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DRUG UTILIZATION TRENDS OF ANTIHYPERTENSIVES IN CHRONIC KIDNEY DISEASE: AN OBSERVATIONAL STUDY FROM A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Chronic kidney disease (CKD) is a progressive disorder associated with significant morbidity and mortality, in which hypertension is both a common comorbidity and a major risk factor for disease progression. Rational prescribing of antihypertensive medications is critical to slowing CKD progression, preventing cardiovascular complications, and improving patient outcomes. The present observational, cross-sectional study was conducted in a tertiary care teaching hospital to analyze the prescribing patterns and utilization trends of antihypertensive agents among CKD patients. Data were collected from medical records and patient case sheets, including demographic details, stage of CKD, associated comorbidities, and prescribed antihypertensive drugs. The study evaluated the distribution of drug classes such as angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), calcium channel blockers (CCBs), beta-blockers, and diuretics. WHO prescribing indicators were used to assess rationality. Findings revealed that CCBs and ARBs were the most commonly prescribed antihypertensives, often used in combination therapy for optimal blood pressure control. ACEIs were less frequently prescribed, particularly in advanced CKD stages due to risk of hyperkalemia. Polypharmacy was observed in a significant proportion of patients, reflecting the complexity of managing comorbid hypertension in CKD. The overall prescription pattern aligned with clinical guidelines, though occasional deviations and irrational prescribing were noted.

I. INTRODUCTION

Chronic Kidney Disease encompasses high degree kidney loss functionally. The kidney mainly functions to filter waste products and fluids from the blood and consequently release them into the urine. The underlying causes or risk factors of CKD are Hypertension, Diabetes, Obesity, elderly, family history of kidney diseases, low birth weight, smoking, alcohol consumption, cardiovascular diseases, hyperlipidemia, metabolic syndrome, etc [1]. Regardless of the underlying cause, once the reduction of renal function and loss of nephrons reaches a certain level, begins irreversible process resulting into the progressive decline of Glomerular filtration rate [2]. According to the National Health and Nutrition Examination Survey (NHANES) study, the prevalence of CKD in stage 3 was rise to 24.5% from 18.8% during the year 2003-2006 from the year 1988-1994 respectively. Moreover, the overall prevalence of CKD in the SEEK (Screening and Early Evaluation of Kidney Diseases) study in India, the prevalence of the CKD stages 1,2,3,4, and 5 was 7%, 4.3%, 4.3%, 0.8%, and 0.8% respectively. On the other hand, the general population worldwide found a consistent estimated global CKD prevalence of 11-13% [3]. HTN is most often associated with co-morbid conditions with CKD. Moreover, it is considered the most modifiable risk factor of CKD and has been reported to occur in 85% to 95% of patients with CKD. It also considers as one of the leading causes of CKD due to the deleterious effects that increased BP has on kidney vasculature. Longterm, uncontrolled high

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BP patients are more vulnerable to CKD. Elevated BP results in increasing intraglomerular pressure and impairing the glomerular filtration, which ultimately leads to the damage of glomeruli and abnormally increased amounts of protein in the urine [4]. The National Kidney Foundation clinical practice guidelines recommended a blood pressure goal of ≤130 mmHg systolic and ≤ 80 mmHg diastolic for all CKD patients [5]. Moreover, International guidelines recommend lowering BP to 140/90 mmHg or less in patients with uncomplicated hypertension, and 130/80 mmHg or less in patients with diabetic or chronic renal diseases [6]. Several classes of antihypertensive agents play a significant role as nephroprotective in the treatment of CKD with HTN. Anti-hypertensive provides renal protection via two mechanisms: a reduction of BP and effects on intrarenal mechanisms of damage, such as glomerular pressure and proteinuria [7]. The present study was taken for assessing the prescription pattern of anti-hypertensive and also to assess the medication adherence in CKD patients. This helps in better controlling and hence improves the quality of life of CKD patients.

II. METHODOLOGY

It was a prospective cross-sectional study conducted for 6 months at the Department of General Medicine and Nephrology of the Dhiraj General Hospital, Vadodara. The study obtained ethical approval from the Sumandeep Vidyapeeth Institutional Ethics Committee (Ref no: (SVIEC/ON/Phar/BNPG18/D19006). All adult patients from Department of General Medicine and Nephrology between 18-65 years old having CKD with HTN were included in a study after explaining to the patients, the details of the study, the Informed consent form was taken. Patient's medical records were checked and following information were noted in Patient Medical Record sheet: Patient's demographic details, Patient Medical History, Diagnosis of the patient – CKD stages, age of onset of hypertension and chronic kidney disease and its duration, time since last hypertension and chronic kidney disease occur, family history of hypertension and chronic kidney disease and presence of other co-morbidities, Prescribed drugs including Anti- hypertensive (Frequency, Dose and Duration) was also collected, number of anti-hypertensive, doses was collected along with details of hypertension control on hypertensive, Lab investigations reports (which are already mentioned in patient medical records) All the relevant data was obtained from the patients' medical records and through counselling the patients who visited the OutPatient Department (OPD) or In-Patient Department (IPD). All the relevant data collected and recorded electronically. Descriptive statistics used for the analysis of the data. After the data collection, all the data were exported to statistical software for statistical analysis. All the quantitative data were represented in mean ± standard deviation. Comparative statistical differences were calculated using appropriate parametric tests.

III. RESULTS

A total of 60 patients were included in the study. we noticed that the number of inpatients was 67% (n=40) while the number of OPD patients was just 33% (n=20). Comparing the gender proportionality, male represents 63% (n=38) and female represents 37% (n=22) of the total population. In our study, the age of patients varies from 18 to 65 years with a mean age of 53 ± 12.4 years. The maximum number of patients were from the age group of 45-65 years [71.67% (n=43)] followed by the age group 31-45 years [25.00% (n=15)], and lastly, the least number of patients were found in the age group of 18-30 years 3.33% (n=2)]. The average number of comorbidities of the overall study population was found to be 2.6 (±1.15). The maximum number of co-morbidities was found to be 5. Out of 60 patients, 42% (n=25) had 2 number of

comorbidities, 18% (n=11) had 3 number of comorbidities, 18% (n=11) had 4 number of comorbidities, 15% (n=9) had 1 number of comorbidities, 7% (n=4) had 5 number of comorbidities. The analysed data of 60 patients were then categorized based on the severity of CKD. There is a total of 5 CKD stages. The maximum number of patients having stage 5 CKD. Out of 60 patients, 58% (n=35) had stage 5 CKD, 27% (n=16) had stage 4 CKD, 7% (n=4) had stage 3B CKD, 7% (n=4) had stage 3A CKD, 1 % (n=1) had stage 2 CKD, 0% (n=0) had stage 0 CKD.

Table 1. Patient's demographic data

Gender	No. of patients	Percentage
Male	38	63.33
Female	22	36.67
Age		
18-30	2	3.33
31-45	15	25.00
46-65	43	71.67
Co-morbidity		
1	9	15.00
2	25	41.67
3	11	18.33
4	11	18.33
5	4	6.67
CKD stages		
Stage 1	0	0
Stage 2	1	1.67
Stage 3A	4	6.67
Stage 3B	4	6.67
Stage 4	16	26.67
Stage 5	35	58.33

Hypertension is defined by the presence of an elevation of systemic arterial pressure above a certain threshold value. There are three types of classification of hypertension that is grade 1 (mild), grade 2 (moderate), and grade 3 (severe). [8] The recorded systolic BP in mild case in the overall study population was found to be 140-159 mmHg and diastolic BP was found to be 90-99 mmHg. In moderate case systolic BP was 160- 179 mmHg and diastolic BP was found to be 100-109 mmHg. In severe cases systolic BP was ≥180 mmHg and diastolic BP was found to be ≥110 mmHg. Most of the CKD patients with HTN were treated with polypharmacy. 66.67% (n=40) of patients were taking multi-drug therapy (polypharmacy), 28.33% (n=17) of patients were taking double therapy and 5% (n=3) of patients were taking single therapy. Antihypertensive drugs used in the study population were identified and categorized based on their classification of drugs. Maximum antihypertensive class prescribed was calcium channel blocker [34.18% (n=63)] and minimum anti- hypertensive class prescribed was beta blocker non-selective [1.66% (n=3)]. Total no. of anti-hypertensive classes that were prescribed to 60 patients was 10. It was found that calcium channel blockers 34.18 (n=63) having frequency of 34.35% (n=113), diuretics-aldosterone antagonist 2.21% (n=4) having frequency of 2.43% (n=8), diuretic-loops 23.20% (n=42) having frequency of 24.92% (n=82), beta blockers-cardio selective 8.29% (n=15)having frequency of 6.69% (n=22), beta blockers-non selective 1.66% (n=3) having frequency of 1.52% (n=5), mixed alpha beta blockers 6.08% (n=11) having frequency of 4.56% (n=15), alpha-1 blocker 3.31% (n=6) having frequency of 3.34% (n=11), angiotensin receptor blockers 3.87% (n=7) having frequency of 2.74% (n=9), ACEinhibitors 2.21% (n=4) having frequency of 1.52% (n=5), central alpha 2 agonist 14.36% (n=26) having frequency of 17.93% (n=59) were the various antihypertensive classes prescribed to the study population. A total of 60 case records of patients having chronic kidney disease and on antihypertensive medications were collected and analysed. Maximum anti-hypertensive drug prescribed was furosemide [19.34% (n=35)] and minimum antihypertensive drug prescribed was Azilsartan, Benidipine, Bisoprolol, Moxonidine [0.55% (n=1)]. Total no. of anti-hypertensive drugs that were prescribed to 60 patients was 181 and its

Table 2. Total number of patients having systolic BP

Grade	Systolic	No of patients	Percentage
Mild	140-159	20	51.28
Moderate	160-179	9	23.08
Severe	≥180	10	25.64

Table 3. Total number of patients having diastolic BP

Grade	Diastolic	No of patients	Percentage
Mild	90-99	27	61.36
Moderate	100-109	10	22.73
Severe	≥110	7	15.91

Table 4. Clinical parameters

Urea (mg/dL)	Creatinine (mg/dL)	Hemoglobin (g/dL)	Total Count	Differential count	
				Neutrophils	Lymphocytes
128.58	7.95	9.44	10159.65	74.30	17.91

Table 5. Treatment pattern in patients

Therapy	No. of patients	Percentage
Multi drug therapy (polypharmacy)	40	66.67
Double therapy	17	28.33
Single therapy	3	5

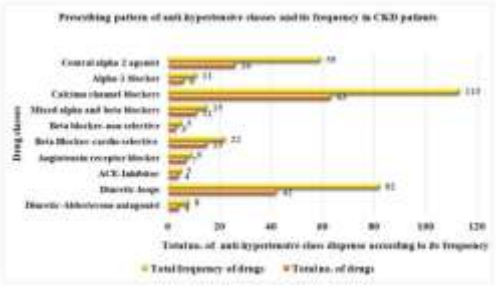

Fig. 1. Prescribing pattern of anti-hypertensive classes and its frequency in CKD patients

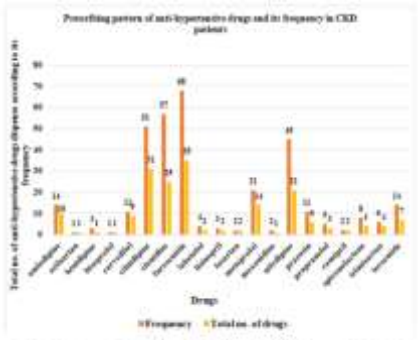

Fig. 2. Prescribing pattern of anti-hypertensive classes and its frequency in CKD patients

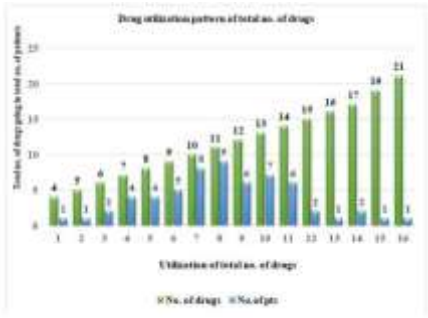

Fig. 3. Drug utilization pattern of total no. of drugs

total frequency was 329. It was found that amlodipine 5.52% (n=10) having frequency of 4.26% (n=14), Azilsartan 0.55% (n=1) having frequency of 0.30% (n=1), Benidipine 0.55% (n=1) having frequency of 0.91% (n=3), bisoprolol 0.55% (n=1) having frequency of 0.30% (n=1), carvedilol 4.97% (n=9) having frequency of 3.34% (n=11), cilnidipine 17.13% (n=31) having frequency of 15.50% (n=51), clonidine 13.81% (n=25) having frequency of 17.33% (n=57), furosemide 19.34 % (n=35) having frequency of 20.67% (n=68), labetalol 1.10% (n=2) having frequency of 1.22% (n=4), lisinopril 1.10 % (n=2) having frequency of 0.91% (n=3), losartan 1.10% (n=2) having frequency of 0.61% (n=2), metoprolol 7.73% (n=14) having frequency of 6.38% (n=21), Moxonidine 0.55% (n=1) having frequency of 0.61% (n=2), nifedipine 11.60% (n=21) having frequency of 13.68% (n=45), prazosin 3.31% (n=6) having frequency of 3.34% (n=11), propranolol 1.66 % (n=3) having frequency of 1.52% (n=5), ramipril 1.10% (n=2) having frequency of 0.61% (n=2), spironolactone 2.21% (n=4) having frequency of 2.43% (n=8), % (n=9) having frequency of 3.34% (n=11), % (n=9) having frequency of 3.34% (n=11), telmisartan 2.21% (n=4) having frequency of 1.82% (n=6) and torsemide 3.87% (n=7) having frequency of 4.26% (n=14) were the various antihypertensive drugs prescribed to the study population.

The average total number of drugs was found to be 11.2 (±3.3). Total no. of drugs 4, 5, 16, 19, 21 respectively was found to be 1.67% (n=1) followed by total no. of drugs 6, 15 and 17 respectively was found to be 3.33% (n=2) followed by total no. of drugs 7 and 8 respectively were found to be 6.67% (n=4) followed by total no. of drugs 9 was found to be 8.33% (n=5) followed by total no. of drugs 12 and 14 was found to be 10% (n=6) followed by total no. of drugs 13 was found to be 11.67% (n=7) followed by total no. of drugs 10 was found to be 13.33% (n=8) followed by total no. of drugs 11 was found to be 15% (n=9). The average total number of drugs was found to be 3.01% (±1.13). Total no. of anti-hypertensive drugs 1, 6 and 3 respectively were found to be 5% (n=3) followed by total no. of anti-hypertensive drugs 4 respectively were found to be 15% (n=9) followed by total no. of anti-hypertensive drugs 2 respectively was found to be 28.33% (n=17) followed by total no. of anti-hypertensive drugs 3 respectively was found to be 41.67% (n=25).

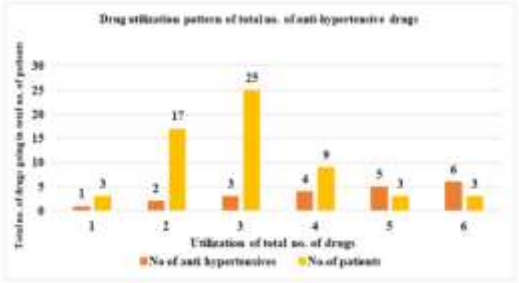

Fig. 4. Drug utilization pattern of total no. of anti-hypertensive drugs

IV. DISCUSSION

This study includes data of 60 CKD patients from the general medicine and Nephrology ward with an evaluation of antihypertensive drugs in CKD patients were analysed. The demographic results of the study revealed gender distribution of male and female with age between 18- 65 years are 64.29% (N=36) and 37.5% (N=21) respectively, similar to the study conducted in Banglore, India in which a total number of 105 renal failure patients are participating, out of which 65 (61.9%) were male and 40 (38.09%) were female [9]. Another study was carried out at Chitradurga, India; where 72.5% were males and 27.5% were females [10]. Hence, the susceptibility of hypertension with CKD could be more probable in males as compared to the female. However, considering the age distribution of patients by three groups i.e., 18-30 age, 31-45 age, and 46-65 age, the percentage of hypertension with CKD patients were 3.51%, 24.56%, and 71.93% respectively.

V. CONCLUSION

This study highlights the current utilization trends of antihypertensive agents among CKD patients in a tertiary care teaching hospital. Calcium channel blockers and ARBs were the most frequently prescribed classes, indicating clinician preference for effective and kidney-safe agents in hypertension management. While most prescriptions were rational and guideline-based, issues such as polypharmacy and occasional inappropriate combinations were identified. These findings underscore the importance of continuous drug utilization studies, periodic prescription audits, and physician awareness programs to ensure evidence-based, rational antihypertensive therapy in CKD. Optimizing drug use not only improves patient outcomes but also reduces adverse events and healthcare burden. Future longitudinal studies with larger sample sizes are warranted to evaluate long-term prescribing trends and clinical outcomes in this high-risk population.

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