BIOSCIENCES BIOTECHNOLOGY RESEARCH ASIA, September 2023. Vol. **20**(3), p. 1065-1071

Evaluation of Drug Utilization Pattern in Patients with Chronic Kidney Disease

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https://dx.doi.org/10.13005/bbra/3157

(Received: 14 March 2023; accepted: 16 August 2023)

Chronic kidney disease is a major public health issue which requires complex pharmacotherapy. This study was aimed to evaluate drug utilization pattern in chronic kidney disease patients. A prospective observational study was conducted at Nephrology department in Rajiv Gandhi Cooperative Multispecialty hospital, Palakkad for a period of 6 month from July 2022 to January 2023. Medications were assessed by using WHO prescribing indicator and classified in the basis of Anatomic Therapeutic Classification. A total of 120 patients were examined. According to the ATC categorization, out of a total of 921 medicines, cardiovascular drugs were most frequently administered. The average number of drugs per prescription was 7.6%. 11.3% of those medications were prescribed by their generic names. 49.9% of drugs were prescribed on the accordance with essential medicine list. The patient prescribed with an injection was 46% and patients prescribed with antibiotic were 25.5%. Poly pharmacy was executed in 86% of patients. Antihypertensive drugs were most frequently recommended class of drugs followed by hematopoietic drugs and vitamin and minerals in therapeutic wise classification of drugs. Of all drugs prescribed, cardiovascular drugs were commonly prescribed and prevalence of poly pharmacy is high in patients due to co morbidities.

Keywords: Chronic kidney disease; Drug utilization pattern; Poly pharmacy; Prescribing pattern; WHO core prescribing indicator.

Chronic kidney disease (CKD) is emerging health crisis and leading cause of mortality, morbidity and disease burden globally[1, 2]. It's defined as decrease in glomerular filtration rate of less than 60ml/min/1.73m^2 for three month or more than three months and abnormality in structure and functioning of kidney[3]. According to Global burden study, disability adjusted life years for CKD has risen to 18th rank in 2019 from 29th in 1990[4]. The global prevalence of CKD is estimated to be 13.4% and ranked as 12th leading cause of mortality[5,6]. Estimates place the frequency of CKD at 13.4% worldwide. The rising incidence of diabetes mellitus, hypertension, coronary artery disease, infections along with environmental factors are all contributing to the rise in prevalence of renal disease[8, 9]. Moreover, diabetes and hypertension accounts for 40-60%of CKD[10] .The patients with CKD suffer electrolyte imbalance, anemia, cardio vascular complications, CKD induced mineral and bone disorder which leads patients to take multiple medications to assuage the symptoms, progression of disease and comorbidities associated with it[11]. Due to alteration

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in pharmacodynamics and pharmacokinetic parameters and renal insufficiency in patients, the pharmacotherapy regimen should properly selected and monitored to avoid adverse drug reactions, interactions and other complications. For proper selection of medication, drug utilization studies should be done periodically[12]. However, prescribing trend always varying which depends upon chronicity of condition, population, time and physician that makes it important to analyze current prescribing trend in a regular basis [12]. Drug utilization studies are evolving field which significant because which provides baseline data needed in pharmacoepidemiological research and aims to promote rational drug usage[13,14]. Conducting drug utilization studies may drive in to different perspectives such as drug usage, prescribing trend and extent of compliance with guidelines. Prescribing indicators with several dimensions are used to measure appropriateness of drug use[15]. Hence this study was aimed to evaluate the drug utilisation pattern in patients with chronic kidney disease.

METHODS

Study design, setting and study population

A prospective observational study of 120 patients was conducted at Nephrology department of Rajiv Gandhi Cooperative multispecialty hospital, Palakkad for a period of 6 month from July 2022 to January 2023. The subjects were enrolled based on inclusion and exclusion criteria. The chosen patient should be at least 18 years or older and have been diagnosed and treated for CKD, be receiving non dialysis treatment. The exclusion criteria's are patients with acute renal failure or obstructions, Pregnant lactating women and children, newly diagnosed CKD patients and patients with major chronic diseases like acute stroke or cancer or acute congestive cardiac failure or chronic liver diseases or psychiatric diseases.

Data collection and Assessment

Signed informed consent is acquired from the each participant prior to the study. Demographic details were obtained from patients at the time of consultation and required clinical data's were extracted from their health records. According to Anatomic Therapeutic Chemical classification (ATC), drugs were categorized in to various classes and medication usages were compared with WHO core prescribing indicators.

Statistical analysis

The collected cases were entered in MS Excel 2007 for calculating percentage of various parameters.

RESULT AND DISCUSSION

The prevalence of CKD volantly increasing in the world wide due to causative and risk factors which directing the importance optimal usage of medication in the management of patients. Hence this study which documenting the drug utilisation pattern by comparing with prescribing indicators and reporting the poly pharmacy.

The observational study of 120 patients which reveals that more number of the patients were in the age range of 61-70 years with male predominance by 72.5% over female by 27.5% This finding were coincide by previous observational study were reported 75% dominance of male patients over female patients [16].It may be due to sedentary life style, difference in social habits and hormonal difference. Table 1 which portrays the socio demographic details of patients. Overall patients, 34 patients (28.3%) had a history of renal disease in their families and, 45 patients (37.5%) of them ascertained to be employed. In the assessment of social habits, 39 patients (32.5%) were either ex or current smokers and 15 patients (12.5%) consuming alcohol in their daily life. Smoking and drinking are two risk factors for developing chronic kidney disease (CKD). Nicotine can produce oxidative stress and alcohol can disrupt the hormonal system, which can damage the kidneys. Of all, 102 patients (85%) were preferred mixed diet over vegetarian diet(15%).The patients were classified basis on BMI and 48patients (40%)of them reported as obese followed by overweight, normal and underweight categories (30.8%),(18.3%),(10.8%) respectively. Due to compensatory hyperfiltration that occurs in obese people to meet metabolic needs, a rise in intraglomerular pressure might harm the kidneys and increase the risk of long-term CKD development. Out of 120 participants, majority of patients belong to stage IV(40%), which is followed by stages V, III, II, and I (18.1%, 37.4%, 3%, and 1%) in stage wise categorization

Table 1. Baseline characteristics of population

Characteristics	Number Of Patients (n=120)	Percentage (%)
Sex		
Male	87	72.5
Female	33	27.5
Age		
40-50	13	10.8
51-60	24	20
61-70	46	38.3
ABOVE 70	37	30.8
Social Habits		
Current smoker	6	5
Ex smoker	33	27.5
Never	63	52.5
Alcoholic	15	12.5
Smoking and Alcohol	3	2.5
Family History		
Present	34	28.3
Absent	86	71.6
Occupation		
Employed	45	37.5
Unemployed	55	45.8
Retired	20	16.6
Dietary Pattern		
Mixed diet	102	85
Vegetarian	18	15
BMI		
<18.5 (underweight)	13	10.8
18.5-22.9(Normal)	22	18.3
23-24.9(Overweight)	37	30.8
>25 (Obese)	48	40

of CKD patients. These results were consistent with earlier cross-sectional research, which led to the conclusion that a greater proportion of patients were in stage IV [17, 18]. Figure 1 which represents the five stage classification of CKD and distribution of population in each stage. Table 2. Illustrates the distribution of comorbidities prevailed in the patients. Hypertension (93.3%) was found to be prominent co morbid condition followed by other co morbidities such as diabetes, anaemia, hyperlipidaemia and stroke (85%, 82%, 38% and 10%) among study population. These results were revealed to be identical to a cross sectional study who reported that hypertension was the most prevalent co morbidity reported by 34% of the patients, followed by diabetes and coronary artery disease [19]. Earlier prospective study reported that hypertension was common co morbidity which affected 34% of CKD patients. It possible that hypertension was triggering factor and risk factor for CKD in population [25] .The term Poly pharmacy defined as regular intake 5 or more medications per day. The study revealed a burden of medication, about 86% of patients received poly pharmacy reveals the significant association between comorbidities and number of medications. Earlier prospective study reported that prevalence of poly pharmacy at baseline and FU was 80% [11], which inevitable in management of comorbidities and to control progression of disease with maintaining electrolyte balance. The medication usage pattern was analysed by using WHO prescribing indicators. The total number

Table 2. Distribution based on Comorbidities and poly pharmacy

Parameters	Frequency (n=120)	Percentage (%)
Diabetes mellitus	102	85
Hypertension	112	93.3
Anaemia	99	82.7
Hyperlipidaemia	45	38
Stroke	12	10
Thyroid disorder	9	7.5
Number of medication		
Less than 5 medication	17	14.6
6-10medication	79	65.5
More than 10medication	24	20

of drugs encountered in study was 921 drugs. The average of number of drugs prescribed in the study was 7.6%, which was found to be greater than that reported in a cohort study which found that 6.5%, respectively [20]. About 11.3% of drugs prescribed by generic name, whereas previous study conducted who showed that 15.7% of drugs prescribed by generic name [24]. The wide difference in prescribing pattern of generic drugs and average number of drugs might be due to variation in population, comorbidities and preference of prescriber. The percentage of drugs prescribed from essential medicine list was 49.9% which is smaller than reports of previous observational study conducted and showed as 65% [22]. The percentage of patients prescribed with injection was 46%. Similar studies conducted which demonstrate that 66% of patients prescribed with injections [23]. The prescribing injections in CKD patients were normal due to comorbid conditions like anemia and DM where use of erythropoietin and insulin essential for management. The percentage of patients prescribed with antibiotics was 25% which lies between the standard range (20-26%). According to ATC classification established by WHO, Cardiovascular system class of drugs (40.1%) was commonly prescribed followed by drugs for alimentary tract and metabolism (34.8%) and blood and blood forming agents (17.2%). These findings were consistence with previous study conducted who reported that cardio vascular drugs (16.4%) are mostly prescribed followed by gastrointestinal tract drugs (14.4%) and nutritional supplement (10%) [21].This is what we expected because of 93.3% of patients were hypertensive and hypertensive management found to be crucial in patients. Among the cardiovascular class of drugs, diuretics (30.1%) were mostly prescribed antihypertensive, followed

Table 3. WHO prescribing indicators

WHO core prescribing indicators	Data	Optimal value
Total number of drugs	921	
Average number of drugs per prescription	7.6	1.6-1.8
Percentage of drugs prescribed by generic name	11.3%	100%
Percentage of drugs prescribed from essential medicine list	49.9%	100%
Percentage of patients with an injection prescribed	46%	13.4-24.1%
Percentage of patients prescribed with antibiotics	25.5%	20.0-26.5%

Table 4. Drug classification according to ATC classification

#	ATC CLASS	No. of drugs (n=921)	Percentage (%)
A	Alimentary tract and metabolism	321	34.8
B	Blood and blood forming organs	159	17.2
C	Cardiovascular system	371	40.1
D	Dermatology system	5	0.5
G	Genito-urinary system and sex hormones	7	0.7
H	Systemic hormonal preparations	8	0.8
J	Antiinfectives for systemic use	24	2.6
L	Antineoplastic and immunomodulating agents	2	0.2
M	Musculo-skeletal system	11	1.3
N	Nervous system	7	0.7
P	Antiparasitic products, insecticides and repellants	0	0
R	Respiratory system	3	0.3
S	Sensory organs	0	0
V	Various	3	0.3

by calcium channel blocker (19.3%). These results were similar to a previous cross sectional study reported that diuretics were the most often prescribed CVS class of medicines, followed by calcium channel blockers and angiotensin receptor blocker II (8.2%, 6.3%, and 2.8%, respectively) [22]. Among the diabetic population, insulin (30.7%) was mostly prescribed drug followed by oral hypoglycemic agents amd lipid lowering therapy initiated by prescribing statin (27%) to patients. These findings were supported by findings of a cohort study conducted which found that statin and insulin were prominently prescribed to patients in their management [24]. Insulin can be used in hyperkalemia management and statin used as prophylactic agent to patients who attained 50 years of age or greater than 50 years. In anaemic management, folic acid constituted 61.4% over erythropoietin. This is might due to folic acid are far more affordable and convenient than erythropoietin. In this study, among phosphate binders, 80.9%of selevamer was prescribed to patients while only 19% of calcium acetate was prescribed. These results were similar

Table 5. Therapeutic class wise drug distribution

Drug Class	ATC Code	No	Percentage (%)
Antihypertensive drugs		272	29.5
Diuretics	C03	83	30.1
CCB	C08CA	52	19.3
CCB-BB		35	12.8
Beta blocker	C07AB	25	9.1
Alpha blocker	C02CA	16	5.8
ACE inhibitor	C09AA	5	1.8
ARBs	C09CA	17	6.2
ARB+DU		9	3.3
Others(Nitrates,ARB+CCB,ACEInhibitors+diuretics)		30	11.0
Hypolipidemic drugs		99	10.7
Statin	C10AA	27	27
Fibrates		10	10.4
Statin+Aspirin		16	15.6
Clopidogrel+statin		15	15.6
Aspirin+clopidogrel+statin		31	31.2
Anti diabetic		137	14.8
Insulin	A10A	42	30.7
DPP-4 Inhibitors	A10B	24	17.5
Sulphonyl urea	A10B	38	27.7
Metformin		33	24.0
Vitamin and Minerals		139	15.0
Vitamin D	A11HA	30	21.5
Vitamin B12	A11EA	18	12.9
Multivitamin		35	25.1
Sodium bicarbonate		56	40.2
Phosphate binders		25	2.7
Calcium	V02AA04	4	19.0
Selevamer	V03AE02	17	80.9
Hematopoetic agents		159	17.3
Folicacid	B03B	87	61.4
Erythropoetin	B03XA01	54	38.5
Anti microbials	J01	24	2.6
Others		66	7

Others- Anti thyroid drugs, antacid, lactulose, renal nutrition, antihistamine and analgesics

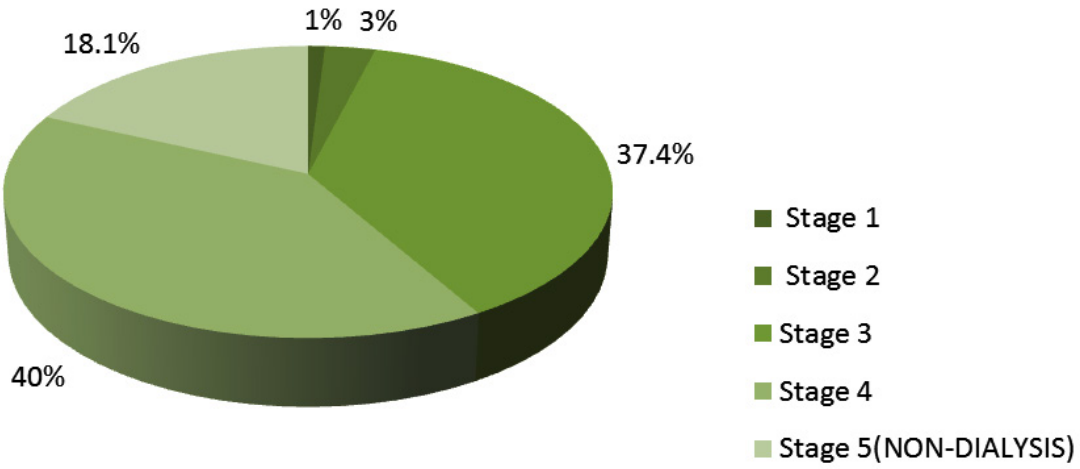

Fig. 1. Distribution of stages of CKD patients

to study conducted who reported the higher use of selevamer over calcium acetate [24]. Selevamer is non calcium based phosphate binder, which do not possess any risk of coronary calcification. In order to control acid-base disorder, 40.2% of the patients prescribed with sodium bicarbonate. Multivitamins are commonly prescribed to patients which constitute 25.1% in total drugs.

CONCLUSION

Assessment of drug utilization pattern using WHO prescribing indicators in CKD patients aids in reaffirm the existing hospital recommendations for the optimal and effective medication usage. The prevalence of poly pharmacy was high in patients due to increased existence of co morbidities. Drugs from Cardio vascular system were commonly utilized according to ATC Classification and drug utilization pattern studies helps to improve management strategy and facilitate rational drug use. Thereby overall outcome of pharmacotherapy can be improved.

ACKNOWLEDGEMENT

The authors are thankful to the principal, Librarian and other faculties in Grace College of Pharmacy for their support and cooperation and thankful to faculties of department of nephrology who supported to conduct the study.

Conflict of Interest

There are no conflict of interest

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