ejpmr, 2017,4(9), 361-379

SJIF Impact Factor 4.161

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

APPRAISEMENT OF PREPONDERANCE AND RISK FACTORS OF GESTATIONAL HYPERTENSION IN A TERTIARY CARE REFERRAL HOSPITAL

Archana Vijai* and Dr. Dileep C.

India.

***Corresponding Author: Archana Vijai**

India.

Article Received on 04/07/2017 **Article Revised on 24/07/2017** **Article Accepted on 15/08/2017**

ABSTRACT

Gestational hypertension and preeclampsia are hypertensive disorders during pregnancy (HDP).Gestational hypertension is a condition of onset of hypertension without proteinuria after 20 weeks of gestation whereas preeclampsia is refers to the onset of hypertension and proteinuria after 20 weeks of gestation. The aim of prospective Observational study is to appraise the preponderance and risk factors of gestational hypertension in a tertiary care referral hospital. The study was carried out at the in-patient and out -patient setting of a private tertiary level hospital at the Malabar region of Kerala. The study was carried out for a period of 12 months. Based on inclusion criteria a total of 150 eligible consenting antenatal mothers were enrolled and participated in the study. All the study subjects were screened for GHTN, 35 subjects were categorized into GHTN group and 115 to non GHTN group. The prevalence of GHTN is about 23%. A number of risk factors for GHTN were identified, including age> 35 yrs, overweight, history of hypertension as well as family history of hypertension and diabetes. The prevalence of preterm birth, IUGR, NICU admission was significantly higher in women in GHTN than those with non GHTN. The percentage of cesarean delivery is higher in GHTN women than that of non GHTN women and the percentage of low birth weight of infants is higher in GHTN patients when compared to non GHTN patients. Nifedipine is commonly used in the management of GHTN. The possible risk factors confirmed in the study may be useful for the development of early diagnosis and appropriate treatment of GHTN.

KEYWORDS: Gestational Hypertension, Intra Uterine Growth Retardation, Hypertensive disorders during pregnancy, Elevated liver enzymes low platelet count syndrome.

INTRODUCTION

Background

Gestational hypertension and preeclampsia are hypertensive disorders during pregnancy (HDP). Gestational hypertension is a condition of onset of hypertension without proteinuria after 20 weeks of gestation whereas preeclampsia is refers to the onset of hypertension and proteinuria after 20 weeks of gestation. Gestational hypertension occurs in approximately 6%of pregnancies and evolves into preeclampsia in 10% to 20% of cases.[1] HDP are group of medical complications in pregnancy and it is a major cause of maternal and neonatal mortality and morbidity.

HDP can also trigger severe forms of maternal complications, such as cardiovascular and cerebrovascular disease, liver and kidney failure, placental abruption, disseminated intravascular coagulation (DIC) and Haemolysis, Elevated liver enzymes, low platelet count (HELLP) syndrome. Under these circumstances, the placenta dysfunction may occur leading to fetal growth restriction, fetal distress, preterm birth, intra uterine fetal demise, still birth, and neonatal asphyxia.[2] Pregnancy induced hypertension (PIH) is the second most common medical disorder during pregnancy. WHO estimates that at least one woman dies every 7 minutes from complications of hypertensive disorders of pregnancy. Most death in PIH occurs due to its complications and not due to hypertension itself.

The death related to hypertensive disorder can be avoided by providing timely and effective care to woman presenting with such complications. Thus, optimization of health care for woman during pregnancy to prevent and treat pregnancy induced hypertension is a necessary step towards achievement of the millennium development goals. Management of women with hypertension aims at minimizing further pregnancy related complications, avoiding unnecessary prematurity and maximizing maternal and infant survival.[3] The primary objective of treating PIH is to improve the quality of care and outcomes for pregnant women having hypertension.

Hypertension

Hypertension (HNT/HT) or high blood pressure, called arterial hypertension, is a chronic medical condition in which the blood pressure in the arteries is increased.

Blood pressure is determined by two measurements, systolic and diastolic which depend on whether the heart muscle is contracting (systole) and relaxed between beats (diastole). Normal blood pressure of a person at rest is within the range of 100–140 mmHg systolic and 60–90 mmHg diastolic.[4] High blood pressure is refers if it is often at or above 140/90 mm Hg. Hypertension may cause hypertensive heart disease, coronary heart disease, stroke, aortic aneurism, peripheral artery disease and chronic kidney disease. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of health complications, although drug treatment is still often necessary in people for whom lifestyle changes are not enough or not effective.

Classification of hypertension

Hypertension is classified into 3 categories. They are

- Primary hypertension
- Secondary hypertension
- Pregnancy induced hypertension

Primary hypertension

Primary (essential) hypertension is the most common form of hypertension, accounting for 90–95% of all cases of hypertension. Numerous common genetic variants with small effects on blood pressure have been identified as well as some rare genetic variants with large effects on blood pressure but the genetic basis of hypertension is still poorly understood. Several environmental factors also influence on blood pressure. Lifestyle factors that lower blood pressure include reduced dietary salt intake, increased consumption of fruit and low fat products, exercise, weight loss and reduced alcohol intake. Stress play a minor role on blood pressure and the specific relaxation techniques is not supported by the evidence.[4] The possible role of other factors such as caffeine consumption and vitamin D deficencies are well unknown. Insulin resistance, which is common in obesity and is a component of syndrome X (the metabolic syndrome), is also thought to contribute to hypertension.

Secondary hypertension

5–10% cases categorized as secondary hypertension and has an identifiable cause**.** Renal disease is the most common secondary cause of hypertension. Hypertension can also be caused by endocrine conditions such as, Cushing's syndromes, hyperthyroidism, hypothyroidism, acromegaly, Conn's syndrome or hyperaldosteronism, hyperparathyroidism and pheochromacytoma. Other causes of secondary hypertension include obesity, sleep apnea, coarctation of the aorta, excess liquorice consumption and certain prescription medicines, herbal remedies and illegal drugs.

The following diseases cause hypertension and have characteristic symptoms and signs:

- Cushing's syndrome- truncal obesity, glucose intolerance, moon face, a hump of fat behind the neck/shoulder, and purple abdominal stretch marks.
- Hyperthyroidism- weight loss with increased appetite, resting tachycardia, bulging eyes, tremor
- Renal artery stenosis- localized bruit in the mid abdomen to the left or right of the midline
- Coarctation of the aorta- decreased blood pressure in the lower extremities and/or delayed or absent femoral arterial pulses.
- Pheochromacytoma -intermittent hypertension accompanied by headache, palpitations, pallor and perspiration.

Pregnancy induced hypertension

Hypertension in pregnancy can be diagnosed on the basis of absolute blood pressure, mean blood pressure or an elevation in blood pressure during the second trimester from a baseline reading in the first trimester .Hypertension in pregnancy is defined as a diastolic blood pressure of 90 mm Hg or more, regardless of the degree of rise insystolic or diastolic blood pressure between visit. A systolic blood pressure >140 mm Hg,although not necessarily defining hypertension in pregnancy, provide close monitoring of the patient and fetus.[3]

The diagnosis is changed to:

- Gestational hypertension, no protenuria
- Preeclampsia, if proteinuria or signs of end-organ dysfunction develop
- Chronic hypertension, if blood pressure elevation persists ≥12 weeks postpartum
- Transient hypertension of pregnancy, if blood pressure returns to normal by 12 weeks postpartum

a) Gestational hypertension

Gestational hypertension is a condition in which systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg in a previously normotensive pregnant woman who is ≥20 weeks of gestation and has no proteinuria or new signs of end-organ dysfunction. The blood pressure readings should be documented on at least two occasions at least four hours apart. It is considered severe when sustained elevations in systolic blood pressure ≥160 mmHg and/or diastolic blood pressure ≥110 mmHg are present for at least four hours. Gestational hypertension is a temporary diagnosis for hypertensive pregnant women who do not meet criteria for preeclampsia or chronic hypertension (hypertension first detected before the 20th week of pregnancy).

b) Pre-eclampsia

Preeclampsia is diagnosed as hypertension with significant proteinuria, specifically gestational hypertension with new onset proteinuria, or chronic (preexisting) hypertension with new or worsening proteinuria. When preeclampsia develops in women with chronic (preexisting) hypertension, the classification of disease is chronic (preexisting) hypertension plus superimposed preeclampsia. Edema is not considered as specific diagnostic criterion for preeclampsia. Pregnant women with hypertension with other adverse conditions

but no proteinuria should have further evaluation for preeclampsia.

c) Chronic hypertension

Chronic (preexisting) hypertension is determined as hypertension (systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg or both) that is present before 20 weeks of gestation or prior to pregnancy. Elevated readings should be documented on more than one occasion during the antenatal care visit.

Epidemiology of hypertension

Global

As per the World Health Statistics 2012, of the estimated 57million global deaths in 2008, 36 million (63%) were due to non-communicable diseases (NCDs). The largest proportion of NCD deaths is caused by cardiovascular diseases (48%). In terms of attributable deaths, raised blood pressure is one of the leading behavioral and physiological risk factor to which 13% of globaldeaths are attributed. Hypertension is reported to be the fourth contributor to premature death in developed countries and the seventh in developing countries.[5]

Recent reports indicate that nearly 1 billion adults (more than a quarter of the world's population) had hypertension in 2000 and this is predicted to increase to 1.56 billion by 2025. Earlier reports also suggest that the prevalence of hypertension is rapidly increasing in developing countries and is one of the leading causes of death and disability. While mean blood pressure has decreased in nearly all high-income countries, it has been stable or increasing in most African countries. Today, mean blood pressure remains very high in many African and some European countries. The prevalence of raised blood pressure in2008 was highest in the WHO African Region at 36.8%.

The Global Burden of Diseases; Chronic Disease Risk Factors Collaborating Group has reported 35-year (1980-2005) trends in mean levels of body mass index (BMI), systolic BP and cholesterolin 199 high-income, middle-income and low-income countries. Mean systolic BP declined in high and middle-income countries but increased in low-income countries and is now more than inhigh-income countries. The India specific data are similar to the overall trends in low-income countries.

National

The prevalence of hypertension in the late nineties and early twentieth century varied among different studies in India, ranging from 2-15% in Urban India and 2-8% in Rural India. Review of epidemiological studies suggests that theprevalence of hypertension has increased in both urban and rural subjects and presently is 25% in urban adults and 10-15%among rural adults.

In a meta-analysis of multiple cardiovascular epidemiologicalstudies, it was reported that prevalence rates of coronary artery disease and stroke have more than trebled in the Indian population. In the INTERHEART and INTERSTROKE study, hypertension accounted for 17.9% and 34.6% of populationattributable risk of various cardiovascular risk factors for coronary artery disease and stroke respectively.

The prevalence of hypertension in the last six decades has increased from 2% to 25% among urban residents and from 2% to 15% among the rural residents in India. According to Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, the overall prevalence of hypertension in India by 2020 will be 159.46/1000 population. The prevalence of high normal blood pressure (also called prehypertension in JNC-VII) has been seen in many recent studies and was found to be around 32% in a recent urban study from Central India. In some studies from South India (Chennai) and from Delhi prevalence of high normal blood pressure has been even higher up to 36% and 44% respectively in these regions. The prevalence of hypertension increases with age in all populations. In a recent urban study it increased from 13.7% in the 3rd decade to 64% in the 6th decade.

In last 2 decades the prevalence of hypertension has been seen to be static in some urban areas. The prevalence of smoking has declined while that of diabetes, metabolic syndrome,

Hyper cholesterolemia and obesity has been increasing. Hypertension awareness, treatment and control status is low, with only half of the urban and a quarter of the rural hypertensive individuals being aware of its presence. It has been seen that only one in five persons is on treatment and less than 5% are controlled. Rural location is an important determinant of poor hypertension awareness, treatment and control. It has been said that in India the rule- of-halves is not valid and only a quarter to a third of subjects are aware of hypertension.

Table 1: Recent studies (2000 – 2012) on prevalence of hypertension in urban and rural Indian population.[5]

First author	Year	Place	Age (yr)	Sample Size	Prevalence (%)
Urban Population					
Anand MP	2000	Mumbai	30-60	1662	34.0
Gupta PC	2004	Mumbai	≥ 35	88653	47.9
Prabhakaran D	2005	Delhi	20-59	2935	30.0
Reddy KS	2006	National	20-69	19973	27.2
Mohan V	2007	Chennai	≥ 20	2350	20.0
Kaur P	2007	Chennai	18-69	2262	27.2
Yadav S	2008	Lucknow	≥ 30	1746	32.2
Rural Populations					
Hazarika	2004	Assam	>30	3180	33.3
Thankappan	2006	Kerala	>30	2159	36
Krishnan A	2008	Harayana	15-64	2828	9.3
Todkar SS	2009	Maharashtra	≥ 20	1297	7.2
Vijaykumar G	2009	Kerala	≥18	1990	36.1
Bhardwaj R	2010	Himachal	≥ 18	1092	35.9
Kinra S	2010	National	20-69	1983	20.0

Epidemiology of pre-eclampsia

Assessing the epidemiology of pre-eclampsia is difficult due to lack of conformity of the definitions. The incidence of pre-eclampsia for developing countries was estimated to be 3.4%. The incidence of pre-eclampsia was estimated to be 2.8% from the Norwegian Birth Registry for the period 1967-1998. The South East Thames Study estimated that pre-eclampsia incidence to be 0.4% for the period 1997-1998.[6]

The 0.4% incidence rate estimate from the South East Thames Study was used as the estimate of pre-eclampsia incidence for all WHO .A sub-regions Incidence for eclampsia from the systematic review was 2.3% of pre-eclampsia cases for developingregions and 0.8% of pre-eclampsia cases for developed regions.

Atieology

There are various etiological factors for pregnancy induced hypertension. This is a disorder of hypothesis and affliction to involve all organs in the body. The potential causes of pregnancy induced hypertension are,

1.6.1. Abnormal placentation
1.6.2. Vasculopathy and inflammatory changes
1.6.3. Immunological factors
1.6.4. Genetic factors
1.6.5. Nutritional factors

Abnormal placentation

In normal pregnancy, the spiral arterioles of the placental bed undergo a series of physiological changes. They are invaded by endovascular trophoblast, which breaks down the endothelium, internal elastic lamina and muscular coat of the vessel, replaced by fibrinoid material. These changes occurs in two waves, the invasion of decidual segments of spiral arterioles in the first trimester and myometrial segments, by a subsequent wave in the second trimester. These physiological changes convert the vessels supplying the placenta from muscular end arteries to wide mouth sinusoids, which are unresponsive to vasoactive substances. The vascular supply isthus transformed into low pressure high flow system to meet the needs of the foetus and placenta.[7,8,9]

In pregnancy induced hypertension there is inadequate maternal vascular response to placentation, the above changes are restricted to the decidual segments of the uteroplacental arteries, the primary invasion of trophoblast is partially impaired, and second wave of trophoblastic invasion fails to occur. Hence the myometrial segments of spiral arterioles are left with their musculoelastic architecture, there by responsive to hormonal substances. This restriction of normal physiological changes,result in restricted placental flow, which becomes more critical with advancing gestation.

Intra myometrial segments of spiral arterioles show changes like endothelial damage, insudation of plasma constituents into vessel wall, proliferation of lipid laden myointimal cells and medial necrosis termed acute atherosis. The vessels affected by atherosis develop aneurysmal dilatation. Obstruction of lumen by atherosis may impair placental blood flow. These changes pathologically diminish the placental blood flow and lead to infarcts, patchy necrosis and intracellular damage tothe synctiotrophoblast and obliterative endarteritis of

foetal stem arteries. It has been suggested that there is incomplete development of foetal macrovascular in pregnancy induced hypertension associated with foetal growth restriction.

Vasculopathy and inflammatory changes

In response to ischemic changes, various noxious substances are released from the placenta and decidua, these serve as mediators to provoke endothelial injury. Cytokines such as tumour necrosis factor-alpha (TNF-alpha) and interleukins contribute to the oxidative stress characterized by reactive oxygen species (ROS) and free radicals that lead to formation of lipid peroxides. These in turn generate highly toxic radicals that injure the endothelial cells, modify their nitric oxide production and interfere with prostaglandin balance. Oxidative stress also causes production of lipid laden macrophages foam cells seen in atherosis, activation of micro vascular coagulation seen in thrombocytopenia and increased capillary permeability seen in oedema and proteinuria.

Immunological factors

Immunological factors may play an important role in the development of pregnancy induced hypertension. This phenomenon in pregnancy induced hypertension include absence of blocking antibodies, decreased cell mediated immune responses, activation of neutrophils and involvement of cytokines. An aberrant immune reaction between fetal trophoblast with maternal tissue in the placental bed is a fundamental factor in the aetiology of pregnancy induced hypertension, supported by the findings that this syndrome most often complicates first pregnancy. Incidence is also increased by change of partner and in a subsequent pregnancy after birth control methods that prevent sperm exposure. Women who develop pregnancy induced hypertension have decreased proportion of helper T cells (Th 1) in early second trimester, compared with those who remain normotensive. The Th 1/Th 2 imbalance may be mediated by adenosine, found in higher concentration in pregnancy induced hypertension women. The helper lymphocytes secrete cytokines that promote implantation and their dysfunction leads to pregnancy induced hypertension.

Genetic factors

Familial predisposition for pregnancy induced hypertension has been recognized, single gene model and polygenic inheritance has been suggested. A number of single gene mutation and inherited thrombophilia's may predispose to pregnancy induced hypertension. Polymorphisms of the genes for TNF, lymphotoxin-alpha and interleukin-1 have been studied with varying results.

Nutritional factors

There is a relationship between dietary deficiencies andincidence of pregnancy induced hypertension. A diet high in fruits and vegetables thathave antioxidant activity is associated with decrease in the incidence of pregnancyinduced hypertension. Antioxidants enzymes and antioxidant nutrients, includingcarotenoids, alpha-tocopherol and thiols are the primary defence against oxidativestress and free radical induced damage. Antioxidants protect the endothelial cellmembrane against free radical damage by their quenching abilities. When protectivemechanisms are compromised, the products of lipid peroxidation increase with decrease in antioxidant carotenoids. This imbalance leads to oxidative stress andtissue injury. Protective antioxidant systems are deficient inpregnancy induced hypertension as low placental tissue and maternal serum carotenoid level such as β carotenes; lycopene and canthaxanthin have been observed in pregnancy induced hypertension. Vitamin C and Vitamin E supplementation between 16 to 22 weeks gestation decreases the incidence of pregnancy induced hypertension by more than 50%.

Pathophysiology of Gestational hypertension

Pathogenesis

Pregnancy induced hypertension is characterized by vasospasm, endothelial cell damage resulting in activation of coagulation system.[8]

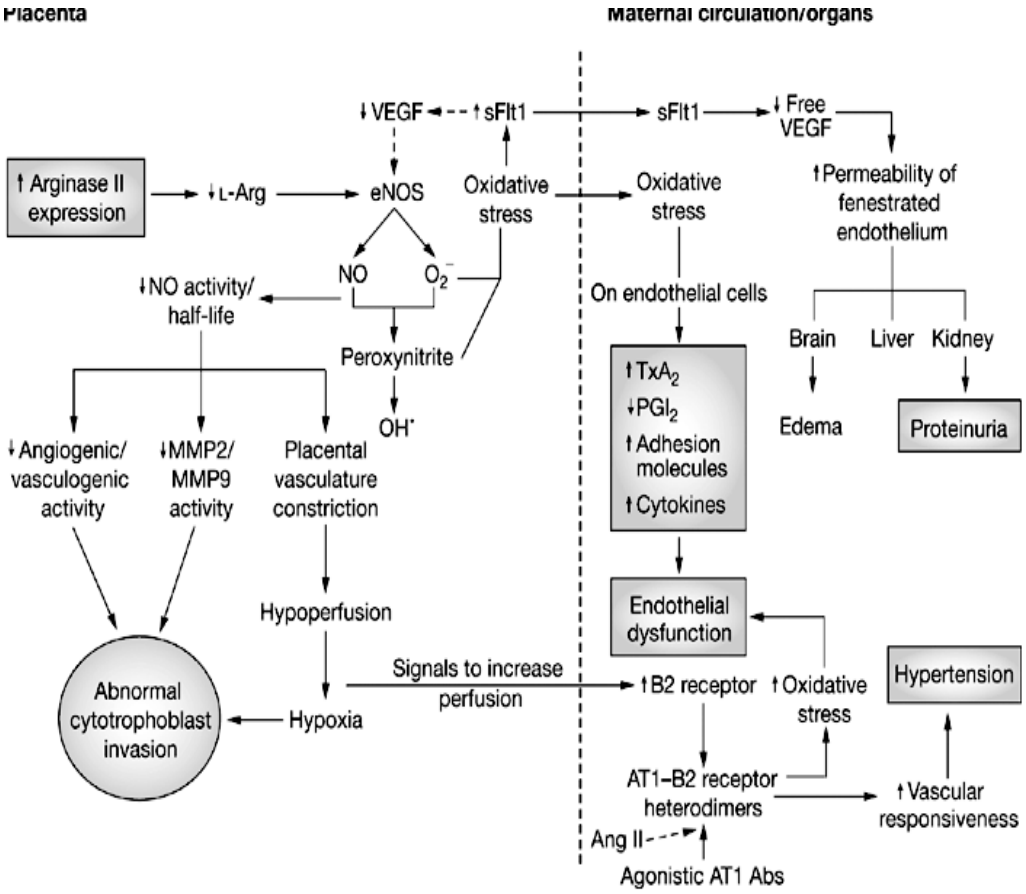

Figure 1: Pathogenesis of pregnancy induced hypertension.

Vasospasm

A reduction in the synthesis of vasodilator nitric oxide (NO) and an increased production of endothelin by the vascular endothelium in pregnancy induced hypertension could account not only for characteristic vasospasm but also for activation of circulating platelets. Vasoconstriction causes resistance and subsequent hypertension. Associated endothelial damage causes interstitial leakage through which blood constituents, including platelets and fibrinogen are deposited sub endothelially with diminished blood flow because of mal distribution; ischemia of surrounding tissues would lead to necrosis, haemorrhage and other end organ disturbances characteristic of the syndrome.[7,8]

Endothelial cell activation

Various noxious placental factors released by ischemic changes and toxic radicals generated by oxidative stress cause activation and dysfunction of vascular endothelium. Intact endothelium decreases responsiveness of vascular smooth muscles to agonists by release of nitric oxide and it also has anticoagulant properties. Damage or activated endothelium secretes substances that promote coagulation and increased sensitivity to vasopressors. Increased circulating fibronectin, factor VIII antigen and thrombomodulin, all markers of endothelial dysfunction are reported in pregnancy induced hypertension/preeclampsia.

A) Enhanced pressor responses

Normal pregnant women are refractory to infused vasopressors like angiotensin II. Womenwho are destined to develop pregnancy inducedhypertension/pre-eclampsia have increased vascular reactivity to angiotensin II. This increased sensitivity precedes the onset of hypertension. Autoantibodies are thought to activate AT1 receptors and increased angiotensin II sensitivity. Up regulation of bradykinin receptors (B2) leads to heterodimerisation with angiotensin II type Ireceptors (ATI). ATI/B2 receptors have been shown to increase responsiveness toangiotensin II in-vitro.

B) Prostaglandins

Endothelial prostacyclin (PGI2), a vasodilator; its production is decreased in pregnancy induced hypertension/pre-eclampsia mediated by phospholipase A2.Thromboxane A2 (vasoconstrictor and platelet aggregator) levels are increased. The prostacyclin: Thromboxane A2 ratio decreases, these changes result in vasoconstriction and hypertension. In normal pregnancy, PGI2 is more than TXA2=Vasodilation=No hypertension. In Pregnancy induced hypertension, PGI2 is less than TXA2=Vasoconstriction=hypertension.

C) Nitric oxide
Nitric oxide is a potent vasodilator, synthesized from L-arginine by endothelial cells. Nitric oxide maintains the normal low pressure vasodilated state of foeto placental circulation in humans. Pregnancy induced hypertension/preeclampsia is associated with decreased endothelial nitric oxide synthesis which increases the cell permeability.

D) Endothelin
Endothelin-1 is the primary isoform produced by human endothelium. These alpha 1- amino acid peptides are potent vasoconstrictors; levels in pregnancy induced hypertension/pre-eclampsia are higher when compared to normotensive pregnancies in response to endothelial activation.

E) Circulating angiogenic factors
Vascular endothelial growth factors (VEGF) are endothelial specific growth factors plays a key role in promoting angiogenesis; placental growth factor (PLGF) is another member of VEGF family that is made predominantly in placenta. Activity of VEGF is mediated by interaction with two high affinity receptor tyrosine kinases: Kinase insert domain region (KDR) and tyrosine kinase-1 (flt-1). These are expressed an endothelial surface. Alternative splicing of flt-1 results in production of sflt-1; this cannot attach to cell membranes and is secreted in to the maternal blood. It can antagonize VEGF and PLGF by binding to it and preventing its interactionwith endogenous receptors. Excess sflt-1 production is seen in pregnancy induced hypertension/pre-eclampsia placentas, which creates an antiangiogenic state and plays a causal role in the pathogenesis of maternal syndrome in pregnancy induced hypertension/pre-eclampsia. VEGF is known to stimulate angiogenesis as well as to promote vasodilation by increasing production of nitric oxide and prostacyclin, signalling molecules that are decreased in pregnancy induced hypertension/preeclampsia. PLGF is important in vasculogenesis and control of microvascular permeability.

Pathological changes in various organs
Vasospasm and endothelial cell damage with subsequent platelet activation and aggregate formation account for many of the pathological changes seen in pregnancy induced hypertension.

1. Brain
Vasospasm and cerebral oedema have been implicated in the cerebral manifestations of pregnancy induced hypertension/preeclampsia. There are small haemorrhages scattered throughout its substance. Massive haemorrhage in the brain may cause death. There may be cerebral oedema, increased intracranial tension, cerebral haemorrhage and hyperaemia.

2. Eye
Retinal haemorrhage, exudates and papilledema are characteristics of hypertensive encephalopathy and are rare in pregnancy induced hypertension. Vasospasm in occipital lobe is the usual cause of temporary blindness sometimes found in severe preeclampsia.

3. Kidneys
Characteristic lesion is glomeruloendotheliosis, it consists of endothelial and mesangial cell swelling, basement membrane inclusions but little disruption of renal endothelial podocyte. There are proteinuria, decreased glomerular filtration rate and decreased urate excretion.

4. Liver
Sub endothelial fibrin deposition is associated with elevated liver enzymes. This can be associated with elevated liver enzymes. This association with haemolysis and a low platelet count due to platelet consumption constitute the HELLP syndrome (haemolysis, elevated liver enzymes, low platelets). There may be periportal hemorrhagicnecrosis and sub capsular hematoma. The epigastric pain and liver tenderness probably arise from distension of the capsule.

5. Cardiovascular
In early phase cardiac output is high with low peripheral resistance, but as the disease progresses this changes to low cardiac output with high peripheral resistance. There is reduced central venous pressure and pulmonary wedge pressure. Generalizedvasospasm is the basic factor. Cardiac arrhythmia, failure and pulmonary oedema can occur due to effect of the disease or drugs used. Rarely peripartum cardiomyopathy is reported in preeclampsia women after delivery.

6. Lungs
Pathological changes in lungs results in adult respiratory distress syndrome, Bronchopneumonia and airway obstruction.

7. Haematological
Platelet activation and consumptive coagulopathy, decreased plasma volume, increased blood viscosity.

Risk factors
Risk factors of gestational hypertension are:

Pre conceptional and or chronic risk factors
a) Partner related risk factors
Nullipara/primi/teenage pregnancy
Assisted reproductive techniques
Partner who fathered a preeclampsia in another women

b) Non-partner related risk factors
History of previous PIH
Polycystic ovary disease
Age interval between pregnancies
Family history

Low socio economic class

Underlying disorders
Chronic hypertension, renal disease, obesity, insulin resistance, low birth weight, gestational diabetes mellitus, protein C resistance, protein S deficiency, antiphospholipid antibody syndrome, hyper homocystenemia and sickle cell disease.

Exogenous factors
Smoking
Steroids

Pregnancy associated risk factors
Multiple pregnancies
Structural anomalies
Gestational trophoblastic diseases
Urinary tract infection
Chromosomal anomalies

Complications of Gestational hypertension
Complications can be categorized as maternal and fetal complications.

Maternal complications
HELLP syndrome, temporary blindness, abruptio placentae, disseminated intravascular coagulation (DIC), acute renal failure (ARF), pulmonary oedema, arrhythmias, liver lesions, intracranial or hepatic hemorrhage, adult respiratorydistress syndrome (ARDS), hypervolemia and risk of recurrent preeclampsia.

Fetal complications
Intrauterine growth retardation and fetal death.

HELLP syndrome
HELLP syndrome i.e., hemolysis, elevated liver enzymes and low platelet count is form of severe preeclampsia with high rates of neonatal and maternal morbidity. It occurs in 5 to 10% of patients with hypertension in pregnancy. HELLP syndrome was defined by the presence of all of the three following criteria: hemolysis (characteristic peripheral blood smear), serum lactate dehydrogenase ≥ 600U/l, total serum bilirubin ≥ 1.2 mg/ml, elevated liver enzymes (serum aspartate aminotransferase ≥ 70U/l) and low platelet count (<100,000/µl). Partial HELLP syndrome (PHS) is defined, by the presence of one ortwo features of HELLP syndrome but not the complete syndrome.

Blindness
Rarely, temporary blindness may accompany severe preeclampsia and eclampsia which may last a few hours to a week.

Abruption placentae
It is a maternal complication in 10% of eclamptic patients particularly with antepartum eclampsia.

Disseminated intravascular coagulation (DIC)
It occurs in about 5% of patients. DIC may indicate a worsening of HELLP syndrome, a developing abruptio placentaeor the first sign of sepsis. Intracranial bleeding was the cause of maternal death in one case while the other two cases were lost due to acute renal failure and disseminated intravascular coagulation, respectively.

Acute renal failure (ARF)
Usually due to acute tubular necrosis or bilateral cortical necrosis, rare complications, associated with DIC and abruptio placentae. It occurs in about 5% of eclamptic patients.

Cardiogenic pulmonary oedema
It is uncommon, occurring in about 3 to 4% of patients. It indicates severe hypertension in pregnancy.

Haemorrhage
Any patient with clinical evidence of preeclampsia and right upper quadrant abdominal pain, particularly in presence of thrombocytopenia and elevated liver enzymes should be considered risk for hepatic haemorrhage from sub capsular orintrahepatic hematoma (with or without rupture) associated with high maternal and fetal mortality.

Arrhythmias
Malignant ventricular arrhythmias not related to electrolyte imbalance, deranged acid base status or hypoxia has been described in patients with severe hypertension in pregnancy.

Intra uterine growth retardation
IUGR is defined as pathological decrease in the rate of fetal growth. Increased risk of IUGR in hypertensive pregnancies, particularly those associated with severe and early-onset pre-eclampsia.

Diagnosis of Gestational Hypertension
Diagnosis is based on measurement of BP and proteinuria.

Measurement of BP
1. BP should be measured with women in the sitting position with the arm at the level of the heart.
2. An appropriately sized cuff (i.e., length of 1.5 times the circumference of the arm) should be used.
3. Korotkoff phase V should be used to designate diastolic BP.[10]
4. If BP is consistently higher in one arm, the arm with the higher values should be used for all BP measurements.
5. BP can be measured using a mercury sphygmomanometer.

Measurement of proteinuria
1. All pregnant women should be assessed for proteinuria.

2. Urinary dipstick testing may be used for screening for proteinuria, when suspicion on preeclampsia is low.
3. More definitive testing for proteinuria (by urinary protein: creatinine ratio or 24 hour urine collection) is encouraged when there is a suspicion of preeclampsia.

Diagnosis of hypertension

1. The diagnosis of hypertension should be based on office or in- hospital BP Measurements.
2. Hypertension in pregnancy should be defined as a diastolic BP of ≥ 90 mm Hg, based on the average of at least two measurements, taken using the same arm.
3. Women with a systolic BP of ≥ 140 mm Hg should be followed closely for development of diastolic hypertension.
4. Severe hypertension should be defined as a systolic BP of ≥ 160 mm Hg ordiastolic BP of ≥ 110 mm Hg.
5. For non-severe hypertension, serial BP measurements should be recorded before a diagnosis of hypertension is made.
6. For severe hypertension, repeat measurements should be taken for confirmation in 15 minutes.

Management of Gestational Hypertension

The goal of treatment is to prevent the condition from becoming worse and to prevent it from causing other complication. Treatment for GH may include:

Non pharmacologic methods

a) Diet

Proper diet will provide to lower the blood pressure and to ensure the growth of the baby. Focus on gaining a healthy amount of weight by eating normal portions and focusing on consuming lean proteins, fruits, vegetables, whole grains, and low fat dairy products.

1. Calcium benefits

Calcium is a mineral mainly found in dairy products such as cheese, yogurt and milk. It plays a large role in the body, helping to form and maintain bones and teeth as well as helping the heart maintain a normal beat. Calcium also aids the body in blood clotting, sending and receiving nerve signals and releasing hormones. A pregnant woman needs 1,300 milligrams of calcium per day to develop the baby's bones and maintain her body's functions. Calcium supplementation during pregnancy may also reduce the risk for developing gestational hypertension and pre-eclampsia.[3]

2. Sodium

There is no need to treat gestational hypertension with a low-sodium diet. Following a sodium-restricted diet is not effective in treating or preventing mild pregnancy-induced hypertension. If there is experiencing edema, limiting the salt intake to 2 grams per day may help with the swelling.

3. Calories, Carbs, Protein and Fat

It is important to maintain a balanced diet with adequate calories and protein throughout the pregnancy. The Academy of Nutrition and Dietetics recommends that for women of normal weight, daily caloric requirements should increase by 350 calories during the second trimester and by 500 calories during the third trimester. Carbohydrates should consist of 50 percent to 65 percent of total calories. Aim for 71 grams of protein per day, or 1 gram of protein per kilogram of body weight. Fat should make up the remaining 20 percent to 30 percent of the daily calories.

4. Foods to avoid

During pregnancy, women are more susceptible to food-borne illness .Avoid raw or undercooked eggs, meat, poultry and fish to prevent salmonella. Do not consume fish that is high in mercury such as shark, swordfish and mackerel because mercury can harm the baby's developing nervous system. Unpasteurized juices and raw sprouts can also cause a food-borne illness.

5. Water

Drink plenty of water during pregnancy. The American Pregnancy Association recommends that drink at least eight glasses of water a day in a high blood pressure pregnant women.

b) Bed rest

There are many evidences showing that the bed rest is one of the suitable to reduce the complications of pregnancy induced hypertension.it shows that bed rest will provide better pregnancy outcomes in women with hypertension in pregnancy.

Pharmacologic methods

Hypertension in pregnancy must be treated in its own right, regardless of the assumed underlying pathology, largely to reduce the risk of maternal intracranial haemorrhage. The level at which antihypertensive treatment is initiated, depending on whether treatment is focused on maternal or fetal wellbeing.[11] Physicians provide antihypertensive medications when the systolic blood pressure >140-170mm Hg or diastolic pressure >90-110mm Hg. Most of the antihypertensive drugs will cross the placenta and reach the fetal circulation. The drugs which included in the class of ACE inhibitors and ARBs are fetotoxic. The main aim of treating hypertension in pregnancy is to protect the women from dangerously high blood pressure and to permit continuation of the pregnancy, fetal growth, and maturation.Commonly used safe drugs fortreating pregnancy induced hypertension are:

Methyl Dopa
Nifedipine
Labetalol

Agent	Dosage Range	Caution/Comment
Labetalol	Standard dose: 200-800 mg orally per day in 2-3 divided doses Maximum dosage: 2,400 mg per day	Should be avoided in women with cardiac conduction abnormalities, systolic heart failure or asthma.
Nifedipine (extended-release)	Standard dose: 30-60 mg orally per day Maximum dosage: 120 mg per day	Ensure correct form of nifedipine prescribed; short acting nifedipine is not recommended due to the risk of hypotension. There is concern for severe hypotension if nifedipine is continued with intravenous magnesium.
Methyldopa	Standard dose: 250-1000 mg orally per day in 2-3 divided doses Maximum dosage: 3000 mg per day	Associated with hepatitis, hemolytic anemia, depression, and sedation.

Patient counseling

Gestational hypertension is a condition that occurred during second trimester of pregnancy. In this condition the blood pressure should be elevated. If the blood pressure is not controlled it will cause complications during delivery that will adversely affect to mother and baby. Every mother should take preventive measures against gestational hypertension. The preventive measures are:

- Use salt as needed for taste.
- Drink at least 8 glasses of water a day.
- Increase the amount of protein you take in and decrease the amount of fried foods junk foods you eat.
- Get enough rest.
- Exercise regularly.
- Elevate your feet several times during the day.
- Avoid drinking alcohol.
- Avoid beverages containing caffeine.
- Your doctor may suggest you to take prescribed medicines and additional supplements.
- Increase prenatal checkups.

The preponderance and risk factors of hypertension during pregnancy is not well documented in Indian literature. The present study was taken to study the preponderance and risk factors of hypertension in pregnancy and its impact on fetal and maternal outcome

AIM AND OBJECTIVES

To appraise the preponderance and risk factors of gestational hypertension in a tertiary care referral hospital

Objectives

- To evaluate the complications associated with Gestational hypertension and to study the delivery and fetal outcomes of such patients
- To study the treatment patterns of GH
- To prepare a patient information leaflet for the GHTN patients.

METHODOLOGY

The study was carried out at the in-patient and out - patient setting of a private tertiary level hospital at the Malabar region of Kerala. A prospective observational study was conducted among antenatal mothers with the aim to appraise the preponderance and risk factors of Gestational hypertension in a tertiary care referral hospital. The prospective observational study was carried out for a period of 12 months. The study was approved by the ethics committee of hospital and an official consent was also provided by the Managing director for the purpose of conducting the study. The population of the study was all antenatal mothers who satisfy the inclusion criteria consulting at the Obstrectics and Gynaecology department of the hospital during the baseline data collection period.

Study design

A prospective observational study was conducted among antenatal mothers with the aim to appraise the preponderance and risk factors of Gestational hypertension in a tertiary care referral hospital.

Study period

The prospective observational study was carried out for a period of 1 year.

Ethics committee approval

The study was approved by the ethics committee and an official consent was also provided by the Managing director for the purpose of conducting the study. It was certified by the institutional committee met on15 February 2015 and approved the proposal of the study as per letter no IEC/ASH/2015/MP/2

Study population
The population of the study was all antenatal mothers who satisfy the inclusion criteria consulting at the Obstrectics and Gynaecology department during the baseline data collection period.

Inclusion criteria
- Pregnant women with gestational age of 20 weeks and above.
- Pregnant women who is not having any history of hypertension.

Exclusion criteria
- Pregnant women with gestational age of less than 20 weeks.
- Pregnant women with history of hypertension.
- Patients not willing to participate in the study.

Sample size
Based on inclusion criteria a total of 150 eligible consenting antenatal mothers were enrolled and participated in the study.

Study tools
Data collection form
A data collection form was developed in order to enter the necessary information relevant to the study. The form consists of details like:
- Patient demographics
- Socioeconomic status
- Educational qualification
- Anthropometry
- Laboratory investigations
- Risk factors
- Complications
- Delivery outcomes
- Fetal outcomes

Questionaire for GHTN assessment
A pre tested, semi-structured questionnaire was designed in order to collect information regarding the risk factors and personal history of study subjects by direct interviewing the subjects. The questionnaire form consists of the following details;
- Medical history
- Pregnancy history
- Dietary pattern
- Exercise pattern
- Cardinal symptoms

Patient information leaflet
Patient education on gestational hypertension was given to all the study participants. Study subjects were provided with a specially designed patient information leaflet for their reference which contains the following details;
- Definition of gestational hypertension
- Types of hypertension in pregnancy
- Risk factors of GHTN
- Diagnosis of GHTN
- Management of GHTN
- Tips to prevent GHTN

Kuppuswamy's socioeconomic status scale
Kuppuswamy's socioeconomic status is an important tool in hospital and community based research in India. It was proposed in 1976. This scale takes account of education, occupation and income of the family to classify study groups in to high, middle, and low socioeconomic status. Revised scale in 2012to define socioeconomic status has obtained by revision of family income per month (in Rs). In this study Kuppuswamy's socioeconomic status scale modified for 2012 was used.

Study Procedure
Literatures supporting the current study were collected from authorized International and National journals. Information from the review of these literatures and the scenario in the study site, were put together in developing a data collection form and questionnaire for GHTN assessment.

The study was divided into two phases,

The first phase includes the identification and documentation of risk factors, complications and to study the current treatment practice followed.

The second phase includes creating awareness among patient about risk factors, complications and to educate them for the effective management of the disease by providing patient counseling with the help of a patient information leaflet.

All the antenatal mothers consulting at the Obstrectics and Gynecology department during the study period were enrolled in the study based on inclusion criteria after obtaining the informed consent for the participation in the study.

Data Collection
All the relevant information regarding the study was collected from the study subjects with the help of a specially design data collection form and questionnaire. Before data collection all subjects were informed that the study is to explore their personal background and their medical details and the treatment patterns. Confidentiality was addressed. Data were collected anonymously.

All the datas were collected by
- Patient interview
- Review of patient's admission details, medication records and discharge summary
- Discussion with other health care professionals

Patient counseling
Patient education is a key component for the effective self-management of the gestational hypertension. Each

and every participants were counseled about the management of the disease, risk and complication, therapeautic lifestyle changes including dietary modifications and exercise. Patients were encouraged to adhere to healthy lifestyle habits and medications to prevent from future risk of hypertension.

Assessment of risk factors and complications of gestational hypertension

Data on prevalance of risk factors and complications were collected from all the study subjects. The following definitions were used;

- **Body Mass Index (BMI):** weight in kilograms divided by the square metre of the height.
- **Family history of GHTN:** self-reported or collected from the case record or from the physician.
- **Past history of GHTN:** Being self-reported or collected from case record or physician
- **Past history of GDM:** Being self-reported or collected from case record or physician
- **NICU Admission:** self-reported, collected from case record

Measurement of outcome

The data obtained were analysed and compared among GHTN and non GHTN group for the following parameters.

- Prevalence of GHTN
- Age distribution
- Socio economic status
- Educational qualification
- Region wise distribution
- Risk factors
- Complications
- Delivery outcomes
- Fetal outcomes

Statistical Analysis

All the statistically analysis was carried out using statistical package for social sciences (SPSS) software version 16.0 for WINDOWS. The collected data from 150 subjects were analyzed by statistical treatment using appropriate statistical tools.

RESULTS

Patients with Gestational Hypertension

A total of 150 pregnant subjects > 20 weeks of gestation were enrolled in the study and evaluated for GHTN. Out of 150 subjects, 35 (23 %) were diagnosed as GHTN. The remaining 115(77 %) formed the Non GHTN and the prevalence of GHTN was found to be 23.3%. Figure 1 shows the distribution of study subjects with GHTN.

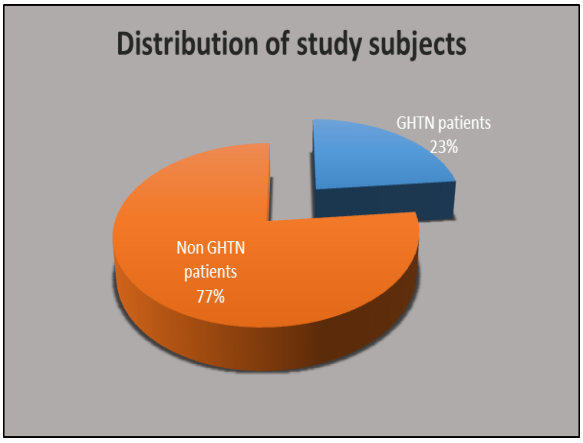

Fig. 1: Percentage distribution of GHTN subjects.

Age Wise Distribution in Total Patients

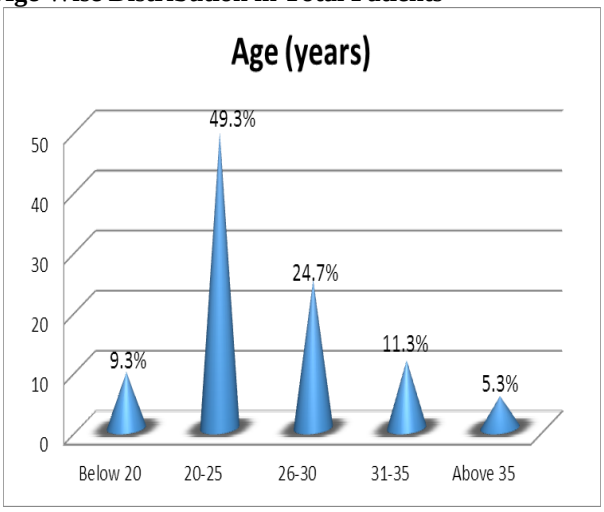

Fig. 2: Age wise distribution among total study subjects.

Among total 150 subjects most of the patients were in the age group of 20-25 years, p value <0.05 and it was found to be statistically significant.

Age Wise Distribution among Ghtn and Non Ghtn Subjects

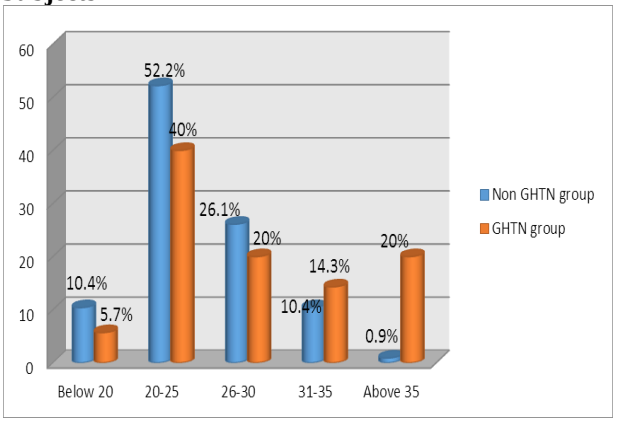

Fig. 3: Age wise distribution among GHTN and Non GHTN group.

Table 1: Age wise distribution.

Category	N	Mean	Std. Deviation	t value	P value
Non GHTN	115	24.27	4.35	3.865	0.0001
GHTN	35	27.94	6.49		

Compared to non GHTN subjects, most of the GHTN patients were in the age group between 20-25 years with the mean age of 27.94± 6.49, p value < 0.05and it was found to be statistically significant.

Region Wise Distribution Among Ghtn And Non Ghtn Group.

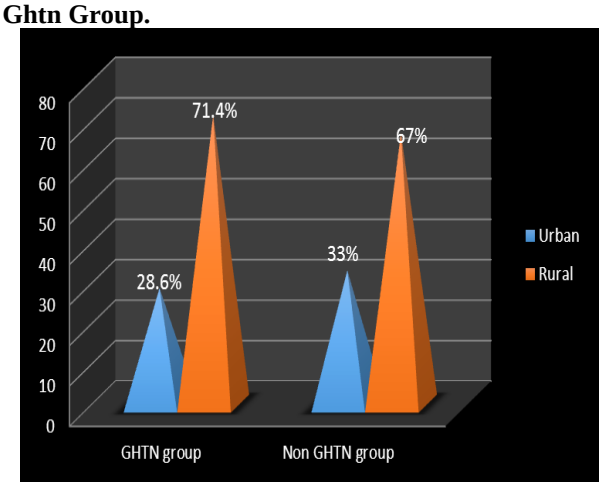

Fig. 4: Region wise distribution among GHTN and non GHTN group.

Among GHTN group, 25(71.4%) patients were residing at rural area and 10 (28.6%) patients from urban area. Where as in non GHTN group 77(67%) study subjects were from rural areas and 38(33%) patients were residing at urban area.

Socio Economic Status

Patients were classified to various socioeconomic status by using the modified Kuppuswamy scale. According to Kuppuswamy scale, 25.7% patients in GHTN group belonged to Upper class followed by 34.3% patients in Upper middle, 20.0% patients in lower middle, 8.6% patients in Upper lower and 11.6% patients in lower. Among non GHTN subjects group 10.4% belonged to Upper class followed by 27.8% patients in Upper middle, 28.7% patients in lower middle, 21.7% patients in Upper lower and 11.3% patients in lower. By comparing both groups, it was found that the prevalence of GHTN was high in upper and upper middle class and it was not statistically significant, p value <0.05.

Table 2: Socio economic status among GHTN and non GHTN group.

Socio economic class	GHTN group Frequency (%)	Non GHTN group Frequency (%)	Chi square value	p value
Upper	9 (25.7)	12 (10.4)	8.11	0.088
Upper middle	12 (34.3)	32 (27.8)		
Lower middle	7 (20.0)	33 (28.7)		
Upper lower	3 (8.6)	25 (21.7)		
Lower	4 (11.4)	13 (11.3)		
Total	35	115		

Educational Qualification

In GHTN group,4 (11.4%) patients were post graduate,10(28.6%)patients were graduate,14(40.0%) were higher secondary and 7(20%)patients are in high school whereas in non GHTN group,6(5.2%) patients were post graduate, 35(30.4%) patients were graduates ,46(40%) patients were higher secondary and 28(24.3%) patients with high school education. By comparing two groups, it has been found that GHTN rate increased in higher secondary and graduates women (28.6%and 40.0% in GHTN patients).

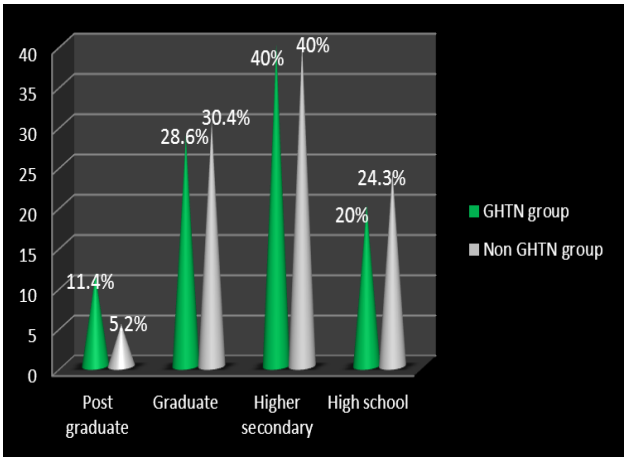

Fig. 5: Educational qualification of GHTN and non GHTN group.

Prevalence of Risk Factors Associated With Ghtn

In analysis of risk factor associated with GHTN, family history of HTN and past history of GHTN were more prevalent in GHTN group than non GHTN group. Among GHTN group, the percentage with family history of hypertension was 51.4% which was higher than the7% non GHTN group.

Table 3: Prevalence of risk factors of GHTN.

Risk factors	GHTN group (%) (n =35)	Non GHTN group (%) (n=115)	Chi square	p value
Age >35 years	8 (22.9)	0	27.767	0.0001
BMI >26 kg/m²	26 (74.3)	44 (38.3)	13.992	0.0001
Family history of HTN	17 (48.6)	15 (13.0)	20.182	0.0001
Family history of GHTN	18 (51.4)	8 (7.0)	37.037	0.0001
Past history of DM	14 (40.0)	11 (9.6)	17.896	0.0001
Past multiple gestation	2 (5.7)	2 (1.7)	1.634	0.201

Chi –square test showed that there was a statistical significant difference (p value <0.05) between the risk factor of family history of hypertension among GHTN and non GHTN women. Similarly the percentage of GHTN with family history of GHTN (51.4%) was higher than non GHTN women (7.0%). A significant statistical difference (p value <0.05) was observed between the family history of GHTN among GHTN and non GHTN group. Similar result were obtained in women with past history of DM (40.0%) and it was also statistically significant (p value < 0.05). The percentage of women with age >35 years was higher in GHTN group (22.9%) than non GHTN group (0) and percentage of BMI>26 kg/m^2 were also higher in GHTN group (74.3%). This difference showed a highly significant result (p value < 0.05). No significant difference was found for other risk factor like history of multiple gestation among GHTN and non GHTN group.

Prevalence of Complications Among Ghtn Group

The prevalence of complications associated with GHTN were assessed and compared statistically using chi square test. Among two groups the most prevailing complications associated with GHTN were found to be IUGR (14.3%),it is higher in GHTN group than with non GHTN group(0.9%) and it is statistically significant (p value < 0.05). Similarly the percentage of pregnant women with Eclampsia is also higher in GHTN group (5.7%) and it is statistically significant (p value <0.05). The percentage of other complication such as cerebro vascular accident in women is higher in GHTN group (2.9%) and it is not statistically significant.

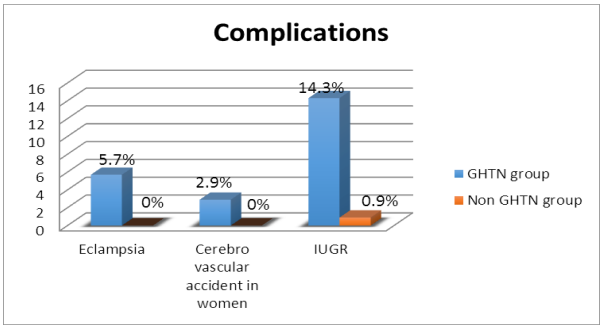

Fig. 6: prevalence of associated complications of GHTN.

Delivery Outcomes Among Ghtn And Non Ghtn Subjects

In GHTN group, the percentage of women who have undergone caesarean section (82.9%) was higher than women who have undergone assisted vaginal delivery (2.9%) and spontaneous vaginal delivery (14.3%). While the percentage of caesarean delivery in non GHTN group was found to be 32.2% and spontaneous vaginal delivery was 60.0% and assisted vaginal delivery was found to be 8.7%.

The prevalence of caesarean delivery was statistically higher in GHTN group than in non GHTN group whereas spontaneous vaginal delivery was higher (60%) in non GHTN group. The observation was statistically significant with p value <0.05.

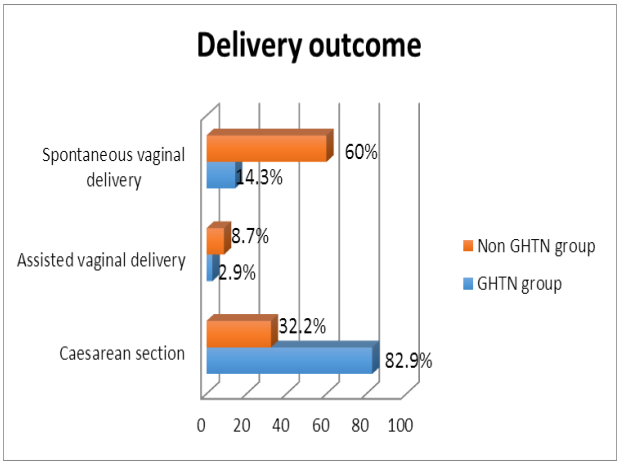

Fig. 7: Delivery outcomes of GHTN and non GHTN group.

Fetal Outcomes in Ghtn and Non Ghtn Groups

The percentage of infants with low birth weight was found to be 28.6% and NICU admission 11.4% were higher in GHTN group than with non GHTN group. These values are statistically significant p value < 0.05. The percentage of still born and post natal death are 2.9% each which was higher in GHTN group and no significant correlation was observed between these fetal outcomes.

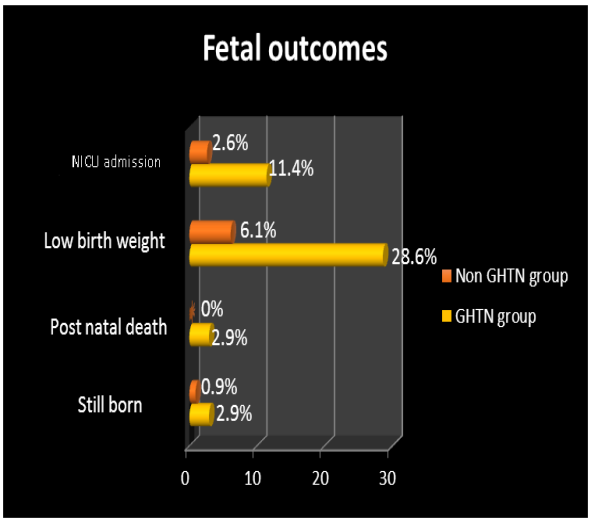

Fig. 8: Fetal outcomes of GHTN and non GHTN groups.

Gravidity of Pregnancy in Ghtn Groups

The percentage of multi gravida pregnancy (77%) was higher in GHTN patients than with primi gravida pregnancy (23%) group. These are statistically significant with p value < 0.05

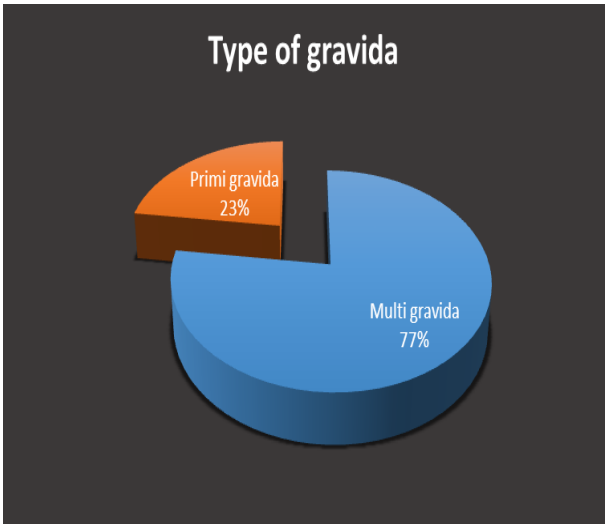

Fig. 9: Gravidity of pregnancy in GHTN group.

Treatment Pattern in Ghtn Group

In the present study, out of 150 patients 35 were diagnosed as GTHN and they were managed with nifidipine, methyl dopa,and labetalol. Nifidipine was used at a dose of about 10 mg whereas methyl dopa and labetalol in 250mg and 100mg respectively.

Out of 35 subjects 25(71.4%) were managed with nifidipine, 11 (31.4%) subjects were managed with labetalol and 5(14.3%) subjects were managed with methyl dopa.

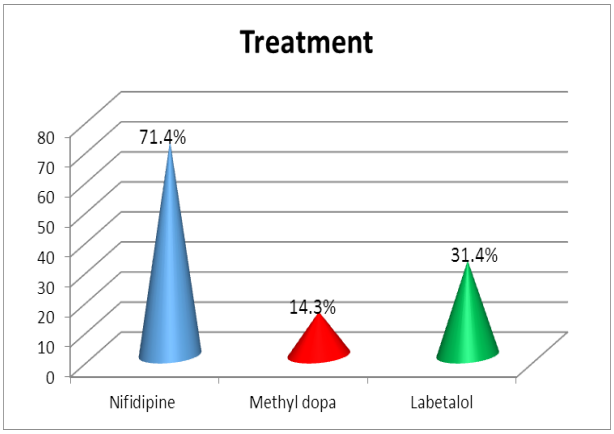

Fig. 10: Treatment pattern of GHTN patients.

DISCUSSION

Pregnancy Induced Hypertension is a syndrome of hypertension with or without proteinuria and edema, with the clinical manifestation usually occurring late in pregnancy and regressing after delivery of the conceptus. PIH is a known cause of premature delivery, Intra uterine growth retardation, placental abruption and fetal death, as well as maternal mortality and morbidity. The prevalence of hypertensive disorder of pregnancy is 8-10% of all pregnancies in the population worldwide. HDP related complications are still threatening maternal and fetal life and health. The prognosis of HDP is associated with the severity of disease process. In general, the more severe the disease, the poorer will be the prognosis. Despite a massive research effort, there was also lack of efficient therapeutic methods in clinic at present. For the unpredictable characteristic and potential poor prognosis, symptomatic treatment to relieve clinical symptoms and timely termination of pregnancy were the main treatment measures, which can effectively increase curative rate and decrease complication rate and mortality. The present study was conducted with the aim to appraise the preponderance, risk factors, complications, and the management of Gestational hypertension in a tertiary care referral hospital at Perinthalmanna, Malappuram, Kerala.

In this prospective observational study, as per the demographics collected, out of 150 subjects, 35(23%) were diagnosed as GHTN and thus the prevalence of GHTN was found to be 23%, which was quite high compared to the study of Manjusha et al[14] in Pune, they observed a prevalence of 7-8%.

Muhammed Obaid Ur Rehman et al.[31] performed a similar study in karachi and found a prevalence rate of 37%. Zenebe W et al.[22] in Jimma found a prevalence rate of 8.5%. Franklin David Kilembe[29] in Malawi found a prevalence rate of 52.1%. Swati Singh et al[20] in Nigeria found a prevalence rate of 17%.GHTN showed an association with increasing age, BMI, family history of hypertension and past history of hypertension in various studies. In the present study the prevalence of GHTN was found to be associated with increasing age,

lower education level, socio economic status, BMI, family history of HTN and past history of GHTN.

The study estimates that most of the GHTN were in the age group between 20-25 years compared with non GHTN group, with the mean age of 27.94± 6.49, p value < 0.05 and it was found to be statistically significant. Similar study in china showed age> 35-39 years are 1.8 times higher risk than 20-24 years women and 2.4 times higher in those aged 40 years and older. A significant association was found between prevalence of GHTN and increasing BMI of participants. Obesity as a significant risk factor for GHTN which is shown in several studies. In Chun Ye et al.[2] studies showed that there is a close relationship between HDP and the pre-pregnancy BMI. They suggest that each increase of 5-7 kg/m2 in BMI doubles the risk of developing preeclampsia. Obesity is associated with insulin resistance, dyslipidaemia, chronic inflammation and oxidative stress, all of which have been demonstrated in women presenting with PIH. As a result of the strong relationship observed, the association between increasing changes in BMI and risk of PIH may support that obesity mediated inflammatory changes may play a role in the pathogenesis of PIH . W.K.B.A. Owiredu et al [6] also found that obesity as a risk factor for developing GHTN.

In our study showed that women with a low level of education are more likely to develop GHTN than those who have received a higher level of education. Chun Ye et al in china had found similar result between the education level of the pregnant women and gestational hypertension. W.K.B.A. Owiredu et al showed that educational status in GHTN women was not associated with PIH. Pratima V et al.[15] studies showed that they could not found any association between educational status of pregnant women with causation of hypertension during pregnancy. The results from the study states thatthe educational qualification was not statistically significant. It was found that the prevalence of GHTN was more in rural than urban women. Compared to non GHTN group it was found to be an increasing prevalence of GHTN in participants who are residing at rural areas. There were no statistically significant associations with gestational hypertension seen with socio economic status of the patients. J. Prakash et al.[4] conducted similar study in India and they found that the prevalence of gestational hypertension are more in low socio- economic status. While the prevalence of hypertension disorders of pregnancy in studies conducted outside India were different may due to some genetic and environmental factors like climate, altitude, socio economic conditions etc. In our study the prevalence of GHTN patients are higher in Upper and Upper middle class compared to non GHTN group. This association could be related to multiple factors such as maternal age, higher pre-pregnancy weight and BMI, life style in women of higher socio economic status.

Family history of hypertension has been reported to be associated with higher chances of developing GHTN. In this study significantly high percent of women with GHTN had a positive family history of hypertension (48.6%), Family history of GHTN (51.4%) and past history of DM (40%) compared to non GHTN group. The result was statistically significant with p value < 0.05. Chun Ye et al also found similar result with high percent of GHTN women with family history of hypertension, family history of GHTN, past history of DM, age > 35 years and obesity. W.K.B.A. Owiredu et al in Ghana and Caroline A et al in Brazil also found the similar results.

Other studies showed that past multiple gestations was also risk factor for developing GHTN. In the study results the past multiple gestation with GHTN was not statistically significant (p value> 0.05). Chun ye et al in china conducted a study and found out that there was a significant association between GHTN and age>35 years, twin pregnancy, over weight and obesity, primi para, history of hypertension as well as family history of hypertension and diabetes.

The study showedthat the most common complications seen in GHTN mothers were IUGR (14.3%) followed by Eclampsia (5.7%) and Cerebro vascular accident in women (2.9%). The findings are statistically significant. On evaluation of delivery outcomes of GHTN and non GHTN women it had been observed a higher rate of cesarean delivery (82.9%) among GHTN group. In non GHTN women the most prevalent outcomes was spontaneous vaginal delivery (60%). The observation was statistically significant with p value < 0.05. This results correlates with the observation of Solange Regina et al[(25)]. Infants who were admitted in the NICU was 11.4% in GHTN group where as in non GHTN were 2.6%. Percentage infants of low birth weight were higher in GHTN (28.6%) than non GHTN group (6.1%) and still born were 2.9%. By statistical correlation it was found that the prevalence of NICU admission, low birth weight was higher in GHTN than in non GHTN group with statistical significance, p value < 0.05. The prevalence of still born was not statistically significant (p value>0.05). This study correlates with the observation of Solange Regina et al. Another study by J. Prakash et al found that fetal and neonatal outcome of gestational hypertension increased prevalence of IUGR, prematurity and perinatal mortality. Preterm delivery in 28.8%, still births in 4.8% and overall perinatal mortality of 14.8% were reported in an Indian study.

Outof 35 GHTN patients 27(77.1%) were multi gravida and 8(22.9%) were in primi gravida. This result was statistically significant, p value < 0.05. In other studies most of the GHTN patients are included in primipara and it was considered as one of the risk factors for GHTN. In the study group, age wise prevalence of GHTN patients are included in the age group of 20-25 years and they have family history of hypertension and past history of

gestational hypertension. This study negatively correlates with the observation of Chun Ye et al and positively correlates with the observation of Pratima V et al.Primipara are at maximum risk of developing gestational hypertension because this is the pregnant woman's first exposure to chorionic villi specifically to trophoblast of fetal origin, to which the body respond with strong immunological reaction in the form of hypertension during pregnancy.

Among 150 patients, 35 were diagnosed as GHTN patients and they were managed with Nifedipine, Methyl dopa and Labetalol. Nifedipine used for the management of GHTN patients was Nicardia R 10 mg BD, Methyl dopa were 250 mg OD and Labetalol were 100 mg OD. Out of 35 GHTN patients 20(57.14%) patients were managed with Nifedipine, 5(14.3%) patients with Methyl dopa and 10(28.5%) patients with Labetalol. The drugs included in the other classes, for the treatment of hypertension is not used for the management of GHTN because it produce teratogenic effect and produce adverse effect to mother. Nifedipine was most commonly prescribed antihypertensive drugs in 57.14% of GHTN patients. Similarly in a study by Manjusha et al, Methyl dopa was most commonly prescribed antihypertensive drugs in 17% of patients. The studies from Ray J G et al showed that Nifedipine (47.7%) was prescribed more frequently than Methyl dopa (27.7%). This shows that utilization pattern differs from hospitals, prescribers and among countries also.

Primipara and multi paras should be monitored carefully for hypertension. Health care providers should counsel women at risk on prevention measures such as nutrition, weight and stress management, and early and continual monitoring of gestational hypertension throughout the pregnancy. Community education efforts for women for childbearing age are also needed to reinforce the importance of healthy diets, regular physical activity, and maintaining a healthy weight before and during pregnancy. The knowledge of important risk factors in our population could be useful to help clinician to detect pregnant women who will develop pre-eclampsia. Prevention of hypertensive diseases in pregnancy would mean a huge step forward in prenatal care and assuming that effective prenatal is available, it may have greater potential in the treatment of these diseases.

The study was conducted in only one setting and the sample size was very low. Therefore the results may not be extrapolated to populations. The study period was too short to identify more significant results in all outcomes. Patients were partially co-operating with the study because of their anxiety therefore it affects the significance of the result. The study explored a large number of factors, but because of the small sample size and too short duration of the study the effects of pharmacist's intervention on some of the factors cannot detected.

CONCLUSION

Gestational hypertension is one of the serious complications in pregnancy which leads to adverse effects to both mother and fetus in her womb. Almost 20% of maternal death in India occurred due to hypertensive disorder of pregnancy. In 2013, the Maternal Mortality Rate (MMR) of India was 178 per one lakh live births. The situation was worst in Assam and Uttar Pradesh. According to the survey of Annual Survey Bulletin In August 2011, the MMR of Faizabad division was 451 per lakh which was highest in the country, while Kerala has the lowest MMR of 81 per lakh. The national is to achieve the MMR of 109 per lakh by 2015. There are many causes for increasing the MMR and hypertensive disorders play a role for that.

The prevalence of HDP was 8-10% of all pregnancies in the population worldwide. The prevalence of Gestational hypertension may vary from region, race, climate, socioeconomic status, family history, personal history and their life style changes. The prevalence of Gestational hypertension in the study was 23%.This could be due to life style pattern of patients, obesity and family history of hypertension and past history of hypertension. The prevalence of risk factors was higher in the study. Complications of GHTN include IUGR, Eclampsia and fetal complications like preterm delivery, low birth weight, still born. The alarmingly high rate of these risk factors remains a cause of concern and a challenge that needs to be tackled to prevent any adverse effects of the disease in mothers and their children.

The exact etiology and pathophysiology of pregnancy induced hypertension is unknown. For the unpredictable characteristic and potential poor prognosis, symptomatic treatment to relive clinical symptoms and timely termination of pregnancy were the main treatment measures, which can effectively increase curative rate and decrease complication rate and mortality. Obesity and age >35 years are risk factors for developing gestational hypertension. Increasing weight of 5-7 kg/m2 which produce more risk during their pregnancy period. Age >35 years have 1.8 times more risk than patients who have an age group of 20-25 years and 2.4 times more risk in patients having age >40 years.

The result obtained from the study reveals the importance of proper screening, diagnosis and management of GHTN in pregnant women by the clinicians to prevent the future burden of pre-eclampsia and hypertension. Strictly controlling of blood pressure definitely gives good outcomes of gestational hypertension pregnancy. It should be given equal importance to primigravida and multigravida women for the screening of gestational hypertension. There is a risk factor for children for developing hypertension from a gestational hypertensive mother. Hence future risk for obesity and hypertension to offspring of gestational hypertension mother should be monitored.

Prevention of hypertensive diseases in pregnancy would mean a huge step forward in prenatal care and, assuming that effective prenatal is available, it may have greater potential in the treatment of these diseases. Increased awareness of the magnitude and timing of risk of hypertension after gestational hypertension among patients and clinicians could provide an opportunity to test and use dietary, life style and pharmacological interventions that might prevent or delay the onset of hypertension in affected women. A major part of GHTN management involves educating the patient about diet, exercise, rest, need of regular checkups, blood pressure monitoring and medication adherence. Pharmacists can optimize overall care of a gestational hypertensive patient by educating, monitoring, and intervening or assisting the patient in the management of gestational hypertension. There is a need for pharmacist intervention in the prevention and management of GHTN and provide guidance to the patients of GHTN regarding diet plan and exercise to prevent it.

REFERENCE

1. I- Kuan Wang et al Hypertensive disorders in pregnancy and preterm delivery and subsequent stroke in Asian women, stroke. ahajournals, 2015; 42: 716-721.
2. Chun Ye et al The 2011 survey on hypertensive disorders of pregnancy (HDP) in China: prevalence, risk factors, complications, pregnancy and perinatal outcomes, journal PLoS ONE, 2014; 9(6): 1-10.
3. Mehul T et al Study of risk factors of perinatal death in pregnancy induced hypertension (PIH), National journal of community medicine (2012); 3(4): 703-7.
4. J Prakash et al Hypertension in pregnancy: hospital based study, ObstetGynecol, 2006; 78: 451-61.
5. Elizabeth Baraban, MPH, PhD, Lucie McCoy, MPH, Paul Simon, MD, MPH. Increasing Prevalence of Gestational Diabetes and Pregnancy-Related Hypertension in Los Angeles County, California, 1991–2003; 5(3): 1-9.
6. W.K.B.A. Owiredu, L. Ahenkorah, C. A. Turpin, N. Amidu and E. F. Laing Putative risk factors of pregnancy-induced hypertension among Ghanaian pregnant women Journal of Medical and Biomedical Sciences, 2012; 1(3): 62-76.
7. Brichant*et al*. Management of hypertension during pregnancy Am J Obstet Gynaecol, 2010; 183: S1-S22.
8. Granger JP et aletiology and pathophysiology of pregnancy induced hypertension**,** Am J Hypertens, 2001; 6(2): 178-185.
9. Jun Zhang et al Epidemiology of Pregnancy-induced Hypertension, Epidemiol Rev, 1997; 19(2): 218-32.
10. James M. Roberts et al Uric acid is as important as proteinuria in identifying fetal risk in women with gestational hypertension aha hypertension, 2005; 46: 1263-9.
11. Elham Kazemian et al Maternal obesity and energy intake as risk factors of pregnancy induced hypertension among Iranian women J health populnutr, 2014; 32(3): 486-493.
12. Alice M. Kiya,et al ARTICLE Growth of preterm low birth weight infantsuntil 24 months corrected age: effect ofmaternal hypertension J Pediatr (Rio J), 2014; 228-34.
13. Jong ShiuanYeh et al Synergistic Effect of Gestational Hypertension and Postpartum Incident Hypertension on Cardiovascular Health: A Nationwide Population Study J Am Heart Assoc, 2014; 3: 114-24.
14. Manjushasajithet al Incidence of pregnancy induced hypertension and prescription pattern of antihypertensive drugs in pregnancy International Journal of Pharma Sciences and Research (IJPSR), 2014; 5(04): 163-70.
15. Pratima V Borade et al Hypertensive disorders of pregnancy: an ongoing holocoust National journal of community medicine, 2014; 5(1): 61-65.
16. Corrie Macdonald-Wallis et al Gestational-age-specific reference ranges for blood pressure in pregnancy: findings from a prospective Cohort Journal of Hypertension, 2015; 33(1): 96-105.
17. Esayas Kebede Gudina et al Prevalence of hypertension and its risk factors in southwest Ethiopia: a hospital-based cross-sectional survey J Dove press Integrated Blood Pressure Control, 2013; 6: 111–117.
18. Corrie Macdonald-Wallis et al Gestational weight gain as a risk factor for hypertensive disorders of pregnancy American Journal of Obstetrics & Gynecology, 2013; 209-327.
19. Wietske Hermes et al Cardiovascular risk factors in women who had hypertensive disorders late in pregnancy: a cohort study Am J Obstet Gynecol, 2013; 208-474.
20. Swati Singh et al Hypertensive disorders in pregnancy among pregnant women in a Nigerian Teaching Hospital West Afr J Med, 2012; 21: 74–6.
21. Sutapa Agrawalet al Prevalence and risk factors for Pre-eclampsia in Indian women: a national cross sectional study J ObstetGynaecol, 2012; 4: 424–425.
22. ZenebeWolde et al Hypertensive disorders of pregnancy in jimma University specialized hospital Ethiop J Health Sci., 2011; 21(3): 147-54.
23. Bertozzi et al Investigate a possible couple predisposition for pregnancy-related hypertensive disorders Med J Aust, 2011; 182(7): 332-5
24. Shireen Meher et al Rest during pregnancy for preventing pre-eclampsia and its complications in women with normal blood pressure Am J Obstrect Gynecol, 2010; 102-20.
25. Solange Regina Perfetto Chaim, Pregnancy-induced hypertension and the neonatal outcome Acta Paul Enferm, 2008; 21(1): 53-8.
26. Helena Salonen Roset al Comparison of risk factors for pre -eclampsia and gestational hypertension in a population based cohort study, American J of epidemiology, 2007; 147(11): 1062-70.

27. Christine L Roberts et al Hypertensive disorders in pregnancy a population based study, Med J Aust, 2005; 182(7): 332-5.
28. Xu Xiong et al the effect of different types of pregnancy-induced hypertension on fetal growth, Am J ObstetGynecol, 2005; 141: 780-7.
29. Franklin David Kilembe et al Hypertensive Disorders of Pregnancy: Prevalence, Maternal Complications and Perinatal Outcomes at Lilongwe Central Hospital, Malawi, Obstet. Gynaecol, 2002; 100(2): 369-377.
30. Sharma A et al Management of hypertension , International journal of research in Ayurveda and pharmacy, 2010; 1(2): 390-8.
31. Muhammad Obaidet al Incidence of women having pregnancy Induced hypertension in karachi Pak. Jour. of Pharmacology, 2003; 20(1): 5-8.
32. K. Champagne et al Obstructive sleep apnoea and its association with gestational hypertension Eur Respir J, 2009; 33: 559–565.
33. Sonia Hernández-Díaz et al Risk of Gestational Hypertension in Relation to Folic Acid Supplementation during Pregnancy, American Journal of Epidemiology, 2002; 156: 806–812.
34. Brenda J Wilson et al Hypertensive diseases of pregnancy and risk of hypertension and stroke in later life: results from cohort Study BMJ, 2003; 326: 1-7.
35. Laura A. Magee et al Diagnosis, evaluation, and management of the hypertensive disorders of pregnancy, Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health, 2014; 4: 105–145.
36. Shweta Anand et al Perinatal Outcome in Growth Retarted Babies Born to Normotensive and Hypertensive Mothers: A Prospective Study People's Journal of Scientific Research, 2012; 5(1): 24-28.
37. Judi A Turner et al Diagnosis and management of pre-eclampsia: an update, International Journal of Women's Health, 2010; 2: 327–337.
38. Molina Ordas et al Gestational hypertension: risk factors, clinical and laboratory findings, Journal of Hypertension, 2010; 28: 293-4.
39. Sarah Timmermanset al Major dietary patterns and blood pressure patterns during pregnancy: the Generation R StudyAmerican Journal of Obstetrics &Gynecology, 2011; 337: 1-12.
40. Aleid G. van Wassenaer, Outcome at 4.5 years of children born after expectant management of early-onset hypertensive disorders of pregnancy American Journal of Obstetrics &Gynecology, 2011; 510.