

**STUDY ON MEDICATION ADHERENCE AND FACTORS AFFECTING IT IN PATIENTS  
TREATED FOR HYPERTENSION AT A TERTIARY CARE HOSPITAL**

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**IN**  
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**OCTOBER-2018**

## **CERTIFICATE**

This is to certify that the M.Pharm Dissertation entitled “**Study of Medication Adherence and Factors Affecting it in Patients Treated for Hypertension at a Tertiary Care Hospital**” being submitted to The Tamil Nadu Dr. M.G.R Medical University, Chennai was carried out by **Mr.Jobin Koshy(Reg. No. 261640104)** in the Department of Pharmacy Practice, College of Pharmacy, Sri Ramakrishna Institute of Paramedical Sciences, Coimbatore, which is affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai, under my direct supervision and guidance to my fullest satisfaction.

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## **ABBREVIATIONS**

ACE	: Angiotensin Converting Enzyme
ARB	: Angiotensin Receptor Blocker
AT	: Angiotensin
ADR	: Adverse Drug Reaction
BB	: Beta Blocker
BP	: Blood Pressure
BMI	: Body Mass Index
BUN	: Blood Urea Nitrogen
CNS	: Central Nervous System
CCB	: Calcium Channel Blocker
COX	: cyclooxygenase
DM	: Diabetes Mellitus
DASH	: Dietary Approaches to Stop Hypertension
DBP	: Diastolic Blood Pressure
ECG	: Electrocardiogram
HTN	: Hypertension
JNC-7	: Seventh Joint National Committee
JNC-8	: Eighth Joint National Committee
LVH	: Left ventricular Hypertrophy
MOA	: Mechanism Of Action
MPR	: Medical Possesion Ratio
MMAS	: Morisky Medication Adherence Scale
MARS	: Medication Adherence Rating Scale

NIH	: National Institute of Health
NSAID	: Non Steroidal Anti inflammatory Drugs
NCBI	: National Centre for Biotechnology Information
OD	: Organ Damage
PDC	: Proportion of Days Covered
RAAS	: Renin Angiotensin Aldosterone System
RCT	: Randomized Controlled Trials
SBP	: Systolic Blood Pressure
SD	: standard deviation
WHO	: World Health Organisation



## ABSTRACT

Hypertension is one of the most common non communicable diseases globally. It represents a major cause of cardiovascular morbidity and mortality and affects approximately 1 billion individuals world wide. Blood pressure varies from person to person and from time to time for individuals , however if the blood pressure constantly elevated above 140/90 mmHg at different times of measurement, it is regarded as high blood pressure (hypertension).prevalence is predicted to increase by approximately 60% by2025. Therefore international guidelines mandate not only an assessment of the global cardiovascular risk, but also a risk based approach to antihypertensive therapy.WHO describes poor adherence is one of the most important cause of uncontrolled BP and it increases the risk of ischemic heart disease 3-4 fold and the overall cardiovascular risk by 2-3 fold.

A number of studies conducted internationally have reported significant association between medication adherence and blood pressure control . Poor medication adherence is associated with various medical/psychosocial complications, poorer health-related quality of life and increased the health care costs. The effectiveness of antihypertensive agents must be achieved by optimal adherence to prescribed medications according to health care providers instructions.

The study was carried out to document the medication adherence and factors affecting it in patients treated for hypertension in the study site .The study was conducted in the department of cardiology and general medicine of a 1000 bedded multi specialty hospital. After ensuring the scope of the study in the department of cardiology and general medicine of the study hospital , the study protocol was prepared and submitted to hospital ethics committee and official approval was obtained to carry out the study in the hospital. After receiving the official approval, the study was conducted for a period of 10 months from December 2017 to September 2018 .Study population of 132 patients were included as per the inclusion criteria and data were collected in a specially designed data entry form. The medication adherence were calculated through the Morisky Medication Adherence Scale (MMAS-8) and Medication Adherence Rating Scale (MARS).

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*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

From the study it was found that male [77(55.3%)] patients are mostly affected than female [59(44.7%)]. Analysis for the reason for admission revealed that the chief complaints include head ache, followed by nausea, vomiting, chest pain and shortness of breath .44(33.3%) patients belong to the age group between 60-69 years. From the study it was found that apart from ageing, diet or eating habits (54.5%), alcohol consumption (36.4) and smoking (27.3%) were the major risk factors which may contributed to HTN.

The category of anti-hypertensive drugs most prescribed in the study site includes calcium channel blocker (50.8%) followed by ARBs 44 (33.3%). In the study population 121(91.7%) had past medical history and 122 patients had at least one co-morbid disease. Most common are diabetes62(46.9%), followed by dyslipidemia 27(20.4%) and renal disorder 23 (17.4%) . According to JNC-7 guidelines , we found that most of the patients were in stage I hypertension.

The study observed medication adherence through The Morisky Medication Adherence Scale (MMAS-8) and Medication Adherence Rating Scale (MARS). According to Morisky scale 76(57.6%) were having medium adherence followed by 39(29.5%),17(12.9%) low adherence and high adherence respectively. Based on the MARS,45(34.1%) were having compliance over the medication and 87(65.9%) were having non-compliance and were having[56(42.4%),45(34.1%),31(23.5%)] partial, low and high adherence respectively. Apart from the risk factors the intentional non adherence and non intentional adherence factors also was found to have a major role in adherence. The adherence between the variables in each scale were calculated by one-way ANOVA. The mean standard deviation of MMAS is  $6.03 \pm 1.73$  and the f-ratio is 189.17. The mean S.D of MARS is  $4.94 \pm 2.7$  and the f-ratio value is 73.243. Both the f-value of MMAS and MARS is  $<0.0001$ , which is significant at  $p < 0.05$ . The comparison of adherence between MMAS and MARS has been done by chi-square and found that the chi-square statistical value is 7.5422 and the p-value is 0.0230, which is significant at  $p < 0.05$ . Non adherence to the therapeutic regimen remains a major limiting factor of hyper tension management in India. Overall the hypertensive patients was having medium adherence

## INTRODUCTION

Hypertension is one of the most important chronic non communicable diseases with increasing trend worldwide<sup>[1]</sup>. It is defined as the pressure exerted by the blood on the walls of blood vessels or a condition in which arterial BP is chronically elevated. Hypertension (defined as a blood pressure  $\geq$  (systolic/ diastolic) 140/90mmHg) is an internationally common disease and an important treatable public health problem. High blood pressure is an important modifiable risk factor for cardiovascular morbidity and mortality<sup>[2]</sup>.

The risk of cardiovascular morbidity and mortality is directly correlated with blood pressure (BP). Starting at a BP of 115/75 mm Hg, risk of cardiovascular disease doubles with every 20/10-mm Hg increase. Even patients with pre hypertension have an increased risk of cardiovascular disease. Outcome trials have shown that antihypertensive drug therapy substantially reduces the risks of cardiovascular events and death. A goal BP of less than 140/90mmHg is appropriate for most patients. Achieving lower BP values has not been proven to provide additional risk reduction, except in patients with DM or chronic kidney disease. These patients have a goal BP of less than 130/80 mm Hg<sup>[3]</sup>.

The global prevalence of hypertension (HTN) is projected to increase markedly by 2025. Poor hypertension management increases health care expenditure and complication, mortality and morbidity rates, as such medication adherence is key. There is inadequate patient adherence to anti-hypertensive's globally. Medication adherence can be predicated significantly by patients beliefs about health and illness and can be assessed by help of different adherence scales like MMAS, MARS etc. Moreover, beliefs regarding the severity of disease, self efficacy and the benefits of medication may explain patients attitude towards medication adherence<sup>[4]</sup>.

The Seventh Report of the Joint National Committee (JNC7) on Detection, Evaluation and Treatment of High BP classifies blood pressure based on systolic and diastolic values.

Pre hypertension: 120–139 mm Hg systolic or 80–89 mm Hg diastolic.

Stage 1 hypertension: 140–159 mm Hg systolic or 90–99 mm Hg diastolic.

Stage 2 hypertension:  $\geq 160$  mm Hg systolic or  $\geq 100$  mm Hg diastolic<sup>[5]</sup>.

#### GOAL BP VALUES RECOMMENDED BY THE JNC7:

- Most patients < 140/90 mm Hg
- Patients with diabetes < 130/80 mm Hg
- Patients with chronic kidney disease < 130/80 mm Hg (estimated GFR < 60 mL/min, serum creatinine > 1.3 mg/dL in women or > 1.5 mg/dL in men, or albuminuria > 300 mg/day or  $\geq 200$  mg/g creatinine)<sup>[3]</sup>.

JNC 8 is unique in the sense, as the clinical recommendations by this guideline were based on randomized controlled trials (RCTs) which are considered ‘gold-standard’ in representing the scientific evidence generated. As there was no further evidence to make a change to the previously established definition of high blood pressure or hypertension, the Panel members of JNC 8 support in continuing with the previous JNC 7 guidelines definition<sup>[6]</sup>.

However, a substantial proportion of hypertensive patients do not have their blood pressure within control, a major reason being poor adherence to antihypertensive medications. Thus, identification of factors influencing medication adherence is crucial.

Lifestyle modifications should be prescribed in all patients with hypertension and prehypertension. However, they should never be used as a replacement for antihypertensive drug therapy in patients with hypertension. The global prevalence of hypertension is projected to increase markedly by 2025. Poor HTN management increases health care expenditure and complications, mortality and morbidity rates as such, medication adherence is key. However, a lot of literature reveals that patient adherence to hypertensive medications is inadequate and it needs to be addressed. Patient beliefs about health and illness are significant predictors of medication adherence. Moreover, beliefs regarding the severity of disease, self-efficacy and the benefits of medication may explain patients' attitudes towards medication adherence<sup>[4]</sup>.

Medication adherence may be defined as the extent to which patients behaviors coincide with health care providers recommendations for health and medical advice. Greater knowledge of health beliefs and medication habits of patients with HTN may help clinicians develop strategies to foster medication adherence and enhance HTN management.

Medication adherence can be measured by subjective, direct and indirect methods. Subjective methods include self report. Direct method include serum or urine drug level. Indirect method include pharmacy database records, pharmacy refill rates or pill counts.

Patients who were adherent to the regimen of the hypertension treatment were often significantly less likely to have elevated blood pressures. Poor adherence to AHT is usually associated with a bad outcome of the disorder and wastage of limited health care resources.

The medications prescribed should enable the process, but become complicating factors for the treatment, which often compromises compliance itself and does not guarantee the reduction of BP values, interfering in control of the disease, prevention of complications, and in worsening of the disease.

## **EPIDEMIOLOGY<sup>[3]</sup>**

It is estimated that approximately 30% of the population has high BP ( $\geq 140/90$  mm Hg). Estimates from the National Health and Nutrition Examination Survey from 1999–2000 indicate that the prevalence is 30.1% and 27.1% among men and women, respectively. This represents a significant increase of 5.6% in women from 1988 to 2000, where as the prevalence in men has remained unchanged<sup>[3]</sup>.

Currently, almost 1 billion people are hypertensive, and it is estimated that in 2025, nearly 1.56 billion persons i.e. two-thirds of the world's population would be inflicted with this chronic ailment. Hypertension is a “silent killer” accounting for a substantial amount of morbidity and mortality worldwide, which is preventable. Hypertension is reported to be the fourth contributor to premature mortality in developed countries and the seventh in developing countries<sup>[6]</sup>.

BP values increase with age, and hypertension is very common in the elderly. The lifetime risk of developing hypertension among those 55 years of age and older who are normotensive is 90%. Most patients have pre hypertension BP values before they are diagnosed with hypertension, and most hypertension diagnoses occur between the third and fifth decades of life. Up to the age of 55 years, more men than women have hypertension. From the ages of 55 to 74 years, slightly more women have hypertension than men, with this sex difference becoming greater in the very elderly ( $\geq 75$  years)<sup>[3]</sup>.

Hypertension is a significant public health problem causing around 13% of total death world wide. The overall prevalence of increased blood pressure in people 25 years or older was about 40% in 2008. The prevalence of hypertension increases with age so that two-thirds of those with the disease are 60 years or older. HTN is a major risk factor for heart disease(47%) and cerebrovascular disease including stroke(54%). Optimal control of blood pressure is paramount to prevent hypertension related complications<sup>[7]</sup>.

The sinister sobriquet of “silent killer” stays true even for Indian population, as only about half (55%) of the hypertensive patients were aware of their disease state, only one third (36%) of these known hypertensive subjects were under treatment and furthermore only a quarter (28.2%) of this treatment group had their BP values under control. Recent epidemiological data suggest both an increase in prevalence(urban 25% rural 10-15%)and poor level of hypertension in India<sup>[6]</sup>.

### **ETIOLOGY<sup>[3]</sup>**

Hypertension is a heterogeneous medical condition. In most patients it results from unknown pathophysiologic etiology (essential or primary hypertension). While this form of hypertension cannot be cured, it can be controlled. A small percentage of patients have a specific cause of their hypertension (secondary hypertension). There are many potential secondary causes that are either concurrent medical conditions or are endogenously induced. If the cause of secondary hypertension can be identified, hypertension in these patients potentially can be cured<sup>[3]</sup>.

## Primary hypertension ( essential hypertension )<sup>[5]</sup> :

This include renal dysfunction, peripheral resistance vessel tone, endothelial dysfunction, autonomic tone, insulin resistance and neuro humoral factors. Although only 5 – 10% of the hypertensive population has secondary hypertension, further diagnostic evaluation should occur if physical or laboratory findings are consistent with a secondary cause. Secondary causes are potentially correctable. Further diagnostic workup should also be considered in patients who do not respond to increasing doses of anti-hypertensive medication or who have a sudden increase in BP or accelerated or malignant hypertension.

## Secondary hypertension

Fewer than 10% of patients have secondary hypertension, where either a co-morbid disease or a drug is responsible for elevating BP. In most of these cases, renal dysfunction resulting from chronic kidney disease or renovascular disease is the most common secondary cause. Certain drugs, either directly or indirectly, can cause hypertension or exacerbate hypertension by increasing BP. The most common agents are listed below :

Disease	Drugs Associated with Hypertension in Humans
Chronic kidney disease	<b>Prescription drugs</b>
Cushing's syndrome	Corticosteroids, <sup>a</sup> ACTH
Coarctation of the aorta	Estrogens <sup>a</sup> (usually oral contraceptives with high estrogenic activity)
Obstructive sleep apnea	Nonsteroidal anti-inflammatory drugs, <sup>a</sup> COX-2 inhibitors <sup>a</sup>
Parathyroid disease	Phenylpropanolamine <sup>a</sup> and analogues <sup>a</sup>
Pheochromocytoma	Cyclosporine <sup>a</sup> and tacrolimus <sup>a</sup>
Primary aldosteronism	Erythropoetin <sup>a</sup>
Renovascular disease	Sibutramine <sup>a</sup>
Thyroid disease	Antidepressants (especially venlafaxine), bromocriptine, buspirone, carbamazepine, clozapine, desfulrane, ketamine, metoclopramide Clonidine/ $\beta$ -blocker combination Pheochromocytoma: $\beta$ -blocker without $\alpha$ -blocker first
	<b>Street Drugs and Other Natural Products</b>
	Cocaine <sup>a</sup> and cocaine withdrawal <sup>a</sup>
	Ma huang, <sup>a</sup> "herbal ecstasy," <sup>a</sup> other phenylpropanolamine analogues <sup>a</sup>
	Nicotine and withdrawal, anabolic steroids, narcotic withdrawal, methylphenidate, phencyclidine, ketamine, ergotamine and other ergot-containing herbal products, St. John's wort
	<b>Food Substances</b>
	Sodium <sup>a</sup>
	Ethanol <sup>a</sup>
	Licorice
	Tyramine-containing foods if taking a monoamine oxidase inhibitor
	<b>Chemical Elements and Other Industrial Chemicals</b>
	Lead, mercury, thallium and other heavy metals, lithium

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## **PATHOPHYSIOLOGY<sup>[8]</sup>**

There are two mechanism that regulates blood pressure. Baroreceptor mediated autonomic nervous system and renin angiotensin aldosterone mechanism.

### **Baroreceptor Mediated Autonomous Nervous System**

When there is reduced blood pressure, Baroreceptor present in the blood vessel sent fewer impulses to the autonomic nervous system. It lead to

Increase in sympathetic outflow



Decrease in parasympathetic outflow



Increase in cardiac output



Increase in blood pressure

### **RAAS Mechanism**

When there is a decreased blood pressure, baroreceptor present in the kidney senses this and release renin, as a result following events takes place

Renin



Angiotensinogen



Angiotensin I



ACE

Angiotensin II



Aldosterone

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Angiotensin II is a potent vasoconstrictor. Aldosterone increases the reabsorption of sodium and water. This leads to blood volume expansion and blood pressure increases.

### **CLINICAL PRESENTATION OF HYPERTENSION<sup>[3]</sup>**

The patient may appear very healthy or may have the presence of additional cardiovascular risk factors:

- Age ( $\geq 55$  years for men to 65 years for women)
- Diabetes mellitus
- Dyslipidemia (elevated low-density lipoprotein [LDL] cholesterol, total cholesterol or triglycerides; low high-density lipoprotein [HDL] cholesterol)
- Microalbuminuria
- Family history of premature cardiovascular disease
- Obesity (body mass index  $\geq 30$  kg/m<sup>2</sup>)
- Physical inactivity
- Tobacco use

### **SYMPTOMS**

Patients with primary hypertension are usually asymptomatic, sometimes elevated blood pressure may develop:-

- Headache
- Dizziness
- Blurred vision
- Nausea and vomiting
- Chest pain
- Shortness of breath.

### **DIAGNOSIS<sup>[9]</sup>**

Blood pressure is measured using the device Sphygmomanometer. The only sign of primary hypertension on physical examination is elevated blood pressure. The BP should be measured in a consistent and standardized manner. The British hypertension society's recommendations include:

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1. Patient sitting or lying as long as the cuff is at heart height.
2. Patient should have rested for 10 minutes beforehand and the average of two or more readings taken at two or more clinical encounters should be considered.
3. The effects of anxiety, time of day, smoking, alcohol and room temperature should be minimized.
4. As hypertension progresses, signs of end organ damage begin to appear, chiefly related to pathologic changes in eye, brain, heart, kidneys and peripheral blood vessels
5. Laboratory test that should be obtained in all patients prior to initiating drug therapy includes urinalysis, complete blood counts, serum chemistries (Na,K,Cl, fasting glucose, fasting lipid panel)and a 12 lead ECG .

### **LABORATORY TESTS<sup>[3]</sup>**

The patient may have normal values and still have hypertension. However, some may have abnormal values consistent with either additional cardiovascular risk factors or hypertension-related damage.

- ❖ Blood urea nitrogen (BUN) and serum creatinine
- ❖ Fasting lipid panel
- ❖ Fasting blood glucose
- ❖ Serum potassium
- ❖ Urinalysis .

### **OTHER DIAGNOSTIC TESTS<sup>[3]</sup>**

- 12-lead electrocardiogram (to detect LVH)
- Highly sensitive C-reactive protein (high concentrations are associated with increased cardiovascular risk).

## TREATMENT

### AIMS:

- The overall goal of treating hypertension is to reduce hypertension-associated morbidity and mortality. This morbidity and mortality are related to target-organ damage (e.g., cardiovascular events, cerebrovascular events, heart failure, and kidney disease).
- Target blood pressure values less than 140/90 mmHg for uncomplicated hypertension and less than 130/80 mmHg for patients with diabetes mellitus and chronic kidney disease.
- To improve quality of life.

### NONPHARMACOLOGIC THERAPY

All patients with pre hypertension and hypertension should be prescribed lifestyle modifications including:

1. Weight reduction, if BMI is more than 25 kg/m<sup>2</sup>.
2. Adopt DASH eating plan (includes substantial potassium intake). Consume a diet rich in fruits, vegetables, low fat dairy products with a reduced content of saturated and total fat<sup>[7]</sup>.
3. Reduce dietary sodium intake to not more than 2-4 g/day of sodium.
4. Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes/day)
5. Moderate alcohol consumption (less than or equal to 1 oz ethanol per day)
6. Smoking cessation.

Patients diagnosed with stage 1 or 2 hypertension should be placed on lifestyle modifications and drug therapy concurrently<sup>[9,10]</sup>.

### PHARMACOLOGIC THERAPY

There are nine different antihypertensive drug classes. Diuretics,  $\beta$ -blockers (BB), ACE inhibitors, angiotensin II receptor blockers, and calcium channel blockers are considered primary antihypertensive agents. These agents, either alone or in combination, should be

used to treat the majority of hypertensive patients because evidence from outcomes data have demonstrated benefits with these classes. Several of these classes (i.e., diuretics,  $\beta$ -blockers, and calcium channel blockers) have subclasses where significant differences in mechanism of action, clinical use, or side effects or evidence from outcomes studies exist.  $\alpha$ -Blockers, central  $\alpha$ 2-agonists, adrenergic inhibitors, and vasodilators are considered alternative drug classes that may be used in select patients after primary agents<sup>[3]</sup>. Initial drug selection depends on the degree of blood pressure elevation and the presence of compelling indications for selected drug<sup>[9]</sup>.

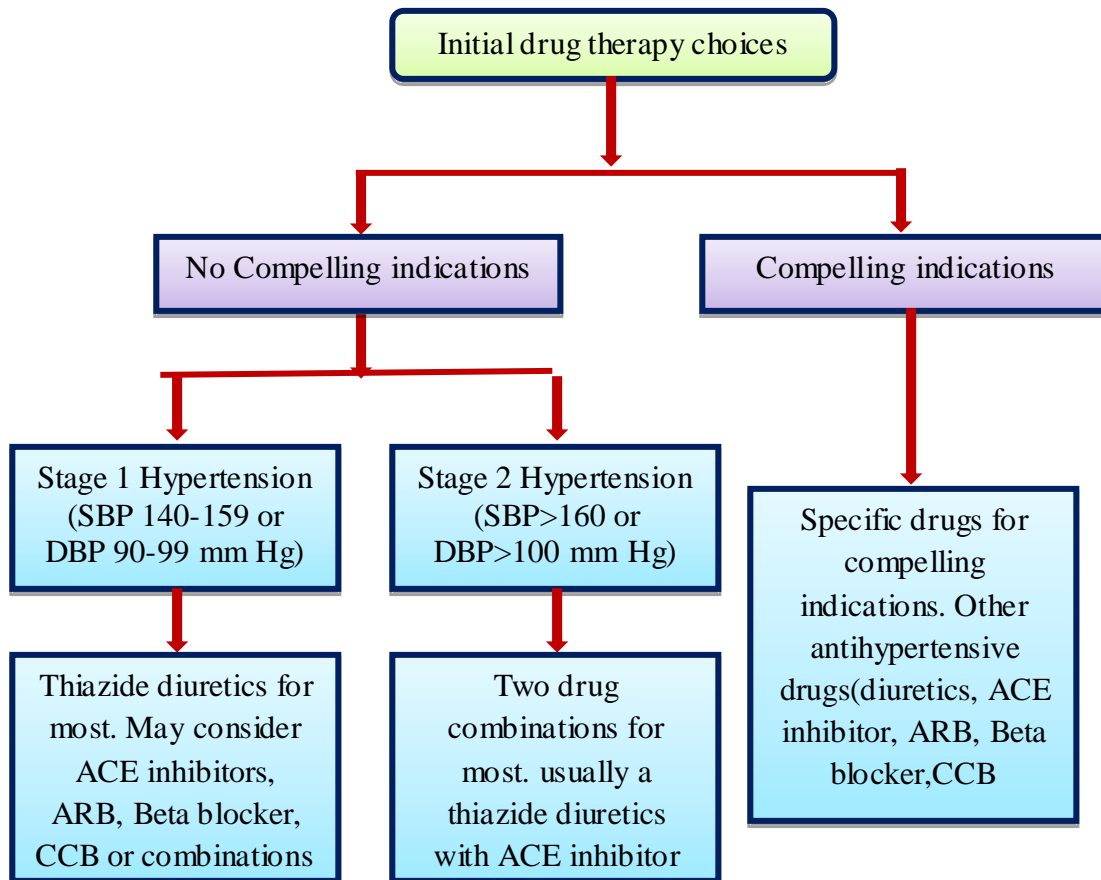
Most patients with stage 1 hypertension should be treated initially with thiazide diuretic. Patients with stage 2 hypertension should be prescribed combination therapy with one of the agents being a thiazide type diuretic unless contraindications exist<sup>[9]</sup>.

There are 6 compelling indications where specific antihypertensive drug classes have shown evidence of unique benefits<sup>[10]</sup>.

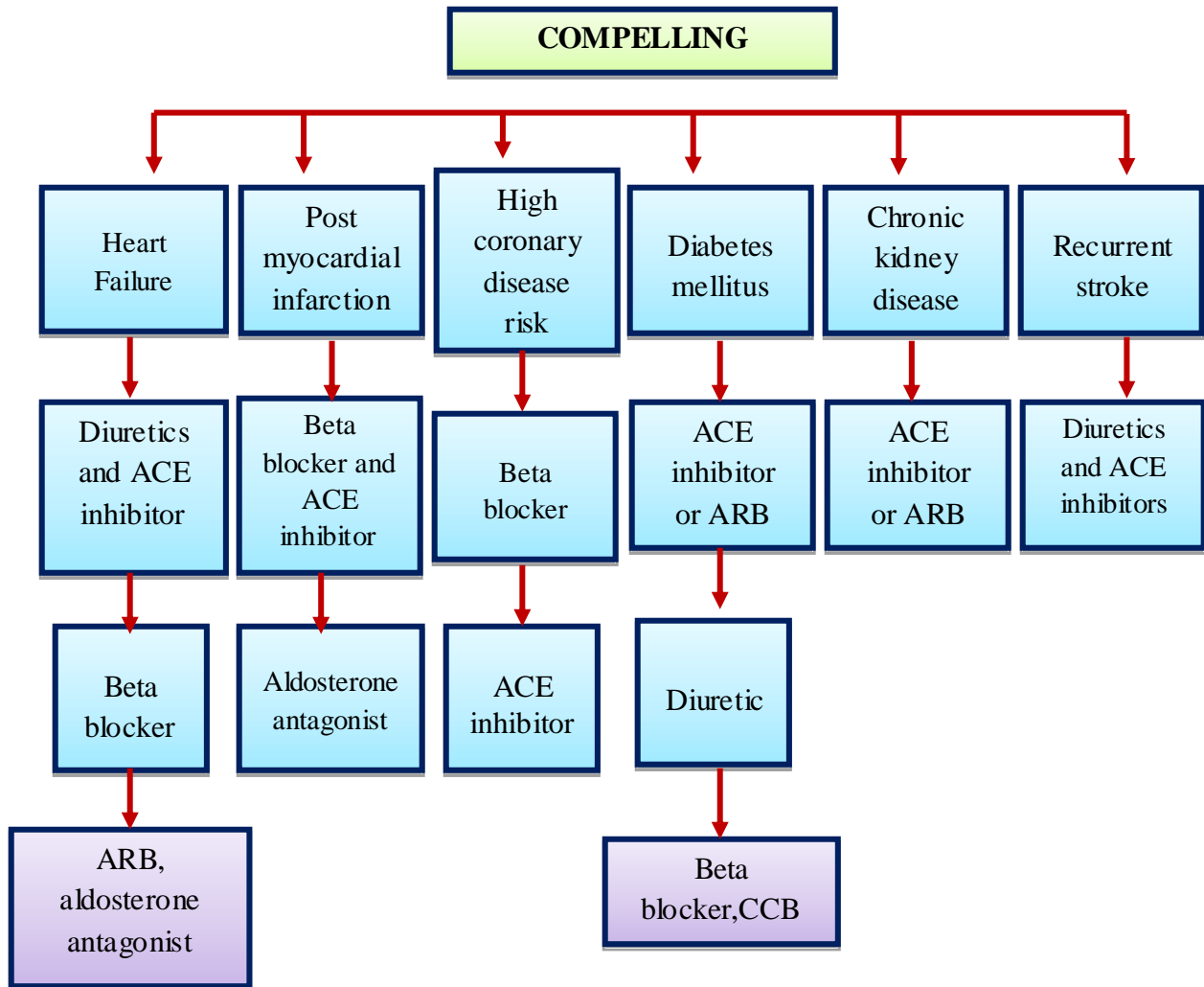
Diuretics, Beta blockers, Angiotensin-converting enzyme (ACE) inhibitors, Angiotensin II Receptor Blockers (ARBs) and Calcium Channel Blockers (CCBs) are the primary agents based on outcome data demonstrating reductions in target organ damage or cardiovascular morbidity and mortality. Alpha Blockers, Central Alpha 2 Agonists, Adrenergic Inhibitors and Vasodilators are alternatives that may be used in select patients after primary agents<sup>[10]</sup>.

Hypertensive urgency/ emergency: "Hypertensive emergency" is defined as a state of elevated BP values of SBP or DBP, above 180 mmHg or 120 mmHg, respectively with accompanying end organ damages (OD) such as major neurological changes, hypertensive encephalopathy, cerebral infarction, intracranial hemorrhage, acute LV failure, acute pulmonary edema, aortic dissection, renal failure, or eclampsia.

"Hypertensive urgency" is characterized by isolated large BP elevations without acute OD. Though parenteral drug therapy is generally not necessary in urgencies both hypertensive emergencies and urgencies require the usage of intravenous agents like labetalol, sodium nitroprusside, nicardipine, nitrates and furosemide to bring down the BP. It is always recommended.

**Algorithm for treatment of hypertension<sup>[3]</sup>**

**Compelling indications for individual drug classes<sup>[3]</sup>**



**CLASSIFICATION OF DRUGS<sup>[2]</sup>:****1. DIURETICS****a) Thiazide-eg:Chlorthalidone,hydrochlorothiazide,Indapamide**

MOA:Thiazide diuretics increases excretion of sodium and chloride. It directly affects the distal convoluted tubule of nephron, resulting in decreased extracellular volume, plasma volume, cardiac output. It is postulated that sodium and water depletion provide a basis for its antihypertensive effect.

ADR:Arrhythmia,hyperuricemia,hypokalemia, gout,hyperlipidemia,mild gastro intestinal disturbances,agranulocytosis.

**b) High ceiling-eg:Furosemide**

MOA: It is a potent diuretic that works by blocking absorption of sodium and chloride in the kidney tubules(proximal and distal tubules also in loop of Henle) causing a profound increase in urine output.

ADR:Electrolyte disturbances,dehydration,gastrointestinal disturbances,hyperuricemia, visual disturbances,tinnitus and deafness.

**c) Potassium sparing diuretics-eg:Spiranolactone**

MOA: Exhibits antidiuretic activity with weak natriuretic,diuretic and antihypertensive properties. It blocks the reabsorption of sodium at the distal convoluted tubule,cortical collecting tubule and collecting duct, resulting in reduced net negative potential of the tubular lumen and decreased secretion and subsequent excretion of hydrogen and potassium.

ADR:Hyperkalemia,gynaecomastia,hepatotoxicity,electrolyte disturbances,Stevens-Johnson syndrome.

**2. ACE INHIBITORS**

eg:Ramipril,Captopril,Enalapril,Perindopril,Lisinopril

MOA: It prevents the conversion of angiotensin I to angiotensin II,a vasoconstrictor agent,which decrease vasopressor activity and aldosterone secretion.

ADR:Hypotension,cough,anaphylactoid reactions,taste disturbances,angioedema.

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### **3. ANGIOTENSIN RECEPTOR BLOCKERS**

eg: Telmisartan, losartan and valsartan

MOA: It selectively blocks the binding of angiotensin II to the AT 1 receptors in vascular smooth muscles and adrenal gland. Angiotensin II decreases the excretion of sodium and increases the excretion of potassium.

ADR: Cough, upper respiratory tract infections, renal failure, edema, headache, dizziness, hyperkalaemia.

### **4. CALCIUM CHANNEL BLOCKERS**

eg: Amlodipine, Diltiazem, Verapamil, Nifedipine,

MOA: Calcium channel blocker exerts its effect by blocking the trans membrane influx of calcium ions into cardiac and vascular smooth muscles. It also reduces peripheral arteries of vascular smooth muscles.

ADR: Flushing, Palpitation, Abdominal pain, bradycardia, constipation (verapamil), headache, syncope.

### **5 BETA ADRENERGIC BLOCKERS**

eg: Metoprolol, propranolol, Atenolol

MOA: Beta blockers act by competitive antagonism of catecholamines at peripheral and cardiac adrenergic receptors (resulting in decreased cardiac output), a central effect leading to reduce sympathetic outflow and suppression of renin activity .

ADR: Tiredness, dry cough, bradycardia, hypotension, peripheral vasoconstriction, bronchospasm.

### **6. ALPHA BLOCKERS**

eg: Prazosin, Terazosin, Doxazosin

MOA: it causes a reduction in total peripheral resistance and directly relaxes vascular smooth muscles which may be related to post synaptic alpha adrenoceptor blockade.



ADR:Orthostatic hypotension,headache,oedema, dyspnoea,nervousness,urinary frequency.

## **7. CENTRAL SYMPATHOLYTICS**

eg:Clonidine,Methyldopa,Moxonidine

MOA : It stimulates alpha 2-adrenergic receptors in brain resulting in reduced sympathetic outflow from CNS and decreased peripheral resistance.

ADR:Contactdermatitis,erythema,drymouth,posturalhypotension,depression,dizziness, sleep disturbances.

## **8. VASODIALATORS**

eg:Hydralazine,minoxidil,diazoxide,sodium nitroprusside

MOA: It decreases blood pressure by exhibiting a peripheral vasodialating effect through a direct relaxation of vascular smooth muscles, it interferes with calcium movement responsible for initiating or maintaining the contractile state within the vascular smooth muscle by altering cellular calcium metabolism.

ADR:Chestpain,postural hypotension,headache,oedema,sodium and water retention, dizziness.

## **BENEFIT OF ANTIHYPERTENSIVE DRUG THERAPY**

Diuretics or Beta blockers have been shown to reduce the risk of coronary heart disease by 16%,stroke by 38%,cardiovascular death by 21% and causes of mortality by 13%. The effects of ACE inhibitors and calcium antagonists are similar.

## MEDICATION ADHERENCE

The WHO defines adherence to long-term therapy as “the extent to which a person’s behaviour—taking medication, following a diet, and/or executing lifestyle changes or responds with agreed recommendations from a health care provider.” Often, the terms *adherence* and *compliance* are used interchangeably. However, their connotations are somewhat different: *adherence* presumes the patient’s agreement with the recommendations, whereas *compliance* implies patient passivity.

Medication-taking behavior is extremely complex and individual, requiring numerous multi factorial strategies to improve adherence. An enormous amount of research has resulted in the development of medications with proven efficacy and positive benefit-to-risk profiles. This millennium has seen a new and greater focus on outcomes. However, we seem to have forgotten that between the former and the latter lies medication adherence:

Treatment → Adherence → Outcomes

Measurement of medication adherence is challenging because adherence is an individual patient behavior. The following are some of the approaches that have been used: (1) subjective measurements obtained by asking patients, family members, caregivers, and physicians about the patient’s medication use; (2) objective measurements obtained by counting pills, examining pharmacy refill records, or using electronic medication event monitoring systems; and (3) biochemical measurements obtained by adding a nontoxic marker to the medication and detecting its presence in blood or urine or measurement of serum drug levels. Currently, a combination of these measures is used to assess adherence behavior. Along with the monitoring of outcome, these tools assist investigators in studying medication adherence.

## BARRIERS IN ADHERENCE

- Complexity: “There are so many pills, I can’t keep them straight!”
- High cost: “I can’t afford my medicine so I will only take half a pill today.”
- Difficulty remembering schedules: “I forget to take them.”

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- Lack of understanding: “Why do I need them?”
- Not feeling sick: “I feel fine. I don’t need them.”
- Side effects: “The yellow pills make me feel sick and I heard the blue pills give you liver problems.”
- Embarrassment/Stigma: “I don’t want my friends to know that I’m sick.”
- Depression: “I don’t care.... What’s the point?”
- Health literacy: “I can’t understand these instructions!”
- Belief systems: “My sister took insulin, then had her leg amputated.”

### **Improving Medication Adherence Among Patients with Hypertension** <sup>[11]</sup>:

Use the SIMPLE method to improve medication adherence among your patients

#### **Simplify the regimen**

- Encourage patients to use adherence tools, like day-of-the-week pill boxes or mobile apps.
- Work to match the action of taking medication with a patient’s daily routine (e.g., meal time or bed time, with other medications they already take properly).

#### **Impart knowledge**

- Write down prescription instructions clearly, and reinforce them verbally.
- Provide websites for additional reading and information—find suggestions at the Million Hearts website.

#### **Modify patients’ beliefs and behavior**

- Provide positive reinforcement when patients take their medication successfully, and offer incentives if possible.
- Talk to patients to understand and address their concerns or fears.

### **Provide communication and trust**

- Allow patients to speak freely. Time is of the essence, but research shows that most patients will talk no longer than 2 minutes when given the opportunity.
- Use plain language when speaking with patients. Say, “Did you take all of your pills?” instead of using the word “adherence.”
- Ask for patients’ input when discussing recommendations and making decisions.
- Remind patients to contact your office with any questions.

### **Leave the bias**

- Understand the predictors of non-adherence and address them as needed with patients.
- Ask patients specific questions about attitudes, beliefs, and cultural norms related to taking medications.

### **Evaluate adherence**

- Ask patients simply and directly whether they are sticking to their drug regimen.
- Use a medication adherence scale—most are available online:
  - Morisky-8 (MMAS-8)
  - Morisky-4 (MMAS-4 or Medication Adherence Questionnaire)
  - Medication Possession Ratio (MPR)
  - Proportion of Days Covered (PDC)

## **MEDICATION NON-ADHERENCE** <sup>[11]</sup>

Medication non-adherence is a vitally significant health concern because it influences the quality of life and consequently can lead to disability and mortality, and also affects the productivity of the workforce. According to the American Heart Association, (2013) and Malmstrom et al., (2007) there are many factors affecting adherence to hypertensive medication regimen: knowledge of medication, long and ongoing treatment, education level, literacy, and poor relationship with health care provider, beliefs about medication and side effects, psychological factors, social support, socio-economics, access to health care, lack of health insurance, asymptomatic disease and inconvenience. Usually medication non-adherence is associated with increasing age, male gender, lower income, obesity, smoking, cognitive impairment, disease burden, and lower social support.

### **Predictors of Non-Adherence** <sup>[11]</sup>

When discussing medications, be aware if your patient:

- Demonstrates limited English language proficiency or low literacy.
- Has a history of mental health issues like depression, anxiety, or addiction.
- Doesn't believe in the benefits of treatment.
- Believes medications are unnecessary or harmful.
- Has a concern about medication side effects.
- Expresses concern over the cost of medications.
- Says he or she is tired of taking medications.

These can all be predictors of a patient who may struggle with adherence to medication "

## LITERATURE REVIEW

**Kumar A et al (2018)** conducted a study on medication adherence among hypertensive adults residing in a rural area of dhakshina kannada district. Medication adherence was assessed using morisky medication adherence scale and the study showed medium adherence in patients who were treated for hypertension <sup>[12]</sup>.

**Huda Al Noumani et al (2017)** conducted a study on relationship between medication adherence and health beliefs among patients with hypertension in oman. Medication adherence was assessed using Morisky Medication Adherence Scale and the beliefs were measured using belief about medicine questionnaire, Brief illness perception questionnaire and the revised Medication Adherence self efficacy scale and the study shows that this pilot study emphasize the role of health beliefs with regards to omani patients adherence to antihypertensive medications <sup>[4]</sup>.

**Ezeala –adikaibe BA et al(2017)** conducted a study on factors associated with medication adherence among hypertensive patients in a tertiary health centre. A total of 436 were surveyed in the study. The medication adherence was assessed using morisky green medication adherence scale and the study showed non-adherence is high among hypertensive patients attending tertiary care centers in the south east and education related to medication adherence needs to be improved<sup>[13]</sup>.

**Endang Sulisyiyowayiningsih and Mutiara Herawati (2017)** conducted a Multicentre study on treatment adherence of hypertension focused on primary health care in Indonesia. The adherence was calculated by using the 8 item morisky scale. The study concluded that the non adherence treatments of hypertensive out patients in primary healthcare was highest through application of MMAS-8 <sup>[14]</sup>.

**Anjana brijith johnson et al (2016)** conducted a study on Medication adherence rating of patients with hypertension in a tertiary care hospital. The adherence was calculated using MARS scale. The study concluded that there were a high rate of adherence for the patients treated for hypertension <sup>[15]</sup>.

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**Yu Ting Li et al (2016)** conducted a study on medication adherence and blood pressure control among hypertensive patients with coexisting long –term conditions in primary care settings. Medication adherence was assessed using Chinese version of the Morisky Medication Adherence scale and study showed poor BP control owing to multi morbid conditions arising as a result of poor adherence in patients<sup>[16]</sup>.

**Suzanne H.S.Lo et al (2016)** conducted a study on adherence to anti hypertensive medication in older adults with hypertension. The study was conducted on 195 older adults using morisky medication adherence scale, medical interview satisfaction scale and illness perception questionnaire. The results showed poor medication adherence in old age and the results highlight the importance of cultivating positive beliefs that hypertension is amenable to control by treatment<sup>[7]</sup>.

**Anup Bhusal et al ( 2015 )**conducted a cross sectional study for assessment of medication adherence among hypertensive patients .The study was done on 129 hypertensive patients to assess adherence using Hill-Bone scale, the findings showed poor adherence and education related to medication adherence needs to be improved<sup>[17]</sup>.

**Vincent boima et al(2015)** conducted a study on factors associated with medication non adherence among hypertensive’s in Ghana and Nigeria. The study was done on 357 patients using 8 –item morisky scale, belief about medication questionnaire and patient health questionnaire, the findings showed medication non adherence is high among hypertensive’s in Ghana and Nigeria and is associated with depression, concern about hypertensive medications, formal education and use of herbal preparations<sup>[18]</sup>

**Asmamaw Yenesew et al ( 2014 )**conducted a study on prevalence of non adherence and its associated factors of hypertensive patients at Jimma University specialized hospital in southwest Ethiopia. The findings suggested reported side effects of medicines, forgetfulness followed by financial and religious believes were the causes of non adherence<sup>[19]</sup>.

**Chythra in (2014)** conducted a study on treatment compliance among patients in costal population with HTN and type 2 DM and the study showed factors for

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non compliance such as patient related, condition related, therapy related, socioeconomic factors<sup>[20]</sup>.

**Rowa Al-Ramahi (2014)** conducted a study on Adherence to medication and associated factors : a cross sectional study among Palestinian patients . Social and demographic variables and self reported drug adherence (morisky scale) was determined for each patient. Study concluded that poor adherence to medications was very common adherence and education related to medication adherence needs to be improved<sup>[21]</sup>.

**Amonov Malik et al (2014)** conducted a study on Hypertension –related knowledge, practice and drug adherence among inpatients of a hospital in samarkand, Uzbekistan. The study was done on 209 patients using 4 item morisky scale and the reason for non adherence was assessed by a self administered questionnaire. The study concluded that the inpatients of the secondary hospital had sufficient general knowledge about hypertension, but they had in adequate knowledge about specific issues such as treatment for and symptoms of hypertension. Both drug adherence and BP control rate were sub optional and significantly associated with hypertension knowledge<sup>[22]</sup>.

**Sharon J Rolnick et al (2013)** conducted a study on Patient characteristics associated with medication adherence. The medication possession ratio was calculated. Study concluded that medication adherence for those with one condition was higher in males, caucasians, older patients, and those living in areas with higher education rates and higher income<sup>[23]</sup>.

**Gabrielle K.Y.Lee et al ( 2012)** conducted a study regarding determinants of medication adherence to antihypertensive medications among a Chinese population using Morisky Medication Adherence Scale on 1114 patients. The study showed (65.1%) had good adherence to antihypertensive agents. The findings showed younger age ,shorter duration of antihypertensive agents used ,self perceived health status and lack of money as causes for non adherence<sup>[24]</sup>.

**Azuana Ramli et al in (2012)** conducted a study on medication adherence among hypertensive patients of primary health clinics in Malaysia .The study showed that

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poor adherence to medication was major cause of treatment failure in chronic disease such as HTN and developing intervention to improve adherence is needed<sup>[25]</sup>.

**Virginie korb-savoldelli et al (2012)** conducted a study on validation of a French version of the 8 item morisky medication adherence scale in hypertensive adults and found there is high rate of medication adherence in patient and the only factor significantly associated with adherence was age. The French MMAS has acceptable psychometric effects to measure medication adherence in hypertensive patients may be useful in detecting non adherent hypertensive patients <sup>[26]</sup>.

**Samuel wagner et al (2012)**, conducted a study on Impact of medication adherence on work productivity in hypertension. Work productivity and activity impairment were evaluated using the work productivity and activity impairment questionnaire and morisky medication adherence scale. The results concludes that low adherence to prescribed antihypertensive medication regimens was associated with a reduction in work productivity<sup>[27]</sup>.

**Krezenski and Leeman in (2011)** conducted a study on practical issues in medication compliance in hypertensive patients and the study identified barriers to adherence and necessity to bring about interventions<sup>[28]</sup>.

**Arshia Bilal et al (2011 )**conducted a study on non compliance to antihypertensive medication and its associated factors among hypertensives.The study was conducted on 113 inpatients and the results showed 64.14% patients were non-compliant and the reason for non-compliance was associated with gender and socioeconomic status of patients <sup>[29]</sup>.

**Giampiero mazzaglia et al (2009)**conducted a study on Adherence to antihypertensive medications and cardiovascular morbidity among newly diagnosed hypertensive patients. The adherence was calculated by observing PDC (proportion of days covered), and concluded that the long term reduction of acute cardiovascular events associated with high adherence to antihypertensive treatment underscores its importance in assessment of the beneficial effects of evidence based therapies in the population <sup>[30]</sup>.

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## SCOPE

Hypertension is a common disease that is defined simply as persistently elevated arterial blood pressure (BP). It is now identified as one of the most significant risk factors for cardiovascular disease. Increasing awareness and diagnosis of hypertension and improving control of BP with appropriate treatment are considered critical public health initiatives to reduce cardiovascular morbidity and mortality.

The global prevalence of hypertension (HTN) is projected to increase markedly by 2025. Poor hypertension management increases health care expenditure and complication, mortality and morbidity rates, as such medication adherence is key. There is inadequate patient adherence to anti hypertensive's globally. Medication adherence can be predicated significantly by patients beliefs about health and illness and can be assessed by help of different adherence scales like MMAS, MARS etc. Moreover , beliefs regarding the severity of disease, self efficacy and the benefits of medication may explain patients attitude towards medication adherence<sup>[4]</sup>.

Medication-taking behaviour is extremely complex and individual, requiring numerous multifactorial strategies to improve adherence. An enormous amount of research has resulted in the development of medications with proven efficacy and positive benefit-to-risk profiles. This millennium has seen a new and greater focus on outcomes. However, we seem to have forgotten that between the former and the latter lies medication adherence : Treatment → Adherence → Outcomes.

The WHO defines adherence to long-term therapy as “the extent to which a person’s behaviour—taking medication, following a diet, and/or executing lifestyle changes or responds with agreed recommendations from a health care provider.” Often, the terms *adherence* and *compliance* are used interchangeably. However, their connotations are somewhat different: *adherence* presumes the patient’s agreement with the recommendations, whereas *compliance* implies patient passivity.

Patients’ adherence to medical treatment usually depends on the relationship between the patient and the physician .Adherence to medication can be measured by subjective, direct

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and indirect methods. Subjective methods include self report. Direct method include serum or urine drug level. Indirect method include pharmacy database records, pharmacy refill rates or pill counts. Patients that were adherent to the regimen of the hypertension treatment were often significantly less likely to have elevated blood pressures.

Medication non-adherence is a vitally significant health concern because it influences the quality of life and consequently can lead to disability and mortality, and also affects the productivity of the workforce. There are many factors affecting adherence to hypertensive medication regimen: knowledge of medication, long and ongoing treatment, education level, literacy, and poor relationship with health care provider, beliefs about medication and side effects, psychological factors, social support, socio-economics, access to health care, lack of health insurance, asymptomatic disease and inconvenience. Usually medication non-adherence is associated with increasing age, male gender, lower income, obesity, smoking, cognitive impairment, disease burden, and lower social support .

In this study we planned to estimate the rate of adherence to medications in hypertensive patients and to study the factors that might affect adherence to medications.

Medication adherence is usually understood as whether patients take their medications regularly as they are prescribed as well as they continue to take them for a needed period of time. Medication adherence is of special attention to clinicians, healthcare systems, and other investors because the numbers of medication non-adherence is rampant and very much related to the adverse outcomes and higher costs of care . Medication adherence is necessary for the patients who suffer chronic diseases such as diabetes, heart disease and cancer.

Measurement of medication adherence is challenging because adherence is an individual patient behavior. Here we assess medication adherence by subjective measurements obtained by asking patients, family members, caregivers, and physicians about the patient's medication use and also evaluate the adherence by use of different scales like MMAS and MARS.

To close the adherence gap means to improve the quality of health care, to stimulate better chronic care supervision, and to promote better health outcomes. Some researchers came to the conclusion that adherence proportions during the first year of therapy across a range of chronic medical conditions are usually treated with conservation therapy .

## **PLAN OF THE STUDY**

The proposed study assessment of medication adherence among hypertensive patients was planned and carried out as per the given plan and was designed as given below.

**Study site** : General medicine and Cardiology department

**Study design** : Prospective observational study

**Study period** : 10 months

### **Phase 1 :**

- Literature survey
- Identification of scope
- Submission of protocol and obtaining consent letter from the hospital authority.
- Designing of :
  - Data entry form
  - Patient information and consent form
  - Questionnaire

### **Phase 2 :**

- Data collection through standard data entry format in ward rounds
- Literature surveys
- Data analysis.

### **Phase 3 :**

- Literature survey
- Data analysis
- Preparation and submission of study reports.

## **OBJECTIVE**

To study medication adherence , factors affecting medication adherence and health beliefs among patients with hypertension and subsequently analyze the relationship between health beliefs and medication adherence.

## **METHODOLOGY**

### **STUDY SITE**

The proposed work entitled “**Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital**” was carried out in a 1000 bedded multispecialty tertiary care teaching hospital in Coimbatore. The hospital is unique and well known for its service to the people who come from various part of the country. The institution excels in diverse specialties like General medicine, General surgery, Obstetrics, Gynecology, Pediatrics and Neonatology, Orthopedics, Psychiatry, Neurology, Radiology, Cardiology, Nephrology, E.N.T, Ophthalmology, Oncology, Dentistry, Plastic surgery, and department of physical rehabilitation. The hospital has well- staffed Pharmacy and a Drug Information Centre.

The hospital is well equipped with modern diagnostic facilities like CT scan, MRI, ECG, tread mill, colour Doppler etc. The hospital also have twelve well equipped Hi-tech operation theatres , Intensive Care Unit, Intensive cardiac unit, Intensive pulmonary care unit, NICU, Catheterization laboratory performing diagnostic cardiac catheterization, balloon valvuloplasty, coronary stenting, kidney transplantation unit with hemodialysis machines, assisted reproductive technology centre, 24 hour microbiological and pathological services, blood bank, round the clock casualty and pharmacy services etc.

### **DEPARTMENT SELECTED FOR THE STUDY IN THE HOSPITAL**

The department selected for the study in Cardiology. The reason for selection of this department is more prevalence of hypertensive cases. The Department of Pharmacy Practice provides services to these departments and also has a good cooperation from medical team added up reasons for selecting this department for conducting the study. Knowledge on prescribing patterns, potential drug interactions, and ADRs especially in geriatric population will help the health care professionals to ensure safer and better treatment outcomes.

## **CONSENT FROM HOSPITAL AUTHORITIES**

It is mandatory that every project work carried out in the hospital by Pharmacy Practice department students has to get the study approved by the hospital ethical committee and should be informed to all physicians and other health care professionals of the hospital. A protocol of the study which includes the objectives, methodology and probable outcome was prepared and submitted to the Institutional Ethical Committee. The approval from the committee was procured through the letter [SRH/EC.12-9/2017-18 dated 28<sup>th</sup> December 2017] and the same is attached to reference in the (Annexure 1). The study was conducted with the expert guidance of senior and junior physicians of the study departments. The authors were allowed to utilize the hospital facilities to make a follow up of the cases, in the selected departments. All the health care professionals of the study site were well informed through Dean's official circular.

## **LITERATURE REVIEW**

An extensive literature review was done regarding the medication adherence in hypertensive patients diagnosed along with other co morbid conditions. This includes information about the categories of drugs prescribed in hypertensive population. The necessary information quoted on the literature is well documented. The literatures supporting the study were gathered from various sources such as :

1. Journal of Hypertension
2. International Journal of Basic & clinical pharmacology
3. International Journal of Community Medicine and Public health
4. The Annals of Pharmacotherapy
5. International journal of Cardiology
6. International journal of Medicine and Public health
7. International Journal of Pharmacy and Pharmaceutical science
8. Family Practice- An International Journal

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9. International Journal of Hypertension
10. Singapore Medical Journal
11. Therapeutics and Clinical Risk Management

Databases such as Micromedex, Science direct, NIH Medscape, PubMed, WebMed, and NCBI were also widely used.

## **OUTLINE OF THE STUDY**

### **PATIENT SELECTION :**

#### **Inclusion criteria :**

- Adult patient with HTN aged  $\geq 21$  years old.
- All participants who were diagnosed with HTN by their primary physician at least one year prior to the study and had been prescribed at least one anti hypertensive medication.
- Patients from both gender.
- Patients who give their consent.

#### **Exclusion criteria :**

- Patients with other cardiac disorders, pregnant women, patients less than 21 year old, patients who are following other system of medicine.

### **PATIENT INFORMATION FORM :**

A patient information form has been prepared , to inform the patient or the caregivers about the purpose and the necessity of the study. The patients were assured that the confidentiality will be strictly maintained. The model of the patient information form is given in the Annexure No.2 for reference.

### **PATIENT CONSENT FORM :**

A patient consent form has been prepared and written consent was obtained from patient or care givers. The format contains details like address, date, place, provision for

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signature of the patient or caregivers, investigator and superior. The same is given in the Annexure No.3 for reference.

**DATA ENTRY FORM :**

A specially designed data entry format was prepared and used to record the patients details. Data entry format has the provision to record patient details such as name, age ,sex, height, weight, IP.No, .date of admission and discharge, reason for admission, patient medical and medical history, vital signs, laboratory investigations, co-morbidities, diagnosis, drug chart, drug interaction monitoring chart, MMAS, MARS, self made questionnaire for factors affecting HTN. The same is given in the Annexure No.4 for reference.

**DATA COLLECTION :**

Data was collected from cardiology department on a regular basis during the ward rounds. Each patients medication profile was reviewed. Patients who met the inclusion criteria were briefed on the project with the help of patient information form. The consents were obtained from the willing participants. The data from the medical charts were recorded in the customized data entry form.

**DATA ANALYSIS :**

The data obtained from the case sheets were collected and analyzed in a systemic format. The collected data includes demographic details of the study population such as name, age, gender, height, weight, BMI and IP number. The case sheets also includes details such as past medical and medication history, length of stay, vital signs, social history, laboratory investigations, diagnosis, co-morbid conditions, drugs prescribed and dosage regimen.

The appropriateness of each prescription was analyzed with the help of WHO core prescribing indicators. The prescriptions with problems like drugs with out indication, conditions where appropriate drugs were not prescribed, drug interactions, adverse drug reactions and contra indications were identified.

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The adherence was measured using two scales Morisky Medication Adherence Scale (MMAS-8) and Medication Adherence Rating Scale (MARS).

**Morisky Medication Adherence Scale :**

1. Do you some time forget to take your medicine ?
2. People some times miss taking their medicines for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medicines ?
3. Have you ever cut back or stopped taking your medicine with out telling your doctor because you felt worse when you look it?
4. When you travel or leave home, do you some times forget to take your medicines?
5. Did you take all your medicines yesterday?
6. When you feel like your medicines are control, do you sometimes stop taking your medicines ?
7. Taking medicines everyday is real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan ?

( questions 1 to 7- yes or no )

8. How often do you have difficulty remembering to take all your medicines ?
  - a) Never or rarely
  - b) Once in a while
  - c) Some times
  - d) Usually
  - e) All of the time

**Scoring :**

- Each “no” response is rated as 1 and each “yes” is rated as 0 except for item 5, in which each respond “yes” is rated as 1 and each no is rated as 0.

- For item 8 , if a patient chooses response “0”, the score is 1, and if they choose response “4”, the score is 0. Response “1,2,3” are respectively rated as “0.25, 0.5,0.75” respectively.

Using the morisky medication adherence scale, hypertensive patients were evaluated and classified based on the scores (0-8)obtained into three categories which are as follows :

- High adherence – 8
- Medium adherence - 6 to less than 8
- Low adherence - less than 6

**Medication Adherence Rating Scale :**

1. Do you ever forget to take your medicine ?
2. Are you careless at times about taking your medicines ?
3. When you feel better, do you some times stop taking your medicines ?
4. Some times if you feel worse when you take your medicine, do you stop taking it ?
5. I take my medication when i am sick.
6. It is unnatural for my mind and body to be controlled by medication.
7. My thoughts are clearer on medication.
8. By staying on medication i can prevent getting sick.
9. I feel weird, like a ‘zombie’, on medication.
10. Medication makes me feel tired and sluggish.

Patients are complaint if they respond “NO” to questions 1-6 and 9-10 and “YES” to questions 7-8.

**Scoring :**

- 0-3 = non-adherent
- 4-6 = partially adherent
- 7-10 =adherent

## RESULTS

The work entitled “ **Study of medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital**” was conducted in the department of Cardiology and General medicine at a 1000 bedded multispecialty hospital which has got state of art facilities. Data were collected from 132 hypertensive patients who fulfilled the criteria. The obtained data were analyzed and the result are furnished below.

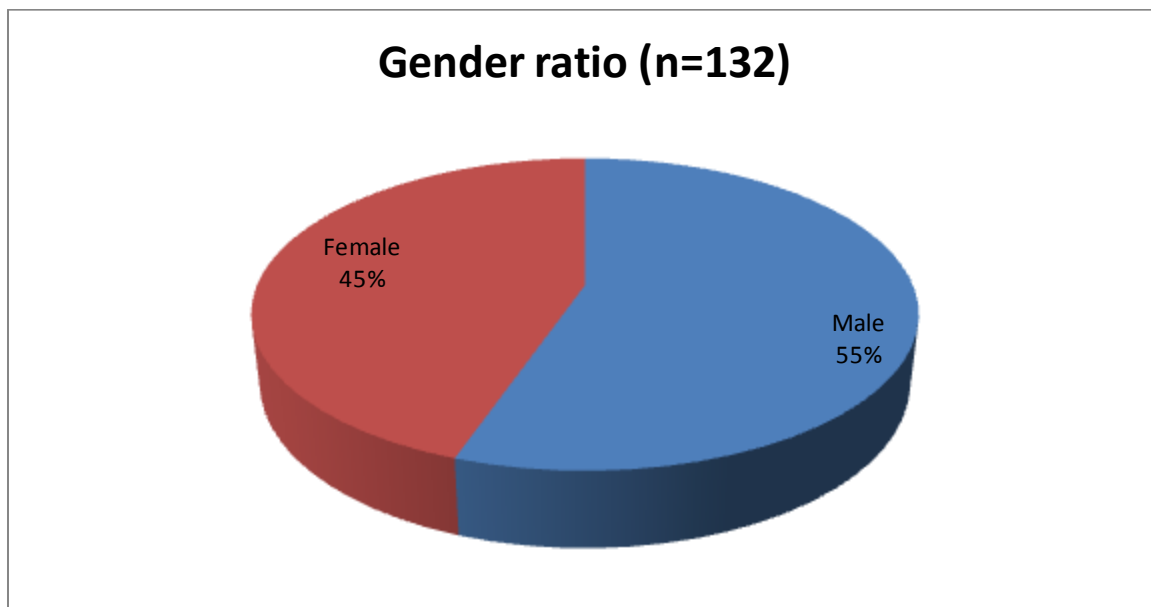
### GENDER RATIO IN PATIENT POPULATION

The total number of patients in the study were 132 of which 55.3% were males and 44.7% were female. The study results showed that predominantly males are affected with HTN.

**Table 1: Distribution of the patients in the study on the basis of their gender : values are expressed as numbers and percentages of the patients.**

(n=132)

Gender	No.of patients	Percentage (%)
Male	73	55.3%
Female	59	44.7%



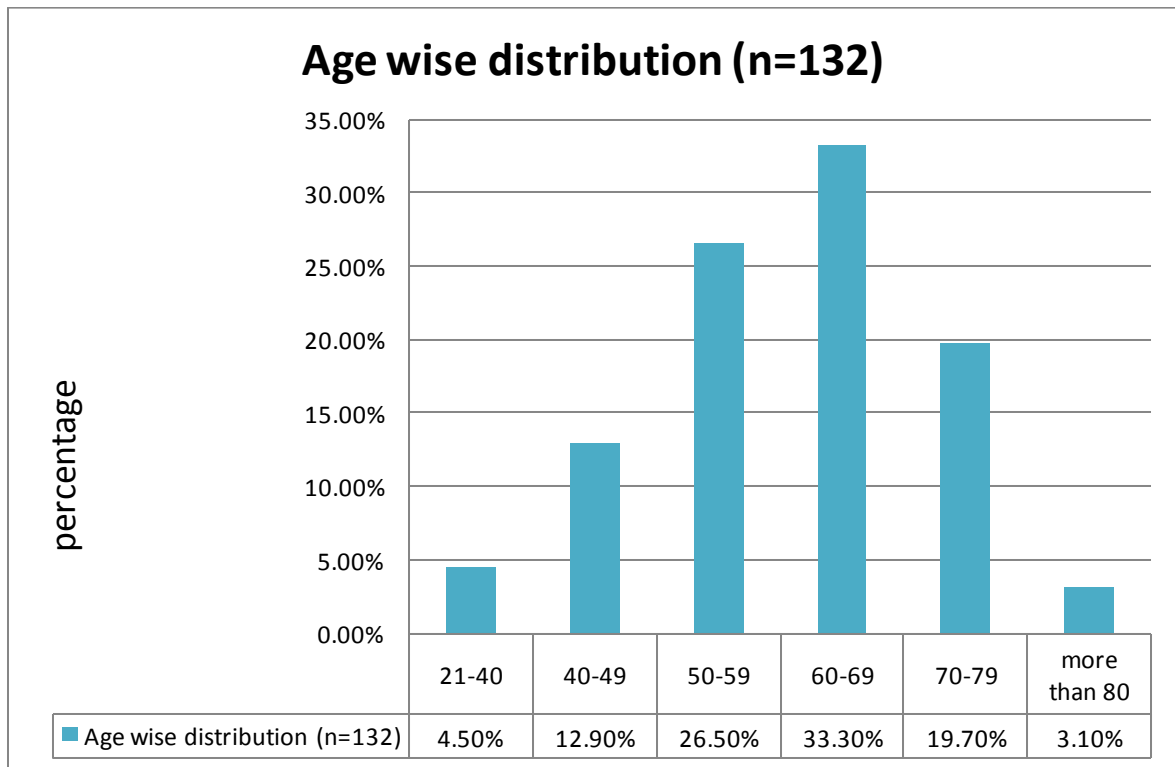
AGE WISE DISTRIBUTION

The study population was categorized based on their age. The obtained results are shown in the table below, the most predominant was in the age group 60-69 followed by age group 50-59.

**Table 2: Distribution of the patients in the study on the basis of their age. Values are expressed as numbers and percentages of the patients.**

(n=132)

Age in ratio (years)	No.of patients	Percentage (%)
21-40	6	4.5%
40-49	17	12.9%
50-59	35	26.5%
60-69	44	33.3%
70-79	26	19.7%
>80	4	3.1%



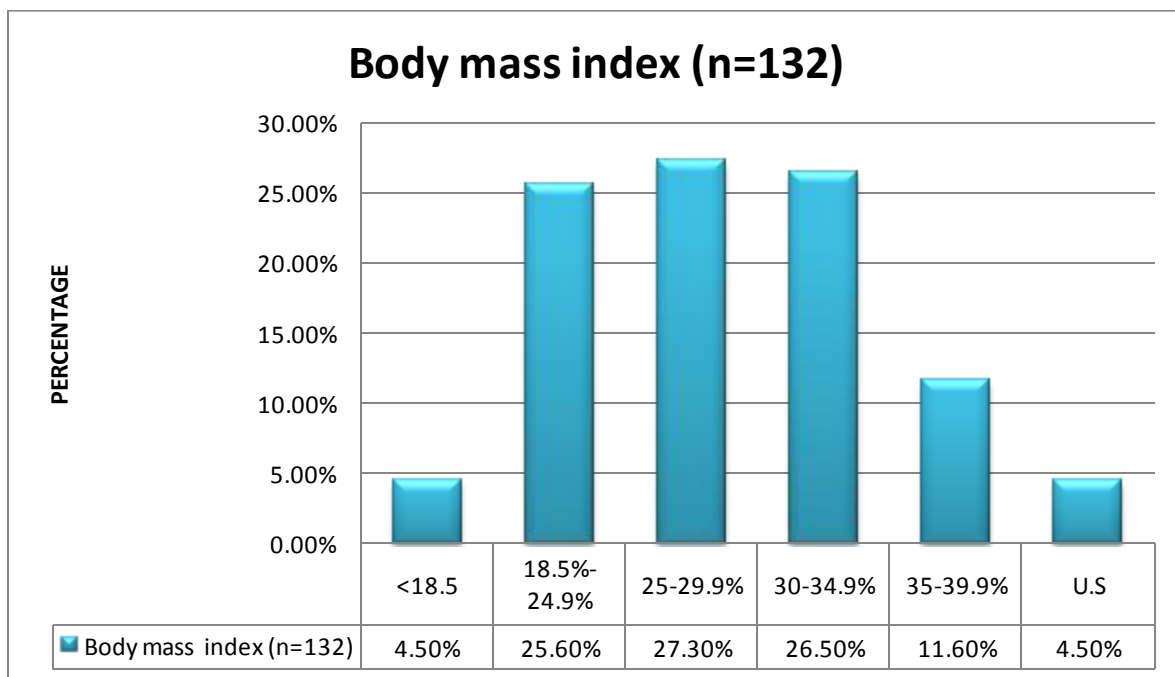
**BODY MASS INDEX**

The study population was categorized based on their BMI. The obtained results are shown in the below table. The most predominant was in over weight (27.3%) which is, in between the range 25-29.9.

**Table 3: Distribution of patients in the study on the basis of their BMI. Values are expressed as numbers and percentage of the patients.**

(n=132)

Category	Value	No.of males	No.of females	Percentage (%)
Under weight	<18.5	2	4	4.5%
Normal weight	18.5-24.9	21	13	25.6%
Over weight	25-29.9	21	15	27.3%
Obese class I	30- 34.9	16	19	26.5%
Obese class II	35-39.9	9	6	11.6%
Unable to stand		4	2	4.5%



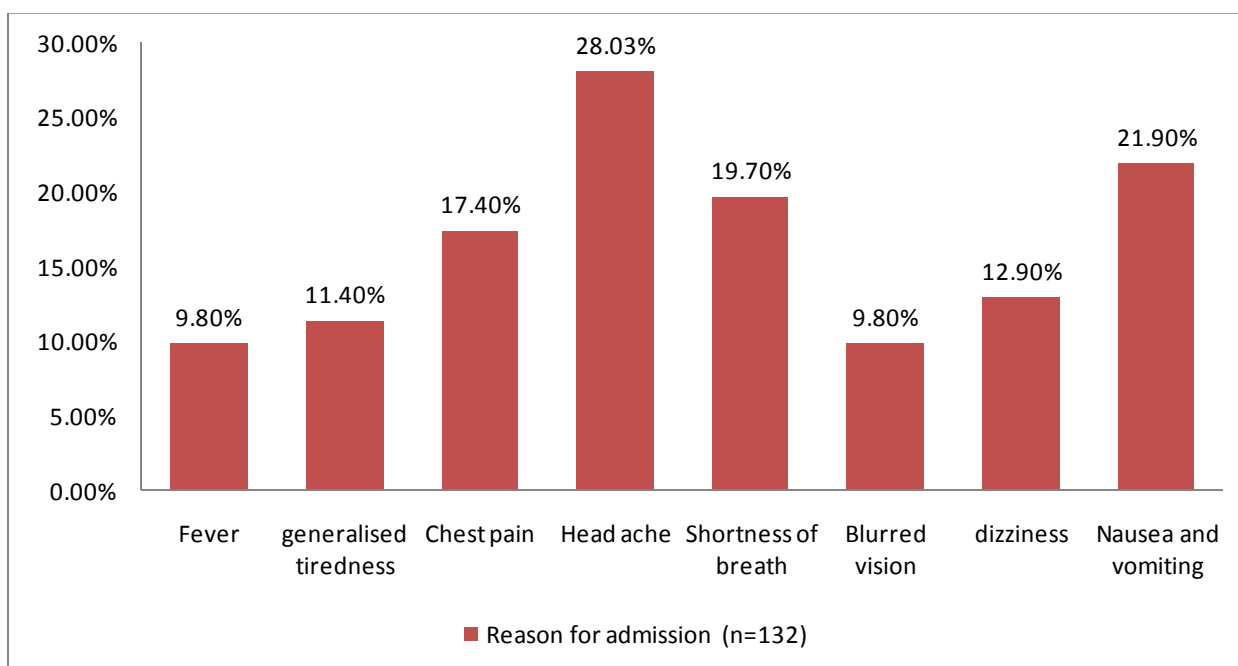
REASON FOR ADMISSION

It was observed that head ache, followed by nausea, vomiting, chest pain and shortness of breath were the major reasons for admission among the hypertensive patients. The details of the other reasons for admission are listed in the below table.

**Table 4: Distribution of patients in the study on the basis of their reason for admission. Values are expressed as numbers and percentage of the patients.**

(n=132)

Chief complaints	No.of patients	Percentage (%)
Fever	13	9.8%
generalized tiredness	15	11.4%
Chest pain	23	17.4%
Head ache	37	28.03%
Shortness of breath	26	19.7%
Blurred vision	13	9.8%
dizziness	17	12.9%
Nausea and vomiting	29	21.9%





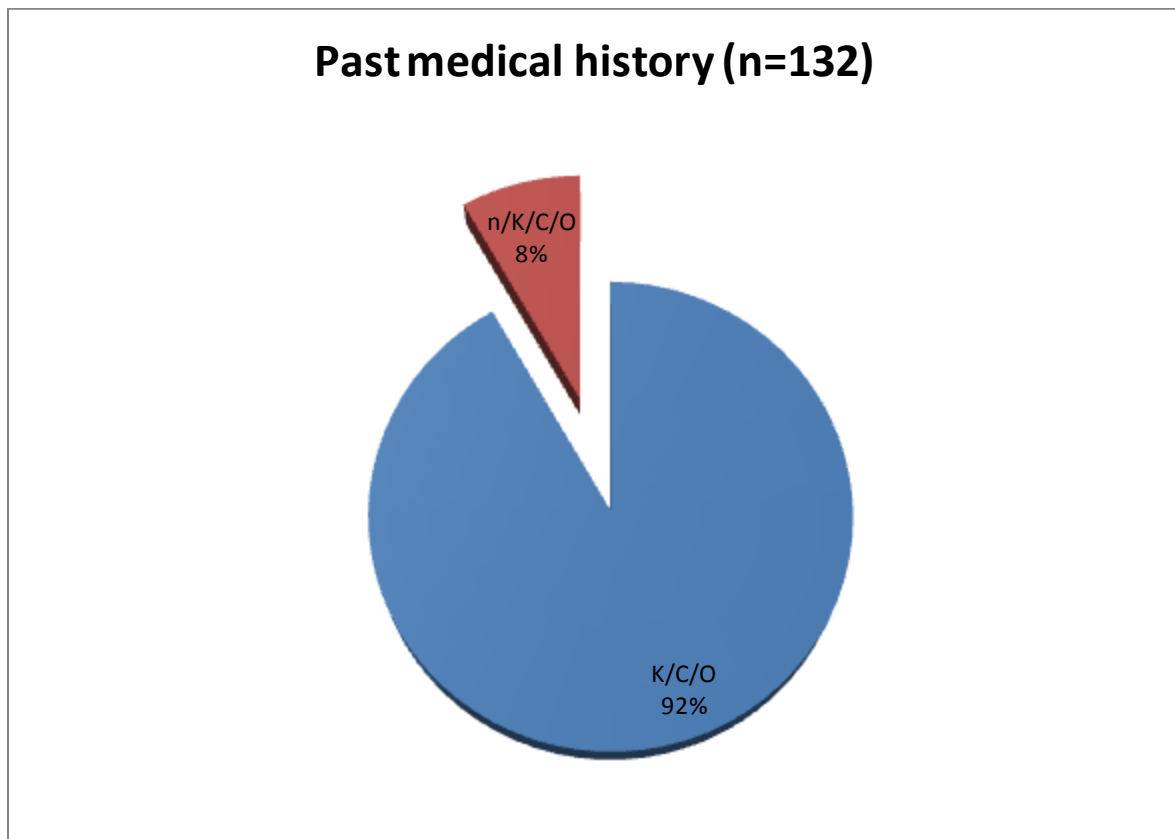
**PAST MEDICAL HISTORY**

12(91.7%) of the patients who participated in the study were having the past medical history.

**Table 5 : Distribution of the patients in the study on the basis of their past medical history. Values are expressed as numbers and percentage of the patients.**

(n=132)

Past medical history	No.of patients	Percentage (%)
K/C/O	121	91.7%
N/K/C/O	11	8.3%

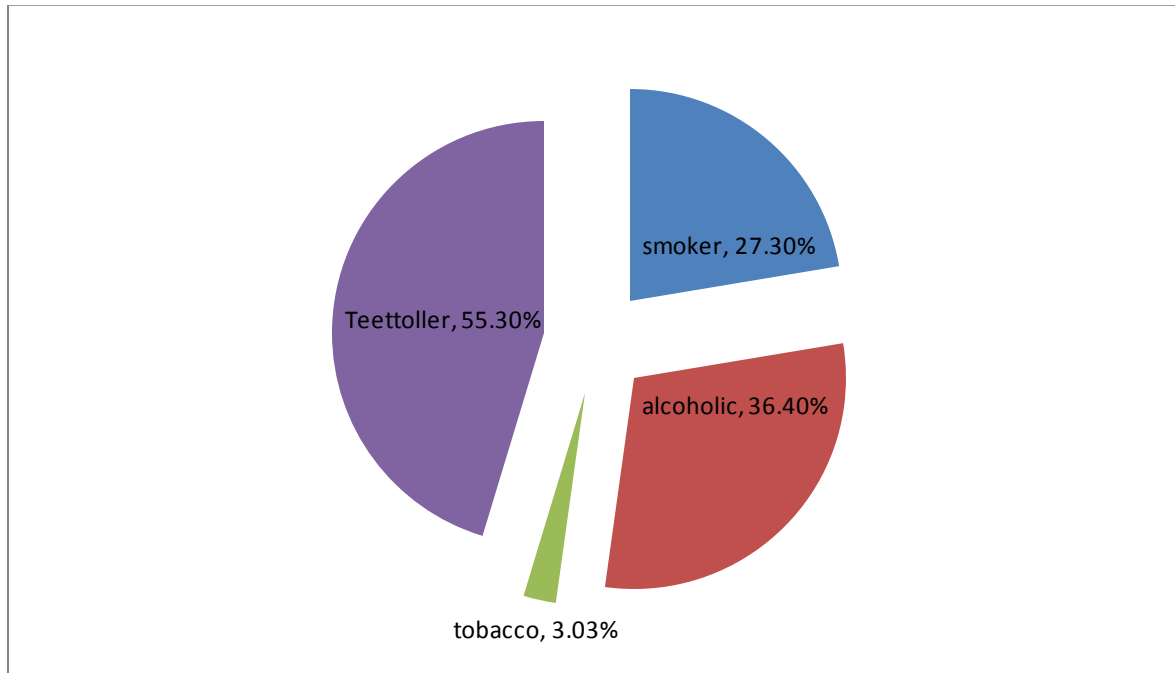


**SOCIAL HISTROY**

The social history of the patients were analyzed to find out the smoking and drinking habits and it was observed that 27.3% of the male study population were smokers and 36.4% were alcoholics. Smoking and alcohol are major predisposing risk factors for hypertensive patients.

**Table 6 : Distribution of the patients in the study on the basis of their social history. Values are expressed as numbers and percentage of the patients. (n=132)**

Age group	No. of patients	Percentage (%)
smoker	36	27.3%
alcoholic	48	36.4%
tobacco	4	3.03%
Teetotaler	73	55.3%

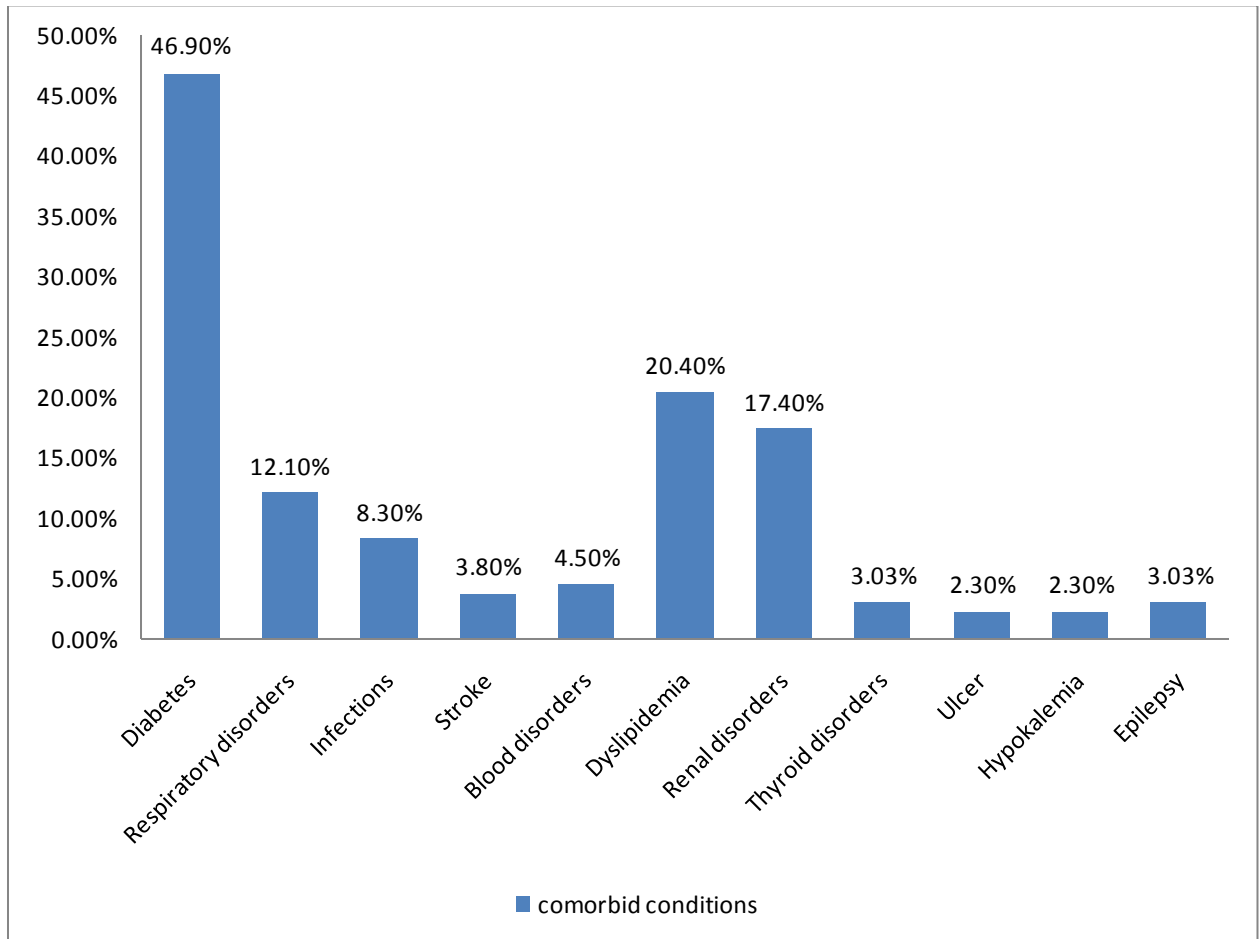


**PATIENTS COMORBID CONDITION**

Treatment of concomitant disease play an important role in the therapy of HTN patients. The collected data was analyzed to find out the concomitant disease suffered by the HTN patients. Around half of the population suffered from diabetes mellitus ( 46.9 %), followed by dyslipidemia (20.4%),renal disorders(17.4%) and respiratory disorders (12.1%).

**Table 7: Distribution of the patients in the study on the basis of their co-morbid condition. Values are expressed as numbers and percentage of the patients. (n=132)**

<b>Sl.no</b>	<b>Concomitant disease</b>	<b>No.of patients</b>	<b>percentage</b>
1	Diabetes	62	46.9%
2	Respiratory disorders	16	12.1%
3	Infections	11	8.3%
4	Stroke	5	3.8%
5	Blood disorders	6	4.5%
6	Dyslipidemia	27	20.4%
7	Renal disorders	23	17.4%
8	Thyroid disorders	4	3.03%
9	Ulcer	3	2.3%
10	Hypokalemia	3	2.3%
11	Epilepsy	4	3.03%



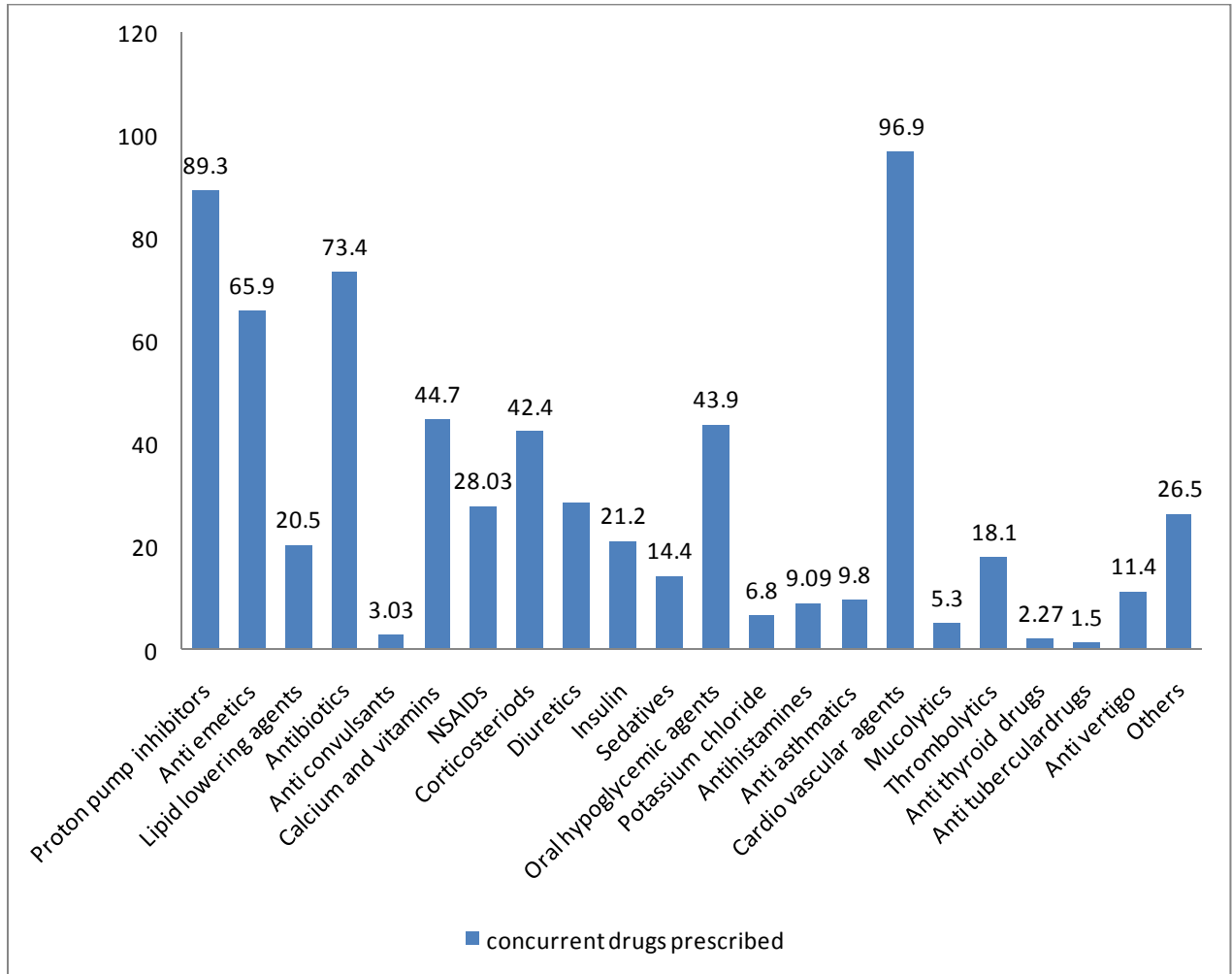
**CONCURRENT DRUG PRESCRIBED**

Concurrent drug prescribed to the HTN patients were analyzed to know the rationality of prescription. It is observed that PPI,s were given predominantly [118(89.3%)]. Some of the drugs like NSAIDs and corticosteroids may induce hypertension and these drugs were also given widely.

**Table 8: distribution of the patients in the study on the basis of their concurrent drugs prescribed. Values are expressed as numbers and percentage of the patients.**

(n=132)

Drugs	No. of patients	percentage
Proton pump inhibitors	118	89.3
Anti emetics	87	65.9
Lipid lowering agents	27	20.5
Antibiotics	97	73.4
Anti convulsants	4	3.03
Calcium and vitamins	59	44.7
NSAIDs	37	28.03
Corticosteriods	56	42.4
Diuretics	38	28.7
Insulin	28	21.2
Sedatives	19	14.4
Oral hypoglycemic agents	58	43.9
Potassium chloride	9	6.8
Antihistamines	12	9.09
Anti asthmatics	13	9.8
Cardio vascular agents	128	96.9
Mucolytics	7	5.3
Thrombolytics	24	18.1
Anti thyroid drugs	3	2.27
Anti tuberculardrugs	2	1.5
Anti vertigo	15	11.4
Others	35	26.5



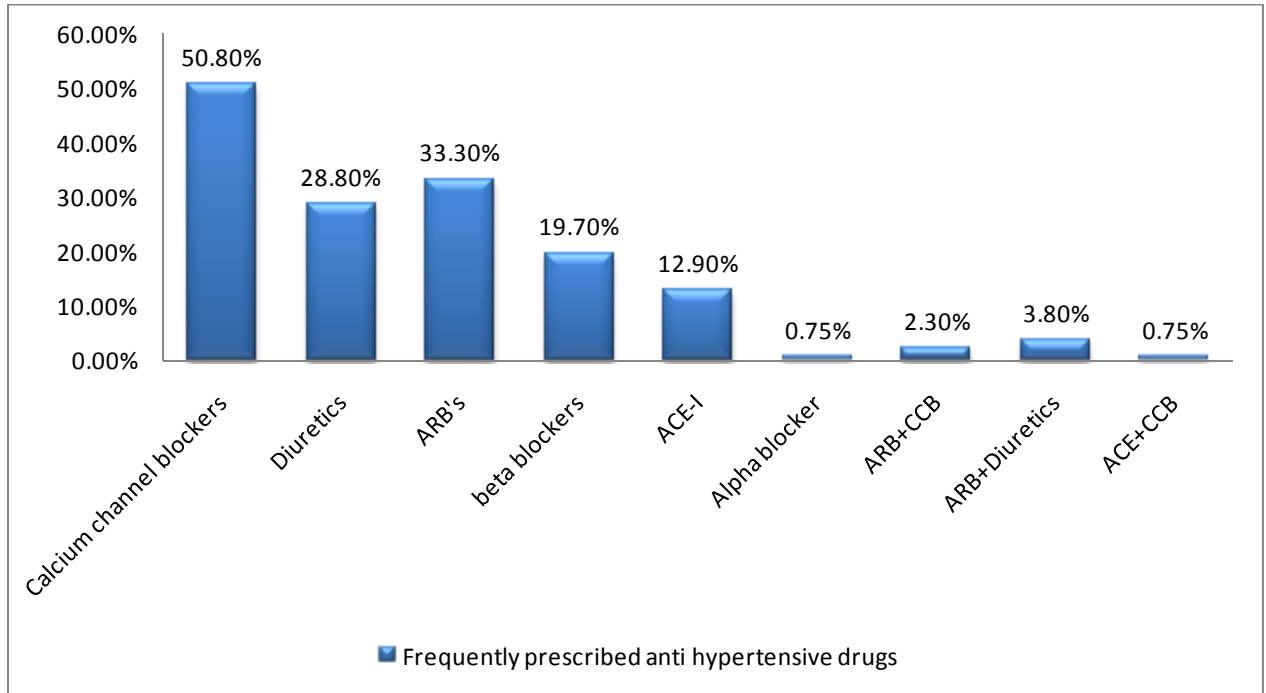
**DRUGS PRESCRIBED FOR HYPERTENSION**

The drugs prescribed were analyzed and it was seen that the calcium channel blockers (50.8%) was the major drug prescribed followed by diuretics (28.8%).

**Table 9: Distribution of the patients in the study on the basis of their drugs prescribed for HTN. Values are expressed as numbers and percentage of the patients.**

(n=132)

<b>Drugs</b>	<b>No of patients</b>	<b>Percentage (%)</b>
Calcium channel blockers	67	50.8%
Diuretics	38	28.8%
Beta blockers	26	19.7%
ARB's	44	33.3%
ACE-I	17	12.9%
Alpha blocker	1	0.75%
ARB+CCB	3	2.3%
ARB+Diuretics	5	3.8%
ACE+CCB	1	0.75%





**DRUG INTERACTION**

The prescription of the study population was thoroughly investigated for any possible drug-drug interactions using Micromedex software which is available with the department of pharmacy practice. The results revealed that there was a total of 139 interactions among which 19 (13.7%) were major ones and 120 (86.3%) were moderate severity. The details are listed below.

**Table 10: Distribution of the patients in the study on the basis of their drug interactions. Values are expressed as numbers and percentage of the patients.**

(n=132)

Sl.no	Interaction drugs	Effects	severity	No.of patients
1	Cefpodoxime+ pantoprazole	Decrease absorption and blood levels of cefpodoxime	moderate	1
2	Salmeterol+ ondansetron	Irregular heart rhythm	moderate	1
3	Isosorbide dinitrate+ clobazam	Lowers the BP	moderate	1
4	Atorvastatin+ pantoprazole	Increase the blood levels and effects of atorvastatin	moderate	15
5	Furosemide + levosalbutamol	Risk of hypocalcemia	moderate	3
6	Ketorolac+ naproxen	Nausea, vomiting, drowsiness, coughing up blood, allergy	Major	1
7	Naproxen + propranolol	Reduce effects of propranolol	moderate	1
8	Ketorolac+ losartan	Reduce effects of losartan	moderate	1
9	Aspirin + heparin	May cause bleed more easily	moderate	2
10	Atorvastatin + clopidogrel	Decrease effects of clopidogrel	moderate	5
11	Heparin + telmisartan	Increase k <sup>+</sup> levels in blood	moderate	1
12	Clopidogrel + pantoprazole	Decrease effects of clopidogrel	moderate	14
13	Aspirin + telmisartan	Decrease effects of telmisartan in decreasing BP	moderate	3
14	Aspirin + clopidogrel	May cause unusual bleeding	moderate	4
15	Furosemide + pantoprazole	May cause hypomagnesemia	moderate	3

*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

## *Results and discussion*

16	Telmisartan + metoprolol	Both increases serum pottasium pharmacodynamic synergism	modearte	1
18	Theophylline + pantoprazole	Pantoprazole increases the toxicity of theophylline	moderate	1
19	Carvedilol + metoprolol	Both increases anti hypertensive channel blocking	major	1
20	Alprazolam + telmisartan	May decrease the BP	moderate	3
21	Clopidogrel + heparin	Increased bleeding risk	major	1
22	Clopidogrel + torsemide	May cause increased torsemide toxicity	moderate	1
23	Amlodipine + nebivolol	May decrease BP and heart rate	moderate	1
24	Glimipride + metoprolol	Concurrent use may result in hypoglycemia	moderate	1
25	Furosemide + alprazolam	May decrease BP	moderate	3
26	Torsemide + pantoprazole	May cause hypomagnesemia	moderate	4
27	Rifampin + amlodipine	Decrease levels of amlodipine	major	1
28	Ethambutol + isoniacid	Increase risk of nerve damage	moderate	1
29	Insulin + metoprolol	Concurrent use may result on hypoglycemia	moderate	1
30	Calcitriol + sevelamer	Sevelamer can decrease the absorption of fat soluble vitamis A,D,E &K	moderate	1
31	Furosemide + metformin	Increase effects of metformin and may lead to lactic acidosis	moderate	3
32	Clonidine + metoprolol	May decrease BP and heart rate	major	1
33	Clonidine + methyl prednisolone	Decrease effect of clonidine in lowering BP	moderate	1
34	Metoprolol + methyl prednisolone	Decrease effect of metoprolol in lowering BP	moderate	1
35	Dextromethorphan + ondansetron	May potentiate serotonin syndrome	major	1
36	Aspirin + insulin	Hypoglycemia may be potentiated	moderate	1
37	Metoprolol+ amlodipine	May decrease BP	modearte	2
38	Aspirin + amlodipine	May decrease BP	moderate	3
39	Metoprolol+ torsemide	May decrease BP and slower heart rate	moderate	2
40	Torsemide + nebivolol	Lowers BP and slows heart rate	moderate	2
41	Ranitidine + metformin	May increase effects of metformin leading to lactic acidosis	moderate	1
42	Amlodipine + calcium. vitamin D	Can decrease effects of amlodipine	moderate	1

*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

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43	Ondansetron + ivabradine	Can increase the risk of an irregular heart rhythm	major	1
44	Amlodipine +ivabradine	Can slower heart rhythm and may cause irregular heart rhythm when used together	moderate	1
45	Glimipride + nebivolol	May cause hypoglycemia	moderate	1
46	Carvedilol +digoxin	Concurrent use may lead to increased digoxin concentration. Increased risk of heart block	moderate	1
47	Digoxin + spiranolactone	Increased risk of digoxin exposure	major	1
48	Pottasium chloride + spirancolactone	May cause hyperkalemia, kidney failure, cardiac arrest	major	2
49	Ondansetron + tramadol	Reduced effect of tramadol. May cause serotonin syndrome	major	2
50	Hydrochlorthiazide + acarbose	Can reduce effect of acarbose	moderate	1
51	Hydrochlorthiazide+ pantoprazole	May cause hypomagnesemia	moderate	2
52	Telmisrtan + insulin	Increased risk of hypoglycemia	modearte	1
53	Torse mide + rabeprazole	May cause hypomagnesemia	moderate	1
54	Aspirin + calcium carbonate	Decrease effects of aspirin	moderate	1
55	Aspirin + glimipride	Increase effects of glimipride	moderate	3
56	Spiranolactone + metfromin	Can increase blood sugar levels	moderate	2
57	Clarithromycin + ivabradine	May increase blood levels and effects of ivabradine which results in decreased heart rate	major	1
58	Clarithromycin + ondansetron	Increase risk of irregular heart rhythm	moderate	1
59	Clarithromycin + lactulose	Increase risk of irregular heart rhythm	moderate	1
60	Ondansetron + lactulose	Increase risk of irregular heart rhythm	moderate	1
61	Rifabutin + amlodipine	May significantly reduce the blood levels of amlodipine, which makes the medication in effective	major	1
62	Telmisartan + pregabalin	May cause angioedema	moderate	1
63	Chlorthalidone + metformin	May increase blood sugar levels	moderate	1

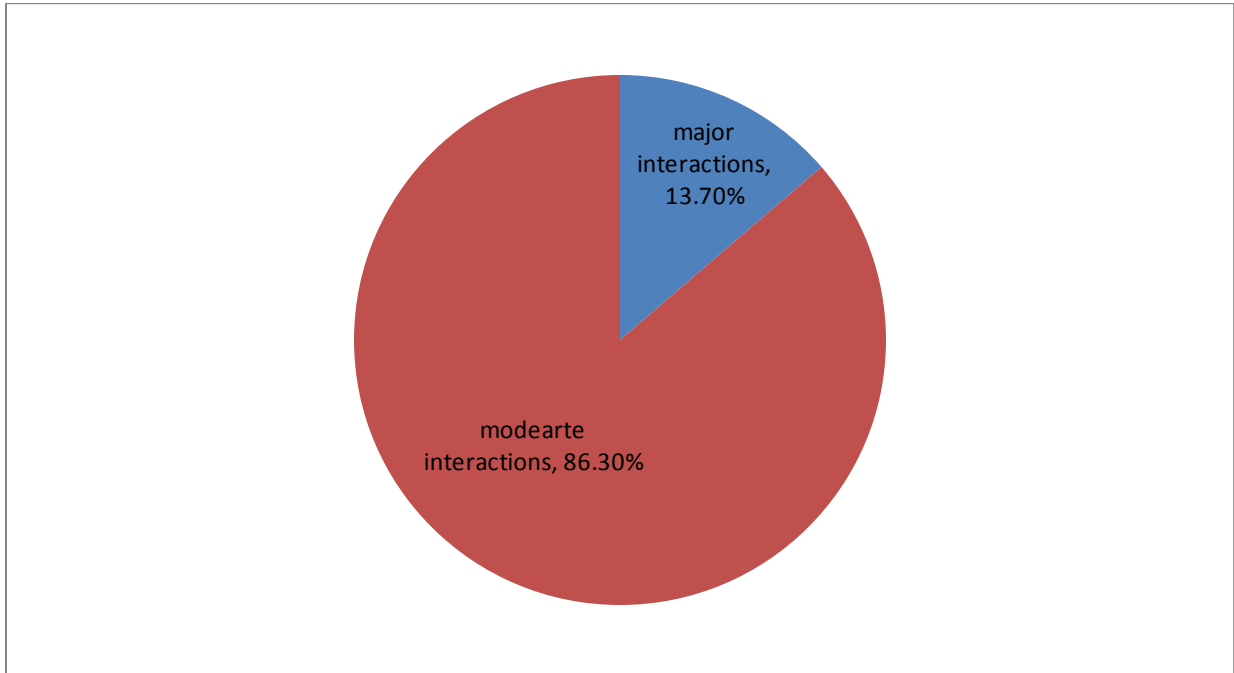
*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

## *Results and discussion*

64	Amiodarone + digoxin	Increase blood levels of digoxin	major	1
65	Amiodarone + ondansetron	Can increase risk of irregular heart rhythm	major	1
66	Amiodarone + torsemide	Can increase risk of irregular heart rhythm	major	1
67	Digoxin + pantoprazole	Increase effects of digoxin	moderate	1
68	Digoxin + telmisartan	Increase effects of digoxin	moderate	1
69	Torsemide + clonazepam	May decrease BP	moderate	1
70	Torsemide + acarbose	Decrease effects of acarbose	moderate	1
71	Hydrochlorothiazide + nebivolol	May decrease BP and slow heart rate	moderate	1
72	Trimethoprim + telmisartan	Increase potassium levels which leads to kidney failure, cardiac arrest	major	1
73	Aspirin + dexamethasone	Increased risk of side effects in GI tract	moderate	1
74	Sulfamethoxazole + glimepiride	Decrease blood sugar level	moderate	1
75	Dexamethasone + glimepiride	Decrease blood sugar level	moderate	1
76	Levothyroxine + glimepiride	Decrease blood sugar level	moderate	1
77	Insulin + metformin /vidagliptin	Increased risk of hypoglycemia	moderate	1
78	Dexamethasone + spiranolactone	May cause decreased BP	moderate	1
79	Dexamethasone + amlodipine	May decrease BP	moderate	1
80	Ketorolac + amitriptylline	Concurrent use may lead to increased risk of bleeding	major	1
81	Levothyroxine + theophylline	Using together may alter the effects of theophylline	moderate	1
82	Atenolol + diclofenac	May reduce the effects of atenolol in lowering BP	moderate	1
<b>Total No.of interactions</b>				<b>139</b>

**Drug interactions (n=132)**

<b>Total no. of drug interactions</b>	<b>139</b>
<b>Total no. of major interactions</b>	<b>19 (13.7%)</b>
<b>Total no. of moderate interactions</b>	<b>120 (86.3%)</b>



**ASSESSMENT OF PATIENTS MEDICATION ADHERENCE**

**Measurement of adherence by using MMAS-8 Scale (n=132):**

From the collected data it was seen that 88 (66.7%) patients were having medium adherence, 39(29.5%) were having low adherence and only 5(3.8%) having high adherence to the medication.

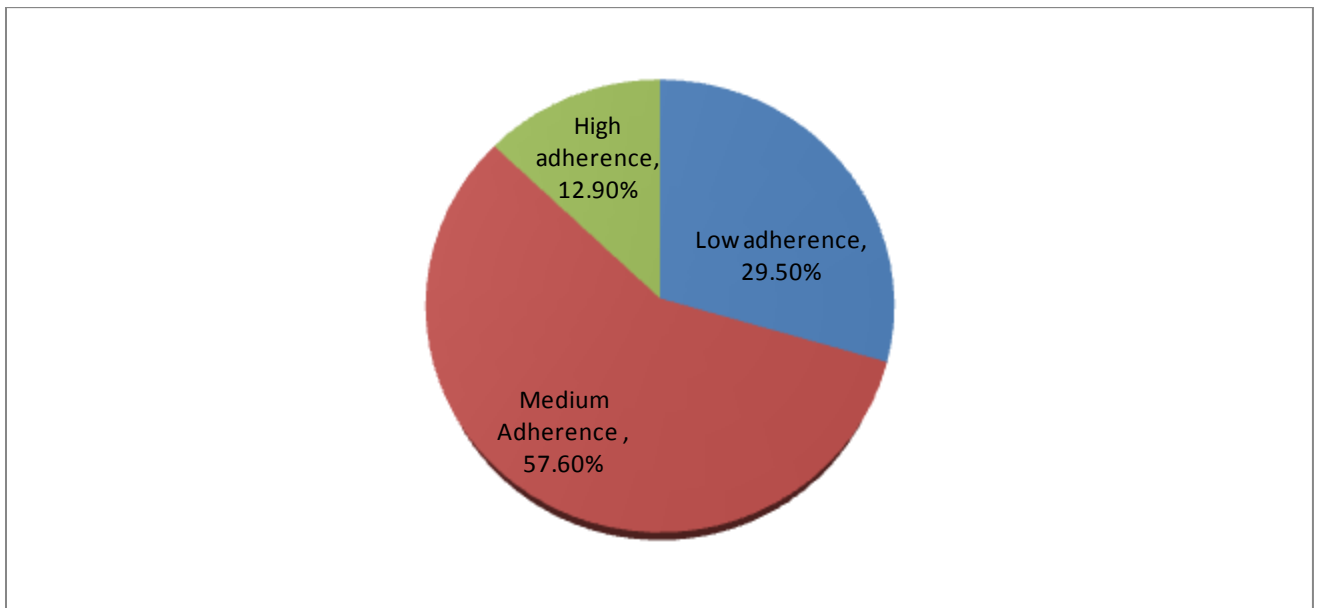
**Table 11: Response of patients to morisky medication adherence scale (MMAS-8). Values are expressed in numbers and percentages.**

Questions	No.of patients		Percentage (%)	
	Yes	No	Yes	No
1. Do you sometimes forget to take your medicine?	87	45	65.9%	34.1%
2. People sometimes miss taking their medicines for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medicines?	73	59	55.3%	44.7%
3. Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?	58	74	43.9%	56.06%
4. When you travel or leave home, do you sometimes forget to take your medicines?	63	69	47.7%	52.3%
5. Did you take all your medicines yesterday?	104	28	78.8%	21.2%
6. When you feel like your symptoms are under control, do you sometimes stop taking your medicines?	65	67	49.2%	50.8%
7. Taking medicines everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?	59	73	44.7%	55.3%
8. How often do you have difficulty remembering to take all your medicines?				
a. Never or rarely	14	-	10.6%	-
b. Once in a while	47	-	35.6%	-
c. Sometimes	63	-	47.7%	-
d. Usually	8	-	6.1%	-
e. All of the time	0	-	0	-

**Table 12 : Distribution of patients in the study on the basis if Morisky Medication Adherence Scale. Values are expressed as numbers and percentage of the patients.**

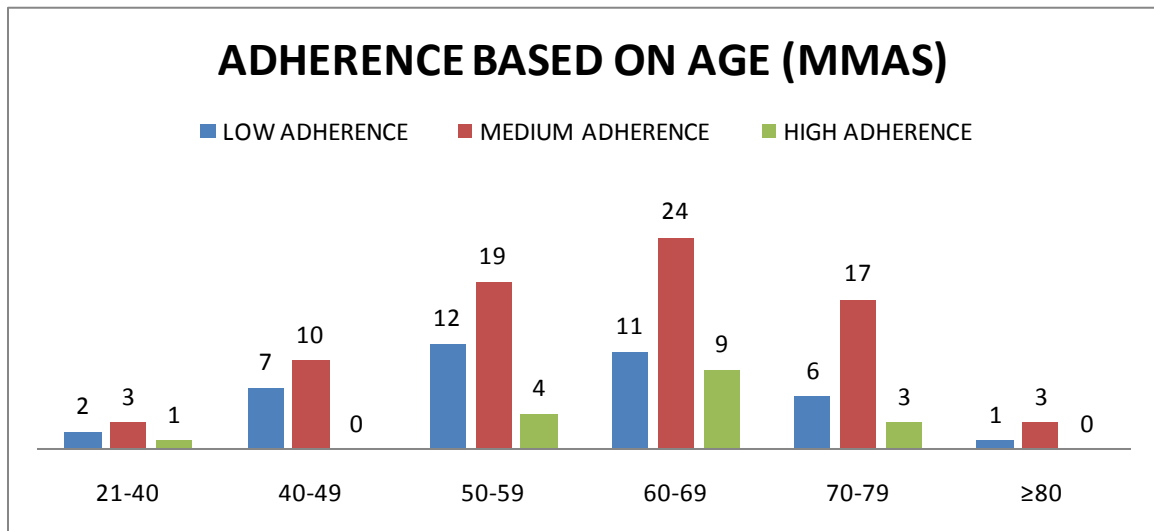
(n=132)

<b>Medication Adherence</b>	<b>No.of Patients</b>	<b>Percentage (%)</b>
Low adherence	39	29.5%
Medium adherence	76	57.6%
High adherence	17	12.9%



**Table 13: Distribution of the patient adherence in MMAS on the basis of age categorization.**

Age category	Adherence		
	low	Medium	high
21-40	2	3	1
40-49	7	10	0
50-59	12	19	4
60-69	11	24	9
70-79	6	17	3
≥80	1	3	0
<b>Total</b>	<b>39</b>	<b>76</b>	<b>17</b>



	No.	Mean S.D	f-ratio value
Low adherence	39	6.03±1.73	189.176
Medium adherence	76		
High adherence	17		

f-ratio is 189.176.the p-value is<0.00001. the result is significant at p<0.05



**Measurement of adherence by using MARS Scale (n=132):**

From the collected data it was seen that only 45 (34.1%) patients were having compliance, 87(65.9%)were having non-compliance. Based on scoring it was found that 56(42.4%) were having partial adherence to the medication followed by 45(34.1) having non adherence and 31(23.5%) having good adherence.

**Table 14 :Response of patients to Medication Adherence Rating Scale (MARS). Values are expressed in numbers and percentage.**

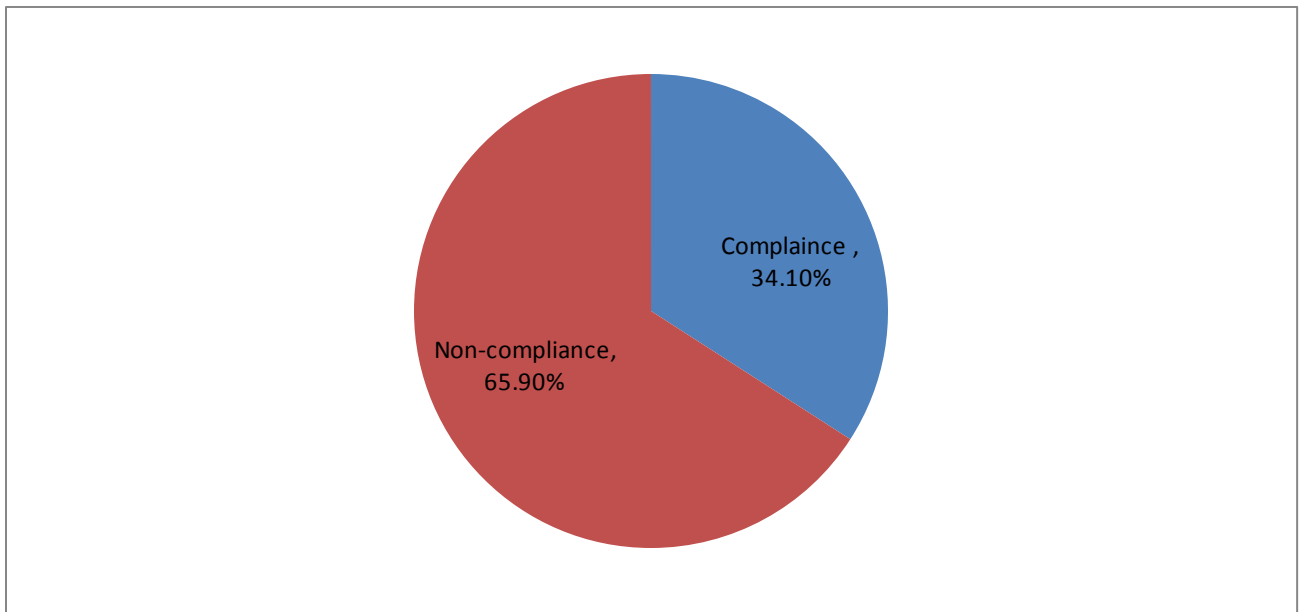
(n=132)

Questions	No.of patients		Percentage (%)	
	Yes	No	Yes	No
1.Do you ever forget to take your medicine ?	87	45	65.9%	34.1%
2.Are you careless at times about taking your medicines ?	58	74	43.9%	56.1%
3.When you feel better, do you some times stop taking your medicines ?	65	67	49.2%	50.8%
4.Some times if you feel worse when you take your medicine, do you stop taking it ?	58	74	43.9%	56.1%
5.I take my medication when i am sick.	67	65	50.8%	49.2%
6.It is unnatural for my mind and body to be controlled by medication.	71	61	53.8%	46.2%
7.My thoughts are clearer on medication.	68	64	51.5%	48.5%
8. By staying on medication i can prevent getting sick.	77	55	58.3%	41.7%
9. I feel weird, like a ‘zombie’, on medication.	53	79	40.2%	59.8%
10. Medication makes me feel tired and sluggish.	63	69	47.7%	52.3%

**Table 15: Distribution of the patients in the study on the basis of compliance and non-compliance. Values are expressed as numbers and percentage of the patients.**

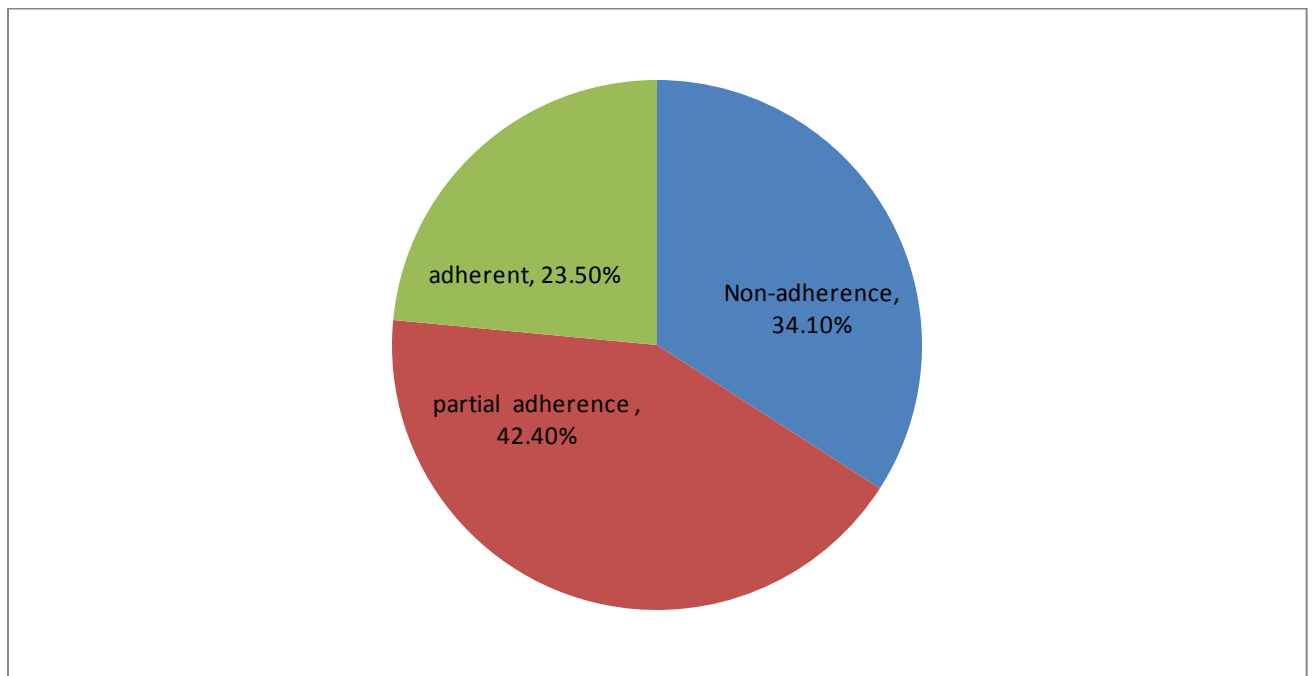
(n=132)

	<b>No.of Patients</b>	<b>Percentage (%)</b>
Compliance	45	34.1%
Non-compliance	87	65.9%



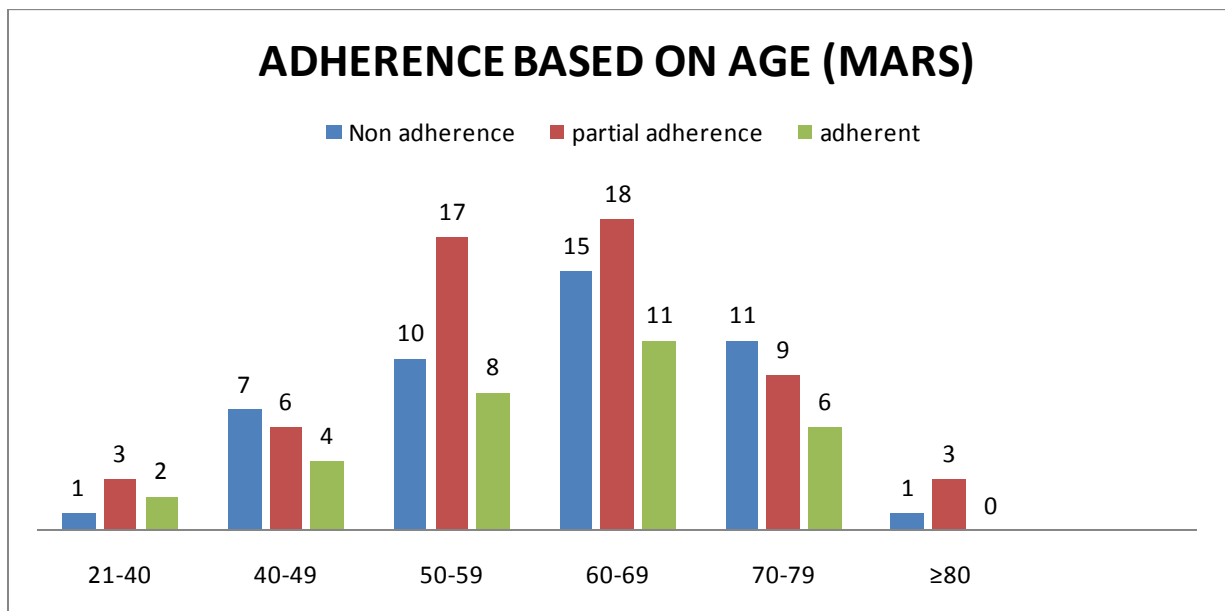
**Table 16: Distribution of the patients in the study on the basis of Medication Adherence Rating Scale. Values are expressed as numbers and percentage of the patients.**

<b>Medication Adherence</b>	<b>No.of Patients</b>	<b>Percentage (%)</b>
Non-adherence	45	34.1%
partial adherence	56	42.4%
Adherent	31	23.5%



**Table 17: Distribution of the patient adherence in MARS on the basis of age categorization.**

Age category	Adherence		
	Non adherent	Partial adherent	Adherent
21-40	1	3	2
40-49	7	6	4
50-59	10	17	8
60-69	15	18	11
70-79	11	9	6
≥80	1	3	0
<b>Total</b>	<b>45</b>	<b>56</b>	<b>31</b>



	No.	Mean s.d	f-ratio value
Non-adherence	45	4.94±2.7	73.243
Partial adherence	56		
Adherence	33		

f-ratio is 73.243. the p-value is <0.0001. the value is significant at p<0.05

**Table 18 : Comparing adherence of MMAS V/S MARS**

	<b>MMAS</b>	<b>MARS</b>	<b>Chi-square value</b>	<b>p-value</b>
<b>Low</b>	39	45	7.5422	0.023027
<b>Medium</b>	76	56		
<b>High</b>	17	31		

The chi-square statistic value is 7.5422. the p-value is 0.23027, the result is significant at  $p < 0.05$ .

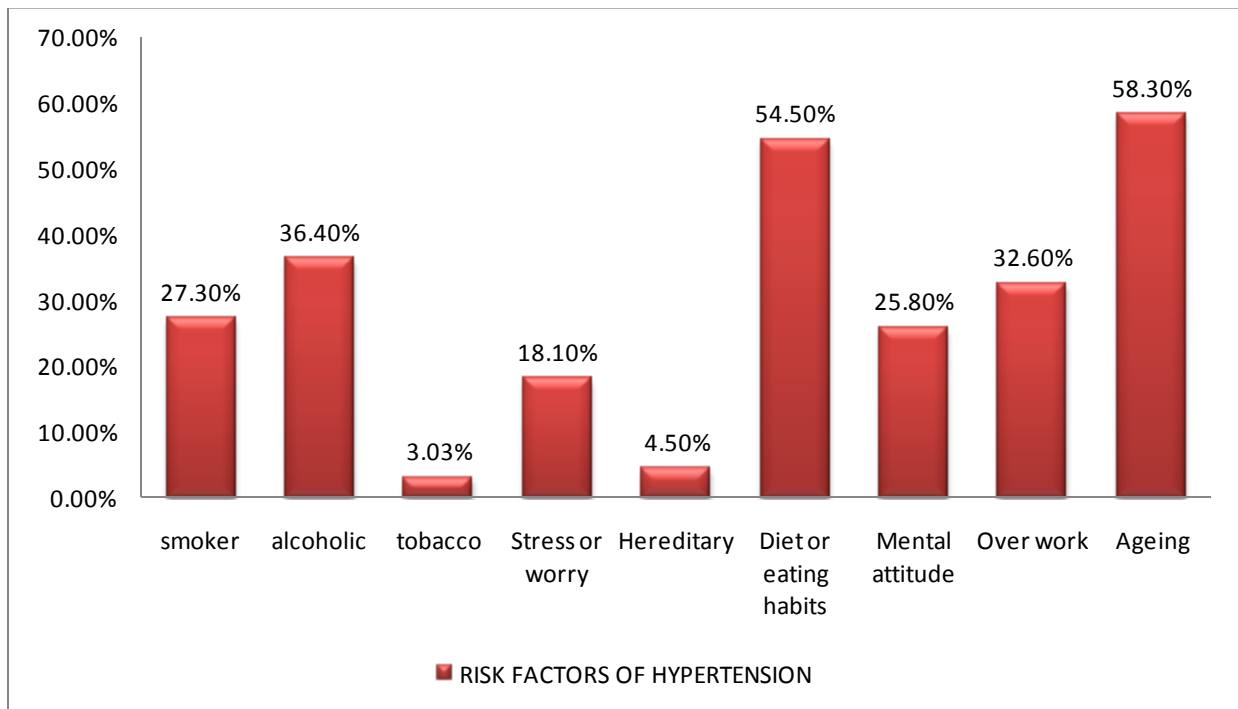
**MAIN CAUSES OF HYPERTENSION (RISK FACTORS)**

(n=132)

The risk factors of HTN were analyzed and was observed that ageing (58.3%) followed by diet or eating habits (54.5%) were the major risk factors of HTN.

**Table 19 : distribution of the patients in the study on the basis of their social history. Values are expressed as numbers and percentage of the patients.**

Age group	No. of patients	Percentage (%)
smoker	36	27.3%
alcoholic	48	36.4%
tobacco	4	3.03%
Stress or worry	24	18.1%
Hereditary	6	4.5%
Diet or eating habits	72	54.5%
Mental attitude	34	25.8%
Over work	43	32.6%
ageing	77	58.3%



**REASON FOR NON ADHERENCE TO ANTI HYPERTENSIVE MEDICATION**

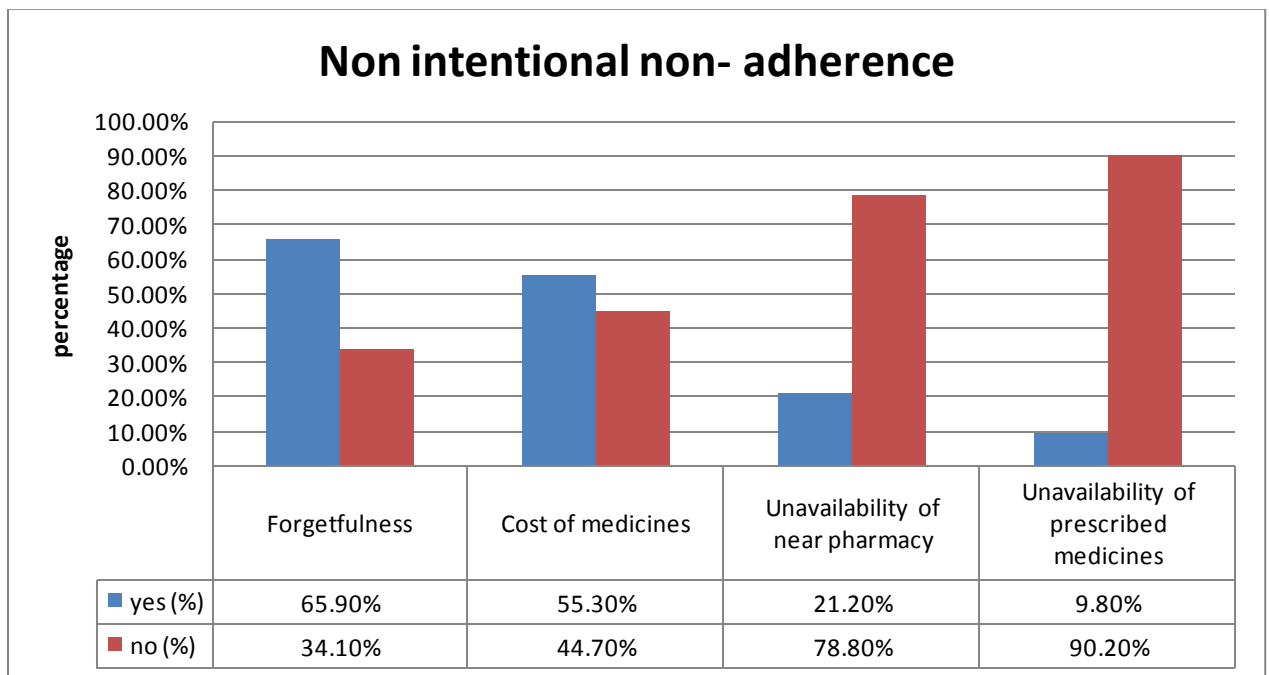
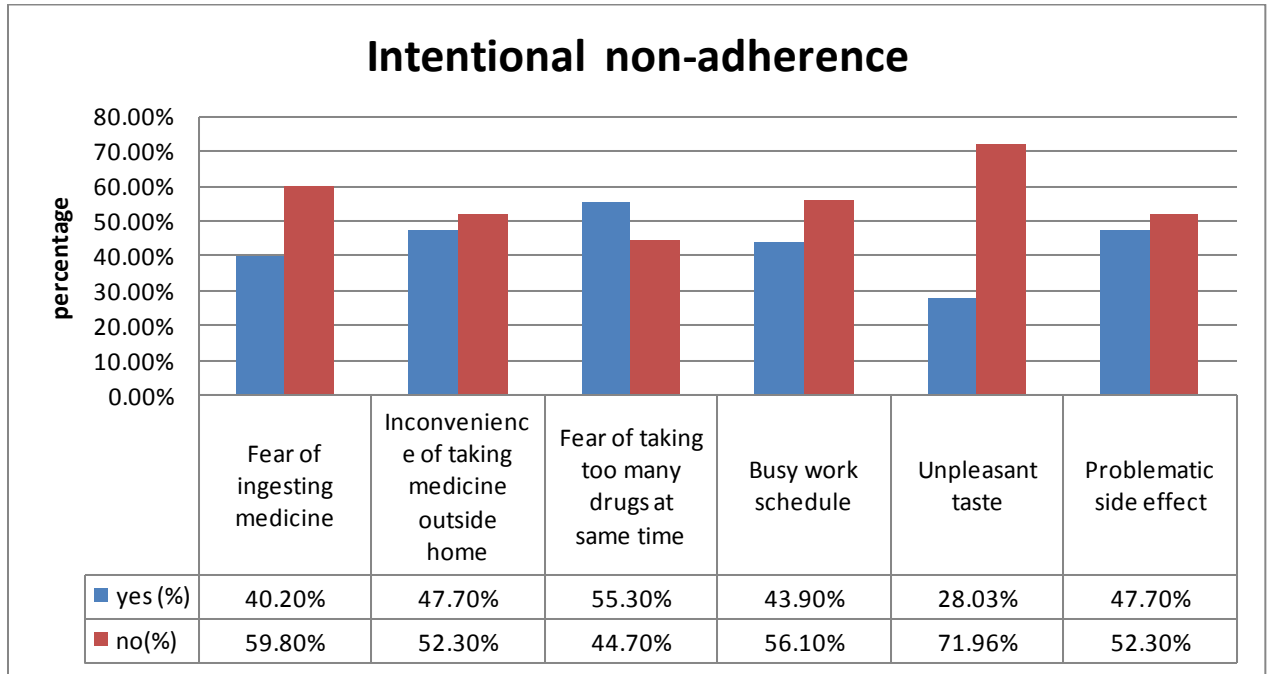
Fear of ingesting too many drugs at the same time (55.3%) followed problematic side effect and inconvenience of taking medicine outside home 63(47.7%) are the main factors for intentional non adherence. Forgetfulness 87(65.9%) followed by cost of medicine 73(55.3%) are the main factors for non intentional non- adherence.

**Table 20: Distribution of the patients in the study on the basis of reason for non adherence to anti hypertensive medication . Values are expressed as numbers and percentage of the patients.**

(n=132)

SL.NO	INTENTIONAL NON ADHERENCE	YES	(%) YES	NO	(%)NO
1	Fear of ingesting medicine	53	40.2%	79	59.8%
2	Inconvenience of taking medicine outside home	63	47.7%	69	52.3%
3	Fear of taking too many drugs at same time	73	55.3%	59	44.7%
4	Busy work schedule	58	43.9%	74	56.1%
5	Unpleasant taste	37	28.03%	95	71.96%
6	Problematic side effect	63	47.7%	69	52.3%

SL.NO	NON INTENTIONAL NON ADHERENCE	YES	(%) YES	NO	(%)NO
7	Forgetfulness	87	65.9%	45	34.1%
8	Cost of medicines	73	55.3%	59	44.7%
9	Unavailability of near pharmacy	28	21.2%	104	78.8%
10	Unavailability of prescribed medicines	13	9.8%	119	90.2%





**PERSONAL VIEWS OF HOW PATIENT SEE THEIR CURRENT ILLNESS :**

The personal views about medication helps to identify the belief of patient toward the medication and it is found that in most of the cases a high degree of patients were having a negative belief about medication, health and disease, which is one of the main factor for non-adherence.

**Table 21: Distribution of the patients in the study on the basis of personal view about medication . Values are expressed as numbers and percentage of the patients.**

Sl. No	Views about your illness	Strongly disagree		disagree		Neither agree nor disagree		agree		Strongly agree	
		No	%	No.	%	No.	%	No.	%	No.	%
1	My illness last for a short time	41	<b>31.1%</b>	39	29.5%	27	20.5%	19	14.4%	6	4.5%
2	My illness likely to permanent rather than temporary	9	6.8%	21	15.9%	24	18.2%	38	28.8%	40	<b>30.3%</b>
3	My illness does not have much effect on my life	47	<b>35.6%</b>	38	28.8%	29	21.9%	11	8.3%	7	5.3%
4	I have the power to influence my illness	21	15.9%	23	17.4%	46	<b>34.8%</b>	21	15.9%	21	15.9%
5	My illness will improve in time	14	10.6%	11	8.3%	37	<b>28.0%</b>	33	25%	37	<b>28.0%</b>
6	My treatment can control my illness	15	11.4%	40	25.3%	18	13.6%	31	<b>28.5%</b>	28	21.2%
7	The negative effects can be prevented by my treatment	18	13.6%	12	9.1%	33	25%	38	<b>28.8%</b>	31	23.5%
8	There is nothing which can help my condition	31	23.5%	27	20.5%	45	<b>34.1%</b>	17	12.9%	12	9.1%
9	I have a clear understanding of my condition	22	16.7%	64	<b>34.5%</b>	32	28.2%	23	27.4%	13	9.8%
10	The symptoms of my illness change a great deal from day to day	18	13.6%	21	15.9%	32	24.2%	37	<b>28.0%</b>	24	18.1%
11	When I think about my illness I get upset	33	25%	31	23.5%	34	<b>25.8%</b>	23	17.4%	11	8.3%
12	My illness doesn't worry me	34	<b>25.8%</b>	31	23.5%	33	25%	23	17.4%	11	8.3%

*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

## **DISCUSSION**

The work entitled “ **Study of medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital**” was conducted in the department of Cardiology and General medicine at a 1000 bedded multispecialty hospital which has got state of art facilities. After ensuring the scope of the study in the department of Cardiology and General medicine of the study hospital, the study protocol was prepared and submitted to the Dean of the hospital and official approval was obtained to carry out the study in the hospital. After receiving the official approval, the study was conducted for a period of ten months December 2017 to September 2018.

A total of 132 cases with hypertension were found. Prior consent was taken from the patient or bystanders after explaining them the need of the study. Gender distribution of HTN patients varies throughout the world. The analysis of the study conducted for a period of 10 months revealed that there were 73 (55.3%) male patients and (44.7%) female patients who fits into the inclusion criteria. Men were more affected with HTN which is in accordance to the literature which documented that male were prone for HTN because of their social habits like smoking, drinking alcohol followed by stress, overwork and dietary habits. A study conducted by Virgine korb-savoldeli et al(2012) men were found mostly affected with HTN <sup>[26]</sup>.

The age categorisation of the study population revealed that about 44(33%) belongs to the age group 60-69, followed by 35 (26.5%) which belongs to the age group 50-59 and 19.7% (70-79). A study conducted by Elsheba mathew et al(2017)<sup>[31]</sup> indicated that around 50% of hypertension is mostly seen in the age group between 50-69 years and also according to Suzanne H.S.Lo et al(2016), the prevalence of hypertension increases with age so that two-third of those with the disease are 60 years or older<sup>[7]</sup>.

One of the major risk factor of hypertension is obesity. It was found that 36(27.3%) of the patients in the study population were having over weight and 38.1% (class I + class II) were obese.

As the treatment for co-morbid condition is very much essential for effective management of HTN, an attempt was made to know the conditions prevailing in the study population. The study revealed that Diabetes mellitus 62(46.9%) and dyslipidemia 27(20.4%) were the major co-morbidities among HTN patients. The study by Ananta kumar, Pracheth R (2018) documented that DM is found to be the major disorder associated with low medication adherence <sup>[32]</sup>.

Literatures suggest that there are many drugs that cause HTN. The list includes drugs like sympathomimetic agents, NSAIDs, and COX-2 inhibitors, CNS stimulants, corticosteroids, immunosuppressants etc. To find out any irrationality in therapy an attempt was made to know about the concurrent drugs prescribed. The results revealed that PPIs (89.3%), anti biotics (73.4%) and antiemetics were the major category of drugs prescribed apart from cardiovascular drugs. It was also found that corticosteroids (42.4%) and NSAIDs (28.03%) were also given widely. In a review article, Charles Faselis, Michael Documas and Vasilios Papademetriou (2011) suggests that drug induces HTN represents one of the most common secondary causes of resistant hypertension. Several drugs can induce or exacerbate pre existing HTN, with NSAIDs being the most common due to their wide use <sup>[33]</sup>.

Among the hypertensive drugs prescribed Calcium channel blockers 67(50.8%) were the maximum prescribed category of hypertensive, followed by ARBs 44(33.3%), diuretics (28.8%) and beta blockers 26 (19.7%) which is matching with the study done by Georgy M Varghese et al (2016) which was done at a tertiary care hospital at Bangalore. The study states that the most utilised antihypertensive was CCBs (50.84%), followed by ARBs (35.59%) <sup>[34]</sup>.

In this study, there were 132 patients. The medication adherence was calculated by MMAS & MARS. Based on MMAS-8, 76(57.6%) patients shows medium adherence, 39(29.5%) shows low adherence and only 17 (12.9%) showed high adherence, which is similar to the study conducted by Kumar A et al (2018), at Dakshina kannada district at

Karnataka, India were it found that the medication adherence based on MMAS-8, 67.8% were having medium adherence<sup>[32]</sup>. On the contrary, a study carried out by Ramli et al (2012) in Malaysia reported that more than half 53.4% of the participants had good medication adherence<sup>[25]</sup>. On the contrary to these studies carried out by Hema and P.Padmalatha carried out a study(2014) at Andhra pradesh, India reported that more than half of the patients had low adherence (62%)<sup>[35]</sup>. These difference may be due to the socio demographic difference profile between these places. Based on MARS, the overall level of non-adherence was found to be 45 (34.1%). The partial adherence was found to be 56(42.4%) and 31(23.5%) were highly adherent. The non- adherence degree of 34.1% is however within the range of literature values 74.2%(24.8% is the baseline for adherence according to WHO 2003 disease report, study done in seychelles). Studies done in Colombia, USA (2009) showed that the levels of medication adherence among the elderly ranging from 26% to 59%. Adherence to a medication regimen requires a set of behaviors that include obtaining the medication, timely administration of the correct drug, dose and route, and persisting with taking the medication as long as the medication is needed. Success at these behaviors hampered by many of the changes often seen with age. The same is truth in this study that more of the non- adherence was elderly,  $\geq 60$  years age group except that adherence rate was slightly higher. In this study, the adherence was studied based on the age group and found that in both the scales used, the level of adherence was high in the age category 60-69. An Iranian study by Hadi (2004) states that older patients were having more compliance<sup>[36]</sup>.

The adherence between the variables in each scale were calculated by one-way ANOVA. The mean S.D of MMAS is  $6.03 \pm 1.73$  and the f-ratio is 189.17. The mean S.D of MARS is  $4.94 \pm 2.7$  and the f-ratio value is 73.243. Both the f-value of MMAS and MARS is  $< 0.0001$ , which is significant at  $p < 0.05$ . The comparison of adherence between MMAS and MARS has been done by chi-square and found that the chi-square statistic value is 7.5422 and the p-value is 0.0230, which is significant at  $p < 0.05$ .

The main risk factor of hypertension in the study was ageing 77(58.3%), followed by dietary habits (54.5%). The study done by Suzanne H.S Lo (2016) showed

that the prevalence of HTN increases with ageing [7]. Along with these factors both intentional and non intentional factors plays a major role in adherence., in which the non-intentional factors especially forgetfulness 87(65.9%) and cost of medicine 73(55.3%) were mostly seen in the patients. According to the study conducted by Sabu et al (2016), 46% of the study population do not comply with the diet<sup>37</sup> which is similar in accordance to the value obtained by Papatya karakurt and Magfiret Kasikci (2012)<sup>[38]</sup>. The study also shows that forgetfulness, aloneness, ignorance (49.3%), followed by poverty(26.5%) were the reason for non adherence. Another study by Ezeala-Adikaibe BA et l (2017) revealed that about 90% of patients forget to take their medication or do not bring their medication along when they leave home (94.3%) . Thus they conclude that non- adherence is high among hypertensive patients attending tertiary care centre [13].

Most of the studies revealed the importance of medication and health which plays a major role in the adherence. An attempt was made to know the views of the patient and it was found that around half of the patients 52.3% (those whose marked agree + strongly agree) were having a strong belief that the therapy can help to prevent the negative effects and thus help to control the illness. But it is also found that the negative beliefs and thoughts affects mostly in the therapy, and it is found that about 51.2% (marked strongly disagree+disagree) of the patients do not have a clear understanding about their condition. According to a study conducted by Clarris Shiri et al (2007) the participants in the study is highly concerned about the medication and most are not knowing about there condition exactly. Thus there exist a knowledge gap which is needed to be filled with help of patient education system<sup>[39]</sup>. This is in accordance with the findings by Horne and Weinman(1999). They have reported a correlation between beliefs about medicines and reported adherence. They found that medication beliefs were more powerful predictors of reported adherence than the clinical and socio demographic factors<sup>[40]</sup>.

### **Limitations**

Generally, it is reported that self report measures over estimate adherence do not reflect reality. Because of this over estimation, these measures cannot discriminate between participants regarding their adherence score, making it more difficult to study

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*Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital*

determinants of medication adherence and effects of interventions designed to improve adherence.

A main limitation of these self report scales is the lack of coverage of the entire range of different types of adherence behaviors and the failure to consider the difference in the likelihood of occurrence of these behaviors. The patients who are in the hospital stay showed high rate of adherence. The review and follow up of the patients after the discharge was not possible, which is also a major drawback.

## CONCLUSION

Non adherence to the therapeutic regimen remains a major limiting factor of hypertension management in India. Overall the medication adherence was moderate in hypertensive patients. Poor adherence to therapy largely goes unrecognized in clinical practice.

The present study indicates that by improving the medication adherence in hypertensive patients, it is easy to achieve optimal blood pressure goals and prevent further hypertension related complications.

- The study enrolled 132 patients which had [73(55.3%)] males and [59(44.7%)]female patients.
- Patients belonging to late adult hood (60-69) were mostly affected [44 (33.3%)].
- Ageing [77(58.3%)], dietary factors [72(54.5%)], alcohol consumption [48(36.4%)], obesity [36(27.3%)] and smoking [36 (27.3%)]were the most common risk factors seen in the affected population.
- Mostly seen co-morbid condition was DM [62(46.9%)] and is followed by dyslipidemia [27(20.4%)].
- Several drugs can induce or exacerbate pre existing hypertension. Here NSAIDs (28.03%) and corticosteroids (42.4%) are such classes of drugs which were given can induce hypertension and can be one of the most common cause of resistant hypertension.
- The most commonly prescribed drug in the study was calcium channel blockers [67(50.8%)] followed by ARBs [ 44(33.3%)].
- Both intentional and non-intentional factors plays a major role in non- adherence. Among which the non-intentional factors like forgetfulness [87(65.9%)] and cost of medicine (socio- economic factor) [73(55.3%)] were the main causes for non-adherence.
- Personal views and beliefs about medication and disease plays a major role in adherence. It was found that around half of the patients (52.3%) were having a strong belief that the therapy can control the illness. But it was also found that

about 51.2% of the patients do not have a clear understanding about their disease condition, which mainly leads to non-adherence such that there is correlation between belief about medication and reported adherence.

Both Morisky Medication Adherence Scale (MMAS-8) and Medication Adherence Rating Scale were used to find the medication adherence of the patient and both the scale shows a medium 'or' partial adherence in [76(57.6%)] and [56(42.4%)] respectively. The adherence between the variables in each scale were calculated by one-way ANOVA. The mean S.D of MMAS is  $6.03 \pm 1.73$  and the f-ratio is 189.17. The mean S.D of MARS is  $4.94 \pm 2.7$  and the f-ratio value is 73.243. Both the f-value of MMAS and MARS is  $< 0.0001$ , which is significant at  $p < 0.05$ . The comparison of adherence between MMAS and MARS has been done by chi-square and found that the chi-square statistic value is 7.5422 and the p-value is 0.0230, which is significant at  $p < 0.05$ .

Adherence to therapeutic regimen is an important factor for better therapy and control of disease. Therefore effort should be made by the physicians to identify the reasons for non-adherence and initiate steps to improve it. Hence the pharmacist and health care professionals should work in collaboration to ensure the patients quality of life.



## **FUTURE OUTLOOK**

The present study covers the medication adherence and factors affecting it in the patients in the study site. Medication adherence is measured using the 8-item Morisky scale (MMAS-8) and also by the Medication Adherence Rating Scale (MARS) and the factors affecting medication adherence is measured by self made questionnaire, by directly interviewing the patients or care givers at the bed side of hospital. A hypertension leaflet is also provided to the patients and care givers to give more education about the condition after giving patient counseling.

Future aspects of the study may expand to more patients in Cardiology department in the hospital with modification to current methodology to increase the medication adherence in hypertensive patients with co-morbid condition and also to interview the patients at the first time of admission, during the hospital stay and after discharge. Similar interview can be done both directly and through phone.

Future studies can be made on comparing the adherence to medication with the past adherence which will help to increase the adherence by interviewing both patient and care giver. Increased adherence rates in hypertensive cases can reduce further cardiovascular complication and thus bring down co-morbidities.

## REFERENCE

1. Habtamu Abera Hareril, Molla Gedefaw, Bekel Simeng. Assesment of prevalance and associated factors of adherence to anti hypertensive agents among adults on follow up in Adama Referral hospital, East Shoa, ethiopia-cross sectional study. *Int. J.Curr.Microbial.App.Sci* 2014;3(1): 760-770
2. Tripathi KD. *Essentials of medical pharmacology*. 6<sup>th</sup> edition. New Delhi, India. Jaypee brothers;2008:558-574.
3. Joseph T Dipiro. *Pharmacotherapy. A pathophysiological Approach*. 6<sup>th</sup> edition. New York:McGraw-hill Medical,2008:222-255
4. Huda Al-Noumani et al. Relationship Between Medication Adherence and Health Beliefs Among Patients with Hypertwnsion in Oman. *Sultan Qaboos University Med J*, Aug 2017, Vol. 17, Iss. 3, pp. e329–333, Epub. 10 Oct 17.
5. Chobanian A V, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al. The seventh report of Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *The JNC 7 Report. JAMA* 2003;289;2560-72
6. Raj GM, Priyadarshini R,Mathaiyan J Current Perspectives in the Management of Hypertension. *SAJ Cardiol* 2015;1(1):101.
7. Suzanne H.S.Lo et al. Adherence to Antihypertensive Medication in Older Adults With Hypertension. *Journal of Cardiovascular Nursing*. Vol.31,No.4,pp296Y303.
8. Roger Walker, Cate Whittlesea. *Clinical pharmacy and therapeutics*. 5<sup>th</sup> edition. Churchill Livingston Elsevier; 2012;295-301.
9. Russell JG, Norman DH, Larry IG. *Pathology and therapeutics for pharmacist. A basis for clinical pharmacy practice*. 2<sup>nd</sup> edition.2009;93-114.
10. Benjamin MB. Definition of Medication Therapy Management: Development of profession wide Consensus. *J Am Pharma Assoc*.2005;45:566-572.
11. Ho PM, Bryson CL, Rumsfeld JS. Medication Adherence:Its Importance in Cardiovascular Outcomes. *Circulation* .2009;119:3028-3035

12. Anantha Kumar, Pracheth.R. Medication Adherence Among Hypertensive Adults Residing In a Rural area of Dakshina Kannada District. *Int J Community Med Public Health*. 2018 May;5(5).
13. Ezeala –adikaibe BA et al. Factors associated with medication adherence among hypertensive patients in a tertiary health centre. A cross sectional study. *Arch Community Med Public Health* 3(1): 024-031. Mar 2017.
14. Endang Sulisyiwayiningsih and Mutiara Herawati. Multicentre study treatment adherence of hypertension focused on primary health care in Indonesia. DOI: <http://dx.doi.org/10.22159/ajpcr.2017v10s3.21356>.
15. Anjana brijith johnson et al. Study on Medication adherence rating of patients with hypertension in a tertiary care hospital. *World Journal of Pharmacy and Pharmaceutical Science*. Vol.5, Iss.3, 694-710.
16. Yu Ting Li, Harry H.X. Wang, Kirin Q.L. Liu, Gabrielle K.Y. Lee, Wai Man Chan, Sian.M. Griffiths, Ruo Ling Cheng. Medication adherence and blood pressure control among hypertensive patients with coexisting long term conditions in primary care settings. *Md-journal*; May 2016; 95:1-10.
17. Anup Bhusal, Pradeep R. Jadhav, Yeshwant A. Deshmukh. Assessment of medication adherence among hypertensive patients: a cross-sectional study. *International Journal of Basic and Clinical Pharmacology*. July-August 2016; 5(4):1606-11.
18. Vincent boima et al. Factors associated with medication non adherence among hypertensives in Ghana and Nigeria. *International Journal of Hypertension*. Vol. 2015. article ID 205716.
19. Asmamaw Yenesew, Fanta Gashi, Ramanjireddy Tatiparthi. Prevalence of non-adherence and its associated factors of hypertensive patients at Jimma University specialized Hospital in Southwest Ethiopia. *Indian Journal of Health Sciences*. Jan-jun 2015; 8(1):18-23.
20. Chythra R. Rao, Veena G. Kamath, Avinash Shetty, Asha Kamath. Study on treatment compliance among patients in coastal population with HTN and type 2 DM. *Int J Prev Med*. 2014 Aug; 5(8):992-998.

21. Rowa Al-Ramahi. Adherence to Medications and Associated Factors: a Cross sectional Study Among Palestinian Hypertensive Patients. *Journal of Epidemiology and Global Health* (2015)5,125-132.
22. Amonov malik, yoshitoku yoshida, toirov erkin, davlatov salim, nobuyuki hamajima. Hypertension related knowledge, practice and drug adherence among inpatients of a hospital in Samarkand, Uzbekistan. *Nagoya J. Med Sci.*2014;76,255-263.
23. Sharon J Rolnick et al. Patient characteristics associated with medication adherence. *Clin Med Res.*2013 Jun;11(2):54-65.
24. Gabriella K.Y.Lee, Harry H.X.Wang, Kirin Q.L.Liu, Yu Cheung, Donald E. Morisky. Determinants of medication adherence to antihypertensive medications among a Chinese population Using Morisky Medication Adherence Scale. *Hinese antihypertensive medication adherence.* April 2013;8(4):1-6.
25. Ramli A, Ahamad NS, Paraidathathu T. Medication adherence among hypertensive patients of primary health clinics in Malaysia. *Patient Prefer Adherence.*2012;6:613-22.
26. Virginie Korb-Savoldelli et al. Validation of french version of the 8-item Morisky Medication adherence scales in hypertensive adults. *The Journal of Clinical Hypertension.* Vol.14, No.14. July 2012.
27. Samuel wagner et al. Impact of medication adherence on work productivity in hypertension. *Am J Pharm Benefits.*2012;4(4):e88-e96.
28. Krezenski and Leeman. Practical issues in medication compliance in hypertensive patients. *Research Reports in Clinical Cardiology* 2011:2 63-70.
29. Arshia Bilal, Mehwish Riaz, Noor-ulain Shafiq, Mariam Ahamed, Sadaf Sheikh, Sobia Rasheed. Non compliance to anti hypertensive medication and its associated factors among hypertensives. *J Ayub Med Coll Abbottabad.* 2015;27(1):158-163.
30. Giampiero Mazzaglia, Ettore Ambrosioni, Marianna Alacqua, Alessandro Filippi, Emiliano Sessa, Vincenzo Immordino, Claudio Borghi, Ovidio Brignoli, Achille P. Caputi, Claudio Cricelli, Lorenzo G. Mantovani. Adherence to antihypertensive

- medications and cardiovascular morbidity among newly diagnosed hypertensive patients. Drug adherence and cardiovascular morbidity.2009;120:1598-1605.
31. Elsheba Mathew et al. Prescription to Practice in Hypertension: A Community Experience in Central Kerala. Int J Res Med Sci.2017 Nov;(11):4832-4839.
  32. Kumar et al. Medication Adherence Among Hypertensive Adults Residing In a Rural area of Dakshina Kannada District. Int J Community Med Public Health.2018 May;5(5).
  33. Charles Faselis,Michael Doumas, and Vasilios Papademetriou. Common Secondary Causes of Resistant Hypertension and Rational for Treatment. International Journal of Hypertension.Volume 2011, Article ID 236239, 17 pages.doi:10.4061/2011/236239.
  34. GeorgyM.Varghese et al.Study on drug utilization pattern of antihypertensive agents in a tertiary care hospital. World Journal of Pharmacy and Pharmaceutical Science. Vol 5. Iss.6,2016.
  35. Dr.K.Hema, Dr.P.Padmalatha. adherence to medication to medication among hypertensive patients attending a tertiary care hospital in Guntur, Andhrapradesh. Indian journal of Basic and Applied Medical Research; December 2014: vol -4, Issue-1, p. 451-456.
  36. Hadi N. Determinant factors of medication compliance in hypertensive patients of Shiraz, Iran. ARCH Iran Med 2004;7:292-6.
  37. Sabu et al. Study on Medication adherence rating of patients with hypertension in a tertiary care hospital. World Journal of Pharmacy and Pharmaceutical Science. Vol.5,Iss.3,694-710.
  38. PapatyaKarakurt, RN, PhD and MagfiretKa,ikci,RN,PhD(DECEMBER 2012). Factors affecting medication adherence in patients with hypertension. Journal of Vascular Nursng, December 2012;30:118-126.
  39. Clarris shiri et al. The role of insight into and beliefs about medicines of hypertensive patients. Cardiovasc J Afr.2007 Nov-Dec;18 (6):353-357.
  40. Horne R Weinman J. Patients beliefs about prescribed medicines and their role in adherence to treatment in chronic illness. J Psychosom Res. 1999;47(6):555-567.



# Sri Ramakrishna Hospital

Medical Service : M/s. S.N.R. SONS CHARITABLE TRUST



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Ethics Committee Registration No. ECR/690/Inst/TN/2014

SRH/EC.12-9/2017-18

28<sup>th</sup> December 2017

### ETHICAL CLEARANCE CERTIFICATE

**Project Title: "Study On Medication Adherence And Factors Affecting It In Patients Treated For Hypertension At A Tertiary Care Hospital".**

**Researcher: MR. JOBIN KOSHY**

M.Pharmacy II year  
College of Pharmacy,  
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Coimbatore – 641 044

The following members of the ethics committee were present at the meeting held on 23.12.2017 at 11.00am at New Auditorium, Sri Ramakrishna Hospital Campus, Coimbatore.

SI NO	Members Name	Qualification	Designation	Address	Affiliation To the Institution Yes/NO
1.	Dr.P.Murali	M.Sc.,Ph.D., D.Sc	Scientist Mg. Director & CEO	Mg. Director & CEO Evolve Biotech Pvt.Ltd., 401 – 405, 4 <sup>th</sup> floor Ticel Bio park Ltd, Taramani, Chennai - 13	No
2.	Dr.P.Sukumaran	MS., M.Ch., FIACS	Scientific / EC Member Secretary Dean	Dean Sri Ramakrishna Hospital, 395, Sarojini Naidu Road, Sidhapudur, Coimbatore	Yes
3.	Dr.R.Lalitha	DGO.,(OG)	Clinician	Sr.Consultant Gynecologist & HOD Sri Ramakrishna Hospital, 395, Sarojini naidu Road, Sidhapudur, Coimbatore.	Yes
4.	Dr.M.Rangasamy	B.E., M.Sc., Ph.D.,	Lay Person	Former Professor Government College of Technology, Coimbatore.	No

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5.	Dr.S.Rajagopal	M.Ch.,	Clinician	Sr. Consultant Neuro Surgeon Sri Ramakrishna Hospital, 395, Sarojini naidu Road, Sidhapudur, Coimbatore.	Yes
6.	Dr.N.Paramasivan	MBBS., MD	Basic Medical Scientist	Prof. of pharmacology and HOD Sri Ramakrishna Dental College and Hospital, Coimbatore.	Yes
7.	Mrs. Mythili Padmanabhan	M.Sc., (Physiology)	Social Scientist	Corresponded Vriksha 5/14, 2 <sup>nd</sup> street, G.G. Avenue Coimbatore	No

This is to certify that the research work entitled "Study On Medication Adherence And Factors Affecting It In Patients Treated For Hypertension At A Tertiary Care Hospital", placed before the Institutional Ethical Committee has been approved as there is no objection to do this research work.

This ethics committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information / informed consent and asks to be provided a copy of the final report.

The Ethics Committee wishes him well in his research.

Yours Truly,

Member Secretary,  
Institutional Human Ethics Committee,

Dr. P. SUKUMARAN, M.S., M.Ch., FIACS.,  
DIRECTOR / DEAN  
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**PROJECT TITLE**

**Study of medication adherence and factors affecting it in patients treated for hypertension in tertiary care hospital**

**PATIENT INFORMATION FORM**

I, Jobin koshy , M.Pharm second year student of college of pharmacy, SRIPMS,Coimbatore, which is attached to Sri Ramakrishna Hospital Coimbatore, pursuing a dissertation work, entitled “Study of medication adherence and factors affecting it in patients treated for hypertension in tertiary care hospital” which has to be submitted to the Tamil Nadu Dr. M.G.R.Medical university, Chennai.

The details about the patient and the treatment are required by the investigator carrying out the dissertation. It is here by assured that the details collected are only for the purpose of research and it will be helpful to the patient and care giver. It is also assured tht the information obtained from the patient will be maintained confidentially. I hope you will provide the necessary co-operation for the above mentioned work.

Thanking you

Signature of the supervisor

***Dr.S.Sriram, M.Pharm, Ph.D.,***  
Head of Department,  
Department of Pharmacy practice  
College of Pharmacy, SRIPMS,  
Coimbatore-44

signature of the investigator

***Jobin koshy***  
M.Pharm II year  
Dept. Of pharmacy practice  
College of Pharmacy, SRIPMS,  
Coimbatore-44





---

**PATIENT CONSENTFORM**

I \_\_\_\_\_ have been made understood the necessity of the work entitled “ **Study on medication adherence and factors affecting it in patients treated for hypertension at a tertiary care hospital** ” that is being carried out by **Jobin Koshy**, II year M.Pharm, (Pharmacy Practice) in College of Pharmacy, SRIPMS, Coimbatore. I voluntarily hereby agree by giving my consent to participate in this study and provide the necessary co-operation for the same.

**Place:** Coimbatore

**Date:**

**Signature of the Patient/By-stander**

**Name of the Patient:**

**Name of the By-stander:**

**Signature of the Supervisor**

Dr S .Sriram ,M.Pharm, Ph D.,  
Professor & HOD,  
Department of Pharmacy Practice,  
College of Pharmacy, SRIPMS,  
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**Signature of the Investigator**

Jobin koshy  
II M. Pharm., Pharmacy Practice,  
College of Pharmacy, SRIPMS,  
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**GENERAL QUESTIONNAIRE FOR FACTORS AFFECTING HYPERTENSION**  
**DEPARTMENT OF PHARMACY PRACTICE**  
**COLLEGE OF PHARMACY, SRIPMS, COIMBATORE**  
**M.PHARM PROJECT**



**PROPOSED TITLE :STUDY ON MEDICATION ADHERENCE AND FACTORS AFFECTING IT IN PATIENTS TREATED FOR HYPERTENSION AT A TERTIARY CARE HOSPITAL**

SL.NO	INTENTIONAL NON ADHERENCE	YES	NO
1	Fear of ingesting medicine		
2	Inconvenience of taking medicine outside home		
3	Fear of taking too many drugs at same time		
4	Busy work schedule		
5	Unpleasant taste		
6	Problematic side effect		

SL.NO	NON INTENTIONAL NON ADHERENCE	YES	NO
7	Forgetfulness		
8	Cost of medicines		
9	Unavailability of near pharmacy		
10	Unavailability of prescribed medicines		

We are interested in your personal views of how you see your current illness. please indicate how much you agree or disagree with following statements about your illness by **ticking** the appropriate box.

Sl. no	Views about your illness	Strongly agree	disagree	Neither agree nor disagree	agree	Strongly agree
1	My illness last for a short time					
2	My illness likely to permanent rather than temporary					
3	My illness does not have much effect on my life					
4	I have the power to influence my illness					
5	My illness will improve in time					
6	My treatment can control my illness					
7	The negative effects can be prevented by my treatment					
8	There is nothing which can help my condition					
9	I have a clear understanding of my condition					
10	The symptoms of my illness change a great deal from day to day					
11	When I think about my illness I get upset					
12	My illness doesn't worry me					

## MEDICATION ADHERENCE RATING SCALE (MARS)

	Yes	No
1. Do you ever forget to take your medicine ?		
2. Are you careless at times about taking your medicines ?		
3. When you feel better, do you some times stop taking your medicines ?		
4. Some times if you feel worse when you take your medicine, do you stop taking it ?		
5.I Take my medication when i am sick.		
6. It is unnatural for my mind and body to be controlled by medication.		
7. My thoughts are clearer on medication.		
8. By staying on medication i can prevent getting sick.		
9. I feel weird, like a 'zombie', on medication.		
10. Medication makes me feel tired and sluggish.		

Patients are complaint if they respond "NO" to question 1-6 and 9-10 and yes to questions 7-8

## MORISKY MEDICATION ADHERENCE SCALE (MMAS-8)

	Yes/ No	score
1. Do you sometimes forget to take your medicine?		
2. People sometimes miss taking their medicines for reasons other than forgetting. Over the past 2 weeks, were there any days when you did not take your medicines?		
3. Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?		
4. When you travel or leave home, do you sometimes forget to take your medicines?		
5. Did you take all your medicines yesterday?		
6. When you feel like your symptoms are under control, do you sometimes stop taking your medicines?		
7. Taking medicines everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
8. How often do you have difficulty remembering to take all your medicines? (5 point likert question, score from 0-4) a. Never or rarely b. Once in a while c. Sometimes d. Usually e. All of the time		

### TOTAL SCORE :

#### SCORE :

- High adherence - 8
- Medium adherence - 6 to less than 8
- Low adherence - less than 6

# HIGH BLOOD PRESSURE [hypertension]



## WHAT CAN I DO ABOUT IT?

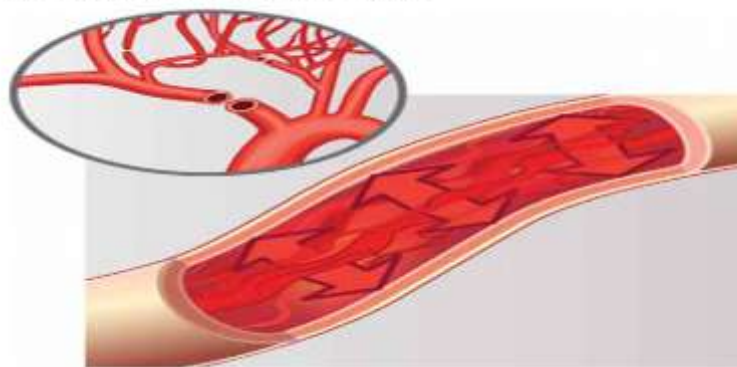
### What is high blood pressure?

The heart pumps blood around the body through arteries. Blood pressure is the pressure, or force, of the blood pushing against the walls of the arteries.

We all need blood pressure to push blood around our body.

When blood pressure is too high for too long, it can cause some damage to the body.

Doctors and medical people call high blood pressure **HYPERTENSION**.



Blood Pressure Category	Systolic mm Hg (upper #)		Diastolic mm Hg (lower #)
Normal	less than 120	and	less than 80
Prehypertension	120 – 139	or	80 – 89
High Blood Pressure (Hypertension) Stage 1	140 – 159	or	90 – 99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis (Emergency care needed)	Higher than 180	or	Higher than 110

### Causes of high blood pressure

- High salt diet
- Overweight
- High alcohol consumption
- Lack of physical activity
- Not enough fruit and vegetables
- Family history of hypertension
- Age

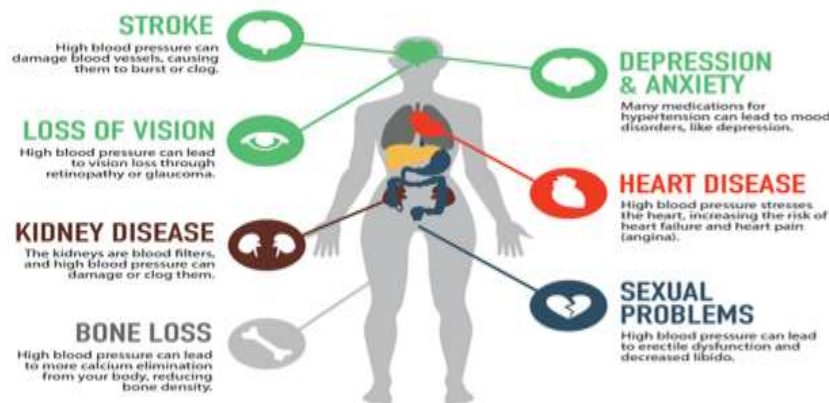


A healthy lifestyle has a **preventive effect**. Make lifestyle changes to reduce your risk.

### Dos and Don'ts to lower blood pressure

- ✓ **High potassium:** in avocados, seaweeds, sunflower seeds, almonds and Brazil nuts
- ✓ **High magnesium:** in green leafy vegetables, nuts and seeds, especially almonds, cashew and brazil nuts.
- ✓ **High fibre:** eat plenty of vegetables, pulses such as beans, lentils and chickpeas and apples.
- ✓ **High vegetables**
- ✓ **Keep hydrated**
- ✓ **Exercise regularly** combining aerobic with resistance training.
- ✗ **No refined carbohydrates:** white bread, white rice
- ✗ **Minimal to no grains:** even wholegrains
- ✗ **No sugar:** in most processed foods, biscuits, cakes, sugary drinks and fruit juices.
- ✗ **Low salt intake:** avoid processed foods and limit salt intake in general.
- ✗ **Limit alcohol**
- ✗ **Avoid smoking**
- ✗ **Restrict caffeine**
- ✗ **Reduce stress levels**

# HYPERTENSION AFFECTS YOUR WHOLE BODY



**DID YOU KNOW?** Sleep apnea shares the exact same risks! Get treatment today. It could save your life.

### SIGNS AND SYMPTOMS OF HYPERTENSION



## The DASH Diet for Healthy Blood Pressure

Follow these DASH (Dietary Approaches to Stop Hypertension) guidelines for a healthier, more balanced diet.



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