DRUG UTILIZATION EVALUATION IN CHRONIC KIDNEY DISEASE PATIENTS AT A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

The aim of the study is drug utilization evaluation of chronic kidney disease (CKD) patients in a tertiary care hospital. The objective of the study is to evaluate the prescribing pattern of drug used in chronic kidney disease, to assess medication adherence to treatment, to assess major drug interactions. A prospective and hospitalbased study was conducted on in – patients admitted in tertiary care teaching hospital. Data regarding patient's demographic details, diagnosis, complete prescription, and any other information will be collected in a predesigned pro forma. The study included 150 patients , among them 88 males and 62 were females . Among the study population majority of patients were in the age group 41-60years 65 (43.3%) . Among all medications the major class of drugs prescribed were cardiovascular drugs followed by vitamins and minerals (20.9 %). Out of 1053 drugs prescribed,582 drug interactions were identified and 119 (20.4 %) drugs shows major drug interactions, 459(78.8%) and 146(97.3%)prescription shows polypharmacy.The present study concluded that one of the most critical elements in patients with CKD is the use of polypharmacy to treat a variety of co-morbid illnesses. The failure of pharmacological therapy and an extension of the hospital stay can both be caused by polypharmacy, which can predispose to drug interactions. However, this risk can be reduced and patient care can be enhanced with the active involvement of clinical pharmacists in clinical activities.

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INTRODUCTION

Chronic kidney disease (CKD) is defined as a reduction in the Glomerular Filtration Rate (GFR) and/or urinary abnormalities or structural abnormalities of the renal tract.In India, one in ten persons suffer from chronic kidney disease, and over 175,000 new cases of stage 5 CKD, which calls for dialysis and/or kidney transplantation, are diagnosed each year.[1]

The biggest issue that India has been dealing with is the increasing prevalence of CKD, which could eventually cause issues with the economy and with health care. According to recent estimates, India's age-adjusted incidence rate of end-stage renal disease (ESRD) is 229 per million people (pmp)3, and more than 100,000 new patients enrol in renal replacement programmes there each year.

The three cities with the highest rates of CKD were Delhi (41%), Kanpur, Uttar Pradesh, and Visakhapatnam, Andhra Pradesh (46.8%). In the state of Karnataka, Mysore and Bangalore had the lowest frequency.[2]
Co-morbidities that are connected to CKD in patients might impair renal and cardiovascular outcomes. These co-morbidities include hypertension, atherosclerosis, glucose intolerance or diabetes, and lipid diseases. Diabetes mellitus is the most frequent cause in adults, accounting for around 40% of patients receiving renal replacement treatment. One third of patients receiving renal replacement treatment have hypertension as their second most common reason.[3]

Elderly people are more likely than younger patients to take many medications, have impaired renal function, and have diabetes. In recent years, polypharmacy has emerged as a public health concern. since using numerous drugs for various ailments may have negative effects. Greater likelihood of dose mistakes and potential effects appears to be linked to older patients and lower GFR.[4]

DRUG UTILIZATION EVALUATION

Drug utilization evaluation (DUE) is a system of continuous, systematic, and criteria-based evaluation of drug use that will aid in ensuring that medications are used properly (at the individual patient level). If therapy is determined to be ineffective, patient or provider interventions will be required to maximise, the brand and kind of medicine, schedule of dosages, including dose, frequency, quantity, duration, method of administration, and any extra warnings likeWarfarin booklet, steroid card, and compliance chart side effects, patient information leaflet special safety measures, storage requirements, a dosage was missed, auxiliary apparatus.Since there have been drugs, there has been irrational medication use.

Modern medicine offers a variety of treatment options rather than just one that all healthcare professionals must use while treating patients. Because there are more medications and therapy alternatives available, there are more illogical medical encounters, which leads to subpar patient outcomes. The use of multiple medications to treat even the most unimportant ailments in order to satisfy a patient's desire for medication (or the need of the pharmaceutical vendor for profit) is known as polypharmacy.[5]

DRUG UTILIZATION EVALUATION IN CHRONIC KIDNEY DISEASE

Multiple conditions that impair the kidneys shape and function make up CKD. Patients with CKD commonly have co-morbid conditions include infection, hypertension, diabetes mellitus, and coronary artery disease. The existence of these co-morbidities affects patients in two ways: first, it raises the expense of care, and second, it makes treating CKD patients more difficult.[6]

Drug use in CKD varies with time, the doctor, the patient's health, and the population, so it's critical to continuously track drug use throughout time.Studies on drug usage in CKD patients aid in understanding drug use patterns. Since CKD patients require lifetime treatment, it is crucial to regularly monitor prescribing trends.[7]

Given India's population of more than 1 billion, the increased incidence of CKD is projected to cause significant issues in the future for both healthcare and the economy. In order to comprehend current prescribing trends, prevalent co-morbidities associated with CKD, and their long-term effects on the patient's overall health status, it is crucial to evaluate the drug usage pattern in CKD patients.

Regularly doing DUE is advantageous in the following ways: First, it will provide a general overview of the actual pattern of drug usage for a specific clinical condition during a specific time period in a given population. Additionally, it will aid in spotting early signs of reckless drug usage. Thirdly, long-term drug use can be improved with the use of the information gleaned from these studies. Fourthly, it will support the maintenance of a high standard of drug use. When elderly people have various disease processes, polypharmacy is a common problem.

As part of the natural ageing process, declining organ function compounds the issue of negative medication effects in this situation.Studies on drug use in CKD patients aid in understanding and development of supporting data. Since CKD is usually linked to hypertension, anaemia, acidosis, phosphor-calcic problems, and other conditions, it is difficult to achieve precise therapeutic goals, regular monitoring, and dosage adjustment without significant medication therapies. The major objectives once maintenance dialysis begins are to manage problems (such as anaemia and hyperparathyroidism) and reduce morbidity and mortality. Therefore, in terms of highest daily pill burden, patients with CKD receiving dialysis are comparable to those with diabetes or cardiac disease.

Patients with impaired renal function have altered pharmacokinetics, which frequently leads to medication buildup and toxicity. The way that pharmaceuticals are used, marketed, and distributed changes greatly with time, location, health economics, and sociomedical factors. In order to recognise the presence of irrational use of medications, it is helpful to investigate the pattern of medication use in a particular environment. For medicines to be rational, a specific assessment methodology is required. Since then, WHO has created fundamental measures of drug usage in utilization studies.

Drug utilization studies can be used to assess the prevalence of drug use in a population based on factors including demographics, morbidity, and other factors. Inappropriate drug use can lower patient quality of life and raise the likelihood of harmful drug responses. These studies are helpful for tracking drug trends from specific therapeutic subcategories where issues can be foreseen. Additionally, ongoing research on drug usage patterns is necessary to enhance patient care and management strategies.[8]

Hence, the aim of the present study is to evaluate the Drug Utilization Evaluation (DUE) and to assess current prescribing trends in the management, drug – drug interactions, polypharmacy assessment in CKD patients.

METHODS

A Prospective and hospital based study was conducted in the inpatient wards of Medicine Department of Karnataka Institute of Medical Sciences, (KIMS) Hospital, Hubli .A pre-made pro forma will be used to gather information on the patient's demographics, diagnosis, full prescription, and any other relevant information. The gathered information was evaluated and carefully examined.

Ethical Issues

The ethical clearance for the study was obtained from institutional ethical committee of SET's College of Pharmacy, Dharwad.

Study Procedure

The study was carried out by regular visits to in-patient medicine department and case sheets of 150 patients were collected. The relevant data collection from case sheets were properly documented in a separate data collection form. The obtained data were then identified, evaluated and analyzed based on gender, age group, etiology, social history and drug interactions.

RESULTS

Atotalof 150 caserecords werereviewed, analyzedand categorizedbased ongender,agegroup, socialhistory, past medical history,length ofhospital stays, stages of CKD, drug interactions, Moriskymedicationadherencescale,drugprescriptionpattern, polypharmacy assessment.

Table1: Distribution based on gender.

Gender	No. ofPatients (N = 150)	Percentage (%)
Male	88	58.6
Female	62	41.3

Among the study population of 150 patients, 88 were male patients and 62 female patients. It shows that male patients were found to be more (58.6 %). [Table 1]

Table2: Distribution based on age.

Age Range	No. of patients (N = 150)	Percentage (%)
18-25 years	11	7.3
26-40 years	29	19.3
41-60 years	65	43.3
>60 years	45	30

Out of 150 patients, majority of patients were in the age group 41-60years 65 (43.3%),followed by >60 years 45 (30%), whereas patients belonging to age group of 18-25years 11 (7.3%). [Table 2]

Table3:Distribution based on social history.

SocialHistory	Number (N = 150)	Percentage (%)
Smoker	94	6.26
Non–Smoker	25	16.6
Ex–Smoker	18	12
Tobacco	8	5.3
Alcohol	5	3.3

Among 150 patients, 94 (6.26 %) were smokers, 8 (5.3 %) were tobacco chewers, 5 (3.3%) were alcoholics whereas 18 (12%)& 25 (16.6 %) were ex – smokers & non – smokers. [Table 3]

Table 4:Distribution based on past medical history.

Pastmedical history	Number of patients (N = 150)	Percentage (%)
Hypertension	62	41.3
Type 2 Diabetes Mellitus	60	40
Chronic Kidney Disease	43	28.6
Ischemic Heart Disease	4	2.6
Congestive Cardiac Failure	2	1.3

In our study 43 (28.6%) had history of CKD, 60 (40%) Type 2 Diabetes Mellitus, 62 (41.3 %) were diagnosed with Hypertension, 2 (1.3 %) Congestive Cardiac Failure and 4 (2.6 %) ischemic heart disease. [Table 4]

Table 5: Distribution based on length of hospital stay.

Hospital Stay	No. of patients (N = 150)	Percentage (%)
0-3days	15	10
4-6days	48	32
>6 days	87	58

Majority of patients stayed more than 6 days 87(58%), 4-6days 48(32%), and 0-3days 15 (10%).[Table 5]

Table 6: Morisky Medication Adherence Scale.

Adherence Scale	Score 0-1 (Low)	Score 2-3-(High)
Knowledge	25	125
Motivation	40	110

Based on Morisky Medication Adherence scale, majority of patients (125) scored 2-3, only 25 patients scored 0-1 in knowledge. In motivation 110 patients scored 2-3 and 40 scored 0-1. [Table 6]

Table7:Distribution based on drug interactions.

DrugInteraction	Numbers (N = 582)	Percentage (%)
Major	119	20.4
Moderate	459	78.8
Minor	4	0.6

Among 150 patients, 582 drug interactions were identified and 119 (20.4 %) drugs shows major drug interactions, 459(78.8 %) shows moderate interactions and 4(0.6 %) were showing minor interaction. [Table 7]

Table 8: Distribution based on CKD stages.

Stages according to eGFR	Numbers (N=150)	Percentage (%)
Stage V	12	8
Stage IV	20	13.3
Stage III	82	54.6
Stage II	24	16
Stage I	12	8

In our study, majority of patients were belonging to stage lll 82 (54.6%) of CKD and only 12 (8%) are in the stage l & stage V. [Table 8]

Table 9: Distribution based on class of drugs.

Drug Class	No. of Drugs (N = 1053)	Percentage (%)
Vitamin & Minerals	221	20.9
Calcium channel blocker	139	13.2
Anti – diabetics	139	13.2
Proton pump inhibitors	135	12.8
Diuretics	133	12.6
Anti – platelet	107	10.1
Hematopoietic Agent	69	6.5
Hypolipidemic	48	4.5
Beta blockers	41	3.8
AngiotensinIIreceptor antagonists	21	1.9

In our study, cardiovascular class of drugs (calcium channel blockers, diuretics, beta blockers, angiotensin II receptor antagonists) were commonly prescribed followed by vitamins & minerals (20.9 %). The other prescribed drugs are as follows. [Table 9].

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Table 10: Distribution based on drugs prescribed.

Name of Drugs	No . of Drugs (N = 1053)	Percentage (%)
Calcium	142	13.4
Amlodipine	139	13.2
Pantoprazole	135	12.8
Furosemide	120	11.3
Aspirin	107	10.1
Plain Insulin	97	9.2
B – Complex	79	7.5
Folic Acid	69	6.5
Atorvastatin	48	4.5
Metformin	42	3.9
Metoprolol	41	3.8
Spironolactone	13	1.2
Telmisartan	12	1.1
Losartan	9	0.8

In our study the most commonly prescribed drug was cardiovascular class of drugs, amlodipine (13.2 %), furosemide (11.3 %), metoprolol (3.8%), telmisartan (1.1%), losartan (0.8%).The other prescribed drugs are as follows.[Table 10]

Table 11: Polypharmacy assessment.

No. of drugs prescribed	Numbers (N = 150)	Percentage (%)
> 5 Drugs	146	97.3
2- 5 Drugs	4	2. 3

Out of 150 prescriptions, 146 (97.3%) prescriptions had more than five drugs and 4 (2.3 %) prescriptions been less than five drugs. The prevalence of polypharmacy was high in chronic renal failure patients. [Table 11]

DISCUSSION

A prospective and hospital based study on drug utilization evaluation of chronic kidney disease patients was conducted in medicine department of KIMS hospital – Hubli over a period of 6 months. A total of 150 patients were included in the study .

There was a male preponderance over the female patients. Out of 150 patients studied 88 (56.8 %) were male and 62 (41.3 %) were female patients. This is in concurrence with Ahlawat et al, Devi et al and Al Ramahi R. [9,10,11] Studies have indicated that compared to female patients, male patients exhibit a significantly greater prevalence of CKD and incidence rate of ESRD. Studies have also shown that men with diabetes may experience nephropathy at a higher rate than women. This may be one of the causes of the study's male predominance.

Majority of patients in current study were in the age group of 41 – 60 years 65 (43.3 %) this was found to be lower than that found in studies done by Ahlawat et al, Devi et al and Al Ramahi R.[9,10,11] The fact that the majority of CKD patients in our study fell into the 41–60 age range may be attributable to diabetes and hypertension, which are significant comorbidities seen to be linked to CKD.

In present study 94 (6.26 % %) were found to be smokers, 8 (5.3 %) were tobacco chewers, 5 (3.3%) alcoholics whereas 18(12%) ex- smokers and 25 (16.6 %) non – smokers. Several comorbidities were found to be associated among these CKD patients and they are, Hypertension 62 (41.3 %), Diabetes 60 (40 %), ischemic heart disease 4 (2.6%),Congestive cardiac failure 2 (1.3%). These findings were similar to Ahlawat et al, where hypertension was found to be common comorbidity (55%) followed by diabetes and ischemic heart disease.[9]However, the incidence of hypertension as comorbidity with CKD was higher (84%) in studies conducted by Al Ramahi R.Duration of hospital stay was more than 6 days 87 (58%), 4-6 days (32 %), and 0-3 days 15 (10 %).[11]

This study has used the Morisky Medication Adherence Scale (MMAS) for estimation of medication adherence. Based on MMAS , majority of patients(125) have high score based on motivation and knowledge . The study implies that most of the patients are adherent to the treatment.

A total of 582 drug interactions are seen in the present study. Out of the 582 drug interactions, major interactions were 119(20.4%), moderate interactions found were 459(78.8%), minor interactions found were 4 (0.6%).

Majority of patients belonged to stage III 82 (54.6 %),studies conducted by Ahlawat et al, Devi et al and Al Ramahi. showed majority of patients belonged to stage IV and more of CKD.[9,10,11]

Among the cardiovascular class of drugs calcium channel blockers were commonly used in the present study followed by diuretics and angiotensin II receptor blockers (ARBs) (13.2 % , 12.6 % and 1.9 % respectively) . Ahlawat et al reported that diuretics were the most commonly prescribed cardiovascular group of drugs followed by calcium channel blockers and angiotensin II receptor blockers (8.2%, 6.3 %, and 2.8% respectively).[9] Multivitaminsalso were commonly prescribed in our study. Among all the prescribed drugs , antihypertensive agents were the most predominantly used,this was similar to study conducted by Rajeshwari et al . followed by multi – vitamins (20.9%)and anti – diabetic drugs (13.2 %).[12]

Drugs like haematinics and multivitamins are frequently administered because CKD patients are more likely to experience anaemia and weakness as a result of the condition.

Antacids are also frequently administered to CKD patients because of their increased susceptibility to stress, ulcers, and dyspepsia. Proton pump inhibitors like pantoprazole (12.8 %) was used in most of the patients to reduce the symptoms of heart burns, similar results were noted in studies done by Bajait et al. [13]

In current study drugs from cardiovascular system class were commonly utilized class of drugs, a fair proportion of drugs were prescribed from National List of Essential Medicines (NLEM).Multivitamins , anti – diabetics, oral iron supplements and ulcer protectives were found to be commonly utilized drugs in the current study.

Out of 150 prescriptions, 146 (97.3%) prescriptions use more than 5 drugs which was similar to the study conducted by Rajiv Ahlawat et al. [14]

LIMITATION OF THE STUDY

Our study included a random selection of patients. As a result, the findings cannot be generalized to all the patients admitted in the hospital, as many cases might have been missed during night shifts and public holidays.

CONCLUSION

The current study highlights the current situation of CKD patients visiting a tertiary care hospital, as well as the prescribing patterns of doctors handling patients with co-morbidities and disease-related problems. The baseline information provided by the current study can aid in understanding howdifferent medications are utilized to treat CKD, its consequences, and other comorbid disorders linked to it.

The current study provides the baseline information and will contribute to the development of data for future drug consumption studies. When it comes to side effects, toxicities, and other aspects of the pharmaceuticals, doctors can better manage patients if they have a general grasp of the different medications used to treat CKD, its consequences, and other comorbid disorders linked to it. Hence enhancing the effectiveness of CKD medication overall and patient adherence to therapy.

To comprehend the negative effects of medications provided to CKD patients, it is crucial to categorise and identify drug interactions. Patients must frequently go through both clinical and laboratory evaluations for the overall management of CKD.Clinical pharmacists have specialised training in pharmacotherapy, which can be used to modify dosages, reduce medication toxicity, and lessen side effects in patients with impaired renal function. More diverse pharmaceutical regimens can be produced and made readily available on the market to reduce patient burden and prevent medication toxicity.

Drug utilization evaluationis essential to improving patient care. One of the most significant aspects in patients with CKD has been shown to be the usage of polypharmacy for the treatment of numerous co-morbid illnesses. Pharmacological interactions that lead to the failure of drug therapy and an extension of the hospital stay can be made more likely by polypharmacy. Clinical pharmacists' active involvement in clinical activities can help to reduce risk and enhance patient care.

The current study provides the baseline information and will contribute to the development of data for future drug consumption studies.

However, it is necessary to periodically undertake further, large-scale studies at multiple sites with a bigger sample size. This will assist put these results into correct perspective on a wider population.

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CONFLICT OF INTEREST
The authors have no conflict of interests to declare pertaining to this article.

LIST OF ABBREVIATIONS
CKD   - Chronic Kidney Disease
GFR   **-** Glomerular Filtration Rate
ESRD   - End-stage renal disease
Pmp   - per million people
DUE   - Drug utilization evaluation
KIMS   - Karnataka Institute of Medical Sciences
NLEM   - National List of Essential Medicines

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