A Study on Evaluating the pattern of medicine use by patients undergoing dialysis in a tertiary care hospital of Eastern India

Kanailal Karmakar[1], Swapan Kumar Mandal[2], Apurba Mandal[3], Arunava Biswas[4], Abhik Saha[5], Anjan Adhikari[6]

[1]Associate Professor, Department of Nephrology, [2]Assistant Professor, Department of Pharmacology, R. G. Kar Medical College and Hospital, Kolkata, [3]Associate Professor, Department of Obstetrics and Gynaecology, [4]Associate Professor, [6]Professor and Head, Department of Pharmacology, Maharaja Jitendra Narayan Medical College and Hospital, Coochbehar, [5]Junior Pharmacovigilance Associate, Indian Pharmacopoeia Commission, National Pharmacovigilance Centre, Department of Pharmacology, R. G. Kar Medical College and Hospital, Kolkata, West Bengal, India

ABSTRACT

Background: Patients of end stage renal diseases on hemodialysis often suffer from multiple comorbidities leading to poly pharmacy which might lead to potential drug-drug interaction. **Aims and Objectives:** The aim of this study was to assess the pattern of medicines prescribed to patients undergoing dialysis in a tertiary care hospital. **Materials and Methods:** A cross-sectional observational study was conducted on patients admitted in dialysis unit to assess the pattern of drug use among them in a tertiary care hospital in eastern India from June to December 2019. With prior approval from the Institutional Ethics Committee the demographic details, biochemical and hematological parameters and details of medicine use were captured in a pre-designed, pre-validated form. The data were interpreted in mean, percentage, and diagrams using Microsoft Excel 2010. **Results:** Among the recruited patients (n = 160), majority of them were homemakers (30.62%) and unemployed (30%), out of which 42.75% were male and 51.25% were female suffering from chronic kidney diseases (70.62%) and acute kidney injury (29.37%). The mean age of the study population was 46.7 ± 16.35 years. The mean pre-dialyzed systolic and diastolic pressure (mm Hg) and pulse rate recorded was 140.56 ± 21.94, 83.04 ± 13.29, and 81.97 ± 5.51, respectively. Before hemodialysis, the mean hemoglobin level was 11.135 ± 1.219 gm/dl, urea 139.81 ± 69.29 mg/dl, creatinine 6.48 ± 3.77mg/dl, sodium 136.63 ± 4.07mEq/L, and potassium 4.47 ± 1.00 mEq/L. Major comorbidities found associated with these patients were hypertension (68.75%), diabetes mellitus (52.5%), and hypothyroidism (11.87%). The commonly prescribed drugs were anti-hypertensive (73.8%), proton pump inhibitors mainly pantoprazole (68.1%), diuretic (86.2%), calcium supplements (74.3%), insulin (53.1%), and erythropoietin (49.3%). Average number of drugs administered per patient was 5.3 ± 1.78. **Conclusion:** Patients in the dialysis unit are exposed to multiple drugs at a time due to their association with multiple comorbidities. Physician need to deal such patients very cautiously to avoid drug-drug interactions and adverse drug effects.

Key words: Dialysis unit; Prescription pattern; Tertiary care hospital

INTRODUCTION

Hemodialysis for improper kidney functioning due to chronic kidney disease (CKD) and or acute kidney injury (AKI) is often a lifesaving procedure. The incidence of End Stage Renal Disease (ESRD) is 100 patients per million population per year, which means more than 100,000 new patients every year for a population of 1 billion in India.[1] Thus, ESRD is swiftly impacting the global health care burden to a great extent.[2] According

Address for Correspondence:
Dr. Arunava Biswas, Associate Professor, Department of Pharmacology, Maharaja Jitendra Narayan Medical College and Hospital, Coochbehar - 736 101, West Bengal, India. **Mobile:** 9674328329. **E-mail:** drabiswas@gmail.com

to the World Health Organization, CKD contributes to nearly 850,000 deaths worldwide annually.[3] With an increase in the number of comorbidities such as diabetes and hypertension specially in the age group of middle or elderly subjects, hemodialysis has been a main therapy in those who develop ESRDs.[4] Chronic hemodialysis patients have several complications requiring pharmacological management, and ESRD may elevate the risk of unfavorable drug effects. The presence of these comorbidities has a two-fold impact on the patients – firstly, it increases the cost of treatment and second, it poses a challenge for the treatment of CKD patients.[5] The prescription of multiple medications as well as poor compliance with various drug regimens and different drug interactions may contribute to drug-related problems. To avoid unwanted drug effects and to ensure optimal patient outcomes suitable, drug selection for patients with CKD is essential. Rational drug prescription is difficult in CKD patients due to a higher risk of drug-related problems because they need complex therapeutic regimens requiring frequent monitoring and dosage adjustments.[6]

Drug prescription in CKD changes with time, physician's perspective, disease conditions, and population, which makes it important to study the drug utilization continuously over a period of time.[7] Studying the prescription pattern or type of drug utilization might help in understanding the possibility of any potential drug-drug interaction or adverse drug reaction, especially in patients having multiple comorbidities and under poly pharmacy. The early detection of any such possibilities in dialyzed patient might minimize the untoward incidences. Second, data obtained from such studies can be used for rational drug approach in future and finally that will help in quality control on drug use.[8] Although some prescribed medications in hemodialysis patients may be related to their morbidity and mortality, this relationship has not yet been examined.[9] In India, given its population of more than 1billion, and the rising incidence of CKD is likely to pose major problems for both healthcare and the economy in future years.[10] The overall medication profile in patients admitted to hospital for dialysis purpose should vary greatly depending on the individual morbidity profile, control over disease progression, and drug selection in the developing country like us. Hence, this study was planned to assess the pattern of medicine use among patients undergoing maintenance dialysis in a tertiary care hospital.

Aims and objectives
The aim of this study was to assess the pattern of medicines prescribed to patients undergoing dialysis in a tertiary care hospital.

MATERIALS AND METHODS

After obtaining the Institutional Ethics Committee approval, a cross-sectional observational study was conducted at the Dialysis unit of R. G. Kar Medical College and Hospital, Kolkata, India in collaboration with the Department of Pharmacology during June to December 2019. Patients admitted for dialysis due to any indications, any age of either sex, and voluntary given written informed consent were recruited in the study. Critically ill patients and unwilling to participate in the study were excluded from the study. The patient related data such as demographic profile including age, sex, occupation along with their provisional diagnosis, and comorbidities. The previous medicine intake history was documented in a pre-designed, pre-validated data collection form with the help of bed head tickets, and conversation with the patients and/or their relatives available, along with the patient. Other pre-dialyzed clinical parameters such as blood pressure and pulse rate and laboratory parameters such as urea, creatinine, sodium, potassium, and hemoglobin were also documented during the study period from the bed head tickets of the respective patients. Pattern of prescription drugs during dialysis along with the previously prescribed medications for each patients was also noted. The investigators of this study neither interfered with the treatment regimen of the study patients nor tried to modify them during the study. Since all the data were collected during time of study visit to the dialysis ward no subsequent changes (if any) in the treatment regimen which was captured in this study, as the patients were not prospectively followed up. At the end of all the relevant data collection, the demographic data, laboratory, and clinical parameters were statistically analyzed by standard statistical software Microsoft Excel 2010 and expressed as mean and standard deviation and pie charts.

RESULTS

Following inclusion/exclusion criteria, a total (n=160) patients were analyzed during this study with a mean age of 46.7±16.35 years of whom 78 (42.75%) were male and 82 (51.25%) female. The most common age group of dialyzed patients observed in this study was 41 to 60 years (Figure 1).

Most of the patients were found to be suffering from CKDs 113 (70.62%) followed by AKI 47 (29.37%), as shown in Figure 2, due to various comorbidities such as hypertension (69.3%), diabetes mellitus (52.7%), and hypothyroidism (12.1%) (Table 1).

Majority of the study participants were either homemaker 49 (30.62%) or unemployed 48(30.0%), as described in the Figure 3.
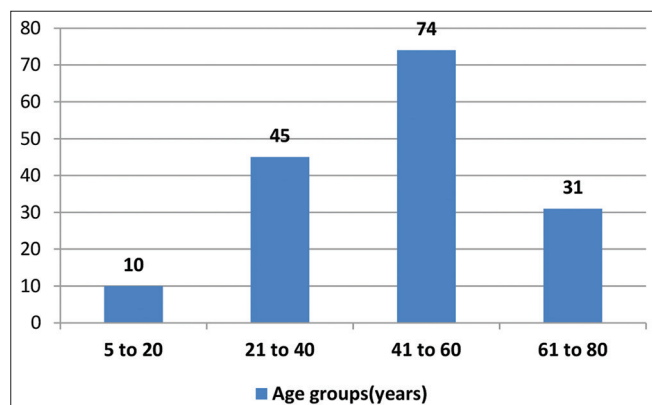
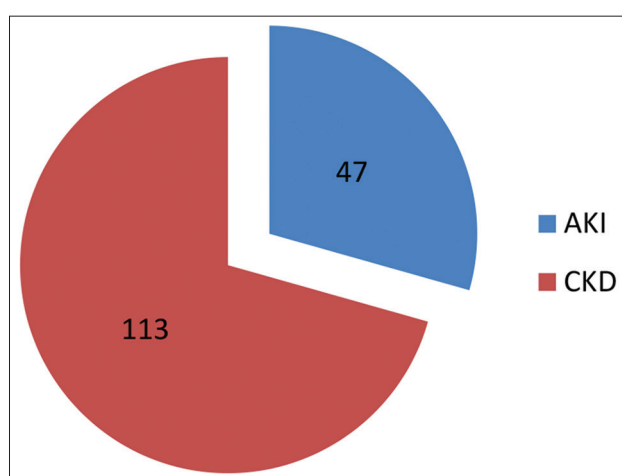**Figure 1:** Distribution of age groups of the study participants (n=160)

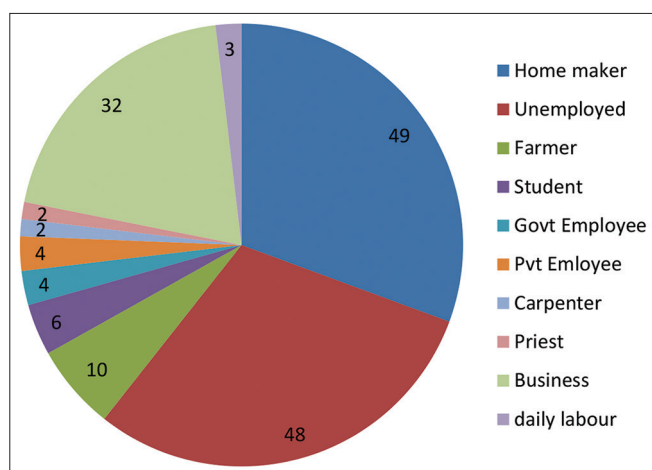**Figure 2:** Pattern of renal disease of the study participants (n=160)

Figure 3: Distribution of occupation of the study participants (n=160)

The baseline clinical and laboratory parameters as observed in the study patients are mentioned in Table 2.

Commonly prescribed drugs were anti-hypertensive (73.8%) mainly calcium channel blockers (Cilnidipine, amlodipine, and benedipine), followed by beta blockers (52.6%) mainly (bisoprolol, carvedilol), proton pump

Table 1: Comorbidities associated with dialyzed patients (n=160)

Comorbidities	Number of patients (%)
Hypertension	110 (68.75%)
Diabetes mellitus	84 (52.5%)
Hypothyroidism	19 (11.87%)
Neuropathy	14 (8.75%)
COPD	7 (4.37%)
Ischemic heart disease	4 (2.5%)

COPD: Chronic obstructive pulmonary disease

Table 2: Baseline clinical and biochemical parameters expressed in mean±SD

Parameters	Mean±SD
Systolic blood pressure (mm Hg)	140.56±21.94
Diastolic blood pressure (mm Hg)	83.04±13.29
Pulse rate (per minute)	81.97±5.51
Hemoglobin (g/dl)	11.135±1.21
Blood urea (mg/dl)	139.81±69.29
Serum creatinine (mg/dl)	6.48±3.77
Serum sodium (mEq/L)	136.63±4.07
Serum potassium (mEq/L)	4.47±1.00

Table 3: Total numbers of prescribed drugs for each patient per day

Number of drugs/day	Number of patients (n=160) n (%)
3	3 (1.87)
4	18 (11.25)
5	116 (72.5)
6	8 (5.0)
7	8 (5.0)
8	7 (4.37)

inhibitors, that is, pantoprazole (68.1%), diuretic (86.2%) mainly oral frusemide, intravenous frusemide, and metolazone), calcium supplements (74.3%), insulin (53.1%) and erythropoietin (49.3%) (Figure 4).

Average number of drugs including oral and injectable, administered per patient per day was 5.5±1.78 (Table 3).

DISCUSSION

Out of (n=160) patients those recruited in the study, there was female preponderance (51.25%) against male (42.75%) unlike an earlier study conducted by Chakraborty et al.[6] The average age of the patients was below 50 years in contrast to the other study conducted by Bajait et al.,[11] with majority belonging to 41–60 years age group. Hypertension (68.75%) and diabetes mellitus (52.5%) observed as the most common comorbidities associated with CKD in this study. The targeted blood pressure below 140/90 mm Hg for CKD patients was found to be fairly maintained in this study with an average systolic of 140.56±21.94 mm Hg and diastolic 83.04±13.29 mm Hg, respectively. The
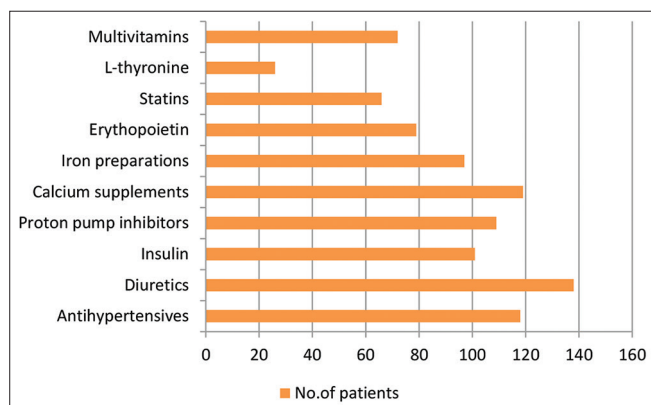
Figure 4: Distribution of prescribed medicines among the study participants

mean blood urea (139.81±69.29) mg/dl and creatinine (6.48±3.77) mg/dl level of the pre-dialyzed patients were much high as expected most probably due to compromised state of renal functioning. None of the patients had any electrolyte imbalance before dialysis. The average number of medicine prescribed was 5.5±1.78 per patient which is just at per with the definition of poly pharmacy since 5 or more drug use per patient at a given point of time is considered as poly pharmacy.[12] However, it is possible that with the complexity of the disease leading to dialysis the number of drugs administered probably difficult to restrict within the definition of poly pharmacy due to increased comorbidities with fluctuation in the stability of the health of the CKD patients.

The present study revealed that diuretics were the most commonly prescribed medicines (86.2%) followed by anti-hypertensive (73.8%). However, in some other studies of Bailie et al., and Negri et al., antihypertensive was found to be commonest one prescribed by the physician.[13,14] Among the diuretics furosemide was prescribed in maximum number of patients (58.19%) followed by hydrochlorothiazide (40.92%) and metolazone (11.18%). Amlodipine (calcium channel blockers) was found prescribed to (48.8%) patients followed by metoprolol (beta-blockers) 42.12% and alpha blocker in 12.8 patients. In a study conducted by Tamiselvan T et al., metoprolol was the most commonly prescribed drugs.[15] Many patients (64.4%) received the combination of above diuretics and antihypertensive for stabilizing their vital parameters which are quite justified. Due to over activity of renin angiotensin aldosterone system and increased levels of sympathetic activity in hemodialysis patients,[12] calcium channel blockers and beta-blockers are the preferred drugs for these patients which matched with our study findings.

Unlike a study conducted by Piparva et al.,[16] where less than 50% of the patients received insulin, the present

study revealed 53.1%, that is, more than half of the study population received the same.

During the present study, neither any serious drug-drug interactions nor any adverse event documented during the entire study period. From this study, appearance of any drug related complications was also not evident. Such findings may be obvious as due to the cross-sectional nature of the study which has its own limitation. It is understandable that for overall management of CKD, patients need to undergo frequent clinical and laboratorial assessment as well. Prevention of progression and treatment of the ongoing disease process is the main aim of pharmacotherapy of CKD. Treatment of CKD not only is targeted towards the disease *per se* but also involves management of comorbid diseases associated with CKD.

Limitations of the study
Limitations of this study include insufficient study duration, cross sectional nature of the study and conduct of study in a single center.

CONCLUSION

The present study demonstrates the scenario of CKD patients attending a dialysis unit in a tertiary care hospital, prescribing trends of the doctors in managing these patients with comorbidities and disease related complications. The study provides the baseline data and would assist in building more data for carrying out further prescribing pattern studies. An overall understanding of various drugs used for the management of CKD and other comorbid diseases associated with it, which will help the physicians in better management of patients as far as adverse effects of drug or toxicities related to them are concerned. Such knowledge and understanding will help in improving the patient compliance to therapy and overall better consequence of CKD pharmacotherapy.

ACKNOWLEDGMENT

REFERENCES

1. Veerappan I, Arvind M and Ilayabharthi V. Predictors of quality of life of hemodialysis patients in India. Indian J Nephrol. 2012;22(1):18-25.
   https://doi.org/10.4103/0971-4065.91185

2. Thurlow JS, Joshi M, Yan G, Norris KC, Agodoa LY, Yuan CM, et al. Global epidemiology of end-stage kidney disease and disparities in kidney replacement therapy. Am J Nephrol. 2021;52(2):98-107.
   https://doi.org/10.1159/000514550

3. World Health Organization. Burden of Disease Project. Geneva: World Health Organization; 2021. Available from: http://www3.who.int/whosis/menu.cfm [Last accessed on 2021 Jun 22].

4. Abhisek PA, Panda R, Samal R, Mohapatra N and Mohanty S. Drug utilisation pattern and adverse events in patients with chronic kidney disease undergoing maintenance haemodialysis at a tertiary care hospital of Odisha. J Clin Diagn Res. 2017;11(10):FC11-FC16.
https://doi.org/10.7860/JCDR/2017/25444.10793

5. Ahlawat R, Cruz SD and Tiwari P. Drug utilization pattern in chronic kidney disease patients at a tertiary care public teaching hospital: Evidence from a cross-sectional study. J Pharm Care Health Syst. 2015;3:149-153.

6. Chakraborty S, Ghosh S, Banerjea A, De RR, Hazra A and Mandal SK. Prescribing patterns of medicines in chronic kidney disease patients on maintenance hemodialysis. Indian J Pharmacol. 2016;48(5):586-590.
https://doi.org/10.4103/0253-7613.190760

7. Laporte JR and Orme ML. Drug utilization and the teaching of rational drug use. WHO Reg Publ Eur. 1993;45(1):183-191.

8. World Health Organization. Drug Use Evaluation. Geneva: World Health Organization; 2021. Available from: http://www.who.int/medicines/technicalbriefing/tbs/PG_Drug-Use-Evaluation_final-08.pdf [Last accessed on 2021 Jun 23].

9. Tozawa M, Iseki K, Iseki C, Oshiro S, Higashiuesato Y, Yamazato M, et al. Analysis of drug prescription in chronic haemodialysis patients. Nephrol Dial Transplant. 2002;17(10):1819-1824.

10. Singh AK, Farag YM, Mittal BV, Subramanian KK, Reddy SR, Acharya VN, et al. Epidemiology and risk factors of chronic kidney disease in India-results from the SEEK (screening and early evaluation of kidney disease) study. BMC Nephrol. 2013;14(1):114.
https://doi.org/10.1186/1471-2369-14-114

11. Bajait CS, Pimpalkhute SA, Sontakke SD, Jaiswal KM and Dawri AV. Prescribing pattern of medicines in chronic kidney disease with emphasis on phosphate binders. Indian J Pharmacol. 2014;46(1):35-37.
https://doi.org/10.4103/0253-7613.125163

12. Devi DP and George J. Diabetic nephropathy: Prescription trends in tertiary care. Indian J Pharm Sci. 2008;70(3):374-378.
https://doi.org/10.4103/0250-474X.43007

13. Bailie GR, Eisele G, Liu L, Roys E, Kiser M, Finkelstein F, et al. Patterns of medication use in the RRI-CKD study: Focus on medications with cardiovascular effects. Nephrol Dial Transplant. 2005;20(6):1110-1115.
https://doi.org/10.1093/ndt/gfh771

14. Negri AL and Torres PA. Iron-based phosphate binders: Do they offer advantages over currently available phosphate binders? Clin Kidney J. 2015;8(2):161-167.
https://doi.org/10.1093/ckj/sfu139

15. Tamiselvan T and Veerapandiyan AK. Study of drug utilisation pattern of chronic renal failure patients in a tertiary care hospital. Int J Pharm Pharm Sci. 2014;6(9):482-484. http://dx.doi.org/10.18203/2319-2003.ijbcp20190131

16. Piparva KG, Parmar DM, Singh AP, Gajera MV and Trivedi HR. Drug utilization study of psychotropic drugs in outdoor patients in a teaching hospital. Indian J Psychol Med. 2011;33(1):54-58.
https://dx.doi.org/10.4103/0253-7176.85396