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"A STUDY ON HYPERTENSION MANAGEMENT IN WOMEN ON PATIENT OUTCOMES VIA IMPACT OF CLINICAL PHARMACIST"

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ABSTRACT

In order to improve the clinical pharmacist participation in the chronic disease management and pharmaceutical care on blood pressure measurement, medication adherence, life style modifications through patient education, this helps to improve in their quality of life. Studies relevant to impact of pharmacist intervention in hypertension management were performed in many countries but studies indicate that inadequate knowledge and lack of awareness about hypertension management among women population.

As such there were no studies reported on the importance of clinical pharmacist intervention and lifestyle modification in women with pregnancy induced hypertension, postmenopausal hypertension and general hypertension.

For hypertension among women as a significant condition attributing to mortality and morbidity to be made conscious of, light must be shed on its prevention and control at the control level.

This is of pivotal importance as the increasing prevalence of hypertension among the various strata of women can be ceased with adequate understanding of the disease and its consequences.

The role of clinical pharmacist is vital in recording and creating awareness among women about their disease management. It is essential to monitor blood pressure and take appropriate measures in order to minimize the risk factors in women due to hypertension.

Therefore, present research is focused on the impact of clinical pharmacist intervention in three groups of women with

Pregnancy induced hypertension- Group I,

Postmenopausal blood pressure- Group II,

General hypertension- Group III.

1. INTORDUCTION

1.1 CARDIOVASCULAR DISEASE

According to World Health Organization (WHO) health statistics, 'Heart disease' is one of the leading causes of death in women which refers to 'Cardiovascular Disease'. Cardiovascular disease (CVD) is often associated to the conditions involving, narrowing or blockage of blood vessels that can cause heart attack, chest pain (angina) or stroke1, which leads to abnormal functioning of the heart or blood vessels.

Other types of CVD include hypertension, congenital heart failure, stroke, congenital cardiovascular defects, hardening or narrowing (atherosclerosis) of the blood vessels, including the coronary arteries, and other diseases of the circulatory system2.

Diabetes, hypertension, high cholesterol, obesity, lack of exercise, smoking, increased age and family history are included as important factors for CVD. Many women live with heart disease, but may not be aware of the severity of the disease condition.

Till 2008, about 5.8% of women having coronary heart disease remained asymptomatic. However, in a 2009 survey, 30 % of women underestimated their risk for heart disease, with racial and ethnic minority

1.2 HYPERTENSION IN WOMEN

Health, in all aspects, physical and mental, is a fundamental human right. It is the basis of well-being and involvement in many phases of life. In many countries, 2 privatizing health care without guaranted access for everyone has reduced services for women. Women's health issues deserve as much attention as men since women have different health impact than men.

Women suffer from diseases limited by their gender but they also are affected with diseases previously thought to affect only men.

Women, being strong multi-taskers for a family and are obviously required for the strengthening of the nation. Hence, it has become necessary to have strong measures for their health management.

The World Health Organization has identified hypertension as one of the most significant preventable causes of premature morbidity and mortality. Blood pressure (BP) is described by two measurements, the systolic blood pressure (SBP) and diastolic blood pressure (DBP), in which maximal and minimal pressures are measured in the arterial system.

The SBP transpires when the left ventricle is contracted maximally and the DBP transpires when the left ventricle is relaxed maximally before the next contraction. Typical BP values range from 100-140 mmHg systolic and 60-90 mmHg diastolic.

HTN is an important risk factor for cardiovascular disease in women but is often underestimated and undiagnosed.

Approximately two-thirds of treated hypertensive women have uncontrolled BP5.

1.3 Definitions of Hypertension

Hypertension is described as the sustained increase in arterial blood pressure to an extent where benefit is obtained from blood pressure lowering. Hypertension (HTN) is also known as high blood pressure or arterial hypertension (AH).

1.4 TYPES OF HTN

The seventh report of the Joint National Committee on Prevention, Detection, Evaluation & Treatment of High Blood Pressure has introduced various categories of hypertension

Table 1: Categories of Hypertension.

CATEGORY	SYSTOLIC (mmHg)	DIASTOLIC(mmHg)
Normal	< 120	< 80
Pre Hypertension	120-139	80-89
Stage I HTN	140-159	90-99
Stage II HTN	≥ 160	≥ 100

Primary Hypertension

It is seen when arterial blood pressure is increased due to an increase in peripheral resistance.

It is further divided into two types namely, benign and malignant hypertension.

Benign hypertension

There is a moderate increase in blood pressure with systolic pressure of 200 mm Hg and diastolic pressure of greater than 100 mm Hg. However, the blood pressure returns back to normal while resting and during sleep. Subsequently, the rise in blood pressure does not return back to normal levels while resting.

Malignant hypertension

The blood pressure is elevated to a tremendous extent of about 250 mm Hg of systolic pressure and 150 mm Hg of diastolic pressure. It induces severe symptoms and can cause death within few years.

Some of the characteristics of primary or essential hypertension are,

A 40-60 % elevation in mean arteri A 40-60 % elevation in mean arterial pressure

Dwindling of about one half of normal renal blood flow in later stages

2-4 fold increased resistance to blood flow through the kidney

Secondary Hypertension

The etiology of secondary hypertension in women is similar to that seen in men, although the relative prevalence differs among age groups, with a gender predilection in a few select causes.

Aortic coarctation is typical among men, whereas renal artery stenosis resulting from fibro-muscular dysplasia is seen more among young adult women. Fibro-muscular dysplasia should be considered in women who have cervical bruits or develop hypertension before age 35. It can be detected by abdominal magnetic resonance imaging or computed tomography; and the preferred treatment is percutaneous catheter intervention.

Cardiovascular hypertension

Cardiovascular hypertension is often due to atherosclerosis, which is the hardening and narrowing of blood vessels, and coarctation of aorta, (i.e.) narrowing of aorta.

Renal hypertension

Renal hypertension refers to a stenosis of the renal arteries, (i.e.) narrowing of one or both renal arteries, due to which the renal function is impaired. It can also be cause by glomerulonephritis, nephritis with inflammation of the capillary loops in the renal glomeruli.

Endocrine hypertension

It is often due to pheochromocytoma, where a tumor in the adrenal medulla produces hyperaldosteronism, an excess secretion of aldosterone from adrenal cortex; Conn's syndrome; Cushing's syndrome, an excess secretion of cortisone; and also by gigantism or acromegaly, which is the excess secretion of growth hormone.

Neurogenic hypertension

Acute hypertension can be produces by strong induction of the sympathetic nervous system. Neurogenic hypertension is associated with the section of the baroreceptors nerves, lesions in tractus solitarius and increased intracranial pressure.

1.5 OTHER CLASSIFICATIONS OF HTN

Accelerated hypertension

Accelerated hypertension is defined as progressive hypertension with funduscopic vascular changes of malignant hypertension without papilledema.

Adrenal hypertension

It is associated with an adrenal tumor secreting mineralocorticoids.

Borderline hypertension

Borderline hypertension is due to the condition where the arterial blood pressure fluctuates between the normotensive and

Goldblatt hypertension

It is the condition of the kidney in which a constriction of the renal artery causes renal ischemia and the subsequent release of renin causes hypertension.

Ocular hypertension

Ocular hypertension is the persistent elevation of intraocular pressure in the absence of any other signs of glaucoma; it may or may not progress to chronic simple glaucoma.

Portal hypertension

Portal hypertension is defined as the abnormal increase in pressure of the portal circulation.

Pulmonary hypertension

Pulmonary hypertension is the abnormal increase in pressure of the pulmonary circulation.

Pregnancy Induced Hypertension

Pregnancy induced hypertension (PIH) is a global problem which complicates approximately 10-17% of pregnancies.

It is considered as the most usual medical problem which necessitates special attention for women.

PIH is a major disorder that is characterized by the development of idiopathic hypertension in a normotensive pregnant woman after 20th week of gestation without the presence of protein in the urine.

Moreover, it occurs in about 6-8% of all pregnancies and leads to a more critical condition associated with proteinurea as in pre-eclampsia or even eclampsia.

Post Menopausal Hypertension

Hypertension in post- menopausal women is related to hormonal imbalance. Menopause is a universal reproductive phenomenon.

All women who live beyond the age of 45-50 years' experience a period of transition from reproductive to non-reproductive stage of life. Natural menopause, which is of no obvious pathological or physiological cause, is recognized after 12 consecutive months of amenorrhea

General Hypertension

Hypertension or high blood pressure usually means a systolic blood pressure of greater than 140 millimeter of mercury (mmHg) or a diastolic blood pressure greater than 90 mmHg.

Normotension or normal blood pressure is a systolic blood pressure below 140 mmHg and diastolic blood pressure below 90 mmHg.

1.6 EPIDEMIOLOGY

Hypertension is a chronic medical condition. It is one of the most common life threatening non-communicable diseases.

It contributes to 7.6 million premature deaths, of which 54% is due to stroke, 47% of ischemic heart disease and 13% of attributable deaths worldwide.

About 20.9% of Indian women suffer from hypertension, and it is estimated to increase between 22.9-23.6% by 2025. About 67% of those with hypertension were found to be unaware of their diagnosis. A majority of hypertensive subjects still remain to be undetected. The controls of hypertension also seem to be inadequate.

1.7 HAEMODYNAMIC CHARACTERISTICS OF HYPERTENSIVE WOMEN

The short stature of women, when compared to men, imposes a reduced length of the arterial tree, now believed to be responsible for differences in ventricle vascular coupling. After ventricular ejection, the pressure wave propagates 9 along the arterial tree at a given pulse wave velocity (PWV), which is governed by the wall stiffness of the conduit.

Faster heart rate, also related to arterial tree length, induces a shorter diastolic period, a more rapid fall off in diastolic pressure, a lower stroke volume, and a significantly lower aortic diastolic BP at all ages in women.

In young women, the amplification of the primary systolic wave by reflections is less than in older women due to the younger, more compliant arterial tree and the slower PWV. Due to this reason, the brachial systolic BP is much lower in young women than in men and the diastolic BP is also less, due to which the PP is also lower.

With loss of estrogen at the time of menopause, there is no abrupt increase in BP. There is elastin fragmentation and collagen accumulation in the arterial tree with a substantial increase in the intrinsic rigidity of the arterial wall.

1.8 PATHOPHYSIOLOGICAL MECHANISMS

Pathogenesis of PIH

The pathogenesis describes the production of pressor factors which result in endothelial dysfunction causing PIH. The renin-angiotensin system is activated with the presence of strong vasoconstrictor substances, including angiotensin II receptor.

In case of PIH, it occurs due to the increased sensitivity of angiotensin II receptors.

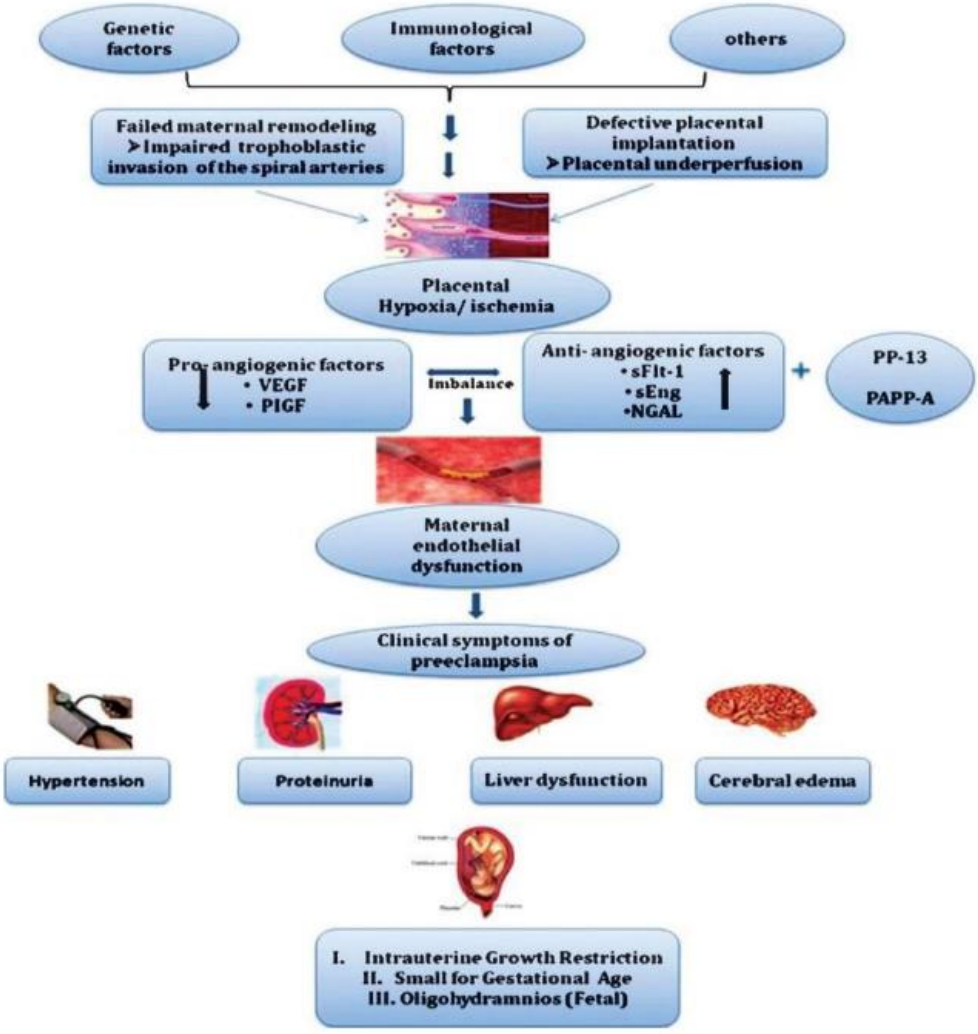

Figure 1 - Process of Pathogenesis of Pre-Eclampsia1

Pathogenesis of PMH

In premenopausal women, estrogens lower the risk of CVD. This cardioprotective effect is lost in premenopausal women with obesity and Diabetes Mellitus.

In such patients, arterial stiffness is substantially higher than in age-matched men, which might explain why obesity limits the cardiovascular protection of estradiol in premenopausal obese women.

Estrogen receptor-α and GPR-30 can also increase TREG-cell function. Insulin sensitivity is modulated by signals mediated by estrogen receptor α in macrophages. The modulation of immune functions of TREG cells and macrophages in obese premenopausal women remains to be determined.

Pathogenesis of GHTN

Hypertension can be classified, by cause, as either **essential (also known as primary or idiopathic) or secondary.** About 90-95% of hypertension cases are essential. There is still uncertainty about the pathophysiology of hypertension and some define that it is due to over consumption of sodium and under consumption of potassium.

Secondary hypertension indicates that hypertension is a result of a specific underlying condition with a well-known mechanism, such as chronic kidney disease, 13 narrowing of the aorta or renal arteries, or endocrine disorders such as excess aldosterone, cortisol or catecholamines.

Persistent hypertension is a major risk factor

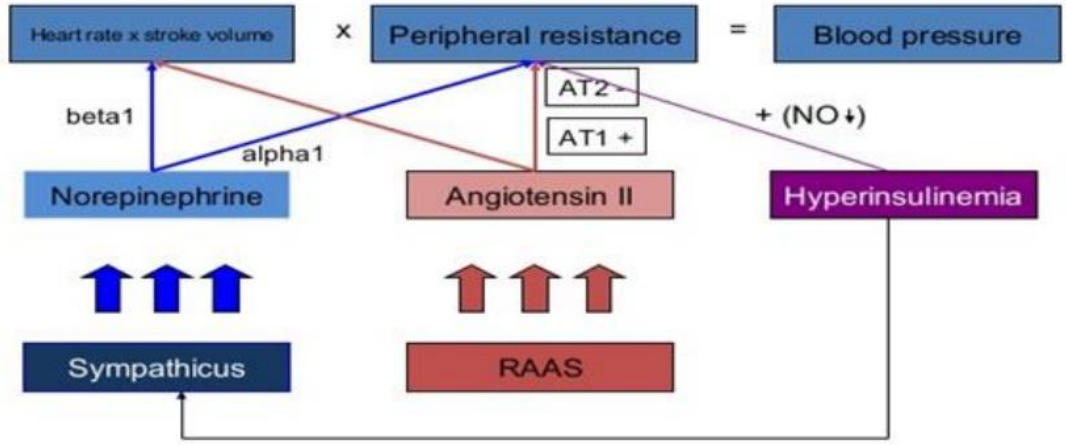

Figure 2: Pathophysiology of Hypertension

1.9 CARDIOVASCULAR RISK

These are the major cardiovascular risk factors such as obesity, physical inactivity, dyslipidemia, diabetes mellitus age (men under age of 55 years, women under age of 65 years) and premature cardiovascular disease. Hypertension is the most common disorder affecting the heart and blood vessels as cardiovascular disease is considered to be the single largest cause of mortality in women with 70% of cardiovascular deaths attributable to modifiable risk factor such as hypertension. For every 20 mmHg SBP or 10 mmHg DBP increase in blood pressure, there is a doubling of mortality from both chronic heart disease and stroke in people.

1.10 CLINICAL MANIFESTATIONS OF HTN

Table 2 – Clinical features of HTN

Pregnancy induced hypertension	Post Menopausal Hypertension	General hypertension
• Elevated uric acid • Elevated liver enzymes • Hemolysis, elevated liver enzymes and low platelets (HELLP syndrome) • Pulmonary oedema • Convulsions • Severe nausea and vomiting • Right upper quadrant and epigastric pain • Frontal headache • Visual disturbance • Abruption placenta	• Vaginal dryness • Night sweats • Sleep problems • Mood changes • Weight gain • Headache • Vasomotor instability • Urinary urgency • Racing heart • Sexual stagnation and loss of libido • Memory loss • Fatigue • Emotional outburst like crying and anger	• Nausea • Dizziness • Tiredness • Restlessness • Sleeplessness • Irritability • Anger • Mood instability • Headache • Vertigo • Increased heart rate

1.11 DIAGNOSIS

BP Monitoring

Blood pressure should be measured with the woman in the sitting position, with the arm at the level of the heart.

An appropriately sized cuff (i.e., length 1.5 times the circumference of the arm) should be used.

Korotkoff phase V should be used to choose diastolic blood pressure.

If blood pressure is consistently higher in one arm, the arm with the higher values should be used for all blood pressure measurements.

Blood pressure can be measured using a mercury sphygmomanometer, a calibrated aneroid device, or an automated blood pressure machine that has been validated for use.

Laboratory tests

Laboratory testing is not diagnostic for hypertension, but tests are frequently ordered to detect conditions that may be causing or exacerbating high blood pressure. It is also conducted to evaluate and monitor organ function over time.

General tests which are followed include

Urine analysis, urine protein

To help assess kidney function

Urinary albumin (microalbumin), BUN (blood urea nitrogen) and creatinine: to detect and monitor the effect of medications on the kidneys.

Potassium: as part of the electrolyte panel, which also includes sodium, chloride and carbon dioxide to evaluate and monitor the balance of body's electrolytes.

Cushing syndrome and crohn's syndrome often cause low potassium. Some high BP medications can upset the balance by causing excessive loss of potassium and potassium retention.

Non-laboratory tests

ECG (electrocardiography): to evaluate the heart rhythm and rate.

Eye exam

To look at the retina for changes in the blood vessels (retinopathy) that are caused by prolonged hypertension.

Hypertensive emergencies

The history and physical examination determine the nature, severity, and management of the hypertensive event. The history should focus on the presence of end-organ dysfunction, the circumstances surrounding the hypertension, and any identifiable etiology.

BP should be measured in both the supine position and the standing position (assess volume depletion). BP should be measured in both arms (a significant difference may suggest aortic desertion).

Assessment

Detailed history of past and present medical conditions.

Evaluation of patient's socio-demographic details.

Evaluation of hypertensive risk factor and obtaining BMI values.

Recommendations for Diagnosis of Hypertension

Hypertension in pregnancy should be described as systolic blood pressure≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, based on the average of at least 2 measurements, taken at least 15 minutes apart, using the same arm.

Resistant hypertension should be defined as the need for 3 antihypertensive medications for blood pressure control at ≥ 20 weeks' gestation.

A transient hypertensive effect should be defined as systolic blood pressure ≥ 140 mmHg or a diastolic blood pressure ≥ 90 mmHg that is not confirmed after rest, on repeat measurement, on the same or on subsequent visits.

A white-coat hypertensive effect refers to blood pressure that is elevated in presence of health care professionals (i.e., systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg), but < 135 mmHg (systolic) and < 85 mmHg (diastolic) on ambulatory or home blood pressure monitoring.

A masked hypertensive effect refers to blood pressure that is normal in presence of health care professionals (i.e., systolic < 140 mmHg and diastolic < 90 18 mmHg) but elevated on ambulatory or home blood pressure monitoring

Recommendations for Measurement of Proteinurea

All pregnant women should be assessed for proteinurea.

Urinary dipstick testing (by visual or automated testing) may be used for screening for proteinurea when the suspicion of preeclampsia is low.

Significant proteinurea should be defined as ≥ 0.3 g/d in a complete 24-hour urine collection or ≥ 30 mg/ mmol urinary creatinine in a spot (random) urine sample.

Significant proteinurea should be suspected when urinary dipstick proteinurea is ≥ 1+.

More definitive testing for proteinurea (by urinary protein: creatinine ratio or 24-hour urine collection) is encouraged when there is a suspicion of preeclampsia, including: ≥ 1+ dipstick proteinurea in women with hypertension and rising blood pressure and in women with normal blood pressure, but symptoms or signs suggestive of preeclampsia.

MANAGEMENT OF HTN

Pharmacological and Non-pharmacological interventions (when needed) are recommended to lower BP in both men and women. Non-pharmacologic interventions addressing concomitant risk factors, especially those directed at reducing central obesity (e.g., caloric and sodium restriction, modest alcohol consumption and regular physical activity) may be particularly important adjuncts for improving BP control and reducing vascular risk in hypertensive women.

Management protocol for PIH

Prevention of adverse maternal outcomes such as organ damage, convulsions, cerebro-vascular accidents (stroke), or death.

Prevention of adverse fetal complications including placental abruption, growth restriction, or still birth.

Symptomatic support

2. Table 3- Management protocol for gestational hypertension

Degree of hypertension	Pre Hypertension (120/80 to 139/89 mmHg)	Stage I HTN (140/90 to 159/99 mmHg)	Stage II HTN (≥ 160/100 mmHg or higher)
Admit to hospital	No	No	Yes (until blood pressure is 159/109 mmHg or lower)
Treat	No	With oral labetalol as first-line treatment to keep: • Diastolic blood pressure between 80–100 mmhg • Systolic blood pressure less than 150 mmhg	With oral labetalol as first-line treatment to keep: • Diastolic blood pressure between 80–100 mmhg • Systolic blood pressure less than 150 mmhg

Measure blood pressure	Not more than once a week	At least twice a week	At least four times a day
Test for proteinuria	At each visit using automated reagent-strip reading device or urinary protein: creatinine ratio	At each visit using automated reagent-strip reading device or urinary protein: creatinine ratio	Daily using automated reagent-strip reading device or urinary protein: creatinine ratio
Blood tests	Only those for routine antenatal care	* Test kidney function, electrolytes, full blood count, transaminases, bilirubin * Do not carry out further blood tests if no proteinuria at subsequent visits	Test at presentation and then monitor weekly: • Kidney function, electrolytes, full blood count, transaminases, bilirubin

1.12 Management protocol for PMH

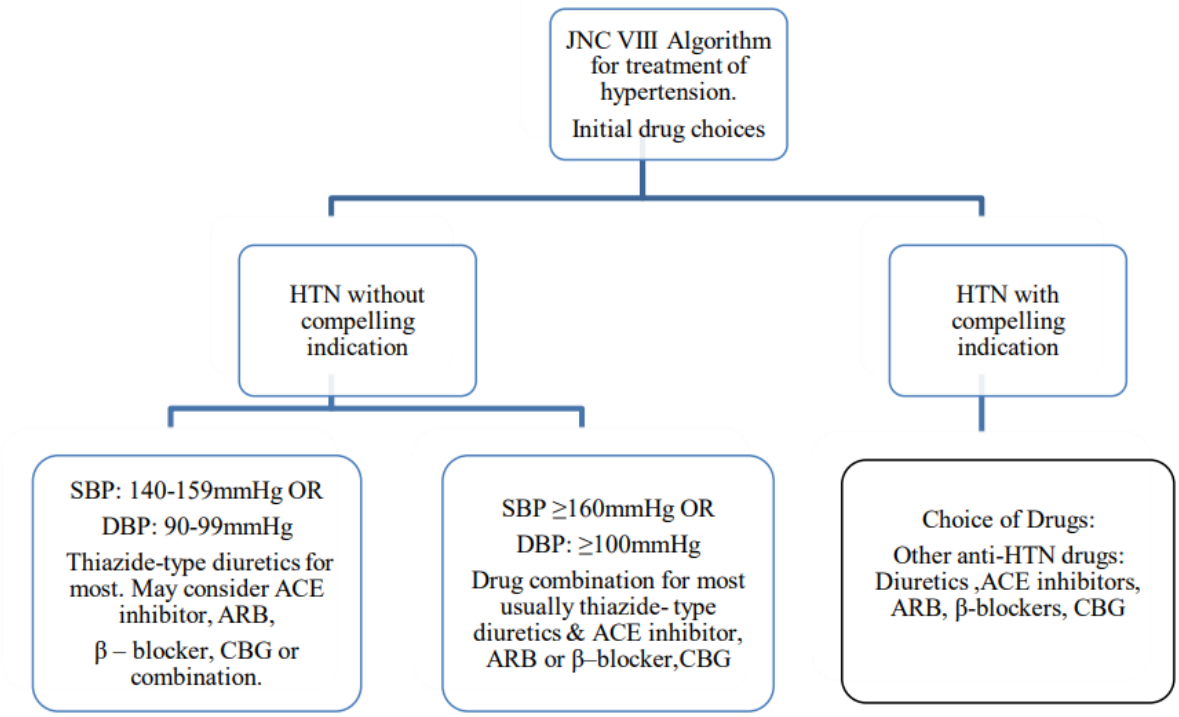

Figure 3: Management protocol for PMH

Table 4 -Hormone replacement therapy

Preparation	Drug	Doses/day
Estrogen:		
Oral	Conjugated estrogen	0.3mg, 0.45mg, 0.625mg,
Transdermal	17β estradiol	0.9mg, 1.215mg
Vaginal	Estradiol acetate	0.5mg, 1.0mg, 2.0mg (Twice weekly)
		0.05mg, 0.1mg (inserted every 90days)
Progestrone:		
Oral	Medroxy progesterone acetate(MPA)	2.5mg, 5.0mg, 10.0mg
		100mg, 200mg(in peanut oil)
	Micronized progesterone	45mg
Vaginal	Progesterone	
Combination:		
Oral sequential	Conjugated estrogen + MPA	0.625mg conjugated estrogen + 5.0 MPA
Oral continuous	Conjugated estrogen+MPA	0.625mg conjugated estrogen+ 2.5mg, 5.0mg MPA Or 0.45mg conjugated estrogen+ 2.5MPA
Transdermal continuous	17β estradiol- Norethindrone acetate	1.0mg estradiol + 0.5mg northidrone
	17β estradiol- Levonorgestrel	0.045mg estradiol + 0.015mg levonorgestrel (twice weekly)

1.13 LIFESTYLE MODIFICATION

Sodium reduction

The recommended sodium intake is less than 100 mEq per L per day for all patients with hypertension or pre hypertension. Epidemiological studies indicate that there is positive relation between dietary salt intake, level of BP and prevalence of hypertension and it reveals that a reduction in sodium intake over long periods lowers BP.

Potassium intake

Oral potassium supplementation significantly lowered SBP and DBP. The reductions in BP were greater in hypertensive women than in normotensive individuals whereas potassium supplementation was the only difference between the intervention and the control conditions where there was a significant reduction in SBP and DBP.

Calcium intake

The prevalence of hypertension is associated with low dietary calcium intake and the mechanism of action of calcium administration on BP may be via natriuresis and diuresis.

It is important to maintain an adequate intake of calcium for general health, e.g. low-fat dairy products. However, it is unlikely that there are important underlying effects of calcium supplementation in reducing BP in those with adequate calcium intake, whether normotensive or hypertensive.

Macronutrients

The effect of a change in a specific macronutrient is that the amount of other macronutrients must be changed concomitantly to balance energy content.

Carbohydrate

Little attention has been given on the possible influence of the amount and type of dietary carbohydrate on BP regulation.

Protein

The higher dietary protein intake (assessed by total nitrogen and urea nitrogen in 24-h urine) has favorable influences on BP. The dietary protein intake has the least association with elevated BP.

On the contrary, it is inversely associated to BP. This seems to present a paradox, as high protein consumption has been correlated with progression of renal damage and impaired renal function with hypertension. Protein may replace fats or sugars that maintain a higher BP.

Lower BP may also be attributed to increased natriuresis, or certain amino acids in the dietary protein that may cause vasodilatation through enhanced endogenous production of nitric oxide.

Fat

There is a significant independent positive relation of dietary cholesterol with SBP and DBP, between dietary saturated fat and DBP as well as an inverse relation of polyunsaturated fat/saturated fat to DBP.

Exercise

Aerobic exercise has favourable effects on BP in hypertensive and normotensive women, producing average reductions of 4 mm Hg in SBP and 3 mm Hg in DBP.

Physicians should suggest the patients to adhere to an activity that they enjoy, because enjoyment will increase their adherence.

Dietary changes

A diet rich in fruits and vegetables, high in low-fat dairy products, potassium, magnesium, and calcium; and low in total saturated fats comes under DASH eating plans.

Following this plan has been shown to produce mean reductions of 6 mm Hg in SBP and 3 mm Hg in DBP and combining the plan with sodium reduction produces additional effect in blood BP reduction.

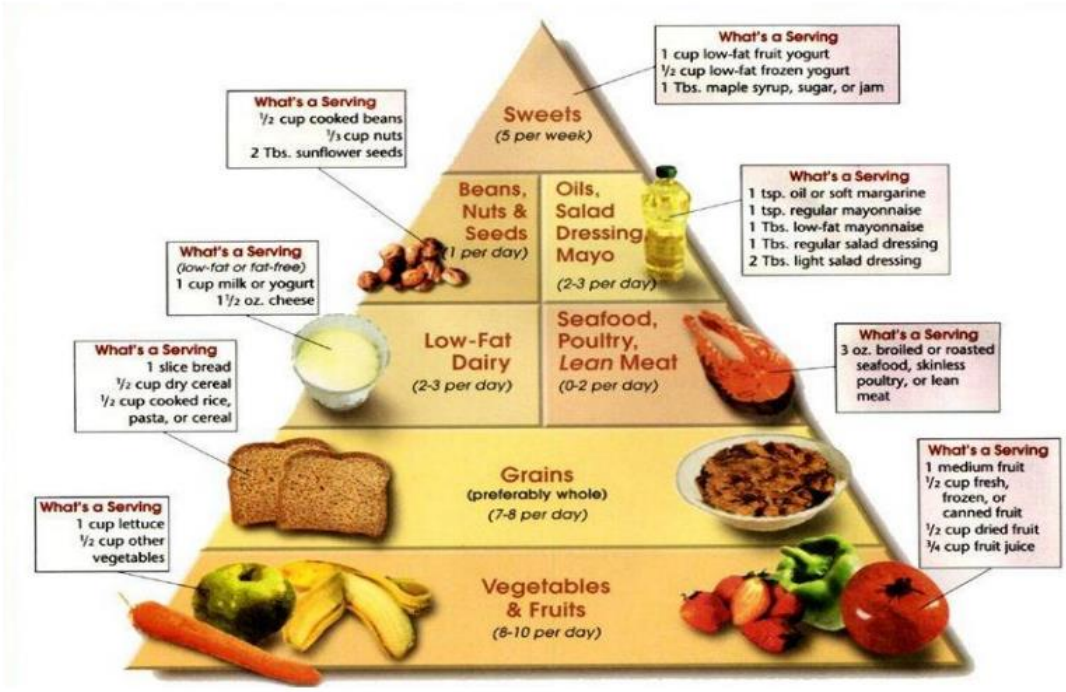

Figure 4 – Dash Diet Pyramid

Weight loss

Weight loss is an important lifestyle modification in reducing blood pressure. A reduction of 10 lb can help lessen blood pressure or prevent hypertension. A reduction of approximately 20 lb (9 kg) may produce a reduction in SBP of 5 to 20 mm Hg.

The potential mechanism of action of weight loss on BP include hemodynamic effects via reduction in blood volume and cardiac output, reduction in plasma renin activity associated with a reduction in sympathetic nervous system activity; and correction of hyperinsulinaemia with reduction in renal sodium retention.

Meditation

Meditation is a practice of concentrated focus upon a sound, object, visualization, the breath, movement, or attention itself in order to reduce stress, promote relaxation and to achieve a mentally clear and emotionally calm condition.

Stress reduction

Attempt to reduce stress for the woman can occur via

Quiet and dim environment.

Clear explanation of the management plan to their family members or care takers.

Minimizing negative stimuli.

Consistent, confident team approach.

1.14 PHARMACEUTICAL CARE PLAN

The philosophy of pharmaceutical care establishes the purpose for the practice that is to meet the social need for control of drug-related morbidity and mortality by managing medications appropriately.

The professional responsibilities defined by the philosophy of pharmaceutical care are to identify drug therapy problems, resolve them, and most importantly, prevent them from occurring in patients.

Definition

Pharmaceutical care plan (PCP) is a patient - centered systematic approach. Clinical pharmacists draft a written format to ensure proper drug use, achieve a definite outcome and improve patient care through assuring the safety, effectiveness and costeffectiveness.

Purpose of care plan

The purpose of the care plan is to determine, with the patient, how to manage his or her medical conditions or illnesses successfully with pharmacotherapy and includes all the work that is necessary to accomplish this task

Aims of care plan

A care plan is developed for each of the patient's medical conditions being managed with pharmacotherapy.

Care plans include goals of therapy, interventions, and a schedule for the next follow-up evaluation.

A goal of therapy is the desired response or endpoint that you and your patient want to achieve from pharmacotherapy.

The care plan includes interventions to resolve the drug therapy problems, interventions to achieve goals of therapy, and any necessary interventions to prevent drug therapy problems.

Objectives of care plan

To improve patients' quality of life, such programs are particularly effective in the case of chronic diseases such as hypertension.

To educate the patient about drugs and provide counseling on lifestyle, medication and patient medication adherence

To monitor on medication management (including drug monitoring with adjustment or change in medication).

To determine the blood pressure after pharmacist intervention through education such as training programs.

To promote healthy lifestyle for CVD prevention through health education.

To teach about self-measurement of blood pressure

Assessment

The purpose of the assessment is to determine if the patient's drug-related needs are being met and if any drug therapy problems are present.

Know your patient by understanding his or her medication experience before making any decisions about his or her drug therapy.

Elicit only relevant information required to make drug therapy decisions.

Always assess the patient's drug-related needs in the same systematic order.

First determine if the indication is appropriate for the drug therapy.

Second, evaluate the effectiveness of the drug regimen for the indication.

Third, determine the level of safety of the drug regimen. Only after deducting that the drug therapy selected or being used by the patient is appropriately indicated, effective, and safe do you logically evaluate the patient's adherence to the medication regimen.

Standards of practice for pharmaceutical care

Pertinent data are collected using appropriate interview techniques.

Data collection involves the patient, family and caregivers, and other health care providers when appropriate.

The medication experience is elicited by the practitioner and incorporated as the context for decision making.

The data are used to develop a pharmacologically relevant description of the patient, the patient's health status, and the patient's drug-related needs.

The relevance and significance of the data collected are determined by the patient's present conditions, illnesses, wants, needs, and preferences.

The medication history is complete and accurate.

The current medication record is complete, accurate, and includes indication, drug product, dosage regimen, and result to date.

Role of pharmacist in management of hypertension in women

To improve the quality of life for the patient.

To obtain medical history, demographic data, socio economic profile, lifestyle, eating habits & measure for cardiovascular risk profile.

Defining medication adherence & compliance.

Describe the effect of lack of medication adherence.

Address barriers hindering successful health behavior modification.

CHAPTER 2

LITERATURE REVIEW

2.1 LITERATURE REVIEW

Quan A et al.,(2006) assessed the efficacy of treating hypertension in woman. The study reported that hypertension treatment lowers the relative risk of cardiovascular morbidity and mortality in women aged 55 years and older. And also suggested greater effort required for increasing the awareness and treatment in these groups of women.

Sylvia WS et al.,(2007) conducted a study on Hypertension and Its Treatment in Postmenopausal Women Baseline Data from the Women's Health Initiative. The study reported that hypertension in older women is not being treated aggressively enough because a large proportion, especially those most at risk for stroke and heart

Vittorio FC (2008) conducted a study on Non-pharmacological treatment of hypertension in women. The author concluded that Lifestyle changes such as increase in physical activity, reduction of body weight and sodium intake, moderate coffee consumption and supplementation in olive oil can be very helpful in preventing hypertension,

Michel ES et al.(2009), investigated about the Hypertension in Women. The author concluded that hypertensive men and women differ not only endocrinologically, but also in terms of their stature and the way in which the arterial tree ages. These factors influence hemodynamic settings, control of heart rate, PP, and cardiovascular risk.

Oparil S et al.,2010) investigated on Gender and Blood Pressure. The author reported that Hypertension is the most common modifiable risk factor for cardiovascular disease in women. The treatment threshold is even lower for those with target-organ damage or diabetes. Thiazide-type diuretics should be first-line agents, but multi-drug therapy is usually required to obtain BP control, and additional agents should be aggressively employed.

Zillich AJ et al., (2011) evaluated the hypertension outcome through blood pressure monitoring and evaluation by pharmacist (HOME study) the author reported the HI intervention achieved a lower blood pressure and suggested that there is a need of added time to focus on the service provided and relationship between the pharmacist and physician.

Castro MS et al.,(2012) evaluated the pharmaceutical care programs for patients with uncontrolled hypertension. The study reported reduction in ambulatory BP, correcting or preventing drug related problem and medication adherence in patients with uncontrolled hypertension. The study concluded that pharmaceutical care program was significant in dropping the BP in study participants with uncontrolled hypertension.

Hajjar I et al.,(2013) conducted a study on Hypertension: Trends in Prevalence, Incidence, and Control. The study reported that despite a greater understanding of the risks of higher blood pressures and the increasing availability of effective antihypertensive therapy

Hashmi SK, et al.,(2014) investigated on factors associated with adherence to antihypertensive treatment in Pakistan. The study stated that younger age, poor awareness, and symptomatic treatment adversely affected to anti-hypertensive medication and thereby low adherence in our population. The author suggested that patients with the risk of low adherence should be targeted for intervention to achieve better BP control and hence prevent complications.

Hunt JS et al., (2015) conducted a study on a randomized controlled trial of team-based care: Impact of physician-pharmacist collaboration on uncontrolled hypertension

Lyra Juniour et al.,(2016) assessed the effect of pharmacist intervention on the prevention and solution of drug therapy problems, BMI and BP control in elderly hypertensive patients. The study confirmed that pharmaceutical care intervention could be an effective method in improving BP control, optimized the medication use, reduced symptoms caused by drug therapy, reducing risk for CVD in elderly patients, as well as achievement of positive health outcomes.

Thoenes M et al.,(2017) reviewed antihypertensive drug therapy and blood pressure control in men and women: An international perspective. The study showed that significant gender disparities in BP levels, in which SBP was about higher in women and DBP was lower than in men.

Hsuan PW et al.,2018) assessed the relationship of blood pressure control and hospitalization risk to medication adherence among the hypertensive patients in Taiwan.

Pawar AB et al.,(2019) observed the prevalence of hypertension among elderly women in slum of surat city. The study showed there is higher prevalence of hypertension among women along with other chronic non-communicable disease. The study also suggested early identification and prompt treatment of hypertension for stamp out the end stage complications.

Agnieszka S et al.,(2020) conducted a study on the impact of pharmaceutical care on patients with hypertension and their pharmacists. The author concluded that more patients who received pharmaceutical care had controlled blood pressure as compared to the group of patients using standard pharmaceutical services. The pharmaceutical care also had positive effect on the patients' knowledge about disease

Quasem I et al.,(2021) investigated on Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicentre study. The study emphasize the need to implement effective and low cost management regimens based on absolute levels of cardiovascular risk appropriate for the economic context. From a public health perspective, the only sustainable approach to the high prevalence of hypertension in the Indian subcontinent is through a strategy to reduce the average blood pressure in the population.

Jose LL et al.,(2021) investigated on Blood Pressure Control in Hypertensive Women Aged 65 Years or Older in a Primary Care Setting. MERICAP Study.

Theresa LC et al.(2022), investigated on Improving hypertension management through pharmacist prescribing; the rural Alberta clinical trial in optimizing hypertension. The study reported that the study design randomizes patients to enhanced pharmacist care or usual care at the patient level rather than at the pharmacist level

Abla MA et al.,(2022) investigated a study on Pharmacists-physician collaboration improves blood pressure. The study concluded that this study found that physicianpharmacist collaborative approach to uncontrolled hypertension in Jordan improved the rate of BP control in hypertensive patients and resulted in more profound decline in both systolic and diastolic BP

Skowron A et al.,(2023) evaluated the impact of pharmaceutical care on patients with hypertension and their pharmacists.

Morgando M et al.,(2023) assessed the pharmacist intervention program to enhance hypertension control: a randomized controlled trial.

Saleem F et al.,(2023) valued the association between knowledge and drug adherence in patients with hypertension in Quetta, Pakistan. The study shown that patients had average knowledge about hypertension and while were categorized as poor adherent.

Claire VM et al.(,2023) investigated the Gender-related differences in the management of hypertension by cardiologists: The PARITE study. The author reported that in French, office-based, cardiology practice, the antihypertensive regimen is prescribed without taking gender into account

Eduardo P et al.(2024), conducted a study on Hypertension in women. The author concluded that Prevalence of hypertension is expected to increase more in women than men.

Helga G et al.,(2024) conducted a study on Hypertension in women: latest findings and clinical implications. The author reported that Hypertension is an important risk factor for CVD in women. Even though women are more at risk to die from hypertension-related CVD than men, women do not perceive CVD as an important health problem.

CHAPTER 3

3.1 AIM OF THE STUDY

The aim of the present research work is to assess the impact of clinical pharmacist's intervention on hypertension management in selected three groups of women and patient outcomes.

i) Women with pregnancy induced hypertension- Group I,
ii) ii) Women with postmenopausal blood pressure- Group II,
iii) iii) Women with general hypertension- Group III.

3.2 MAJOR OBJECTIVES

To assess the impact of clinical pharmacist intervention on blood pressure of three selected groups of women with pregnancy induced hypertension, postmenopausal women and general hypertension.

To identify the socio-demographic factors associated with hypertension (age and age groups, socio-economic status, body mass index, education and employment status).

To determine the symptoms associated with post-menopausal health using menopausal rating scale.

To assess the impact of clinical pharmacist intervention on blood pressure.

To assess the cardio-vascular risk for the next 10 years period based on the serum lipid levels.

To assess the impact of clinical pharmacist intervention on medication adherence by morisky medication adherence scale.

To assess the impact of clinical pharmacist education on life style modification.

To assess the impact of clinical pharmacist intervention on knowledge towards hypertension.

3.3 HYPOTHESIS

In order to improve the clinical pharmacist participation in the chronic disease management and pharmaceutical care on blood pressure measurement, medication adherence, life style modifications through patient education, this helps to improve in their quality of life. Studies relevant to impact of pharmacist intervention in hypertension management were performed in many countries but studies indicate that inadequate knowledge and lack of awareness about hypertension management among women population.

As such there were no studies reported on the importance of clinical pharmacist intervention and lifestyle modification in women with pregnancy induced hypertension, postmenopausal hypertension and general hypertension.

3.4 RATIONALE

For hypertension among women as a significant condition attributing to mortality and morbidity to be made conscious of, light must be shed on its prevention and control at the control level.

This is of pivotal importance as the increasing prevalence of hypertension among the various strata of women can be ceased with adequate understanding of the disease and its consequences.

The role of clinical pharmacist is vital in recording and creating awareness among women about their disease management. It is essential to monitor blood pressure and take appropriate measures in order to minimize the risk factors in women due to hypertension.

Therefore, present research is focused on the impact of clinical pharmacist intervention in three groups of women with

- Pregnancy induced hypertension- Group I,
- Postmenopausal blood pressure- Group II,
- General hypertension- Group III.

3.5 PLAN OF STUDY

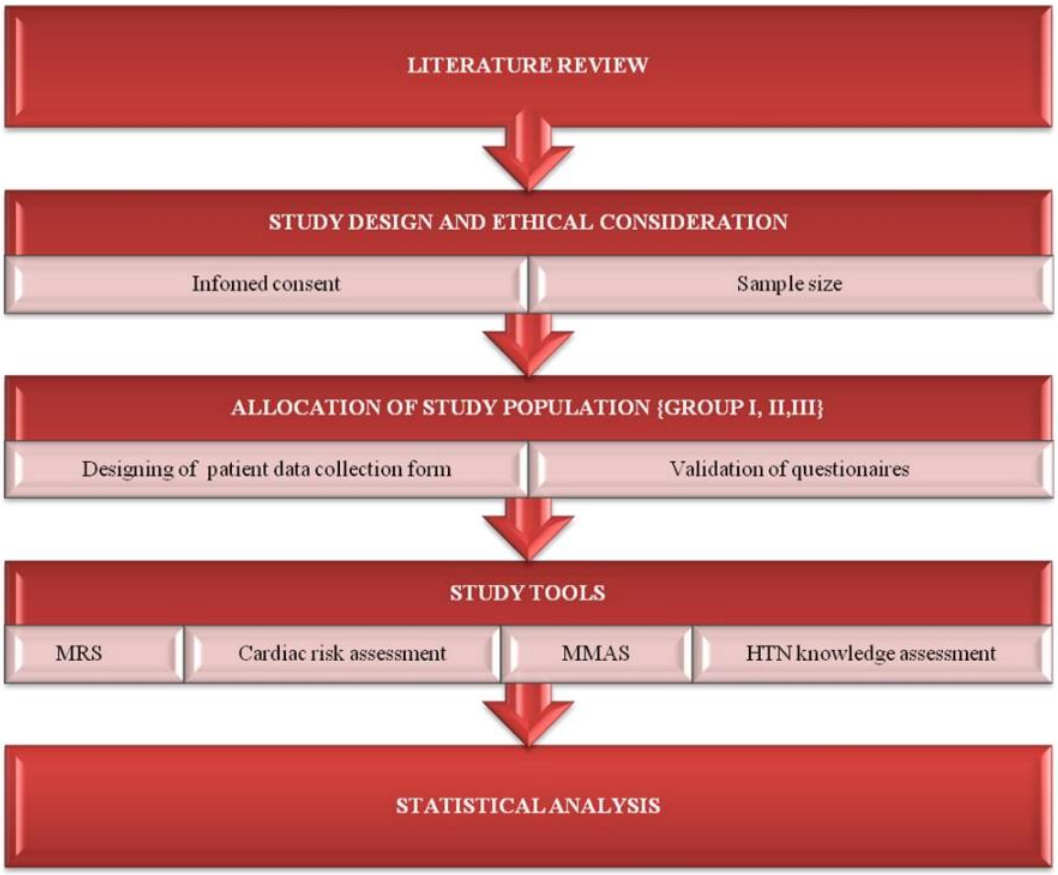

Figure 5- Work plan for study.

CHAPTER 4

MATERIALS & METHODS

4.1 MATERIALS AND METHODS

4.1.1 STUDY DESIGN

The effectiveness of clinical pharmacist intervention and their outcomes in hypertensive women in selected three groups such as pregnancy induced hypertension- Group I, postmenopausal blood pressure- Group II, general hypertension- Group III was assessed through a prospective and interventional study, over a period of 3 years, at Dr. Kamakshi Memorial Hospital, Nepal, India

4.1.2 ETHICAL CONSIDERATION

The study was carried out only among the hypertensive women and the purpose of the study was well explained to the participants. An informed consent was obtained and maintained confidentially.

4.1.3 STUDY DURATION

1 years (2023-2024)

4.1.4 TARGET POPULATION

In the present study, women with pregnancy induced HTN, post- menopausal women and general hypertensive women were target population as these women require the knowledge on disease management on hypertension.

4.1.5 INCLUSION CRITERIA

The following inclusion criteria were considered for the study:

Hypertensive women patients

· Female (Age ≥18 years to ≤ 70 years).

· Willingness to participate in the study by signing the informed consent form.

4.1.6 EXCLUSION CRITERIA

The following exclusion criteria were considered for the study

Clinically unstable patients (as assessed by consultant physician).

Moderate to severe learning difficulties.

Oncology and organ transplantation patient

4.1.7 CALCULATION Of SAMPLE SIZE

The sample size was calculated using the Raosoft online software, available at http://www.raosoft.com/samplesize.html.

The calculation was based on the number of patients visited the department during the study period.

The estimated sample size total number of study population was calculated as 269 [N= 887] hypertensive women patients who visited the hospital were enrolled in the study at margin of error ± 5%, CI = 95%, Response distribution = 50% using Raosoft online software.

4.1.9 STUDY SUBJECTS

The study subjects were selected based on inclusion criteria (confirmed diagnosis of hypertension and willingness to participate by signing the informed consent (Appendix II). Patients were randomly assigned as before intervention group and after intervention group.

4.1.10 BASELINE ASSESSMENT

After randomization, baseline data for each patient was collected by a designed and validated patient data collection form.

The collected data included patient demographics, BMI, assessment of current co-existing health conditions, BP measurement, medication review, serum lipid levels, medication adherence, frequency of exercise practice and assessment of knowledge

The patient were also asked to complete a set of questionnaires (English version) which includes menopausal rating scale (Appendix IV), Morisky Medication Adherence Scale (MMAS) (Appendix V) and hypertension knowledge assessment (Appendix VI).

4.1.11 FOLLOW UP ASSESSMENT

The assessment were repeated at 6 and 12 months in all three groups of hypertensive women with same parameters such as BP measurement, medication review, serum lipid levels, medication adherence, frequency of exercise practice and assessment of knowledge

4.2 STUDY MATERIAL AND DESIGNING OF THE PATIENT DATA COLLECTION FORM

The data collection form was designed by adapting from the previous studies and literatures that assessed the patient medication therapy, clinical pharmacist intervention on lifestyle modification including dietary habits, physical activity and other details, though slightly modified to suit the present need of the study. The data collection form was structured to obtain the demographic details of the hypertensive women and their knowledge. Content validity was ensured for which, the modified questionnaire was pre-validated by experts from faculty of pharmacy (clinical pharmacy and clinical pharmacology) who have sound knowledge on the topic and their suggestions regarding the relevance, clarity and appropriateness of the items were considered for inclusion in the data collection form. The questionnaire was designed in English language followed in all places in India

Patient data collection form is given in Appendix III and was validated to collect the necessary information from the patient medical records and by a personal 73 interview.

It consisting of patient demographic details, complaints on admission, history (social, medication and medical), laboratory reports, obstetric details, comorbidities, patient compliance, and medication chart review. The patient's age was categorized as follows:

In group I, pregnant women in age group from 20 to 40 were included irrespective their parity state

In group II post menopausal women in age group from 45 to 60 were included irrespective of their age at menarche.

In group III women with general hypertension in age group from 21 to 60 were included. Socio-economic status was measure using kuppuswamy rating scale, which was categorized in Table 5:

Table 5- Socio-demographic categorization

S.No	*Score*	*Socio-economic scale*
1.	26-29	Upper
2.	16-25	Upper middle
3.	11-15	Lower middle
4.	5-10	Upper lower
5.	<5	Lower

Socio-economic status is a measure of economic and sociological conditions which as a direct and an indirect impact on an individual's concern towards health, education and employment.

BMI was calculated using the parameters of height and weight using the formula: BMI = body weight in kg ÷ (height in meter × height in meter). The categorization of BMI is given in Table 6:

Table 6- Categorization of Body Mass Index

Category	Range	Intervention
Underweight	18.5	Encourage balanced diet and exercise
Healthy	18.5-24.9	Encourage balanced diet and exercise
Overweight- I	25.26.9	Lifestyle (diet, exercise and behavior therapy)
Overweight- II	27-29.9	Lifestyle and drug therapy for co-morbidities
Obese class 1	30-35	Life style modification and drug therapy
Obese class 2	35-39.9	Life style modification and drug therapy
Obese class 3	Above 40	Life style, drug therapy and surgery

4.3 STUDY TOOLS USED BEFORE AND AFTER INTERVENTION OF CLINICAL PHARMACIST

The study tools that are utilized to assess before and after intervention are given below:

· Menopausal rating scale (only for group II)

· Cardiac care risk assessment

· Morisky Medication Adherence Scale (MMAS)

· Hypertension knowledge assessment

4.4 Menopausal rating scale (MRS)

Menopausal symptoms was assessed using MRS consists of 11 questions. It contains three independent dimensions:

Psychological,

Somatic, and

Urogenital subscale.

Each of the 11 symptoms in MRS contained in the scale can get 0 (no complaints) or up to 4 scoring points (sever symptoms) depending on the severity of the complaints perceived by the women completing the scale.

The composite scores for each of the dimensions (subscales) are based on adding up the scores of each item of the respective dimensions.

The total score is the sum of the dimension scores, and is proportional to their severity of subjectively perceived symptoms

Cardiac care risk assessment calculator: In the study population the parameters pertaining the age, serum lipid levels (total cholesterol and HDL) and blood pressure were obtained and the cardiac risk for next ten years was calculated using **"Cardiac care risk assessment calculator"** (www.http://www.cvdrisk.nhlbi.nih.gov).

4.5 MORISKY MEDICATION ADHERENCE SCALE (MMAS)

The written prescription from the physician was collected from each participant during their baseline and final hospital visit. The number of anti-hypertensive drugs in each prescription was reviewed and the pattern of medication adherence was measured using MMAS questionnaire.

The MMAS questionnaire measures adherence through the participant's response to the verbally asked questions, where the response accounts for the various reasons for non-adherence namely: forgetting, carelessness, stopping when feeling better and stopping when feeling worse. [Scoring: 'Yes'= 0, 'No'= 1].

MMAS scores ranges between 0 and 5.

4.6 HYPERTENSION KNOWLEDGE ASSESSMENT

Knowledge assessment questionnaires were asked to each patient by the clinical pharmacist, which was useful to assess the increase in knowledge towards hypertension management before and after intervention.

The status of knowledge of was categorized into: poor, average and good relating to disease management.

The patient knowledge was analyzed through the questionnaire based on the bloom's cut off points which answered correctly was measured as 1, wrongly was measured as 0 and for 'don't know' was also measured as 0.

From these values, the maximum score obtainable for knowledge based questions was 10 and the minimum was 0.

Using the maximum score, the participants knowledge was rated and classified based on Bloom's cut off point (60-80%) as follows (Table 7):

Table 7 - Categories of knowledge based on Original Bloom's Cut off Points

Score	Percentage	Categories
0-3	<60%	Poor
4-6	60-79%	Average
7-10	80-100%	Good

4.7 CLINICAL PHARMACIST INTERVENTION

Patient screened and counseling was carried out in an environment conductive for capturing patient's perceptions accurately. Patients enrolled under before intervention group were educated by the clinical pharmacist about blood pressure management, medication adherence, lifestyle modification and their importance.

Patient information leaflets (PILs) describing the above information were prepared and distributed to before intervention group, for reinforcing the content delivered through counseling.

PILs were developed based on model leaflets collected from different sources such as JNC guidelines, Micromedex database etc.

The contents of the leaflet were appropriately revised and validated by the physicians.

Readability of the designed PIL was computed online (www.readabilityscore.com) by **(1) Flesch Readability Ease (FRE) and (2) Flesch-Kincaid Grade Level (FK-GL).**

Layout and various designing characteristics of the PILs were made based on the selected three categories of women separately. (Appendix VII).

The counseling sessions and PILs laid emphasis on

(1) importance of medication adherence

(2) knowledge towards hypertension management

(3) lifestyle modification and

(4) need for regular follow up. Participants were followed up for a period of 3 years among the study groups and periodically re-assessed after every six months and their response rate was reassessed before and after clinical pharmacist's intervention

4.8 DATA ANALYSIS

Before intervention and after intervention data's were collected from selected three groups of hypertensive women was tabulated and statistically analysed

Different types of graphs, figures and tables were used to summarize the data's visually.

4.9 **STATISTICAL ANALYSIS STATISTICAL ANALYSIS**

(Data screening, descriptive statistics and univariate analysis) were performed using SPSS 22.0.
Descriptive statistics were used to summarize the baseline characteristics. No data imputation was applied, unless specified otherwise.
Counts and percentages were used to summarize categorical variables. Graphical data displays were used to summarize data.
For outcome measures of continuous data, paired t-test was used for between groups comparison if the data were normally distributed.
Categorical data were represented by mean ± SD and nominal data by percentage frequency.
Since, most of the dependent and independent variables in this study were categorical, non-parametric test were chosen for data analysis.
Chi-Square test for was used to compare data from more than two independent samples.
Differences between before intervention group and after intervention group were assessed for statistical significance by student t test for knowledge based questionnaire and physical exercise.
P-value of 0.05 was considered statistically significant.

4.10 STUDY PROCEDURES

Table 8 – Study assessment procedures

Appointment	Before intervention	After intervention
Enrollment (0 months)	Patient is assessed for eligibility	
Baseline (6 months)	Patient details were collected via patient interview: • Patient demographic information • BMI • Assessment of current co-existing diagnosed health conditions • Blood pressure • Medication review • Serum lipid levels • Medication adherence • Frequency of exercise practice • Assessment of knowledge Patient education was given and recorded the duration of the appointment	Patient details were collected via patient interview: • Patient demographic information • BMI • Blood pressure • Medication review • Serum lipid levels • Medication adherence • Frequency of exercise practice • Assessment of knowledge Measured the outcomes of patient education
Final (12 months)	Patient were followed up in their next hospital visit and obtained the final data for: • Blood pressure • Cardiac care risk assessment • Medication Adherence • Knowledge in understanding hypertension management • Lifestyle modification.	

4.11 OUTCOME MEASUREMENT

Table 9 - Study outcome measurements

OUTCOME	MEASURE
Blood pressure	✓ Measured by the pharmacist utilizing a manual sphygmomanometer. ✓ The patient was asked to sit quietly for 5 minutes before their blood pressure was measured. ✓ A second measurement was taken 5 minutes after the first one and the average of the 2 measurements computed. ✓ Every effort was made to measure blood pressure at the same time of day for each visit to ensure consistency.
Adherence to medication	Measured in 2 ways: ✓ Through patient self-report. ✓ MMAS scale.
Knowledge	Measured by hypertension knowledge assessment questionnaire.
Life style modification	✓ Assessed by asking the patient. ✓ The average number of minutes they engage in physical exercise per week.

CHAPTER 5

RESULTS & DISCUSSION

5.1 RESULTS AND DISCUSSION

Out of 931 hypertensive women from three selected groups screened during the study period, 887 were recruited.

In that, 293 participants in group I,

299 participants in group II and

295 participants in group III completed their follow-up.

Reasons for dropping out, in the decreasing order of importance were: (a) Unable to contact for follow-up (b) Due to participants personal reasons.

Figure 8 is a flow chart indicating allocation of study population.

5.2 PATIENT DATA COLLECTION AND BASELINE CHARACTERISTICS

Baseline characteristics are calculated initially for each group I, II and III.

The baseline characteristics of the study population are presented in Table 9.

Before intervention group and after intervention group were matched (P>0.05) for baseline socio-demographic and clinical characteristics such as

(a) mean age and SD in group I (25.42± 3.1), group II (47.22 ± 4.6) and group III (53.42±2.9),

(b) female gender (33, 33.7, 33.2),

(c) mean BP in group I (73.2±19.5), group II (74.7±18.2), and group III (73.7±17.6),

(d) average number of drugs used in group I (58.6±9.7), group II (49.8±4.7) and group III (49.1±10.1).

As per kuppuswamy's socioeconomic classifications, majority belonged to middle category in group I, II and III. Majority of patients belonged to JNC (Grade II HTN) category in group I (32.76 vs 7.51).

In the present study, the hypertension management upon clinical intervention was carried out including effect of their own characteristics such as age and age groups, socio-economic status, body mass index, education, employment status, menopausal symptoms, measurement of BP, serum lipid levels, medication adherence, knowledge assessment and exercise practice

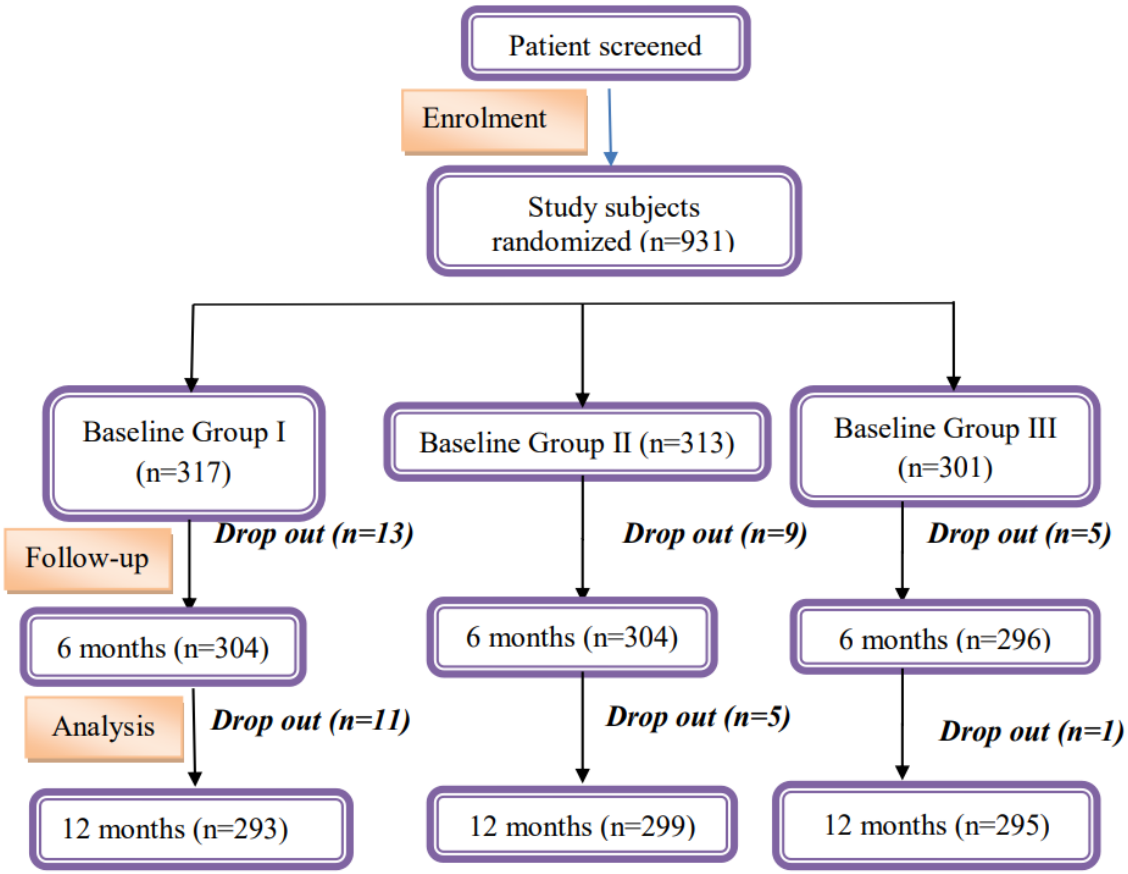

Figure 6- Allocation of Study Population

Table 10 – Baseline characteristics of study population.

Characteristics	Group I (N=293)		Group II (N=299)		Group III (N=295)	
Age (Mean±SD)[a]	25.42±3.1		47.22±4.6		53.42±2.9	
Percentage population in each group	33.0		33.7		33.2	
Socioeconomic status (%)[b]						
Lower	16.38		21.07		17.39	
Upper lower	20.14		19.40		21.07	
Middle	27.65		25.42		23.08	
Upper middle	21.84		19.06		21.40	
Upper	13.99		15.05		17.06	
Blood pressure assessment						
BP (Mean ± SD)[a]	73.2±19.5		74.7±18.2		73.7±17.6	
Severity as per JNC (%)	**Before**	**After**	**Before**	**After**	**Before**	**After**
Pre Hypertension	21.84	40.61	30.77	34.78	25.76	36.95
Grade I HTN	29.69	14.68	24.41	19.40	31.86	12.20
Grade II HTN	32.76	7.51	28.09	13.04	25.08	10.51
Normal	15.70	37.20	16.72	32.78	17.29	40.34
No. of Medications (Mean ± SD)[a]	58.6±9.7		49.8±4.7		49.1±10.1	

SD – Standard deviation, HTN – Hypertension, JNC – Joint National Committee a Data were analyzed by t test

Clinical pharmacist can achieve optimal outcomes from medication adherence, especially in chronic diseases management.

To the best of our knowledge, this is the first prospective study from India that describes the impact of clinical pharmacist aided hypertension management and its significant outcomes in three categories of women population.

Key findings of our study highlight the importance of clinical pharmacist's education to improve the quality of life in hypertensive women.

5.3. DEMOGRAPHIC ANALYSIS OF THE STUDY POPULATION

5.4. Age wise distribution

In Group I The age of the study participants is categorized for better understanding.

Most of the cases were in age from 26-30 (40.27%, N=118) followed by 74 cases of age from 31-35 (25.26%), 62 cases of age from 21-25 (21.16%) and 39 cases of age from 36-40 (13.31%).

The results are revealed in Table 11 and Figure 9. The mean age is calculated and found as 25.42 with standard deviation 3.1.

Table 11 - Age distribution in Group I

Age in years	No. of patients	Percentage (%)
21-25	62	21.16
26-30	118	40.27
31-35	74	25.26
36-40	39	13.31

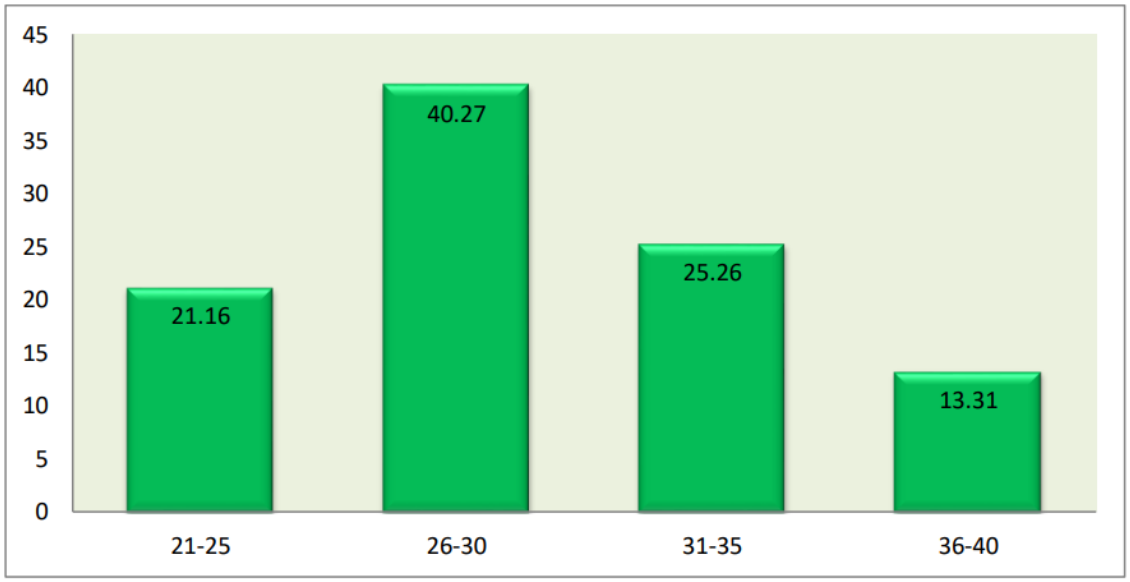

Figure 7 - Percentage distribution of age in Group I

Age wise distribution in Group II: Most of the cases were in age from 51-55 (63.88%, N=191) followed by 71 cases of age from 45-50 (23.75%) and 37 cases of age from 56-60 (12.37%). The results are revealed in Table 12 and Figure 10. The mean age is calculated and found as 47.22 with standard deviation.

Table 12 - Age distribution in Group II

Age in Yrs	No. of patients	Percentage (%)
45-50	71	23.75
51-55	191	63.88
56-60	37	12.37

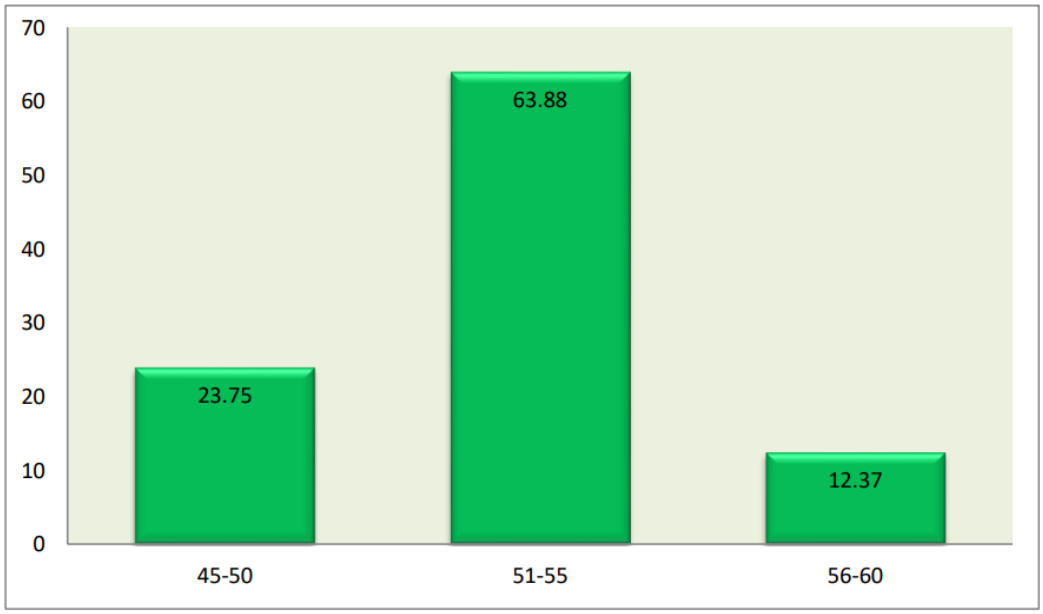

Figure 8 - Percentage distribution of age in Group II

Age distribution in Group III Most of the cases were in age from 51-55 (18.98%, N=56) followed by 51 cases were of age from 41-45 (17.29%), 47 cases of age from 46-50 1(5.93%), 43 cases of age from 56-60 (14.58%), 34 cases of age from 36-40 (11.53%), 28 cases of age from 26-30 (9.49%) and 15 cases of age from 21-25 (5.08%).

The results are revealed in Table 13 and Figure 11. The mean age is calculated and found as 53.42 with standard deviation.

Table 13 - Age distribution in Group III

Age in Yrs	No. of patients	Percentage (%)
21-25	15	5.08
26-30	21	7.12
31-35	28	9.49
36-40	34	11.53
41-45	51	17.29
46-50	47	15.93
51-55	56	18.98
56-60	43	14.58

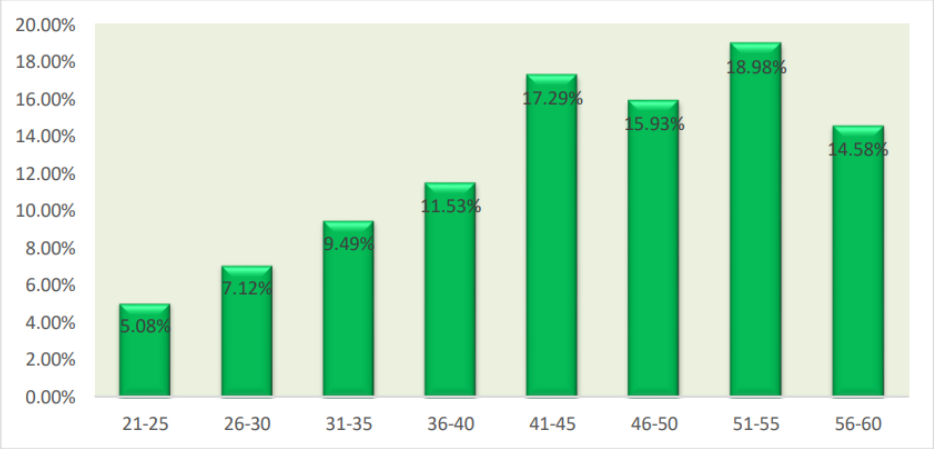

Figure 9 - Percentage distribution of age in Group III

The present study showed the prevalence of hypertension was significantly higher in group I patients aged of 26 to 30 years.

Goonewardene et al., in their study conducted among the younger teenage mothers found significant association of higher risk of gestational hypertension and preeclampsia with age24, 25.

In group II and III, hypertension increase with the increase of age is a well-known fact and the age group of 51-55 years showed the highest incidence of post menopausal symptoms26 .

One reason for the increases in BP, up to age 51-55years was a gradual deterioration of elastic filaments in the aorta and large arteries.

This exchange of elastic filaments with stiffer collagen elements increases the "**Windkessel**" phenomenon in these vessels, leading to increased pulse pressure.

A decreasing ability with age to handle exogenous blood pressure-affecting factors such as salt intake, water content, hormonal changes, extra-cellular volume, agerelated changes in the production of catecholamine, serum proteins may also be of significant.

And also conflicting, that increased nor-epinephrine levels are balanced by a decrease in receptor sensitivity. Plasma renin activity and rennin concentrations have been lowered by increasing age.

5.5 EDUCATIOINAL STATUS

Educational status in group I

The results of educational status of group I women are shown in Table 14 and Figure 12.

Out of 293 pregnant hypertensive women, 67 were found to be with primary level of education (22.87%), followed by 66 were in higher secondary level (22.53%), 63 were in intermediate level (21.50%), 55 were in degree level (18.77%) and 42 were found to be illiterate (14.33%).

Majority of women are in primary level of education.

Table 14 - Educational status in group I

Category	No. of patients	Percentage (%)
Illiterate	42	14.33
Primary	67	22.87
Intermediate	63	21.50
Higher secondary	66	22.53
Degree	55	18.77

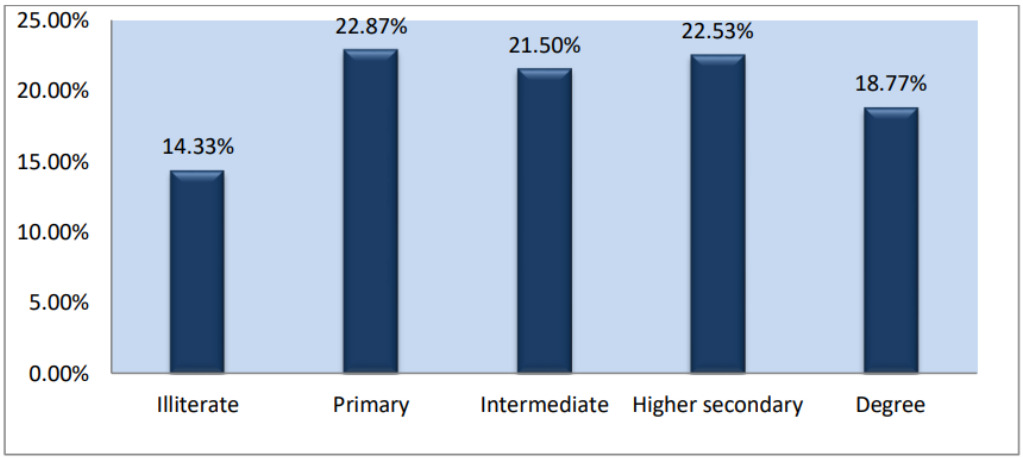

Figure 10 – Percentage distribution of educational status in group I

Educational status in group II

The results of educational status of group II women are shown in Table 15 and Figure 13

Out of 299 post menopausal hypertensive women, 84 were in intermediate level (28.09%), followed by 69 were in degree level (23.01%), 54 were in higher secondary level (18.06%), 53 were in primary level (17.73%) and 39 were found to be illiterate (13.04%).

Majority of women are in intermediate level of education.

Table 15 - Educational status in group II

Category	No. of patients	Percentage (%)
Illiterate	39	13.04
Primary	53	17.73
Intermediate	84	28.09
Higher secondary	54	18.06
Degree	69	23.08

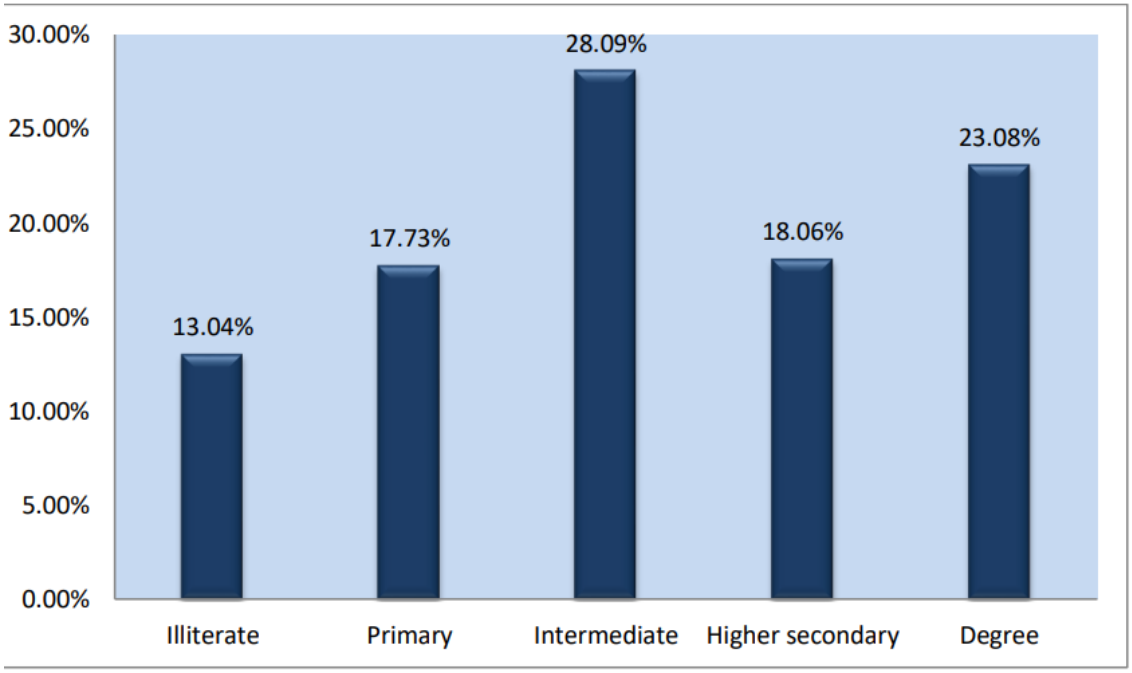

Figure 11 - Percentage distribution of educational status in group II

Educational status in group III

The results of educational status of group III women are shown in Table 16 and Figure 14.

Out 295 general hypertensive women, 87 were found to be gained primary level of education (29.49%), followed by 57 were in degree level (19.32%), 51 were illiterate (17.21%) and 49 were found to be in intermediate level of education (16.61%).

Majority of women are in primary level of education.

Table 16 - Educational status in group III

Category	No. of patients	Percentage (%)
Illiterate	51	17.29
Primary	87	29.49
Intermediate	49	16.61
Higher secondary	51	17.29
Degree	57	19.32

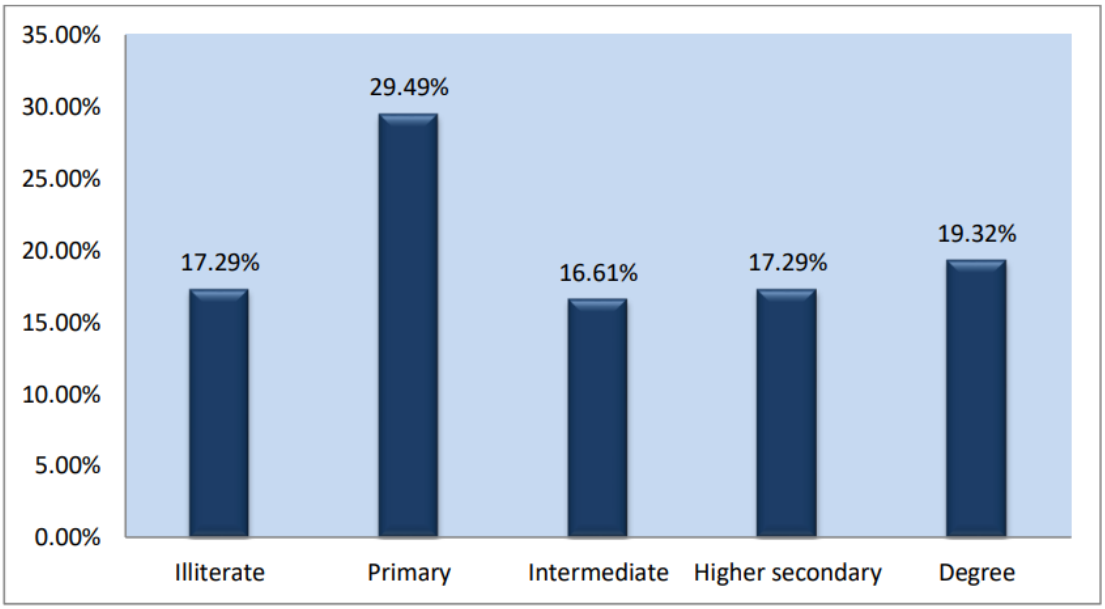

Figure 12 - Percentage distribution of educational status in group III

A systematic review on hypertension management suggests that educational interventions should cover topics recommended by the JNC guidelines, in addition to task sharing, facilitated by a clinical pharmacist28 .

The literacy rates of the hypertensive women were low and many had only primary level of education and illiterate associated with unfavorable health behaviors.

This lack of education in the patients leads to poor understanding of the disease condition and its management of complications.

Education and economic status of women play an important role in helping the women to maintain their health during the different stages of life and association between hormonal changes which are influenced by social and cultural factors.

5.6 EMPLOYMENT STATUS

Employment status in group I

The results of employment status of group I women are shown in Table 17 and Figure 15 Out of 293 enrolled participants, 166 (56.66%) were found to be employed and 127 (43.34%) were found to be unemployed. Most of the participants were employed.

Table 17 - Employment status in group I

Category	No. of patients	Percentage (%)
Employed	166	56.66
Unemployed	127	43.34

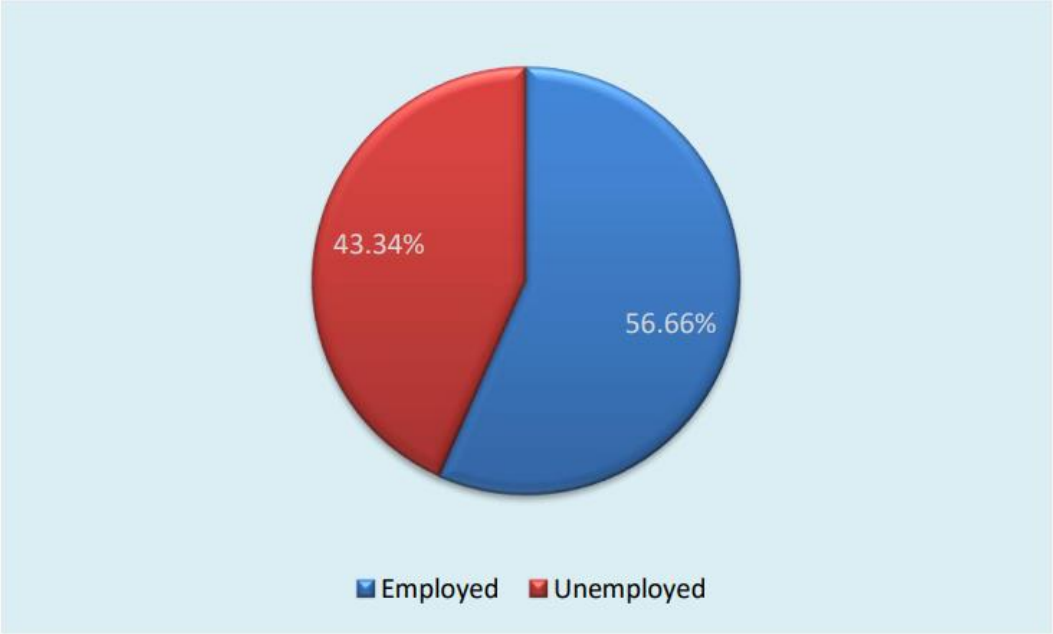

Figure 13: Percentage distribution of employment status in group I

Employment status in group II

The results of employment status of group II women are shown in Table 18 and Figure 16. Out of 299 enrolled participants, 171(58.36%) were found to be employed and 128(43.69%) were found to be unemployed. Most of the participants were unemployed.

Table 18 - Employment status in group II

Category	No. of patients	Percentage (%)
Employed	128	43.69
Unemployed	171	58.36

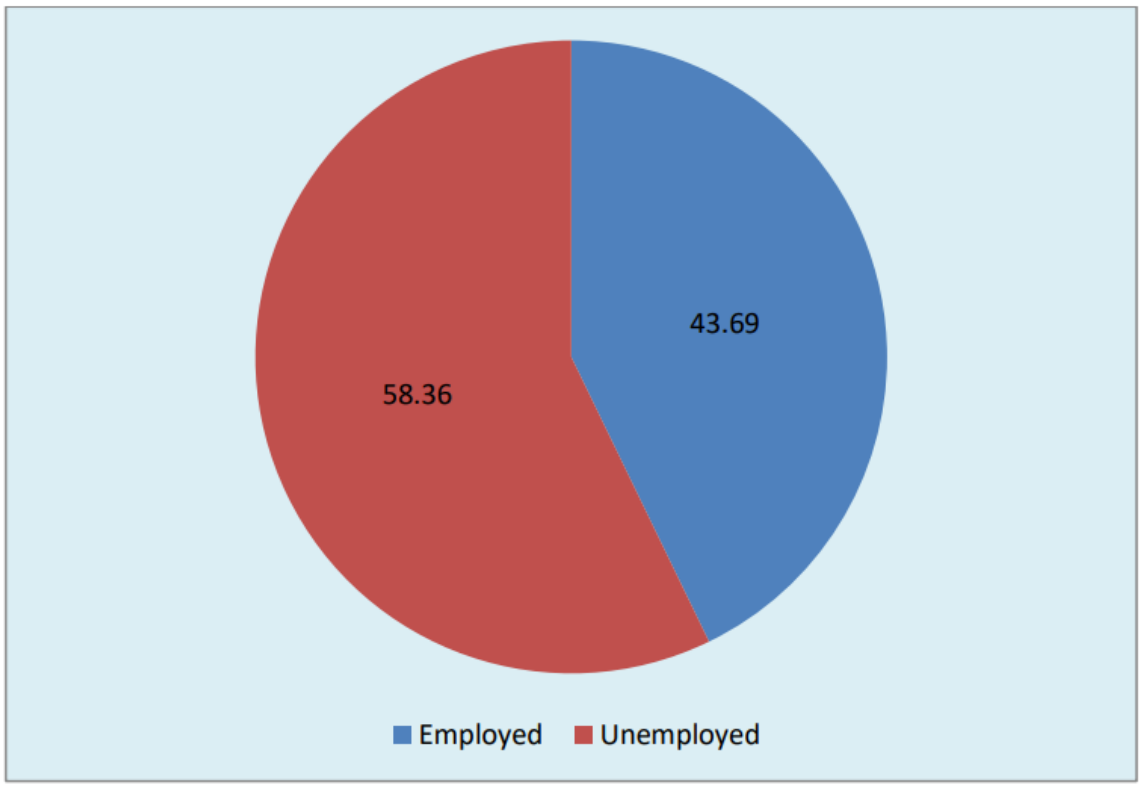

Figure 14 - Percentage distribution of employment status in group II

Employment status in group III

The results of employment status of group III women are shown in Table 19 and Figure 17. Out of 295 enrolled participants, 154(52.56%) were found to be unemployed and 141(47.80%) were found to be employed. Most of the participants were unemployed.

Table 19 - Employment status in group III

Category	No. of patients	Percentage (%)
Employed	141	47.80
Unemployed	154	52.56

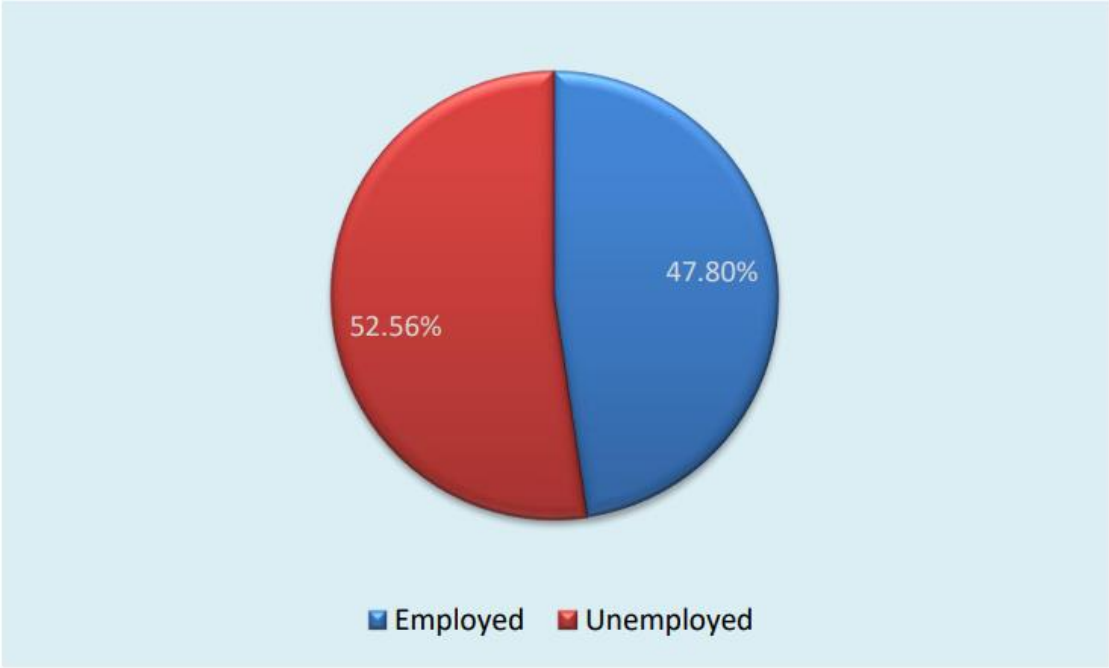

Figure 15 - Percentage distribution of employment status in group III

No significant association was found between hypertension and monthly per capita income but significant differences were found in different occupation classes.

These are consistent with the findings in study conducted by Renu et al., which revealed that the patient populations were employed and it mostly linked to high profile jobs, involving mental stress & competition that were risk factor for high blood pressure.

5.7 BMI CATEGORY

BMI categorization of group I

The results of BMI are shown in Table 20 and Figure 18.

Out of 293 pregnant hypertensive women, 53 (18.09%) were in obese class 2, 49 (16.72%) were in over weight class 2, 46 (15.70%) were in over weight class 1, 37 (12.63%) were in obese class 1, 34 (11.60%) were found to be in under-weight and 28 (9.56%) were found to be healthy.

Most of them are under obese class 2 category. Table 20 - BMI categorization of group I

Table 20 - BMI categorization of group I

Category	Range	No. of patients	Percentage (%)
Underweight	18.5	34	11.60
Healthy	18.6-24.9	28	9.56
Overweight 1	25.26.9	46	15.70
Overweight 2	27-29.9	49	16.72
Obese class 1	30-34.9	37	12.63
Obese class 2	35-39.9	53	18.09
Obese class 3	Above 40	46	15.70

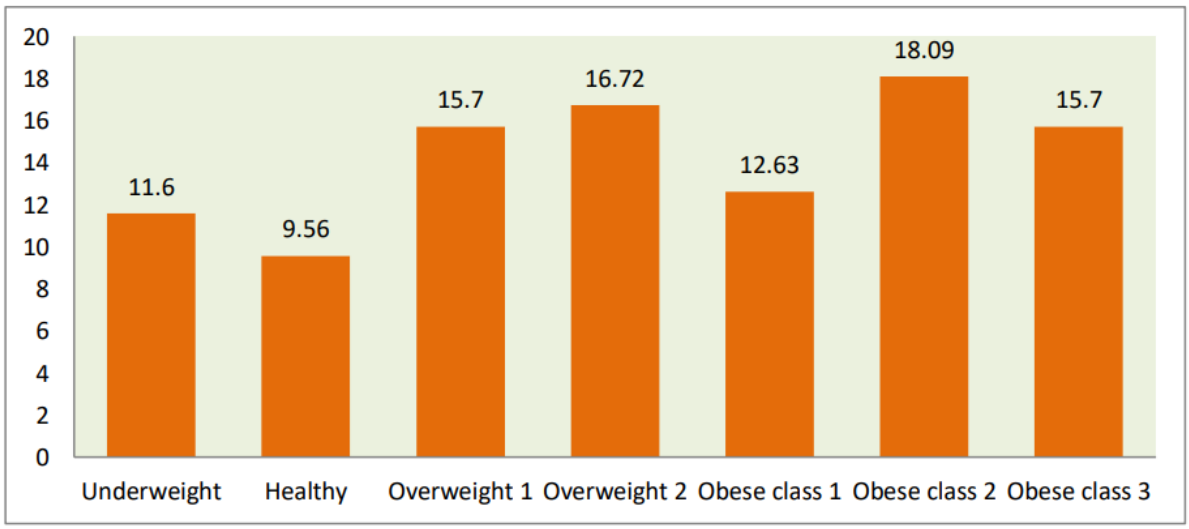

Figure 16 – Percentage distribution of BMI categorization of group I

BMI categorization of group II

The results of BMI are shown in Table 21 and Figure 19. Out of 299 post menopausal hypertensive women, 89 (29.77%) were in obese class 1, 69 (23.08%) were in over weight class 1, 32 (10.70%) were found to be healthy, 29 (9.70%) were found to be underweight, 28 (9.36%) were in over weight class 2 and 26 (8.70%) were in obese class 2.

Most of them are under obese class 1 category.

Table 21 - BMI categorization of group II

Category	Range	No. of patients	Percentage (%)
Underweight	18.5	29	9.70
Healthy	18.6-24.9	32	10.70
Overweight 1	25.26.9	69	23.08
Overweight 2	27-29.9	28	9.36
Obese class 1	30-34.9	89	29.77
Obese class 2	35-39.9	26	8.70
Obese class 3	Above 40	26	8.70

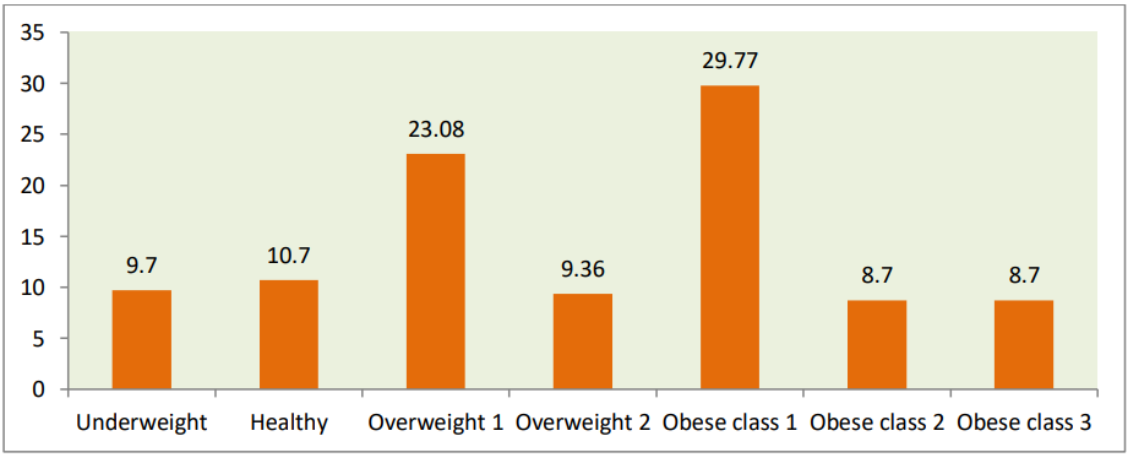

Figure 17 - Percentage distribution of BMI categorization of group II

BMI categorization of group III

The results of BMI are shown in Table 22 and Figure 20. Out of 295 general hypertensive women, 61 (20.68%) were in obese class 1, 52 (17.63%) were in obese class 2, 49 (16.61%) were in over weight class 2, 46 (15.59%) were in over weight class 1, 39 (13.22%) were in obese class 3, 37 (12.54%) were found to be healthy and 11 (3.73%) were found to be underweight. Most of them are under obese class 1 category.

Table 22 - BMI categorization of group III

Category	Range	No. of patients	Percentage (%)
Underweight	18.5	11	3.73
Healthy	18.6-24.9	37	12.54
Overweight 1	25.26.9	46	15.59
Overweight 2	27-29.9	49	16.61
Obese class 1	30-34.9	61	20.68
Obese class 2	35-39.9	52	17.63
Obese class 3	Above 40	39	13.22

Figure 18 - Percentage distribution of BMI categorization of group III

In group I, II, III women was found to be higher in the category of obese

I.

Obesity was a major cause for metabolic syndromes which leads to the development of hypertension and diabetes. Hypertension has a tendency to develop severe complications including diabetic retinopathy, cardiovascular disorders and kidney disease.

Age at onset of hypertension in women was significantly decreased in overweight and increasingly obese categories of patients with hypertension.

Sex-specific differences were seen in clinical characteristics of hypertension onset and in the regulation of blood pressure. In general, blood pressure was higher in men than in women of similar ages; blood pressure in women increased to levels even higher than in men.

The mechanisms responsible for the increase in blood pressure are multi-factorial and include loss of oestrogen, oxidative stress and endothelial dysfunction, modification in renin-angiotensin system spill over and sympathetic activation

5.8 CLASSIFICATION OF GRAVIDA IN GROUP I

Majority of women were found to be multi-gravida stage. Out of 293, 192 (65.53%) were found to be multi-gravida, followed by 101 (34.47%) were found to be primi-gravida. The results were revealed in Table 23 and Figure 21

Table 23 – Classification of gravida

Gravida	No. of Patients	Percentage (%)
Primigravida	101	34.47%
Multigravida	192	65.53%

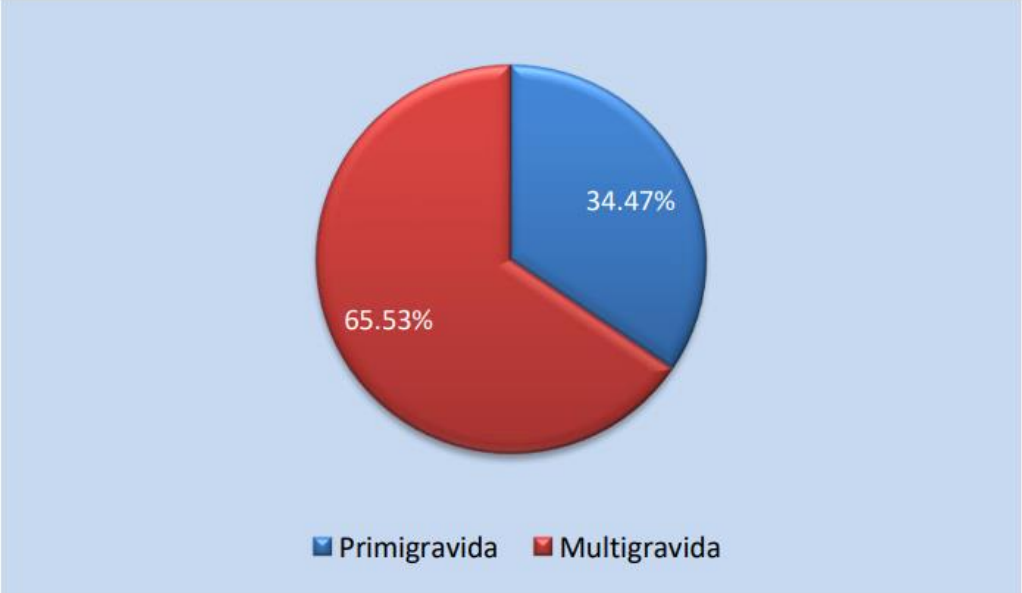

Figure 19 – Percentage distribution of gravida

Pregnant women in primi-gravida and women who had PIH in their previous pregnancy are more likely to develop PIH during their later pregnancies. Increase in age for multi-gravida acts as a key factor to increase PIH.

5.9 MEASUREMENT OF PREGNANCY OUTCOMES IN GROUP I

In the present study, intrauterine growth retardation were seen in pregnancy induced hypertensive women 194 (66.21%), followed by preterm labour 99 (33.79%) and no perinatal death or maternal death were seen. The results were revealed in Table 24 and Figure 22.

Table 24 – Pregnancy outcome

Outcomes	No. of Patients	Percentage (%)
Preterm labour	99	33.79
Intrauterine growth retardation	194	66.21

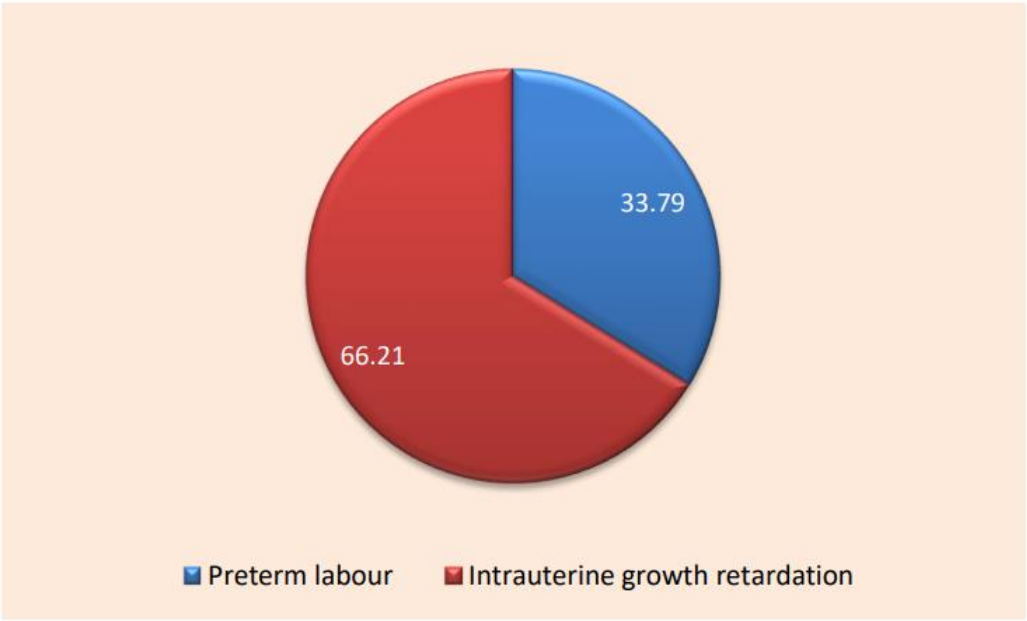

Figure 20 – Measurement of pregnancy outcome

From our study, it was seen that pregnancies complicated by pre-eclampsia are at increased risk of developing perinatal mortality, intrauterine growth retardation (IUGR) and preterm labour and it was more common in women with PIH136 . The impact of pregnancy-induced hypertension on fetal growth in preeclampsia and severe pre-eclampsia increased the risk of intrauterine growth 33.79 66.21 Preterm labour Intrauterine growth retardation 101 restriction and low birth weight14. The abnormal placental implantation and reduced trophoblast invasion link pre-eclamsia with IUGR as pregnancy disorder.

5.10 TYPE OF DELIVERY IN GROUP I

Most of the women have undergone cesarean section. Out of 293 patients, 92 cases had normal delivery (31.40%), followed by 201 had cesarean section (68.60%).

The results were revealed in Table 25 and Figure 23.

Table 25 – Type of delivery

Type of delivery	No. of patients	Percentage (%)
Normal	92	31.40%
Cesarean section	201	68.60%

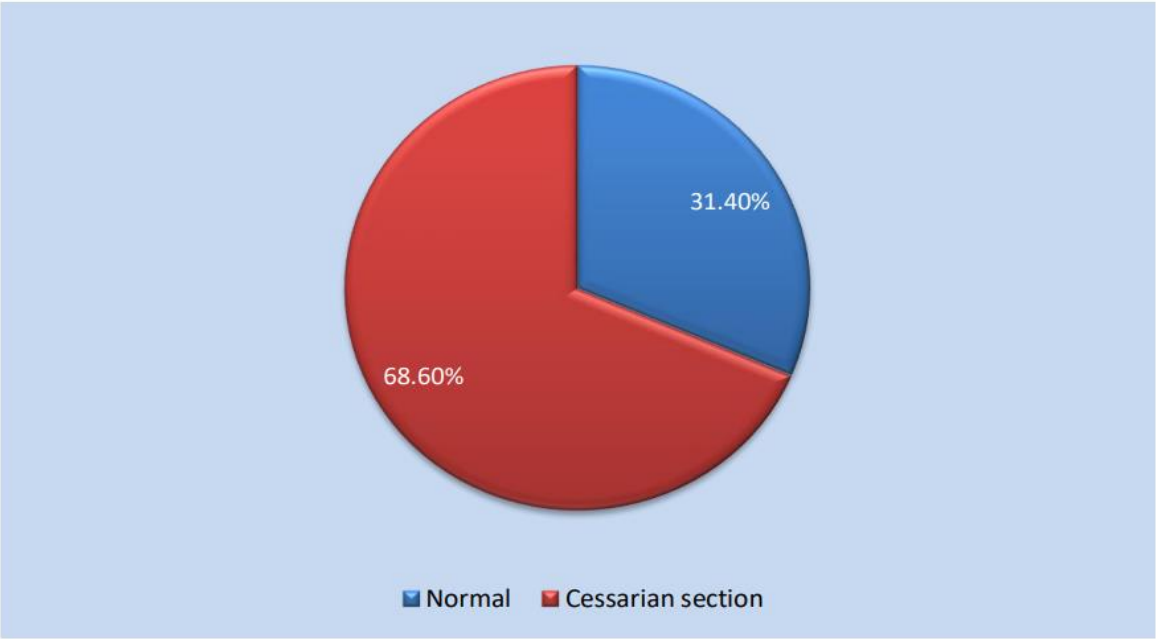

Figure 21 – Percentage distribution of type of delivery

Pregnancy outcome for patients in Group I showed 68% with cesarean type of delivery.

Willy Visser et al., reported that expectant management with plasma 31.40% 68.60% Normal Cessarian section 102 volume expansion and pharmacologic vasodilatation under central hemodynamic monitoring of the maternal circulation may delay delivery 52.

AGE AT MENARCHE IN GROUP II

In our study, out of 299 cases, 126 cases of age from >14 (42.14%),followed by 112 cases of age from 12-14 (37.46%) and 61 cases of age from <12(20.40%)The results were revealed in Table 26 and Figure 24.

Table 26 - Age at menarche

Age in years	No. of patients	Percentage (%)
<12 years	61	20.40
12-14 years	112	37.46
>14 years	126	42.14

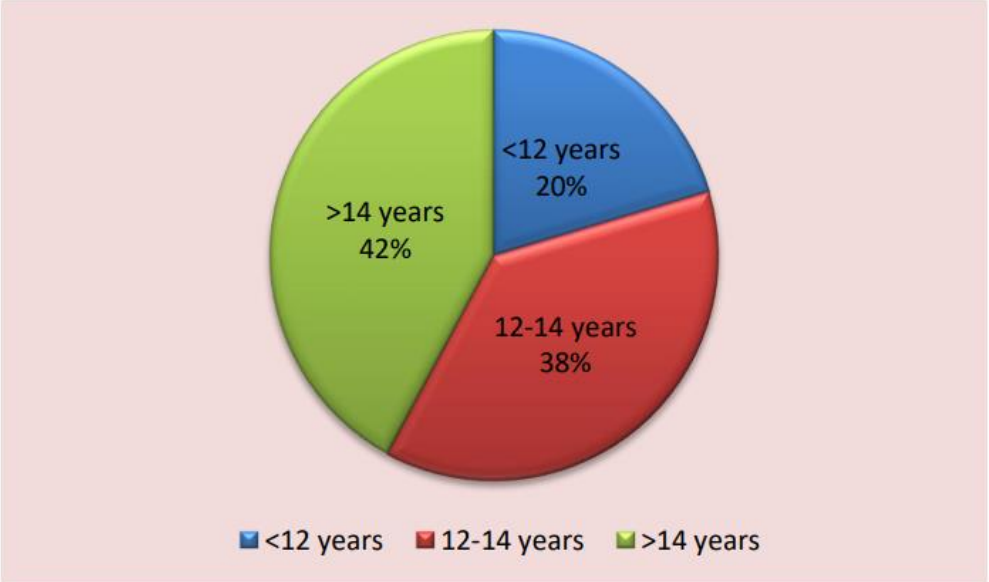

Figure 22 – Percentage distribution of age at menarche

Menarche is one of the most significant milestones in a women's life, occurring between 10-16 years of age in most girls. In our study the mean age of 14 years 42% 14 years 103 menarche was found to be >14 years, which was almost similar in urban and rural areas of the district studied by Sharma et al

CHAPTER 6

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6.1 REFERNCES

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