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Original Research Article

Pattern of antihypertensive drug utilisation among chronic kidney disease patients in a dialysis unit of a tertiary care hospital

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Abstract

Background: India is experiencing a rapid health transition and is projected to become a major reservoir of chronic diseases like diabetes and hypertension and 25–40% of these subjects may develop chronic kidney disease (CKD) and end stage renal disease (ESRD)
Objectives: To analyse the drug utilisation pattern of antihypertensives in patients with Chronic Kidney Disease.
Materials and Methods: A cross sectional study conducted in patients with Chronic Kidney Disease in a tertiary care hospital over a period of 6 months in 2014. The information regarding demographic details and antihypertensive drugs prescribed were collected from the patient's case records and the data was compiled and subjected to statistical analysis
Results: Total of 95 case records was analyzed. CKD was more common in males, with male to female ratio of 4:1. 49.47% of the patients belonged to the age group of 40 – 60 years followed by 31 – 40 years (26.32%). Among the antihypertensive calcium channel blockers, diuretics, centrally acting antihypertensives, β blockers, α blockers, vasodilators, α+β blockers and ACE inhibitors were routinely used.
Conclusion: Combination of various antihypertensive drugs were used in CKD patients undergoing dialysis.
Keywords: Chronic kidney disease, antihypertensives, drug utilisation

1.Introduction

Chronic kidney disease (CKD) is a worldwide health problem, with adverse outcomes of kidney failure, cardiovascular disease (CVD) and premature death.[1] CKD is characterized by progressive destruction of renal mass with irreversible sclerosis and loss of nephrons over a period of months to years, depending on the underlying aetiology.[2] The exact incidence and prevalence rates are not available, it is estimated that one out of 10,000 people suffer from CKD in India and around 100 thousand new patients develop ESRD in India annually. Approximately 1 of 5 adults with high blood pressure has CKD.[3][4]

Medical care for CKD patients is complex, due to widespread co-morbidities and major risk factors for CKD. The progression of CKD and the deterioration of kidney function can be slowed by optimal treatment of underlying co-morbidities and risk factors, which can be accomplished with lifestyle modifications and/or different pharmacological interventions. CKD patients receive nearly 10 to 12 medications daily, many of which require multiple doses every day and due to this, frequent medication adjustments are required.[5] Prescribing pattern studies can provide useful information for the improvement of appropriate and effective use of drugs in a hospital. This will have an enormous impact on patient's quality of life and contribute substantially to the financial cost of patient care.[6]

2. Materials and Methods

A cross sectional study was conducted in the Department of Nephrology in K.R. Hospital attached to Mysore Medical College and Research Institute, Mysore over a period of 6 months in 2014. After obtaining the clearance and approval from the Institutional Ethics Committee, 95 inpatients who gave informed consent were included in the study.

Inpatients that came for dialysis and diagnosed of having Chronic Kidney Disease by the consultant Nephrologist according to KDOQI guidelines were included. Acute renal failure patients

were excluded. The information required was collected from the patient's case records and the data compiled under the headings: demographic data, clinical data and medication data.

2.1 Statistical analysis of the data

Descriptive statistics is done by measuring proportions. All the statistical measurements are done in SPSS version 19.0. Graphical representation is done in using Microsoft Excel.

3. Results

A total of 95 case records of patients having chronic kidney disease and on antihypertensive medications were collected and analyzed. CKD was more common in males 75 (78.95%) and 20 (21.05%) females, with male to female ratio of 4:1. Most of the patients belonged to the age group of 40 – 60 years (49.47%) followed by 31 – 40 years (26.32%), <30 years (15.79%) and >60 years (8.42%).

Among the anti-hypertensives, most commonly prescribed was calcium channel blockers (39.5%) in which amlodipine(61), nifedipine(20) and clinidipine(11) was given. Followed by diuretics(25.12%) which included furosemide (50), metazolamide (metazolone)(2) and torsemide(7); then β blockers (9.7%) were atenolol (8) and metaprolol(12); α blocker (7.9%) was prazosin(17); centrally acting drugs (10.2%) were moxonidine (12) and clonidine(10); α+β blockers (2.7%) were carvidilol (3) and nebivolol (3); vasodilators (3.2%) were nicorandil (7) and isosorbidedinitrate(3) and Angiotensin converting enzyme inhibitors (1.4%) was enalapril(3).

Drugs like amlodipine, atenolol, furosemide, enalapril were available as free drugs for the patients from the hospital.

Figure 1: Gender distribution of CKD patients

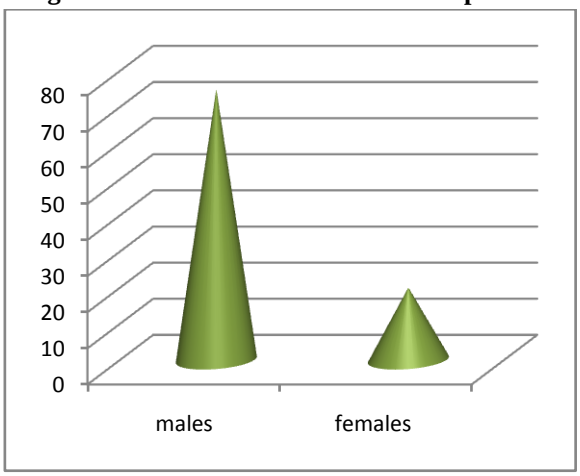

Figure 2: Pattern of antihypertensive in patients of CKD

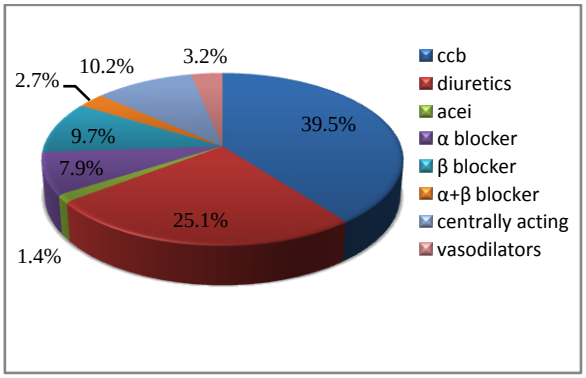

Table 1: Pattern of antihypertensives prescribed in patients with CKD

Antihypertensives	Frequency	Percent
Calcium channel blockers	85	39.53
Diuretics	54	25.12
ACE inhibitors	3	1.40
Alpha blocker	17	7.91
Beta blocker	21	9.77
Alpha and beta blocker	6	2.79
Centrally acting anti-hypertensives	22	10.23
Vasodilators	7	3.26

Figure 3: Antihypertensive drugs used in patients of CKD

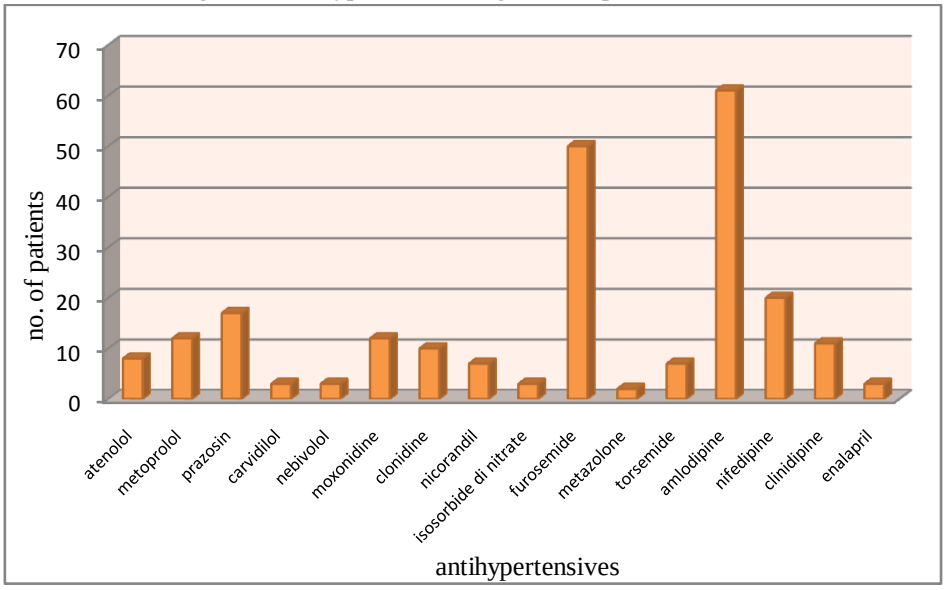

Table 2: Antihypertensive drugs used in patients of CKD

Drugs	Frequency	Percentage
Atenolol	8	3.49
Metoprolol	12	5.24
Prazosin	17	7.42
Carvidilol	3	1.31
Nebivolol	3	1.31
Moxonidine	12	5.24
Clonidine	10	4.37
Nicorandil	7	3.06
Isosorbidedinitrate	3	1.31
Furosemide	50	21.83
Metazolamide	2	0.87
Torsemide	7	3.06
Amlodipine	61	26.64
Nifedipine	20	8.73
Clinidipine	11	4.80
Enalapril	3	1.31

Table 3: Average cost of single dose of the drug in Rupees and its route of administration

Drug	Dose	Average cost of single dose of the drug in Rupees
Tab. Metoprolol	25mg	5.2
Tab. Prazosin	5mg	5
Tab. Carvedilol	3.125mg	2.6
Tab. Nebivolol	2.5mg	3.2
Tab. Moxonidine	0.3mg	5.2
Tab. Clonidine	100mcg	1.15
Tab. Nicorandil	5mg	11.8
Tab. Isosorbidedinitrate	10mg	1.4
InjectionFurosemide	40mg	4.1
Tab. Metazolamide	2.5mg	7
Tab. Torsemide	10mg	2.5
Tab. Nifedipine	10mg	1.8
Tab. Cilnidipine	10mg	5.8
Tab. Amlodipine	5mg	Free
Tab. Atenolol	12.5mg	Free
Tab. Furosemide	20mg	Free
Tab. Enalapril	2.5mg	Free

4. Discussion

Chronic kidney disease is defined as either kidney damage or a decreased glomerular filtration rate of less than 60 mL/min/1.73 m2 for 3 or more months by the Kidney Disease Outcomes Quality Initiative (K/DOQI) of the National Kidney Foundation (NKF).[7] Increased intraglomerular filtration pressure and glomerular hypertrophy develop as a response to loss of nephron number from different kidney diseases. This response is maladaptive, as it promotes the ongoing decline of kidney function even if the inciting process has been treated or spontaneously resolved. Control of systemic and glomerular hypertension is important in slowing the progression of CKD. Therefore, in addition to reduction of cardiovascular disease risk, antihypertensive therapy in patients with CKD also aims to slow the progression of nephron injury by reducing intraglomerular hypertension.

Elevated blood pressure increases proteinuria by increasing its flux across the glomerular capillaries. Conversely, the renoprotective effect of antihypertensive medications is gauged through the consequent reduction of proteinuria. Thus, the more effective a given treatment is in lowering protein excretion, the greater the subsequent impact on protection from decline in GFR. This observation is the basis for the treatment guideline establishing 125/75 mmHg as the target blood pressure in proteinuric CKD patients.[8][9]

Calcium channel blockers cause vascular smooth muscle relaxation, especially in arterial beds and produce negative inotropic and chronotropic effects. They are also renoprotective agents, the calcium-channel blockers are subdivided into dihydropyridine and nondihydropyridine agents. Long-acting dihydropyridine agents are potent vasodilators with little or no effect on cardiac contractility or cardiac conduction. The non-dihydropyridines have both mild vasodilator and cardiac depressant activity and are effective in decreasing proteinuria in diabetic kidney disease.[10][11][12]

Diuretics act primarily by increasing sodium excretion and decrease the blood pressure and also by facilitating the response of other antihypertensive agents in CKD. Thiazide and loop diuretics increase the delivery of sodium to the distal tubule, thereby increasing urinary potassium excretion. This may be a useful side effect in CKD, especially in patients treated with an ACE inhibitor or ARB. Nonetheless, hypokalemia can occur, and if not treated appropriately, poses the same potential risks as in patients without CKD. So, potassium-sparing diuretics are generally used as an adjunct to other diuretics for prevention and treatment of diuretic-induced hypokalemia and in patients with edematous states.[10][13]

Increased glomerular capillary pressure induces glomerular injury, and ACE inhibitors reduce this parameter both by decreasing arterial blood pressure and by dilating renal efferent arterioles, also ACE inhibitors increase the permeability selectivity of the filtering membrane, thereby diminishing exposure of the mesangium to proteinaceous factors that may stimulate mesangial cell proliferation and matrix production.ARBs act by expressing insurmountable antagonism due to slow dissociation kinetics of the compounds from the AT_1 receptor. Both ACE inhibitors and ARB's may result in adverse effects like early decrease in GFR, hypotension and hyperkalemia are seen, which are more common in CKD.[10][14][15]

Centrally acting antihypertensives lowers BP without compromising the renal blood flow or glomerular filtration rate.[13] Sympathetic overactivity is commonly seen in chronic kidney disease and is an important contributor to increasing the risk of cardiovascular events as well as increasing renal disease progression. β blockers are not used in large part may be due to tolerability of these agents and water-soluble β blockers such as atenolol and metoprolol are dialyzable and require supplementation to avoid exacerbation of arrhythmias following dialysis.[16] And α blockers are not commonly used due to their relatively high incidence of side effects like rebound hypertension after sudden discontinuation of therapy and sometimes even with gradual withdrawal of therapy.[11]

Out of the 95 case records evaluated, males are predominant which is similar to other studies.[17] Several classes of antihypertensive have been used for affording therapeutic benefits for CKD patients undergoing weekly twice dialysis. Among the antihypertensive, calcium channel blockers (39.53%) in which the preferred drugs were amlodipine, nifedipine and clinidipine were used. The diuretics (25.12%) used were furosemide, metazolamide and toresimide. The 3rdgroup of drugs used was centrally acting antihypertensive (10.23%) among which moxonidine and clonidine were used. The 4thgroup of drugs was β blockers (9.77%), in which atenolol and metoprolol were used. The 5th group of drug used was prazosin which is anα blocker (7.91%). The 6th group includes vasodilators (3.26%) among which nicorandil and isosorbide dinitrate is used. The 7th group has α+β blockers (2.79%) which includes carvedilol and nebivolol. The last group is ACE inhibitors which has enalapril. Mainly these were orally administered, but in some patients, diuretics were also administered by parenteral route.

4. Conclusion

Data of a total of 95 medical case records pertaining to CKD patients were assessed. The prevalence of CKD was higher in males The preferential drugs employed among antihypertensives were calcium channel blockers, diuretics, β blockers, centrally acting antihypertensives, α blockers, vasodilators, α+β blockers and ACE inhibitors. The overall impression about the prescription trends noted herein is suggestive of modest and rational approach in prescribing practices. Antihypertensives have been employed with different permutations and combinations among the dialysis patients.

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