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## EVALUATION OF DRUG UTILIZATION PATTERN IN INDOOR PATIENTS OF MEDICINE DEPARTMENT AT TERTIARY CARE TEACHING HOSPITAL IN SOUTHERN RAJASTHAN

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### Keywords:

Drug Utilization, Medicine Indoor Patients, PDD, DDD, Polypharmacy

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**ABSTRACT: Aims:** To study and evaluate the pattern of drug utilization by using WHO/ INRUD indicators in medicine indoor patients. **Methodology:** A prospective cross sectional observational study was done on patients admitted in medicine indoor. Information regarding age, gender, occupation, income group, diagnosis, patient's present/past medical history, number of days of hospitalization, treatment, any ADR, investigations and outcome were recorded in a proforma. Drug utilization pattern was evaluated using quality indicators of drug use recommended by WHO. PDD of antibiotics and maximally used drugs were analyzed and ratio of PDD and DDD was calculated. **Results:** Total 200 patients were included, 62% were male and 38% were female. Maximum numbers of patients were admitted for infectious diseases (24%). Pantoprazole was the maximum utilized drug and among antibiotics, ceftriaxone was maximum utilized antibiotic. Average number of drugs prescribed per encounter was  $7.35 \pm 2.36$  and average stay in the hospital was 4.92 days. Oral route (42.8%) was most preferred route. Average cost for treatment per day was Rs 157.6. Maximum financial burden was due to anti-snake venom and minimum due to Clarithromycin. **Conclusion:** Prescription by generic name and from essential list, preference of oral route, and free government supply are encouraging findings. Poly-pharmacy, over use of proton-pump inhibitors and over dosing of some antibiotics are areas of concern. There is a need of more of such studies including larger number of patients and other departments.

**INTRODUCTION:** Drug utilization research as defined by WHO in 1977 is 'the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences'<sup>1, 2</sup>. It provide information about pattern, quality and outcome of drug use. Pattern of drug utilization is studied to estimate the incidence and prevalence of drug use, to analyze that the recommended guidelines for prescription are being followed or not.

The aim of drug utilization study is to promote rational and appropriate use of drugs at lowest possible dose and cost<sup>3-5</sup>. WHO has specified prescribing indicators, patient care indicators, facility indicators and complementary indicators for planning and conducting drug utilization studies.

To compare, analyze and present statistical data of drug utilization research, the anatomical and therapeutic chemical (ATC) classification systems is accepted worldwide and also recommended by WHO. It is used by international drug monitoring centre Upssala, a WHO collaborating centre for classification of ADRs. Defined daily dose is average maintenance dose per day and used as a comparable unit. Prescribed daily dose (PDD) may not be equal to DDD. It is a rough estimate of drug utilization<sup>6, 7</sup>.

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Rational prescribing of drugs is a skill, for which proper knowledge about drugs, pharmacoconomics, pharmacovigilance and experience is mandatory. If the drugs are overused, they increase occurrence of toxic reactions, if underused, there will be therapeutic failure and Chances of development of resistant strain to antibiotics, if misused will lead to unnecessary adverse drug effects and drug interactions<sup>8,9</sup>.

Very few studies are available nationally and internationally which have observed drug utilization in indoor patients of general medicine and no study is available from Rajasthan. So present study was planned to develop a baseline prescription pattern, to evaluate prescription as per WHO quality indicators, apply ATC classification and cost analysis of prescribed drugs in indoor patients of medicine department of a tertiary care teaching institute in southern Rajasthan.

## MATERIAL AND METHODS:

### Study design:

It was a prospective cross sectional observational study.

### Study setting:

This study was conducted in medicine indoor of a tertiary care teaching hospital in southern Rajasthan over a period of one year in 2014-2015.

### Ethical approval:

Research protocol, data collection form and informed consent form (Hindi/English) were approved by the Institutional Ethics Committee.

**Inclusion criteria:** Patients admitted in male and female medical wards.

### Exclusion criteria:

1. Subjects with severe ailments, shifted to ICU from the indoor
2. Pregnant women.
3. Those who denied to participate

Standard socio-demographic data collection form, Subjects informed consent form, drug list and

facility care indicator form of institution, WHO core drug use indicator guidelines, WHO anatomical therapeutic classification (ATC)/ defined daily dose (DDD) metric system were used as study instruments.

**Data collection** - Two hundred male and female patients admitted in respective indoor department and fulfilling inclusion criteria were included in the study. A standard socio demographic and clinical features data collection proforma was prepared and the characteristic like age, gender, occupation, income group, subject IP/OP number were recorded. Information regarding Diagnosis, patient's present/past medical history, number of days of hospitalization, treatment, any ADR, investigations, outcome, was collected from indoor ticket and patient's interview.

Drug utilization pattern among male and female patients was evaluated using following quality indicators of drug use, recommended by WHO:

1. Comparison of demographic data
2. Commonly used drugs in medical indoor
3. Common ailments for which drugs were used
4. Number of drugs used by injectable route
5. Average number of drugs per prescription
6. Percentage of prescription (encounters) with antibiotic prescribed
7. Percentage of drugs prescribed by generic name
8. Percentage of drugs prescribed from essential drug list
9. Total dose, duration and frequency of administration of each drug
10. Average dose per prescription of each drug
11. Adverse drug reactions in the included patients
12. Individual cost of drugs prescribed
13. Total burden on government

14. Average cost per Prescription (encounter)

15. ATC code of drugs

16. Comparison of DDD and PDD of antibiotics and most commonly used drugs

## RESULTS AND DISCUSSION:

Drug utilization studies are conducted to monitor and evaluate prescribing pattern. They also suggest modification and improvement in prescribing practices and promote rational prescribing practices<sup>10</sup>. Study of prescription patterns is an important tool to determine and improvise rational drug therapy. Rational prescribing optimizes benefits and safety, and maximizes utilization of resources. International agencies like WHO and International Network for the rational use of drugs (INRUD) have evolved standard drug use indicators<sup>11</sup>. Present study was conducted to describe and evaluate pattern of drug utilization by application of WHO/INRUD core indicators, which are highly standardized and recommended.

A total of 200 patients were included, out of them 124 (62%) were male and 76 (38%) were female, with age range between 15-90 years. Age and gender distribution is approximately similar to that reported by Meher et al and Choudhary et al.<sup>12, 13</sup> Mean age in our study was 46.6±17.7, while mean age reported by Chaudhary et al was 32.5 years and by Meher et al was 48.12 years<sup>12, 13</sup>.

Educational status varied from illiterate to post graduate level and occupations of included patients were housewives (29%), farmers (20%), students (15.5%), labors (12.5%), businessmen (12.5%) and private or government jobs (10%).

Mean duration of hospital stay was 4.92 days in our study while 7 days was observed in study by Chaudhary et al and 5 days by Meher et al<sup>12, 13</sup>.

diagnosis for which drugs were prescribed were Infectious disease (24%), Respiratory disorders (18.5%), CNS disorders (13%), CVS disorders (9.5%), GIT disorders (9.5%), Urinary tract disorders (6.5%), Endocrine disorders (5.5%), Poisoning (5%), Liver disorders (4.5%) and Anemia (4%). (Table 1)

**TABLE 1: COMMON DIAGNOSIS AMONG PATIENTS**

Diagnosis	No. of cases	Percentage
Infectious Disease	48	24%
Respiratory Disorder	37	18.5%
CNS Disorder	26	13%
CVS Disorder	19	9.5%
GI Disorder	19	9.5%
UTI	13	6.5%
Endocrine Disorder	11	5.5%
Poisoning	10	5%
Liver Disorder	9	4.5%
Anaemia	8	4%
<b>Grand Total</b>	<b>200</b>	<b>100%</b>

Total number of drugs prescribed during study in medical indoor was seventy four. Pantoprazole was the most utilized drug given to 74% of patients while neostigmine was the minimum utilized drug and prescribed to 1% of patients.(Fig.1) Jhaveri et al have observed generalized drug utilization pattern in geriatric population and they found ranitidine (58.14%), metoclopramide (54.29%), furosemide (41.12%), and cefotaxime (23.37%) as the commonly prescribed parenteral drugs.<sup>14</sup> The results are similar if groups of drug utilized are compared, as pantoprazole was the maximum utilized drug in our study and ceftriaxone was maximum utilized antibiotic in their study. Etofylline + theophylline (deriphylline; 14.05%) and multivitamins (7.1%) were the commonly prescribed fixed dose combinations (FDCs) in study by Jhaveri et al<sup>14</sup>. In our study FDCs were not utilized, indicating rationale drug utilization, as combinations may cause drug interactions and increase number of adverse drug reactions. In study by Jhaveri et al average number of antimicrobials prescribed per patient was 0.91 (95% CI: 0.82-0.99). In our study average number of antibiotics prescribed per patient was 1.97, which is much higher than their study<sup>14</sup>. Though the population of both studies is different, the pattern may vary according to health needs of population, availability and drug choice of prescribers.

In our study, mean number of drugs prescribed per patient was 7.35±2.36 which indicate poly-pharmacy, while 4.05 and 4.02 was reported by Choudhary et al and Meher et al respectively, and 4.01±2.24 by Muzammil et al<sup>12, 13, 15</sup>.

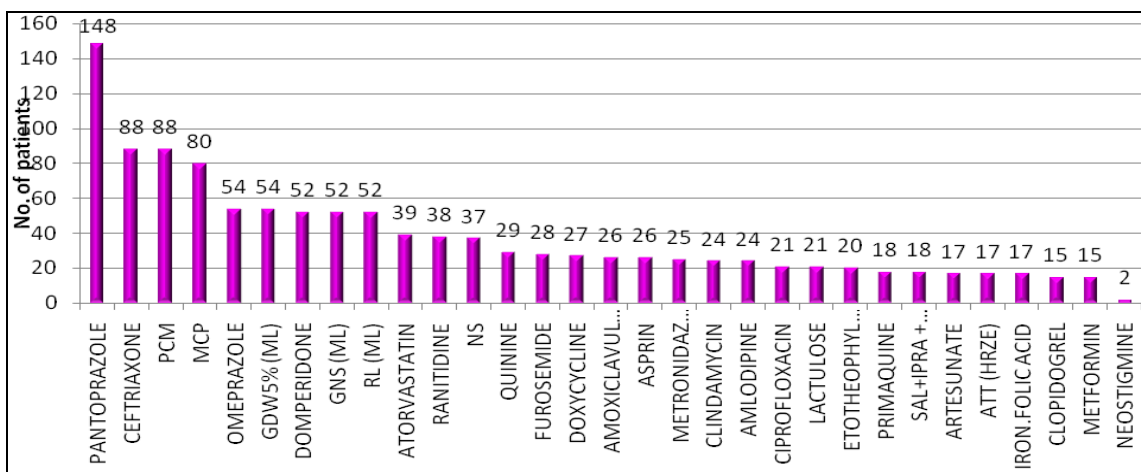


FIG.1: PRESCRIBING PATTERN OF DRUGS USED

Total number of drugs administered by IV route was 737 (50.10%), oral route 631 (42.89%), IV + Oral route 58 (3.94%), inhalational route 26 (1.76%), IM route 12(0.8%) and by SC route 7(0.48%). In study by Choudhary et al total number of drugs administered by oral route was 12%, by injectable route 81% and remaining 7% were used by both routes <sup>12</sup>. In our study oral route was preferred route as compared to study by Choudhary et al <sup>12</sup>. The difference is significant and indicates towards less aggressiveness of the therapy and avoidance of unnecessary selection of parenteral route which is a welcoming step.

Antibiotics are important category of drugs and its improper use can result in antibiotic resistance which may contribute in enhanced cost, patient morbidity and mortality <sup>16, 17</sup>. Therefore monitoring and evaluation of prescribing patterns of antimicrobial agents and recommendations to improve and modify the prescribing pattern are one of the recommended strategies to control resistance and also to improve the prescribing practices<sup>18</sup>.

In our study Cephalosporins were the most commonly used antimicrobial drug (28.91%), followed by Antimalarial drugs (21.38%), Penicillins (12.34%), Fluroquinolones(9.03%), Antiprotozoal drugs (8.43%), Tetracyclines (8.13%), Clindamycin (7.22%), Aminoglycosides (1.80%), Macrolides (1.5%) and Vancomycin (1.2%).Total number of antibiotics prescribed was 332, Total number of patients to whom antibiotics were prescribed was 168 (84%). Total number of antibiotics prescribed per prescription was 1.97. The pattern of antibiotics prescription was

approximately similar to that observed by Choudhary et al and Meher et al <sup>12, 13</sup>. (Table 2)

TABLE 2: ANTIBIOTICS PRESCRIBED AMONG PATIENTS

Antibiotics Prescribed	No. of Patient	number of patients (n = 332)
Cephalosporin	96	28.91
Antimalarial	71	21.38
Penicillin	41	12.34
Fluroquinolones	30	9.03
Antiprotozal	28	8.43
Tetracvcline	27	8.13
Clindamycin	24	7.22
Aminoglycoside	6	1.80
Macrolide	5	1.5
Vancomycin	4	1.2

Regarding cost analysis, all medicines prescribed in the institution were free supply from the Government. So treatment caused no financial burden to the patient. However burden to the government and average cost per patient per day was calculated. The costliest drug prescribed was anti-snake venom, prescribed to five patients. Total cost per patient was Rs. 11150/-. In terms of cost, minimum utilized drug was digoxin, given to two patients. Cost per patient was Rs. 0.63.Total cost of all the drugs utilized during study duration was Rs. 155089.73. Cost per patient was Rs. 775.45 and cost per patient per day was Rs 157.69. In a study conducted at PGI Chandigarh for emergency medicine, the cost per prescription was \$119.23 (approximately Rs 7903). <sup>19</sup> In above study as patients included belong to emergency ward, this may be a factor for such a high cost. <sup>19</sup>

Prescribed daily dose of antibiotics and the most commonly prescribed dose were compared with defined daily dose. PDD/DDD ratio was calculated

to evaluate appropriate dose prescribed. PDD/DDD of Amoxicilline and clavulanic acid was maximum (2.94), followed by Doxycycline (2.00), Pantoprazole (1.99), Ofloxacin (1.22), Amikacin (1.21), Metronidazole (1.20), Cefotaxim (1.18), Norfloxacin (1.17), Ceftriaxone (1.06), Omeprazole (1.03), Ampicillin (1.0), Ciprofloxacin (1.00), Clarithromycin (1.00), Cefixime (1.00) and Clindamycin (0.75). Most of the drugs were prescribed in appropriate dose except Doxycycline where PDD/DDD ratio was 2.0, for amoxicillin-clavulanic acid combination the ratio was 2.94 and for pantoprazole PDD/DDD ratio was 1.992. It indicates that these drugs have been used in higher doses, but as DDD represents maintenance dose of drug, the drugs may have been used for acute and emergency conditions in higher doses.

#### **Adverse drug reactions:**

Three patients (1.5%) were admitted with complaint of hepatitis with Anti tubercular therapy. Two patients (1%) were admitted with chloroquine induced severe gastritis. Other ADRs reported were headache (26%) nausea (26%), vomiting (12%), itching (5%), rashes (2%), urticaria (1%). Nausea and vomiting was reported mainly by the patients taking quinine and headache by the patients taking pantoprazole. No severe ADR was reported during the study.

#### **Some encouraging findings in present study:**

- Average hospital stay of patients was less as compared to other studies that indicate towards quality health services.
- Oral route was preferred as compared to other studies which indicate avoidance of unnecessary use of parenteral route as chances of serious adverse effects and toxicity increases if drug is prescribed by parenteral route.
- All drugs were supplied free of cost to the patients and almost all groups were available. The list of drugs was available in the wards. This indicates quality patient care provided to the patients.

- All the drugs were prescribed from essential drug list and the list was also available in the indoors, most of the drugs were appropriately used indicating rational use of drugs.
- When PDD and DDD were compared, most of the drugs were prescribed in appropriate doses. Multi-vitamin preparations were minimally utilized, indicating rationale drug utilization in the institution.

#### **Areas of concern in present study:**

- Average number of drugs prescribed to patients was much higher as compared to other studies. This indicates poly-pharmacy. Poly pharmacy may be related to adverse reactions, drug interactions and noncompliance. It also increases the cost of therapy.
- Acid suppressive drugs were overused. Drugs which alter acid secretion may alter absorption of other drugs. Proton pump inhibitors are enzyme inhibitors and if prescribed for long time may interact with other drugs and may cause severe toxicity. Along with interactions, they themselves may cause ADRs.

#### **Limitations of the present study:**

Relatively less number of patients was studied and they were not followed after their discharge from the ward. The study was limited to medicine indoor, so could not evaluate generalized pattern in the institution. Choice of treatment also varies from physician to physician and the study provides no data for the same. Drugs were supplied free of cost as government supply, so the costs of different brands could not be calculated and compared. There was an outbreak of malaria during study period and probably that made anti-malarial drugs as second most common used drugs and if another study would be done in same setting, the result might vary a little, so repeated and longer duration studies are required. There were very few similar studies available to compare. However, it identified certain lacunae in prescribing pattern, need for the guidelines, and further studies for drug utilization

in medicine indoor. The study can be expanded in future including other departments to evaluate generalized pattern of drug utilization as well as drug utilization in vulnerable groups like children and pregnant women. The study can also be expanded as a comparative drug utilization study amongst government versus private sector to analyze, evaluate and promote rationale drug prescribing in both sectors.

**CONCLUSION:** A baseline data of drug utilization pattern in inpatients in medicine department is created by this study. Prescription by generic name and from essential list, preference of oral route, and free government supply are encouraging findings. Free health services are one of the major requirements for the developing countries because cost is considered one of the important factors in making therapeutic decision with poor financial resources. However poly-pharmacy, over use of proton-pump inhibitors and over dosing of some antibiotics are areas of concern. There is a need of more of such studies including larger number of patients and other departments.

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**CONFLICT OF INTEREST:** There was no conflict of interest.

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