

# PHARMACIST INTERVENTION ON DRUG RELATED PROBLEMS IN ASTHMA PATIENTS

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## ABSTRACT

**AIMS AND OBJECTIVES:** To study the patient profile and determine any DRP's if present. To identify the cause, type of DRP and intervene the identified DRP by altering the drug therapy.

**METHODS:** A Prospective Interventional Study was conducted for about six months period (November 2018 to April 2019) at Rohini Super Speciality Hospital, Vishwas Super Speciality Hospital, Warangal. Demographic details (age, gender, height, weight, occupation), chief complaints, case sheet of patient were documented in the data collection form. The collected data had been correlated and the DRP's were identified and intervened.

**RESULTS:** A total of 118 patients were screened for the Drug Related Problems (DRPs) in the hospital during the study period of 6 months (Nov 2018 to April 2019). The total of 167 Drug Related Problems was identified of which the most identified DRP was Drug Interactions 95 (56.88%) followed by Therapeutic Duplication 21(12.57%) and the least identified DRP was found to be alternative dosage form 1(0.59%).

**CONCLUSION:** Ensuring patient education and correct medication techniques are key to improve disease management. The study finally concludes that the involvement of Clinical Pharmacy Services in patient care can significantly help to identify, assess, intervene, resolve and prevent the DRP's in the Hospital. This thereby reduce the drug related morbidity and mortality, improves individualization of the drug therapy and enhance the patient compliance.

**KEY WORDS:** Drug Related Problem , Asthma, Patient compliance.

## DRUG RELATED PROBLEMS

### INTRODUCTION<sup>1</sup>:

Drugs not only have beneficial effects but also are associated with adverse reactions. During the last decade, several studies have been published highlighting the significance of Adverse Drug Reactions in hospitalized patients in terms of frequency, consequences for the affected patients and costs of the hospitals. Adverse Drug Reactions can be regarded as the top of pyramid, which contains all problems associated with drug therapy or drug related problems.

### Definition<sup>2</sup>:

The French Society of Clinical Pharmacy describes 'Drug Related Problem (DRP) as an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes.

In current clinical practice, prescribers regularly utilize more number of medications to treat each co morbid conditions in patients and this circumstance convolutes, when patients visit physicians of various specialties, which may prompt the occurrence of potential DRPs<sup>3</sup>. There are some specific hazard factors that encourage the event of DRPs. These include female gender, polypharmacy, administration of medications with a narrow therapeutic range, renal disease, age more than 65 years and the utilization of oral anticoagulants and diuretics.

**Classification:**

A classification system may contribute to identify Drug Related Problems (DRPs) and further to resolve and prevent them. Hence a Norwegian System for defining and classifying DRPs was proposed. The system builds on cross disciplinary agreement between physicians and pharmacist from various clinical and scientific positions<sup>4</sup>. This classification has 6 main categories and 12 subcategories. Later a new system of classification of DRPs came into existence that is Hepler and Strand Classification. With their seminal publication on Pharmaceutical care, Hepler and Strand also introduced several categories of DRPs. In this approach, problems and causes were not separated.

According to this system DRPs were classified into 8 categories<sup>5</sup>.

1. **Untreated indication<sup>4</sup>** – This is the DRP where an indication is present to the patient but it is not treated. That means physician or health care professional did not prescribe any drug to treat the indication or the condition of the patient.  
For example if a patient is suffering with a condition like vomiting but the physician did not prescribe Ondansetron
2. **Improper Drug Selection<sup>4</sup>** – This is the DRP where physician or health care professional fails to select a proper drug for treating the patient's condition. Wrong drug is being prescribed.  
Example: NSAIDs in renal impaired patient.
3. **Sub therapeutic dosage<sup>4</sup>** - Too little of an appropriate drug is being given. Physician prescribes the dose of the drug which is less than required normal dose. This leads to inefficient treatment.  
Example: Too low Paracetamol dose in relation to symptom giving arthritis.
4. **Failure to receive the drug<sup>4</sup>** – The patient doesn't use the drug that was prescribed. The cause for this DRP may be the illegible writing of physician; negligence of nurses or patient representative or patient themselves.  
Example: Physician prescribes the proper drug but patient fails to administer the drug.
5. **Over dosage<sup>4</sup>** - The patient receives too much of an appropriate drug. Higher doses than the required dose of the drug are prescribed. This may lead to side effects of the drug.  
Example: Too high dose of Angiotensin Converting Enzyme (ACE) inhibitors in relation to kidney function.
6. **Adverse Drug Reaction (ADR)<sup>4</sup>** –Any noxious, unintended and undesired effect of a drug, which occurs at doses in humans for prophylaxis, diagnosis or therapy.  
Example: Hypersensitivity reaction with the use of Penicillin.
7. **Drug Interactions<sup>4</sup>** – An interaction is occurring when the effect of a drug is changed by the presence of another drug, food, drink or some environmental chemical agent.  
Example: Furosemide and NSAID reduces the diuretic effect.
8. **Drug Use without Indication<sup>4</sup>** – The patient is taking a drug for which he or she has no medical need. Even there is no use of drugs, physician prescribes the drug.  
Example: Patient uses Anti-emetics even if vomitings were absent.

**Pharmaceutical Care Network Europe Classification<sup>2</sup>:**

During working conference of PCNE in January 1999, a classification scheme was constructed for Drug Related Problems. The current version is V8.03 which was developed during expert workshop in February 2016 and subsequent specialist meetings in April 2017 and February 2019. The classification is used for research, is also used to estimate prevalence and incidence of DRPs. It also acts as a process indicator in experimental studies. It is also meant to help health care professionals to document DRP information in the Pharmaceutical Care process. Throughout the classification the word 'drug' is used instead of the term medicine. The hierarchical classification is different from existing system as it separates problems from its causes. It also included interventions, their acceptance levels and their outcomes.

### ✚ **Problems:**

- ✓ Treatment effectiveness
- ✓ Treatment safety
- ✓ Others

### ✚ **Causes:**

- ✓ Drug selection
- ✓ Drug form
- ✓ Dose selection
- ✓ Treatment duration
- ✓ Dispensing
- ✓ Drug use process
- ✓ Patient related
- ✓ Others

### ✚ **Intervention:**

- ✓ No intervention
- ✓ At prescriber level
- ✓ At patient level
- ✓ At drug level
- ✓ Other

### ✚ **Intervention Acceptance:**

- ✓ Intervention accepted
- ✓ Intervention not accepted
- ✓ Other

### ✚ **Outcomes of Interventions:**

- ✓ Unknown
- ✓ Problem totally solved
- ✓ Problem partially solved
- ✓ Problem not solved

## **IMPORTANCE OF MONITORING DRPs<sup>1</sup>:**

DRPs are of major concern in view of the physical, psychological and economic burden to the patients and to the society as a whole. Thus optimizing drug therapy by preventing DRPs may influence the health costs, potentially save lives and enhances patient quality of life. To improve an individual patient's quality of life through the achievement of definite, medication related therapeutic outcomes is the goal of pharmaceutical care. The outcomes sought are:

- Cure of a patient's disease
- Elimination or reduction of a patient's symptomatology
- Arresting or slowing of a disease process
- Prevention of a disease or symptomatology

The important three major functions of monitoring DRPs are

- Identifying potential and actual medication related problems
- Resolving actual medication related problems

- Preventing potential medication related problem

## **PHARMACIST INTERVENTION<sup>6</sup>:**

Clinical pharmacists are involved in identification and intervening of DRPs. Intervention is an advice to the physicians and other health care professionals by the pharmacists in order to improve the patient quality of life. DRPs are the major reason for the increased hospital stay, increased economic burden and decreased quality of life of the patient. Clinical pharmacist thus plays a major role in the monitoring of DRPs.

## **ASTHMA :**

### **Definition:**

Asthma means 'laboured breathing' in Greek and was first described 3000 years ago. An expert panel of the National Institute of Health, the National Asthma Education and Prevention Program (NAEPP), has provided the following working definition of Asthma<sup>7</sup>:

Asthma is a chronic inflammatory disorder of airways which involve complex interaction between many cells like eosinophil, mast cells and inflammatory mediators (Interleukins, Leukotriene) that result in inflammation, obstruction, bronchial hyper responsiveness and episodic Asthma symptoms<sup>7</sup>.

Acute Severe Asthma is a dangerous condition that requires hospitalization and immediate emergency treatment. It occurs when bronchospasm has progressed to a state where the patient is breathless at rest and has a degree of cardiac stress<sup>8</sup>.

### **Epidemiology:**

An estimated 20.5 million person in the United States has Asthma (approximately 7% of the population). Asthma is the most chronic disease among children in the United States, with approximately 6.5 million children affected. In the United States and worldwide the prevalence of Asthma has continued to increase. The prevalence rate is highest in children 5-17 years at 9.6%<sup>7</sup>. The probability of children having Asthma-like symptoms is estimated to be between 5% and 12%, with a higher occurrence in boys than girls and in children whose parents have an allergic disorder<sup>8</sup>.

### **Risk factors<sup>7</sup> :**

- ✓ Allergies (Animal proteins, dust mites, pollen, cockroaches, fungal spores)
- ✓ Respiratory infection (rhinovirus, mycoplasma pneumonia)
- ✓ Smoking tobacco
- ✓ Foods (Nuts, fish, dairy products, food colouring especially benzoic acid)
- ✓ Environmental pollutants (traffic fumes)
- ✓ Other industrial triggers (wood or grain dust, cotton dust)
- ✓ Chemicals (Aluminium, Sulphur dioxide, Nitrogen dioxide, wood smoke)
- ✓ Emotions (Anxiety, stress)
- ✓ Drugs (Aspirin, NSAID's, non selective  $\beta$  blockers)
- ✓ Obesity
- ✓ Miscellaneous (cold air, hyper ventilation, viral respiratory tract infections)

### **Pathophysiology<sup>8</sup>:**

The major characteristics of asthma include a variable degree of airflow obstruction (related to bronchospasm, edema and hyper secretion), Bronchial hyperresponsiveness and airway inflammation. Pathophysiology of asthma consist of two phases early phase and late phase reaction.

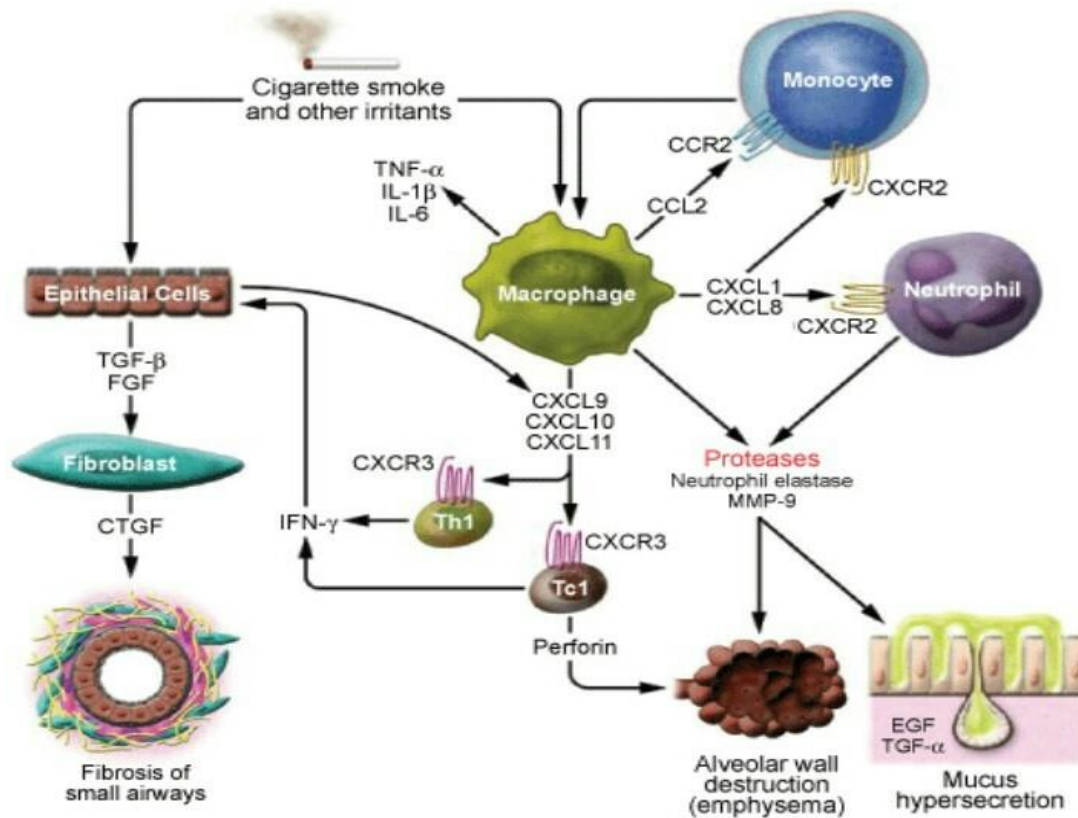


Fig 1: Pathophysiology of Asthma

### Clinical manifestations<sup>7</sup>:

Symptoms of asthma are often intermittent, and the frequency and severity of an episode can vary from individual to individual. Symptoms include Tightness of chest, Wheezing, Shortness Of Breath, Coughing, Tachycardia

### Diagnosis<sup>7</sup>:

- Medical history (Family history of Asthma and allergies)
- Physical observation
- Breathing tests (Spirometry-FEV1,FVC;PEFR;histamine challenge test; respiratory rate)
- Chest X ray
- Arterial blood gas analysis(PCO<sub>2</sub> 35-45 mmHg, PO<sub>2</sub> 80-100 mmHg)
- Blood analysis

### Treatment<sup>8</sup>:

#### Bronchodilators

- β<sub>2</sub> sympathomimetics
  - Salbutamol
  - Terbutaline
  - Salmeterol
  - Formetrol
  - Ephedrine



- Methylxanthines
  - Theophylline
  - Aminophylline
  - Choline theophylline
  - Doxophylline.
- Anticholinergics
  - Ipratropium bromide
  - Tiotropium bromide

#### Leukotriene antagonists

- Montelukast
- Zafirlukast

#### Mast cell stabilizers

- Sodium cromogylcate
- Ketotifen

#### Corticosteroids

- Systemic
  - Hydrocortisone
  - Prednisolone
- Inhalation
  - Beclamethasone
  - Dipropionate
  - Budesonide
  - Fluticaron propionate

#### Anti-Ig E antibody

- Omalizumab

#### Immunosuppressant

- Methotrexate

### AIMS AND OBJECTIVES

#### AIMS:

The aim of the study is to identify and intervene the Drug Related Problems (DRPs) that occur in patients with Asthma.

#### OBJECTIVES:

1. To identify and describe type of DRP in hospitalized patients.
2. To identify causes for DRP's and the drugs that frequently causes DRP's.
3. To intervene the identified DRP by altering drug therapy.
4. To resolve identified DRPs.
5. To report the type and frequency of identified DRP.
6. To reduce the time of hospital stay.
7. To improve patient quality of life and help the patients to get better therapeutic benefit.

## LITERATURE REVIEW

1. A.M.Vinks Fred, H.P.de Koning<sup>9</sup>*et al*, Identification of potential Drug Related Problems in the elderly.

The study was performed from June 2002 to February 2003 in 16 community pharmacies located in the southern part of the Netherlands. In total 196 elderly patients (54 males, 142 females) were included in this

study. The mean (SD) age was 77.0(6.4) years. The mean number of drugs used on the date of inclusion was 8.7(2.5) and varied from 6-18. Antithrombotics, diuretics, beta blockers, nitrates and oral anti diabetics were the six most frequently prescribed medications. A table of 763 potential DRPs was observed in the 196 patients, which correspond to 3.9 potential DRPs per elderly person. Two or more potential DRPs occurred in 90% of the included patients and in almost one third of the study population five or more potential DRPs were identified. The most frequently occurring potential DRPs were no longer existing indication (23.7%), contraindication (20.7%), drug-drug interactions (17.8%) and inconvenience of use (11.7%). With respect to grouping of DRPs into three categories the distribution of the potential DRPs was: patient related 4.7%, prescriber related 55.7% and drug related 39.6%.

**2. Adusumilli PK, Adepur Ramesh<sup>10</sup> et al**, Drug Related Problems: an overview of various classification systems.

Identification and resolving the Drug Related Problems (DRPs) in the prescriptions is the core activity in pharmaceutical care. Suitable classification of DRPs is a vital element in pharmaceutical care practice and research. Different DRP classification systems are in the literature in various international journals. About fourteen different classifications of DRPs were found published with a different focus. Some classifications were hierarchical, categorized into main groups and subgroups. Various terminologies and definitions for DRPs, as well as guidelines for an optimal DRPs classification, were given. In this review, an effort was made to give a general idea about definition and classifications of DRPs.

**3. Abeer Ahmad, M Ruth Mast<sup>11</sup> et al**, Identification of Drug Related Problems of elderly patients discharged from hospital.

Drug Related Problems (DRP) following hospital discharge are common among elderly patients using multiple drugs for the treatment of chronic diseases. The aim of this study was to investigate the occurrence of DRP in these patients using a specific tool for identification of DRP by community pharmacists.

An observational study involving 340 patients aged over 60 years using at least five prescription drugs and discharged from hospital. In total, 992 potential DRPs were observed in the 340 patients (mean 2.9). No drug prescribed but clear indication, an unnecessarily long duration of treatment, dose too low and incorrect drug selection were the DRPs most commonly observed. Ten percent of DRPs occurring in 71 patients were drug-drug interactions. The number of DRPs was related to the number of drugs prescribed. Frequently occurring DRPs found using the patient interview were fear of side effects and no or insufficient knowledge of drug use. Medication of patients discharged from the pulmonary department and of those with type 2 diabetes was particularly associated with occurrence of DRPs.

**4. Hege Salvesen Blix, Kirsten K<sup>12</sup> et al**, The Majority of Hospitalized patients has Drug Related Problems: results from a prospective study in general hospitals.

To describe the frequency and types of drug related problems in hospitalized patients, and to identify risk factors for DRPs and the drugs most frequently causing them. Of the patients, 81% had DRPs, and an average of 2.1 clinically relevant DRPs was recorded per patient. The DRPs most frequently recorded were dose related (31.5%) followed by need for laboratory tests (21.6%), non optimal drugs (21.4%) need for additional drugs (19.7%), unnecessary drugs (16.7%) and medical chart errors (16.3%). The patients used an average of 4.6 drugs at admission. A multivariate analysis showed that the number of drugs at admission and the number of clinical/pharmacological risk factors were both independent risk factors for the occurrence of DRPs, whereas gender and age were not. The drugs most frequently causing a DRP were warfarin, digitoxin and prednisolone, with calculated risk ratios 0.48, 0.42 and 0.26 respectively. The drug groups causing most DRPs were antithrombotic agents, Non Steroidal Anti Inflammatory agents, opioids with risk ratios of 0.22, 0.49 and 0.21 respectively.

**5. Marion Schaefer<sup>13</sup> et al**, Discussing basic principles for a coding system of Drug Related Problems.

Coding systems are important tools for the documentation of DRPs and following interventions.

The main groups comprise the following : unsuitable use by the patient including compliance, unsuitable dosage, drug related, drug interactions, adverse drug reactions, other drug related problems, patient related problems, communication related, technical and logistic problems. The article discusses basic principles of the development of a coding system and the prerequisites for its application. In addition, it tries to give guidance for the classification process itself. It is also recommended to collect further information while documenting drug related problems, in order to allow additional statistical evaluation.

**6. Divaldo Pereira de Lyra, Junior<sup>14</sup> et al**, Impact of Pharmaceutical care interventions in the identification and resolution of drug related problems and on quantity of life in a group of elderly out patients.

To evaluate the impact of a pharmaceutical care services in the identification and resolution of drug related problems and in Quality Of Life (QOL) of a group of elderly outpatients with chronic health patients. The mean age of patients as 66 years, 21 of whom had literacy. During the study, 92 DRP were identified, 3.5 problems per patient. By the end of study, the interventions solved 69% of actual DRP and prevented 78.5% potential DRP. In addition, QOL showed improvement in 22 patients after DRP resolution or prevent.

**7. Gashow Binega Meknonnen, Mequanent Kassa Biarra<sup>15</sup> et al**, Assessment of Drug Related Problems and its associated factors among Medical ward patients.

Drug Related Problems (DRP) are common and in hospitalized patients and may lead to increase hospital stay, health care cost and augment the risk of morbidity and mortality. Objective: The aim of this study was to assess the prevalence of DRP and associated factors among medical ward patients in university of Gondar teaching hospital (GUH). Methods: A hospital based prospective cross sectional study was conducted on 256 patients who were admitted in the medical wards from February to April 2016. Data were collected using a pre-tested standard data abstraction format and semi structured questionnaire. The collected data was checked for completeness and entered into Epi Info 7 software, and analyzed using SPSS version 20. Descriptive, binary and multiple logistic regression analyses were used to assess the association between different variables. Results: Of the 256 study participants, 169(66.0%) of patients had DRP. A total of 174 DRP s were identified on average of 1.04 DRPs per patient. Of the identified DRP the most common DRPs were found due to inappropriate dosage 39.1%, non compliance 28.9% and need additional therapy 24.2%. Length of hospital stay, number of diseases and number of drugs per patient significantly affect DRPs. Conclusions: DRPs are common among medical ward patients. Inappropriate dosage and unnecessary drug therapy were the top and the least prevalent DRPs respectively. Early identification of DRP and the associated factors to them may enhance the prevention and management of DRPs.

**8. Mannu Maria Wincent, D.Potrilingam<sup>16</sup> et al**, Assessment of drug related problems in patients with chronic diseases in general medicine units.

Patients with chronic diseases are more prone to develop a DRP which can further worsen their quality of life. This prospective study was conducted for a duration of 6 months. DRPs were identified, assessed and recorded as per Pharmaceutical Care Network Europe (PCNE) V5.01 criteria. A total of 137 were enrolled into study of which 66 patients developed DRPs. The most prevalent DRP was found to be drug choice problem. The incidence of DRPs was high in patients aged between 50-59 years. 58.33% of total DRPs were completely solved and 19.05% were partially solved. Conclusion: The use of appropriate tool such as PCNE may assist pharmacists and other health care professionals to systematically identify, categorize and report DRPs.

**9. Mohan Greeshma, Selvan Lincy<sup>17</sup> et al**, Identification of Drug Related Problems by Clinical Pharmacist in Prescriptions: A Prospective Interventional Study.

The objective of the study was to assess the pattern of DRPs associated with polypharmacy. During the study of 6 months 150 case sheets were reviewed, 213 DRPs were identified. The most common DRP was found to be Adverse Drug Reactions (ADR)(45%) followed by additional drug therapy (26.8%), untreated indication



(13.6%), drug-drug interactions (DI)(11.7%). Binary logistic regression was performed to identify the predictors of DRPs. It was observed that number of comorbidities, geriatric population and polypharmacy were the major predictors. Conclusion: The study highlights the importance of drug therapy review to minimize DRPs and appointment of clinical pharmacist in hospitals to achieve better therapeutic outcomes and improved patient care.

**10. Sule Apikoglu, Fikret Vehbi Izzetin<sup>18</sup> et al,** Drug related problems and pharmacist intervention in a cohort of patients with asthma and Chronic Obstructive Pulmonary Disease(COPD).

The aim of the study is to describe drug related problems in a cohort of patients with asthma and COPD and to assess interventions provided by pharmacist to address the problems. For the 44 patients with asthma, 59 DRPs and 134 causes for the problems were identified. 84 interventions were made to resolve these problems and 54.2% of the problems were resolved. For 37 patients with COPD, 60 DRPs and 128 causes for the problems were identified. 95 interventions are made to resolve the problems and 63.3% of the problems were resolved. Conclusion: Clinical pharmacists have a significant role to play in improving Asthma and COPD management, which not only impacts on patients lives but also the burden on the health care system. The study has identified that ensuring patient education and correct medication technique are key to improved disease management.

**11. Aziz Ullah Khan, Abdul Khalil<sup>19</sup> et al,** Identification of DRPs and pharmacist's interventions in asthmatic patients in a private tertiary care facility.

DRPs potentially contribute to morbidity, mortality and financial indicators. There is increasing evidence that participation and interventions of clinical pharmacists in health care have a positive influence on clinical practice. A 3 month prospective observational study was conducted in tertiary care hospital setup. A total of 37 patients presenting 91 DRPs were identified including potential drug-drug interactions(48.75%), drug selection(33.75%), drug use process(15%), drug monitoring(6.25%), ADR(6.25%), dosing(3.75%). Clinical interventions documented by pharmacist were drug response (26.25%), patient counseling and education(17.5%), change or clarify medication order (13.5%), proper storage and cost effectiveness(12.5%), medication error/brand duplication (8.75%), change of drug or dosage (3.75%), dose calculations in special populations(3.75%) and discharge plan (2.5%). Conclusion :To minimize the risks of DRPs and prevent their occurrence, drug therapy requires pharmacist's timely and effective interventions at all levels.

## METHODOLOGY

### Study Site:

The study was conducted at tertiary care hospitals in both the inpatient and outpatient wards of General Medicine Department in

1. Rohini Super Speciality Hospital
2. Vishwas Super Speciality Hospital

**Study design:** Prospective Interventional Study

### Study duration:

The study is carried out over a period of 6 months, November 2018 to April 2019

**Sample size:** 118 members

**Study criteria:** Patients with Asthma were enrolled into the study after taking their consent and by considering following inclusion and exclusion criteria.

**Inclusion criteria:**

- Asthma Patients with DRPs.
- Both inpatients and outpatients
- Patients >18 years age group
- Patients of either sex
- Multiple co morbidities
- Poly pharmacy

**Exclusion criteria:**

- Pregnancy and Lactating women
- Patients <18 years age group
- Poisoning and accident cases are excluded
- Patients whose clinical history could not be obtained

**Study material****Data collection and assessment form(Annexure I):**

Patients data were compiled in a pre-tested data collection and assessment form which incorporated patients demographic details(Age, gender, height, weight and occupation), past medical and medication history, chief complaints, social history, laboratory investigations and data corresponding to Asthma,diagnosis and treatment information.

**Study procedure:**

Eligible patients were identified and briefly explained about the study. All the necessary and relevant data of patients who voluntarily agreed to participate in the study were obtained from demographic details, chief complaints, patient's case-sheet, laboratory reports, final diagnosis, current medications, outcomes, patient's previous medical records and through interviewing patients and/or their representatives.

The above data was documented in the data collection form. The collected data was correlated and DRPs were identified, assessed and intervened.

**Sources:**

After assessing the collected data, DRPs were identified and classified into different categories. The sources used were-

- Hepler and Strand classification
- PCNE classification
- Truven Health Analytics- Micromedex solutions for identifying Drug-Drug Interactions
- Adverse Drug Reaction probability scale (Naranjo's) for identifying the probability of adverse effects.

**RESULTS**

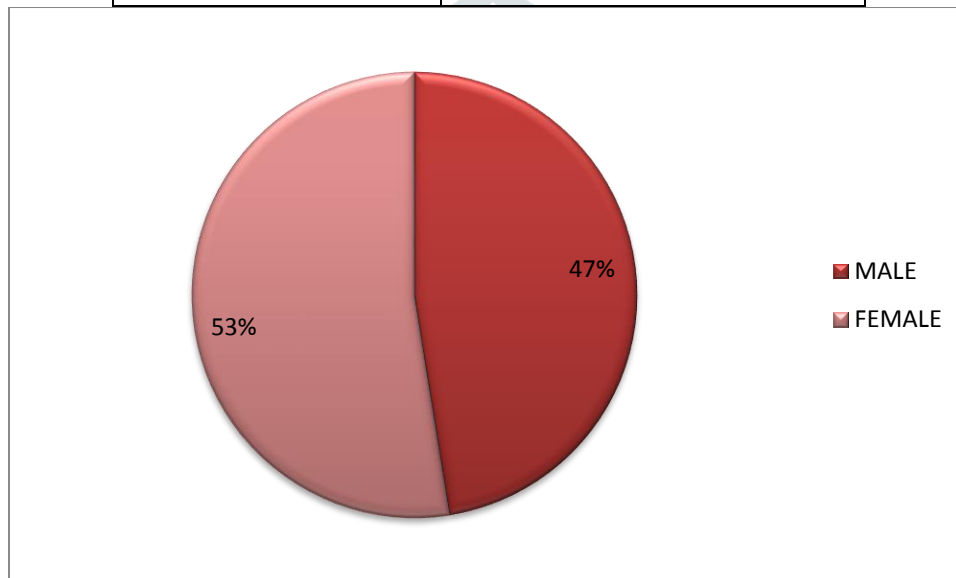
Among 145 patients, DRPs are found in 118 patients. The classification is done based on Gender, Age and DRPs found in them.

**GENDER WISE CLASSIFICATION :**

118 Asthmatic patients were reviewed, of which 56 were male and 62 were female.

**TABLE 1:Gender wise classification of Asthma patients**

GENDER	NUMBER OF PATIENTS
MALE	56
FEMALE	62

**Fig 2 : Gender wise distribution of Asthma patients****AGE WISE CLASSIFICATION:**

The identified Asthma patients were classified based on their age.

**TABLE 2 :Classification of Asthma patients based on age.**

AGE	NUMBER OF PATIENTS
19-39	21
40-60	47
61-81	43
82-102	7

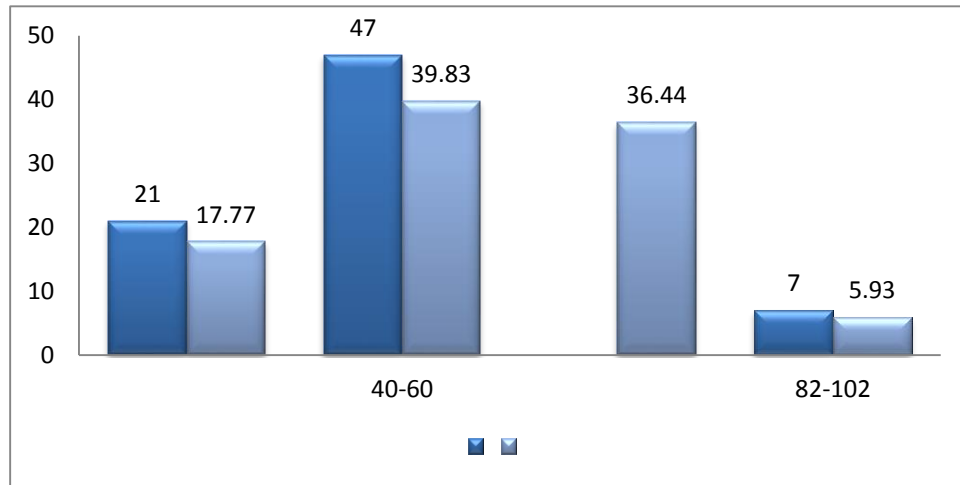


Fig 3: Age wise distribution of Asthma patients

**CATEGORISATION OF DRPs:**

In the observed Asthma patients (118), 167 DRPs were identified and classified into 9 categories. The most identified DRP in Asthma is Drug Interaction (95) followed by Others (21).

TABLE 3: Distribution of DRPs in Asthma patients

DRPs	TOTAL NUMBER
UNTREATED INDICATION	14
DRUG USE WITHOUT INDICATION	19
SUB THERAPEUTIC DOSE	2
OVERDOSE	3
ADVERSE DRUG REACTION	9
DRUG INTERACTION	95
IMPROPER DRUG SELECTION	3
ALTERNATIVE DOSAGE FORMS	1
OTHERS	21

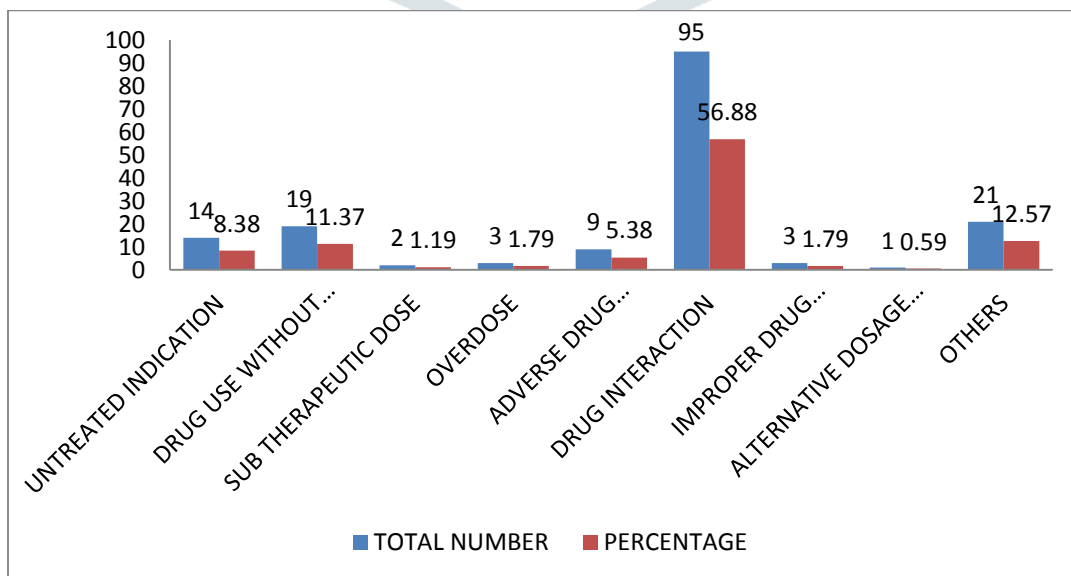


Fig 4: Distribution of DRPs in Asthma patients



**COMMONLY IDENTIFIED DRPs :****UNTREATED INDICATION :**

Untreated Indication was found in 14 cases, the frequency is as follows:

**TABLE-4 : Frequency of Untreated Indication**

INDICATION	FREQUENCY	INTERVENTION
Fever	4	Temperature need to be monitored
Cough	3	TusQ added in the prescription.
Loose Motions	3	Loperamide must be added
Burning Micturition	2	Ibuprofen added in the medication.
Vomiting	2	Ondansetron must be added

**DRUG USE WITHOUT INDICATION :**

Drug use without Indication was found in 19 cases and the frequency is as follows

**TABLE-5: Frequency of Drug use without Indication**

DRUG	CATEGORY	FREQUENCY	INTERVENTION
Sporolac	Anti Diarrheal	4	No diarrhea is seen so sporlac need not be given
Furosemide	Loop Diuretic	3	Loop diuretic was not required in the case
Calcibid	Calcium supplement	3	Calcium supplements are not required
Tranexa	Antifibrinolytic	3	As there is no bleeding antifibrinolytic is not required
Amlodipine	Calcium channel blocker	2	No Hypertension was seen so Amlodipine is not required
Aripiprazole	Anti Psychotic	2	Removal of the drug as there are no psychic conditions
Magnesium Sulphate	Magnesium Supplement	2	Magnesium supplements are not required

**SUBTHERAPEUTIC DOSE :**

2 cases were identified with the DRP of sub therapeutic dose.

**TABLE-6: Frequency of subtherapeutic dose**

DRUG	FREQUENCY	INTERVENTION
Prednisolone	2	Prednisolone dose should be increased

**OVERDOSE:**

3 cases were identified with overdose.

**TABLE-7: Frequency of Over dose**

DRUG	FREQUENCY	INTERVENTION
Prednisolone	2	Reduce the dose of prednisolone
Ipratropium Bromide	1	Ipratropium Bromide dose should be decreased

**ADVERSE DRUG REACTION:**

9 cases were identified with Adverse Drug Reaction and the frequency is as follows

**TABLE-8: Frequency of Adverse Drug Reaction**

DRUG	REACTION	FREQUENCY	INTERVENTION
Tazobactam	Diarrhea	3	Use anti diarrheal drugs
Furosemide	Hyperuricemia	3	Allopurinol should be used
Torsemide	Headache	3	Non steroidal anti inflammatory drugs is used

**DRUG INTERACTIONS:**

Among 167 DRPs 95 Drug Interactions were found

**TABLE-9: Frequency of Drug interactions.**

Drugs Involved	INTERACTION	FREQUENCY	INTERVENTION
Clarithromycin+Methylprednisolone (Major)	Bloodlevels of Methyl Prednisolone increases	1	Decrease the dose of Methylprednisolone
Prednisolone+Ofloxacin (Major)	Increases the ADRof Ofloxacin	3	Alternate antibiotic should be prescribed
Prednisolone+Levofloxacin (Major)	Increases the side effects of Levofloxacin	1	Dose should be adjusted
Clarithromycin+Budesonide (Major)	Increases the absorption of Budesonide	1	Dose should be adjusted
Theophylline+Tramadol (Major)	Seizures	1	Simultaneous administration need to be avoided
Clarithromycin+Aminophylline (Moderate)	Increases the effect of Aminophylline	3	Dose of Aminophylline must be adjusted
Clopidogrel+Pantoprazole	Reduces the	1	Clopidogrel dose

(Moderate)	effect of Clopidogrel		should be adjusted
Prednisolone+Magnesium Sulphate (Moderate)	Increased risk of dehydration and hypokalemia	2	Fluids are to be administered
Furosemide+Prednisolone (Moderate)	Increased effect of Prednisolone	1	Prednisolone dose need to be adjusted
Prednisolone+Clarithromycin (Moderate)	Increased effect of Prednisolone	3	Prednisolone dose need to be adjusted
Furosemide+Insulin (Moderate)	Reduces the effectiveness of Insulin	2	Adjust the insulin dose
Clarithromycin+Insulin (Moderate)	Hypoglycemia	1	Glucose levels are to be monitored
Naproxen+Pantoprazole (Moderate)	Increases the release of Naproxen	1	Naproxen dose should be adjusted
Furosemide+Cefoperazone (Moderate)	Increases the risk of kidney problem	2	Alternate antibiotic should be given
Clarithromycin+Clopidogrel (Moderate)	Reduces the effect of clopidogrel	1	Clopidogrel dose should be increased
Rantidine+Theophylline (Moderate)	Increases the effect of Theophylline	3	Theophylline dose should be adjusted
Prednisolone+Theophylline (Moderate)	Increases the side effects of Theophylline	1	Theophylline dose should be adjusted
Ofloxacin+Theophylline (Moderate)	Increases the side effects of Theophylline	1	Theophylline dose should be adjusted
Ofloxacin+Salbutamol (Moderate)	Increases heart rhythm	2	Heart rhythm should be monitored
Theophylline+Salbutamol (Moderate)	Increased effects of cardiovascular system	2	Pulse rate should be monitored
Ceftriaxone+Amikacin (Moderate)	Risk of kidney damage	4	Alternate antibiotics should be prescribed
Salbutamol+Terbutaline (Moderate)	Increased cardiovascular effects	1	Dose should be adjusted
Cefuroxime+Furosemide (Moderate)	Increased risk of kidney damage	2	Alternate antibiotics should be prescribed
Furosemide+Hydrocortisone (Moderate)	Increased effects of Hydrocortisone	3	Dose need to be adjusted
Hydrochlorthiazide+Prednisolone (Moderate)	Increased side effects of Prednisolone	1	Dose need to be adjusted

Prednisolone+Telmisartan (Moderate)	Reduces the effect of Telmisartan	3	Telmisartan dose should be adjusted
Hydrochlorthiazide+Pantoprazole (Moderate)	Hypomagnesemia	1	Magnesium levels are to be monitored
Atorvastatin+Pantoprazole (Moderate)	Increases the side effects of Atorvastatin	4	Atorvastatin dose should be adjusted
Furosemide+Pantoprazole (Moderate)	Hypomagnesemia	8	Magnesium levels are to be monitored
Theophylline+Pantoprazole (Moderate)	Increases the side effects of Theophylline	2	Theophylline dose should be adjusted
Azithromycin+Salbutamol (Moderate)	Risk of increased heart rhythm	1	Frequent monitoring
Torsemide+Salbutamol (Moderate)	Hypokalemia	1	Potassium supplements are to be added
Aminophylline+Budesonide (Moderate)	Hypokalemia	4	Potassium supplements are to be added
Aminophylline+Formeterol (Moderate)	Increased effects of CVS	2	Dose need to be adjusted
Diphenhydramine+Salbutamol (Moderate)	Increased cardiac side effects	3	Dose need to be adjusted
Methylprednisolone+Aminophylline (Moderate)	Hypokalemia	2	Potassium supplements are to be given
Diphenhydramine+Tramadol (Moderate)	Increases the side effects of Tramadol	1	Dose need to be adjusted
Theophylline+Budesonide (Moderate)	Increases the levels of theophylline	6	Theophylline dose should be adjusted
Furosemide+Lactulose (Moderate)	Dehydration	1	Fluids are to be administered
Theophylline+Hydrocortisone (Moderate)	Hypokalemia	3	Potassium supplements are to be prescribed
Hydrocortisone+Insulin (Moderate)	Decreases the effect of Insulin	1	Increase the dose of insulin



Clarithromycin+Hydrocortisone (Moderate)	Increases the side effects of Hydrocortisone	4	Dose need to be adjusted
Salbutamol+Lactulose (Moderate)	Irregular heart rhythm	1	Dose need to be adjusted
Salbutamol+Ondansetron (Moderate)	Irregular heart rhythm	2	Dose need to be adjusted
Cefoperazone+Heparin (Moderate)	Increased kidney damage	1	Alternate antibiotic need to be prescribed

### IMPROPER DRUG SELECTION :

Among 167 DRPs,3 cases were identified with improper drug selection.

**TABLE-10: Frequency of Improper Drug Selection**

INDICATION	DRUG GIVEN	FREQUENCY	INTERVENTION
Cough	Codeine	1	Alternate cough suppressant should be prescribed
Hypertension	Atenolol	1	ACE inhibitors are better
Infection	Cefixime	1	Macrolide antibiotics need to be prescribed

### ALTERNATE DOSAGE FORM :

Among 167 DRPs,1 case was identified with alternate dosage form.

**TABLE-11:Frequency of Alternate Dosage Form**

DRUG	PRESCRIBED DOSAGE FORM	INTERVENTION
Budesonide	Metered dose inhaler	Dry powder inhaler is better

**OTHERS:**

Out of 167 DRPs, 21 cases are identified with therapeutic duplication.

**TABLE-12: Frequency of Therapeutic Duplication**

DRUGS	CAUSE	FREQUENCY	INTERVENTION
Bronchodilators	3 types were prescribed	6	Only 2 bronchodilators can be used concurrently
Corticosteroids	2 forms were prescribed	5	Only 1 corticosteroid need to be prescribed
Antibiotics	3 Antibiotics were prescribed	4	More than 2 antibiotics should not be prescribed
Anti pyretics	2 drugs were prescribed	3	Only one is efficient to reduce to normal temperature
Anti Diarrheal	2 drugs were prescribed	3	One drug is enough

**DISCUSSION**

A study was conducted by Mohan Greeshma, Selvana Lincy *et al* on 'Identification of Drug Related Problems by Clinical Pharmacist in Prescriptions: a prospective study'. This article has reviewed 150 case sheets and 213 DRPs were identified. The most common DRP was Adverse Drug Reaction (ADR) (45%) followed by Additional drug therapy (26.8%), Untreated Indication (13.6%), Drug-Drug Interactions (11.7%)<sup>17</sup>.

In the present study a total of 118 patients were reviewed and 167 DRPs were identified. The most common DRP was found to be Drug interactions (DI) (56.88%) followed by others (Therapeutic Duplication) (12.57%), Drug use without indication (11.37%) where as the least found DRP was Alternative Dosage form (0.59%).

A study was conducted by Mannu Meria wincent, D Portrilingam *et al* on 'Assessment of DRPs in patients with chronic disease in general medicine units of a tertiary care hospital'. This article has reviewed 137 patients of which 66 patients developed DRPs. The incidence of DRPs was high in patients age between 50-59y<sup>16</sup>.

In the present study 118 patients were enrolled and a total of 167 DRPs were identified. The incidence of DRPs was high in patients age between 61-81y.

A study was conducted by Aziz Ullah Khan, Abdul Khalil *et al* on 'Identification of DRPs and Pharmacists interventions in Asthmatic patients in a private tertiary care facility'. This study has enrolled 37 patients and 91 DRPs were identified. The most identified DRP was found to be Drug Interactions (48.75%) followed by Drug selection (33.75%), ADR (6.25%)<sup>19</sup>.

In the present study 118 patients with Asthma were enrolled and 167 DRPs were identified. The most identified DRP was found to be Drug Interactions (56.88%), others (therapeutic duplication) (12.57%), Drug use without Indication (11.37%)

**CONCLUSION**

In the present study we found that the frequency of DRPs are high in Drug interactions followed by Therapeutic duplication (others) and the least found DRPs are Alternative dosage form. It can be concluded that each patient is facing more than 1 DRP. These DRPs reduce patient quality of life and increase economic

burden. It was identified that the major cause of extension of hospitalization in patients was due to occurrence of DRPs. The frequency of DRPs was found to be high in elderly patients due to poly pharmacy and presence of multiple co-morbidities. Elderly patients were more prone to DRPs because of alterations of their physiological activity. There were no correlation observed with gender in developing DRPs.

Due to lack of information regarding patient's past medical history has led to development of Drug interactions. So this is the duty of physician to assess past medical history. Improper assessment by Nursing staff and physician also led to DRPs like Untreated Indication and Improper drug selection. DRPs like Over dose and Sub therapeutic dose are caused due to lack of knowledge of nurses or patient non-adherence to medication or it may be prescribers fault. So it can be concluded that no one is solely responsible for DRPs instead health care professionals(Physician, Nursing staff) along with patient are collectively involved in it either knowingly or unknowingly.

The study finally concludes that the involvement of Clinical Pharmacy Services in patient care can significantly help to identify, assess, intervene ,resolve and prevent the DRPs in the Hospital. This thereby reduces the drug related morbidity and mortality, improves individualization of drug therapy and enhance the patient compliance.

Acceptance of the Intervention proposals: Out of total Interventions made 56% were accepted.

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