International Journal of Pharmaceutical Sciences and Drug Analysis

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A comparative study of efficacy of telmisartan, chlorthalidone, amlodipine in hypertensive patients on backdrop of beta blockers and ace inhibitors

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Abstract
The aim of the study to compare the efficacy of Telmisartan, Amlodipine and chlorthalidone vs Beta blockers and ACE Inhibitors in patients with hypertension. The prospective observational study is being carried out at Hospitals and community pharmacies located in Villupuram, Dharmapuri, Krishnagiri & Trichy. The outcome of the study shows that addition of Telmisartan (20 mg), Amlodipine (2.5 mg) and Chlorthalidone (12.5 mg) (Triple Pill) to the conventional oral regimen of Hypertension with Beta blockers and ACE Inhibitors has a marked and significant advantage over the Beta blockers and ACE Inhibitors only combination considering all the parameters that shows better and significant control of the blood pressure level.

Keywords: Hypertension, blood pressure, triple pill

Introduction
Definition
Hypertension is characterized by abnormally high blood pressure and a significant amount of psychological stress. Blood pressure readings for these patients with this disease will be greater than 140 over 90 mm.

Blood pressure readings are used to diagnose hypertension. The first measurements would represent the systolic pressure, or the pressure at which the heart contracts and refills the blood, and the second readings would be the diastolic pressure [1].

Causes of hypertension
High blood pressure results from an underlying medical problem or from taking a specific medication in around 1 in 20 cases [2].

The following medical problems can result in high blood pressure:
1. Kidney disease
2. Diabetes
3. Long Term Kidney infection
4. Obstructive sleep apnea occurs when the throat's muscles relax and constrict when a person is sleeping, preventing them from breathing normally.
5. Glomerulonephritis harm to the kidneys' tiny filters.
6. A constriction of the kidney-supplying arteries.

Table 1: Classification of blood pressure [3]

Classification	Systolic (mm Hg)	Diastolic (mm Hg)
Normal	<120	<80
Pre hypertension	120–139	80–89
Stage 1 hypertension	140–159	90–99
Stage 2 hypertension	≥160	≥100

Complications
1. Myocardial Infraction
2. Stroke
3. Malignant hypertension
4. Dissecting aortic aneurysm
5. Hypertensive nephrosclerosis
6. Peripheral vascular disease

1. Myocardial infraction

When blood supply to a portion of the heart is restricted for a long enough period of time, the affected or dead portion of the heart muscle, a heart attack results. Myocardial infarction is the medical term for this condition. A blood clot that narrows one of the coronary arteries is the primary cause of most heart attacks. The coronary arteries supply the heart with blood and oxygen. A stopped blood flow deprives the heart of oxygen, which causes the cardiac cells to perish. Coronary artery walls may accumulate plaque, a dense material. Cholesterol and other cells make up this plaque. The most typical sign of a heart attack is chest discomfort. One may simply have discomfort in one place of their body, or it may spread to their arms, shoulders, neck, teeth, jaw, belly area, or back from their chest. Anxiety, coughing, lightheadedness, dizziness, nausea, vomiting, shortness of breath, perspiration, and palpitations are some other signs of a heart attack. [4]

2. Stroke

When blood flow to a portion of the brain is cut off, a stroke occurs. Sometimes a stroke is referred to as a "brain attack." The brain cannot receive blood and oxygen if blood flow is interrupted for a period of time greater than a few seconds. Death of brain cells can result in long-term harm. Hemorrhagic stroke and ischemic stroke are the two main forms of stroke. An ischemic stroke happens when a blood clot blocks a blood vessel that carries blood to the brain. There are two possible outcomes for this: thrombotic stroke or embolic stroke. An artery blockage may result in an ischemic stroke. The arterial walls get coated with plaque, a gooey substance made of fat, cholesterol, and other chemicals. In a hemorrhagic stroke, blood leaks into the brain as a result of a blood artery in a particular area of the brain becoming weak and bursting open. This is more common in some persons because of blood vessel problems in the brain [5].

3. Malignant hypertension

Malignant hypertension is an abrupt and rapid onset of abnormally high blood pressure. The lower blood pressure reading, or diastolic blood pressure, which is typically about 80 mmHg, is frequently above 130 mmHg. About 1% of people with high blood pressure, including both adults and children, are affected by the condition. It affects younger folks more frequently. Additionally, it affects those who have kidney issues, collagen vascular abnormalities, or pregnancy-related toxaemia. Kidney failure and renal hypertension are high risk factors for malignant hypertension. [6]

4. Dissecting aortic aneurysm

Aortic dissection happens when a tear in the aorta's inner wall allows blood to flow between its layers, driving the layers apart. Most frequently, this is accompanied by a strong, tearing-like chest or stomach pain, as well as additional symptoms brought on by the reduced blood flow to other organs. Even with the best care, an aortic dissection can swiftly result in mortality due to decreased blood flow to other organs, heart failure, and occasionally aorta rupture. Aortic dissection is more frequent in people with a history of hypertension, a known thoracic aortic aneurysm, and several diseases that impact the integrity of blood vessel walls, including Marfan syndrome and the vascular subtype of Ehlers-Danlos syndrome. Aortic dissection is treated differently depending on whether portion of the aorta is affected. Aortic arch dissections typically require surgery, although dissections involving the area furthest from the heart may merely require blood pressure management. [7]

5. Hypertensive nephrosclerosis

Chronically high blood pressure-related kidney damage is referred to as hypertension nephropathy, hypertensive nephrosclerosis, or hypertensive renal disease. It needs to be separated from secondary hypertension in the form of renovascular hypertension. In the kidneys, benign arterial hypertension causes hyaline (pink, amorphous, homogenous material) to build up in the walls of tiny arteries and arterioles, causing their walls to thicken and the lumina of the arterioles to narrow [8].

Treatment for hypertension
Pharmacological treatment

Antihypertensive drugs are those that are prescribed to treat hypertension. The goal of antihypertensive therapy is to stop the effects of high blood pressure, including stroke and myocardial infarction.

Angiotensin converting enzyme inhibitors

One of the first-choice medications in all grades of renovascular and essential hypertension is an ACE inhibitor. Angiotensin II is produced more easily thanks to the ACE, and it plays a big part in controlling arterial blood pressure. Angiotensin II, a powerful vasoconstrictor and activator of aldosterone secretion, is produced when angiotensin I is converted to angiotensin II by ACE inhibitors.

To increase the volume of blood the heart pumps and lower blood pressure, ACE inhibitors expand or dilate blood arteries [9].

Examples: Captoril, Enalapril, Lisinopril, Quinapril, Ramipril, Fosinopril.

Calcium channel blockers

CCBs, or calcium channel blockers, are a class of medications used to treat high blood pressure. Patient rennin status has little bearing on how well CCBs regulate blood pressure. CCBs are helpful in lowering blood pressure and reducing cardiovascular events in older patients with isolated systolic hypertension [10, 11].

Examples: Nifedipine, Diltiazem, Verapamil, Nicardipine, Amlodipine, Foelodipine.

β Blockers

A class of drugs called beta-blockers is used to prevent the heart from becoming impacted by stress chemicals like adrenaline. They are frequently recommended for excessive blood pressure, irregular pulse, and heart attacks. [12,13]

In addition to treating the heart, beta-blockers have been shown to provide various other health effects. For instance, they guard against bone loss over time by stopping the kidney from excreting calcium into urine and by blocking stress hormones.

Various beta-blocker types function differently. These drugs improve the heart's ability to relax in general. When beta-blockers are effective, your heart will beat less swiftly and strongly. Blood pressure can be lowered and irregular heartbeats can be managed thanks to this [8, 9].

Examples: Atenolol, Propranolol, Sotalol

Methodology
Site of study
This Prospective observational study is being carried out at Hospitals and Two community Pharmacies located in Villupuram, Dharmapuri, Krishnagiri & Trichy.

Design of data entry format: (Proforma)
A separate data entry format (Proforma) for incorporating patient details was designed. It consists of Patient details such as Name, ID No, Age, Gender, Present Medical history, Medication history, Social history, Family history, hypertensive history, diabetic profile study, lipid profile study and Medication chart.

Patient selection criteria
The patient population was chosen based on several criteria, including age (30-75 years), maintained diastolic blood pressure >90 mm Hg, high systolic blood pressure >140 mm Hg, and agreement with the prescribed consent form. The exclusion criteria include those who have secondary hypertension, are taking other medications known to affect blood pressure, refuse to participate in the study or withdraw their consent, are pregnant, or are nursing.

Study group
Group A which consists of 25 people known to have administered β Blockers and ACE Inhibitors and Group B which again consists of 25 people have taken Telmisartan (20 mg), Amlodipine (2.5 mg) and Chlorthalidone (12.5 mg).
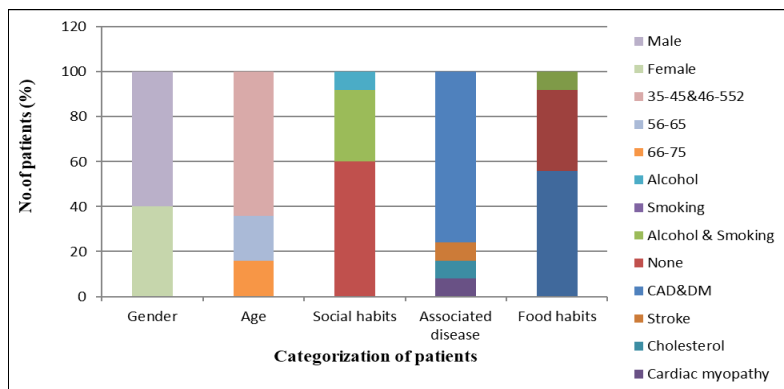
Results & Discussion
Categorization of patients according to Gender, Age, Social habits, associated disease in Group A (β blockers and ACE inhibitors)
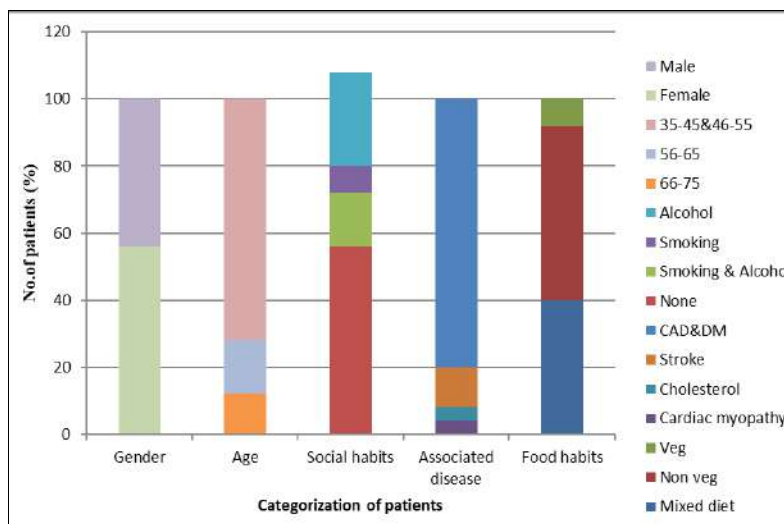
Fig 1: Categorization of patients according to Gender, Age, Social habits, Associated disease in Group A(n=25) (β blockers and ACE inhibitors)**,** 11 patients (44%) were males,14 patients (56%) were females, among the 25 patients, 18 patients (72%) were in the age group of 35-45 & 46- 55 years, 4 patients (16%) were in the age group of 56-65 years, 3 patients (12%) were in the age group of 66-75 years,14 patients (56%) had none of the following habits, 5 patients (20%) were Alcoholics,2 patients(8%)were smokers,14patients(16%)were Alcoholic and smokers, 20 patients (80%) had CAD\Diabetes mellitus,3 patients (12%) had Stroke,1 patient (4%) had Cholesterol,1 patient (4%) had Cardiac Myopathy, 2 patients (8%) were veg, 13 patients (60%) were Non vegetarians, 10patients (40%) were Mixed Diet.

Categorization of patients according to Gender, Age, Social habits, Associated disease in Group B (Triple Pill)

Fig 2: Categorization of patients according to Gender, Age, Social habits, Associated disease in Group B(n=25) (Triple Pill),15 patients (60%) were males,10 patients (40%) were females, 6 patients (24%) were in the age group of 35-45 years,10 patients (40%) were in the age group of 46-55 years, 5 patients (20%) were in the age group of 56-65 years, 4 patients (16%) were in the age group of 66-75 years, 15 patients (60%) had none of the following habits, 2 patients (8%) were Alcoholics, patients (0%) were smokers, 8 patients (32%) were Alcoholic and smoker 19 patients (76%) had CAD\Diabetes mellitus,2 patients (8%) had Stroke,2 patients (8%) had Cholesterol, 2 patients (8%) had Cardiac Myopathy, 2 patients (8%) were veg, 9 patients (36%) were Non vegetarian, 14 patients (56%) were Mixed diet

Table: 02 shows in Group A (Beta blockers +ACE Inhibitors) patients (n = 25), the mean value change of Arterial Blood Pressure at the base line was121 ± 2.273 and after treatment a for mean period of aeverya month, it was observed 104±2.172. In Group B Telmisartan (20mg), Amlodipine (2.5mg) and Chlorthalidone (12.5mg) patients (n = 25) the mean value change of Systolic Blood Pressure at thebaselinewas127 ± 2.845 and after treatment for a mean period of every month, it was observed 104±1.831.

In Group A (Beta blockers +ACE Inhibitors) patients (n = 25), the percentage mean change value is 20.84%.

In Group B Telmisartan (20 mg), Amlodipine (2.5 mg) and Chlorthalidone (12.5 mg) patients (n = 25) the percentage mean change value is 28.38%.

Mean ± SE Reduction in Arterial Blood Pressure of Group A and Group B

Groups	No of patient	Mean ± SE change of Group A &Group B in Arterial Blood Pressure mm/Hg			% Mean Reduction
		Base	Rev I	Rev II	
Group A Beta blockers + ACE Inhibitors	25	182.3 ± 7.517	156.6 ± 7.037	132 ±6.906	20.84%
Group B Telmisartan (20 mg), Amlodipine (2.5 mg) & Chlorthalidone (12.5mg)	25	192 ± 6.058	151 ±6.355	124 ±5.592	28.38%

% Mean change of group A & B on Arterial Blood Pressure level
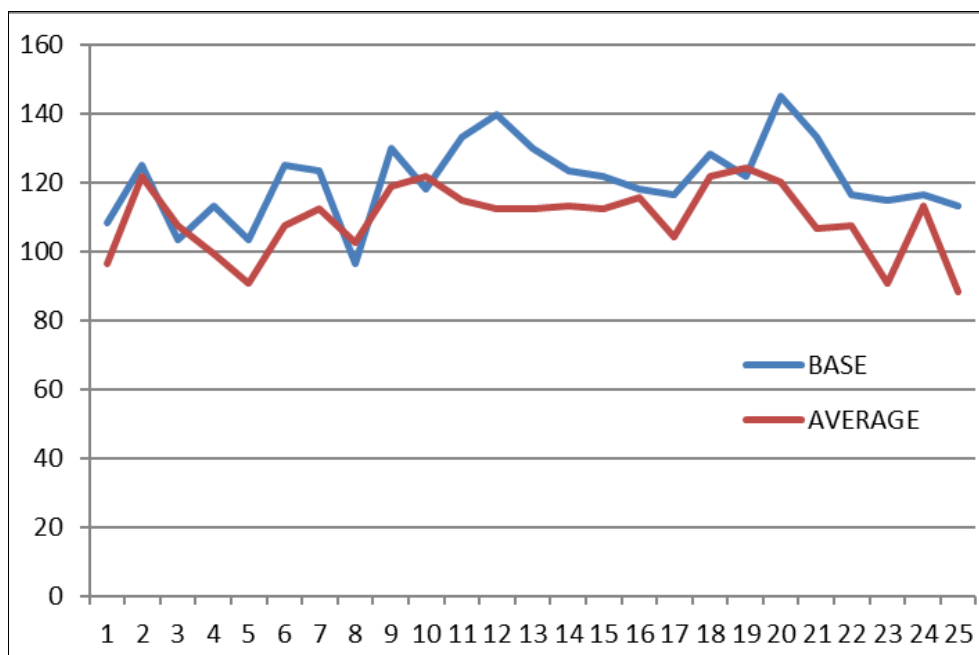
Fig 3: Effect on group a arterial blood pressure level
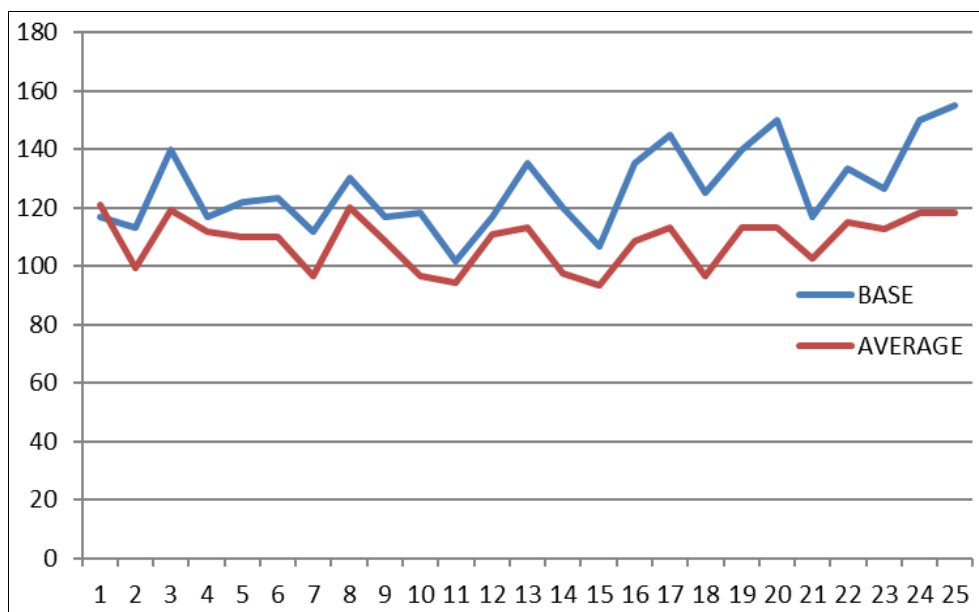
Fig 4: Effect on group b arterial blood pressure level

Conclusion

- This study included 50, HTN patients, in group A 44% of patients were males and 56% of patients were females, in group B 60% of patients were males and 40% of patients were females. Patients in the age group of 35 to 45 years on one end and 66 to 75 years on the other, where 40% of patients were 46 to 55 years on both the groups.
- Arterial blood pressure value showed a reduction of 20.84% from the base value in Group A were as the same was the showing a significant 28.38% reduction in Group B.
- The outcome of the study clearly shows that addition of Triple Pill to the conventional oral regimen of HTN with β blockers and ACE Inhibitors has a marked and significant advantage over the β blockers and ACE Inhibitors only combination considering all the parameters that shows better and significant control of the blood pressure level.
- Hence HTN may conveniently be treated with β blockers and ACE Inhibitors with the additional Triple Pill for a significantly improve life of patient.

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