Original Research Article

Analysis of prescription pattern in patients on maintenance hemodialysis

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ARTICLE INFO

ABSTRACT

Background: Chronic kidney disease (CKD) is a world-wide public health problem associated with various complications. CKD patients undergoing hemodialysis have associated comorbidities and prescribing drugs rationally in these patients is a difficult task.

Objective: To evaluate the prescribing patterns of medicines in CKD patients on maintenance hemodialysis.

Methodology: A Cross-sectional, hospital-based observational study was conducted in King Khalid General Hospital, Al Majmaah for a period of one year. The records of patients in the given period were examined and data pertaining to prescriptions was analyzed.

Results: A total of 41 prescriptions of patients were analyzed. The most common associated co-morbidity was hypertension in 82.9% of the patients, followed by anemia in 73.1% of patients and secondary hyperparathyroidism in 63.4% of the patients. 85.4% of the patients had more than one comorbidity. The total number of drugs prescribed was 504 and the average number of prescriptions per patient was 12.3. The percentage of drugs prescribed using generic name was 71.4 and 65.3% drugs prescribed were from the WHO essential drugs list. Total number of Fixed dose combinations used was only 1.2%.

Conclusion: The study has generated a profile of drugs prescribed in CKD patients on maintenance hemodialysis in a secondary care hospital in Saudi Arabia. High number of medications were used per prescription in this study thus increasing the possibility of drug interactions and Adverse events. Further studies with special consideration for drug-drug interactions, adverse events and adherence need to be conducted.

1. Introduction

Worldwide there has been an upward trend in the incidence and prevalence of Chronic Kidney Disease (CKD) leading to increased cost of treatment with poor outcomes.[1] Keeping with the worldwide trend, there has been upsurge in the prevalence and incidence of CKD in Saudi Arabia during the last three decades.[2] CKD is commonly present among hospitalized patients, nearly 40% of patients admitted to a large academic hospital were observed to have some level of CKD.[3,4]

CKD patients undergoing maintenance hemodialysis have associated comorbidities like hypertension, diabetes mellitus, anemia, acid base balance and electrolyte disturbances etc.[5]The main Goals in CKD patients on maintenance hemodialysis are treatment of the complications and prevention of morbidity and mortality.[6] The patients of CKD have one of the highest daily pill burden.[7] Inappropriate use of medications can increase adverse drug effects and cause excessive length of hospital stays, health care utilization, and costs.

The study of prescribing patterns is a component of medical audit that monitors and evaluates prescribing practices and recommends necessary modifications to achieve rational drug use.[8] In Saudi Arabia, studies on

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overall medication profile in CKD patients are limited. The systematic bibliographic search for prescription analysis of CKD patients in Saudi Arabia using various search engines yielded no results. Hence, this study was planned to analyze current prescribing trends in the management of CKD patients on maintenance hemodialysis.

2. Methodology

This observational, Cross-sectional, hospital-based study was conducted in King Khalid General Hospital, Al Majmaah from October 2016 to October 2017. The study was approved by the ethical committee of the Majmaah University. All Chronic kidney disease patients diagnosed by the nephrologist and undergoing maintenance hemodialysis were included in the study. The data was collected from the patient's case record forms available in the hospital. From the collected data the parameters like average number of drugs per prescription, number of drugs prescribed from the essential drug list, number of drugs prescribed by generic name were calculated. The prescribed drugs were classified into different groups based on Anatomic Therapeutic Chemical (ATC) classification.[9] The ATC classification system groups the drugs according to organ system they act upon and takes into consideration the chemical characteristics of the drugs.[10] Descriptive analysis was done for data on utilization of different classes of drugs as well as individual drugs.

3. Results

A total of 41 prescriptions of patients suffering from CKD and undergoing maintenance hemodialysis were included in the study of these 23 were male patients and 18 females. The details of comorbidities of these patients are shown in Table 1. The most common associated co-morbidity was hypertension in 82.93% of the patients, followed by anemia in 73.17% of patients and secondary hyperparathyroidism in 63.41% of the patients. 85.37% of the patients had more than one comorbidity as shown in Table 2. As shown in Table 3. The total number of drugs prescribed was 504 and the average number of prescriptions per patient was 12.29. The percentage of drugs prescribed using generic name was 71.43 and 65.27% drugs were from the WHO essential drugs list. Total number of Fixed dose combinations used was only 1.19%. Table 4 shows the Anatomic Therapeutic Chemical classification of drugs prescribed. Maximum number of drugs were prescribed from Group A, B and C i.e, 28.77%, 27.78, 22.22% respectively. The drug utilization pattern in maintenance hemodialysis patients is shown in Table 5 along with their ATC code and Group.

4. Discussion

The gender distribution in our study showed male preponderance which was like the studies reported

Table 1: Demographic characteristics of patients of CKD on maintenance hemodialysis

Characteristics	n	%
Gender		
Male	23	56.10
Female	18	43.90
Comorbidities		
Hypertension	34	82.93
Anemia	30	73.17
Secondary Hyperparathyroidism	26	63.41
Diabetes mellitus	13	31.71
Hypothyroidism	9	21.95
CNS disorders	6	14.63
Polycystic Kidney Disease	6	14.63
Asthma	5	12.20
Ischemic Heart Disease	4	9.76
Systemic lupus erythematosus	2	4.88
Rheumatoid Arthritis	1	2.44

Table 2: Number of Co-morbidities in patients of CKD on maintenance hemodialysis

Comorbidities	Number of Patients	%
One	6	14.63
Two	11	26.83
Three	12	29.27
Four	9	21.95
Five	3	7.32

Table 3: Analysis of Prescriptions in Chronic kidney disease patients

Details of prescription	Number
Total Number of drugs prescribed	504
Average number of drugs per prescription	12.29
Number of drugs prescribed by generic name	360 (71.43%)
Number of drugs from WHO essential drug list	329 (65.27%)
Number of FDCs used	6 (1.19%)
Number of prescriptions analyzed	41

earlier.[11–13] In this study we only included the end stage renal disease patients who were undergoing maintenance hemodialysis. In the present study the most associated co-morbidity in the patients was hypertension followed anemia. This was in accordance with the studies by Abhisek et al. and Al-Ramahi et al.[14,15] In our study secondary hyperparathyroidism was found to be third most common associated co-morbidity. The average number of drugs per prescription in our study was 12.29. Polypharmacy can be defined as prescribing of five or more drugs to one patient at single time.[16] The average number of drugs per prescription in CKD patients vary from 8 to 12.8 in various studies.[12,14,17,18] This practice of polypharmacy is a common finding in patients of chronic kidney disease

Table 4: Anatomic Therapeutic Chemical classification of drugs prescribed

Group	Drug Class	n	%
A	Alimentary tract and metabolism	145	28.77
B	Blood and blood forming organs	140	27.78
C	Cardiovascular system	112	22.22
H	Systemic hormonal preparations excluding sex hormones and insulins	15	2.98
J	Anti-infectives for systemic use	9	1.79
N	Nervous system	16	3.17
P	Antiparasitic products, insecticides and repellants	1	0.20
R	Respiratory system	16	3.17
V	Various	50	9.92

due to associated co-morbidities. In our study 71.4% of the drugs were prescribed by generic name, this is in contrast to the previous studies where the percentage varied from 0 to 40.96%.[12–15,19] This practice of writing the prescriptions in generic names is commendable and needs to be encouraged. The percentage of prescribed from WHO essential drugs list was 65.27 which was low in comparison to other studies where the percentage ranged between 72.6 to 84.[13,14,19]

Out of the total prescribed drugs (504) most prescribed were gastrointestinal system drugs, followed by blood and blood forming organs and cardiovascular system drugs. Among alimentary tract and metabolism drugs most prescribed were proton pump inhibitors followed by H_2 blockers.

Among the drugs for cardiovascular system calcium channel blockers were most prescribed followed by beta blockers, this is in accordance with studies by Devi DP and George J, and Bailie GR et al.[17,19] This contrasts with the studies by Bajait CS et al, Ahlawat R et al and Chakrabarty S et al. which reported that diuretics were most prescribed followed by calcium channel blockers.[12,13,20]

Erythropoietin stimulating agents (ESA), erythropoietin and darbepoetin were prescribed in 92.7% of the patients along with iron and folic acid. The use of ESA was high in contrast to other studies where it ranged from 32 to 60%.[12,20] The underutilization of ESA in these studies was probably due to high cost and low economic status.[12,20] Iron is essential for formation of red blood cells which is deficient in patients undergoing hemodialysis due to loss of small amounts of residual blood discarded in dialyzer and tubing after each dialysis session.[21] Erythropoietin is a hormone synthesized by the interstitial cells of peritubular

Table 5: Drug utilization pattern in maintenance hemodialysis patients

Drug class	ATC Code	Number of Patients n (%)
Alimentary tract and metabolism drugs		
PPIs	A02BC	27 (65.85)
H_2 blockers	A02BA	6(14.63)
Miscellaneous		7(17.07)
Antidiabetic drugs		
Insulin	A10A	5(12.2)
Oral hypoglycemic	A10B	1(2.44)
Cardiovascular drugs		
Calcium channel blockers	C08CA	32(78.05)
Diuretics	C03CA	16(39.02)
ACE Inhibitors	C09AA	3(7.32)
Beta Blockers	C07AB	25(60.98)
Lipid modifying agents	C10A	18(43.9)
Centrally acting antiadrenergic drugs	C02A	8(19.51)
Miscellaneous		10(24.39)
Blood and blood forming organ drugs		
Iron	B03A	38(92.68)
Erythropoietin	B03XA01	20(48.78)
Darbepoetin	B03XA02	18(43.9)
Antithrombotic Agents	B01A	20(48.78)
Folic Acid	B03BB01	37(90.24)
Miscellaneous		7(17.07)
Respiratory drugs		
Drugs for obstructive airway diseases	R03	10(24.39)
Antihistamines for systemic use	R06A	6(14.63)
Phosphate binders		
Calcium carbonate	A12AA04	36(87.80)
Calcium RES	V03AE01	27(65.85)
Sevelamer	V03AE02	23(56.1)
Vitamins and minerals		
Calcitriol	A11CC04	26(63.41)
MV and minerals	A11AA	36(87.8)
Nervous system		
Anti-epileptics	N03A	7(17.07)
Antidepressants	N06A	6(14.63)
Miscellaneous		3 (7.32)
Antimicrobials	J01	9(21.95)
Systemic hormonal preparations excluding sex hormones and insulins		
Glucocorticoids	H02AB	1(2.44)
Thyroid hormones	H03AA	11(26.83)
Anti-Parathyroid Agents	H05B	3(7.32)
Miscellaneous drugs		2(4.88)

capillary bed of the renal cortex and stimulates bone marrow to synthesize red blood cells.[22] In chronic kidney disease patient's erythropoietin is deficiently produced leading to anemia hence it should be administered in patients undergoing hemodialysis along with iron supplements.[23] Among phosphate binder's calcium carbonate was most prescribed followed by calcium resonium and sevelamer. The studies by Bajait et al. and Chakraborty S et al. have reported lower use of phosphate binders, although calcium carbonate was also the most frequently prescribed.[12,20]

Hyperphosphatemia is one of the commonest metabolic complications of CKD and an independent risk factor for cardiovascular disease and mortality in dialysis patients, hence use of phosphate binders in dialysis patients is essential.[24]

65.8% of the patients were prescribed a proton pump inhibitor and 14.6% were prescribed H_2 blocker to decrease the gastric acid secretion and prevent peptic ulcer disease which is more common in Chronic kidney disease patients. The use of these agents was more in comparison to other studies.[25,26]

Among 13 diabetic patients only 6 (46.1%) received antidiabetic medication. Insulin was prescribed to 5 patients and repaglinide to 1 patient. The low use of antidiabetic medications is due to decreased requirement in CKD patients in accordance with the previous studies.[27,28]

5. Limitations of the Study

The sample size of this unicentric hospital-based study is low also we have not taken into consideration the drug-drug interactions and adverse effects of these drugs.

6. Conclusion

The present study has generated a profile of drugs prescribed in CKD patients on maintenance hemodialysis in a secondary care hospital in Saudi Arabia. This study will serve as basis for comparison with other studies in future. The drug utilization studies in hemodialysis patients in Saudi Arabia are limited. The number of prescriptions from essential drug list in our study was good and a fair number of prescriptions were written in generic name. High number of medications were used per prescription in this study, increasing the possibility of drug interactions and Adverse events. Further studies with special consideration for drug-drug interactions, adverse events and adherence need to be conducted. The analysis of prescription pattern is essential to improve the utilization pattern of drugs and should be carried out frequently.

7. Source of Funding

8. Conflict of Interest

None.

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