

RATIONALE OF ANTIBIOTIC PRESCRIPTION IN PATIENTS VISITING A TERTIARY CARE SOUTH INDIAN HOSPITAL

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ABSTRACT

Objective: Antimicrobials are the class of drugs that are used irrationally in most cases leading to rise in instances of antimicrobial resistance altering the effect of such agents. Antimicrobial resistance has become a critical issue universally nerving the need to monitor the utilization pattern and rationality in prescribing of antibiotics. This helps in selection of most appropriate antibiotic for the specific patient and achieving the goals of the therapy.

Methods: A prospective cross-sectional study with a sample size of 600 participants was conducted in department of general medicine of a tertiary care hospital. Inpatients prescribed with antibiotics were included in the study and their case sheets were reviewed to analyzing the prescribing pattern. The medication usage pattern was then assessed for rationality in prescribing was evaluated. The results obtained were statistically analyzed using SPSS Software.

Results: It is noted that a more number of males participated and the greatest number of the patients were from the age group of 31-45. The diagnosis found in the majority of the patients was respiratory tract infection followed by others. On scrutinizing the prescriptions, it was noted that cephalosporins and penicillins were most often prescribed, and on an average single, antibiotic was frequently used with the preferred route of administration in most of the prescriptions being injection route. Though many of the antibiotics were prescribed empirically, it was observed that 59% of them were most appropriately dosed and maximum patients that are around 57% were cured from their illnesses.

Conclusion: This study provided important baseline information on antimicrobial use within a large tertiary care teaching hospital and identified potential targets for future antimicrobial stewardship programs. The culture and sensitivity testing suggested that the drug resistance was more for most commonly prescribed antibiotics in the hospital. Increased targeted prescribing based on sensitivity tests will bring down the high use of empiric broad-spectrum antibiotic use.

Keywords: Antibiotics, Rationality, Microbial Resistance, Stewardship, utilization.

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INTRODUCTION

Antimicrobials are the significant class of drugs that are prescribed by the physicians against various bacterial infections. They are produced by microorganisms naturally or may be produced synthetically in laboratories. Antibiotics act by either killing the microorganisms that is bactericidal agents or suppress their growth that is bacteriostatic agents [1].

Infection was a major cause of morbidity and mortality, before the development of antibiotics. The treatment of infections faced a great challenge during those periods. Later in 1928, the discovery of Penicillin, a beta lactam antibiotic, by Alexander Fleming opened up the golden era of antibiotics. It marked a revolution in the treatment of infectious diseases and stimulated new efforts to synthesize newer antibiotics. The period between 1950s and 1970s is considered the golden era of discovery of novel antibiotic classes, with very few classes discovered since then [2].

This class of drugs has evolved the course of modern medicine and is widely used in the patients admitted to the intensive care department; however, there has also been increase in the usage of antibiotics irrationally [2].

Inadequate medical training, lack of diagnostic facilities, widespread availability and usage of irrational fixed dose antimicrobial medication

combinations, and neglecting the basic principles of antimicrobial selection and administration are few common factors that contribute to irrational antimicrobial use [3].

Undiscriminating and overuse of antibiotics is a global issue particularly in developing countries with predominance of infectious diseases as a result of which there is an increased incidence of resistance to most common bacteria thereby subsiding the effect of antibiotic, increased treatment cost, longer hospital stay, and adverse drug reactions [4].

Physicians as well as self-medication by patients, liberally using these drugs has led to increasing concern over the risk of development of resistance to antibiotics, known as Antimicrobial Resistance [5]. AMR has now become a serious public health problem limiting the prescriber's choice of specific antibiotics and forcing them to choose a drug which may be expensive, moderately effective against the infection or may even is toxic therefore increasing the morbidity and mortality [6] Such increasing resistance to antibiotics around the world alarms the need to improve the surveillance of usage of antibiotics by assessing their prescribing patterns and to strictly adhere to rationale prescribing of antibiotics and its use [7].

Rational use of drugs means that the patient receives medication appropriate to their clinical needs, in doses that meet the individual requirement for an adequate period of time, and at an economical

price to the individual and overall to the community [8]. The “Rule of Right” – right medicine in the right manner (dose, route, frequency, and duration of administration) in the right patient at right cost – must be followed while using antibiotics [3]. Therefore, appropriate and safe use of antibiotics in healthcare system is more important not only for economic reasons, but also it plays a key role in achieving the quality care for patients [9].

Quantifying the extent to which irrational use of drugs take place is the first step toward decreasing it. The World Health Organization (WHO) in collaboration with the International Network of Rational Use of Drugs (INRUD) in the 1990s had laid down a set of indicators to estimate the utilization of drugs by healthcare facilities. They are particularly used in three general areas of primary care to measure the performance of rational drug use and are known as core drug indicators. They are prescribing indicators, Patient care indicators and facility indicators. These indicators have been successfully implemented in many developing countries because of its proven

feasibility and applicability and hence effectively increase the evaluation of drug usage patterns [4].

NICE Guidelines are the recommendations that focus on educating individuals about how to properly use antimicrobial drugs (including antibiotics) and the risks of overuse and misuse. It also covers infection prevention and control techniques that can reduce the need

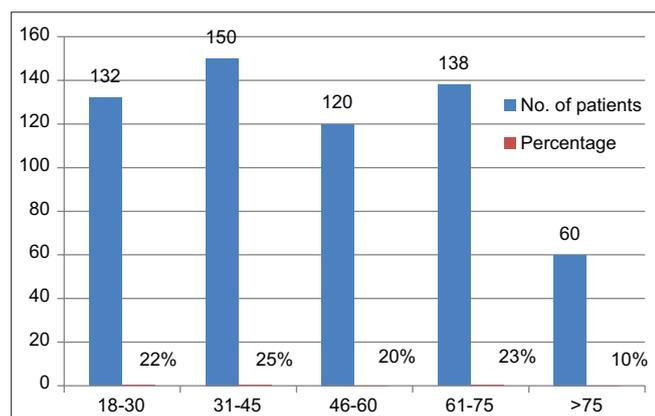


Fig. 1: Age wise distribution among the patients in the study

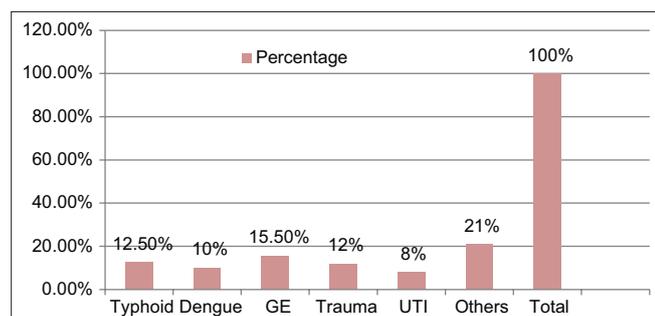


Fig. 2: Prescription differentiation based on diagnosis

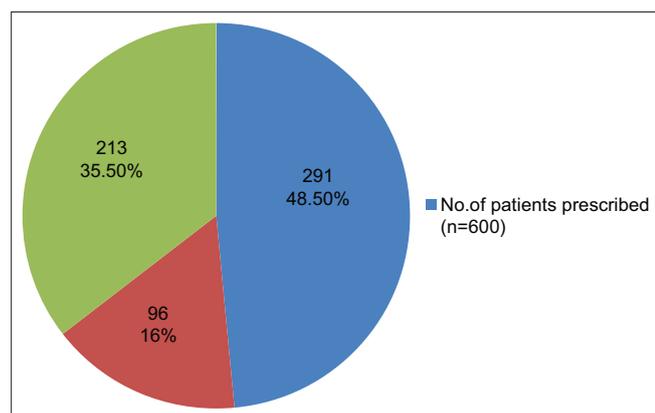


Fig. 3: Reasons for antibiotic prescription

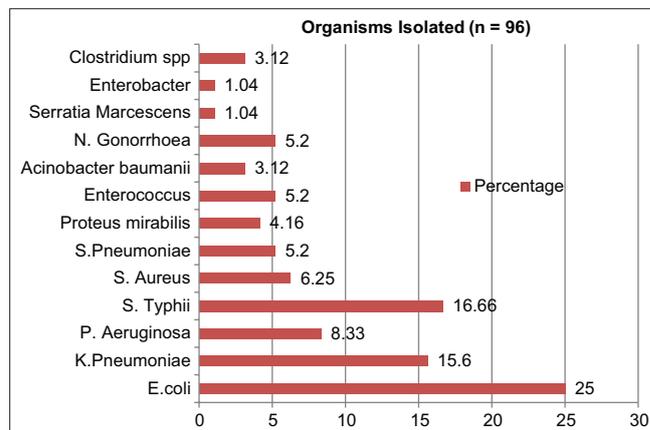


Fig. 4: Organisms isolated

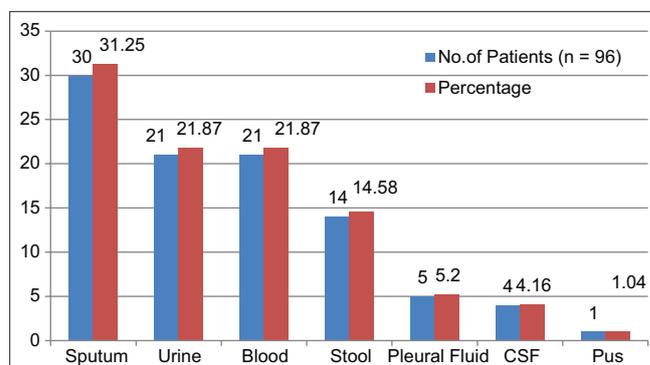


Fig. 5: Specimen sample used for culture sensitivity

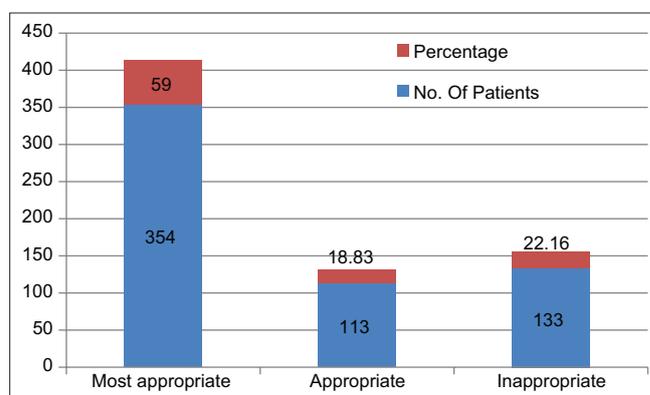


Fig. 6: Appropriateness of antibiotic therapy

Table 1: Gender wise distribution among the patients in the study

Gender	No of patients	Percentage
Male	348	58%
Female	252	42%
Total	600	100%

Table 2: Class and type of antibiotics prescribed

Class of antibiotics prescribed	Type of the drug	Number of prescriptions	Prescription percentage
Cephalosporins	Ceftriaxone	306	36.64%
	Cefoperazone		
	Cefixime		
	Cefuroxime		
Fluoroquinolones	Cefpodoxime	96	11.49%
	Levofloxacin		
	Ciprofloxacin		
	Ofloxacin		
Antiprotozoals	Metronidazole	62	7.42%
Macrolides	Clarithromycin	41	4.91%
	Nitrofurantoin		
	Azithromycin		
Penicillins	Piperacillin	293	35.08%
	Ampicillin		
	Amoxicillin		
Aminoglycosides	Amikacin	27	3.23%
Oxazolidinones	Linezolid	7	0.83%
Lincosamide	Clindamycin	3	0.35%
Total		600	100%

Table 3: Therapeutic outcomes of antibiotics

S. No.	Therapeutic outcomes	No. of patients (n=600)	Percentage
1	Cured	342	57
2	Controlled	192	32
3	No improvement	66	11

for antimicrobials and the spread of infection to others. Its goal is to alter people's behavior to minimize antimicrobial resistance and the propagation of resistant bacteria [10].

The goal of prescribing pattern research is to track, assess, and advise changes to practitioners' prescribing behaviors to make medical care more reasonable and cost-effective [11]. Antibiotic consumption patterns must be understood in order to handle difficulties that occur from various antibiotic usages constructively. It is critical that institutions and hospitals have an antibiotic policy in place and that individual prescribers make the best decisions possible. Prescribers can benefit from highly representative data, which can help them utilize antibiotics more wisely and improve the quality of their patients' treatment [9]

METHODS

A prospective, cross-sectional study was conducted for 6 months in Department of General Medicine of a 720 bedded tertiary care hospital from January 2019 to December 2019. Both inpatients and outpatients of General Medicine who were prescribed with at least one antimicrobial agent were included in the study as per the inclusion criteria. A total of 600 patients who met the inclusion criteria were selected for the study. The patients were well informed about the study, and written informed consent was obtained before including them in the study. Data were collected and recorded in a specially designed case collection form. A guideline regarding rational use of antibiotics was developed after reviewing relevant literatures, electronic database and using NICE guidelines with respect to dose, indication, frequency and duration of antibiotics. Results were statistically analyzed descriptively using SPSS software.

Inclusion criteria

- Patients above 18 years of age.
- Prescriptions with Antibiotic usage were included.

Exclusion criteria

- Pediatrics below 12 years was excluded.
- Pregnant, lactating women were excluded.

RESULTS

Out of 600 patients included in the study majority of them were males that are around 58% of the participants whereas females accounted for 42% of the participants.

Among the 600 patients who participated in the study, 132 of them were under the age group of 13–30, 150 of them were under 31–45, 120 of them were under 46–60, 138 were under the group 61–75 and only 60 of them were above the age of 75 years, maximum number of patients were in the age group of 31–45 years that is 25% of the population.

On evaluating the usage pattern of antibiotics, it is observed that cephalosporins is the class of drugs that was mostly prescribed with a prescription percentage of 36.64% followed by penicillins accounting for 35.08 % of prescriptions and fluoroquinolones accounting for 11.49% of prescriptions. Other classes of antibiotics such as antiprotozoals (7.42%), macrolides (4.91%), aminoglycosides (3.23%), oxazolidinones (0.83%), and lincosamide (0.35%) were less frequently prescribed.

Among the 600 prescriptions, the most common diagnosis was found to be respiratory tract infection in 21% of prescriptions followed by gastroenteritis in 15.50% of prescriptions, typhoid in 12.50% of prescriptions, and trauma in 12% of prescriptions. Diseases such as dengue and urinary tract infections were comparatively less commonly encountered in only 10% and 8 % of prescriptions, respectively. Other diagnosis accounted for around 21%.

On evaluation of reasons for prescribing antibiotics, it is noted that majority of them were prescribed empirically that is 48.5%, and 16% of them were prescribed based on bacteriologically proven infections while 35.5% were prescribed for non-bacteriologically proven infections.

Out of 600 patients, 342 (57%) of them had their ailments cured and around 192 (32%) showed a control over their infections with the use of antibiotics, however 66 (11%) of them had no improvement at all.

On conducting culture sensitivity test *E. coli* was mostly isolated organism in around 24 patients followed by *S. Typhi* in 16 patients, *K. pneumoniae* in 15 patients, *P. aeruginosa* in 8 patients and *S. aureus* in six patients.

S. pneumoniae, *N. gonorrhoea* and *Enterococcus* were isolated in five patients. *Proteus mirabilis* was found in four patients. Three patients

each were infected with *Acinobacter baumannii* and *Clostridium* spp. *Serratia marcescens* and *Enterobacter* were isolated from only one patient each.

Sputum sample was widely used with 31.25% followed by urine and blood sample at 21.87%, stool (14.58%), pleural fluid (5.2%), CSF (4.16%), and pus (1.04%).

When the appropriateness of dosing of antibiotics was evaluated maximum prescriptions that is 354 (59%) were most appropriate whereas 113 (18.83%) prescriptions had appropriate dosing, whereas 22.16% were found to be inappropriate, (22.16%) were found to be inappropriate.

DISCUSSION

In our study, male patients were predominant and the age of the patients ranged between 31 and 45 years were found to be high. The results revealed that out of 600 prescriptions, 835 antibiotics were prescribed to the study population. The most commonly prescribed antibiotics were cephalosporins (36.64%), followed by Penicillins (35.08%). These results were similar to a study done by Raphael [6]. 78% of prescriptions had 1 antibiotic followed by 20% of prescriptions having 2 antibiotics. A similar study was done by Abdel Salam Mohamed Elfaki and reported that cephalosporins to be used in 1/3rd of the prescriptions especially ceftriaxone [12,13]. 59% (354) of prescriptions were most appropriate whereas 22.16% (133) were found to be inappropriate. Culture sensitivity test found that *E.coli* (n=96) was most isolated organism in 25% patients followed by *S. Typhi* in 16.66% patients. A study by Ambili ramesh found that *E.coli* was most identified organism [9].

CONCLUSION

This study analyzed 600 prescriptions and found that physicians used the drugs from the WHO EML. About 54% prescriptions were appropriate whereas other remaining prescriptions were found to be inappropriate which shows that there is a need to develop empiric antibiotic guidelines as to guide clinicians in appropriate antibiotic prescribing. This study provided important baseline information on antimicrobial use within a large tertiary care teaching hospital and identified potential targets for future antimicrobial stewardship programs. The culture and sensitivity testing suggested that the drug resistance was more for most commonly

prescribed antibiotics in the hospital. Increased targeted prescribing based on sensitivity tests will bring down the high use of empiric broad-spectrum antibiotic use. Irrational use of drugs can be detected by frequent prescription auditing.

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