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Prescription auditing and drug utilization evaluation of antimicrobials in indoor patients of general medicine department at tertiary care teaching hospital in eastern Uttar Pradesh

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Abstract
Introduction: Drug Utilization Evaluation play a key role in managing healthcare system to understand, interpret, evaluate and improve the prescribing, administration and use of medications
Objective: Most of the antibiotic utilization is empirical leading to their irrational prescriptions. Our present study aims in accessing the drug utilization pattern of Antimicrobials (AMAs) usage in a tertiary care hospital which helps in accessing rationality that aid in monitoring the drug efficacy and other factors related to patient safety.
Methods: A prospective observational study was conducted for a period of Six months from March 2019 to August 2019 in the Medicine department at GMC, Azamgarh (UP).
Results: A total of 220 prescriptions were analyzed. Among the wide range of AMAs i.e., 825 antibiotics were prescribed where beta-lactams, cephalosporin were found in the maximum number i.e. 264(32%). Around 104 Patients i.e.47.27% was prescribed with two antibiotics, followed by 63(28.63%) patients with three antibiotics. Average numbers of AMAs prescribed were 3.75.
Conclusion: Judicious use of antibiotics will reduce the burden of multi-drug resistance, increase better patient compliance and thereby enabling better patient management and limiting the resultant morbidity and mortality.

Keywords: infections, prescriptions, rational, antimicrobials (AMAs)

1. Introduction

Antimicrobials (AMAs) are powerful and effective drugs in fighting against infectious diseases caused by bacteria and have been frequently used for decades worldwide for effective treatment of a variety of bacterial infections. AMAs have saved millions of lives since their first appearance about fifty years ago [1]. Just like a coin have two sides; antibiotics also have two-sided effects. One is in control of infection; the other is the resistance of an organism. For a decade, the problem of resistance is rising. Drug therapy plays a crucial role in improving human health by enhancing the quality of life and extending the life expectancy. A method to evaluate and improve drug use is by conducting Drug Utilization Studies (DUS).

Drug Utilization Studies (DUS) has been recommended as a method for identifying inappropriate or unnecessary drug use that monitor, evaluate and promote rational drug therapy. Several factors like irrational drug use, polypharmacy, incorrect drug choices, incorrect dose, drug interactions, have contributed to increased morbidity, mortality and health care expenses. The misuse or inappropriate use of antibiotics leads to increase in healthcare expenses, development of drug resistance and serious adverse drug reactions.

Drug Utilization Studies (DUS) is defined as an authorized, structured, ongoing review of healthcare provider prescribing, pharmacist dispensing, and patient use of medication. Drug utilization evaluations involve a comprehensive review of patient's prescription and medication data before, during, and after dispensing to ensure appropriate medication decision making and positive patient outcomes [2].

The introduction of potent drugs with an increased incidence of adverse drug reactions, the high cost of medication, misuse of drugs may result in patient morbidity and mortality. Inadequate knowledge of treatment regimens, lack of diagnostic competence have contributed to incorrect drug choices, incorrect dose, adverse drug reactions, drug interactions, and use of more expensive drugs when less expensive drugs would be equally or more effective. In recognition to this problem, Drug Utilization Studies (DUS) has been recommended as a method for identifying inappropriate or unnecessary drug use that monitor, evaluate and promote rational drug therapy. Several factors like irrational drug use, polypharmacy, incorrect drug choices, incorrect dose, drug interactions, have contributed to increased morbidity, mortality and health care expenses or use of drugs devoid of proven efficacy [3].

Prescription auditing is a type of vigilance activity, which is beneficial in clinical practice in terms of reducing the burden of disease because of medication errors, i.e. because of irrational prescribing [4].

Prescription pattern monitoring studies (PPMS) are a tool for assessing the prescribing, dispensing and distribution of medicines. Prescription pattern monitoring studies (PPMS) are drug utilization studies with the main focus on

prescribing, dispensing and administering of drugs. They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs. Our present prospective observational study of AMAs usage aims to study about the drug utilization pattern for setting appropriate interventions to identify the problems in prescribing practices and also in promoting rational use of drugs in the community. Evaluation of prescribing pattern will Promote Rational use of drugs (RUDs), minimize adverse drug reactions and will provide cost effective medical care. So, in order to monitor the prescribing pattern the present study Was designed to obtain information about demographic profiles of patients, prevalence of infectious diseases and prescribing pattern of antibiotics in medicine ward of a tertiary care teaching hospital so that these can be used judiciously.

Aim and objectives

1. To evaluate the demographic details of the enrolled patients.
2. To evaluate the drug utilization pattern of AMAs in the medicine department of a teaching hospital.
3. To observe for the co-morbid conditions of the enrolled Patients.
4. To identify the adverse drug reactions that occurs in patients undergoing treatment with AMAs.
5. To assess the prescriptions for the WHO prescribing indicators.

Material and methods

This study was prospective observational study which was conducted in the Medicine department of GMC, Azamgarh, which is tertiary care teaching hospitals providing health care services after being approved by the Institutional Human Ethics Committee and taking Informed consent from the patients. This study was conducted for a period of six months from March 2019 to August 2019. This study includes all the indoor patients being treated for various diseases in Medicine department.

Patients Selection

- **Inclusion Criteria:** Patients of all age of either sex aged <80 years getting admitted in the study site during the study period, who have been prescribed with AMAs and are willing to participate, are included in the study.
- **Exclusion Criteria:** Patients in which the AMAs are not prescribed and those who are not willing to participate in the study were excluded.

The demographic and clinical treatment data of 220 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.
- Co-Morbid Conditions
- Adverse effects of AMAs.

Statistical Analysis

Data were entered into Microsoft Excel (Windows 7; Version 2007) according to their age, gender, therapeutic category and prescription and analysis were performed accordingly. Descriptive statistics such as frequencies and percentages were calculated for categorical variables. Mean (±) and standard deviation (±) were computed for continuous variables. Graphic representations were used for visual interpretation of the analyzed data.

Results

During the study Period, a total of 220 Patients undergoing treatment with different kinds of AMAs were enrolled. Out of 220 Patients it was observed that 136(61.40%) were Male while 84(38.40%) Patients were female as shown in Figure no 1.

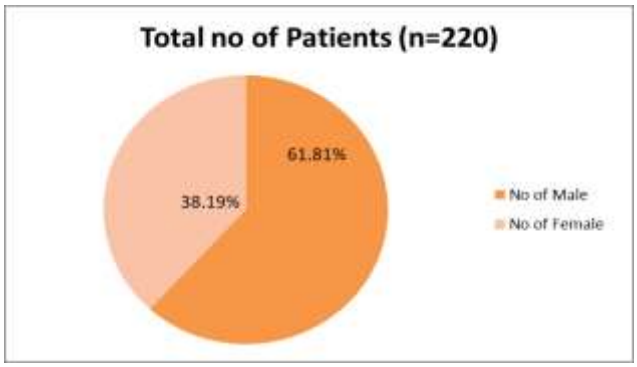

Fig 1: Distribution of Patient according to sex (n=220)

During the study Period, Out of 220 Patients it was observed that majority of Patients was in the Age group of 61-80 (34.54%) followed by Age group of 41-60 (31.81%) while Patients with age group of <19 was minimum (6.36%) as depicted in Figure no 2.

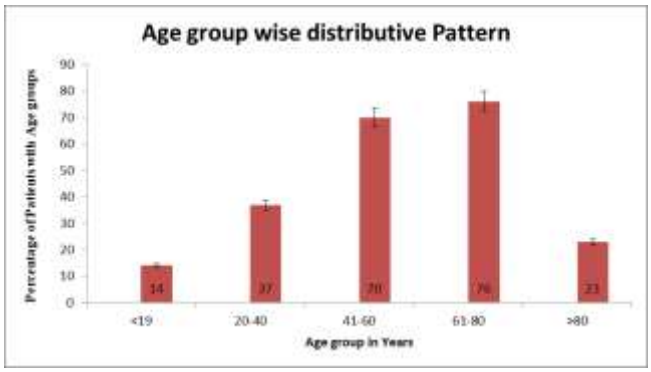

Fig 2: Age Group of Patient in years

In our study out of 220 Patients enrolled, 38(17.27%) cases were diagnosed with Typhoid for which AMAs was prescribed. Followed by it, 36 cases were diagnosed with Diarrhoea which was second highest no. of cases while only 5 (2.27%) cases were diagnosed with Myocarditis for which AMAs was prescribed which was least no of cases observed as depicted in Table no 2.

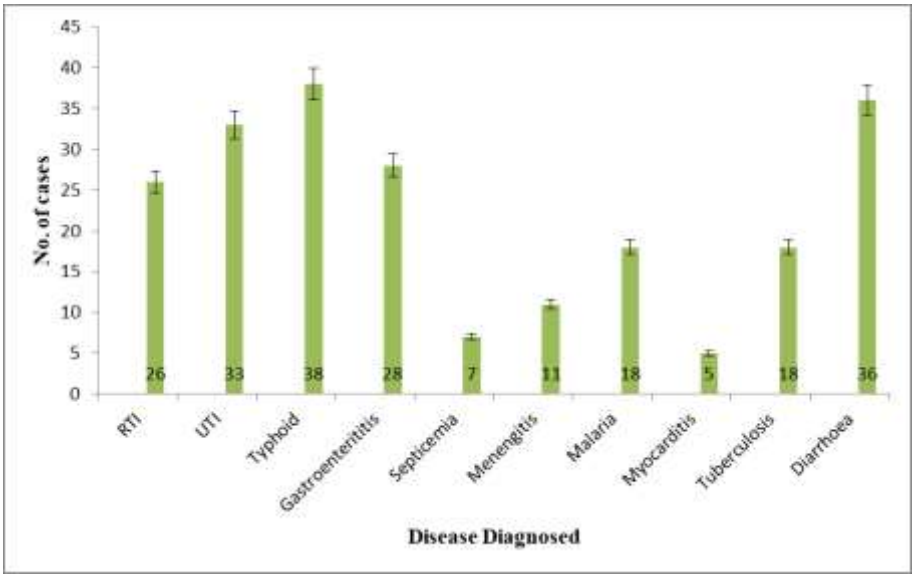

Fig 3: Names of Disease Diagnosed

Out of 220 Patients, among the wide range of AMAs Prescribed Penicillin, cephalosporins & other beta-lactams, were found in the maximum number to be prescribed 264 (32%) Followed by 149 (18.06%) Fluroquinolones class of drugs while Tetracycline was the least prescribed drugs 17 (2.06%) as shown in Table no 1.

Table 1: Names of Antimicrobials (AMAs) Prescribed

Classes of AMAs	Name of Drugs	No. of Encounters	(Percentage %)
Penicillins, Cephalosporins & other Beta-lactams	Amoxycillin + Clavaulanic acid	72	8.72
	Piperacillin + Sulbactum	26	3.15
	Ceftriaxone	31	3.75
	Cefoperazone	39	4.72
	Amoxycillin	29	3.51
	Cefixime	37	4.48
	Meropenem	12	1.45
	Cefoperazone + Tazobactum	18	2.18
Aminoglycosides and others Antibacterials	Amikacin	17	2.06
	Metronidazole	42	5.09
	Linezolid	16	1.93
	Streptomycin	28	3.39
Tetracycline	Tetracycline	17	2.06
Fluroquinolones	Norfloxacin	36	4.36
	Levofloxacin	38	4.60
	Ciprofloxacin	44	5.33
	Oflxacin	21	2.54
	Moxifloxacin	10	1.21
Macrolides	Clarithromycin	30	3.63
	Azithromycin	33	4
	Erythromycin	17	2.06
Anti-malarials	Quinine	27	3.27
	Artesuanate	25	3.03
	Primaquinine	19	2.30
Antitubercular	Isoniazid	26	3.15
	Rifampicin	26	3.15
	Pyrizinamide	30	3.63
	Ethambutol	21	2.54
	Others	38	4.60
Grand Total		825	100

Average no AMAs Prescribed/Prescription = 3.75

In the present study 106 (48.18%) were observed with ADEs out of which 30(13.63%) of patients observed Nausea & Vomiting followed by Itching (8.18%) while 9 (4.09%) patients observed CVS disorder as shown in Fig 4.

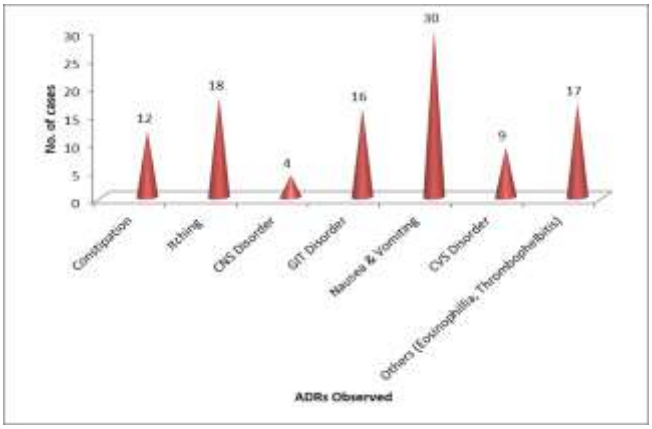

Fig 4: ADRs Observed

During the study period out of 220, 31 (14.09%) Patients had hypertension followed by 22 (7.72%) had Renal Disorder while Dyslipidemia was found in 9 (4.09%) patients as shown in Fig 5.

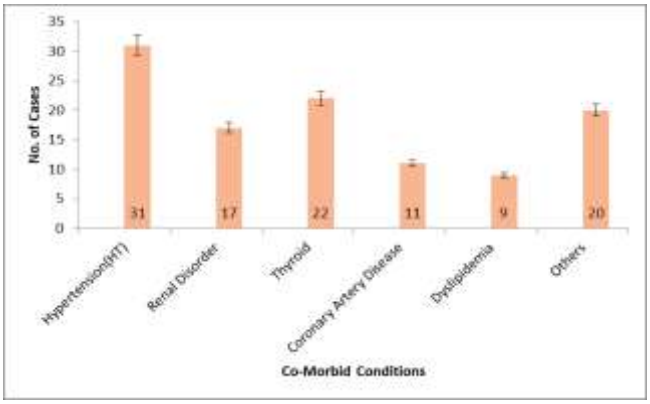

Fig 5: Co- Morbid Conditions

In our Study, out of 220 Patients 104(47.27%) patients were Prescribed with 2 Antibiotics followed by 63 Patients with 3 Antibiotics, 28 Patients with 1 Antibiotics while 25 Patients were Prescribed with >3 Antibiotics which was the least one as depicted in Figure no 6.

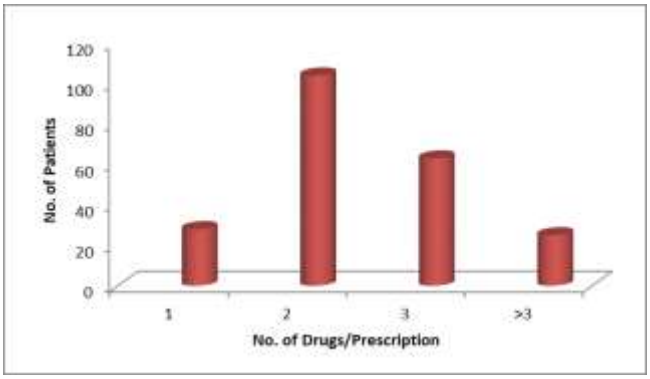

Fig 6: No. of Drugs/Prescription

Out of 220 Patients 104(47.27%) patients stayed in hospital for <5 days followed by 76(34.54%) for 5 days while only 40(18.18%) patients stayed for > days as shown in Table 2.

Table 2: Duration of Hospital stay

Duration of Hospital stay	Total no. Patients	Percentage (%)
<5	104	47.27
5	76	34.54
>5	40	18.18
Total	220	100

During the study out of 220 Patients 137(62.27%) patients were prescribed AMAs for treating Infection while 66(30%) patients Prophylactically and 17 (7.72%) patients Symptomatically respectively as shown in Table 3.

Table 3: Indications for AMAs Use

Indications for AMAs Use	Total no. Patients	Percentage (%)
Infection	137	62.27
Prophylactic	66	30
Symptomatic	17	7.72
Total	220	100

In our study 188(85.45%) patients were prescribed oral medication and 32(14.54%) were prescribed Parenteral medication while 184 (83.63%) patients with Generic name while 36(16.36%) patients with Brand names as shown in Table 4.

Table 4: Other parameters

Other parameters		
Routes of Administration of Drugs	**No. of Patients**	**Percentage (%)**
Oral	188	85.45
Parenteral	32	14.54
Total	220	100
Drugs prescribed by generic/brand name	No. of Patients	Percentage (%)
Generic Name	184	83.63
Brand Name	36	16.36
Total	220	100

Discussion

C in prescriptions. Irrationality is the leading cause of resistance. Avoidance of resistance and rationality can be improved by prescribing a least possible dose of antibiotics for the shortest possible duration with lowest economic consideration [5]. Therapy or treatment duration of antibiotics should be as per the standard treatment guidelines laid. Over or under the prescription of antibiotics may result in either treatment failure or side effects. So drug utilization evaluation is a tool in accessing the rationality of prescription [6].

Our Present study has shown that gender categorization revealed that the overall study population was predominantly male population. A research study conducted by Meher BR *et. al* shown majority of male patients, which was in correlation to our study [7]. In our study Age distribution was analyzed and it was observed that most of the prescription were in the age group of 61-80 years followed by 41-60 years which is very much similar to a

study conducted by Mujtaba Hussain *et. al*. [8] who also reported that most of prescription were in age group of 46-60 years while our results were contradictory to the result of Gowthami *et al.* [9] who reported that antibiotic prescription was found to be major in the age group of 21-40 years.

Our study has shown that Typhoid was the most common cause for prescribing Antibiotics followed by Diarrhea and UTI. Similar findings were observed in a study conducted by Meher BR *et. al*. [7] who reported typhoid to be the most common cause for Antibiotic use. Beta-lactams, Cephalosporins and Fluroquinolones were the most commonly prescribed antimicrobial classes. This is quite in correlation to the study conducted Khan FA *et al*. [10] In our study average no AMAs Prescribed per Prescription was found to be 3.75 which is contradictory to the findings of Meher BR *et. al*. [7] who reported average no AMAs Prescribed per Prescription to be 1.8.

In the present study 106 ADRs were observed among which Nausea & vomiting was most commonly observed ADRs. Male were more prone to ADRs than female. In a study conducted by M. Shamna *et. al*. [11] also reported males to be more predominant than females in ADR occurrence. In our study Hypertension was found to be most common co-morbid conditions which may be due to intake of patients of higher age group while duration of hospital stay was found to be less than 5 days in most of patients. Not much of the literature has been found on the co-morbid conditions and duration of hospital stay.

In our study two antibiotic usages were seen in majority of patients followed by three drug usage which is similar to the findings of Gowthami *et al*. [9] while it is contradictory to a study conducted by Syed MHN *et al* who reported [12] that more than half of the patients taken into the study were with a single antibiotic followed by two antibiotic usages. The common indication for use of antibiotic was infection (62.27%) followed by prophylactic (30%) & symptomatic (7.72%) which is contradictory to the findings of Suping Hu *et al*. [13] & Bosu W.K *et al*. [14] who reported percent of patients treated for infections was 45% percentage of Patients used Prophylactically was 11%. In our study 188 patients was prescribed with oral drugs and 32 patients was prescribed with parenteral drugs while 184 patients was prescribed with Generic name and 36 patients was prescribed with Brand name.

The present study analyzed the antimicrobial drug utilization of patients admitted to the medical department of the hospital setting. The purpose of inpatient based prescription audit has the advantage of minimizing the 'drop-outs' as patients had to purchase and take the prescribed drugs and limitation of the study was a qualitative assessment of antimicrobial drug.

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. 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'.

Finally, we conclude that that cautious and judicious use of antibiotics will reduce the burden of multi-drug resistance and thereby enabling better patient management and limiting the resultant morbidity and mortality. This will help in rationalizing prescribing practices based on the feedback from these studies and practices between institutions, regions and countries can be compared.

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