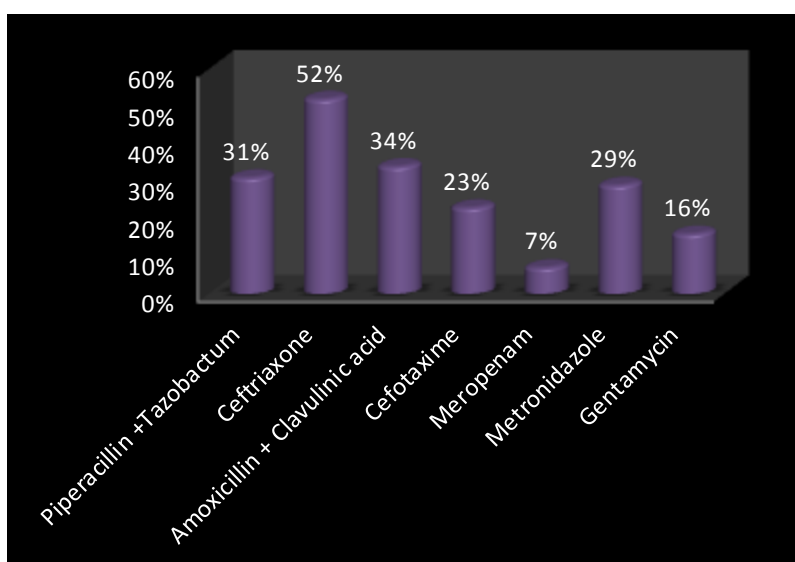
**Fig 1: Gender.**



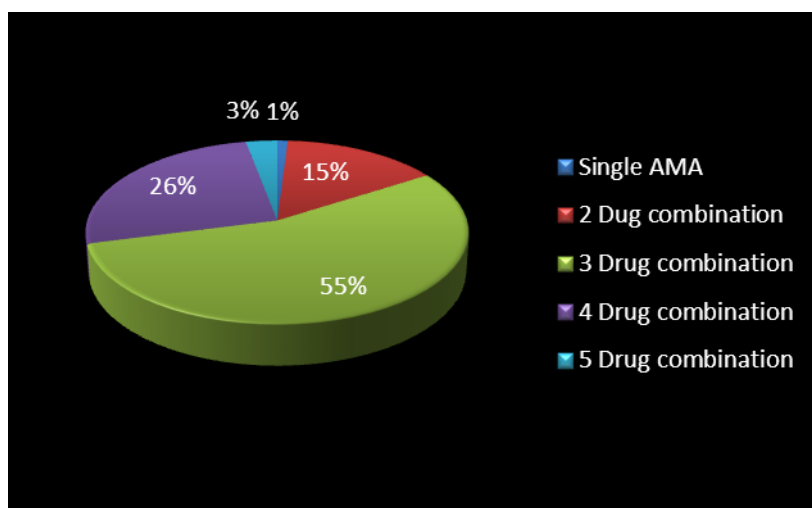
**Fig 2: Age of Patients.**



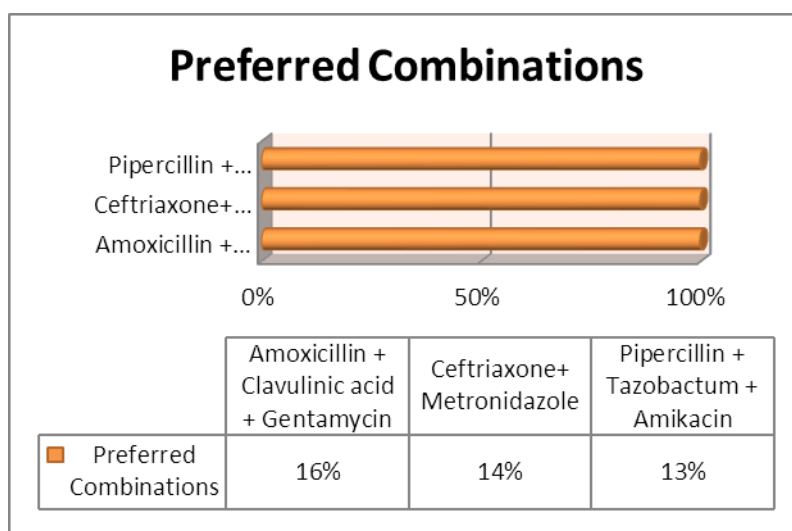
**Fig 3: Indication for ICU admission.**



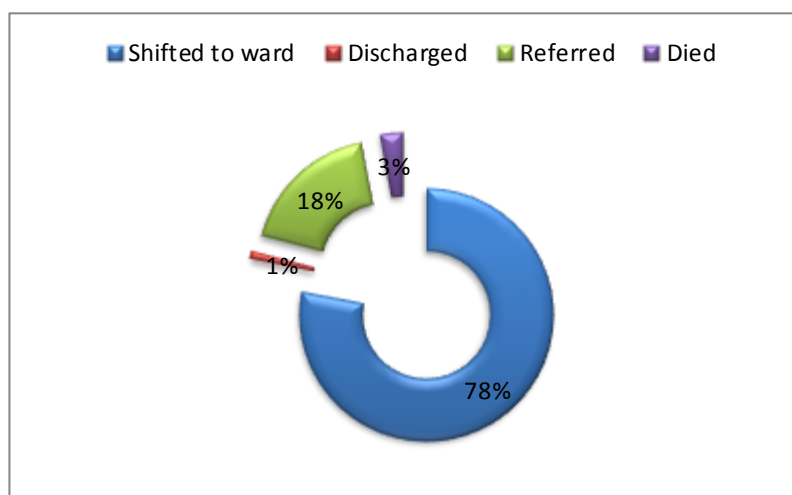
**Fig 4: Antimicrobial agents prescribed in ICU.**



**Fig 5: Percentage of Combination of drugs used.**



**Fig 6: Preferred Combinations of drugs.**



**Fig 7: Outcome of the Patient.**

## DISCUSSION

Infections are an everyday problem in the intensive care unit (ICU) and antibiotics are therefore commonly used in this setting. <sup>[7]</sup> The present study was done in 300 patients admitted in Medicine ICU in Rajarajeswari Medical college and hospital where we found that female admission were more than males with a mean age of 55 years. This is in contrast to the studies conducted in Nepal. <sup>[8]</sup> Which showed male predominance. Smythe et al. study showed equal number of male and female patients admitted with a mean age of 65 years. <sup>[9]</sup> Other Indian study reported male predominance. <sup>[10]</sup>

Respiratory infection and abdominal infections were the most common indication for the use of AMA's in our study which is synonymous with the study conducted by Lisa Jenny John et al. <sup>[11]</sup> which showed sepsis, acute renal failure, acute respiratory distress syndrome, pneumonia and lower respiratory tract infections as the common reason for the use of AMA's.

In this present study Ceftriaxone was the preferred AMA followed Amoxicillin+Clavulanic acid, Piperacillin/Tazobactam, Metronidazole which is in contrast to a study reported from 35 German ICUs, the most commonly used antibiotic was penicillin with a beta-lactamase inhibitor followed by quinolones and second generation cephalosporins. <sup>[12]</sup> And Shankar et al. <sup>[13]</sup> where ceftriaxone was prescribed in patients as initial therapy followed by ampicillin, amoxicillin, metronidazole, ciprofloxacin and crystalline penicillin.

Higher utilization of cephalosporins was noticed in our study which is similar to Usluer G et.al study. <sup>[14]</sup> Cephalosporins are commonly prescribed due to their relatively lower toxicity and broader spectrum activity. Cephalosporins often used in combination with aminoglycosides due synergistic activity and broader coverage of organisms for several serious gram negative infections. In our study only 1% of the admitted patients got single antimicrobial therapy, 15% received 2 drug combination, 3 drug combination in 55% and 4 drug combination in 26% and 5 drug combination in 3% of the patients which is comparable to a data reported in a literature. <sup>[15]</sup> Which should average no of AMA's per patient is 5 and a study conducted Vandana A Badar et al. <sup>[16]</sup> reported usage of multiple AMA's.

Amoxcillin, Clavulanic acid and Gentamycin most preferred drug combination as per our study which is similar to Biswal et al study. <sup>[17]</sup> And in contrast to John et al. <sup>[11]</sup> where Cefoperazone + sulbactam combination was the most preferred drug combination.

Our study reveals that the number of AMA's used per patient were much more than required which increased the risk of drug interactions, development of bacterial resistance and the hospital costs. Hence there is a need for improvements. Formulation of strict antibiotic restriction policy and implement protocols for antibiotic usage is a must.

## CONCLUSION

This Study shows multiple drug combination therapy being widely used which is irrational. Hence the use of AMAs requires great caution with close monitoring for optimizing their efficacy. Antibiotic resistance is increasing at an alarming rate leading to increasing morbidity, mortality and treatment cost. Hence Antibiotic policy should be employed and followed in every hospital.

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