Original Article

A study on the prescription pattern among patients with chronic kidney disease at a tertiary care hospital

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ABSTRACT

Patients with chronic kidney disease require careful selection and dosing of drugs to prevent drug interactions, adverse effects and further renal damage. The objective of this study was to evaluate and assess the prescription pattern of drugs used in chronic kidney disease patients. Data of all the in-patients diagnosed with chronic kidney disease was collected from the case sheets available at the Medical Records Department of our hospital. Out of the 448 patients, there were 237 (53%) males and 211 (47%) females. 45.98% people were between the age group of 46-60 years. Totally, 298 patients had anemia, 116 had diabetes mellitus, 157 had hypertension, 103 had cardiovascular diseases and 72 patients had other associated comorbid conditions. 84.83% had stage 5 chronic kidney disease. Total number of drugs prescribed were 3132 out of which 533 (17.01%) vitamins, 470 (15%) anti ulcer drugs, 417 (13.32%) diuretics, 309 (9.87%) antibiotics, 260 (8.3%) antiemetics, 228 (7.28%) antihypertensives, 211 (6.74%) antihistamines, 211 (6.74%) antiplatelet drugs and 202 (6.44%) antidiabetics were commonly used. 2518 (80.39%) drugs were taken by oral route and 493 (15.75%) drugs were taken by injection. According to WHO drug prescribing indicators, an average of 7.2 drugs were prescribed per encounter, percentage of drugs prescribed by generic name was 4.43%, percentage of encounters with antibiotics prescribed was 64%, percentage of encounters with injection prescription was 48%, and percentage of drugs from the National list of Essential Medicines (NLEM) was 12.86%. Out of the 3132 drugs, 551 (17.59%) were given as fixed dose combinations. This study shows the current prescribing practice of nephrologists for hospitalized patients with chronic kidney disease. Due to multiple aetiologies and comorbid conditions, the polypharmacy noted is inevitable. Clinicians have to be made intellectually aware of prescribing generic drugs from the National list of Essential Medicines to rationalise drug therapy.

KEYWORDS: chronic kidney disease, prescription pattern, rationality, prescribing indicators.

INTRODUCTION

Chronic kidney diseases pose a major problem to both healthcare and economy. Chronic kidney disease (CKD) is a disorder which affects the morphology and functioning of kidneys [1]. It is a type of kidney disease where there is slow loss of kidney function over a course of months or years. It is due to the decrease in glomerular filtration rate to less than 60 mL/min/1.73 m^2 for three or more months [2]. The main risk factors for chronic kidney disease patients are diabetes mellitus, hypertension, coronary artery disease and infections [3]. Chronic kidney disease patients present with lots of complications and comorbidities and they require a large number of drugs. It presents initially with no specific symptoms but later can be detected by increase in serum creatinine or protein in urine [4]. Appropriate drug selection is

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important to avoid adverse drug effects and improve patient outcomes [3]. According to the World Health Organization (WHO), the global burden of kidney disease is 5-10 million casualties annually [5]. But due to lack of exposure to health facilities and laboratory and lack of data, it is expected to be much more. If risk factors of chronic kidney disease are identified and diagnosis done at an earlier stage, then the worsening of kidney function can be reduced and the cost of treatment can also be reduced.

Drug utilization research is defined as the study on marketing, prescription, distribution and use of drugs in the society with emphasis on medical, social and economic consequences [6]. Drug utilization pattern studies provide data on prescribing pattern and improve the prescribing habits. Some factors which influence drug utilization pattern are medical needs and demands, cost of drugs, economy, drug industries, technological developments, geographical location, culture and tradition. The proper and necessary drugs should be provided to the patients only after considering the various factors listed. Some reasons for improper prescription are lack of knowledge on some drugs, increase in number of patients and improper diagnosis. Thus the drugs used are indicators of health and disease.

As chronic kidney disease patients need to take drugs lifelong, it is important to understand and study drug utilization patterns and prescribing patterns regularly in such patients. Drug utilization changes with time, disease conditions and population region [7]. Hence drug utilization must be monitored frequently. The studies on drug utilization pattern help to understand and to create baseline strategies that have to be adopted under different conditions to optimize medication.

Our study is one such study where an attempt was made to study the prescription pattern of patients with chronic kidney disease admitted to a tertiary care hospital. The main objectives of our study were:

- To assess the number of patients with varying levels of chronic kidney disease and their causative factors.

- To evaluate the prescription pattern of drugs used in patients with chronic kidney disease admitted to the Nephrology Department of our hospital.

- To assess the rationality of the drugs prescribed in these patients using WHO drug prescribing indicators.

PATIENTS AND METHODS

Study design: Retrospective observational study.

Study duration: The study was conducted over a period of 3 months starting from January 2019 to March 2019.

Study place: The study was conducted in the Medical Records Department of Saveetha Medical College and Hospital.

Sample size: The sample size for the study was calculated using the statistical formula that takes in to account the margin of error and prevalence of the study population.

Study population

Inclusion criteria

The data of all the patients diagnosed with chronic kidney disease admitted to the Nephrology Department of our hospital from Jan 2017 to Jan 2019 were included in the study.

Exclusion criteria

➢ All the outpatients of the Nephrology Department were excluded from the study.

➢ Incomplete and illegible data were excluded.

Procedure

- The study was started only after getting approval from the institutional ethics committee and permission to conduct the study was obtained from the Head of the Nephrology Department.

- Data of all the in-patients diagnosed with chronic kidney disease admitted to the Nephrology Department from January 2017 to January 2019 was collected from the case sheets available at the Medical Records Department of our Hospital. The patients' age, gender, diagnosis, grade/stage of disease, drugs used, dosage frequency, dosage route and form and duration of treatment were collected.

- The brand names of drugs prescribed were decoded to generic names using the Standard

Current Index of Medical Specialties (CIMS) India 2019 edition.

- WHO drug prescribing indicators were used to find the rationality of drugs prescribed.

RESULTS

Chronic kidney disease patients admitted to the Nephrology Department as in-patients were included in the study. The prescription pattern and treatment given to them were noted. In total, 448 patients were included in the study based on the inclusion and exclusion criteria.

Out of the 448 patients, there were 237 (53%) males and 211 (47%) females. The male-female ratio was 1.127:1 (Table 1).

Out of this, the maximum number of people affected was between the age group of 46 years to 60 years. 206 (45.98%) patients were between the age group of 46-60 years (Table 2).

Some of the most common causes of chronic kidney disease were diabetes mellitus, hypertension and coronary artery disease. Totally, 298 patients had anemia, 116 patients had diabetes mellitus, 157 patients had hypertension, 103 patients had cardiovascular diseases and 72 patients had other associated comorbid conditions (Figure 1).

Table 1. Demographic details: Gender distribution.

Parameters	Number
Male	237 (53%)
Female	211 (47%)
Male : Female ratio	1.127 : 1

Table 2. Demographic details: Age distribution.

Age (Years)	Number
<18	9 (2%)
18-30	22 (4.92%)
31-45	72 (16.07%)
46-60	206 (45.98%)
>60	139 (31.03%)

Among the 448 patients, 9 (2%) were affected by stage 1 chronic kidney disease, 9 (2%) were affected by stage 2 chronic kidney disease, 23 (5.14%) were affected by stage 3 chronic kidney disease, 27 (6.03%) were affected by stage 4 chronic kidney disease and 380 (84.83%) were affected by stage 5 chronic kidney disease. The staging of chronic kidney disease was based on the glomerular filtration rate (Figure 2).

Total number of drugs prescribed for 448 patients were 3132 out of which 533 were vitamins (17.01%), 470 were antiulcer drugs (15%), 417 were diuretics (13.32%), 309 were antibodies (9.87%), 260 were antiemetics (8.3%), 228 were antihypertensives (7.28%), 211 were antihistamines (6.74%), 211 were antiplatelet drugs (6.74%), 202 were antidaibetic drugs (6.44%) and 291 were other drugs (9.3%) (Figure 3).

Among the 116 patients having diabetes mellitus 94 patients received antibiotics. The association of diabetes mellitus and usage of antibiotics among patients with chronic kidney disease was found out by applying chi square test and the p-value was calculated (Table 3).

The chi-square statistic is 10.6406. The p-value is 0.001106. The result is significant at $p < 0.05$.

Some of the most prescribed drugs were Rantac (260 (8.3%)), Livogen (193 (6.16%)), Lasix (188 (6%)), Shelcal (170 (5.42%)), Taxim (67 (2.13%)) and Ultracet (54 (1.72%)) out of 3132 drugs (Table 4).

Out of the 3132 drugs prescribed, 2518 (80.39%) drugs were taken by oral route in the form of tablets or capsules, 493 (15.75%) drugs were taken by injection, 72 (2.29%) drugs in syrup form and 49 (1.57%) were taken in powder form (Figure 4).

According to WHO drug prescribing indicators, an average of 7.2 drugs were prescribed per encounter, percentage of drugs prescribed by generic name was 4.43%, percentage of encounters with antibiotics prescribed was 64%, percentage of encounters with injection prescription was 48%, percentage of drugs from the National list of Essential Medicines was 12.86%. Out of the 3132 drugs, 551 (17.59%) were given as fixed dose combinations (Table 5).
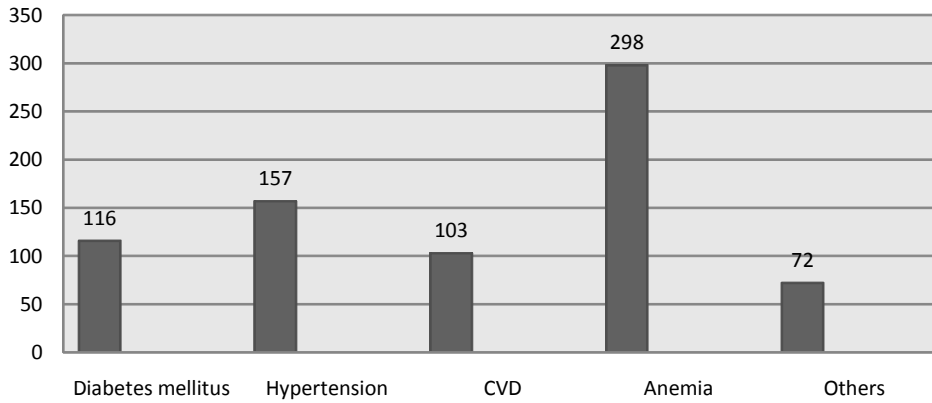
Comorbidities associated with CKD

Figure 1. Frequency of comorbidities associated with CKD.

Severity of CKD among admitted patients

- Stage 1 - GFR-≥90ml/min/1.73m²
- Stage 2 - GFR-60-89ml/min/1.73m²
- Stage 3 - GFR- 30-59ml/min/1.73m²
- Stage 4 - GFR-15-29ml/min/1.73m²
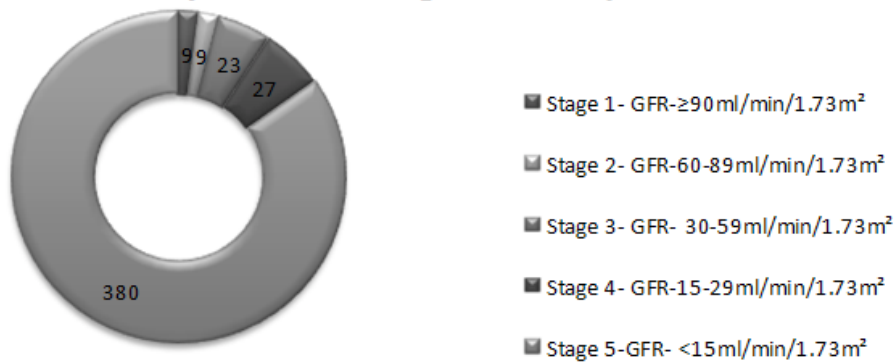- Stage 5 - GFR- <15ml/min/1.73m²
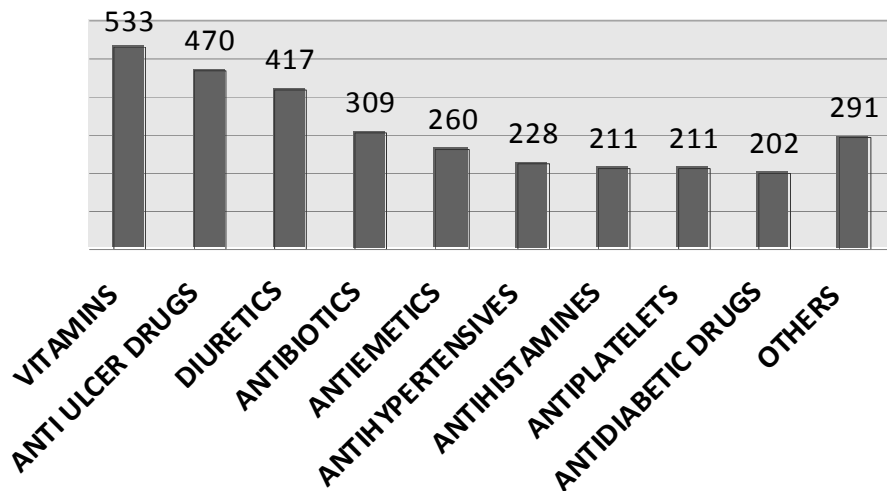
Figure 2. Stages of CKD.

Figure 3. Commonly prescribed group of drugs.

Table 3. Association of diabetes mellitus and usage of antibiotics among patients with chronic kidney disease.

Presence/absence of DM	Antibiotics +	Antibiotics -	Row totals
Diabetes mellitus +	94 (80.01) [2.45]	22 (35.99) [5.44]	116
Diabetes mellitus -	215 (228.99) [0.85]	117 (103.01) [1.90]	332
Column totals	309	139	**448** (Grand total)

Table 4. Commonly prescribed drugs.

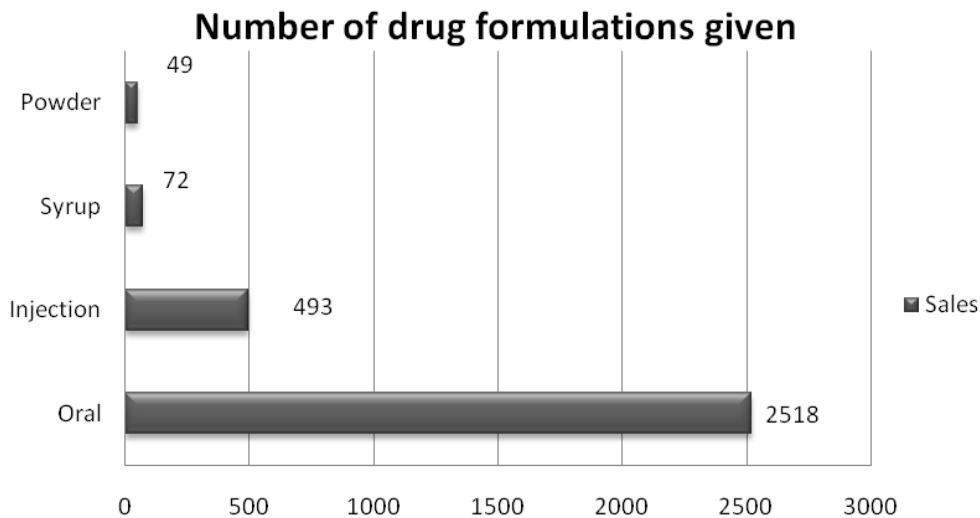| Sl No	Name of drug	Generic name	Number
1	Rantac	Ranitidine	260 (8.3%)
2	Livogen	Ferrous fumarate + Folic acid	193 (6.16%)
3	Lasix	Furosemide	188 (6%)
4	Shelcal	Calcium carbonate + Vitamin D3	170 (5.42%)
5	Taxim	Cefotaxime	67 (2.13%)
6	Ultracet	Tramadol + Paracetamol	54 (1.72%)

Figure 4. The different drug formulations prescribed.

DISCUSSION

Data of 448 patients were included in the study, out of which 53% were males and 47% were females. There was a slight male predominance in our study which coincides with other similar studies done previously by Bajait, C. S. and Sourav Chakraborty *et al.* [3, 8]. This may be because of health-compromising behaviours such as smoking, alcoholism and stressful lifestyle among males.

The maximum number of patients with chronic kidney disease was in the age group of 46-60 years and that of above 60 years, with 45.9% and 31.09% of patients, respectively. This is similar to other previous studies [8-10]. The natural changes

Table 5. The WHO drug prescribing indicators analysed.

Sl No	WHO drug prescribing indicators	Number	Percentage
1	Average drugs per encounter	7.2	
2	Percentage of drugs prescribed by generic name	139 out of 3132	4.43%
3	Percentage of encounters with antibiotics prescribed	287 out of 448	64%
4	Percentage of encounters with injection prescribed	215 out of 448	48%
5	Percentage of drugs from NLEM	403 out of 3132	12.86%
6	Other parameters analysed: Fixed dose combinations given	551 out of 3132	17.59%

that the kidney undergoes with advancing age and associated comorbid conditions in the age group of above 45 years, like diabetes mellitus and hypertension, might be the possible explanation for this age group being affected more commonly.

The most common comorbid conditions in these patients were anaemia, diabetes mellitus, hypertension and cardiovascular diseases. This is in agreement with other studies done by Manley, H. J., Khan, S. S. and Soumya Santra *et al*. [11-13]. This shows the clear cause-and-effect relationship of these factors with the development of chronic kidney disease.

The majority of patients included in this study belonged to stage 5 chronic kidney disease which accounts to 84.83% patients out of the total number of patients. This agrees with the study done by Anand *et al.* and Kiran, A. *et al.* [14, 15]. The reason for this is because, the study included only patients admitted to the Nephrology Department and not the outpatients. Only patients with end stage renal disease may require admission in the hospital for their deteriorating and worsening signs and symptoms compared to patients with the earlier stage of the disease.

The most common group of drugs prescribed were vitamins (533 (17.01%)), anti ulcer drugs (470 (15%)), diuretics (417 (13.32%)), antibiotics (309 (9.87%)), antiemetics (260 (8.3%)), antihypertensives (228 (7.28%)), antihistamines (211 (6.74%)), antiplatelet drugs (211 (6.74%)), antidiabetic drugs (202 (6.44%)) and other drugs (291 (9.3%)). Vitamins and minerals like iron, folic acid, calcium and vitamin D3 would have been given for anemia and hypocalcemia associated with the disease. Anti ulcer drugs & antiemetics are generally used to symptomatically relieve the

patients from belching, vomiting, nausea, heart burn and reflux which develop due to stress ulcers or due to intake of multiple medications. Patients with high urea levels also present with nausea and vomiting which necessitates the use of antiemetics. Diuretics would have been used to reduce the edema as most patients with end stage renal disease usually present with sodium and water retention. Antihistamines are used to combat pruritis which is more common in patients with end stage renal disease. Antihypertensives, oral hypoglycemic agents/insulin and anti platelet drugs would have been given for associated comorbid conditions like hypertension, diabetes mellitus and cardiovascular disease, respectively. Antibiotics are given to prevent hemodialysis or peritoneal dialysis-associated infections which are common during stage 5 renal disease. The usage of antibiotics is more among patients with diabetes mellitus and shows statistically significant results (p value < 0.05). This might be because these patients are more prone to access-related infections than non diabetics with CKD.

Rantac-ranitidine (260 (8.3%)), Livogen-ferrous fumarate + folic acid (193 (6.16%)), Lasix-furosemide (188 (6%)), Shelcal-calcium + vitamin D3 (170 (5.42%)), Taxim-cefotaxime (67 (2.13%)) and Ultracet-tramadol + paracetamol (54 (1.72%)) were the most commonly used drugs as evidenced by the study. The use of ranitidine, an H_2 blocker is considered safer compared to proton pump inhibitors in CKD. A fixed dose combination of ferrous fumarate + folic acid and calcium carbonate + vitamin D3 is used to treat anemia and hypocalcemia in CKD. Calcium carbonate also acts as a phosphate binder and thereby corrects alterations in phosphate levels which are

usually disturbed in patients with CKD. A fixed dose combination reduces the need for multiple drugs and increases the patient's compliance. Furosemide, a loop diuretic is considered beneficial in patients with residual renal function as it improves the mortality in these patients. Cefotaxime given intravenously is considered a safe antibiotic in renal failure although close monitoring of renal parameters is essential periodically. It prevents the patients going in for dialysis from contracting associated infections. Pain is one of the common symptoms in patients with chronic kidney disease. Non steroidal anti inflammatory drugs are nephrotoxic and hence have to be avoided in these patients. Except for methadone, opioids also are not recommended as these drugs undergo renal excretion [16]. Hence, the use of tramadol + paracetamol is justified as these drugs are not known to be directly nephrotoxic.

Out of the 3132 drugs prescribed, majority of drugs (80.39%) were taken by oral route in the form of tablets or capsules and 15.75% of the drugs were taken by injection. This finding is similar to that of other studies done previously on chronic kidney disease [10, 15].

According to the WHO drug prescribing indicators analyzed, an average of 7.2 drugs was prescribed per encounter. Usage of 5 or more drugs in a patient is considered polypharmacy. But due to the severity of the disease and associated comorbidities like anemia, hypertension, diabetes mellitus, cardiovascular diseases, and edema, and for symptomatic relief, a number of other drugs are needed by these patients and therefore, the results of our study are justified. In fact in similar studies conducted by Santra *et al.*, Sourav Chakraborty *et al.* and Chaitali S Bajait *et al.* the average number of drugs prescribed per encounter was much more than that in our study [3, 8, 13]. The reason for this may be due to the higher number of fixed dose combinations of iron and folic acid, calcium carbonate and vitamin D3 and tramadol with paracetamol used in our study which is routinely used in patients with CKD. These fixed dose combinations are counted as a single drug which obviously decreases the average number of drugs used in a patient.

Percentage of drugs prescribed by generic name is 4.43% which is low. This is however greater than

that recorded in the studies of Bajait *et al.* and Rajiv *et al.* where no drugs were found to be prescribed by generic name [8, 10]. As these drugs are to be taken for a long time or even life long, prescription of drugs by generic name should be more encouraged. Percentage of encounters with antibiotics prescribed was 64% which is because most of the patients underwent hemodialysis and antibiotics prevent access-related infections in these patients.

Percentage of encounters with injection prescribed was 48% which is because of the parenteral iron, parenteral antibiotics and insulin given to most of the patients with CKD. This however is more than that observed by Kamath *et al.* wherein only 16.6% of encounters with injection was recorded [17]. This disparity may be because of the greater number of patients with diabetes mellitus in our study requiring more antibiotics and insulin injections. Percentage of drugs from National list of Essential Medicines is 12.86% unlike that of studies conducted by Kamath *et al.* and Bajait *et al.* where the percentages were 65.8% and 42%, respectively [8, 17]. Awareness has to be created among the clinicians to use more drugs from NLEM. Fixed dose combinations given were 17.59% of the total drugs prescribed.

CONCLUSION

This study reveals the current drug prescribing pattern of clinicians towards patients with chronic kidney disease admitted in our hospital. Most of the patients admitted were in the stage 5 CKD and had associated comorbidities like hypertension, anaemia, diabetes mellitus, cardiovascular diseases etc. Treatment of these causative factors at an earlier stage can prevent the morbidity and mortality associated with CKD. Due to multiple aetiologies and comorbid conditions the average number of drugs used per patient is justified and polypharmacy noted is inevitable. Clinicians have to be educated and made intellectually aware of the advantages of prescribing drugs by generic name and selecting more drugs from National list of Essential Medicines to rationalise drug therapy.

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CONFLICT OF INTEREST STATEMENT

None to declare.

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