

# Prescription Pattern of Antihypertensive Agents in Chronic Kidney Disease Patients of Two Tertiary Care Hospitals in Bangladesh

Akter N<sup>1</sup>, Moon KJ<sup>2</sup>, Fatema SK<sup>3</sup>, Akkas N<sup>3</sup>, Yusuf R<sup>5</sup>, Nahar K<sup>6</sup>, Sultana S<sup>7</sup>

### ABSTRACT

Occurrence of chronic kidney disease (CKD) is significantly high in Bangladesh. CKD is viewed as a common cause of hypertension, also as a complication of uncontrolled hypertension. Therefore, blood pressure control is vital in all stages of CKD. Early control of hypertension can prevent further CKD progression. A cross-sectional study was conducted in the Department of Nephrology of Sir Salimullah Medical College & Mitford Hospital and National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, Bangladesh, to assess the current antihypertensive prescription pattern in chronic kidney disease patients. A total of 264 diagnosed hypertensive CKD (all stages) patients were included in this study. Among 264 CKD patients, 52.7% were female and 47.3% were male. 23.9% were smokers and 52.3% had habits of extra salt intake. Most of the patients were in CKD stage 1, followed by CKD stage 5 in both hospitals. Common comorbidities of the CKD patients were anemia (51.5%), followed by diabetes mellitus (29.7%) and ischemic heart disease (18.8%). Regarding anti-hypertensive medications, angiotensin receptor blockers (ARBs) were prescribed to 58 patients; they were the highest prescribed agents observed in our study. Among them, losartan was the most common prescribed drug (44.8%), followed by olmesartan (31.0%), telmisartan (20.7%), and irbesartan (3.5%). Calcium channel blockers (CCBs) were prescribed to 16 patients, with amlodipine accounting for 50% of those prescriptions. Angiotensin converting enzyme (ACE) inhibitors were used in 13 patients; ramipril (61.5%) and lisinopril (38.5%) were two drugs of choice. Blood pressure control is very crucial for CKD patients to minimize cardiovascular risks associated with CKD progression and to decrease morbidity and mortality.

**Keywords:** Chronic kidney disease, hypertension, antihypertensive agent, cardiovascular risks

Mugda Med Coll J. 2026; 9(1): 31-36

DOI: <https://doi.org/10.3329/mumcj.v9i1.90805>

1. Dr. Nazia Akter, Lecturer, Department of Pharmacology & Therapeutics, Dinajpur Medical College, Dinajpur-5200. Email: naziadjmc@gmail.com (Corresponding author)
2. Dr. Kawsar Jahan Moon, Associate Professor, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College, Dhaka-1100.
3. Dr. Syeda Kaniz Fatema, Lecturer, Department of Pharmacology & Therapeutics, Mugda Medical College, Dhaka-1214.
4. Dr. Nafisa Akkas, Lecturer, Department of Pharmacology & Therapeutics, Chattogram Medical College, Chattogram-4203.
5. Dr. Riti Yusuf, Assistant Professor, Department of Pharmacology & Therapeutics, Sir Salimullah Medical College, Dhaka-1100.
6. Dr. Kamrun Nahar, Assistant Professor, Department of Pharmacology & Therapeutics, Mugda Medical College, Dhaka-1214.
7. Dr. Sadia Sultana, Assistant Professor, Department of Pharmacology & Therapeutics, Mugda Medical College, Dhaka-1214.

### INTRODUCTION

Hypertension stands as a key risk factor for cardiovascular disease, and ranks among the top reasons for early death worldwide.<sup>1</sup> Uncontrolled hypertension can lead to serious adverse cardiovascular and cerebrovascular events including acute coronary syndrome, stroke, heart failure, and even death.<sup>2</sup> Hypertension happens when one's systolic BP is above 140 mm of Hg and/or diastolic BP is above 90 mm of Hg or is on anti-hypertensive drug.<sup>3</sup> In Bangladesh, the rate of hypertension is 26.2%.<sup>4</sup> About 1.28 billion people age range 30-79

years, suffer from hypertension. Low- and middle-income countries have almost two-thirds of hypertensive people.<sup>5</sup> In 2017, hypertension caused 10.4 million deaths and 218 million disability. Hypertension is an important etiological factor for cardiovascular diseases and cerebrovascular diseases. Those who have hypertension are more likely to develop CVD sooner than those who do not have hypertension.<sup>4</sup> Due to regional heterogeneity various risk factors are seen in hypertension prevalence, for example: intake of high salty food, intake of food containing low potassium food, obesity, consumption of alcohol, being physically inactive and unhealthy diet.<sup>1</sup>

Chronic kidney disease is considered as a fatal condition. This disease is life threatening which has turned into a global public health challenge with an accelerated risk for ESKD, cardiovascular disorder and other health problems.<sup>6</sup> Renal function gets progressively lost because of chronic kidney disease, in most cases present with high blood pressure which should be managed by antihypertensive medications.<sup>7</sup> The global burden of morbidity and mortality is directly affected by CKD.<sup>6</sup> In 2017, almost 697.5 million cases of CKD were submitted. Among them, about 1.2 million people lost lives<sup>8</sup>. In Bangladesh, occurrence of CKD was 22% in 2020<sup>9</sup>. The global estimated chronicity is 13.4% (11.7-15.1) & dialysis or renal transplant needed ESKD patients are about 4.9-7.1 million<sup>6</sup>. An authentic study shows that the occurrence of CKD was 21.2%, 10.2% and 13.4% for Pakistan, India and Nepal respectively.<sup>10</sup> Due to the excessive occurrence of diabetes mellitus, hypertension, hyperlipidemia & aging, CKD is increasing globally. In a few areas, other causes i.e. infection, herbal and environmental toxins are common.<sup>6</sup> CKD patients have renal impairment that causes hemodynamic overload, metabolic & endocrine abnormalities which damages the cardiovascular system. CKD causes many other health issues for example: hypertension, anemia, dyslipidemia, electrolyte imbalances, mineral disorders and bony abnormalities.<sup>11</sup> The link between hypertension and CKD is bi-directional. Hypertension can be the reason for CKD also it can be the cause of uncontrolled hypertension. CKD picks up its pace as hypertension has its contribution to it.<sup>12</sup> It has been reported approximately 80-85% CKD patients develop hypertension and almost 15.8% hypertensive patients suffer from CKD.<sup>13</sup> Due to

volume overload and peripheral vascular resistance, progressive kidney disease can lead to uncontrolled hypertension. Heightened blood pressure causes injury to endothelium resulting in vascular damage within the kidney's ability to excrete fluid and waste from blood, causing fluid retention and it causes hypertension<sup>11</sup>. CKD patients have higher chance to develop cardiovascular diseases. When kidney function and cardiovascular diseases get worse, risk of death also increases. Once kidney impairment begins, it progresses to a stage where expensive treatments like dialysis and renal transplantation are required.<sup>14</sup>

Antihypertensive medications have three main purposes in CKD patients, they are: decreasing blood pressure in hypertensive patients, lowers the CVD in hypertensive patients and slows the declination of kidney disease in patients with or without hypertension. There also lessens proteinuria which results in improved health outcome and reduces healthcare expenses.<sup>15</sup> Proper treatment must be provided to CKD patients with hypertension to prevent the risk of poor prognosis of chronic kidney disease.<sup>16,17</sup>

Evidence showed that angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) decrease the prevalence of kidney dysfunction by 39% and 30% respectively in CKD patients with or without diabetes mellitus. These medications also reduce the risk of major cardiovascular events from 18% to 24%. Blockade of renin-angiotensin system might prevent new onset or deterioration of albuminuria in renal impaired patients.<sup>6</sup>

Understanding of utilization pattern of anti-hypertensive drugs in hypertensive CKD patients is essential to know the current prescription pattern, to observe patient compliance with medication, to understand common comorbidities associated with CKD and to study the impact on overall health condition of the patient. Prescribing patterns are powerful and important tools to exhibit the role of drugs in society. Drug utilization studies at regular intervals help physician to prescribe drug rationally. This study is helpful to observe the appropriate anti-hypertensive drug prescription pattern among the patients of chronic kidney disease for control of hypertension.

## METHODS

This cross-sectional study was conducted in the Department of Nephrology of Sir Salimullah Medical College & Mitford Hospital and National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, Bangladesh, between July 2023 and June 2024. A total of 264 patients who diagnosed with CKD and having anti-hypertensive therapy were enrolled in this study. However, patients aged <18 years, having acute renal injury, renal transplantation or stroke were excluded. Participants were interviewed using a pretested semi-structured questionnaire through the face-to-face interview. Blood pressure (BP) was assessed according to the Kidney Disease: Improving Global Outcomes (KDIGO) 2021 Clinical Practice Guideline for the Management of BP in CKD. BP was considered controlled when systolic blood pressure was <120 mmHg, provided that the target was tolerated by the participant. Data was collected including demographic characteristics, clinical history, smoking habit, salt intake, comorbidities, laboratory findings, CKD staging and record of anti-hypertensive medication.

Collected data was compiled, coded and analyzed. Data analysis was carried out using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY, USA). Data was presented as frequency and percentage for qualitative variables. To find out relation between dependent and independent variables (both are qualitative variables), Chi-square test was done. A p-value <0.05 was considered statistically significant. The results were presented in tables.

## RESULTS

Out of 264 hypertensive CKD patients enrolled, 52.7% were female and 47.3% were male, indicating a slight female predominance. The mean age was 48.48±14.2 years. Most of the patients had normal BMI (61%), while 21.6% were overweight and 17% underweight. Extra salt intake was reported by 52.3% and smoking by 23.9% of the patients (Table-I). Regarding multiple comorbidities, anemia was the most common, affecting 184 (69.7%) patients, followed by diabetes mellitus 106 (40.2%) and ischemic heart disease 67(25.4%) (Table-II). Only 19.7% of the CKD patients had no associated comorbidities. Controlled BP was observed in 10(9.8%) stage 1 patients, 2(4.6%) stage 2 patients, 2(11.1%) stage 4 patients and 2(2.7%) stage 5 patients. In contrast, all patients in stage 3a and 3b had uncontrolled BP. The variation in BP control across different CKD stages was statistically significant (p=0.023) (Table-III). Regarding anti-hypertensive medications, angiotensin receptor blockers (ARBs) were prescribed to 58 patients; they were the highest prescribed agents observed in our study. Among them, losartan was the most common

prescribed drug (44.8%), followed by olmesartan (31.0%), telmisartan (20.7%), and irbesartan (3.5%). Calcium channel blockers (CCBs) were prescribed to 16 patients, with amlodipine accounting for 50% of those prescriptions. Angiotensin converting enzyme (ACE) inhibitors were used in 13 patients; ramipril (61.5%) and lisinopril (38.5%) were two drugs of choice (Table-IV).

**Table-I :** BMI and risk factors among CKD patients (n=264)

Variables	Frequency	Percentage
BMI		
Underweight	45	17.0
Normal	161	61.0
Overweight	57	21.6
Obese	1	0.4
Extra salt intake		
Yes	138	52.3
No	126	47.7
Smoking		
Yes	63	23.9
No	201	76.1

**Table-II:** Multiple comorbidities observed among CKD patients (n=264)

Comorbidities	Frequency (n)	Percentage of cases (%)
Anemia	184	69.7
Diabetes Mellitus	106	40.2
Ischemic Heart Disease	67	25.4
Response	357	

Multiple responses were allowed; therefore, percentages do not sum to 100%

**Table-III:** Status of blood pressure of the patients in different stages of CKD (n=264)

CKD Stage	Blood Pressure Controlled	Blood Pressure Uncontrolled	p-value
1	10 (9.8)	92 (90.2)	0.023 <sup>S</sup>
2	2 (4.6)	41 (95.4)	
3a	-	21 (100)	
3b	-	6 (100)	
4	2 (11.1)	16 (88.9)	
5	2 (2.7)	72 (97.3)	

Chi-square test was applied to reach p-value; S=significant.

**Table-IV:** Distribution of antihypertensive agents used in CKD patients

Antihypertensive agents	Frequency	Percentage
Angiotensin receptor blockers (n=58)		
Losartan	26	44.8
Olmesartan	18	31.0
Telmisartan	12	20.7
Irbesartan	2	3.5
Calcium channel blockers (n=16)		
Amlodipine	8	50.0
Cilnidipine	6	37.5
Nifedipine	2	12.5
Angiotensin converting enzyme inhibitors (n=13)		
Ramipril	8	61.5
Lisinopril	5	38.5
Combination therapy	177	67.0

## DISCUSSION

In the present study, the mean age of the patients was  $48.48 \pm 14.2$  years. This finding resembled to the study done by Oommen et al.<sup>18</sup>, where the mean age was observed  $49.53 \pm 15.1$  years. Kidney function deteriorates with aging due to decrease in number of glomeruli and decreased glomerular filtration rate. Our study showed that hypertension along with CKD is more prevalent in women than in men. This findings similar to another study done by Sarker et al.<sup>9</sup> in Bangladesh. In contrast, Thomas et al.<sup>7</sup> observed a male predominance in their study.

In this study, it was observed that anemia was the most prevalent comorbidity among hypertensive CKD patients, affecting 69.7% of the cohort. This finding aligns with the findings of several previous studies conducted in Bangladesh, which also reported high prevalence rates of anemia among CKD patients. For instance, Yousuf et al.<sup>19</sup> reported higher anemia prevalence rates with progression of CKD reaching up to 86% in stage 5 patients, while Rahman et al.<sup>20</sup> found reduced hemoglobin levels in CKD patients, which was directly associated with the severity of the disease (i.e., more anemia in advanced stages of CKD). Those findings highlight the commonality of such complication among Bangladeshi CKD patients.

Regarding blood pressure control, this study found that a significant proportion of patients, especially those in advanced CKD stages, had uncontrolled hypertension. Specifically, all patients in stages 3a

and 3b, and 97.3% of stage 5 patients, exhibited poor BP control in those CKD stages. This trend is also consistent with the findings from previous studies that reported poorer BP control and outcomes in advanced stages of CKD.<sup>21,22</sup> Similar patterns have been documented by Lee & Han<sup>17</sup>, who emphasized the challenges of blood pressure regulation due to fluid retention and vascular resistance in advanced CKD. We observed a significant difference in BP control across different CKD stages ( $p < 0.05$ ), which underscores the importance of tailored anti-hypertensive strategies.

ARBs were the most frequently prescribed anti-hypertensive agents, particularly losartan (44.8%), corroborating global and regional prescribing trends. Previous studies confirmed ARBs' dual role of reducing blood pressure as well as proteinuria, which ultimately slower down the progression of CKD.<sup>23,24</sup> However, the risk of hyperkalemia and need for renal function monitoring especially in later CKD stages always remain clinical concerns for those patients.<sup>16</sup> Amlodipine was the most commonly used calcium channel blocker preferred for its renal safety and effective blood pressure control and among ACE inhibitors, ramipril dominated in our observation, which is consistent with the findings of Prabitha et al.<sup>14</sup>; however, those drugs require dose adjustments in renal impairment.<sup>14</sup>

Overall, our study findings highlight a high prevalence of anemia and poor BP control among hypertensive CKD patients in Bangladesh. The prescribing patterns observed are consistent with national trends, emphasizing the need for individualized treatment strategies and regular monitoring to improve patient outcomes.

However, in our study, patients were recruited from two selected hospitals in Dhaka city; we could recruit a small sample due to time and budget constraint. Therefore, the study results may not reflect the exact picture of the whole country. Further studies with larger sample and longer duration involving hospitals from different regions of the country are recommended.

## CONCLUSION

The study concluded that the control of hypertension is necessary in all stages of CKD to minimize cardiovascular risk associated with CKD progression and to decrease morbidity and mortality. ARBs were most prescribed single drug therapy in both hospitals

among adherent prescriptions. The findings of this study may offer additional information for healthcare professionals about anti-hypertensive therapies in CKD patients in our country. However, we observed that inconsistencies exist towards anti-hypertensive treatment approach. There is need for further improvement in the prescribing patterns of anti-hypertensive and strategies to improve patient adherence to drug treatment for ensuring safety, efficacy and rationality.

**Conflict of Interest:** None declared.

**Funding Statement:** Self-funded.

**Ethical Approval:** Ethical approval was obtained from the Institutional Ethics Committee of Sir Salimullah Medical College, Dhaka, Bangladesh (Ref: 59.14.1100.031.18.001.24.566).

**Authors' Contribution:** Concept and design of the study: N Akter; Data collection, compilation and analysis: N Akter, SK Fatema, N Akkas, R Yusuf, K Nahar, S Sultana; Manuscript preparation, review, editing and final submission: N Akter, SK Fatema, N Akkas, R Yusuf, K Nahar, S Sultana.

## REFERENCES

- Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. *Nat Rev Nephrol.* 2020;16(4):223-37.
- Kim KM, Oh HJ, Choi HY, Lee H, Ryu DR. Impact of chronic kidney disease on mortality: a nationwide cohort study. *Kidney Res Clin Pract.* 2019;38(3):382-90.
- Amin MR, Khan FA, Chowdhury RI, Chowdhury AW, Banerjee SK, Choudhury SR, et al. eds. National guideline on hypertension. 2nd ed. Dhaka, Bangladesh: Non Communicable Disease Control Programme, Directorate General of Health Services (DGHS), Ministry of Health & Family Welfare; 2023.
- Khan MN, Oldroyd JC, Chowdhury EK, Hossain MB, Rana J, Renzetti S, et al. Prevalence, awareness, treatment, and control of hypertension in Bangladesh: Findings from National Demographic and Health Survey, 2017-2018. *J Clin Hypertens (Greenwich).* 2021;23(10):1830-42.
- World Health Organization (WHO). Guideline for the pharmacological treatment of hypertension in adults. Geneva, Switzerland: WHO; 2021.
- Liyanage T, Ninomiya T, Jha V. Worldwide access to treatment for end-stage kidney disease: a systematic review. *Lancet.* 2015;385:1975-82.
- Thomas R, Sam S, Neelaphar P, Shabeeb P, Vishwanath BA. A study on prescribing pattern of antihypertensive in chronic kidney disease patients. *J Drud Deliv Ther.* 2020;10(3-s):75-81.
- GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet.* 2020;395(10225):709-33.
- Sarker MHR, Moriyama M, Rashid HU, Chisti MJ, Rahman MM, Das SK, et al. Community-based screening to determine the prevalence, health and nutritional status of patients with CKD in rural and peri-urban Bangladesh. *Ther Adv Chronic Dis.* 2021;12:204062232111035281.
- Hasan M, Sutradhar I, Gupta RD, Sarker M. Prevalence of chronic kidney disease in South Asia: a systematic review. *BMC Nephrol.* 2018;19(1):291.
- Burnier M, Damianaki A. Hypertension as cardiovascular risk factor in chronic kidney disease. *Circ Res.* 2023;132(8):1050-63.
- Horowitz B, Miskulin D, Zager P. Epidemiology of hypertension in CKD. *Adv Chronic Kidney Dis.* 2015;22(2):88-95.
- Huang QF, Hoshide S, Cheng HM, Park S, Park CG, Chen CH, et al. Management of hypertension in patients with chronic kidney disease in Asia. *Curr Hypertens Rev.* 2016;12(3):181-5.
- Prabitha P, Reshmi TR, Jayakumar KP. Analysis of prescription pattern of antihypertensives in various stages of chronic kidney disease. *Int J Basic Clin Pharmacol.* 2019;8:524-8.
- Hernandez MF, Chang TI. Revisiting hypertension treatment in patients with chronic kidney disease. *Semin Nephrol.* 2024;44(2):151514.
- Pugh D, Gallacher PJ, Dhaun N. Management of hypertension in chronic kidney disease. *Drugs.* 2019;79(4):365-79.
- Lee JY, Han SH. Blood pressure control in patients with chronic kidney disease. *Korean J Intern Med.* 2021;36(4):780-94.
- Oommen JM, Nerurkar DP, Sajith M, Jawale S, Ambike S. Prescription pattern of chronic kidney disease patients undergoing hemodialysis in tertiary and private hospital. *J Young Pharm.* 2019;11(2):202-6.
- Yousuf MA, Ahsan T, Hossain M, et al. Prevalence of anemia among chronic kidney disease patients: a study in tertiary care hospitals in Dhaka. *Bangladesh Renal J.* 2020;9(2):45-50.

20. Rahman MA, Shanjana Y, Ahmed MS, Dhama K, Hasan Fahim M, Mahmud T, et al. Hematological abnormalities and comorbidities are associated with the severity of kidney disease: a hospital-based cross-sectional study in Bangladesh. *Clin Pathol.* 2022;15:2632010X221114807.
21. Khan MSH, Chy UK, Islam MR, Alam D, Habib R, Latif ZA. State of blood pressure control in adult type 2 diabetic patients with chronic kidney disease and hypertension: experience from a tertiary care centre of Bangladesh. *BIRDEM Med J.* 2021;11(3): 212-7.
22. Liu B, Wang Q, Wang Y, Wang J, Zhang L, Zhao M, et al. Utilization of antihypertensive drugs among chronic kidney disease patients: results from the Chinese cohort study of chronic kidney disease (C-STRIDE). *J Clin Hypertens (Greenwich).* 2020; 22(1):57-64.
23. Al-Mirza A, Al-Subhi HR, Abdelrahman AM. Utilization patterns of antihypertensive drugs in the management of hypertension among patients with chronic kidney disease at a tertiary hospital. *Int J Basic Clin Pharmacol* 2021;10(5):466-70.
24. Magvanjav O, Cooper-DeHoff RM, McDonough CW, Gong Y, Segal MS, Hogan WR, et al. Antihypertensive therapy prescribing patterns and correlates of blood pressure control among hypertensive patients with chronic kidney disease. *J Clin Hypertens (Greenwich).* 2019;21(1):91-101.