A PROSPECTIVE OBSERVATIONAL STUDY ON MEDICATION USE PATTERN IN PATIENTS WITH RISK FACTORS OF CHRONIC KIDNEY DISEASE

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ABSTRACT

Objectives: The current study was undertaken to review and assess the medication usage pattern in patients with chronic kidney disease (CKD).

Methods: A 12-month prospective observational study was carried out at Shadan Teaching and General Hospital, Peerancheru (Hyderabad), involving 384 CKD patients considering the inclusion and exclusion criteria. Medication evaluation for optimization was done using the World Health Organization (WHO) core prescribing indicators. Data collected were entered using Microsoft Excel. Descriptive statistics such as mean, percentage, and standard deviation (SD) were used to present sociodemographic characteristics of the study participants.

Results: Out of the total of 384 patients, 249 (65%) were male and 135 (35%) were female with a mean age of 58.28 (SD: 13.12). A total of 384 prescriptions were scrutinized with a total of 3634 drugs, out of which drugs acting on the cardiovascular system were the most prescribed drugs (36.37%). The average number of drugs per prescription was found to be 9.08 considering the total number of prescriptions. The percentage of drugs prescribed by generic name was 15.57%. The percentage of encounters with antibiotics was 25%, whereas the percentage of encounters with injections was 86%. The percentage of drugs prescribed from the Essential Drug List or Formulary was found to be 26.36%.

Conclusion: Assessment of medication usage patterns using the WHO core indicators in CKD patients helps to reinforce the current hospital guidelines for the optimal usage of medications. The introduction of a clinical pharmacist along with a multidisciplinary team provides intensive care to the patients and helps to improve the clinical outcome.

Keywords: Chronic kidney disease, Medication usage pattern, Long-term treatment, Medication-related problems, World Health Organization prescribing indicators.

INTRODUCTION

The kidneys are organs that serve a number of essential regulatory roles. Most of us know that our kidneys function as filters, removing metabolic wastes and toxins from the blood and excreting them through the urine. But the kidneys also serve other essential functions. Through various regulatory mechanisms, the kidneys help maintain the body's water balance, electrolyte balance, and acid-base balance. Additionally, the kidneys produce or activate hormones that are involved in erythrogenesis, calcium metabolism, and the regulation of blood pressure and blood flow [1].

Due to the rise in the prevalence and incidence of chronic kidney disease (CKD), there is a major threat among the general population. It remains a mainstay problem throughout the world. Nearly 11–13% of CKD cases remain prevalent globally. As per the World Health Organization (WHO), the annual death rate of 850,000 contributed by this ailment [2].

Renal failure is a broad term mainly associated with the incompetency of kidneys to carry out their normal homeostatic and excretory function results in the accumulation of nitrogenous waste products in the body. It could be acute or chronic. CKD is characterized by the progressive morphological and physiological detrimental changes in the kidneys persistent for more than 3 months which is usually irreversible. Serum creatinine levels remain elevated for more than 3 months and estimated glomerular filtration rate is estimated to be <60 ml/min/m^2 [3].

Medication usage pattern in CKD patient varies from patient to patient depending on the condition and duration of the chronicity. Hence, it is essential to analyze the medication usage pattern among CKD patients from time to time as they need to acquire the medications throughout their life. In India, CKD remains a major threat to the health-care system as well as the patient's well-being. Conducting the drug utilization survey for chronic diseases helps to promote rational use of drugs [2].

In 2017, the total mortality rate because of CKD and cardiovascular disease attributed to impaired kidney function was estimated to be 4.6%. The overall mortality rate raised by 41.5% from 1990 to 2017. Researchers also reported that diabetic kidney disease remains the apparent cause of CKD [4]. Since very limited studies are available in India on the prescribing trends among CKD patients, this study was carried out with the main focus on the medication usage pattern in the management of CKD patients and also to assess the prescription following the rational use.

METHODS

Study site
The study was conducted at Shadan Institute of Medical Sciences, Peerancheru, Hyderabad.

Study design
- Prospective observational study
- Review and collection of cases.

Study duration
The study was carried out for 12 months.

Sample size
Approximately 384 patients were enrolled in the study who fulfilled the inclusion and exclusion criteria.

Inclusion criteria
The following criteria were included in the study:
1. All CKD patients
2. Both male and female patients
3. Patients with/without comorbid conditions
4. Patients with risk factors of CKD.

Exclusion criteria
The following criteria were excluded from the study:
1. Patients refused to participate in the study
2. Patients Who cognitive impairment
3. Pregnant and lactating women.

Research methodology
Medication evaluation for optimization was done using the WHO core prescribing indicators, that is,
- Average number of drugs per encounter
- Percentage of drugs prescribed by generic name
- Percentage of encounters with an antibiotic prescribed
- Percentage of encounters with an injection prescribed
- Percentage of drugs prescribed from the essential medicine list or formulary.

Study approval
Permission for collecting patient data was approved by the ethical committee of Shadan Hospital. It also permits the utilization of the hospital facilities for regular follow-ups of prescriptions for research work.

Statistical analysis
Data were checked for completeness, correctness, and grouped accordingly. Data collected were entered using Microsoft Excel. Descriptive statistics such as mean, percentage, and standard deviation (SD) were used to present sociodemographic characteristics of the study participants.

RESULTS

A total of 384 patients were included in the study considering inclusion and exclusion criteria. Out of total 384 patients, 249 (65%) were male and 135 (35%) were female. This study shows male predominance. Gender-wise distribution is summarized in Fig. 1.

Age-wise distribution of patients
In this study, age ranged from 21 to 84 years. The mean age of the population was 58.28 (SD: 13.12). The majority of the participants were in the age group >60 years (50%) of age. The age-wise distribution of patients is summarized in Fig. 2.

Sociodemographic characteristics of the study participants
Sociodemographic characteristics of the study participants were also analyzed. The relevant data are presented in Table 1.

Distribution based on comorbidities
Almost all the patients enrolled in the study had at least more than 1 comorbid condition. Hypertension (HTN) (34.10%) is the most common comorbid condition which is followed by diabetes mellitus (DM) (20.30%), anemia (13.30%), and cardiovascular disorders (8.05%).

The distribution of comorbidities in CKD patients is enumerated in Fig. 3.

Medication usage pattern
A total of 384 prescriptions were scrutinized with a total of 3634 drugs, out of which drugs acting on the cardiovascular system were the
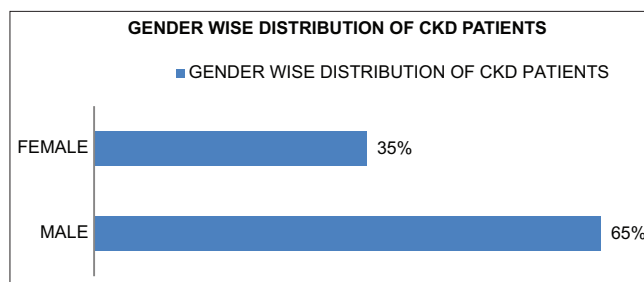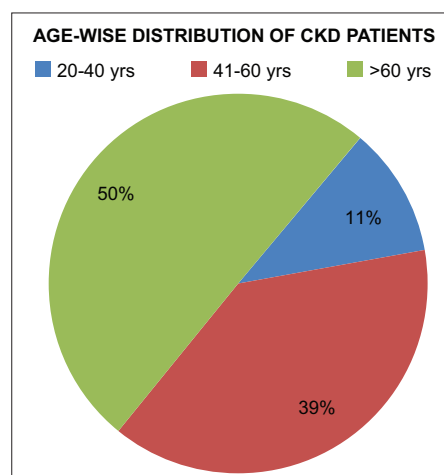

Fig. 1: Gender-wise distribution

Fig. 2: Age-wise distribution

Table 1: Sociodemographic characteristics of the study participants

Variables	Categories	Frequency (n)	Percentage
Age (years)	20–40 years	42	11
	41–60 years	150	39
	>60 years	192	50
Sex	Male	250	65
	Female	134	35
Marital status	Married	263	68.50
	Single	121	31.50
Education status	Illiterate	44	11.50
	Primary	106	27.50
	Secondary	130	34
	Higher	104	27
Residence	Urban	246	64
	Rural	138	36
Occupation	Retired	119	31
	Private employee	77	20
	Government employee	31	8
	Business	36	9.50
	Others	121	31.50
Social history	Non-smokers	275	71.50
	Smokers	109	28.50
Monthly income	Low	29	7.50
	Average	59	15.50
	Above average	94	24.50
	High	202	52.50
Duration of HTN	<5 years	111	29
	5–15 years	167	43.50
	Above 15 years	106	27.50

HTN: Hypertension.

most prescribed drugs (1322 drugs, 36.37%) followed by vitamins and minerals (548 drugs, 15.07%), hematinics (426 drugs, 11.72%), and gastrointestinal drugs (334 drugs, 9.19%), whereas acid-base disorder
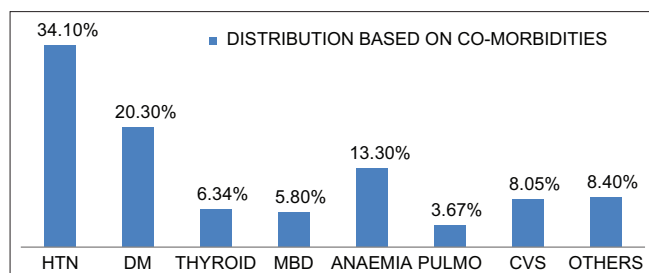
Fig. 3: Distribution based on comorbidities

drugs were least prescribed (30 drugs, 0.82%). The most commonly prescribed combination therapy was antiplatelets + hypolipidemics (42 drugs, 36.20%). A complete summary of the medication usage pattern among study participants is depicted in Table 2.

WHO core drug use indicator

In this current study, medication usage pattern was analyzed using the WHO core drug use indicators. A total of 3634 medicines were prescribed. Therefore, the average number of drugs per prescription was found to be 9.08 considering the total number of prescriptions. The percentage of drugs prescribed by generic name was 15.57%. The percentage of encounters with antibiotics was 25%, whereas percentage of encounters with injections was 86%. The percentage of drugs prescribed from the essential drug list or formulary was found to be 26.36%. A brief description of the WHO prescribing indicators is summarized in Table 3.

DISCUSSION

In this present study, out of 384 CKD patients, 65% were male whereas only 35% were female. This shows male predominance over females. Similar reports were published by various other authors. Shastry *et al.* [5] and Abhisek *et al.* [6] reported 75% and 71.3% of male dominance over the female.

This suggests that males are more prone to CKD when compared to females. This is mere because of different hormonal environments [7]. In this present study, the majority of the participants were in the age group >60 years (50%) of age. A similar observation where the majority of participants were the elderly in the age group above 60 years (54%) was made by Monika *et al.* [8].

The existence of several comorbid conditions leads to the requirement of multiple drug therapy to treat the underlying condition. The average number of drugs per prescription was found to be 9.08 considering the total number of prescriptions. Chakraborty *et al.* [9] and Al-Ramahi [10] reported that3almost similar results with an average number of drugs per prescription were 10 and 9.38, respectively.

Our study revealed that the percentage of drugs prescribed by generic name was found to be 15.57%. Similar studies were conducted by Shrestha and Dixit and Shastry *et al.* where the percentage of drugs prescribed by generic name was 16.94% and 8.7%, respectively [5,11]. Whereas, Ahlawat *et al.* and Bajait *et al.* reported none of the drugs prescribed with the generic name [12,13]. This revealed that prescribing with brand names remains a common practice in major parts of the world. Therefore, there is a need to encourage prescription writing by generic name to promote rational drug use.

This study revealed that the percentage of encounters with injections was 86%. Similar results were reported by Shrestha and Dixit which were 71% of encounters with injections [11]. Prescribing a large number of injections in CKD patients is normal due to the presence of

Table 2: Medication usage pattern in CKD patients

Drug class	Frequency	Percentage
Cardiovascular drugs (n=1322, 36.37%)		
Calcium channel blockers	250	18.91
Diuretics	168	12.7
Centrally acting alpha agonist	90	6.80
Beta-blockers	194	14.67
Alpha-blockers	122	9.22
Anticoagulants and ant platelets	206	15.58
Hypolipidemics	114	8.62
Vasodilators	16	1.21
RAAS inhibitors	74	5.59
Nitrates	40	3.02
Others	48	3.63
Hematinics (n=426, 11.72%)		
Epoetin alpha	204	47.88
IV iron sucrose	144	33.80
Darbepoetin	34	7.98
Oral elemental iron	18	4.22
Folate	26	6.10
Antidiabetic drugs (n=186, 5.11%)		
Insulin	114	61.29
Oral hypoglycemic agents	72	38.70
Vitamins and minerals (n=548, 15.07%)		
Calcium carbonate+Vitamin D3	156	28.46
Vitamin D3 derivatives	92	16.78
Vitamin B complex	94	17.15
Others	206	37.59
Gastrointestinal drugs (n=334, 9.19%)		
Proton-pump inhibitors	200	59.88
Dopamine antagonist	10	2.99
H2 blockers	18	5.38
Others	106	31.73
Acid-base disorder drugs (n=30, 0.82%)		
Sodium bicarbonate	14	46.66
Febuxostat	16	53.33
Phosphate binders (n=92, 2.53%)		
Calcium acetate	6	6.52
Sevelamer	86	93.47
Antibiotics (n=130, 3.57%)		
Cephalosporins	52	40
Fluoroquinolones	12	9.23
Aminoglycosides	10	7.69
Penicillins	6	4.61
Tetracyclines	6	4.61
Carbepenems	4	3.07
Others	40	30.76
Analgesics (n=84, 2.31%)		
Acetaminophen+Tramadol	22	26.19
Paracetamol	38	45.23
Diclofenac	8	9.52
Others	16	19.04
Thyroid medications (n=62, 1.70%)		
Levothyroxine	62	100
Drugs acting on nervous system (n=96, 2.64%)		
CNS drugs	96	100
Miscellaneous drugs (n=208, 5.72%)		
Others	208	100
Combination therapy (n=116, 3.19%)		
Antiplatelets+Hypolipidemics	42	36.20
Vasodilators+Nitrates	40	34.48
Calcium channel blockers+Beta-blockers	14	12.06
ARBs+Diuretics	4	3.44
PPI+Dopamine blockers	16	13.79

ARBs: Angiotensin receptor blockers, PPI: Proton-pump inhibitors, RAAS: Renin-angiotensin-aldosterone system, RASI: Renin-angiotensin-aldosterone system inhibitor, CNS: Central nervous system.

comorbid conditions such as anemia and DM where parenteral use of erythropoietin and insulin is required for management.

Table 3: WHO core drug indicator

Indicators	Data
Prescribing indicators	
Average number of drugs per prescription	9.08
Percentage of drugs prescribed by generic name	15.57%
Percentage of encounters with an antibiotics	25%
Percentage of encounters with injections	86%
Percentage of drugs prescribed from essential drug list or formulary	26.36%

In our study, the percentage of encounters with antibiotics was 25%. Our study results lie within the standard range (20.0–26.8%) which is considered to be ideal [14]. Whereas other studies show a slightly higher range such as the study conducted by Shrestha and Dixit and Ulhas and Rataboli who reported 64.1% and 31.8% of encounters with antibiotics, respectively [11,15].

In this current study, the percentage of drugs prescribed from the WHO essential drug list was found to be 26.36%. Similar studies were conducted by Ahlawat *et al.* and Sindhura *et al.* who showed 19% and 36.1% of drugs prescribed from the WHO essential drug list, respectively [12,16].

In this study, cardiovascular drugs were the most prescribed drugs (661 drugs, 36.37%) followed by vitamins and minerals (n=274, 15.07%) and hematinics (n=213, 11.72%).Whereas, a study conducted by Monika *et al.* who reported that cardiovascular drugs (16.48%) are most frequently prescribed followed by gastrointestinal tract drugs (14.07%) and nutritional supplements (10.88%) [8]. Since the majority of the population suffers from the comorbid condition of HTN, cardiovascular drugs are mostly required for their management.

Among the cardiovascular drugs, calcium channel blockers (CCBs) were most commonly prescribed (18.91%) in our study. Similar results were reported by Shastry *et al.* [5], Bailie *et al.* [17], Dasari *et al.* [18], and Tadvi and Hussain [19] where CCBs were most commonly prescribed constituting 78.05%, 27.6%, 60.5%, and 52%, respectively. Where as studies conducted by Chakraborty *et a*l. [9], Ahlawat *et al.* [12], and Bajait *et al.* [13] constituting 9.29%, 54%, 9.50% respectively followed by CCBs. In our study, nearly 80.05% of participants were at end-stage renal disease. Therefore, CCBs are being preferred over renin-angiotensin-aldosterone system inhibitors as this may aggravate hyperkalemia and also require dosage adjustment.

In our study, among phosphate binders (PBs), 93.47% of sevelamer was prescribed while only 6.52% of calcium acetate was prescribed. A study conducted by Martins *et al.* who reported the high use of sevelamer (45.4%) over other calcium-based PBs (26.5%) [20]. In contrast to the studies conducted by Chakraborty *et al.* (11.02%) [9] and Bajait *et al.* (9.97 %) [13] reported higher use of calcium-based PBs when compared to sevelamer due to high cost.

Sevelamer, a newer non-calcium, non-aluminum binder, is used more frequently to avoid soft-tissue calcification which is caused by calcium-based PBs such as calcium acetate and calcium carbonate. Moreover, sevelamer is associated with a reduction of coronary and aortic calcification [13]. A recent meta-analysis reported that non-calcium-based PBs associated with a 22% reduction in all-cause mortality compared to calcium-based PBs in CKD patients [21].

CONCLUSION

Assessment of medication usage patterns using the WHO core indicators in CKD patients helps to reinforce the current hospital guidelines for the optimal usage of medications. Due to the existence of comorbid conditions in CKD patients, polypharmacy remains the common practice in the clinical setting. Therefore, the likelihood for drug interactions and adverse outcomes are very common. The introduction of a clinical pharmacist along with a multidisciplinary team provides intensive care to the patients and helps to improve the clinical outcome. There is a need to encourage prescription writing in generic names to eliminate medication errors and need to enhance the medication use from the WHO essential drug list for the easy access to the cost-effective medication.

Further sophisticated studies with special emphasis on drug interaction, adverse events, pharmacoeconomics, and assessment tools for early detection of CKD need to be carried out.

AUTHORS' CONTRIBUTION

Concept, design, data analysis, and manuscript writing of the study were done by the first author. The second and third authors helped in guiding. The fourth author helped in data collection.

CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHORS' FUNDING

Self.

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