AN PROSPECTIVE OBSERVATION STUDY ON DRUG UTILIZATION IN RENAL IMPAIRED PATIENTS AT TERTIARY CARE TEACHING HOSPITAL

[1]Dr. V. Mouna Reddy,[2]Mr. J. Karunakar,[3]Dr. M. Radhakishan

[1,2]Assistant Professor,[3]Principal
[1]Department of pharmacy practice
[2]Department of Pharmacology
[3]Department of Pharmaceutics
Vaagdevi Institute of Pharmaceutical Sciences, Bollikunta, Warangal. Telangana.

ABSTRACT

First of all, A gradual decrease in glomerular filtration rate is a hallmark of renal impairment, a major global public health concern linked to elevated rates of morbidity and death. Most of the time, comorbid conditions like diabetes and hypertension that need several pharmacological therapies during the course of treatment—a condition known as polypharmacy—are linked to renal impairment.

This research set out to evaluate the medication prescription practices of Dhiraj General Hospital's renally impaired patients. Supplies and Procedures: After closely adhering to the selection criteria, 150 patients with renal impairment were ultimately included in this cross-sectional, observational trial, which lasted six months at a tertiary care teaching hospital run by the directorate general of hydrocarbons. By speaking with the patients and consulting prescriptions, case files, and investigative reports, pertinent information was gleaned. Findings: Of the 150 patients, 56 (37%) and 94 (63%) were female. The age group over 60 years old had the largest number of cases (59 individuals, or 39.3%). The most frequent comorbidity (143 patients, 95%) was anemia, which was followed by diabetes mellitus (64 patients, 43%) and hypertension (129 patients, 86%). 150 individuals with poor kidney function were administered a total of 1693 medications. On average, each patient was given 11.19 ± 3.51 (8%) medications. Every patient had evidence of polypharmacy. The majority of prescriptions (25.87%) were for medications that affect the cardiovascular system. These were followed by medications for the gastrointestinal tract (GI) (18.72%), vitamins and minerals (14.94%), and antibiotics (8.33%). Conclusion: Because of related comorbidities, individuals with renal impairment have polypharmacy. Polypharmacy was shown to be more prevalent among people suffering from chronic kidney disease (CKD). Patients with chronic kidney disease (CKD) were often treated with antihypertensive medications, GI medications, antibiotics, and antidiabetic medications.

Keywords: polypharmacy, medication use, and chronic kidney disease.

I. INTRODUCTION

Drug utilization research is defined as "the marketing, distribution, prescription and use of drugs in society, with particular emphasis on resulting medical, social and economic consequences.[1] It is used to ensure the appropriate and rational use of drugs, i.e., according to the individual patient. It is an essential tool to study the clinical use of drugs in the population and its impact on the health-care system.[2] Renal hindrance or kidney failure is an ailment, wherein kidney capacities are impeded. This prompts failure in sufficiently filtering the metabolic wastes from the blood.[3] It is a common disease worldwide and is

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associated with high rates of morbidity and mortality.[4] The two primary types of kidney disease are acute kidney injury (AKI) and chronic kidney disease (CKD). Acute kidney disease is often reversible with adequate treatment, whereas CKD is often not reversible. In both cases, there is usually an underlying cause.[3] A decrease in the glomerular filtration rate (GFR) can determine kidney failure. Based on the GFR rate, renal impairment can be classified into five stages.[5]

•Stage 1: If the GFR is average or above 90 ml/min, which is associated with albuminuria, blood abnormalities, and abnormal urine tests

• Stage 2: If the GFR is slightly reduced, that is in kidney damage which can be studied by imaging, abnormality in urine and blood

• Stage 3: If the GFR is moderately reduced, that is in the range of 30– 59 ml/min, which is associated with the need for screening and physician reference, and it is also divided into:

• Stage 3a: Moderate reduction in GFR of 45 ml/min/1.73 m2)

•Stage 3b: GFR of 30 ml/min/1.73 m2).

• Stage 4: If the GFR is highly reduced, that is in the range of 15–29 ml/min, requiring renal replacement therapy

• Stage 5: if the GFR is<15 ml/min, it is considered kidney failure and requires kidney transplantation, also called end-stage kidney disease.[6]

If the patient's state is severe and renal failure prompts end-stage renal disease (ESRD), renal substitution treatments incorporate dialysis, and renal transplant. A noteworthy part influencing renal disabled patients is polypharmacy. Polypharmacy is basic in patients with CKD.[7] ESRD patients who are on hemodialysis have complex medication regimens and get numerous prescriptions with multiple doses every day. Visit prescription changes on dialysis versus nondialysis days, therapeutically temperamental nature of the ailment, and confined ways of life render these patients at high hazard for creating

medication-related issues and nonadherence to treatment.[8]

II. MATERIALS AND METHODS

A prospective observational study with 150 patients was conducted. After the approval from the ethics committee, data collection for this prospective observational study was conducted with intensive monitoring for 6 months in the department of nephrology in a tertiary care teaching hospital. All patients admitted with a confirmed diagnosis of CKD, and AKI in the nephrology ward were included. All the quantitative data were represented in mean ± standard deviation. Comparative statistical differences were calculated using an appropriate parametric test (t-test, Chi-square test). A graphical representative was used for a better understanding of the data. A $P \leq 0.05$ was considered statistically significant.

III. RESULTS

A total of 150 patients for the study were recruited. Only in-patient data were recorded and analyzed.

Demographic profile

In this study, 150 patients were recruited. Of these, 94 (63%) were male, and 56 (37%) were female. Therefore, male patients dominated female patients. The figure represents the gender distribution among CKD patients [Figure 1].

Comorbidity assessment

The most prevalent comorbidity was observed to be anemia trailed by hypertension, diabetes mellitus (DM), etc. The figure depicts the comorbidity assessment.

Anemia was found to be the most common comorbidity (143 patients, 95%) observed in the study population, followed by hypertension (129 patients, 86%), DM (64 patients, 43%), IHD (10 patients, 7%), hypothyroidism, ascites, hepatitis (six patients each, 4%), COPD, cirrhosis, pleural effusion (three patients each, 2%), angina, benign prostatic hyperplasia (two patients each, 1%), and asthma (one patient, 1%) [Table 1].

Number of drugs prescribed per patient

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The number of drugs prescribed to the patient was associated with the number of comorbidities present. The P value was found to be 0.0005. The table shows the association between comorbidities and treatment [Table 2].

Polypharmacy assessment

Polypharmacy is the prescription of seven or more medications given to one patient at one time. In our study, more than five drugs (87%) were received by 131 patients to treat comorbid conditions and complications of CKD.
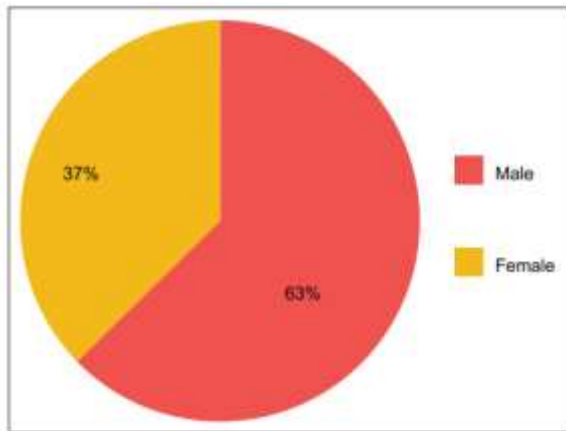

Figure 1: Gender distribution

Table: 1: Comorbidity assessment

Comorbidity	Number of patients, n (%)
Anemia	143 (95)
HTN	129 (86)
DM	64 (43)
IHD	10 (7)
Hypothyroidism	6 (4)
Ascites	6 (4)
Hepatitis	6 (4)
COPD	3 (2)
Cirrohsis	3 (2)
Pleural effusion	3 (2)
Angina	2 (1)
BPH	2 (1)
Asthma	1 (1)

Table 2: Association between comorbidities and treatment

Number of drugs prescribed	Number of comorbidities				P
	1	2	3	4	
Upto 9	9	27	14	1	0.000541
10 or more	5	32	50	12	

Patients receiving more than five drugs have an increased risk of mortality. Nineteen patients required less than five drugs (13%). The average number of drugs per prescription was found to be 11.19 ± 3.51 (8%) [Figure 2].

Frequency of various classes of drugs

A total of 1693 drugs were analyzed. cardiovascular drugs were commonly prescribed (438 drugs, 25.87%) followed by gastrointestinal (GI) drugs (317 drugs, 18.72%), vitamins and minerals (253 drugs, 14.94%), antibiotics (141 drugs, 8.33%), hematopoietic agents (108 drugs, 6.38%), antidiabetic drugs (105 drugs, 6.20%), analgesics (81 drugs, 4.78%), anti-asthmatic drugs (35 drugs, 2.07%), and xanthine oxidase inhibitors (29 drugs, 1.71%).

Out of 332 antihypertensive drugs prescribed, calcium channel blockers (CCBs) (111 drugs, 33.43%) were the most commonly prescribed antihypertensive medications, followed by diuretics (109 drugs, 32.83%), alpha agonists (54 drugs, 16.27%), beta-blockers (30 drugs, 9.04%), alpha-blocker (16 drugs, 4.8%), angiotensin receptor blockers (ARB) (nine drugs, 2.71%), vasodilator (two drugs, 0.60%), and angiotensin-converting enzyme (ACE) inhibitor (one drug, 0.30%) were the least prescribed antihypertensive medications.

A total of 317 GI drugs were prescribed. Proton-pump inhibitors (99 drugs) were commonly prescribed GI medication, in which pantoprazole (90 drugs, 90.91%) was widely used, followed by rabeprazole (five drugs, 5.05%) and esomeprazole (four drugs, 4.04%) [Table 3].

Classification of antihypertensive drugs

Of the 332 antihypertensive drugs prescribed, CCBs (111 drugs, 33.43%) were the most commonly prescribed antihypertensive medications, followed by diuretics (109 drugs, 32.83%), alpha agonists (54 drugs, 16.27%), beta-blockers and vasodilator (two drugs, 0.60%), and ACE inhibitor (1 drug, 0.30%) were the least prescribed antihypertensive medications [Figure 3]
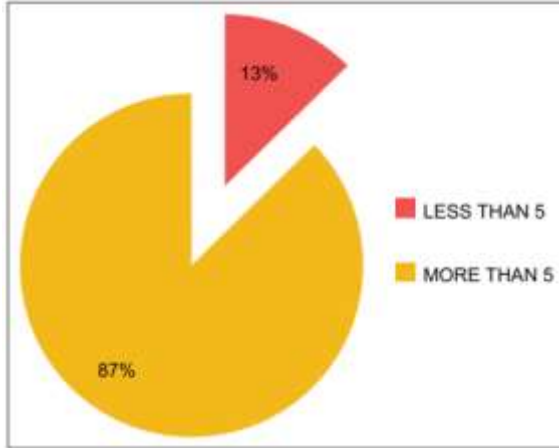
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Figure 2: Polypharmacy assessment

IV. DISCUSSION

Prescription pattern studies evaluate the quality of care given to patients in the health-care system. Proper determination of the medication treatment guarantees the most undue advantage to the patients.

In this study, over a time of 6 months, we assessed medications given to 150 patients. There were 94 (63%) male and 56 (37%) female. This is following the prevalence of CKD being more in men than in women worldwide and in India. The mean age of the patients in our study was 56.1 ± 15.2 years. This contrasts with the report of the Indian CKD registry, which showed a mean age of 45.22 ± 15.2 years. This could be coincidental as demographic variations are common. The table below shows the comparison between the present study with the previous studies.

Table 3: Frequency of various classes of drugs	
Drug class	Number of drugs, n (%)
Cardiovascular drugs	438 (25.87)
Antihypertensive drugs	332 (19.61)
Antiplatelet drugs	38 (2.24)
Antianginal drugs	34 (2.01)
Antihyperlipidemic drugs	29 (1.71)
Antidysrhythmic drugs	5 (0.30)
Gastrointestinal drugs	317 (18.72)
PPI	99 (5.85)
Antiemetic	86 (5.08)
Antacids	68 (4.02)
H2-blockers	44 (2.60)
Laxative	12 (0.71)
Antidiarrheal	5 (0.30)
Others	3 (0.18)
Vitamins and minerals	253 (14.94)
Antibiotic	141 (8.33)
Hematopoietic agents	108 (6.38)
Antidiabetic	105 (6.20)
Analgesic	81 (4.78)
Antiasthmatic	35 (2.07)
Xanthine oxidase inhibitor	29 (1.71)
Hepatitis B vaccine	15 (0.89)
Antiplatelet	12 (0.71)
Antihistamine	11 (0.65)
Corticosteroids	11 (0.65)
Anticoagulants	10 (0.59)
thyroid products	8 (0.47)
Anticonvulsants	8 (0.47)
Vasopressin analogs	7 (0.41)
Antifungal	6 (0.35)
Miscellaneous	98 (6)
Total	1693 (100)

PPI: Proton-pump inhibitor

Anemia was the most common comorbidity (143 patients, 95%) observed in our study subjects, followed by hypertension (129 patients, 86%). A study was done by Chakraborty et al.[10] report similar findings. In our study, we found that 43% of patients had type 2 diabetes. A study done by Kantanavar et al. report identical results for type 2 diabetes (43% of patients).[9]

A total of 1693 drugs were prescribed to 150 patients who were part of our study. Each patient received an average of 11.19 drugs. A similar study was done by Kantanavar et al. which included 1436 drugs, received an average of 6.7 drugs.[9] None of the patients received monotherapy. Thus, polypharmacy was evident. Polypharmacy has been variously defined. It has been described as the concurrent use of multiple drugs, and some researchers have discriminated between minor (two drugs) and major (more than four drugs) polypharmacy. Others have defined it as using more than five drugs that are clinically indicated or too inappropriate many

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medicines to treat the same condition or have other comorbidities. Polypharmacy is inevitable in CKD patients due to the prevalence of a large number of comorbidities [Table 4].

In our study, antihypertensive medications were the most commonly used cardiovascular agents. CCBs (33.4%) were the most frequently prescribed antihypertensive drugs, followed by diuretics (32.8%), alpha agonists (16.2%), beta-blockers (9.04%), alpha-blockers (4.8%), ARB (92.71%), vasodilator (0.60%), and ACE inhibitor (0.30%) were the least prescribed antihypertensive medications. In a study done by Chakraborty et al., drugs acting on the cardiovascular system were the most frequently prescribed drugs in CKD, the same as our study.[10]

V. CONCLUSION

We looked over data from 150 individuals who had renal impairment. This analysis presents the suggested drug example. Males were more likely than females to have CKD. Patients had a significant frequency of polypharmacy. Furthermore, investigations were conducted on different kinds of prescription drugs. The analysis evaluated the specific drug classes that were suggested.
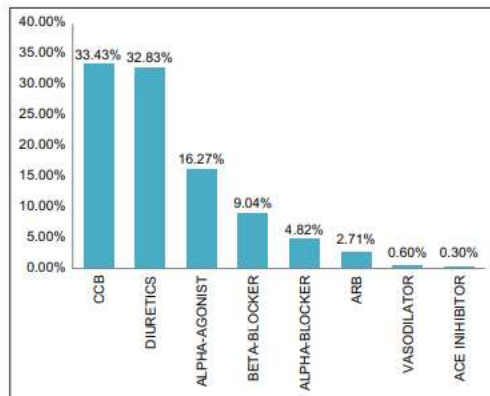

Figure 3: Antihypertensive drug classification

Table 4: Comparison discussion on core indicator parameters

Core indicator	Present study	Chakraborty S et al.[29]	Nayagam BD et al.[30]	Abhevat R et al.[31]	Rajesh CN et al.[32]	Al-Ramahi R et al.[33]	Devi DP et al.[34]
Study population	150	100	53	408	113	600	182
Study type	Cross-sectional, observational	Cross-sectional, Observational	Cross-sectional	Cross-sectional	Prospective, cross-sectional, observational	Prospective	Prospective, cross-sectional, observational
Mean age	56.1±15.2	N/A	56.1±3.18	53.8	51.46±14.28	55.56±14.15	55.1±9.3
HTN (%)	86	81	76	55	54.95	60	100
Anemia (%)	95	89	N/A	46	49.14	47.50	N/A
DM (%)	43	N/A	41	40	36.63	62.30	100
Number of drugs/prescription (mean)	11.19±3.15	10 (median)	5.6±2.2	4.37%	9.47%	8.39±3.63	7.4
Cardiovascular drugs (%)	23.87	23.41	N/A	33.90	22.05	N/A	27.90
Diuretics (%)	32.83	4.29	N/A	9.20	9.58	N/A	N/A
CCBs (%)	33.43	3.92	N/A	6.30	5.90	N/A	N/A
B blockers (%)	9.04	8.91	N/A	1.60	1.04	N/A	N/A
Alpha blockers (%)	4.82	3.91	N/A	1.80	1.14	N/A	N/A
ACE inhibitors (%)	0.30	8.36	N/A	2.00	0.57	N/A	N/A
ARB (%)	2.71	8.18	N/A	2.80	1.23	N/A	N/A
Hematopoietic agents (%)	6.30	N/A	64	N/A	N/A	N/A	N/A
Antidiabetic (%)	4.20	N/A	16	N/A	N/A	45.30	61.50
Antibiotic (%)	8.33	N/A	N/A	N/A	N/A	54.70	75.40

HTN: Hypertension, DM: Diabetes mellitus, CCBs: Calcium channel blockers, N/A: Not available, ACE: Angiotensin Converting Enzyme, ARB: Angiotensin Receptor Blockers

The most often given pharmaceuticals were antihypertensive agents, which were followed by GI system-acting medications, nutritional supplements, antibiotics, haematinics, and antidiabetic agents. Among the pharmacological classes administered most often were calcium channel blockers. The most often given antidiabetic was insulin. The most often given hematinic was erythropoietin. One often recommended antibiotic was ceftriaxone. DM was the most frequent comorbidity seen, followed by anemia and HTN. Comorbidities and the quantity of prescription medicines administered were shown to be related. Furthermore, it is necessary to periodically assess drug use patterns in order to enhance patient quality of life and treatment tactics.

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