



## ASSESSMENT OF PRESCRIPTION ERRORS RELATED TO ANTIMICROBIALS-A PROSPECTIVE STUDY

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### ABSTRACT

Prescription errors related to use of Antimicrobial agents (AMAs) basing on Patient's demographics viz. age & sex and a database was constructed for such awareness program. From 150 prescriptions, the error regarding prescription of antimicrobial agents without hypersensitivity test or diagnosis of specific parasite male patients shown a higher proportion (92%) followed by the female patients (87.8%). The data revealed that such errors were almost in a similar proportion in the male patients and female patients (51.3% and 51.2% respectively). Unauthorized synergistic combinations of antimicrobial agents with low therapeutic index were greater in male patients (20.27%) than in female patients (14.63%). Prescribing mistakes need to be acknowledged, taken seriously, discussed openly, and actions taken in a blame free culture. Pharmacists' collusion in the current low profile of prescribing mistakes, giving verbal feedback to the prescriber, or writing on sticky notes must be stopped

### KEY WORDS

Antimicrobial agents, adverse drug event, statistical process control, gastro intestinal tract.

### INTRODUCTION

The advent of antimicrobial agents changed the outlook of the physician about the power these drugs can have. They are one of the few curative drugs and their importance is magnified in developing countries, where infective diseases predominate. As a class they are one of the most frequently used as well as misused drugs. Currently, a majority of AMAs are employed in daily practice to treat infective as well as other diseases. The most serious misconsequence of this practice is the development of resistance in the population. A study has shown that a prescription of antibiotics taken with not more than five days doubles the chances of patients carrying antibiotic resistant bacteria. The same effect was not seen in patients who had taken antibiotics atleast for the period of five days.<sup>1</sup> The development of permanent resistance by bacteria and fungi against antibiotics cannot be prevented in the longer-term. Health care systems have been traditionally operated under the assumption that if care providers are well educated and follow well developed policies or guidelines, errors will not happen. This is in fact not the case. Errors reoccur despite the best educational and



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planning efforts. On the basis of above definitions, we can now clearly define the prescription error. The errors arising in the treatment of a patient are a medication error. It may arise at any stage of treatment like diagnosis, prescribing, dispensing or administration of the drug by the patient. If the error occurs at prescription stage, this may be referred to as prescription error. A clinically meaningful prescribing error occurs when as a result of a prescribing decision or prescription writing process, there is an unintentional significant reduction in the probability of treatment being timely and effective or increase in the risk of harm when compared with generally accepted practice.<sup>2</sup> Such an error can be prevented from giving an adverse drug event by an interception of a person involved in the system. Hence the adverse drug events arising from prescription error can be classified as preventable adverse drug event.<sup>3</sup> In terms of the components of the prescribing process, most of the errors concerned with selection of the drug dose. This was also found to be the case in previous US studies.<sup>4, 5, 6, 7</sup> An ADE is one that is "noxious and unintended and occurs at doses used in man for prophylaxis, diagnosis, therapy or modification of physiologic functions.<sup>8</sup> ADEs are common in most clinical settings including adult inpatients with a reported incidence of 6.5%,<sup>4</sup> adult outpatients with an incidence of 27.4%<sup>9</sup> and pediatric inpatients with a reported incidence of 2.3%.<sup>10</sup> The intended work is to assess the frequency and type of prescription errors related to use of AMAs and to construct a database for such awareness program.

### MATERIAL AND METHODS

The study was conducted on 150 prescription of out patients in Moradabad city. Prescriptions from newly registered patients were included in this study. Once the consultation by the physician was over, the prescriptions were copied and the following indicators were determined.

**Study period:** The study was carried out for the period of three months from Feb-April, 2008

**Study design:** Prospective – Observational study

**Patient selection:** All the out patients who were prescribed with antibiotics were selected for the study.

**Study Procedure:** The intended work was divided into the five steps:

Step 1: to collect the prescriptions randomly.

Step 2: to separate the prescriptions with AMAs and the ones without AMAs.

Step 3: to divide the prescriptions into various age groups.

Step 4: to find out the errors regarding the use of AMAs in the following aspects:

- Combinations of drug with the AMAs which interact to the pharmacokinetics of AMAs.
- Improper synergistic combinations of AMAs.
- Dose of AMAs.
- Combinations of drug with AMAs which may give serious ADR.



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Step 5: to count the number of prescriptions with each type of error in the different age groups represent them statistically and to find out the total number of prescriptions with errors related to AMAs.

### RESULTS

From 150 prescriptions, in which 61.33% (n=92) were male and (38.67%) (n=58) were female. Among these patients the highest number was in the adults & geriatrics (65.33%) and lowest in neonates & adults (4.0%). The demographic data is shown in Table 1.

**Table 1.**  
*Demographic characteristics of patients*

| Sl. No | Age group                                 | Males      | Females    | Total (group wise) |
|--------|---|------------|------------|--------------------|
| 1      | Neonates & adults<br>(1 month to 2 years) | 03(2%)     | 03(7.33%)  | 06                 |
| 2      | Child<br>(2 years to 12 years)            | 11(7.33%)  | 10(7.33%)  | 21                 |
| 3      | Adolescent<br>(12 years to 18 years)      | 20(13.33%) | 05(3.33%)  | 25                 |
| 4      | Adults & geriatrics<br>(Above 18 years)   | 58(38.67%) | 40(26.67%) | 98                 |
| 5      | Total (sex wise)                          | n=92       | n=58       | n=150              |

115 were containing one or more anti-microbial agents as the prescribed item of which 7.8% were containing topical preparations of antimicrobial agent. Female predominance (9.8%) was observed over male patients (6.8%). Parenteral routes were used with a lower frequency (7%) with 5.4% in male patients and 9.8% in female patients. Orally administered antimicrobials were found to be prescribed with a very high frequency of 85.2%. (91.6% in male patients and 80.5% in female patients). The results are shown in Table 2.

**Table 2.**  
*The preferred routes of administration of AMAs in the prescriptions*

| Sl. No | Route      | Males | Females | Total (route wise) |
|--------|------------|-------|---------|--------------------|
| 1.     | Topical    | 6.8%  | 9.8%    | 7.8%               |
| 2.     | Oral       | 91.6% | 80.5%   | 85.2%              |
| 3.     | Parenteral | 5.4%  | 9.8%    | 7.0%               |



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Of the 150 prescriptions containing antimicrobial agents, an overall error rate was found to be 79.13% of which 79.73% was related to male patients and 78.05% in female patients. The error rates were found to differ significantly in different age groups (50% in neonates and infants as a whole, 80% in children, 78.8% in adults & geriatrics and 90.3% in adolescents); this is presented in Table 3.

**Table 3.**  
*Percentage prescription errors in different age group patients*

| Sl. No | Age groups           | Males | Females | Total ( group wise) |
|--------|----------------------|-------|---------|---------------------|
| 1.     | Neonates and infants | 66.3% | 33.6%   | 50%                 |
| 2.     | Children             | 72.7% | 88.9%   | 80%                 |
| 3.     | Adolescents          | 94.4% | 90%     | 90.3%               |
| 4.     | Adults & geriatrics  | 78.6% | 79.2%   | 78.8%               |
| 5      | Total (sex wise)     | 79.7% | 78.1%   | 79.13%              |

Errors related to the combination of antimicrobial drugs with the drugs affecting pharmacokinetics of the given antimicrobial were found to be 35.7% and the combinations that interact in any other way which may give rise to serious adverse drug reaction was found to be 22.6%. Dose related error was found to be 23.47% and the error related to the choice of combination of anti-Infective was found to be 18.26%. Some of the important errors are summarized in Table 4.

**Table 4.**  
*Percentage prescription errors of antimicrobial administered in combination with some other drug*

| Sl. No | Error                        | Male   | Female | Total  |
|--------|------------------------------|--------|--------|--------|
| 1.     | Pharmacokinetic interactions | 33.8%  | 39%    | 35.7%  |
| 2.     | Pharmacodynamic Interactions | 27.03% | 14.6%  | 22.6%  |
| 3.     | Dose related                 | 20.3%  | 29.3%  | 23.48% |
| 4.     | Very low therapeutic index   | 20.27% | 14.63% | 18.26% |

Of the prescriptions neglecting the nutritional supplements, it was found that the adolescent age group was receiving 74% prescriptions having such an error and this was followed by children group (60%) and adult & geriatrics (39%). The data showed that such errors were almost in a similar proportion in the male patients and



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female patients (51.3% and 51.2% respectively). The outcome of management of nutritional supplements is given in Table 5.

**Table 5.**

*The percentage of prescriptions prescribing systemic AMAs without any nutritional supplement*

| Sl. No | Age groups           | Males  | Females | Total ( group wise) |
|--------|----------------------|--------|---------|---------------------|
| 1.     | Neonates and infants | 66.7%  | 66.7%   | 66.7%               |
| 2.     | Children             | 54.5%  | 66.7%   | 60%                 |
| 3.     | Adolescents          | 77.8%  | 60%     | 74.0%               |
| 4.     | Adults & geriatrics  | 38.1%  | 41.7    | 39.4%               |
| 5.     | Total (sex wise)     | 51.35% | 51.22%  | 51.3%               |

### DISCUSSION

Our analysis shows that most of these reports are accurate and reflect true errors based on expert clinician review. Most of the errors fell fairly equally into the categories of interactions, dosing, improper diagnosis and unauthorized combinations.

Medication errors are probably the most prevalent form of medical error, and prescribing errors are the most important source of medication errors. interventions are needed at three levels to improve prescribing: by improving the training and test the competence of prescribers; control the environment in which prescribers perform in order to standardise it, have greater controls on riskier drugs, and use technology to provide decision support; and change organisational cultures, which do not support the belief that prescribing is a complex, technical act, and that it is important to get it right. Solutions involve overt acknowledgement of this by senior clinicians and managers, and an open process of sharing and reviewing prescribing decisions.<sup>11</sup>

Prescribing error is the most serious error. Once an error has been made, unless detected, it will be systematically applied and can result in significant harm or death. In United Kingdom hospitals, prescribers make errors in 1.5% of prescriptions.<sup>12</sup> Despite this prescribing is a relatively neglected skill. There is no simple, or single, solution to its improvement; rather, a range of different measures is needed in order to make a significant breakthrough. The most frequently used explanatory model of the causes of medical error has been taken from Reason's studies of the causes of disasters in high risk industries. It can be described with some simplification as studying the disaster from three perspectives: the individual, their immediate surroundings, and the organisational culture.<sup>13</sup> while being similar to that of various studies carried out in India and the neighboring countries.<sup>14,15,16,17,18,19,20,21</sup> We have grouped our suggestions as to the sources of, and solutions to, prescribing error in three broadly comparable categories: the competence of the



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individual, the controls immediately around which an individual practices, and the culture of medicine as a whole. Much of a doctor's prescribing is personal to them and not debated in the open. Hence, it is hard for any reflective learning to occur. Pharmacist's correction of prescriptions is usually just discussed with the prescribers and the information does not come out into the team to discuss and learn from. Even in primary care general practitioners will rarely discuss details of their prescribing with colleagues.

### CONCLUSION

Prescribing flawlessly needs to be seen as an important act. To achieve this, senior staff, both medical and managerial, should overtly spend time on it. Prescribing mistakes need to be acknowledged, taken seriously, discussed openly, and action taken in a blame free culture. Pharmacists' collusion in the current low profile of prescribing mistakes, giving verbal feedback to the prescribers, or writing on sticky notes, must be stopped. Their interventions need to be written in the notes and form part of a team approach to improving quality. The new primary care trusts will generally have a pharmacist advisor and although their initial agenda will probably be cost containment, improvements in specific areas of prescribing, such as use of antimicrobial agents are equally important.

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