Original Article

Evaluation of self medication practices and prescription patterns in patients of chronic kidney disease: A cross-sectional, questionnaire based study

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Abstract

Background: Pharmacotherapy of chronic kidney disease (CKD) consists of prescribing myriad of drugs such as antihypertensives, antidiabetics, and phosphate binders to delay disease progression and control the comorbidities, resulting in inherent variability in prescriptions. In addition, tendency to self-medicate may further aggravate the condition. Hence, the present study was planned to assess self-medication practices and variability in prescription patterns in CKD patients.

Methodology: A cross-sectional, questionnaire-based study approved by the ethics committee was conducted in CKD patients attending the nephrology outpatient department. The prescription details which included drug name, dosage form, dose, frequency, duration, and dosage instructions were recorded and prescription completeness was checked. To assess the tendency of CKD patients to self-medicate, each patient was administered a prevalidated [Content Validity Ratio (CVR) = 0.76] 8-item questionnaire which had dichotomous responses "Yes" and "No" and was scored as 2 and 0, respectively (total score 16).

Results: Three hundred CKD patients (150 on hemodialysis and 150 nondialysis) yielded 300 prescriptions with 1272 drugs. It was evident that 33% of patients did self-medicate themselves with analgesics, and the mean score (7.81 ± 3.01) of self-medication practices was perceived significantly higher in the nondialysis group (8.41 ± 3.46). The most common classes of drugs prescribed in CKD patients were calcium channel blockers (41%), antidiabetic drugs (39%), diuretics (35%), gastrointestinal drugs (35%), and multivitamins (27%), with the average number of drugs being 5.84 ± 0.51.

Conclusion: Nearly one-third of CKD patients were self-medicating with paracetamol, nonsteroidal anti-inflammatory drugs; more in the nondialysis group emphasizing reinforcement of patient education programs. The most common drugs prescribed were amlodipine, followed by metformin, and the average number of drugs was less in our setting, indicating vigilant dose prescribing in CKD patients.

Keywords: Medication, nephrotoxicity, nonsteroidal anti-inflammatory drug, prescription

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INTRODUCTION

Chronic kidney disease (CKD) is characterized by structural/functional renal abnormalities, symptom presentation for >3 months and has health implications[1] with an increasing global health burden. In 2017, the global prevalence was 9.1% (697.5 million cases), which had increased by 29% since 1990.[2] Liyanage etal in their systematic review reported substantial variation in CKD prevalence (7.0%–34.3%) and approximately 434.3 million people have CKD across across Asia, with India prevalence as 140.2 million (95% CI 110.7 to 169.7)[3]

Pharmacotherapy of CKD includes prescribing a myriad of drugs such as antihypertensives, antidiabetics, and phosphate binders to delay disease progression, prevent complications, and control the comorbidities such as hypertension, diabetes, and anemia. This results in an inherent variability in prescriptions of CKD patients. Drug utilization study conducted in CKD patients visiting a tertiary care hospital, Odisha, revealed that the average number of drugs prescribed was 8.1 ± 3.2 and the five most frequently prescribed drugs were diuretics (100%), antiulcer agents (98%), antihypertensives (95%), vitamins including calcium (92%), and hematinics (85%).[4] A similar study conducted by Sontakke *et al.* in Nagpur showed that the average number of medicines was 8.0 + 1.612 (mean ± standard deviation)/day,[5] while the study by Chakraborty *et al.*, Kolkata, revealed that the median number of drugs/prescription was 10 (9–13).[6]

Apart from the much-needed polypharmacy in these patients, they also show self–medication, which can be harmful and may interact with the prescribed medicines. The treating physician does advise about prohibited medications and discourages self-medication practices in these CKD patients, but patients do disregard this vital advice. A report from Centers for Disease Control and Prevention revealed that 5% of patients with moderate-to-severe CKD used over–the-counter (OTC) nonsteroidal anti-inflammatory drugs (NSAIDs) regularly, and two-thirds of them used NSAIDs for >1 year.[7] A survey conducted in the US general population in 2008 revealed that approximately 38% of adults do take herbal and dietary supplements, but only 12% of these had sought advice from a physician.[8] A systematic review conducted in the UA stated that intake of certain dietary supplements has been associated with renal injury, immune-mediated nephrotoxicity, and nephrolithiasis.[9]

After thorough literature search, no studies were found in India evaluating the tendency of self-medication in CKD patients. Hence, the present study was planned to assess self-medication practices in CKD patients and variability in prescription patterns in these patients.

METHODOLOGY

This was a cross-sectional, questionnaire-based study conducted after approval from the institutional ethics committee (EC NO. EC/153/2016) and in compliance with National Ethical Guidelines for Biomedical and Health Research Involving Human Participants, 2017.[10]

The study enrolled 300 (150 dialysis and 150 nondialysis) adult CKD patients who provided voluntary written consent, of either gender with confirmed diagnosis of CKD attending the nephrology outpatient department (OPD) at a tertiary care hospital from January 2017 to June 2018. Admitted patients and those who were scheduled for renal transplant were excluded from the study.

The demographic details such as age, sex, socioeconomic status, and literacy level according to Modified Kuppuswamy Scale, CKD stage (as per National kidney Foundation), type of dialysis (hemo or peritoneal), sessions per week, and presence of comorbid conditions were noted. In addition, the current prescription written by the consulting nephrologist was noted for the presence of generic name, dosage form, dose, frequency, duration (days), and dosage instructions and considered complete if all this information was present.

To assess the tendency of CKD patients to self-medicate, each patient was administered a prevalidated (CVR = 0.76 validated by pharmacologists $n = 6$ and nephrologists $n = 2$) 8-item questionnaire. The first 5-items inquired whether patients took pain killers, calcium, multivitamins, herbal medicines, and other OTC drugs, while the last 3 items tried to capture whether patients felt a need to consult/inform the treating doctor about this self-medication [Table 1]. Each item had dichotomous responses "Yes" and "No" which was scored as 2 and 0 respectively, thus patient's self-medication score ranged from +16 to 0. Higher the score indicated that patient indulged in self-medication. If patients stated "yes" for intake of any self-medication, they were probed to state the names of the drugs, reasons, and duration for taking these drugs.

The data obtained were entered into MS-Excel and stratified into dialysis and nondialysis patient groups. The number of respondents stating "yes" for each item on the CKD patient self-medication practice questionnaire in the dialysis and nondialysis groups was compared using the Chi-square

test. The mean self-medication scores between dialysis and nondialysis group were compared using Mann–Whitney test. $P < 0.05$ was considered statistically significant.

The drug utilization was calculated as the ratio of prescribed daily dose (PDD) and daily defined dose (DDD). The other prescribing indicators analyzed were average number of drugs prescribed/prescription, percentage of drugs prescribed by generic name, percentage of prescriptions with injectables/antimicrobials/fixed dose combinations (FDCs), and percentage of complete prescriptions. The data were analyzed using descriptive statistics using GraphPad prism 7.0 (2016, GraphPad Software Inc., SanDiego, CA, USA) statistical software.

RESULTS

The demographic and disease details of 300 patients in the study are represented in Table 2. In the study, there were more number of males (164, 55%) compared to females (136, 45%). The mean age of patients was 48 ± 11 years and the majority patients (264, 88%) of patients belonged to the upper lower class. Illiterate patients were 96 (32%), while only 32 (11%) patients were graduates. The study showed that the maximum number of patients belonged to Stage 5 (95, 32% of patients), followed by Stage 4 (75, 25% of patients), and hypertension was found to be the most common comorbidity (186, 62% of patients), followed by diabetes (168, 56% of patients). All 150 dialysis patients were on hemodialysis, and the average number of cycles/week/patient was 4.5.

The item-wise responses to self-medication practice questionnaire of CKD patients are represented in Table 1. It is evident that 100/300 (33%) patients (68 patients in the nondialysis group and 32 patients in the dialysis group) were taking self-medication, i.e., NSAIDs ($n = 21$), multivitamins ($n = 10$), herbal medicines ($n = 9$), and other OTC drugs ($n = 60$) without consulting the doctor, and the number was significantly higher in the nondialysis group ($P = 0.0236$). The most common drug was paracetamol taken by 58 CKD patients.

When probed further regarding self-medicating drugs, none of the patients could give complete information regarding painkillers, while complete information was provided by only one patient (herbal medicines), 8/10 patients (multivitamins - 4 dialysis and 4 nondialysis patients) and 39/60 (other OTC drugs 17 dialysis and 22 nondialysis) patients. The mean self-medication practice score was 7.81 ± 3.01, which was significantly lesser ($P < 0.01$) in dialysis patients (7.26 ± 0.97) versus nondialysis 8.41 ± 3.46. Similarly, male patients indulged more in self-medication (8.03 ± 0.83) versus females (7.03 ± 1.28). In addition, illiterate and upper middle class CKD patients documented significantly increased self-medication practice versus their educated and lower income group CKD patients [Table 3]. This self-medication practice score was correlated with demographic factors, and it was found that self-medication score had a weak significant positive correlation with gender ($r = 0.22$, $P = 0.0001$), disease duration ($r = 0.28$, $P \leq 0.00001$), while a strong positive significant correlation with socioeconomic and literacy status ($r = 0.73$, $P \leq 0.00001$).

The total number of drugs prescribed was 1272 in 300 prescriptions. The average number of drugs/prescriptions was 5.84 ± 0.51 (6.41 ± 0.13 in the dialysis and 5.24 ± 0.61 in the nondialysis group), and it was found to be significantly higher in the dialysis group ($P < 0.05$). The percentage of drugs prescribed by generic names was 16%. Overall, 39 injections were prescribed and only six patients received concomitant antimicrobials. Incomplete prescriptions were 90/300 (21 dialysis and 69 nondialysis) and all of them were incomplete in terms of written instructions.

The four most common classes of drugs prescribed were calcium channel blockers (48% nondialysis and dialysis 34% patients), antidiabetic drugs (45% nondialysis and 33% dialysis patients), gastrointestinal (GI) drugs (40% nondialysis and 30% dialysis patients) and diuretics (36% nondialysis and 34% dialysis patients). Sodium bicarbonate appeared the single most common drug prescribed in 130/300 prescriptions. The different classes of drugs prescribed in nondialysis and dialysis patients are represented in Table 4.

Drugs such as amlodipine, cilnidipine, furosemide, telmisartan, metolazone, atenolol, losartan, olmesartan, prazosin, ramipril, aspirin, clopidogrel, insulin, sitagliptin, calcium carbonate, and calcitriol had PDD/DDD ratio of 1, while nifedipine (PDD/DDD 0.66), metoprolol (PDD/DDD 0.33), carvedilol (PDD/DDD 0.16), atorvastatin (PDD/DDD 0.5), rosuvastatin (PDD/DDD 0.5), metformin (PDD/DDD 0.25), glipizide (PDD/DDD 0.5), calcium acetate (PDD/DDD 0.11), and sevelamer (PDD/DDD 0.12) were underprescribed and torsemide (PDD/DDD 6.6) was overprescribed. The most common FDC prescribed in dialysis patients was tablet calcium carbonate + Vitamin D3 (48), followed by iron + folic acid (12) and the most common FDC prescribed in nondialysis patients was tablet telmisartan + hydrochlorothiazide (12), followed by amlodipine + olmesartan (6).

Table 1: Responses of the chronic kidney disease participants to self-medication practices questionnaire

Questionnaire item	Responses (%)						*P*
	Total patients		Dialysis		Nondialysis		
	Yes	No	Yes	No	Yes	No	
Do you take any painkillers without consulting your doctor?	21 (7)	279 (93)	5 (3)	145 (97)	16* (11)	134 (89)	0.0236
Do you take any calcium supplements without consulting your doctor?	0	300 (100)	0	150 (100)	0	150 (100)	1.0000
Do you take any multivitamins without consulting your doctor?	10 (3)	290 (97)	5 (3)	145 (97)	5 (3)	145 (97)	NA
Do you take any herbal medicines for treatment?	9 (3)	291 (97)	0	150 (100)	9* (6)	141 (94)	0.0068
Do you take any other over the counter drugs?	60 (20)	240 (80)	22 (15)	128 (85)	38 (25)	112 (75)	0.6502
There is no need to inform your doctor before taking over the counter drugs?	163 (54)	137	75 (50)	75 (50)	87 (58)	63 (42)	0.2464
There is no need to inform your doctor before taking herbal drugs?	145	155	0	150	145	5	0.0001
If doctor has stated "NO," do you still take drugs?	6 (2)	294 (98)	2 (1)	148 (99)	4 (3)	146 (97)	0.6801

*denotes $P<0.05$, hence statistically significant. The number of respondents in dialysis group versus non dialysis compared by Chi square test.

Table 2: Demographic and disease details of chronic kidney disease patients enrolled in the study

Demographic and disease profile	Number of participants (%)		
	Total patients (*n*=300)	Dialysis patients (*n*=150)	Nondialysis patients (*n*=150)
Gender			
Male	164 (55)	85 (56)	79 (52)
Female	136 (45)	65 (44)	71 (48)
Age (years)			
<30	40 (13.3)	12 (8)	28 (19)
31–40	20 (6.7)	6 (4)	14 (9)
41–50	100 (33.3)	37 (25)	63 (42)
51–60	100 (33.3)	66 (44)	34 (23)
>60	40 (13.3)	29 (19)	11 (7)
Socioeconomic status			
Lower middle (11–15)	36 (12)	10 (7)	26 (17)
Upper lower (5–10)	264 (88)	140 (93)	124 (83)
Literacy			
Illiterate	96 (32)	50 (33)	46 (31)
Primary education	84 (28)	36 (24)	48 (32)
Secondary education	48 (16)	29 (19)	19 (13)
Higher secondary education	40 (13)	15 (10)	25 (16)
Graduate	32 (11)	20 (13)	12 (8)
CKD stage			
Stage 1	45 (15)	0	45 (30)
Stage 2	37 (12)	0	37 (25)
Stage 3	48 (16)	0	48 (32)
Stage 4	75 (25)	60 (40)	15 (10)
Stage 5	95 (32)	90 (60)	5 (3)
Duration of disease (years)			
<1	40 (13)	21 (14)	19 (17)
1–5	70 (23)	46 (31)	24 (16)
5–10	90 (30)	41 (27.3)	49 (33)
>10	100 (33)	42 (28)	58 (39)
Comorbid conditions			
Diabetes	168 (56)	100 (67)	68 (45)
Hypertension	186 (62)	112 (75)	74 (49)
Anemia	60 (20)	55 (37)	5 (3)
Infections	6 (2)	0	6 (4)

CKD=Chronic kidney disease

DISCUSSION

This study attempted to capture self-medication practices and prescription patterns in CKD patients. It was evident that 33% of patients did self-medicate themselves without consulting the treating physician and the mean score of self-medication practices was perceived higher in the nondialysis group. The common class of drugs prescribed in CKD patients in this study was calcium channel blockers, antidiabetic drugs, diuretics, GI drugs, and multivitamins with an average number of drugs being 5.84 ± 0.51.

In the study, 55% were male and 45% were female. This finding is similar to the results of Kantanvar *et al.*, in which there were 53.7% of males and 46.3% of females.[11] The mean age of patients was 48 ± 11 years similar to the report of Indian CKD registry with a mean age of 45.22 ± 15.2 years.[12] It was observed in the current study that most of the patients belonged to Stage 5 CKD (32%),

Table 3: Scores of chronic kidney disease patients for self-medication practice questionnaire

Mean score	Total patients	Dialysis	Nondialysis	*P*
Mean score	7.81±3.01	7.26±0.97*	8.41±3.46	0.0001
According to the gender				
Female	7.03±1.28#	6.06±1.41*	8.05±0.91	0.0357
Male	8.03±0.83	7.33±1.69*	8.64±1.28	<0.0001
According to literacy level				
Illiterate	7.76±3.19$	7.03±2.01*	8.49±1.27	0.0058
Primary education	7.18±1.09	6.93±0.71*	7.4±0.49	<0.0001
Secondary education	6.89±2.27	6.10±1.23*	7.43±0.91	0.0087
Higher secondary	6.14±1.81	5.41±2.83*	6.63±1.22	0.0022
Graduate/postgraduate	5.02±1.91	4.03±1.06*	5.77±1.27	<0.0001
According to the socioeconomic status				
Upper lower class	6.74±3.29$	6.16±1.23*	7.10±0.83	<0.0001*
Lower middle class	7.26±2.63	6.63±1.26*	7.89±0.41	<0.0001*

*$P<0.05$ when scores compared between dialysis and nondialysis group using Mann–Whitney test, #$P<0.0001$when compared with females using unpaired *t*-test, $$P=0.0101$ when scores compared with socioeconomic status using one-way ANOVA with *post hoc* Tukey's test

Table 4: Classes of drugs prescribed in chronic kidney disease patients

Drug class	Total patients, *n* (%)	Nondialysis, *n* (%)	Dialysis, *n* (%)
Calcium channel blockers	123 (41)	72 (48)	51 (34)
Amlodipine	68	43	25
Nifedipine	31	21	10
Cilnidipine	24	8	16
Diuretics	105 (35)	54 (36)	51 (34)
Furosemide	71	21	50
Torsemide	17	16	1
Telmisartan + hydrochlorothiazide	12	12	0
Metolazone	5	5	0
Beta blockers	57 (19)	37 (25)	20 (13)
Metoprolol	33	23	10
Carvedilol	18	8	10
Atenolol	4	4	0
Statins	33 (11)	33 (22)	0
Atorvastatin	20		
Rosuvastatin	13		
Angiotensin II receptor blockers	57 (19)	57 (38)	0
Telmisartan	21		
Losartan	20		
Olmesartan	16		
ACE inhibitors	12 (4)	12 (8)	0
Enalapril	7		
Ramipril	5		
Antiplatelet drugs	43 (14)	43 (29)	0
Aspirin	22		
Clopidogrel	21		
Antidiabetics	118 (39)	68 (45)	50 (33)
Metformin	49	29	20
Glipizide	43	20	23
Insulin	6	6	0
Sitagliptin	20	13	7
GI drugs	105 (35)	60 (40)	45 (30)
Pantoprazole	17	7	10
Ranitidine	88	53	35
Multivitamins	81 (27)	35 (23)	46 (31)
Hematinics	57 (19)	42 (28)	15 (10)
Iron and folic acid	24 (8)	12	12
Erythropoietin	33 (11)	30	3
Calcium supplements	51 (17)	3 (2)	48 (32)
Calcium carbonate and Vitamin D3	48	0	48
Calcitriol	3	3	0
Phosphate binders	12 (4)	0	12 (8)
Calcium acetate	6	0	6
Sevelamer	6	0	6
Sodium bicarbonate	130 (43)	105 (70)	25 (17)

GI=Gastrointestinal, ACE=Angiotensin-converting enzyme

followed by Stage 4 (25%), which was dissimilar to the results of Kantanvar *et al.*'s study (Stage 5: 87.8% and Stage 4: 7.4%) CKD patients).[11]

In this study, hypertension was the most common comorbidity (62%), which was similar to Ahlawat *et al.*'s study[13] and Bajait *et al.*'s study[14] where in both reported 55% patients presenting with hypertension. Anemia was found in 60 (20%) patients. The reason for lesser number of anemic patients could be as majority of patients were referred to hematology OPD and this prescription data was not captured.

It was good practice that 66% of patients were not indulging in self-medication. When the 100 patients who self-medicated were probed, only 48 patients could say the details of self-medicated drugs. This indicates that patients who were taking self-medication were unaware about the drug regimen, adverse effects, and potential drug interaction of these drugs with their current CKD treatment. It is advisable that pharmacists must proactively inquire if medicine are being bought by CKD patients and the patient must declare that they are CKD patients they should be counseled by clinical pharmacists to avoid drug consumption and if the drug is necessary then advise on interactions with prescribed medicines. The Kidney Research UK has given information on OTC medicines recommended for minor ailments, such as paracetamol is recommended for headache while aspirin is to be avoided.[15] Such initiatives and guidelines need to be implemented in our country too, to curb the self-medication practice.

Alarmingly 54% of CKD patients felt no need to inform the treating doctor before taking OTC drugs. Patients were taking these drugs for pain (headache and joint pain), fatigue, and weakness which were their common ailments which they considered as minor and would self-medicate and did not consider this fact vital to inform the treating doctor. Pain, fatigue, and weakness are symptoms common in CKD patients not only because of the disease but also due to the presence of comorbidities like hypertension, diabetes, and anemia. It is advisable that physicians must proactively investigate patients during their regular visits regarding their intake about this OTC drugs and common ailments. In addition, the patients should be regularly counseled by the physician about the hazards of self-medication in CKD.

It is evident that 7% of CKD patients took NSAIDS; however, none of these patients gave the complete drug information. Thus, drug unawareness coupled with self-medication with NSAIDs can be more hazardous in CKD patients. It is a known fact that NSAIDs should be avoided in renal conditions and prescribers must reinforce this fact. Similarly, only nine patients took herbal medicines, some herbal medicines may contain steroids and heavy metals which can worsen the kidney function.

The self-medication practice scores were lower in dialysis patients, which can be attributed to daily/alternate day contacts with the treating physician, vigilant review of drug records, and repeated counseling occurring in these patients in comparison to nondialysis patients who visited OPD on weekly/fortnightly basis. Similarly, educated CKD patients had less tendency to self-medicate as they were better aware of the disease and its complications and hazards of drug therapy. It is shown in previous studies that low health literacy is a significant problem, which affects 23%–28% of patients with CKD and low health literacy may contribute to inferior CKD knowledge and poor patient self-management. In addition, patients with higher income documented higher self-medication practice may be they were financially better to buy the drugs in contrast to low income patients who received drugs free of cost at the study site. Similarly, male CKD patients were more involved in self-medication rather than females the reason could be that in the current study, 55% of participants were males and may be financially better.

In our study, the average number of drugs prescribed per prescription was 5.84 ± 0.51. This does reflect vigilant prescribing practices and avoiding unnecessary polypharmacy. This was less than the average number of drugs prescribed (7.6 drugs) in the study conducted by Kantanavar *et al.* and in Bajait *et al.*, where the average number of drugs prescribed was 9.47.[11,14] The smaller number of drugs prescribed could be because as the site was tertiary care hospital having separate dedicated hematology and endocrinology OPDs and most of the CKD patients were referred to these OPDs and these prescriptions were not captured.

Among the 300 prescriptions analyzed, 84% of prescriptions were with brand names. This is similar to the studies conducted by Ahlawat *et al.* and Devi and George where in all the drugs were found to be prescribed by brand name.[13,16] The practice of prescribing drugs by generic name must be reinforced in the prescribers as a preliminary step toward rational prescribing. The good practice was that prescriptions were complete in terms of drug regimen but 30% prescriptions were incomplete in terms of written instructions. This could be explained as with the heavy load of patients (site being a government hospital) prescribers were verbally explaining the patients and their relatives but

not writing in the OPD paper. The remedial measure to this could be printing standardized instruction lists for CKD patients which can be attached to the prescription which could ensure documentary evidence also and patient could refer it multiple times rather than trusting the memory of the patient/caregivers.

The number of drugs prescribed as injection was found 11% out of the total number of medicines similar to Ahlawat *et al.*'s study.[13] The % could be less as few CKD patients with comorbid diabetes and anemia were on injection insulin or erythripoeitin therapy in the current study.

The five most common class of drugs prescribed in CKD patients in this study were calcium channel blockers (41%), antidiabetic drugs (39%), diuretics (35%), GI drugs (35%), and multivitamins (27%). The results are similar to the study conducted by Bajait *et al.*, in which the most commonly prescribed drug classes were vitamins and minerals (24.71%), cardiovascular drugs, (22.14%), and hematopoietic agents (20.15%). However, the number of GI drugs prescribed in our study is higher compared to the Bajait *et al.*'s study, wherein only 8% of GI drugs were prescribed.[14] The reason for this could be presence of coexisting risk factors for hyperacidity or to prevent drug-induced gastritis as CKD patients are on multidrug therapy.

The most commonly used antihypertensive in the current study was calcium channel blockers (31%), followed by diuretics (27%) and beta blockers (14.5%). The Ahlawat *et al.*'s study reported that diuretics (8.2%) was the most commonly used antihypertensive followed by calcium channel blockers (6.3%) and angiotensin II Receptor Blockers (ARBs) (2.8%).[13] The KDIGO 2012 suggested that coadministration of beta blockers and calcium channel blockers with angiotensin-converting-enzyme (ACE)-inhibitors or ARBs is acceptable and a combination of an ACE-I and calcium channel blocker (Amlodipine) is superior compared to ACE-I used with a diuretic.[17]

In diabetic CKD patients, the most commonly prescribed antidiabetic drugs were metformin (49%) and glipizide (43%). In the Abhisek PA *et al.*'s study, 45% of CKD patients were diabetic and all the diabetics received insulin.[18] The reason for higher prescription of oral antidiabetic drugs in the current study could be that CKD patients attending nephrology OPD were controlled stable diabetic patients on oral drugs, as uncontrolled diabetics were referred to endocrinology OPD for further treatrment modifications.

Phosphate binders and calcium are the commonly prescribed concomitant medications in CKD. In the current study, phosphate binders were prescribed in 4% of patients and calcium carbonate 16% in CKD patients. This was lower than the results of Bajait *et al.* and Chakraborty *et al.* studies where in both reported 11% prescriptions with phosphate binders.[6,14] Both the studies show that calcium carbonate was also frequently prescribed. In contrast to these studies, the Abhisek *et al.* study reported that among all the prescribed drugs, 6.04% were phosphate binders and calcium acetate was most frequently prescribed followed by sevelamer hydrochloride.[18] The reason for low prescription of sevalamer may be because it was costly and not available in the hospital formulary.

Hematopoietic agents were prescribed in 19% patients similar to Bajait *et al.* study, (20% hematopoetic drugs). Erythropoietin was prescribed in 11% CKD patients in contrast to Bajaj *et al.* study (3% patients)[14] while Chakrabarty *et al.* study (32% patients).[6] The underprescription of erythropoeitinin our study might be due to high cost and low economic status of patients. Iron was prescribed in 8% patients which was nearly similar to the Ahlawat *et al.*, study (13% patients on iron).[13] However, the reason for low prescription of iron could be that majority of anemic patients were referred to the hematology OPD and these prescription data were not captured. Sodium bicarbonate was prescribed in 43% of patients, which was higher than Abhisek *et al.*'s study (25% of patients).[18]

Nifedipine, metoprolol, carvedilol, atorvastatin, rosuvastatin, metformin, glipizide, calcium acetate, and sevelamer had PDD/DDD ratio <1 and torsemide had PDD/DDD ratio >1. The reason for underprescribing of these drugs can be attributed to dose adjustment of these drugs in elderly CKD and advanced renal failure patients with cautious prescribing to minimize adverse effects. Torsemide was overprescribed, but guidelines for CKD management suggest that higher doses of torsemide can be prescribed in patients with lower creatinine levels.

The limitation of the study was that prescriptions were captured only from nephrology OPD and not for concomitant diseases; not in longitudinal setting.

CONCLUSION

Nearly one-third of CKD patients were taking OTC medicines, namely, paracetamol, NSAIDs, and multivitamins without consulting their treating physician, more in the nondialysis group. The most common drugs prescribed

were antihypertensive-amlodipine followed by antidiabetic drug-metformin. Underprescribed drugs were statins, metoprolol, nifedipine, metformin, and glipizide indicating vigilant dose prescribing in CKD patients.

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Conflicts of interest

There are no conflicts of interest.

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