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A STUDY OF DRUG UTILIZATION AND POTENTIAL DRUG-DRUG INTERACTIONS IN OUTPATIENT PHARMACY OF A TERTIARY CARE TEACHING HOSPITAL: A CROSS-SECTIONAL OBSERVATIONAL STUDY.

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ABSTRACT **INTRODUCTION:** Drug utilization research evaluates the appropriateness of the prescriptions which is important in clinical practice. Hospital Pharmacy is the place where the data of prescriptions from all the Outpatient departments of the hospital can be gathered under one roof. **METHODOLOGY:** A cross-sectional, observational study was carried out in the Outpatient pharmacy of a tertiary care teaching hospital. The study was conducted over a period of 1 month on 400 prescriptions. **RESULTS:** Average no of drugs per prescription was 2.40 ± 1.49. 30.25% of prescriptions contained an antibiotic. Beta lactam was the most commonly prescribed class of antibiotics, while Coamoxiclav was the most commonly prescribed antibiotic drug. 78.46% and 67.22% of the drugs were prescribed from NLEM and WHO list, respectively. Total 130 pDDIs were observed in all the 400 prescriptions surveyed, out of which 51 prescriptions were showing at least one pDDI. **CONCLUSION:** The rate of prescription of drugs from both the Essential drug lists was satisfactory. No injection was prescribed on OPD basis. Almost 87 % prescriptions were not having any potential drug-drug interaction (pDDI). All these observations highlight the rational prescription of drugs as per WHO Drug use indicators. The study highlights the need to minimize the percentage of antibiotics prescribed. Further studies are warranted to analyse the causes of Polypharmacy observed in some prescriptions in this study and to find ways to minimize it as much as possible.

KEYWORDS : Drug Utilization, Drug Interactions, Antibiotics

INTRODUCTION

Drug utilization research (DUR) was defined by the World Health Organization (WHO) in 1977 as "the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences" [1].

Irrational prescription includes unjustified use of drugs, polypharmacy, incorrect dosage and use of parenteral drugs in spite of the availability of oral drugs, misuse and overuse of antibiotics. These medication errors put patient health in jeopardy and also cause unnecessary economic burden to the patient or to the institution or community [2].

Drug utilization research evaluates the appropriateness of the prescriptions which is important in clinical practice as it provides the clear picture of the utilization pattern of various drugs and allows identifying areas that need change and improvement [3].

A drug–drug interaction (DDI) is an event that occurs when the effects of a drug are modified by another drug that is administered concomitantly [4]. Growing evidence attributes DDIs as a major contributor to hospital admissions, failure of treatment, avoidable medical complications, and associated healthcare costs [5].

Hospital Pharmacy is the place where the data of prescriptions from all the Outpatient departments of the hospital can be gathered under one roof.

Keeping all these facts in consideration, the present study was undertaken with the aim to study and analyze the drug utilization and Potential Drug Drug Interactions in Outpatient pharmacy of a tertiary care teaching hospital.

OBJECTIVES

1. To study the prescription pattern of the drugs in Outpatient pharmacy and analyse it using various Drug Use indicators
2. To study the Potential Drug-Drug Interactions (pDDIs) amongst the drugs prescribed by using Medscape software [6].

MATERIALS AND METHODS

This was a cross-sectional, observational study carried out in the Outpatient pharmacy of a tertiary care teaching hospital. The study was conducted over a period of 1 month.

Inclusion Criteria: Prescriptions of the patients of both the sexes with age more than 18 years were included in the study.

Exclusion Criteria: Prescriptions of the patients with age less than 18 years were excluded from the study.

The study was initiated after obtaining permission from the Institutional Ethics Committee. The prescriptions were collected from the Outpatient pharmacy inside the hospital. The data was collected using Systematic random sampling technique [7]. The prescriptions were scanned and information transcribed onto a proforma on Microsoft Excel.

The collected data included the following elements:

1. Demographics
2. Medications prescribed with their Dosage form, Doses, Route and frequency of administration, and Duration of therapy

Detailed research plan:

The collected data was analysed for-

1. Demographic variables
2. Average no of drugs per prescription: Mean ± SD (SD= Standard Deviation)
3. Percentage of prescriptions with an injection prescribed
4. Percentage of prescriptions with an antibiotic prescribed
5. Percentage of drugs prescribed from the National List of Essential Medicines 2015 [8]
6. Percentage of drugs prescribed from 21st WHO Model List of Essential Medicines 2019 [9]
7. Most commonly prescribed Class of Antibiotics (for example Macrolides, Fluoroquinolones, etc)
8. Most commonly prescribed Antibiotic drug
9. Classification of the drugs belonging to different classes (for example, Antihypertensives, Antihistaminics, Antibiotics, etc)
10. Percentage of prescriptions containing Fixed Dose Combinations (FDCs)
11. Potential Drug-Drug Interactions (pDDIs) among the drugs prescribed were analysed using Medscape software available online [6].

RESULTS

A. Demographic variables: Among the total 400 study participants, 205 were Males and 195 were Females. Maximum number of participants [199 patients (49.75%)] were belonging to age group of 18 to 36 years.

B. Drug Utilization Analysis:

All the 400 prescriptions were analysed using various Drug Use

Indicators and their results are tabulated in Table 01 below.

Table 01: Prescription Analysis of study population

Sr No	Drug Use Indicators	Result
1	Average no of drugs per prescription: Mean ± SD	2.40 ± 1.49
2	Percentage of prescriptions with an injection prescribed	0/400 (Zero %)
3	Percentage of prescriptions with an antibiotic prescribed	121/400 (30.25%)
4	Most commonly prescribed Class of Antibiotics	Beta lactam (79/400 prescriptions)
5	Most commonly prescribed Antibiotic drug	Coamoxiclav
6	Percentage of prescriptions containing Fixed Dose Combinations (FDCs)	145/400 (36.25%)

- Classification of the drugs belonging to different classes (for example, Antihypertensives, Antihistaminics, Antibiotics, etc) is depicted in Table 02 below:

Table 02: Classification of the drugs belonging to different classes

Sr. No	Class of Drugs	Name of drug	Number of prescriptions
1	**Antihypertensives**	Amlodipine	44
		Enalapril	35
		Frusemide	18
		Prazosin	1
2	**Antibiotics**	Amoxycillin	19
		Coamoxiclav	60
		Azithromycin	8
		Permethrin	7
		Benzoyl Peroxide	6
		Ciprofloxacin	9
		Clotrimazole	21
		Doxycycline	2
		Metronidazole	16
3	**Nutraceuticals**	Vitamin-B complex	71
		Calcium lactate + Vitamin D	39
		Calcium lactate	15
		Folic acid	11
		Ferrous sulphate + Folic acid	10
4	**Respiratory drugs**	Cough syrup	30
		Etophylline + Theophylline	4
5	**Oral Hypoglycemics**	Glibenclamide	2
		Glimepiride	4
		Metformin	48
6	**Anti-Epileptics**	Sodium valproate	3
		Phenobarbitone	4
		Phenytoin	1
7	**Corticosteroids**	Prednisolone	6
		Betamethasone dipropionate	1
		Betamethasone valerate	6
8	**Antihistaminics**	Cetrizine	113
9	**Antiplatelet**	Aspirin	26
10	**Hypolipidaemics**	Atorvastatin	31
11	**Anti-thyroid**	Carbimazole	2
12	**Non-Steroidal Anti-inflammatory drugs (NSAIDs)**	Diclofenac	78
		Paracetamol	82
13	**Drugs for Rheumatoid arthritis**	Hydroxychloroquine	1
14	**Anti-anginal**	Isosorbide dinitrate	2
15	**H2 receptor-blocker**	Ranitidine	120
16	**Thyroid supplement**	Thyroxine	3
17	**Rehydration treatment**	WHO Oral Rehydration Solution (ORS)	1

- Percentage of drugs prescribed from the National List of Essential Medicines (NLEM) 2015 and 21st WHO Model List of Essential Medicines 2019are depicted in Figure 01 below:

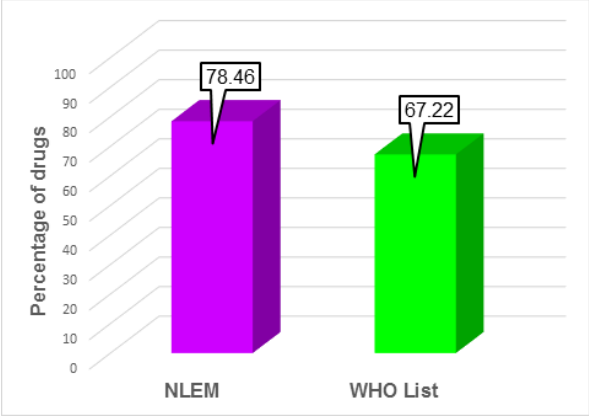

Figure 01: Percentage of drugs prescribed from NLEM and WHO List

C. Potential Drug-Drug Interactions (pDDIs):

pDDIs observed using Medscape software were analysed as follows:

Table 03: Analysis of pDDIs

Criteria	Result
Total number of pDDIs observed in all the 400 prescriptions surveyed	130 pDDIs
Number of prescriptions with no (Zero) pDDIs	349 (87.25%) prescriptions
Number of prescriptions showing at least One pDDI	51 (12.75%) prescriptions

Table 04: Number of pDDIs observed per patient

Number of pDDIs per patient	Number of Patients
1 – 2	35
3 – 5	13
≥ 6	3
TOTAL	51

- **Range of pDDIs observed per patient:** 1 to 7 pDDIs
- **Mean pDDIs observed per prescription:** 0.33 ± 1.05

DISCUSSION

Prescription gives insight into nature of health care delivery system in drug utilization research [2]. Study of the drug use pattern provides opportunity to monitor therapeutic trends. Retrieval of data from hospital pharmacy allows us to analyse the prescriptions from all the departments of the hospital. Therefore, this study was carried out on the data from hospital pharmacy.

A) Demographic details of Study Participants:

a) Age-wise distribution of Study participants:

In the present study, maximum number of participants [199 patients (49.75%)] were belonging to age group of 18 to 36 years. This finding coincides with the study conducted by Thakkar KB et al, 2013 [10].

b) Gender-wise distribution of Study participants:

In the current study, Males constituted higher percentage than Females. This finding is similar to the study conducted by Mudhaliar MR et al [11].

B) Drug Utilization Pattern:

Drug Utilization Pattern was assessed using WHO Drug Use indicators and some other parameters.

In the current study, average number of drugs per prescription was 2.40 ± 1.49. Similar finding has been reported in another study [10]. A systematic review by Masnoon N et al has depicted that the most commonly used definition of Polypharmacy implied five or more medications per day [12]. So as per this definition 29 out of 400 prescriptions exhibited Polypharmacy. The hospital here this study was undertaken is a tertiary care hospital. Here the patients suffering from advanced stages of various diseases are treated. In addition to the general OPDs, there are some Speciality OPDs also in this hospital where patients suffering from Chronic ailments like Diabetes mellitus, Hypertension, Epilepsy, Hypothyroidism, Chronic Renal disease are

treated. Such patients require multiple medications daily for the treatment. This might be the reason behind Polypharmacy observed with some prescriptions.

No injection was prescribed in this study, which might be because of the fact that the prescriptions analysed in this study were all from the OPD patients, and generally the oral route of administration is preferred more on OPD basis compared to parenteral route. Current study revealed that 30.25% of prescriptions had an antibiotic prescribed. Similar finding was reported by Singha J et al [13]. Beta lactam was the most common class of antibiotic prescribed in this study, which is in accordance with the study conducted by Orlando V et al [14].

145 out of 400 prescriptions (36.25%) were found to be containing Fixed Dose Combination (FDC) in present study, the finding which coincides with the results reported by Belhekar MN et al. Since FDCs reduce the actual quantity of dosage forms to be taken by the patient, it helps to improve the adherence to treatment by increasing compliance of the patients [15]. 78.46 % drugs were found to be prescribed from the National List of Essential Medicines (NLEM) 2015 and 67.22 % drugs were from WHO List of essential medicine 2019 in this study. Another study conducted by Mittal N et al has also revealed the similar findings [16].

C) Potential Drug-Drug Interactions (pDDIs):

Whenever two or more than two drugs are prescribed to a patient, there are chances of the drug-drug interactions between the medications given. Therefore, potential drug-drug interactions (pDDIs) were documented and analysed in the current study using an online Medscape software and the findings were compared with a couple of other similar studies.

Total 130 pDDIs were observed in this study in all the 400 prescriptions surveyed. Another study conducted by Shetty V et al reported the 663 pDDIs in total 209 patients [17]. 12.75% prescriptions in current study showed at least One pDDI, whereas this value was 83.3 % in the study done by Shetty V et al [17] and 78.2% in the study conducted by Tesfaye ZT et al [18].

Among the prescriptions with at least One pDDI, majority had 1 to 2 pDDIs per prescription in our study, the finding which was in line with that reported by Shetty V et al [17]. Mean pDDI per prescription in this study was found to be 0.33 ± 1.05. In the articles published by Shetty V et al [17] and Tesfaye ZT et al [18], the value of this parameter was observed to be higher than our finding (3.17 ± 2.78 and 3.7 ± 3.4, respectively).

LIMITATIONS:

1. As this was a cross-sectional study, the follow up of the patients under study was not done. In many patients, depending on their response to the treatment, the medications might be, in future, increased or tapered off. Hence, in later stages, the number of drugs may change, due to which the values of the Drug use indicators may get changed. Even the Potential Drug-Drug Interactions might also get altered, which was not possible to be documented in this study.
2. This study was conducted in a tertiary care teaching hospital, due to which the results may differ from the studies conducted in non-teaching and secondary care hospitals, because the tertiary care hospital caters to a vast diverse variety of diseases compared to other hospitals.
3. In this study, some of the aspects of Potential Drug-Drug interactions were not covered, for example, mechanisms of interactions, severity of interactions, etc.

CONCLUSION

This study is an attempt to evaluate the drugs prescribed and dispensed at the outpatient pharmacy of tertiary care hospital. The results obtained from this study demonstrated that:

1. The majority of the patients were in their 3rd or 4th decade of life. Some other similar studies done in India also reported the same finding.
2. The prescriptions observed were complete in terms of mentioning the dosage form, dose, frequency of administration, the duration of treatment and instructions given to the patients. However, Further studies are warranted to analyse the causes of Polypharmacy observed in some prescriptions in this study and to find ways to minimize it as much as possible.
3. Though the appropriateness of the antibiotics prescribed was not evaluated, this study highlights the need to minimize the percentage of antibiotics prescribed. Therefore, strict protocol for prescribers is required to promote rational use of antibiotics which would not only prevent antibiotic resistance but also reduce the treatment expenditure.
4. The rate of prescription of drugs from both the Essential drug lists was satisfactory. No injection was prescribed on OPD basis. Almost 87 % prescriptions were not having any potential drug-drug interaction (pDDI). All these observations highlight the rational prescription of drugs as per WHO Drug use indicators.

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