

Study of Drug Related Problems in Ambulatory Hemodialysis Patients

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Abstract: A prospective, observational study was conducted for a period of six months in a quaternary care hospital in south India to detect and categorize drug related problems in ambulatory haemodialysis patients. Medication related problems were identified through reviewing patient charts, patient interview and communication with other healthcare disciplines. 79 ambulatory haemodialysis patients were enrolled with 56 males and 23 females. In that 86.07% patients were hypertensive and 43.03% patients were suffering from diabetes. A total of 660 drugs were prescribed for 79 patients with a mean of 8.35 ± 2.33 drugs per patients. We found a total of 301 Drug Related Problems (DRPs). The most common DRP identified was drug interactions 86.38% and the second was ADR 4.98%. Other DRPs identified were indication without drug therapy 3.98 %, improper drug selection 1.32%, overdose 2.99 % and failure to receive drug 0.33 %. Supplements like iron, calcium, vitamins and antihypertensives were the widely prescribed drugs. Presence of co-morbidities increases the number of drugs. A direct proportionality is seen with number of drugs prescribed and DRPs. Health professionals like clinical pharmacists must be aware of these problems, and efforts must be made to terminate or resolve DRPs.

Keywords: ADR (Adverse Drug Reaction), Ambulatory, Drug Related Problems (DRPs), Co-morbidities, Haemodialysis

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I. Introduction

Chronic Kidney Disease (CKD), is defined as the presence of kidney damage or decreased Glomerular Filtration Rate (GFR) for 3 months or more¹. CKD is a progressive disease that eventually leads to renal failure called End-Stage Renal diseases (ESRD). CKD is associated with several risk factors namely advanced age, family history, diabetes mellitus, hypertension and tobacco smoking².

Dialysis involves the removal of metabolic waste product by diffusion and ultra filtration from the bloodstream across a semi permeable membrane into an external dialysate solution. Dosing of drugs in patients receiving hemodialysis is affected greatly by the frequency and type of dialysis machine used and by the physiochemical and pharmacokinetic properties of the drugs. Water insoluble drugs, tightly bound drugs and drugs having molecular weight of more than 500D are poorly dialysed. Also drugs with large volume of distribution are dialysed more slowly⁸.

Whether a drug is significantly removed by dialysis or hemofiltration is an important clinical issue. Drugs that are not removed may well require dose reduction to avoid accumulation and minimize toxic effects. Alternatively, drug removal may be significant and require a dosage supplement to ensure an adequate therapeutic effect is maintained. ESRD patients are at high risk for getting medication related problems as they are taking many drugs for multiple co-morbidities and undergo frequent medication changes¹⁰.

CKD is more common in south Asian origin (India, Sri Lanka and Pakistan) and black people than the general population. The reasons for this are higher rates of diabetes in south Asian people and higher rates of high blood pressure in African or Caribbean people¹¹. There are about 350,000 ESRD patients in US currently. It is estimated that these patients have a mean of 5 co-morbid conditions with a mean of 8 medications¹². The number of chronic dialysis patients is now more than 280,000 in Japan¹³. Almost all haemodialysis patients are prone to drug related problems due to their multiple risk factors and complex treatment regimen¹⁴.

A drug therapy (related) problem (DRP) can be defined as an extent or circumstance involving drug treatment that actually or potentially interferes with the patient experiencing an optimum outcome of medical care¹⁰. Basically DRP's are of 8 categories namely Indication without drug Therapy, Drug without indication, Improper drug selection, Sub-therapeutic dosage, Over dosage, Adverse Drug Reaction, Drug Interaction, Failure to receive drugs^{18,19,20,21}. Hence this current study was conducted to determine the drug related problems in haemodialysis patients.

II. Materials And Methods

The study was conducted at a quaternary care super speciality hospital in south India. It was a prospective observational study conducted for period of six months in haemodialysis patients. All the age category of haemodialysis patients taking medications irrespective of gender was included in the study. Pregnant women and patients who were not willing to participate in the study were excluded. The data necessary for the study was collected by informed consent form, patient data collection form, approaching haemodialysis patients, their care takers and health professionals. This study was approved by the Institutional Ethical Committee. Medication related problems (MRP) were identified through review of the patient chart, patient interview and communication with other healthcare disciplines. All MRP were categorized by type and medication class. MRP appearance rate was determined as the number of MRP identified per month divided by number of months in study. The data collection form was prepared by referring patient dialysis file and drug file. The main aim of the study was to identify and report drug related problems in critical areas of care like haemodialysis. Before collecting the necessary data, the purpose of the study was explained to the patients and informed consent form was given to the patients, who were interested to participate in the study. The data collection form was developed by referring available literatures. It included patient demographics, monthly laboratory results, patient medication chart and the eight categories of drug related problems such as indication without drug therapy, drug without indication, improper drug selection, over dosage, under dosage, drug interactions, adverse drug reactions, and failure to receive drug. Current medications, their necessity, ADR's, possible interactions, risk factors and other drug related problems were documented. The collected data was analyzed and categorized into respective drug related problems. Several suitable literatures, online resources and textbooks were reviewed to analyze the result. Correlation between DRPs and multiple medication regimens was observed.

III. Result

We found a total of 301 Drug Related Problems. The most common DRP identified was drug interactions (n=260). It constituted 86.38%, out of these 34 were major or serious drug interactions (13.07%), 195 were moderate or significant drug interactions (75%) and 31 were minor or mild drug interactions (11.92%). 3.84 % of drug interactions showed clinical symptoms. The second major DRP was adverse drug reactions 15 (4.98%). Other DRPs identified were indication without drug therapy 12 (3.98%), improper drug selection 4 (1.32%), overdose 9 (2.99)% and failure to receive drug 1 (0.33)%

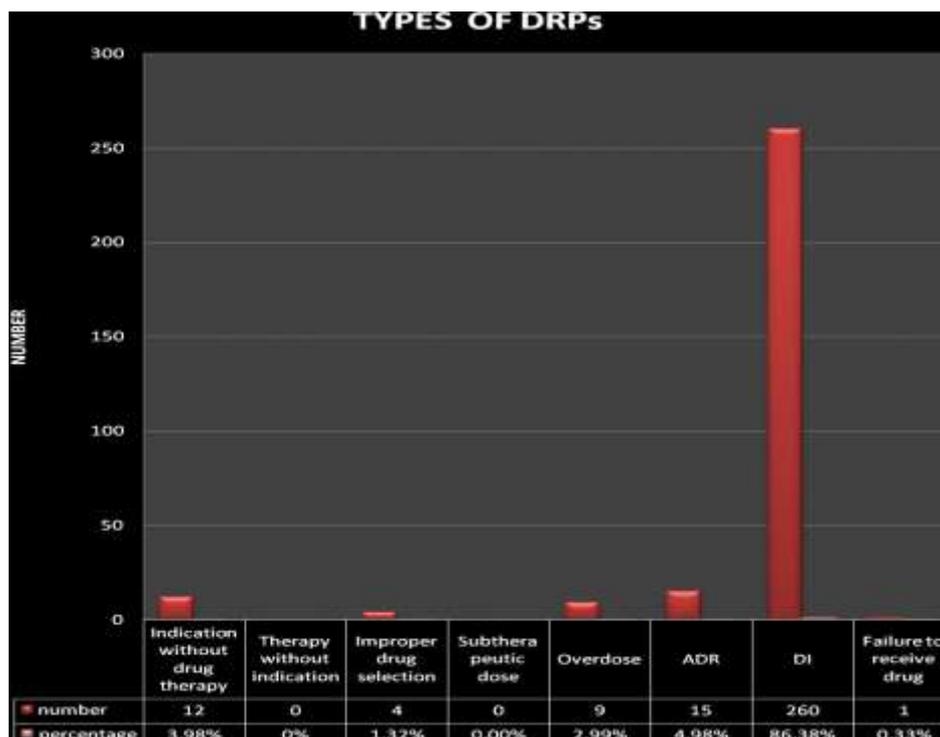


Fig. 1: Types of drug related problems

Table 1: Types of Drug Interactions

	Major/serious	Moderate/significant	Minor/mild
Number (n=260)	34	195	31
Percentage	13.07%	75%	11.92%

A total 12 cases of indication without drug therapy were observed. Depression was one of the main indications seen in most patients. We were also intervened about muscle pain by one female patient who was not taking any drug for that. There were 4 improper drugs selection, one of these was use of oral hypoglycemic agents in dialysis patients. Ethambutol is not recommended if GFR is <10ml/min²³. A patient of 47 kg was found as prescribed with 750mg Pyrazinamide daily where the recommended dose was 4.5gm/week for weight <50 kg. Out of 15 ADRs, clonidine contributed the most. Suspected ADRs like giddiness and dry mouth were observed for clonidine. No cases were identified for sub-therapeutic dose and drug therapy without indication.

Table 2: Reported suspected adverse drug reactions (ADRs)

Sl. No	Name of drug	ADR's observed
1.	Clonidine	Drowsiness, giddiness and dry mouth
2.	Tablet EIDO (multivitamin)	Insomnia
3.	Amlodipine	Headache, hypotension and dry mouth
4.	Sevelamer	Gastric problems
5.	Insulin	Tiredness
6.	Prazosin	Hypotension
7.	Iron sucrose	Chills

Table 3: Types of medications prescribed

Types of medication	n=660	Percentage
Anti-hypertensives	166	25.15%
Anti-diabetics	26	3.93%
Dyslipidemics	29	4.39%
Anti-coagulants & Anti-platelets	52	7.87%
PPIs and H2RAs	61	9.24%
Phosphorous binders	40	6.06%
Supplements	205	31.06%
Anti TB drugs	16	2.42%
Thyroid drugs	13	1.96%
Miscellaneous drugs	52	7.87%

A total of 660 drugs were prescribed for 79 patients with a mean of 8.35 ± 2.33 per prescription. Anti-hypertensives was the next widely prescribed drugs n=166 (25.15 %) after supplements.. Other drugs included gastric drugs, anticoagulants, antiplatelets, phosphorous binders, dyslipidemics, antidiabetics and miscellaneous. Sixty eight patients were prescribed with iron supplements like erythropoietin stimulating agents (ESA), iron sucrose and carbonyl iron. Four patients were undergoing TB treatment with Rifampicin, Ethambutol, Pyrazinamide and Isoniazid. Antidiabetics constituted 26 (3.93 %), out of those 3 drugs were oral hypoglycemic agents. Pantoprazole was noticed as the most commonly prescribed proton pump inhibitor (93.44% of PPI). Thyroid drugs constituted 1.96% and phosphorous binders 6.06% respectively.

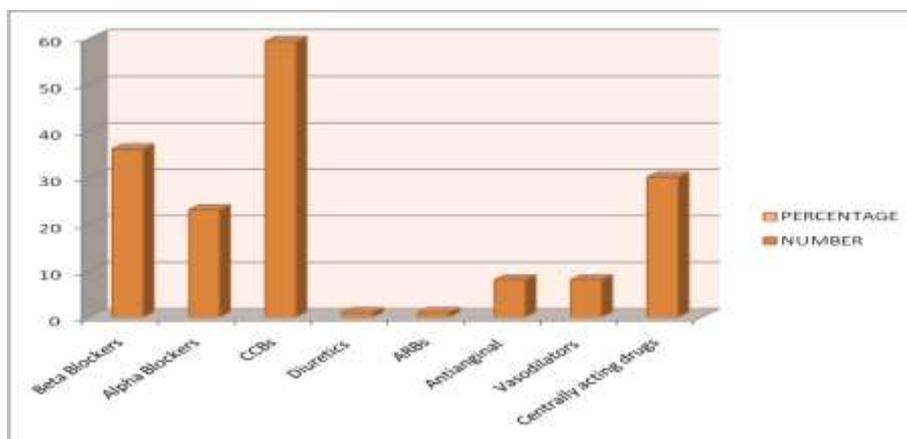


Fig 2: Anti-hypertensives prescribed

Among anti-hypertensives calcium channel blockers (CCBs) were the most commonly prescribed class of drugs (35.54%). In this, the largest proportion (n=36) was constituted by Amlodipine (61.01%). The remaining drugs were Cilnidipine, Nifedipine, Verapamil and Diltiazem. Second widely prescribed class of anti-hypertensives was beta blockers 36 (21.68%). Metoprolol, Carvediol, Labetalol and Nebivolol were the drugs. Clonidine was the only prescribed centrally acting drug 30 (18.07%). 13.85% of anti-hypertensives was alpha blockers where Prazosin was the only drug of choice in 23 cases. Anti-anginal and vasodilators were found to serve same percentage, ie 4.82%. Furosemide and Telmisartan were prescribed only once. The number of MRP per patient drug exposures were determined using: {(number of patients)*(mean number of medications)/number of months of study} / number of MRP identified⁴². It was found to be 0.36.

IV. DISCUSSION

Drug related problems are more common in haemodialysis patients; hence they need extra care to identify and resolve these. Multiple co-morbidities and drugs can be some of the reasons for DRP. In our study, 86.07% patients were hypertensive and 43.03% patients were suffering from diabetes. A total of 660 drugs were prescribed for 79 patients. It shows a mean of 8.35 ± 2.33 drugs per patients. The most common DRP that we had come across was drug interactions 260 (86.38%). In that 75% was significant drug interactions. A study conducted by Juno J Joel et.al concluded that DI as the major DRP¹⁸. Also Grabe DW and his co-workers in another study revealed the same results in patients undergoing hemodialysis¹⁵. Our next major MRP was ADR which constituted 4.65%, Indication without drug therapy (3.32%) was the next one, over dosage and under dosage were identified as 2.99% and 1% respectively. It has been said that dosing problems may arise when creatinine clearance is not considered. Similar results were noticed in a study conducted by HJ Manley et.al²⁴. Supplements like iron, calcium, vitamins (31.06%) and antihypertensives (25.15%) were the widely prescribed drugs. Haemodialysis patients often suffer from hypertension and it is poorly controlled²⁵. Two retrospective studies say that CCB are associated with a lower risk of mortality in haemodialysis patients^{26, 27}. CCBs are not removed by haemodialysis (HD). Thus it is not required to dose after dialysis and once daily dosing is sufficient for use. Several clinical trials show that ACE Inhibitors are safe and effective in HD patients^{28, 29}. Erythropoietin (EPO) has eliminated anaemia as a major cause of morbidity in dialysis patients. Almost 90% of chronically dialyzed patients in US currently receive EPO^{30, 31}. Anti TB drugs and thyroid drugs were the least prescribed drugs, i.e. 47 % and 1.96 % respectively. Our study shows a direct relationship between the number of drugs prescribed and MRPs. As the co-morbid conditions increase simultaneously prescribed drugs are also added up. Although our results are promising, this study has certain limitations. Non updated patient drug charts, inadequate medication information transfer and difficulty in distinguishing ADRs are few of them. MRPs are common in hemodialysis patients. These patients often require more number of medications to treat co-morbid conditions. DIs and ADRs were the main DRPs we have come across. The introduction of clinical pharmacy services can potentially contribute in many aspects of healthcare in hemodialysis patients through the detection and resolution of DRPs¹⁸. The inclusion of a clinical pharmacist will allow the application of pharmaceutical care to identify and resolve a variety of DRPs and thus optimize the global care management of patients²². It improves quality of life (QOL) and results in decreased morbidity and mortality of patients up to some extent. It was found that most of the our patient's blood group was B positive and also hemodialysis patients were depressive. This topic can be taken for future studies with the objective to provide social, economical and emotional support.

V. Conclusion

Hemodialysis patients are prescribed with more numbers of medications which increases the risk of DRPs like drug interactions (86.38%), adverse drug reactions (4.98%) and other drug related problems like indication without drug therapy (3.98%), improper drug selection (1.32%), over dosage (2.99%), and failure to drug therapy (0.33%). Here we found that presence of co-morbidities increases the number of drugs. A direct proportionality can be seen with number of drugs prescribed and DRPs. Recognition and resolution of DRPs will decrease drug related morbidity and mortality. Health professionals like pharmacists must be aware of these problems and efforts must be made to terminate or resolve DRPs. The introduction of clinical pharmacy services in dialysis unit will minimize this problem to an extent by detecting and resolving these.

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