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Original Research Article

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Assessment Of The Drug Utilization Pattern Among Chronic Kidney Disease Patients With Comorbid Conditions

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Abstract: The aim of this study was to analyze the drug utilization pattern for different comorbid conditions among chronic kidney disease patients. A total of 176 patients were included in this study based on the inclusion and exclusion criteria. A specially designed proforma was used to collect demographic, clinical, and medication details. Among the 176 patients, 103 (58.52%) were females and 73 (41.48%) were males. The mean (±SD) age of total study population was 52±19.9 years and the prevalence of Chronic Kidney Disease (CKD) increased with ageing in both males and females. Prevalence of CKD was found to be higher for stage 3.Out of 176 patients, 24 (13.64%) male and 41 (23.30%) female patients had stage 3 CKD. Type 2 diabetes mellitus was found to be highly prevalent comorbid condition, followed by hypertension, anaemia and coronary artery disease. Insulin was the most common anti-diabetic drug prescribed (32.7%), calcium channel blockers were the most common antihypertensive drugs prescribed (48.8%), iron and vitamin supplements were the most commonly prescribed haematinics (68.1%) and the most commonly prescribed drug for coronary artery disease was found to be statins (38.9%). Type 2 diabetes mellitus was found to be highly prevalent co-morbid condition in CKD. To improve the disease management strategy and quality of life, time to time studies are required in drug utilization pattern.

Keywords: Chronic kidney disease, Diabetes mellitus, Hypertension, Anaemia, Coronary artery disease.

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1. INTRODUCTION

Chronic kidney disease (CKD) is increasingly recognized as a global public health problem[1]. With the fastest growth occurring in low-income and middle-income countries, the prevalence and associated burden of CKD is rising worldwide[2-4]. The global prevalence of CKD was estimated at about 10%, corresponding to almost 500 million people, with similar estimates in men and women, and in high-income countries compared with low-income countries[5]. CKD is defined as either kidney damage or a decreased glomerular filtration rate of less than 60 mL/min/1.73 m^2 for 3 or more months by The Kidney Disease Outcomes Quality Initiative (K/DOQI) of the National Kidney Foundation (NKF)[6]. In India the population exceeds one billion and is projected to become the major reservoir of chronic diseases like diabetes and hypertension. Since 25-40% of these subjects may develop CKD and end stage renal disease (ESRD), burden will rise and the health care system would need to take care of them[7]. Often considered a comorbidity of diabetes or hypertension, chronic kidney disease has numerous complex causes[8]. Importantly, on global morbidity and mortality such disease has an indirect impact by increasing the risks associated with at least five other major killers: cardiovascular diseases, diabetes, hypertension, infection with human immunodeficiency virus (HIV) and malaria[14]. For example, 1.2 million deaths, 19 million disability-adjusted life-years (DALYs) and 18 million years of life lost from cardiovascular diseases were directly attributable to reduced glomerular filtration rates as estimated from the 2015 Global Burden of Disease (GBD) study[9]. In the ever-higher ranking of chronic kidney disease among leading cause of deaths there may already be evidence of such growth, across all country income categories, between 1990 and 2016. Therefore, accurate and early diagnosis of kidney disease is necessary not only to prevent future comorbidities but also to reduce financial cost and burden[10]. The study of drug prescribing pattern is a component of medical audit that does the monitoring and evaluation of the prescriber as well as recommends necessary modifications to achieve rational and cost-effective medical care[11]. Irrational prescription of drugs is a common occurrence in clinical practice and prescribing habits of clinicians[12]. Inappropriate prescribing habits lead to ineffective and unsafe treatment, prolongation of illness, distress and unnecessary economic burden to the patient[13]. Studies of prescribing patterns and drug utilization are useful to identify the problems and provide feedback to prescribers so as to create awareness about rational use of drugs[14]. Appropriate drug selection for patients with chronic kidney disease (CKD) is important in order to avoid unwanted drug effects and to ensure optimal patient outcomes[15,16]. Rational drug prescription is a difficult task in CKD patients. These patients are at higher risk of drug-related problems since they need complex therapeutic regimens that require frequent monitoring and dosage adjustments. In addition, they usually have other comorbidities including diabetes mellitus, hypertension, coronary artery disease and infection[17-19]. Inappropriate use of medications can increase adverse drug effects, which can be reflected by excessive length of hospital stays, excessive health care utilization, and costs[15, 20-22]. As indicated by an estimation done by the World Health Organization (WHO), more than half of all medications are endorsed, administered or sold improperly. Likewise, half of all patients come up short to take the endorsed prescription effectively. The abuse, underuse or misuse of prescriptions results in wastage of rare assets and far-reaching wellbeing perils. Therefore, steps need to be taken to ensure the rational use of medications worldwide, so that an adequate standard of treatment is provided at all levels of the health care delivery system[23]. Hence, to analyze current prescribing trends in the management of CKD patients with a focus on different comorbid conditions and to suggest ways to rationalize drug use, minimize medication errors and improve therapeutic outcome was the plan of this study.

2. MATERIALS AND METHODS

This cross-sectional observational study was conducted in nephrology department of Vivekanandha Medical Care Hospital, Tiruchengode, Tamil Nadu, India for a period of 6 months from April 2019 to October 2019. The study was approved by the institutional ethics committee(IEC Approval no.: VMCH/IEC/APRIL/2019) and written informed consent was obtained from each patient before enrolment for the study.

2.1 Sampling Technique

Patients who visited nephrology department of Vivekanandha medical care hospital, Tamil Nadu, India between April 2019 to October 2019 were included for the study.

2.2 Sample Size Estimation

CKD patients of both genders, above 18 years of age, from the in-patient department of nephrology with a discharge summary were included in the study. Patients attending out-patient department, prescription with insufficient data, patient undergoing peritoneal dialysis, pregnant and lactating women were excluded from the study. The discharge-summary records of 176 CKD patients, admitted to nephrology wards were scrutinized and the data was collected in a specially designed proforma which included the following details.

2.2.1 Inclusion criteria

Patients within 18-95 years of age, Patients with CKD, Both male and female patients.

2.2.2 Exclusion criteria

Prescription with insufficient data, Pregnant and lactating women, Patient undergoing peritonial dialysis.

2.3 Demographic data

Name, age, gender, reason for admission, past medical history, past medication history, family history, educational level, marital status, allergies (drugs, foods and others), social history (alcoholic/ smokers/ tobacco/ betel nuts etc.) and anthropometric measurements such as weight, height, waist-hip ratio, body mass index (BMI) and blood pressure were considered for the study.

2.4 Disease data

Stage of CKD and co-morbidities

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2.5 Data pertaining to the drug therapy

Drugs prescribed (with group/class), fixed dose combination (if any), dose of the drugs, frequency of prescription, route of administration and usage of generic/brand name.

3 STATISTICAL ANALYSIS

Data was tabulated on Microsoft Excel spreadsheet (version 2007) and analyzed using Microsoft Excel and represented as numbers and percentages.

4 RESULTS

Among the study population, 103 (58.52%) were females and 73 (41.48%) were males. Gender wise distribution among the study population shows that females are more prone to kidney disease. (Figure 1)

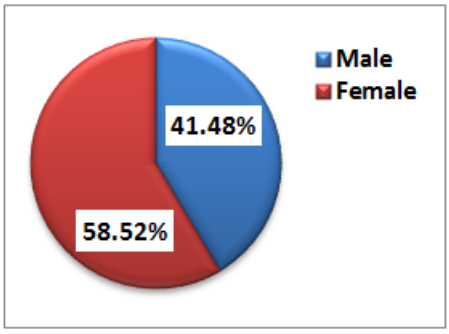

Fig 1. Gender wise distribution (n=176)

The mean (±SD) age of total study population was 52±19.9 years. (Table 1)

Table 1. Gender wise distribution among different age groups (n=176)

S. No	Age in years	No. of patients		Percentage (%)	
		Males	Females	Males	Females
1.	18-28	3	4	1.70	2.27
2.	29-38	7	9	3.98	5.11
3.	39-48	12	14	6.82	7.95
4	49-58	13	21	7.39	11.93
5	59-68	17	23	9.66	13.06
6	>68	21	32	11.93	18.18
7	Total	73	103	41.48	58.52
8	Mean age	52±19.9 Years			

Mean age: 52±19.9 Years

Of the study population, 5 (2.84%) males and 8 (4.55%) female patients had stage 1, 9 (5.11%) male and 18 (10.23%) female patients had stage 2, 24 (13.64%) male and 41 (23.30%) female patients had stage 3, 20 (11.36%) male and 22 (12.50%) female patients had stage 4, 15 (8.52%) male and 14 (7.95%) female patients had stage 5 CKD respectively. (Table:2)

Table 2. Stages of CKD in the study population

S. No	Stages of CKD	No. of patients		Percentage (%)	
		Males	Females	Males	Females
1	Stage 1	5	8	2.84	4.55
2	Stage 2	9	18	5.11	10.23
3	Stage 3	24	41	13.64	23.30
4	Stage 4	20	22	11.36	12.50
5	Stage 5	15	14	8.52	7.95

Diabetes was the most common comorbidity (104 patients, 59.10%) observed in the study population, followed by hypertension (66 patients, 37.5%), anaemia (38 patients, 21.59%). Other comorbidities observed were coronary artery disease, Sepsis,congestive cardiac failure,ischemic heart disease, Pyelonephritis, Hyperlipidemia, urinary tract infection, stones in the urinary tract, hypothyroidism, pulmonary disorders, and thrombocytopenia. Among the study population (5 patients, 2.84%) patients did not have any medical co-morbidity. (Figure 2)

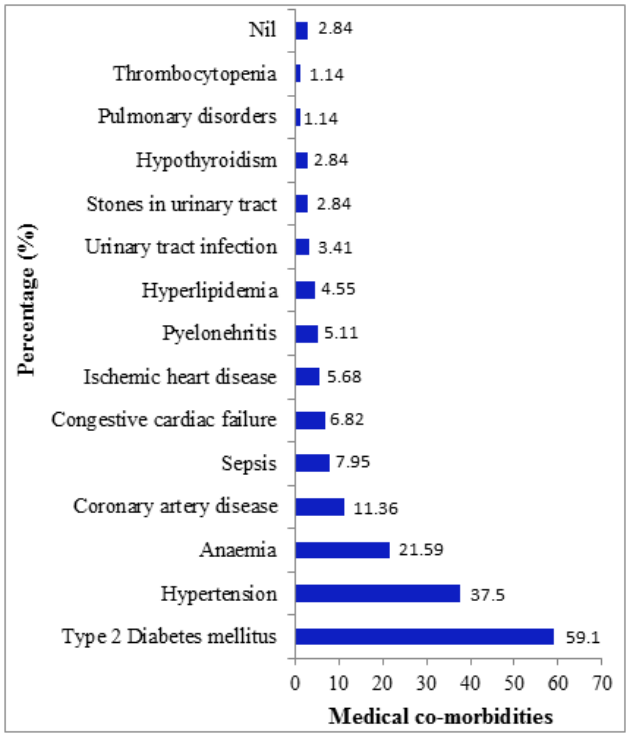

Fig 2. Distribution of medical comorbid conditions among the study population (n=176)

Among the 104 patients who had CKD with Type 2 DM, 104 anti-diabetic drugs were prescribed. 15 (14.4%) patients were prescribed with metformin (biguanides); 15 (14.4%) patients were prescribed with glyburide, 3 (2.9%) patients were prescribed with glipizide, 13 (12.5%) patients were prescribed with gliclazide (sulfonylureas); 13 (12.5%) patients were prescribed with linagliptin (dipeptidyl Peptidase 4 Inhibitors); 11 (10.6%) patients were prescribed with glimepiride (thiazolidinedione derivative); and 13 (12.5%) patient was prescribed with huminsulin, 21 (20.2%) patients were prescribed with lupisulin (insulin derivatives). (Table:3)

Table 3. Prescription pattern of drugs in CKD patients with Type 2 DM (n=104)

S. No.	Class of drug prescribed	Generic name of drugs	No. of patients	Percentage of drugs prescribed (%)
1	Biguanides	Metformin	15	14.4
2	Sulfonylureas	Glyburide	15	14.4
		Glipizide	3	2.9
		Gliclazide	13	12.5
3	Dipeptidyl Peptidase 4 Inhibitors	Linagliptin	13	12.5
4	Thiazolidinedione derivative	Glimepiride	11	10.6
5	Insulin derivatives	Huminsulin	13	12.5
		Lupisulin	21	20.2

Among the 66 patients who had CKD with HTN, 84 anti-hypertensive drugs were prescribed. 9(10.7%) patients were prescribed with amlodipine, 21(25%) cilnidipine, 11(13.1%) nifedipine (calcium channel blockers); 13(15.5%) nebivolol, 7(8.3%) metoprolol (β blockers); 8(9.5%) furosemide, 4(4.7%) torsemide (diuretics); 7 (8.3%) prazosin, 1(1.2%) terazosin (α blockers); and 3(3.6%) and labetalol (both α blockers & β blockers). (Table: 4).

Table 4. Prescription pattern of drugs in CKD patients with HTN (n=66)

S. No.	Class of drug prescribed	Generic name of drugs	No. of patients	Percentage of drugs prescribed (%)
1	Calcium channel blockers	Amlodipine	9	10.7
		Cilnidipine	21	25
		Nifedipine	11	13.1
2	β blockers	Nebivolol	13	15.5
		Metoprolol	7	8.3
3	Diuretics	Furosemide	8	9.5
		Torsemide	4	4.7
4	α blockers	Prazosin	7	8.3
		Terazosin	1	1.2
5	Both α & β blockers	Labetalol	3	3.6

Among the 38 patients who had CKD with anaemia, 44 anti-anaemic drugs were prescribed. 11 (25%) patients were prescribed with erythropoietin, 3 (6.8%) with epoetin - α (erythropoiesis-stimulating agents); 13 (29.5%) ferric pyrophosphate, 10 (22.7%) ferrous fumarate and 7 (15.9%) folic acid. (Table:5)

Table 5. Prescription pattern of drugs in CKD patients with anaemia (n=38)

S. No.	Class of drug prescribed	Generic name of drugs	No. of patients	Percentage of drugs prescribed (%)
1	Erythropoiesis stimulating agents	Erythropoietin	11	25
		Epoetin α	3	6.8
2	Iron and vitamin supplements	Ferric pyrophosphate	13	29.5
		Ferrous fumarate	10	22.7
		Folic acid	7	15.9

Among the 20 patients who had CKD with CAD, 36 drugs were prescribed. 11 (30.5%) patients were prescribed with clopidogrel: (antiplatelet drug); 2 (5.5%) cilnidipine (calcium channel blockers); 1 (2.8%) nebivolol (β blockers); 8(22.2%) nitroglycerin (nitrates); and 14 (38.9%atorvastatin (statins). (Table: 6)

Table 6. Prescription pattern of drugs in CKD patients with CAD (n=20)

S. No.	Class of drug prescribed	Generic name of drugs	No. of patients	Percentage (%)
1	Antiplatelets	Clopidogrel	11	30.5
2	Calcium channel blockers	Cilnidipine	2	5.5
3	β blockers	Nebivolol	1	2.8
4	Nitrates	Nitroglycerin	8	22.2
5	Statins	Atorvastatin	14	38.9

5 DISCUSSION

Prescription pattern studies were done to evaluate the quality of care given to the patients in the health care system. Appropriate selection of the drug therapy ensures maximum benefit to the patients and decreases the side effects. In our study population of 176 CKD patients 103 (58.52%) were females and 73 (41.48%) were males. A study conducted by Leila Malekmakan et al., resulted that 59.6% of CKD cases account females and 40.4% for males. This study was found to be similar with above study and indicated that the female gender was the strongest risk factor for CKD. In this study, the mean (±SD) age of the total study population was 52±19.9 years. 53 (30.11%) patients were in the age group of >68 years. The result of this study coincides with the study conducted by Leila Malekmakan et al., and Lin et al., stating that the prevalence of CKD increased with aging in both males and females and the prevalence of CKD was were higher in women than in men in almost all age groups respectively. In our study, using the CKD EPI equation from the mobile application used to calculate eGFR, the prevalence of CKD was found to be higher for stage 3. 24 (13.64%) male and 41 (23.30%) female patients had stage 3 CKD. The results of this study are in contrast to the study conducted by Kore C et al. which showed the prevalence of CKD to be higher for stage 5 and lower for stage 3 and stage 4. The prevalence of medical comorbidities was analyzed and Type 2 diabetes mellitus was found to be highly prevalent, followed by hypertension and anaemia in our study. This is in contrary to the previous study reports showing hypertension in the first place, which may be attributed to the socio-economic status and other medical conditions of the study population.[23-26] In our study, Insulin was the most common antidiabetic drug prescribed (32.7%) and sulfonylureas were the commonly prescribed oral hypoglycemic agents (29.8%). The results coincide with the study results conducted by Kantanavar KA et al., The most common antihypertensive drugs prescribed in our study were calcium channel blockers (48.8%) followed by β blockers (23.8%) which was found to be similar with the study conducted by Kantanavar KA et al., which resulted that the calcium channel blockers are the most commonly prescribed antihypertensive drugs. In our study iron and vitamin supplements were the most commonly prescribed haematinics (68.1%) followed by erythropoiesis-stimulating agents (31.8%). The results of this study is in contrast with the study results of Kantanavar KA et al. in which erythropoietin was found to be the most frequent hematinic prescribed followed by intravenous iron sucrose and oral elemental iron. The most commonly prescribed drug for coronary artery disease in our study was found to be statins (38.9%) followed by antiplatelets (30.5%). Physicians and nephrologists can play an important role in better outcomes in CKD patients by practising evidence based practice guidelines from NKF and RPA. Finally, patients undergoing other dialysis procedures than hemodialysis were not included in this study and this study was based on primary care population; thus limiting the generalization of our results to the general population.

6 CONCLUSION

A high burden of chronic kidney disease exist in the Indian population that accounts for a high prevalence of morbidity and mortality. This study revealed the prescribing pattern of the various drugs used in CKD patients. Type 2 diabetes mellitus was found to be highly prevalent co-morbid condition in CKD. Antidiabetic drugs and antihypertensive were used more frequently in chronic renal failure patients because of the high prevalence of comorbidities. The value of indiscriminate use of anticoagulants and vitamins is a valuable addition to the effective medications for secondary prevention of high-risk patients. Moreover from time to time studies is required in drug utilization pattern to improve disease management strategy and quality of life. However, targeted education of prescribers and dissemination of treatment guidelines could facilitate the rational use of drugs and adherence to treatment guidelines.

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8 AUTHORS CONTRIBUTION STATEMENT

Dr. M. Rangapriya was the guide for this study and also made necessary corrections. Bini K.P conceptualized and gathered the data with regards to this work and analyzed these data and necessary inputs were given towards the designing of the manuscript. Both authors discussed the methodology and results and contributed to the final manuscript.

9 CONFLICT OF INTEREST

Conflict of interest declared none.

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