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A PROSPECTIVE OBSERVATIONAL STUDY ON EVALUATION OF ANTIHYPERTENSIVE DRUGS IN HEMODIALYSIS PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Aim: To study the evaluation of various antihypertensive drugs in hemodialysis patients in a Tertiary Care Hospital. Objective: A Prospective Observational Study was conducted to study and analyse the prescription pattern and efficacy of various antihypertensive drugs in hemodialysis patients. Methodology: In this study a total of 100 patients were enrolled based on inclusion and exclusion criteria. The study was conducted for six months in End Stage Renal Disease patients undergoing hemodialysis with hypertension. Effectiveness of antihypertensives was evaluated by monitoring blood pressure control. The patients were followed up for a period of 12 weeks. Results: A total of 100 patients were included in this study. Male patients (73%) were more compared to female patients (27%). The maximum number of patients was from the age group of 51-60 years (50%). In the present study, Calcium Channel Blockers (42%) and Beta Blockers (30%) were most commonly prescribed along with Diuretics. Efficacy of various antihypertensive drugs was evaluated by monitoring Pre-dialysis blood pressure. Calcium Channel Blockers with Beta Blockers and Diuretics have shown better efficacy than all other combinations. One tailed paired t test with alpha level of 0.05 was applied to compare the blood pressure before and after taking antihypertensives. Conclusion: Our study revealed that multi-drug therapy was more preferred than mono-drug therapy. Calcium Channel Blockers with Beta Blockers and Loop Diuretics were frequently prescribed and have shown more efficacy than other combinations. It has been concluded that prescribing of antihypertensives in an appropriate manner is helpful for improving the quality of life.

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INTRODUCTION

Kidney disease are common, harmful and often treatable. About 8-10% of adult population have some form of kidney damage, and every year millions die prematurely of complications related to Chronic Kidney Disease (CKD).[1] According to World Health Organization (WHO) Global Burden of disease study, about 1.2 million deaths occurred due to kidney disease which made CKD as the 13th most common cause of death.[2] The mortality rate of Chronic Kidney Disease (CKD) has increased by 31.7% over the last 10 years. CKD is defined as either kidney damage or kidney failure for $\geq$ 3 months. The severity of CKD is classified from 1 to 5 depending upon level of glomerular filtration rate.[3] If CKD is detected early and managed appropriately, the deterioration in kidney function can be slowed or even stopped, and the risk of associated cardiovascular complications can be reduced.[1] The prevalence of hypertension is higher among patients with CKD, progressively increasing with the severity of CKD. The excess salt and water retention leads to the increased blood flow to the tissues. The tissue arterioles vasoconstrict to decrease the excessive blood flow and thereby raises the peripheral vascular resistance.[4]

According to JNC 8 guidelines, the BP goal for patients with CKD is less than 140/90 mmHg. Most of the CKD patients require 2 or more antihypertensives for better control. Angiotensin Converting Enzyme Inhibitors (ACEI) and Angiotensin Receptor Blockers (ARB) are considered as the first line agents for hypertension. Second line agents include Calcium Channel Blockers (CCB) followed by Beta Blockers along with Diuretics. Although, the first line drug for hypertension in CKD patients are ACEI and ARB but these drugs are not used in stage 5 CKD patients as it increases serum potassium level and worsens creatinine level.

The objective of the study was to evaluate the prescription pattern and efficacy of various antihypertensive drugs in End Stage Renal Disease patients (ESRD).

MATERIAL AND METHODS

A prospective observational study was conducted in a tertiary care hospital for a period of 6 months after getting approval from the institutional ethical committee. All the patients with hypertension undergoing hemodialysis between the age group of 30-70 years were included in the study. A total of 127 patients received Hemodialysis therapy, 27 patients were excluded from the study since they were co-infected with HIV and Hepatitis. Patient's pre dialysis BP was monitored and the patient was followed up for a period of 12 weeks.

The patient's information collected were recorded in a master chart. Percentages were calculated. One tailed paired t test was performed and a P value <0.05 was considered to be significant.

RESULTS

This study showed that the prevalence of CKD was more in males than females.

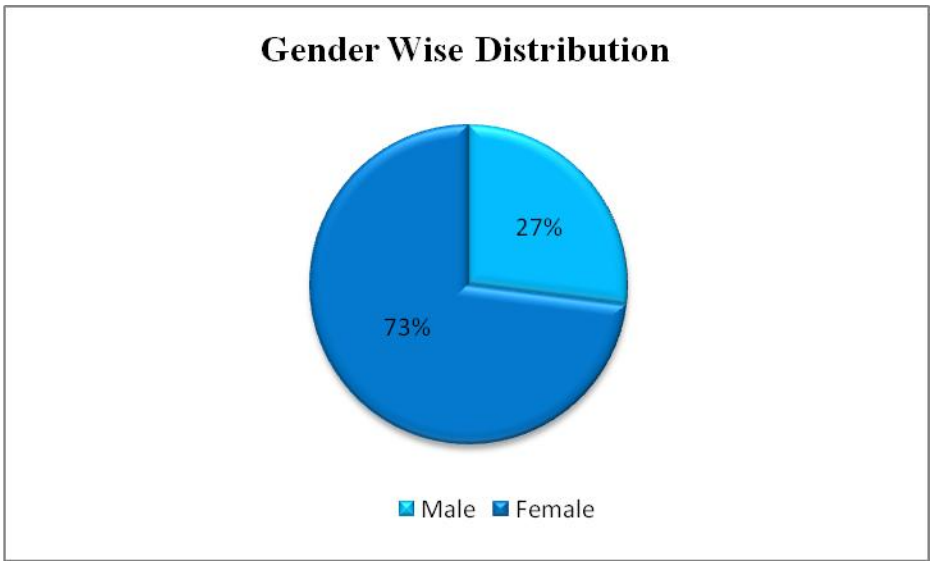

Figure no 1: Gender Wise Distribution.

We have assigned the patients within the age group of 30-70 years. The maximum number of patients was from the age group of 51-60 years (50%) followed by patients of age group 41-50 years (21%), 61-70 years (18%) and minimum number of patients was observed in the age group of 31-40 years (11%) (fig.2).

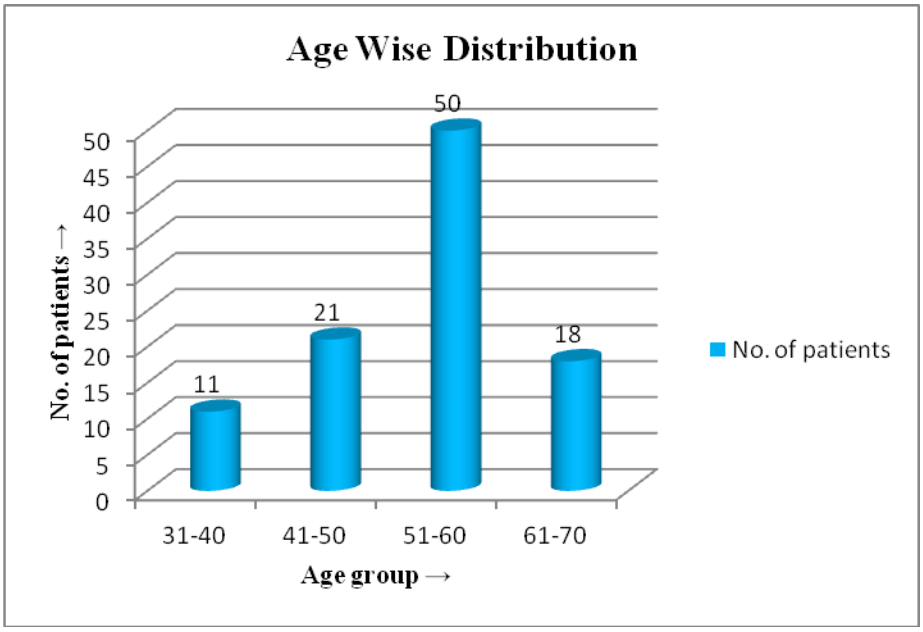

Figure no 2: Age Wise Distribution.

Co-morbid conditions:

The risk and co-morbidities associated with these patients was Diabetes mellitus (49%), Coronary Artery Disease (8%), Anemia (12%) and Cerebrovascular Accident (3%) (fig.3).

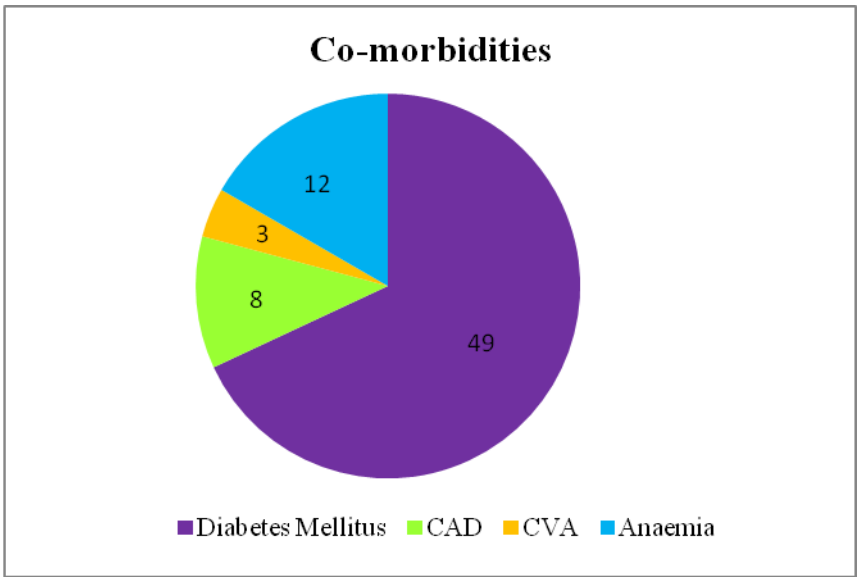

Figure no 3: Co-morbid Conditions Social history:

Smoking and alcoholism are major social histories contributing to kidney failure. In this study, among 100 patients 43% of patients were the smokers and 30% were alcoholic (fig.4).

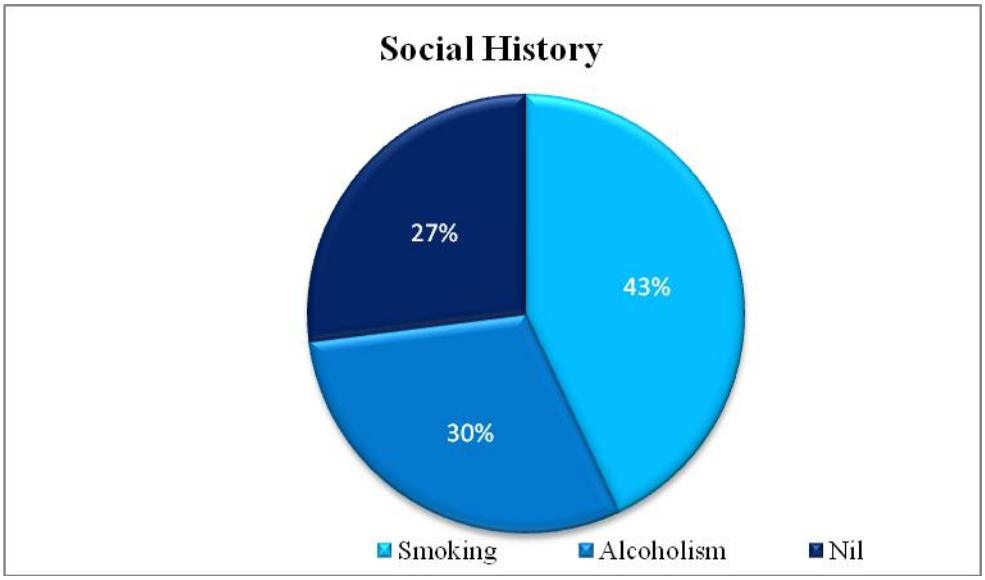

Figure no.4: Social History.

Prescription pattern of antihypertensive agents in hemodialysis patients:

Most of the CKD patients with hypertension were treated with multi drug therapy. In the present study the most commonly prescribed antihypertensives were found to be CCBs (42%) and Beta Blockers (30%) along with Diuretics. Other drug prescribed include Alpha Blockers (12%) Alpha + Beta Blockers (8%) Alpha agonist (8%). Among CCB most commonly prescribed drug was found to be Cilnidipine (48%) followed by Amlodipine (41%) and Nifedipine (7%). Cilnidipine has its longer duration of action of 24 hours and also prevents reflex tachycardia as it's selectively acts on both L and N type of calcium channels. Among Beta blockers, Metprolol (60%) was most commonly prescribed followed by Nebivolol (8%). Torsemide was preferred over Furosemide due to its longer duration of action and increased potency (fig. 5).

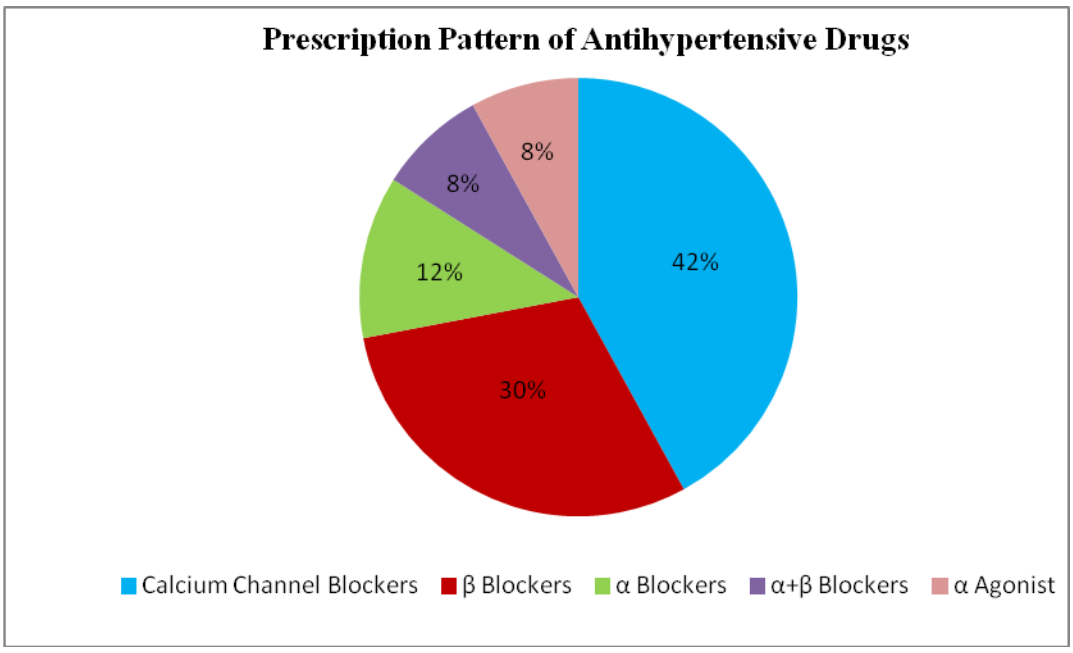

Figure no 5: Prescription Pattern of Antihypertensive Drugs in Hemodialysis Patients.

Efficacy of antihypertensive drugs in hemodialysis patients:

In this study, different combinations of antihypertensive drugs had been used in controlling blood pressure of hypertensive patients with ESRD. Most of the patients were given CCB with BB and Diuretics (33%) followed by CCB with Alpha blockers and Diuretics (8%). (Table 1).

Table no 1: Pattern of Antihypertensive Drugs Prescribed.

ANTIHYPERTENSIVE DRUGS COMBINATION	NO. OF PATIENTS (n=100)
Amlodipine + Prazosin + Furosemide + Nifedipine	2
Cilnidipine + Torsemide + Metoprolol	21
Amlodipine + Prazosin + Furosemide	6
Cilnidipine + Prazosin + Carvedilol + Furosemide	6
Cilnidipine + Torsemide + Prazosin	8
Cilnidipine + Torsemide + Carvedilol	5
Clonidine + Cilnidipine + Torsemide + Nebivolol	8
Clonidine + Carvedilol + Metoprolol + Furosemide	6
Amlodipine + Torsemide + Metoprolol	33
Nifedipine + Clonidine + Furosemide + Prazosin	5

Table 2 shows the mean difference of systolic blood pressure (SBP) before and after taking antihypertensive drugs. It shows there is a reduction in blood pressure after the consumption of medication from the initial BP. The combination of CCB with Beta Blocker s and Diuretics showed the largest mean difference (SBP reduction 29.39 mmHg). A one tailed paired t test with the alpha level of 0.05 was applied to compare the blood pressure before and after taking antihypertensive drugs. On average, mean difference of SBP before and after taking antihypertensive drugs were statistically significant ($p<0.05$) except for the combinations of CCB with Alpha+ Beta blockers and Diuretics and two CCB with Alpha blockers and Diuretics.

Table no 2: Mean Difference of Systolic BP Before and After Taking Antihypertensive Drugs.

DRUG CATEGORY	MEAN DIFFERENCE	P VALUE
Amlodipine + Prazosin + Furosemide + Nifedipine	25	0.0628
Cilnidipine + Torsemide + Metoprolol	28.57	0.0001*
Amlodipine + Prazosin + Furosemide	16.67	0.0099*
Cilnidipine + Prazosin + Carvedilol + Furosemide	16.67	0.0211*
Cilnidipine + Torsemide + Prazosin	15	0.0027*
Cilnidipine + Torsemide + Carvedilol	10	0.0945
Clonidine + Cilnidipine + Torsemide + Nebivolol	17.5	0.0262*
Clonidine + Carvedilol + Metoprolol + Furosemide	11.67	0.0421*
Amlodipine + Torsemide + Metoprolol	29.39	0.0001*
Nifedipine + Clonidine + Furosemide + Prazosin	18	0.0907

*The mean difference is significant at the 0.05 level

Table 3 shows the mean difference of diastolic blood pressure (DBP) before and after taking antihypertensive drugs. Patients DBP showed a significant decrease after taking antihypertensive drugs with $p<0.05$. The greatest mean difference of DBP was observed in patients taking CCB with Beta blockers and Diuretics (19.69 mmHg, $p<0.05$).

Table no 3: Mean Difference of Diastolic BP Before and After Taking Antihypertensive Drugs.

DRUG CATEGORY	MEAN DIFFERENCE	P VALUE
Amlodipine + Prazosin + Furosemide + Nifedipine	15	0.1024
Cilnidipine + Torsemide + Metoprolol	17.62	0.0001*
Amlodipine + Prazosin + Furosemide	11.66	0.1004
Cilnidpine + Prazosin + Carvedilol + Furosemide	6.67	0.0510*
Cilnidipine + Torsemide + Prazosin	6.25	0.0246*
Cilnidpine + Torsemide + Carvedilol	8	0.0889
Clonidine + Cilnidpine + Torsemide + Nebivolol	7.5	0.0013*
Clonidine + Carvedilol + Metoprolol + Furosemide	6.67	0.0125*
Amlodipine + Torsemide + Metoprolol	19.69	0.0001*
Nifedipine + Clonidine + Furosemide + Prazosin	6	0.1523

*The mean difference is significant at 0.05 level

DISCUSSION

Our study reveals that prevalence of hypertension in CKD is more in males (73%) than females (27%) which was similar to the study conducted by Neethu Joseph, *et al.,* on A Study On Prescription Pattern Of Antihypertensive Agents In Chronic Renal Failure Patients And Assessment Of Medication Adherence.[5] The maximum number of patients were from the age group of 51-60 years (50%) and minimum number of patients were from 31-40 years (11%) which was similar to the study conducted by P. Ansuman Abishek, *et al., on* Antihypertensive Drug Utilization Pattern Among CKD Patients Undergoing Maintenance Dialysis In A Tertiary Care Teaching Hospital in which most of the patients belonged to the age group of 51-60 years(43%).[6]

The major co-morbities found in these patients was Diabetes Mellitus (49%), Anemia (12%) Coronary Artery Disease (8%) and Cerebrovascular Accident (3%). In our study, 43% of patients were the smokers and 30% were alcoholic.[5]

The most commonly prescribed antihypertensives were found to be CCBs (42%) and Beta Blockers (30%) along with Diuretics. Efficacy of various antihypertensive was evaluated by monitoring Pre-dialysis blood pressure. Calcium Channel Blockers with Beta Blockers and

Diuretics have shown better efficacy than all other combinations. One tailed paired t test with the alpha level of 0.05 was applied to compare the blood pressure before and after taking antihypertensives. Most of the drug combination prescribed was significant.[7,8]

CONCLUSION

CKD and HTN are chronic diseases which are interrelated to each other and cyclic in nature. HTN is a cause and complication of CKD. Our study revealed that multi-drug therapy was more preferred than mono-drug therapy. The preferential drugs employed among the patients were CCBs, Beta Blockers, Alpha Blockers, Alpha Agonist, mixed Alpha-Beta blockers and Diuretics. In our study a combination of CCB with β Blockers and Diuretics were the most frequently prescribed. Use of antihypertensives in CKD patients did not deviate from the guidelines laid down by NKF KDOQI guidelines. Combinations of antihypertensive drugs prescribed were effective in reducing blood pressure since there was significant decrease in blood pressure before and after taking antihypertensive drugs. In our study we have found that CCB with β Blockers and Loop Diuretics have shown more efficacy when compared with other drug combinations. It has been concluded that prescribing of antihypertensive drugs in an appropriate manner is helpful for improving the quality of life. In future, this helps to maintain supervision over efficacy of various antihypertensive drugs in chronic kidney disease patients.

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CONFLICT OF INTEREST

Nil

ABBREVIATIONS

WHO: World Health Organization
CKD: Chronic Kidney Disease
CAD: Coronary Artery Disease
CVA: Cerebrovascular Accident
ACEI: Angiotensin Converting Enzyme Inhibitors
ARB: Angiotensin Receptor Blockers
CCB: Calcium Channel Blockers
ESRD: End Stage Renal Disease
SBP: Systolic Blood Pressure
DBP: Diastolic Blood Pressure

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