Identifying Drug Related Problems in department of nephrology at a rural set up

R. Kavya sri[1], P. Shirisha[1], D.Venkataramana[2], D.Sudheer kumar[3], P. Kishore[1*]

[1]Department of Pharmacy Practice, Care College of Pharmacy, Warangal

[2]Nephrologist, Department of Nephrology, SVR Hospital, Warangal

[3]Department of Pharmaceutics, Care College of Pharmacy, Warangal (Rural)

ABSTRACT: Background and purpose: *Drug Related Problem is defined as an extent or circumstance involving drug treatment that actually or potentially interferes with the patient experiencing an optimum outcome of medical care. Drug Related Problems are of two types actual DRP and Potential DRP.Clinical pharmacist has a significant role in identification, prevention and management of the drug related problem*

Materials and methods: *A total of 184 patients visiting nephrology department were enrolled in this prospective study for a period of 6 months in Warangal region.*

Results: *Of 184 patients, 94.5 %, 2 %, 1.2 %, 1.07 %, 0.3 % and 0.17 % were drug drug interaction, adverse reaction and treatment effectiveness, non adherence, medication error and over dose and contraindication respectively.*

Conclusion: *Anti-hypertensive drugs, antibiotics are the major class of drugs which cause DRPs. Drug interactions, non-adherence and ADRs are most frequently observed DRPs.*

Key Words: *Drug Related Problem, Adverse Drug Reaction*

INTRODUCTION

Drug Related Problem (DRP) is defined as an extent or circumstance involving drug treatment that actually or potentially interferes with the patient experiencing an optimum outcome of medical care [1]. DRPs can increase the carrying cost and also can block the attained of the therapy purposed [2]. One of the factors for identifying DRPs is use of electronic prescription and for improving the drug safety [3]. The core process of pharmaceutical care is identification, prevention and solution of DRPs [4]. The purpose of identifying DRPs is to realize the best possible outcomes from drug therapy and help to the patients achieve their goals of therapy [5]. Therefore, through knowledge of DRPs may benefit health care professionals including pharmacists to identify DRPs, resolve actual DRPs and prevent potential DRPs in order to optimise patients' outcomes [6].50-80 % of the drug related problems can be prevented by pharmacist intervention [7].

There are two types of DRPs: Actual DRP and potential DRP.

Actual DRP: An actual drug related problem is defined as an event which is already seen in patients due to the drugs which are administered without involvement of pharmacist.

Potential DRP: Potential drug related problem is defined as an event that occurs in the absence of pharmacist intervention.

The most important drug related problems include adverse drug reactions (ADRs), drug interactions (DIs) and therapeutic failure [8].

 Types of drug related problems:

HELPER AND STRANDS classified the DRPs into 8 categories: [9]

i. Adverse drug reaction (ADR)

ii. Drug interaction (DI)

iii. Failure to receive drug

iv. Sub therapeutic dosage

V. Over dosage

Vi. Indication without drug therapy

Vii. Drug use without indication

Viii. Inappropriate drug selection

i. Adverse drug reaction (ADR):

According to WHO an adverse drug reaction (ADR) is defined as a response to a drug which is noxious and unintended and which occurs at doses normally used in man for the prophylaxis, diagnosis or therapy for a disease and for the modification of function excluding failure to accomplish the intended purpose. Drug

administration either alone or combination can leads to ADR. When the number of medications administered increases the frequency of ADR increases [10].ADRs are major cause for morbidity and it accounts mostly 5% of hospitalised patients all over the world. ADRs are 4th leading cause of death in pulmonary disease, diabetes mellitus, AIDS, pneumonia and automobile death conditions [10]. Ex: theophylline induced anxiety and seizure [10]; methylxanthines induced hypokalaemia [11].

ii. Drug interactions (DIs):
Drug-drug interaction:
Drug-drug interaction can be defined as a change in a drugs effect on the body when the drug is taken together with a second drug [12].A drug-drug interaction can delay, decrease, or enhance absorption of either drug. This can decrease or increase the action of either or both drugs or cause adverse effects [11]. More number of drugs prescribed in elderly is more prone to drug-drug interactions. Patient factors, prescriber factors, and communication between health professional and patient are the patient's risk factors for drug-drug interactions [13]. Interactions can be prevented by avoiding multiple drug treatment and potential benefits of drug combination [13]. Ex: combination of linezolid and theophylline, linezolid may enhance the hypertensive effect of sympathomimetic [11], combination of amlodipine and labetalol cause bradycardia [12].

Drug-drug interactions include Pharmacokinetic interactions and pharmacodynamic interactions. Pharmacodynamic interactions are mainly synergism, antagonism and additive effect; synergistic is one of the most pharmacodynamic interactions [14]. Ex: efficacy of inhaled corticosteroids might be reduced in patients with asthma and COPD. Higher doses of inhaled corticosteroids are required in patients with asthma who smokes [15].Pharmacokinetic type of interaction which affects the drug absorption, distribution, metabolism and elimination. The most pharmacokinetic interaction is metabolism [14]. Ex: smoking and theophylline; theophylline has a narrow therapeutic window dose adjustment is done in the smoking patients [15].

Drug-food interaction:
Drug-food interactions occur when food and medicine interfere with one another. Interactions can happen both prescription and over the counter medicines. These include antacids, vitamins and iron pills [16].Interaction between food and drugs can produce negative effects in safety and efficacy of drug therapy and nutritional therapy. They may increase or decrease the drug effect. Taking one hour before or 2 hours after eating interactions can be avoided [14]. Ex: while taking ACE inhibitors potassium containing foods are avoided like banana, sweet potato etc... [16].

Drug-disease interaction:
Drug-disease interaction is an event in which a drug intended for therapeutic use causes some harmful effect in a patient because of disease or condition that the patient has. There are some diseases that alter the body ability to metabolize or breakdown, a drug so that it can have the intended effect [17]. These interactions can occur in any age group people but more common in elderly people and who are having a greater number of diseases. For example, beta blockers are taken for hypertension can worsen the asthma [18].

iii. Failure to receive drug:
Failure to receive drug is defined as a deviation from the prescribed medications because of a choice, non-comprehension or forgetfulness [19]. Ex: Iron preparations, multivitamins, paracetamol, phenytoin [7].

iv. Sub therapeutic dosage:
It can be defined as if the prescribed dose was less than recommended dose [19]. Ex: according to indication or guidelines; budesonide inhaler -pregabalin [20], amoxicillin-calcium [19], telmisartan-metoprolol [7].

V. over dosage:
Over dosage can be defined as if the prescribed dose was too high in relation to the patient's renal function, liver function or age; Ex: Gabapentin and allopurinol dose was not adjusted in renal function patients.

Vi. Indication without drug therapy:
If a patient had an unnecessary drug therapy this was classified as indication without drug therapy [19].Ex: calcium and vitamin D, omeprazole, potassium, prednisolone [20].

Vii. Drug use without indication:
Inappropriate drug use according to explicit Swedish criteria and inappropriate drugs according torenal function or disease were classified as inappropriate or ineffective drug. Ex: antidiabetic agents like Metformin and Glibenclamide [19].

Viii. Medication error:

The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines a "medication error" as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer". Types of Medication Error include prescription error, dispensing error and administration error

MATERIALS AND METHODS

A total of 184 patients attending nephrology department were subjected to prospective study for a period of 6 months in Warangal region at SVR Hospital, Hanumakonda after obtaining approval from Institutional Ethics Committee. Every individual patient was approached before and after consultation with the Clinician. Nature and purpose of the study have been explained to every individual person and informed consent was obtained. Patients prescribed with more than one drug were included in the study. Information was collected from the case sheets, patients and their care givers.

RESULTS

Table 1: Types of drug related problems and percentage of drug related problem

Drug related problems	Percentage
Drug drug interaction	94.5 %
Adverse effects	2 %
Treatment effectiveness	2 %
Non adherence	1.2 %
Therapeutic duplication	1.07 %
Medication error	0.3 %
Over dose	0.3 %
Contraindication	0.17 %

Table 2: percentage of drug related problems in male and female patients

Drug related problems	Male	Female
Drug drug interaction	61 %	39 %
Adverse effects	60 %	40 %
Treatment effectiveness	66.6 %	33.3 %
Non adherence	67 %	33 %
Therapeutic duplication	50 %	50 %
Medication error	100%	0 %
Over dose	100 %	0 %
Contraindication	100 %	0 %

Table 3: Drug related problemsVs Patient age group

Drug related problems	Age group (in years)	
Drug drug interaction		31-40
Adverse effects	21-30	
Treatment effectiveness		61-70
Non adherence	21-30	
Therapeutic duplication		41-50
Medication error	61-70	
Over dose	51-60	
Contraindication	61-70	

DISCUSSION

Among 184 patients, drug- drug interactions accounted for 94.5 %, adverse drug reactions accounted for 2 %, non-   adherence 1.2 %, therapeutic duplication 1.2 %, treatment effectiveness 0.5 %, medication errors 0.3 % and over dose 0.3 %. Of 184 patients, 64.1 % were male and 35.8 % were female. Most of the patients had 6-7 drugs prescribed in this department.

<u>Drug interactions:</u>

According to our study, 94.5 % DRPs were drug-drug interactions and they were observed more in male patients (61 %) compared to female (39 %). Similar observations were made by Sibi C Chacko*et al.,* 2016

[13]. Hospitalized patients with severe illness were more prone to drug interactions due to presence of more than one comorbid condition demanding a greater number of drugs. In our study, hypertensive patients were found to have more number of drug interactions. Drug-drug interactions were observed more in patients above 50 years of age, which is similar to the findings of Enugu Adana Onyedikachi *et al.,* 2017 [21]. Contrast to our study Maxwell O Adibe *et al*., 2017 [22] observed 36.7 % drug interactions. Drug interactions in our study were observed more with concomitant use of metoprolol with prazosin, metolazone with torsemide and calcium with ferrous fumarate.

Adverse drug reactions & treatment effectiveness:

In our study, 2 % adverse drug reactions were observed of which 60 % were male& 40 % were female patients, which are found to be similar to the study conducted by Aster Wakjira Garedow *et al.,* 2016 [23]. The failure of treatment effectiveness is observed in 0.5 % patients among which 66.6 % were male and 33.3 % were female which is in contrast to the findings of Hesty U.Ramadaniati *et al.,* 2016[[6] wherein they observed 47.1 % ADRs and 28.7 % failure of treatment. The less number of ADRs and failure of treatment effectiveness could be due to rational use of the drugs.

Medication error & over dose:

According to our study, 0.3 % male patients were identified with medication error and drug over dose. A Study conducted by Ghazal vessal 2010 [24] observed 16 % medication error and 12.8 % drug over dose in 76 patients. In our study, less number of medication error and over dose were due to constant monitoring of patient's condition by clinician regularly during clinical rounds. It may also be attributed to active participation of other healthcare professionals in monitoring patients.

Contraindications:

In our study 0.17 % male patients were found to be prescribed with contraindicated drugs. In contrast to our study higher percentage (14 %) contraindications were observed by Adel Yousess *et al.,* 2015 [25] despite using health information technology adopting system like CDSS, which is designed to support physician and other healthcare professionals in clinical decision making. Where as in our study, without implementing of following CDSS, contraindications were observed in small number of patients which reflects team work of all health care professionals and sound clinical knowledge of physician regarding drug combinations used in comorbid conditions and chronic conditions.

Non-adherence:

Of 1.2 % non-adherence patients, 67 % were male and 33 % female which is similar to the study conducted by Savitha R S *et al*., 2020 [26]. The less incidence of non-adherence may be due to elder patients being regular with their hospital visits, religious intake of drugs without failure. Another reason could be rational drug therapy and as most of the patients were hospitalized, medication therapy management was done properly. In contrast, Shiva Kala *et al*., 2019 [27] observed non-adherence in greater number of patients due to forgetfulness and high cost of medications.

Therapeutic duplication:

In our study, 1.07 % were therapeutic duplication 50 % were male and 50 % were female patients. Similar study was conducted by Vishwam K Subeesh *et al* 2016 [28] observed 4.4 % therapeutic duplications. The occurrence of therapeutic duplication may be due to not discontinuing pervious medication before initiation of new therapy.

CONCLUSION

In our study, DRPs such as drug-drug interactions, adverse drug reactions, non-adherence, treatment effectiveness, therapeutic duplication, medication error, over dose werer observed. Polypharmacy, multiple co- morbid conditions, age, lack of awareness and irrational use of drugs were the major risk factors for DRPs. Anti-hypertensive drugs, antibiotics are the major class of drugs which cause DRPs. Drug interactions, non-adherence and ADRs are most frequently observed DRPs. Clinical pharmacist has important role in management of treatment, patient counseling, creating awareness of disease and drug and thus help in early detection of DRPs so that overall treatment cost can be reduced and patients can be benefited with maximum therapeutic outcome.

REFERENCES

1. ChinnuReebaGeorge, Dr. Daphna Jacob, Study of Drug Related Problems in Ambulatory Haemodialysis Patients.IOSR   Journal of Pharmacy and Biological Sciences (IOSR-JPBS); Volume12, PP 32-36.
2. G. Shivaraj, Dr.K. Muralikrishna, NijeeshC.H., Study on Drug Related Problems in Tuberculosis patients With Comorbidities in A Tertiary Care Teaching Hospital. European Journal of Pharmaceutical and Medical Research; 2017; 4(9), 756-767.

3. Anne B. Taegtmeyer, Ivanka Curkovic, Natascia Corte, Drug Related Problems and Factors Influencing Acceptance of Clinical Pharmacologists Alerts in a Large Cohort of Neurology Inpatients. The European Journal of Medical Sciences; 2012; 142: w13615.

4. DlearHassan Mossman, Basra Hassan et.al...Identification Of Drug-Related Problems In Patients With Chronic Kidney Disease Maintained on Hemodialysis In Sulaimani City.J.Pharma.Sci.Innov.2015;4(3)

5. 5.Kosisochi chinwendu amorha, Anthony Chukwuma onu, et.al. Evaluationof Drug Therapy Problems in Astma Patients Receving Care In Two Hospitals In South-Eastren Nigeria.International journal of pharmacy and pharmaceutical sciences ;2017; vol 10,50-55.

6. Hesty u. ramadaniati,yusi anggriani,vonny m. wowor,Alvina rianti Drug Related Problems In Chronic Kidney Disease Patients In An Indonesia Hospital:Do The Problems Really Matter?;international journal of pharmacy and pharmaceutical sciences ;2016;vol 8,298-302.

7. Celin A.T, Seuma J, Ramesh A,Assesment of Drug Related Problems In Stroke Patients Admitted To A South Indian Tertiary Care Teaching Hospital .Indian Journal of Pharmacy Practice;2012;volume 5.

8. Ezugwu Adanne Onyedikachi, Adibe Maxwell Ogochukwu, et.al.Evaluation of Drug-Drug Interactions Among Chronic Kidney Disease Patients of Nephrology Unit In The University of Nigeria Teaching Hospital ,Ituku-Ozella,Enugu State. Journal of Basic and Clinical Pharmacy;2017;vol 8:S1.

9. Juno J.Joel,Muhammed Musthafa M,Shastry C.S,A Study on Drug Related Problems And Pharmacist Intervention In Patients Undergoing Haemodialysis In a Teritary Care Hospital.IRJPAS;2013;3(5):263-265.

10. N.Tyagi,K.Gulati,V.K.Vijayan and A. Ray, A Study To Monitor Adverse Drug Reactions In Patients of Chronic Obstructive Pulmonary Disease:Focus on Theophylline.The Indian Journal of Chest Disease & Allied Sciences;2007.

11. Amrutha Thomas, Dr. Aryamol George, Dr. Kabindra Karna, A Prospective Observational S of Medications Related Problems In Patients With Chonic Obstructive Pulmonary Disease. International Journal of Pharmaceutical Sciences Review and Research;2018; 50(2):89-94.

12. Venkateshwaramurthy n,Krishnaveni k,Mercy Freeda r,Assessment of Potential Drug-Drug Interaction In Stroke Patients.International Journal of pharmacy and Pharmaceutical Sciences;2016;vol 8:Issue 12,221-224,.

13. Sibi C Chacko, Javedh Shareef,Janardhan Kamath Assessment of Drug-Drug Interactions In Chronic Kidney Disease Patients In Nephrology Unit of Tertiary Care Teaching Hospital. Indo American Journal of Pharmaceutical Research,2016;vol 6.

14. R.Kameswaran,Neha.k.Abraham,Benliya Bensen,et.al. Assessment of Potential Drug Interactions Among Hospitalized Patients In The Pulmonary Wards In Tertiary Care Hospital. International Journal of Pharmaceutical Sciences Review and Research;2017;47(2);page:18-21.

15. Sule Apikoglu-Rabus, Gozde Yesilyaprak, Fikret Vehbi izzettin Drug-Related Problems and Pharmacist Interventions a Cohort of Patients With Asthma and Chronic Obstructive Pulmonary Disease.Respiratory Medicine 2016;109-115.

16. https://familydoctor.org/drug-food-interactions/.

17. https://study.com/academy/lesson/common-drug-disease-interactions.html.

18. https://www.msdmanuals.com/en-in/home/drugs/factors-affecting-response-to-drugs/drug-interactions.

19. Bettina Pfister, Jeanette Jonsson and Maria Gustafsson, Drug -Related Problems and Medication Reviews Among Oid People With Dementia.bmc Pharmacology and Toxicology;2017: 18:52.

20. Cecilia Peterson.Maria Gustafsson Characterisation of Drug-Related Problems and Associated Factors at a Clinical Pharmacist Service-Navive Hospital in Northern Sweden.drugs-real world outcomes 2017;97-107.

21. Enugu Adanne Onyedikachi, Adibe Maxwell Ogochukwu, Amorha Kosisochi Chinwendu: Evaluation of Drug-Drug Interactions Among Chronic Kidney Disease Patients of Nephrology Unit in the Universuty Of Nigeria Teaching Hospital, Ituku-Ozalla, Engu State Journal of Basic and Clinical pharmacy, Vol 8, SI, 2017

22. Maxwell O Adibe, Nneka U Igboeli and Chinwe V Ukwe: Evaluation of drug therapy problems among renal patients receiving care in some tertiary hospitals in Nigeria. Tropical Journal of Pharmaceutical Research March 2017; 16 (3): 697-704

23. Aster Wakjira Garedow, Eshetu Mulisa Bobasa, Amare Desalegn Wolide, Fantu Kerga Dibaba, Fanta Gashe Fufa, Birtukan Idilu Tufa, Serkadis Debalke, and Kabaye Kumela Goro: Drug- Related Problems and Associated Factors among Patients Admitted with Chronic Kidney Disease at Jimma University Medical Center, Jimma Zone, Jimma, Southwest Ethiopia: A Hospital-Based Prospective Observational Study. International Journal of Nephrology Volume 2019, Article ID 1504371, 9

24. Ghazal Vessal: Detection of pharmacist errors by unit-based clinical pharmacist in a nephrology ward. Pharma world science (2010) 32:59-65

25. Adel Youssef, PhD, Alaa Almubarak, BS, Maisan Aljohnai, BS, Malak Alnuaimi, BS Banan Alshehri, BS, Ghayda Al-ghamdi, BS, Khalid Akkari, MD and Mohammed Sager, MD: Contraindicated medications administered to inpatients with renal insufficiency in a Saudi Arabian hospital that has a computerized clinical decision support system. Journal of Taibah University Medical Sciences (2015) 10(3), 320-326