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Original Research Article

Drug Utilization Pattern in Indoor Patients of Medicine Department at Tertiary Care Teaching Hospital in Southern Rajasthan

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Background: Drug utilization studies (DUS) are used as powerful tool in the evaluation of healthcare systems. The principal aim of drug utilization research is to facilitate the rational use of drugs in populations. Present study has been planned to develop baseline prescription pattern of drugs in medicine indoor patients of M.B. hospital and To evaluate the cost analysis of each prescription in the medicine Department at Tertiary care teaching hospital in Southern Rajasthan.

Methods: This prospective, cross-sectional, observational study. The study was conducted over a period of 12 months (Aug 2020 – July 2021) in Indoor Patients Of Medicine department, MB Hospital, Udaipur, a tertiary care teaching health center in southern Rajasthan. All the Patients (Male & Female) who were visiting the Indoor Patients Of Medicine department were included. Sample size of 200 prescriptions was taken into consideration.

Result: Total no. patients included were 200. Out of them 124 (62%) were male patients and 76 (38%) were female patients. Clinical diagnosis for which drugs were prescribed are 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%). Cephalosporins were the most commonly used antibiotics (28.91%). No severe ADR was reported during the study.

Conclusion: The study can be expanded in future including different units of medicine departments, surgery departments to evaluate generalized pattern of drug utilization as well as drug utilization in vulnerable groups including Paediatrics department and Obstetrics & Gynaecology department.

Keywords: Drug Utilization, Medicine OPD, Prescribing Pattern.

Introduction

Drug utilization research as defined by W.H.O. 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 [1]. Drug utilization research

is an essential part of pharmacoepidemiology as it describes the extent, nature and determinants of drug exposure. Drug utilization studies (DUS) are used as powerful tool in the evaluation of healthcare systems. The principal aim of drug utilization research is to facilitate the rational use of drugs in populations. Rational use of medicines requires that "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirement, for an adequate period of time, and at the lowest cost to them and their community. [2]

WHO estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and that half of all patients fail to take them correctly. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards. Without knowledge of how drugs are being prescribed and used, it is difficult to initiate a discussion on rational drug. [1]

Patients admitted to the Medicine department are suffering from a diverse group of diseases and often suffer from chronic illnesses. These patients receive multiple medications from a variety of pharmacological classes. They are a unique group of population with diverse disease processes, existing or impending multi organ system failure and potentially altered pharmacokinetic and pharmacodynamic characteristics onto which pharmacotherapy is added.

The use of drugs is a specialized art requiring knowledge and experience. In addition there are non-medical factors that may influence the prescribing pattern [3]. There may be a striking variation in the pattern of drug use from country to country and in different areas of an individual country [4]. The continuous flow of new drugs in market, wide variation in the pattern of drug prescribing, growing concern about the delayed adverse effects, increasing concerns regarding the cost of drug and volume of prescription, all these factors contribute to the increasing importance of drug utilization studies.

Prescribing drugs is a skill that needs to be assessed and redefined continuously. Prescription pattern reflects health professional attitude towards the disease and role of drugs in its treatment, and their therapeutic knowledge. Very few drug utilization studies have been reported on indoor patients and particularly those admitted in medicine wards both nationally and internationally [5,6]. No such study has been reported from Rajasthan. With large number of patients being admitted in any tertiary care hospital and health services being catered from junior resident to unit in-charge, it is expected that there may be a lot of variations in the prescribing of drugs and prescription study may be helpful to know the presence and extent of variations.

Keeping these facts in consideration the present study has been planned to develop baseline prescription pattern of drugs in medicine indoor patients of M.B. hospital and to evaluate the cost analysis of each prescription in the medicine Department at Tertiary care teaching hospital in Southern Rajasthan.

Material and Methods

Drug utilization research is a health service research to quantify, understand, evaluate and quality improvement of prescribing, dispensing and consumption of drug.

Study setting

This prospective cross-sectional study was conducted in both male and female, medical indoor department of Maharana Bhopal Hospital Udaipur, a tertiary care teaching hospital in southern

Rajasthan.

Ethical considerations

Prepared standard research protocol, subject's proforma and informed consent form (Hindi/English) was approved by the Institutional Ethics Committee of R.N.T. Medical College, Udaipur and permission

to carry out the study was obtained from superintendent, M.B. Hospital, Udaipur and Head of Medical indoor.

Study design

The cross sectional, prospective quantitative descriptive and analytic type of observational study.

Study duration and period

The study was conducted over a period of one year in 2020-2021 in medicine department of Male and Female wards, MB Hospital, Udaipur, a tertiary care teaching hospital in southern Rajasthan

Sampling unit

Patients (Male & Female) who were admitted to the medical indoor.

Inclusion criteria

Patients who were admitted to male and female medical wards

Exclusion criteria

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

Study instruments:

1. Standard socio demographic data collection form.
2. Subjects informed consent form.
3. Prescribing Indicator form,
4. MNDY (Mukhya mantra nishulk dava yojana) drug list and facility care indicator form.
5. WHO core drug use indicator guidelines.
6. WHO anatomical therapeutic classification (ATC)/defined daily dose (DDD) metric system.
7. Drug statistics methodology devised by WHO collaborating centre.

All male and female patients admitted in respective indoor department and fulfilling inclusion criteria were included in the study. A standard subject 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, subject present/past medical history, number of days of hospitalization, treatment, any ADR, investigations, outcome, Patients knowledge about drug treatment, self-medication was collected from indoor ticket and patient's interview. All the data were entered in the proforma. (Enclosed).

Drug utilization pattern among male and female patients was evaluated using following quality indicators of drug use, recommended by W.H.O.

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 (defined daily dose) and PDD (prescribed daily dose) of antibiotics and most commonly used drugs

Statistical analysis

The data collected was analyzed and entered in the 'prescribing indicator form' manually and statistical tools like frequencies, averages/means, standard deviations and percentages were applied in this study. Data was analyzed by entering it into a Microsoft excel sheet and applying descriptive statistics.

Results

Total no. patients included were 200. Out of them 124 (62%) were male patients and 76 (38%) were female patients (Table-1)

Table 1: Gender Distribution among patients

Row Labels	No. of cases	Percentage
Male	124	62%
Female	76	38%
Grand Total	**200**	**100%**

Age of patients included was between 15 and 90 years, among whom patients < 16 were 3(1.5%), 16-30 were 47(23.5%), 31-45 were 52(26%), 46-60 were 53(26.5%), 61-75 were 39(19.5%) and 76-90 were 6(3%) patients. Mean age in our study was 46.6 ± 17.7 (Table-2)

Table 2: Age Distribution among patients

Age Group (yrs)	No. of cases	Percentage
<16	3	1.5%
16-30	47	23.5%
31-45	52	26%
46-60	53	26.5%
61-75	39	19.5%
76-90	6	3%
Grand Total	**200**	**100%**

Clinical diagnosis for which drugs were prescribed are 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-3)

Table 3: Common Diagnosis in 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%
Grand Total	**200**	**100%**

Table 4: Prescription pattern

Particulars	
Mean No. of Drug per prescription	7.35 ± 2.36
Total No. of Drug prescribed	1471
No. of Drugs used	74
Max. used drug (No.)	Pantoprazole (148)
Mean Age	46.6 ± 17.7 yrs

Cephalosporins were the most commonly used antibiotics (28.91%), followed by Antimalarial drugs (21.38%), Penicilllins (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%) (Table - 5). 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 (Table-5).

Table 5: Antibiotics prescribed among patients

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

- Total number of antibiotics prescribed = 332
- Total number of patient antibiotic prescribed = 168 (84%)

Number of Antibiotics per prescription (encounter) = 1.97

Table No. 6 : Prescribing pattern of Anti-hypertensive Drug

Name of Drugs	Total Drug Prescribed	Percent % (n = 52)
Diuretic	38	73.07
CCB	25	48.07
ACEI/ARB	23	44.23
Beta Blocker	12	23.07

Table No. 7 : Prescribing pattern of Anti Diabetic Drugs

Drugs Prescribed	Total Drug Prescribed	Percentage (n = 16 Pt.)
Metformin	15	93.75%
Glimepiride	13	81.25%
Insulin (IU)	10	62.50%

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 ratio 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) (Table - 8).

Table 8: PDD and DDD of Prescribed Antibiotics

Antibiotics Prescribed	Total Dose	Total Days	PDD = (T Dose/ T Day)	DDD	PDD\DDD Ratio
Doxycycline	32400	162	200.00	100	2.00
Amoxi-Clavulinic	318300	108	2947.22	1000	2.94
Cefixime	8400	21	400.00	400	1.00
Cefotaxime	71000	15	4733.33	4000	1.18
Ampicillin	50000	25	2000.00	2000	1.00
Clindamycin	100800	112	900.00	1200	0.75
Metronidazole	229200	127	1804.72	1500	1.20
Ceftriaxone	768000	361	2127.42	2000	1.06
Ciprofloxacin	80000	80	1000.00	1000	1.00
Ofloxacin	10800	22	490.91	400	1.22
Norfloxacin	16000	17	941.18	800	1.17
Amikacin	36500	30	1216.67	1000	1.21
Clarithromycin	6000	6	1000.00	1000	1.00
Omeprazole	4280	206	20.78	20	1.03
Pantoprazole	51160	642	79.69	40	1.99

Adverse drug reactions—Three patients (1.5%) were admitted with complaint of hepatitis with antitubercular 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.

Discussion

Drug utilization studies seek to monitor, evaluate and suggest modifications in the prescribing practices with the aim of making the medical care rational and cost effective [7].

A study of prescription patterns is an important tool to determine rational drug therapy and maximize utilization of resources. To improve the overall drug use, especially in developing countries, international agencies like the World Health Organization (WHO) and the International Network for the rational use of drugs (INRUD) have applied themselves to evolve standard drug use indicators [8].

With development of new therapeutic agents it is possible to provide symptomatic control as well as cure of many clinical disorders. However in any circumstances drugs are to be prescribed rationally for optimal benefit and safety to the consumer which is possible only if drugs are used rationally and appropriately.

The present study is to describe and evaluate pattern of drug utilization by application of WHO/INRUD core indicators, which are highly standardized and recommended. This study would also serve as the basis for follow-up intervention for including other departments in this institution as well as private sector to compare with the government sector.

As per pharmacoepidemiology in drug utilization studies, our study has covered population from rural as well as urban areas, both genders, different socio economic groups and age groups.

The present study was conducted in male and female indoor of Department of Medicine. Total no. patients included were 200. Out of them 124 (62%) were male patients and 76 (38%) were female patients (Table-1). There were very few studies available for comparison. In study by

Choudhary et al 63% were male and 37% were female [9]. In study by Meher et al 58% were male and 42% were female [10]. The gender distribution of all studies was approximately similar.

In our study age of patients included was between 15 and 90 years, among whom patients <16 were 3(1.5%), 16-30 were 47(23.5%), 31-45 were 52(26%), 46-60 were 53(26.5%), 61-75 were 39(19.5%) and 76-90 were 6(3%) patients. Mean age in our study was 46.6±17.7. (Table-2) Similar study in medical indoor has been done by Chaudhary et al and Meher et al. In study by Chaudhary et al, mean age was 32.5 years and in Meher et al mean age was 48.12 years. [9, 10]

Mean duration of hospital stay was 4. 92 days in our study while that of 7 days in study of Chaudhary et al and 5 in study of Meher et al. [9, 10]

Diagnosis, for which drugs were prescribed were clubbed in ten headings according to main system involved. These clinical diagnoses for which drugs were prescribed are 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-3) While clinical diagnosis for which drugs were prescribed and their distribution among patients in study of Choudhary et al [9] were Diabetes (22.5%), Renal disorders (19.9%), Respiratory disorders (13.4%), Coronary artery disorders (12.1%), GIT disorders (9.9%), Liver disorders (7.7%) and Miscellaneous (14.5%)8 and in study of Meher et al[10] were Infectious diseases (32%), Respiratory disorders (24%), Urinary tract disorders (18%), GIT disorders (18%) and CNS disorders (8%).

Total number of drugs prescribed during study in medical indoor was seventy four. Pantoprazole was the maximally utilized drug, given to 74% of patients while neostigmine was the minimum utilized drug and prescribed to 1% of patients.

Only one study by Bhavesh et al [11] was available where generalized drug utilization pattern was evaluated in geriatric population and they found that Ranitidine (58.14%), metoclopromide (54.29%), furosemide (41.12%), and cefotaxime (23.37%) were the commonly prescribed parenteral drugs. 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 study by Bhavesh et al, [11] Etofylline + theophylline (deriphylline; 14.05%) and multivitamins (7.1%) were the commonly prescribed FDCs. In our study fixed dose combinations were not utilized indicating rationale drug utilization, as combinations may cause drug interactions and increase number of adverse drug reactions. In study by Bhavesh et al [11] 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 and it was much higher than their study 47.Though the population of both studies was different; the pattern may vary according to health needs of population availability and drug choice of prescribers.

Mean number of drugs prescribed per patient in our study was 7.35 ± 2.36, (Table-4) while in study of Choudhary et al [9] it was 4.05, in study of Mehere et al10 4.2 and in study of Muzammil et al [12] 4.01±2.24. This observation is indicating towards poly- pharmacy in our study.

The total number of diagnosis was divided into ten groups according to system involved and four groups i.e. antibiotics, antihypertensives, antidiabetic and antimalarial drugs are compared with other studies.

In our study total number of drugs administered by IV route was 737 (50.10%), by oral route 631 (42.89%) by IV

+ Oral 58 (3.94%), by inhalational route 26 (1.76%), by IM route 12 (0.8%) and by SC route 7 (0.48%). In study of Choudhary et al [9] total number of drugs administered by oral route was 12%, by injectable route was 81% and remaining 7% were used by both routes.

Antibiotics are important category of drugs and its improper use can result in antibiotic resistance. The widespread use of antibiotics has lead to the emergence of several resistant strains of microbes. These contribute significantly towards rise in the escalating health care costs and patient morbidity and mortality [13,14]. Therefore monitoring and evaluation of prescribing patterns of antimicrobial agents are one of the recommended strategies to control resistance and also to improve the prescribing practices. Drug utilization study is a process of medical audit that involves monitoring and evaluation of the prescribing patterns of drugs and it helps to make the necessary modifications in prescribing practices to achieve rational therapeutic practice as well as prevent the economic burden which will improve health care system [15].

In our study Cephalosporins were the most commonly used antibiotics (28.91%), followed by Antimalarial drugs (21.38%), Penicilllins (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%) (Table-5).

In study of Choudhary et al Cephalosporins were the most commonly used antibiotics (48%), followed by Penicilllins (22%), Fluroquinolones (10%), Antiprotozoals (8%), Vancomycin (6%), which is very near to our study.

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.

In study by Meher et al [10] a total number of 373 antibiotics were prescribed and average number of antibiotics per prescription was 1.83. The results are very much similar to our study.

Appropriate dose and duration is one of the major determinants to control development of bacterial resistance. The PDD and DDD of prescribed antibiotics were compared. Most of the antibiotics were prescribed appropriately except Doxycycline and combination of amoxicillin and clavulanic acid, where the PDD/DDD ratio was 2.0 and 2.94 respectively.

In our study antimalarial drugs were used as second most common antimicrobial drug which may be due to outbreak of malaria during months of September and October 2015. 62.5% patients were suffering from falciparum malaria while in 37.5% patients plasmodium vivax was detected. The pattern of drug utilization of anti malarial drug was found to be according to national drug policy for India 2013. The most common antimalarial drug prescribed was Quinine (40.84%), followed by Primaquin (25.35%), Artenusate (23.94%), Sulfadoxine - Pyrimethamine (5.63%) and Mefloquine (4.22%).

In study by Limbachia et al [16] Artesunate was the most commonly used drug, and prescribed to 61.3% of patients, followed by chloroquine (27.85%), Sulfadoxine (2.89%), Primaquine (3.96%), Quinine (2.89%), Mefloquine (0.55%) and Artemether (0.55%).

Among antihypertensives most common drugs used was diuretics, prescribed to 73.07% patients followed by Calcium Channel Blockers (48.07%), drugs acting on renin angiotensin system (44.23%) and Beta blockers (23.07%).

As monotherapy, most common drug used was Diuretics and was prescribed to 26.92% patients followed by amlodinpine 15.38% and drugs acting on renin angiotensin system 7.69%. Most common combination prescribed was combination of

ACEI + BB + CCB+ Diuretics (17.3%) followed by ACEI + Diuretics (11.53%), CCB + Diuretics (9.61%), ACEI + CCB (3.84), BB + Diuretics (3.84%), ACEI + BB+ Diuretics (1.92%) and ACEI + CCB + Diuretics (1.92%) (Table-6).

In drug utilization pattern of antihypertensive in another study by Yusuff et al [17] most common used drug was Diuretics (39.4%), followed by centrally acting agents (23.3%), calcium channel blockers (21%), angiotensin converting enzyme (ACE) inhibitors (8.6%) and beta blockers (1.9%). Aspirin was the most frequently prescribed adjoining non-anti-hypertensive drugs (39.7%).

Four drug combinations of anti-hypertensive was more prescribed in our study because in our study, only indoor patients were included while in other studies outdoor patients were also included. The difference may be due to more severity of the disease in indoor patients. Aspirin was prescribed to 13% of patients along with antihypertensive drugs.

Among hypoglycaemic agents most commonly used hypoglycemic agent was Metformin, prescribed to 93.75% patients of Diabetes, followed by Glimepiride (81.25%) and Insulin (62.5%). In most of the patients Metformin was prescribed in combination with Glimepiride (75%). Metformin was prescribed as monotherapy to 18.75% of patients, followed by Glimepiride, prescribed to 6.25% of patients (Table-7).

In study by Ahmed Quazi et al [18] the trend was not same. Most common drug prescribed was sulfonylureas (26.4%), followed by combination of sulfonylurea + metfomnin (18.6%), Insulin alone (18.6%), Metformin alone (17.44%), Pioglitazone alone (13.6%), insulin with other oral hypoglycemic agents (5.81%), Sitagliptin (0.77%) and Acarbose (0.77%). Triple drug combination of Glimepiride + Pioglitazone + Metformin was prescribed to 2.32% of patients.

Multivitamine preparations are the most common misused drugs. In our study multivitamine preparations were prescribed to 5% of patients and injectable methylcobalamine was prescribed to 1.5% of patients. In another study by Javeri et al [19] multivitamins were prescribed to 7.1% of patients and in another study by Bhavesh et al [11] it was 11%. There was no study conducted to evaluate multivitamine drug utilization in indoor was available.

Cost analysis: All medicines prescribed in the institution are free supply from the Government. So treatment causes 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 of 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 [20], the cost per prescription was $119.23 (approximately Rs 7903). In above study as patients included belong to emergency ward, this may be a factor for such a high cost. In our hospital government bears the burden of cost of treatment, and though the patients belong to indoor ward in our study, the cost per patient appears to be less as compared to above mentioned study. This needs to be appreciated as in developing countries like India resources are less, and poor people are not able to bear high cost of treatment. [21]

Prescribed daily dose of antibiotics and the most commonly prescribed dose were compared with defined daily dose (Table no.8) and it was found that 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 the drugs have been used in higher doses. (Table-8).

Adverse drug reactions— Three patients (1.5%) were admitted with complaint of hepatitis with antitubercular 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

- In our study average hospital stay of patients was less as compare to other studies that indicate towards quality health services.
- Regarding route of drug administration, oral route was preferred as compare to other studies. This also indicates towards avoidance of unnecessary use of parenteral route as chances of serious adverse effects and toxicity increases if drug is prescribed by parenteral route.
- In cost analysis, all drugs are available free of cost and cause no burden to the patient. Financial burden on the government was also minimum as compared to other studies in India.
- When PDD and DDD were compared, most of the drugs were prescribed in appropriate doses. Multivitamine preparations were minimally utilized, indicating rationale drug utilization in the institution.

Areas of concern in present study

- Average number of drugs prescribed to patient was much higher in our study as compare to other studies. This indicate pattern of poly-pharmacy in indoor. Poly pharmacy may be related to adverse reactions, drug interactions and noncompliance. It also increases the cost of therapy.
- The maximum utilized drug in the study was Pantoprazole, prescribed to 74% of patient. Omeprazole, from the same group was also prescribed to 23% of patients and ranitidine was also prescribed to 18% of patients. This indicate overuse of acid suppressive drugs. The PDD for Pantoprazole was 1.99 And omeprazole was 1.03

This suggests overuse of acid suppressive drugs. The 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.

Conclusion

The study can be expanded in future including different units of medicine departments, surgery departments to evaluate generalized pattern of drug utilization as well as drug utilization in vulnerable groups including Paediatrics department and Obstetrics & Gynaecology department. The study can also be expanded as a comparative drug utilization study amongst government verses private sector to analyze, evaluate and promote rationale drug prescribing in both sectors.

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