IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 11 Ver. XI (Nov. 2017), PP 12-23
www.iosrjournals.org

Comparative Study of The Effects of Enalapril And Cilnidipine On Blood Pressure, Heart Rate, Proteinuria And Lipid Profile in Hypertensive Patients

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Abstract:*Hypertension can lead to myocardial infarction, stroke, renal failure, and death if not detected and treated appropriately. Cilnidipine, dual L/N-type Ca^{2+} channel blocker, is effective in reducing proteinuria. An open label, parallel group, prospective comparative clinical study was conducted in out-patient department of General Medicine in Osmania General Hospital to compare the efficacy and safety of enalapril and cilnidipine in 60 hypertensive patients. They were divided in to two groups of 30 patients in the age group 25-60years ofeither sex. Group A received Tab. Enalapril 5mg once a day orally for 6 months. Group B received Tab.Cilnidipine 10mg once a day orally for 6 months. Blood pressure, heart rate and spot urinary protein to creatinine ratio were recorded at baseline and at 1, 3 & 6 months of treatment. Lipid profile test was done at baseline and at 6 months of treatment. Any adverse effects of the treatment were also recorded. Paired t-test to compare within the group and unpaired t-test for intergroup analysis was used, with level of significance 0.05. The group receiving cilnidipine is found to have equal efficacy and lower incidence of adverse effects compared to the group receiving enalapril.*

***Keywords:** *Cilnidipine, Enalapril, Heart rate, Hypertension, Proteinuria*

Date of Submission: 17-11-2017 Date of acceptance: 30-11-2017

I. Introduction

Hypertension is a widespread public health problem and a major risk factor[1]. It may lead to damage of heart, kidney, brain, vasculature and other organs results in premature morbidity and death[2].Epidemiological studies have demonstrated that a higher heart rate is associated with a long term risk of cardiovascular mortality, independent of other cardiac risk factors[3].It was reported that antihypertensive therapy suppressed the progression of renal dysfunction[4]. Some of the antihypertensive drugs are reported to affect lipid levels and worsen glycemic control.

Enalapril, an angiotensin-converting enzyme inhibitor (ACEI) effectively controls blood pressure(BP) & reduces both clinic and ambulatory heart rate(HR) in hypertensive patients with faster HR, who seem to be at higher risk[5].ACE inhibitors reduce proteinuria insteroid resistant nephrotic syndrome, which may be due to a specific intraglomeruläraction, rather than a decrease in BP or GFR. It also has a beneficial effect onserum proteins and lipid profile and may decrease morbidity and extrarenal complications of nephritic syndrome[6].

Cilnidipine inhibits N-type Ca^{2+} channels more potently than other Ca^{2+} channel blockers and attenuates norepinephrine release from sympathetic nerve endings. The inhibitory effect on the N-type ca.+ channel by Cilnidipine may bestow an additional clinical advantage for the treatment of hypertension, such as suppression of reflex tachycardia.In clinical studies, Rose and Ikebukorodemonstrated that cilnidipine significantly decreased urinary albumin excretion without affecting serum creatinine concentration in hypertensive patients, which is comparable to the angiotensin converting enzyme inhibitor benazepril[7]. Cilnidipine is superior to amlodipine inpreventing the progression of proteinuria in hypertensivepatients when coupled with a renin–angiotensin systeminhibitor[8].Unlike Amlodipine, Cilnidipine decreased urinary protein excretion and reduced serum triglycerides in hypertensive patients with diabetes mellitus[9]. In a study, at the end of six months treatment with CCBs, there was significant decrease in total cholesterol (TC), serum uric acid level and significant increase in HDL cholesterol[10]. Enalapril is well tolerated, has few class-specific adverse effects, and may offer a potential advantage over captopril by having fewer sulfhydryl-related adverse effects[11]. On meta-analysis of safety of Cilnidipine in a study, the major adverse reactions for cilnidipine included headache (3.29%), dizziness (4.61%), and facial flushing (5.04%) andCilnidipine was equally effective and safe compared to Amlodipine[12]. Therapy with cilnidipine resulted in complete resolution of amlodipine-induced edema in all the cases without significant worsening of hypertension or tachycardia and Cilnidipine is an acceptable alternative antihypertensive for patients with amlodipine-induced edema[13].

1.1 Aims and objectives

- To evaluate and compare the effects of enalapril and cilnidipine on blood pressure, heart rate, proteinuria and lipid profile in hypertensive patients.
- To compare the adverse effect profile of enalapril and cilnidipine in hypertensive patients.

II. Patients And Methods

2.1Place of study: The study was conducted at Out-Patient Department of General Medicine, Osmania General Hospital, Hyderabad.

2.2 Study design: Open label and parallel group prospective comparative clinical study between enalapril and cilnidipine in hypertensive patients.

Selection criteria of the patient

Inclusion Criteria

1. Patients aged 25years to 60years.
2. Both males and females are included.
3. Patients diagnosed with mild and moderate hypertension with systolic BP > 139 and < 180 & Diastolic BP >89 and < 110.
4. UPCR >300mg/g.

Exclusion Criteria

1. Pregnant patients and breast feeding mothers.
2. Severe hypertension.
3. Patients with cerebrovascular disease.
4. Patients with ischaemic heart disease, congestive cardiac failure, cardiac arrhythmia.
5. Patients with liver impairment, malignancy, diabetes mellitus.
6. Patients on other medication(hypolipidaemics, antacids, non-steroidal anti-inflammatory drugs, systemic corticosteroids).
7. Patients on multidrug antihypertensive therapy.
8. Patients who did not give written informed consent.

III. Methodology

Approval from Institutional Ethics Committee of Osmania Medical College, Hyderabad was obtained. After selection of patients based on the above criteria, patient was explained about the study in their own understandable language and written informed consent was obtained.After initial screening, the demographic data, medical history, findings of physical examination and clinical examination were recorded in the case report form.

3.1 Treatment

Group A patients received Tab.Enalapril 5mg orally once a day daily for 6 months.

Group B patients received Tab.Cilnidipine 10mg orally once a day daily for 6 months.

3.2 Follow-up

Follow-up was done at 1, 3 & 6 months of treatment.

BP, HR and UPCR were recorded at baseline and at 1, 3 & 6 months of treatment.

Lipid profile test was done at baseline and at 6 months of treatment.

Any adverse effects of the treatment were also recorded.

3.3 Systolic and diastolic blood pressure was measured in right arm, sitting posture by auscultatory method using standard mercury sphygmomanometer. Two recordings of blood pressure were taken at an interval of 15 min by the same physician.

3. 4 Heart rate was measured after BP recordings by palpating the radial pulse for one minute.

3.5 UPCR spot urinary sample was collected.

Estimation of urinary proteins by Kingbury method.

Estimation of urinary creatinine by Jaffe's kinetic assay.

Spot Urinary Protein Creatinine Ratio (UPCR) =

Spot Urine Protein (mg/dl) / Spot Urine Creatinine (mg/dl)

Spot urinary protein content was standardized for urinary excretion of 1g creatinine.

3.6 Lipid profile After the patients had fasted overnight for at least 8 hours, blood was drawn and collected in bottles. Serum was collected by allowing the blood to clot. TC was estimated by the cholesterol oxidase - peroxidase method, TGs by glycerophosphate - oxidase method, and HDL-C by the phosphotungstate magnesium chloride method. LDL-C was calculated by Friedwald's formula.

LDL Cholesterol = Total Cholesterol – HDL Cholesterol – Triglycerides/5

3.7 Compliance The patients were called for review with filled and empty blisters of the tablets. Compliance to study medicines is measured by pill count during each follow up.

3.8 Statistical analysis

Results were analysed using GraphPad Prism 7.0 h software for Mac Book Pro. Paired t-test to compare within the group and unpaired t-test for intergroup analysis was used, with level of significance 0.05.

IV. Observations And Results

Table1 : Age and sex distribution of patients in Group A and Group B

Parameter	Group A	Group B
Number of patients	30	30
Mean age (years)	48.2 ± 6.4	46.3 ± 9.2
Gender Males Females	 20 10	 19 11

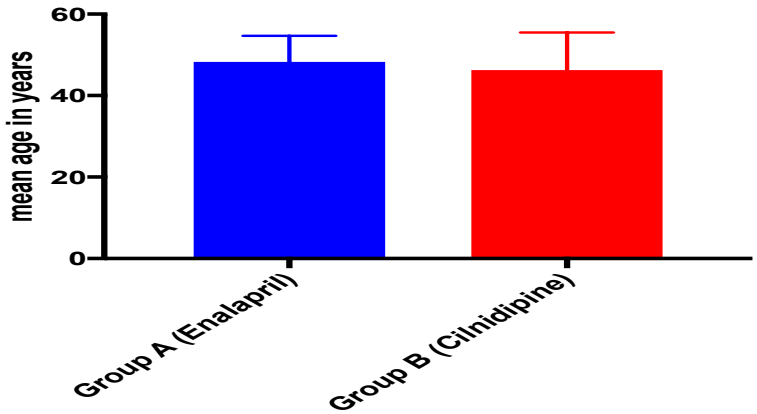

Figure1 : Age distribution of patients in Group A and Group **B**

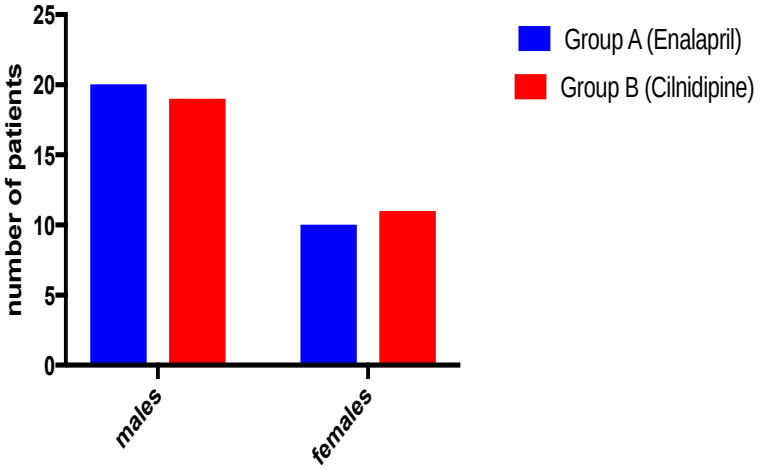

Figure 2: Sex distribution of patients in Group A and Group B

Table 2 : Effects of Enalapril on BP in mmHg, HR in beats/minute and UPCR in mg/g. (MEAN ±SD)

Parameter	Group A (Enalapril)			
	0 month (baseline)	After 1 month	After 3 months	After 6 months
SBP	157.7 ± 6.4	151.3± 6.7	146.5± 6.0	140.0 ± 3.9
p values in comparison to baseline		<0.0001	<0.0001	<0.0001
DBP	95.8 ± 3.2	91.7± 3.1	87.5± 3.0	84.5± 2.2
p values in comparison to baseline		<0.0001	<0.0001	<0.0001
HR	75.9± 3.6	74.8± 2.9	74.3± 2.8	73.8± 2.5
p values in comparison to baseline		<0.0001	<0.0001	<0.0001

UPCR	1323.5 ± 25.0	1313.5± 25.4	1303.4± 25.5	1292.9± 25.5
p values in comparison to baseline		<0.0001	<0.0001	<0.0001

Paired t-test was done.
p <0.05 – Significant
p >0.05- Not Significant

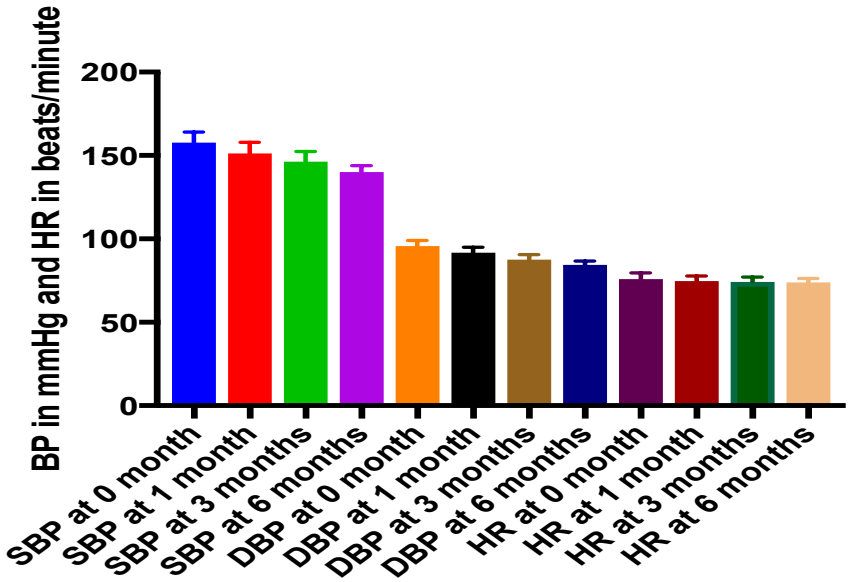

Figure 3: Effects of enalapril on BP and HR

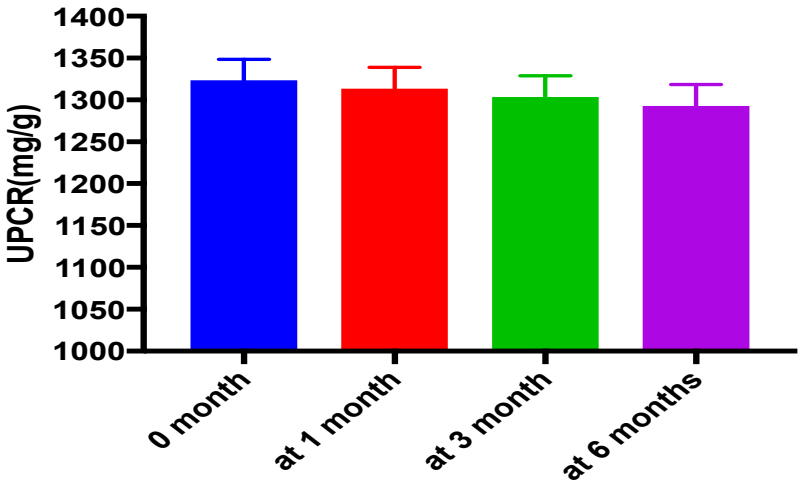

Figure4 : Effect of enalapril on UPCR

Table 3: Effects of enalapril on lipid profile (MEAN ±SD) in mg/dl

LIPID PROFILE	**Group A (Enalapril)**	
	0 month (baseline)	After 6 months
TC (mg/dl)	215.9 ± 16.5	213.1 ± 15.3
p values in comparison to baseline		<0.0001
TG (mg/dl)	170.5 ± 15.6	168.5 ± 14.6
p values in comparison to baseline		<0.0001
HDL (mg/dl)	41.8 ± 3.0	43.1 ± 2.6
p values in comparison to baseline		0.0013
LDL (mg/dl)	117.6 ± 10.9	116.9 ± 11.0
p values in comparison to baseline		<0.0001

Paired t-test was done.
p <0.05 – Significant

p >0.05- Not Significant

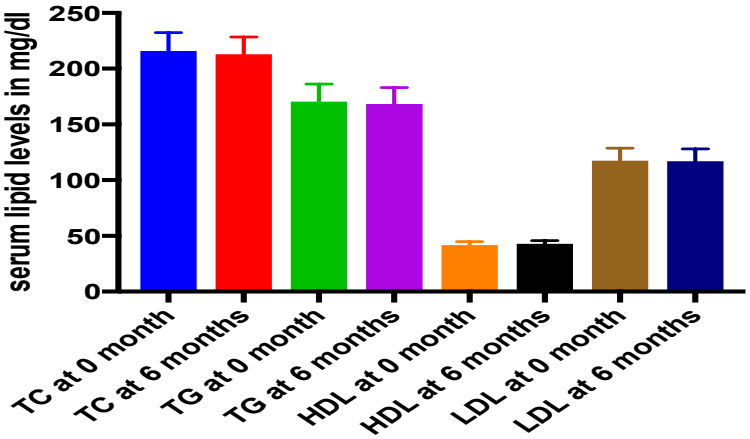

Figure5: Effects of enalapril on lipid profile

Table 4 : Effects of cilnidipine on BP in mmHg, HR in beats/minute and UPCR in mg/g. (MEAN ±SD)

Parameter	**Group B (Cilnidipine)**			
	0 month (baseline)	After 1 month	After 3 months	After 6 months
SBP	155.8 ± 5.5	150.3± 4.5	145.1± 3.8	138.9± 3.7
p values in comparison to baseline		<0.0001	<0.0001	<0.0001
DBP	95.4 ± 3.1	91.8± 3.1	87.7± 3.2	84.4± 3.0
p values in comparison to baseline		<0.0001	<0.0001	<0.0001
HR	75.2 ± 4.6	74.3± 3.9	73.6± 3.3	73.1 ± 2.8
p values in comparison to baseline		<0.0001	<0.0001	<0.0001
UPCR	1323.6 ± 23.8	1312.8± 23.4	1303.4± 22.6	1292.4± 21.9
p values in comparison to baseline		<0.0001	<0.0001	<0.0001

Paired t-test was done.
p <0.05 – Significant
p >0.05- Not Significant

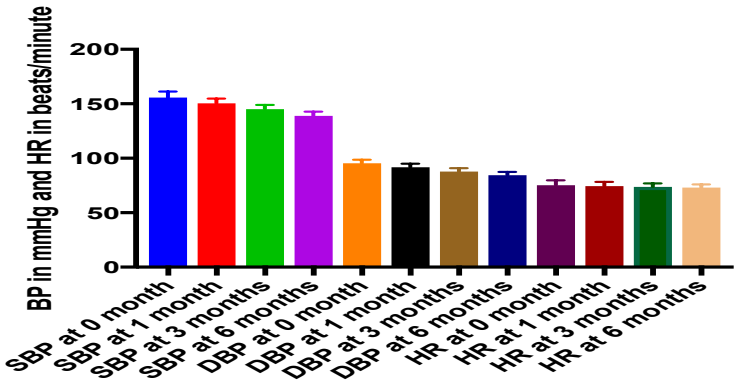

Figure6 : Effects of cilnidipine on BP and HR

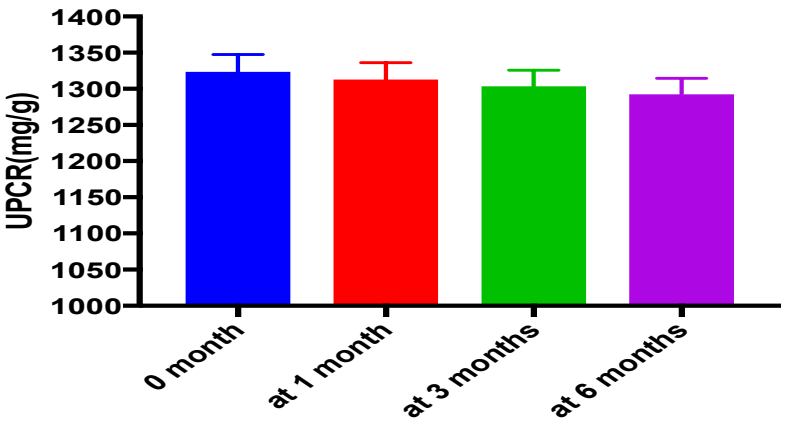

Figure7: Effect of cilnidipine on UPCR

Table 5 : Effects of cilnidipine on lipid profile (MEAN ±SD) in mg/dl

LIPID PROFILE	**Group B (Cilnidipine)**	
	0 month (baseline)	After 6 months
TC (mg/dl)	215.8 ± 13.6	213.0 ± 12.5
p values in comparison to baseline		<0.0001
TG (mg/dl)	170.3 ± 18.3	169.0 ± 17.5
p values in comparison to baseline		0.0027
HDL (mg/dl)	41.7 ± 3.6	44.4 ± 2.4
p values in comparison to baseline		<0.0001
LDL (mg/dl)	117.8 ± 10.3	117.1 ± 10.2
p values in comparison to baseline		0.0002

Paired t-test was done.
p <0.05 – Significant
p >0.05- Not Significant

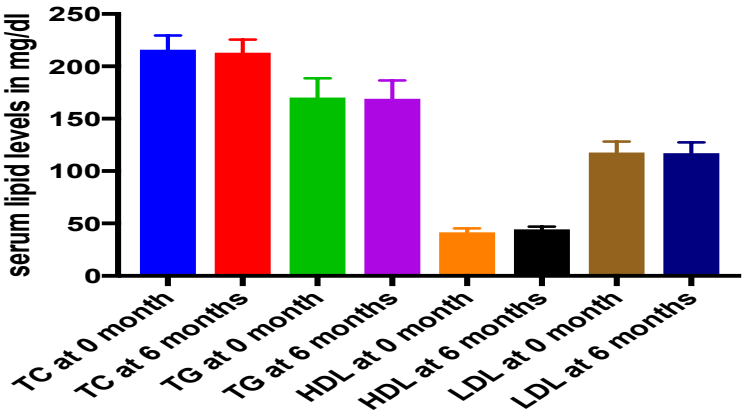

Figure8: Effects of cilnidipine on lipid profile

Table 6 : Average difference between baseline and after 6 months values of various parameters(MEAN **±SD)**

PARAMETER	**GROUP A**	**GROUP B**	**p value**
SBP	17.7 ± 2.5	16.9 ± 1.8	>0.05
DBP	11.3 ± 1.0	11.0 ± 0.1	>0.05
HR	2.1 ± 1.1	2.1 ± 1.8	>0.05
UPCR	31.0 ± 0.5	31.2 ± 1.9	>0.05
TC	2.8 ± 1.2	2.8 ± 1.1	>0.05
TG	2.0 ± 1.0	1.3 ± 0.8	0.0071
HDL	1.3 ± 0.4	2.7 ± 1.2	<0.0001
LDL	0.7 ± 0.1	0.7 ± 0.1	>0.05

Unpaired t-test was done.
p <0.05 – Significant
p >0.05- Not Significant

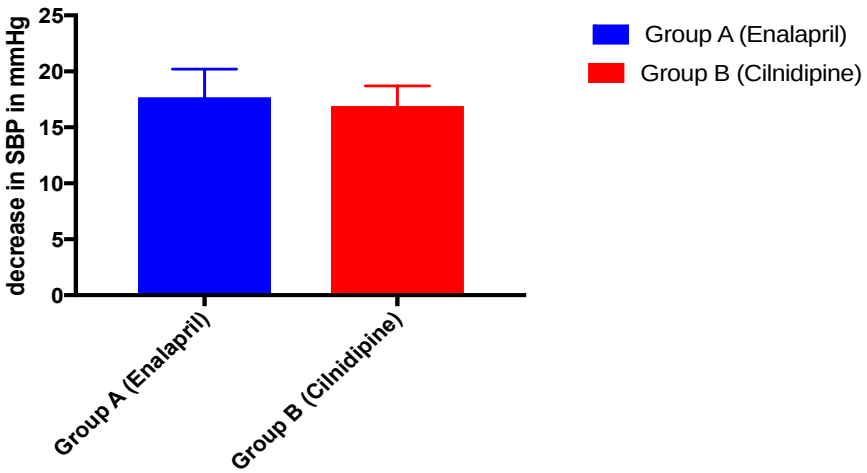

Figure9 : Decrease in SBP values in each group

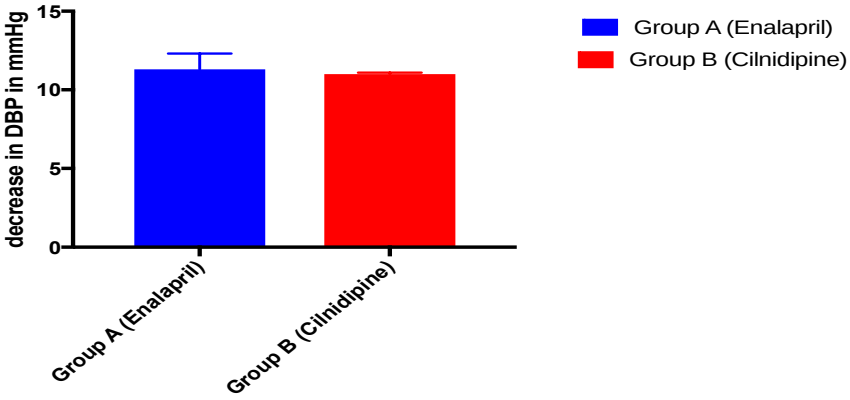

Figure10 : Decrease in DBP values in each group

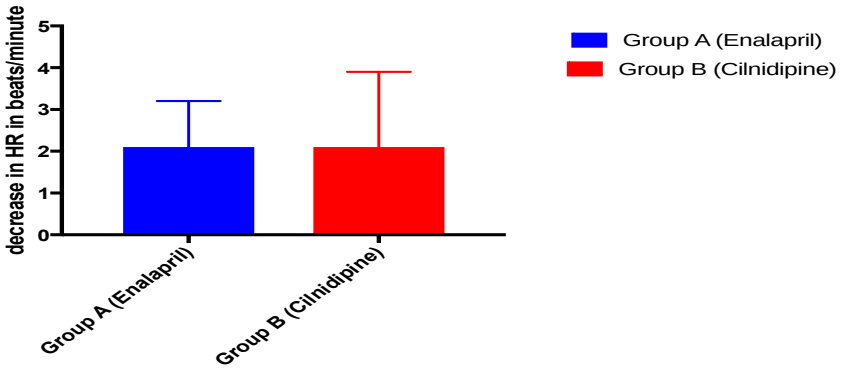

Figure11 : Decrease in HR values in each group

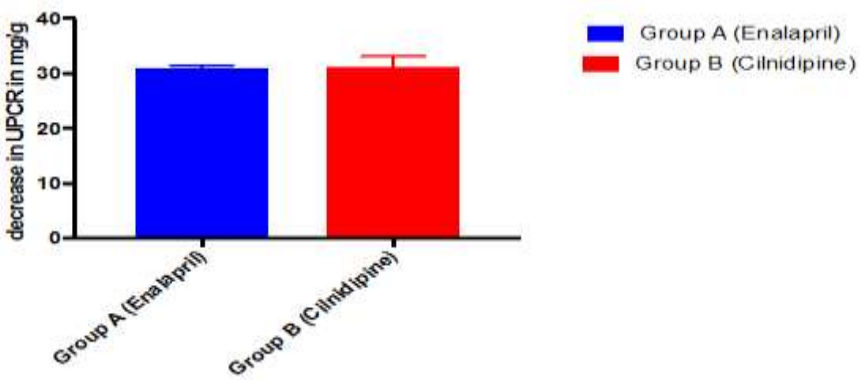

Figure12 : Decrease in UPCR values in each group

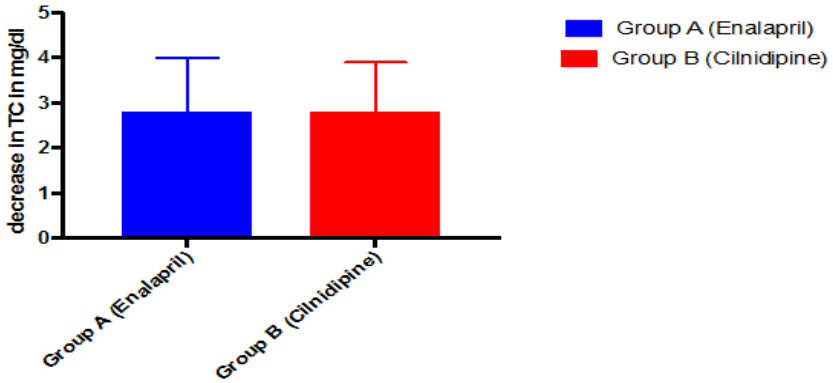

Figure 13: Decrease in TC values in each group

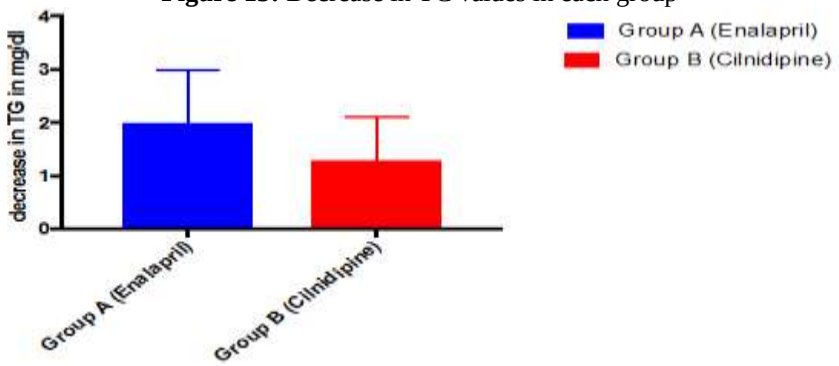

Figure14: Decrease in TG values in each group

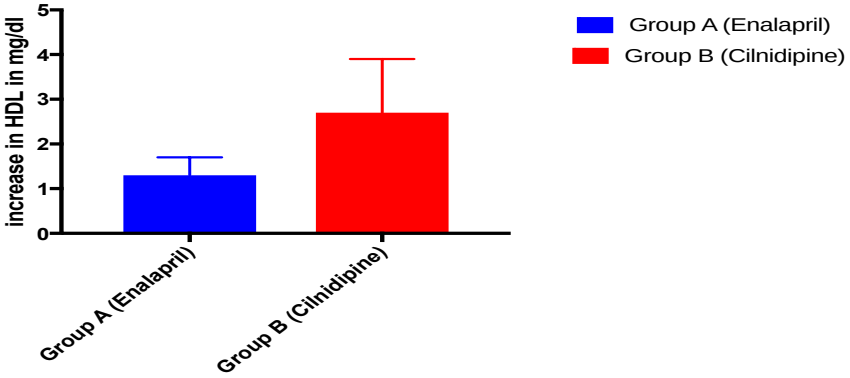

Figure15 : Increase in HDL values in each group

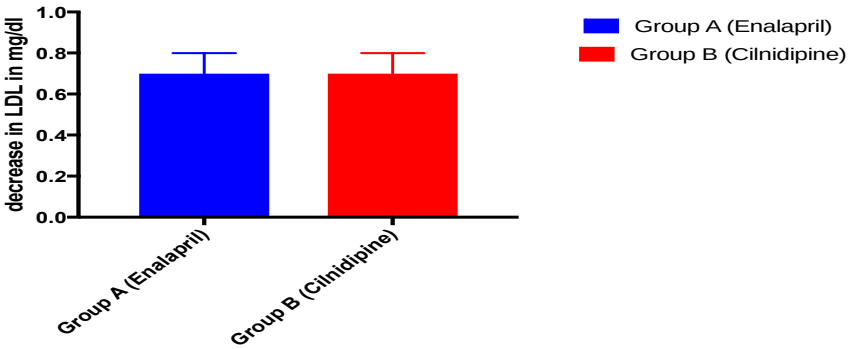

Figure16 : Decrease in LDL values in each group

Table 7 : Loss to follow-up, compliance and total adverse effects in both groups

Parameter	**Group A**	**Group B**
Loss to follow-up (number)	4	3
Compliance (%)	94	96
Total adverse effects (number)	7	4

Table 8 : Adverse effects in each group

Adverse effect	**Group A (Enalapril)** Number of patients	**GroupB (Cilnidipine)**Number of patients
Headache	2	2
Dizziness	2	1
Nausea	1	0
Sweating	1	0
Dry cough	1	0
Facial flushing	0	1

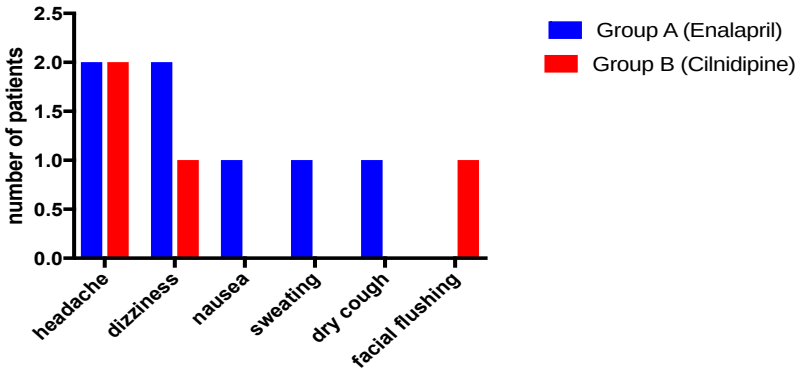

Figure17 : Adverse effects observed with enalapril and cilnidipine

V. Discussion

Arijit Das etal[14] evaluated the effects of cilnidipine on heart rate and uric acid metabolism in patients with essential hypertension. Out of 100 enrolled patients, 92 completed the study. They were randomly assigned to amlodipine (N = 47) and cilnidipine (N = 45) groups. Cilnidipine was started at 10 mg/day and then adjusted to 5 - 20 mg/day, and amlodipine was started at 5 mg/day and then adjusted to 2.5 - 10 mg/day. In Cilnidipine treated group, systolic blood pressure was 155.38 ± 6.76 at baseline and 133.38 ± 6.67 at 24 weeks of treatment. Diastolic blood pressure was 94.16 ± 4.27 at baseline and 79.92 ± 4.27 at 24 weeks of treatment. Heart rate was 76.96 ± 4.53 at baseline and 73 ± 3.28 at 24 weeks of treatment. All results were expressed as mean ± SD. P values < 0.05 were considered significant. After 24 weeks of study, patients in cilnidipine groups showed significant reduction in SBP, DBP and heart rate from baseline.

Comparing the present study with the study done by Arijit Das etal[14],in the present study, in Group B (Cilnidipine) decrease of SBP, DBP and HR was observed. Mean ± SD of SBP at 0, 1, 3 and 6months was 155.8 ± 5.5, 150.3 ± 4.5, 145.1 ± 3.8 and 138.9 ± 3.7 respectively. Mean ± SD of DBP at 0, 1, 3 and 6months was 95.4 ± 3.1, 91.8 ± 3.1, 87.7 ± 3.2and 84.4 ± 3.0 respectively.Mean ± SD of HR at 0, 1, 3 and 6months was 75.2 ± 4.6, 74.3 ± 3.9, 73.6 ± 3.3 and 73.1 ± 2.8 respectively.All results were expressed as mean ± SD. P values < 0.05 were considered significant. After 6 months of study, patients in cilnidipine group showed significant reduction in SBP, DBP and heart rate from baseline.

S. D. Pierdomenico et al[15] evaluated the effect of ACE inhibitors and long-acting dihydropyridine calcium antagonists on clinic and ambulatory heart rate in patients with essential hypertension. 292 hypertensive patients treated with ACE inhibitors and 198 hypertensive patients treated with dihydropyridine calcium antagonists. In the ACE inhibitor group, 67 patients (23%) were treated with enalapril. Treatment duration was similar between the ACE inhibitor and calcium antagonist groups (3.9±1.3 vs 4.0±1.3 months, respectively). In ACE inhibitor group, Clinic SBP (mm Hg) was 155 ± 14 at baseline and 134 ± 10 after treatment. Clinic DBP (mm Hg) was 99 ± 6 at baseline and 81 ± 7 after treatment. Clinic HR (beats per minute) was 75 ± 10 at baseline and 71.5 ± 9 after treatment. Data are expressed as mean ± SD. Statistical significance was defined as $p < 0.05$. Clinic BP was significantly reduced in patients treated with ACE Inhibitors. ACE inhibitors significantly reduced clinic HR in those with baseline HR >75 beats/min and particularly in those with baseline HR >85 beats/min.

Comparing the present study with the study done by S. D. Pierdomenico et al[15],in the present study, in Group A (Enalapril) decrease in SBP, DBP and HR was observed. Mean ± SD of SBP at 0, 1, 3 and 6months was 157.7 ± 6, 151.3 ± 6.7, 146.5 ± 6.0 and 140.0 ± 3.9 respectively. Mean ± SD of DBP at 0, 1, 3 and 6months was 95.8 ± 3.2, 91.7 ± 3.1, 87.5 ± 3.0 and 84.5 ± 2.2 respectively.Mean ± SD of HR at 0, 1, 3 and 6months was 75.9 ± 3.6, 74.8 ± 2.9, 74.3 ± 2.8 and 73.8 ± 2.5 respectively.All results were expressed as mean ± SD. P values < 0.05 were considered significant. After 6 months of study, patients in enalapril group showed significant reduction in SBP, DBP and heart rate from baseline.

Zaki A. Zaman and Vishnu Kumari[9] study compared the clinical effectiveness of Amlodipine and Cilnidipine on blood pressure, heart rate, proteinuria and lipid profile in hypertensive patients. Total ninety five patients were recruited for study in which 45 patients received 5-10mg Amlodipine and other 55 patients of same age groups received 10-20mg Cilnidipine. Both the drug significantly reduced both systolic (SBP) and diastolic blood pressure (DBP). In the Cilnidipine group there was decrease in PR after treatment. Unlike Amlodipine, Cilnidipine decreased urinary protein excretion and in diabetic patients reduced serum triglyceride.
Comparing the present study with the study done by Zaki A. Zaman and Vishnu Kumari[9],in the present study, in Group B (Cilnidipine)Mean ± SD of UPCR at 0, 1, 3 and 6months was 1323.6 ± 23.8, 1312.8 ± 23.4, 1303.4 ± 22.6 and 1292.4 ± 21.9respectively.All results were expressed as mean ± SD. P values < 0.05 were considered significant. After 6 months of study, patients in cilnidipine group showed significant reduction in UPCR from

baseline.

A recently published article showed greater reduction in microalbuminuria in patient treated with enalapril with cilnidipine in comparison with enalapril alone ($P < 0.001$)[16].

In the present study, in Group A (Enalapril) Mean ± SD of UPCR at 0, 1, 3 and 6months was 1323.5 ± 25.0, 1313.5 ± 25.4, 1303.4 ± 25.5 and 1292.9 ± 25.5 respectively.All results were expressed as mean ± SD. P values < 0.05 were considered significant. After 6 months of study, patients in enalapril group showed significant reduction in UPCR from baseline.

Pratibha Salve S and ChitraKhanwelkarC[10]study evaluated the effects of calcium channel blockers (CCBs) on different biochemical parameters in essential hypertensive patients. 21 females and 18 males with mild to moderate hypertension were enrolled in the age group of 25-80 yrs. All 39 patients received mono drug therapy with calcium channel blockers, for six months. At the end of six months there was significant decrease in total cholesterol (TC), and significant increase in HDL cholesterol. These findings suggest that calcium channel blockers may be an attractive option for treatment of essential hypertension and for improving cardio vascular risk profile.

Comparing the present study with the study done by Pratibha Salve S and ChitraKhanwelkar C[10],in the present study, in Group B (Cilnidipine), decrease inTC, TG and LDL levels and an increase in HDL levels were observed.Mean ± SD of TC at 0and 6months was 215.8 ± 13.6 and 213.0 ± 12.5 respectively. Mean ± SD of TG at 0 and 6months was 170.3 ± 18.3 and 169.0 ± 17.5 respectively.Mean ± SD of HDL at 0and 6months was 41.7 ± 3.6 and 44.4 ± 2.4respectively.Mean ± SD of LDL at 0 and 6months was 117.8 ± 10.3 and 117.1 ± 10.2respectively.The decreases in TC, TG, LDL and increase in HDL levels at the end of 6th month were comparedwith baseline values. p values were <0.0001 except for TG and LDL which were 0.0027 and 0.0002 respectively at 6 months when compared with baseline values, whichwere< 0.05 and hence significant.

HanumanthappaNandeesha et al[17] study evaluated the effect of antihypertensives on serum lipids in newly diagnosed male essential hypertensive patients. Lipid parameters were estimated before and after 8 weeks of therapy. In the enalapril group, it was found that a significant reduction in TC, TGs, non- HDL cholesterol, and TG to HDL cholesterol ratio after treatment.

Comparing the present study with the study done by HanumanthappaNandeesha et al[17], in the present study, in Group A (Enalapril), decrease inTC, TG and LDL levels and an increase in HDL levels were observed.Mean ± SD of TC at 0and 6months was 215.9 ± 16.5 and 213.1 ± 15.3respectively. Mean ± SD of TG at 0 and 6months was 170.5 ± 15.6 and 168.5 ± 14.6 respectively.Mean ± SD of HDL at 0and 6months was 41.8 ± 3.0 and 43.1 ± 2.6 respectively.Mean ± SD of LDL at 0 and 6months was 117.6 ± 10.9 and 116.9 ± 11.0respectively.The decreases in TC, TG, LDL and increase in HDL levels at the end of 6th month were comparedwith baseline values. p values were <0.0001 except for HDL which was 0.0013 at 6 months when compared with baseline values, whichwere< 0.05 and hence significant.

Xu Guo-liang et al[12]evaluated the efficacy and safety of cilnidipine tablets to treat Chinese patients with mild to moderate essential hypertension, and to examine the ability of cilnidipine to lower blood pressure without eliciting unfavorable side effects. A total of 547 articles were found, from which 11 articles met the inclusion criteria. Adverse reaction rates for clnidipine tablets and the amlodipine control group were recorded in all 11 trials. The major adverse reactions for cilnidipine included headache (3.29%), dizziness (4.61%), and facial flushing (5.04%). The heterogeneity test, the efficacy analysis and safety analysis showed that cilnidipine was equally effective and safe compared to amlodipine.

Makawana and Panchal[18] compared the efficacy and safety of cilnidipine and losartan in hypertensive patients with type 2 diabetes mellitus (type 2 DM). Out of 114 patients, 59 received cilnidipine 10 mg once a day for 24 weeks and 55 patients received losartan 50 mg once a day for 24 weeks. A total of 19 ADRs were observed in 114 patients during the study period. Out of these 19 ADRs, 7 were observed into patients treated with cilnidipine and 12 were into patients treated with losartan. In patients treated with cilnidipine, the most common ADR washeadache, (04) followed by dizziness (02).

Comparing the present study with the study done by Xu Guo-liang et al[12]and Makawana and Panchal[18], in the present study, at the end of 6 months of study, headache was noted in 2 patients, dizziness was seen in 1 patient and facial flushing was noted in 1 patient of Group B (Cilnidipine).

D. G. Beevers et al.[19] compared enalapril and propranolol in patients with essential hypertension. Fifty-four patients were randomly assigned to treatment with enalapril or propranolol for 16 weeks following a placebo run-in-phase. The study was double-blind. Enalapril and propranolol both reduced blood pressure, though the changes were significantly greater with enalapril. Eight patients (28.6%) in the enalapril reported at least one adverse symptom during the study include tiredness, lethargy, drowsy in 2 patients, headache in 2 patients, sweating in 2 patients, nausea in 1 patients, dizziness, lightheaded in 2 patients, postural hypotension in 1 patient and drycough in 1 patient.

Comparing the present study with the study done by D. G. Beevers et al.[19], in the present study, in Group A (Enalapril) at the end of 6 months of study, headache was noted in 2 patients, dizziness was seen in 2 patients, nausea was complained by 1 patient, sweating was seen in 1 patient and 1 patient complained of dry cough.

VI. Conclusion

Cilnidipine is equally effective as enalapril in decreasing blood pressure, heart rate, proteinuria, total cholesterol and LDL cholesterol. It was found that enalapril is more effective in reducing triglycerides compared to cilnidipine and cilnidipine is more effective in increasing HDL cholesterol compared to enalapril. Cilnidipine has lower incidence of adverse effects compared to enalapril in hypertensive patients. Once-daily dosing of enalapril and cilnidipine is more convenient for patients and is likely to represent a compliance-enhancing advantage.

6.1 Strengths of the present study:

1. The present study included the age group of 25 to 60 years which is considered to be the potential target of hypertension.
2. The present study excluded hypertensive patients on multidrug antihypertensive therapy, so that the effect of the study drugs can be seen without any interactions with other anti hypertensive drugs.
3. The present study has been done for six months which provides sufficient time to evaluate the effects on BP, HR, proteinuria, lipid profile and side effects. It helped to compare the drugs, unlike the previous studies mentioned, which were conducted for a shorter period.

6.2 Limitations of the study:

1. The sample size is small. The sample size is 60. Had the sample size been big, the results would have been more accurate.
2. Follow ups of the study: Follow up was planned at the end of 1 month, 3 months and 6months of treatment in the study. But 7 patients didn't turn up after 1 month of treatment follow up.
3. Duration of study: A long term follow up for one year, will show the long term benefits and side effects of the drugs.

6.3 Recommendations of further work:

1. Study should be carried out with bigger sample size for the results to be more accurate.
2. Studies should be carried out for longer duration (for 1 year) to evaluate the long term safety and efficacy of the drugs.

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