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Assessment of the Prescribing Pattern of Drugs in Chronic Kidney Disease Patients in a Tertiary Care Hospital

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Abstract

Objectives: To study the prescription pattern of drugs in chronic kidney disease (CKD) patients attending a tertiary care hospital.

Materials and methods: This prospective observational study was conducted at a tertiary care hospital in patients with chronic kidney disease. Patient demographic details, clinical profile, drug usage pattern was recorded using medication usage form and structured case report form and data were analysed using statistical software. Drug-drug interactions were checked using Lexicomp.

Results: A total of 60 patients recruited over a period of 3 months were included in the study and data was obtained. Mean age was 59 years. 63% were males and 37% were females. 52% were in stage 4 of chronic kidney disease [1]. Hypertension (64.9%) was most common comorbidity present followed by anaemia (61.4%), and diabetes (52.6%). A total number of 686 drugs were prescribed in 60 prescriptions. Median number of drugs prescribed per prescription was 11.43 Major classes of drugs prescribed were cardiovascular drugs (23.61%), haematopoietic agents (23.03%), gastrointestinal drugs (9.76%), multivitamins and Minerals (16.32%), anti-hypertensive drugs (11%), antibiotics (6.55%). Potential drug-drug interaction per prescription was 3.18. Out of total 686 drugs, 137 drugs were prescribed by generic name.

Conclusion: Due to multiple comorbidities associated with chronic kidney disease patients, large number of drugs were prescribed indicative of polypharmacy. Potential Drug-drug interactions were also significantly high in these patients. A large number of drugs were prescribed by generic name.

Keywords: Chronic kidney disease; Drug-drug interactions; Generic drugs; Injection drugs; Polypharmacy

Introduction

Chronic kidney disease is defined as persistent decrease in kidney function or decrease in glomerular filtration rate of < 60 ml/min/1.73m^2 present for a period of 3 or more than 3 months. Chronic kidney disease affects more than 10% of the population worldwide. Chronic kidney disease is globally associated with hypertension and diabetes. Glomerulonephritis, Polycystic kidney disease, infections are other causes of chronic kidney disease. (Chen et al.) Most of the causes of chronic kidney disease are irreversible. The aim of treatment is focused on decreasing the progression of CKD. (Kidney.org). Based on severity of kidney damage CKD is divided into five stages. Stage is characterized by eGFR of ≥90 ml/min/1.73 m^2. In stage 2; eGFR is 60-89. Stage 3 is characterized by eGFR of 30-59. In stage 4 eGFR is 15-29. In stage 5 eGFR is less than 15 and patient requires dialysis in this stage.

Complications of advanced kidney disease include electrolyte imbalance, altered sodium and water balance, mineral bone disorder, volume overload, acid-base abnormalities, anorexia, fatigue, nausea and rarely sexual dysfunction. (Bello et al.) Patients with CKD also have many cardiovascular complications due to calcium, phosphorus, and potassium abnormalities. Due to multiple complications associated with these patients, a large number of medicines exist prescribed which can sometimes lead to unfavourable effects or can lead to patient harm. Noncompliance with drug regimens may potentiate the risk of severe complications [2] Chronic kidney disease is becoming a problem worldwide. In India, it is estimated that one out of 10,000 suffer from CKD and tens of thousands are added more annually to this number requiring intensive drug therapy and dialysis.

The main objective of this study was to evaluate the prescribing pattern in patients with CKD and analyse the need to improve the rational drug prescribing in these patients thereby minimizing drug related problems and improving therapeutic outcomes.

Materials and Methods

This prospective observational study was conducted at Adesh Institute of Medical Sciences and Research, Adesh Hospital, Bathinda. Institutional Ethics Committee approval was obtained prior conducting this research. Data was collected from 60 CKD patients who were attending Department of General Medicine. Both males and females above age of 18 years were included in the study. Written Informed consent in English and local languages were obtained from participants before enrolling in the study.

Patients clinical profile, drug usage pattern was recorded in structured case report form. All medications prescribed to the patients

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during hospital stay were recorded. Drug-drug interactions were checked using Drugs.com Medication guide application Version 2.12.14. drug. Data was analysed using Statistical Package for Social Sciences (SPSS) version 21. Generic name of drugs was obtained using CIMS India version 3.0.0.

Results

Total of 60 patients agreed to participate in the study. Out of 60 participants, 38 (63 %) were male and 22 (37%) were female respondents. Mean age was 59 years. Minimum age was 29 and maximum 79 (Table 1). Hypertension (64.9%), Anaemia (61.4%), diabetes (42.3%) were most commonly present comorbidities. Most of the patients were in stage 4 (52%), and stage 3 (21%) and stage 5 (24.8%) of CKD. A total number of 686 drugs were prescribed in 60 prescriptions. Average number of drugs prescribed per encounter was 11.43. Number of drugs prescribed per encounter varied across prescriptions (Table 2).

In one encounter a highest number of 19 drugs were prescribed. Cardiovascular drugs (23.61%) were most commonly prescribed followed by Haematopoietic agents (23.03%), multivitamins and minerals (16.32%), gastrointestinal drugs (9.76), antibiotics (6.55), Antidiabetic drugs (3.64%), and miscellaneous drugs (17.05%) (Table 3). Sevelamer (61.3%) was most prescribed phosphate binder in dialysis patients followed by calcium carbonate (23.7%) in non-dialysis patients. A total number of 137 (19.97%) drugs were prescribed by generic name. Antibiotics (70%) were most prescribed generic name drugs. Out of total 686 drugs, 125 (18.22%) were injection drugs. Antibiotics were commonly prescribed injection drugs. Diuretics, antibiotics, multivitamins, Insulin, folic acid and iron were frequently prescribed [3-12].

Table 1: Total of 60 patients agreed to participate in the study.

Characteristic	Number of Patients (%)
Gender	
Male	38 (63)
Female	22 (27)
ComorbiditiesHypertension Anaemia	
Diabetes	37 (64.9) 35 (61.4) 30 (52.6)
Stages of CKD Stage Ⅲ Stage Ⅳ	
Stage Ⅴ	12 (21) 31 (52) 15 (24.8)
Number of drugs	
1-5	6 (10)
5-10	22 (36.7)
10-15	30 (50)
15-20	2 (3.3)

Table 2: Number ofdrugs prescribed per encounter varied across prescriptions.

Drug Class	Number of Drugs Prescribed (%)
Gastrointestinal drugs	67 (9.76)
PPIs	32 (4.66)
H2 Blockers	08 (1.16)
Other GI drugs	27 (3.94)
Cardiovascular drugs	162 (23.61)
Calcium channel blockers	35 (5.10)
Diuretics	90 (13.11)
ACE inhibitors	03 (0.43)
ARBs	09 (1.31)
Beta blockers	05 (0.72)
Others	20 (2.91)
Antidiabetic drugs	25 (3.64)
Insulin	15 (2.18)
Oral Hypoglycaemic drugs	05 (0.72)
Haematopoietic agents	158 (23.03)
Folic acidIron	69 (10.05)
Erythropoietin	65 (9.47) 24 (3.49)
Multivitamins and Minerals	112 (16.32)
Vitamin	23 (3.35)
D3Calcitriol O	45 (6.55)
thers	44 (6.41)
Antibiotics	45 (6.55)
Miscellaneous drugs	117 (17.05)

Table 3: The prevalence of pDDIs per prescription.

Characteristic of prescription	Number
Total number of prescriptions studied	60
Total number of drugs prescribed in 60 prescriptions	686
Average number of drugs prescribed per prescription	11.43
Number of injection drugs	125
Number of drugs prescribed by generic name	137

Number of prescriptions with drug-drug interactions was 55 (83.3%). Drug –drug interactions were classified as major, moderate and minor. A total number of 191 potential DDIs were found in 60 prescriptions. The prevalence of pDDIs per prescription was 3.18 (191/60). Incidence of moderate DDIs was highest with 109 (57.06%), being of moderate intensity. Incidence of Major DDIs was 31 (16.23%) and minor 51 (26.70%). Levofloxacin, aspirin, Clopidogrel, aluminium hydroxide, Amiodarone, and ondansetron were the drugs with most number of appearances in major drug-drug interactions [14-16]. A total number of 109 moderate drug-drug interactions were found. Antidiabetic drugs (metformin, insulin), aspirin, Cardiovascular drugs were most commonly associated with moderate interactions. 51 interactions were minor drug-drug interactions.

Discussion

A total number of 60 patient prescriptions were analysed in our study. Mean age and gender distribution were similar to few other studies [3]. (Bajait et al.) Mean age (57 years) of patients in our study vary slightly from other such studies. Hypertension was most commonly associated comorbidity followed by anaemia and diabetes. These findings were similar to the study conducted by Average number of drugs per prescription was 11.43 which i similar to that of other studies [5-7]. Large number of drugs was prescribed per prescription in our study which is evident as these patients were having multiple cardiovascular and other comorbidities. Polypharmacy is defined as prescription of more than 5 drugs in one patient at a time. Polypharmacy was evident in our study due to associated comorbidities. Apart from the prescribed drugs in Hospital setting, patients take over the counter medications which will further increase polypharmacy in these patients.

In our study, a good proportion of drugs were prescribed by generic name which is contradictory to other studies [4] Prescription of generic name drugs improves patient compliance, reduce confusion and cost [8]. Our study is encouraging for other medical professionals to prescribe generic drugs. Additionally prescribing generic name drugs improve rational use of medicines.

Out of total 686 drugs, 125 were prescribed by injection. Antibiotics were commonly prescribed injection drugs to reduce chances of infection as these patients undergo dialysis. Various National and International guidelines recommend use of antibiotics in patients undergoing dialysis which is encouraging in our study.

Among cardiovascular drugs, Diuretics were most commonly prescribed drugs which are similar to other findings from studies [5,6] Diuretics were prescribed to treat hypertension and oedema in CKD patients. Loop diuretics (Torsemide, Furosemide) are most

commonly prescribed than other diuretics. In our study Torsemide was most commonly prescribed diuretic. Other commonly prescribed cardiovascular drugs were CCBs followed by ARBs and ACE inhibitors.

Haematopoietic agents (23.03%) like folic acid, erythropoietin, iron and ferrous sulphate were most commonly prescribed drugs after cardiovascular drugs. Erythropoietin was used to correct anaemia in these patients along with Iron and Folic acid.

Out of 30 patients with diabetes, only 25 patients received antidiabetic drugs. Insulin was received by 15 patients and in 10 patients oral hypoglycaemic drugs were prescribed. Glycaemic control by anti-diabetic drugs is beneficial in these patients as these drugs can decrease progression to microalbuminuria. In end stage renal disease insulin is generally not prescribed as it can deteriorate renal function. Another important factor that leads to reduced insulin use in chronic kidney disease patients is insulin resistance [13]. Insulin resistance is thought to be caused by the multiple metabolic abnormalities seen in CKD, such as vitamin D deficiency, obesity, metabolic acidosis, inflammation, and accumulation of uremic toxins [9] Among Gastrointestinal drugs, PPIs were most commonly prescribed drugs followed by H2 blockers and sodium bicarbonate. Vitamin D3 and calcitriol were commonly prescribed drugs in multivitamins. These findings showed similar patterns like other studies conducted [10]. The use of calcitriol in CKD patients is mentioned in National Kidney Foundation (NKF) KDOQI Guidelines Sevelamer was most commonly prescribed Phosphate binder in these patients followed by Calcium carbonate. Sevelamer is the first phosphate binder free of calcium and potassium which makes it safer to use in CKD patients though the cost may be high as compared to other PBs. Hyperphosphatemia can increase chances of cardiovascular risk and infection in CKD patients. One of the key characteristics of CVD is vascular calcification, which is brought on by hyperphosphatemia as well as oxidative stress that may be sped up by free iron [11]. Potassium and calcium containing phosphate binders may increase chances of CV risk in these patients. Hence sevelamer may be a better option as PB as compared to other conventional PBs.

Prevalence of drug-drug interactions was high in this study. Out of total 60 prescriptions, 55 (83.3%) prescriptions show potential drug-drug interactions. DDIs were classified as major, moderate and minor interactions. The prevalence of major DDIs was 31 among a total of 686 drugs. Moderate DDIs were 109 and 51 interactions were of minor category. Polypharmacy can be a main reason for high number of DDIs found in these prescriptions [14].

Conclusion

Our study concluded that various drug classes were prescribed in these patients. One limitation of the study is that the drug prescribing pattern might not remain same in future follow up of these patients. Another limitation may be the small sample size which may not be sufficient to study exact prescribing patterns in these patients. Use of generic name drugs, antibiotics, Sevelamer as a phosphate binder was encouraging points in our study [15]. Such studies may provide a framework for further improving rational prescribing patterns in these patients. Prescribing appropriate drugs may help reduce chances of polypharmacy and DDIs.

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