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# A Systematic Study of Hypertension in Pregnancy along with its Causes

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***Abstract*--**Hypertension is one of the highly observed medical diseases, which considerably affects maternal and fetal morbidity and mortality. Hypertension is the most common medical disorder encountered during pregnancy. Hypertensive disorders are one of the major causes of pregnancy-related maternal deaths. There is a progressive increase in the incidence of hypertensive disorders in pregnancy worldwide. However, provision of blood pressure at a level sufficient to preserve maternal end organs plays key role in pregnancies progressing with high blood pressure. Here, we discuss types, risk factors, diagnosis, and management strategies of hypertensive disorders in pregnancies in the light of current guidelines. Moreover, we review hypertension related preeclampsia and eclampsia. The purpose of this review is to present the new staff statement and new definitions as well as management approaches for each of the hypertensive disorders during pregnancy. Finally, we review current management guidelines, treatment goals, and describe the potential risks and benefits associated with different classes of antihypertensive drugs.

***Keywords--Hypertension, Preeclampsia, Hypertensive disorders of pregnancy, high blood pressure***

**Introduction:** Hypertension also known as high blood pressure is a long-term medical condition in which the blood pressure in the arteries is persistently elevated. High blood pressure typically does not cause symptoms. Long-term high blood pressure, however, is a major risk factor for coronary artery disease, stroke, heart failure, atrial fibrillation, peripheral arterial disease, vision loss, chronic kidney disease, and dementia. High blood pressure is classified as primary (essential) hypertension or secondary hypertension. About 90–95% of cases are primary, defined as high blood pressure due to nonspecific lifestyle and genetic factors. Lifestyle factors that increase the risk include excess salt in the diet, excess body weight, smoking, and alcohol use [1]. The remaining 5–10% of cases are categorized as secondary high blood pressure, defined as high blood pressure due to an identifiable cause, such as chronic kidney disease, narrowing of the kidney arteries, an endocrine disorder, or the use of birth control pills. Blood pressure is expressed by two measurements, the systolic and diastolic pressures, which are the maximum and minimum pressures, respectively. For most adults, normal blood pressure at rest is within the range of 100–130 millimeters mercury (mmHg) systolic and 60–80 mmHg diastolic. For most adults, high blood pressure is present if the resting blood pressure is persistently at or above 130/80 or 140/90 mmHg. Different numbers apply to children. Ambulatory blood pressure monitoring over a 24-hour period appears more accurate than office-based blood pressure measurement. Lifestyle changes and medications can lower blood pressure and decrease the risk of health complications. Lifestyle changes include weight loss, physical exercise, decreased salt intake, reducing alcohol intake, and a healthy diet [2]. If lifestyle changes are not sufficient then blood pressure medications are used. Up to three medications taken concurrently can control blood pressure in 90% of people. The treatment of moderately high arterial blood pressure (defined as >160/100 mmHg) with medications is associated with an improved life expectancy. The effect of treatment of blood pressure between 130/80 mmHg and 160/100 mmHg is less clear, with some reviews finding benefit and others finding unclear benefit. High blood pressure affects between 16 and 37% of the population globally [3].

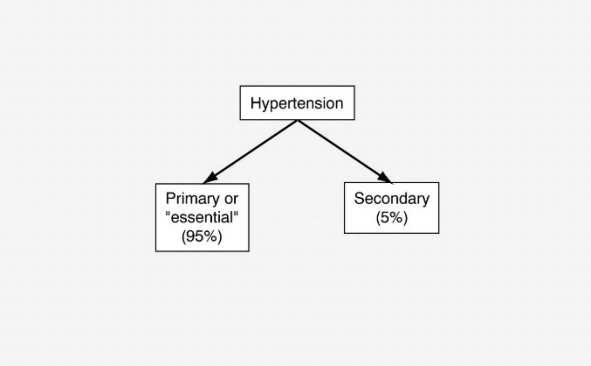


**Fig 1.** Pathophysiology Hypertension

**Signs and Symptoms Hypertension:** Most people with high blood pressure have no signs or symptoms, even if blood pressure readings reach dangerously high levels. A few people with high blood pressure may have headaches, shortness of breath or nosebleeds, but these signs and symptoms aren't specific and usually don't occur until high blood pressure has reached a severe or life-threatening stage. On physical examination, hypertension may be associated with the presence of changes in the optic fundus seen by ophthalmoscopy. The severity of the changes typical of hypertensive retinopathy is graded from I to IV; grades I and II may be difficult to differentiate [4]. The severity of the retinopathy correlates roughly with the duration or the severity of the hypertension.

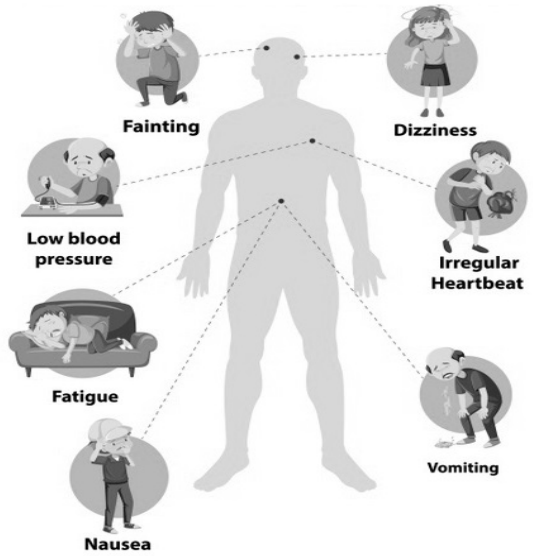


**Fig 2.** Signs and Symptoms Hypertension

**Secondary Hypertension:** Hypertension with certain specific additional signs and symptoms may suggest secondary hypertension, i.e., hypertension due to an identifiable cause. For example, Cushing's syndrome frequently causes truncal obesity, glucose intolerance, moon face, a hump of fat behind the neck/shoulder (referred to as a buffalo hump), and purple abdominal stretch marks. Hyperthyroidism frequently causes weight loss with increased appetite, fast heart rate, bulging eyes, and tremor. Renal artery stenosis (RAS) may be associated with a localized abdominal bruit to the left or right of the midline (unilateral RAS), or in both locations (bilateral RAS). Coarctation of the aorta frequently causes a decreased blood pressure in the lower extremities relative to the arms or delayed or absent femoral arterial pulses [5]. Pheochromocytoma may cause abrupt ("paroxysmal") episodes of hypertension accompanied by headache, palpitations, pale appearance, and excessive sweating [6].

**Hypertensive Crisis:** Severely elevated blood pressure (equal to or greater than a systolic 180 or diastolic of 110) is referred to as a hypertensive crisis. Hypertensive crisis is categorized as either hypertensive urgency or hypertensive emergency, according to the absence or presence of end organ damage, respectively. In hypertensive urgency, there is no evidence of end organ damage resulting from the elevated blood pressure. In these cases, oral medications are used to lower the BP gradually over 24 to 48 hours [7]. In hypertensive emergency, there is evidence of direct damage to one or more organs. The most affected organs include the brain, kidney, heart and lungs, producing symptoms which may include confusion, drowsiness, chest pain and breathlessness [8]. In hypertensive emergency, the blood pressure must be reduced more rapidly to stop ongoing organ damage, however, there is a lack of randomized controlled trial evidence for this approach.

**Hypertension Throughout Pregnancy:**

Gestational hypertension usually goes away after you give birth. Hypertension occurs in approximately 8–10% of pregnancies. Two blood pressure measurements six hours apart of greater than 140/90 mm Hg are diagnostic of hypertension in pregnancy.

High blood pressure in pregnancy can be classified as pre-existing hypertension, gestational hypertension, or pre-eclampsia. This condition happens when you only have high blood pressure* during pregnancy and do not have protein in your urine or other heart or kidney problems. It is typically diagnosed after 20 weeks of pregnancy or close to delivery. For emergency treatment in preeclampsia, IV hydralazine, labetalol and oral nifedipine can be used [9]. The ACOG Practice Bulletins also recommend that methyldopa and labetalol are appropriate first-line agents and beta blockers, and angiotensin-converting enzyme inhibitors are not recommended [10].

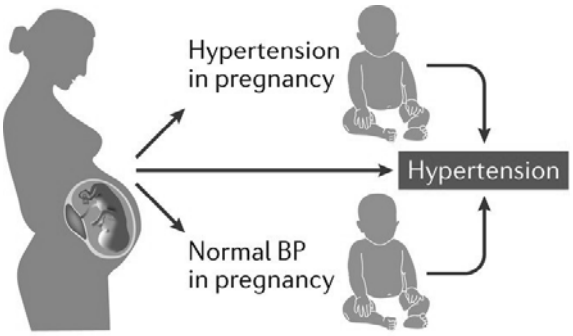


**Fig 3.** Hypertension and Pregnancy

Pre-eclampsia is a serious condition of the second half of pregnancy and following delivery characterized by increased blood pressure and the presence of protein in the urine. It occurs in about 5% of pregnancies and is responsible for approximately 16% of all maternal deaths globally. Pre-eclampsia also doubles the risk of death of the baby around the time of birth. Usually there are no symptoms in pre-eclampsia and it is detected by routine screening. When symptoms of pre-eclampsia occur the most common are headache, visual disturbance (often "flashing lights"), vomiting, pain over the stomach, and swelling [11]. Pre-eclampsia can occasionally progress to a life-threatening condition called eclampsia, which is a hypertensive emergency and has several serious complications including vision loss, brain swelling, seizures, kidney failure, pulmonary edema, and disseminated intravascular coagulation (a blood clotting disorder). In contrast, gestational hypertension is defined as new-onset hypertension during pregnancy without protein in the urine.

**Risks:** Some women have a greater risk of developing hypertension during pregnancy. These are:

- Women with chronic hypertension (high blood pressure before becoming pregnant).
- Women who developed high blood pressure or preeclampsia during a previous pregnancy, especially if these conditions occurred early in the pregnancy.
- Women who are obese prior to pregnancy.
- Pregnant women under the age of 20 or over the age of 40.
- Women who are pregnant with more than one baby.
- Women with diabetes, kidney disease, rheumatoid arthritis, lupus, or scleroderma.

**Children:** Failure to thrive, seizures, irritability, lack of energy, and difficulty in breathing can be associated with hypertension in newborns and young infants. In older infants and children, hypertension can cause headache, unexplained irritability, fatigue, failure to thrive, blurred vision, nosebleeds, and facial paralysis.

**TYPES**

**Preeclampsia:** Preeclampsia is a condition that typically starts after the 20th week of pregnancy and is related to increased blood pressure and protein in the mother's urine (as a result of kidney problems). Preeclampsia affects the placenta, and it can affect the mother's kidney, liver, and brain. When preeclampsia causes seizures, the condition is known as eclampsia--the second leading cause of maternal death in the U.S. Preeclampsia is also a leading cause of fetal complications, which include low birth weight, premature birth, and stillbirth [12]. There is no proven way to prevent preeclampsia. Most women who develop signs of preeclampsia, however, are closely monitored to lessen or avoid related problems. The only way to "cure" preeclampsia is to deliver or abort the baby [13].

**Diagnosis:** Unfortunately, there is no single test to predict or diagnose preeclampsia. Key signs are

increased blood pressure and protein in the urine (proteinuria). Other symptoms that seem to occur with preeclampsia include persistent headaches, blurred vision, or sensitivity to light, and abdominal pain. All of these sensations can be caused by other disorders; they can also occur in healthy pregnancies. Regular visits are scheduled to track blood pressure and level of protein in urine, to order and analyze blood tests that detect signs of preeclampsia, and to monitor fetal development more closely.

**Classification:** A classification of hypertensive disorders of pregnancy uses 4 categories:

- chronic hypertension.
- preeclampsia-eclampsia.
- preeclampsia superimposed on chronic hypertension.
- gestational hypertension (transient hypertension of pregnancy or chronic hypertension identified in the latter half of pregnancy).

This terminology is preferred over the older but widely used term pregnancy-induced hypertension (PIH) because it is more precise. The newer terminology simply reflects relation of pregnancy with either the onset or first detection of hypertension and that the question of causation, while path genetically interesting, is not the important point for most health care purposes [14]. This classification treats HELLP syndrome as a type of preeclampsia rather than a parallel entity.

**Prevention:** Blood pressure control can be accomplished before pregnancy. Medications can control blood pressure. Certain medications may not be ideal for blood pressure control during pregnancy such as angiotensin-converting enzyme (ACE) inhibitors and angiotensin II (AII) receptor antagonists. Controlling weight gain during pregnancy can help reduce the risk of hypertension during pregnancy.

**Prognosis:** The effects of high blood pressure during pregnancy vary depending on the disorder and other factors. Preeclampsia does not in general increase a woman's risk for developing chronic hypertension or other heart-related problems. Women with normal blood pressure who develop preeclampsia after the 20th week of their first pregnancy, short-term complications--including increased blood pressure--usually go away within about 6 weeks after delivery. Some women, however, may be more likely to develop high blood pressure or other heart disease later in life [15]. More research is needed to determine the long-term health effects of hypertensive disorders in pregnancy and to develop better methods for identifying, diagnosing, and treating women at risk for these conditions. Even though high blood pressure and related disorders during pregnancy can be serious, most women with high blood pressure and those who develop preeclampsia have successful pregnancies. Obtaining early and regular prenatal care is the most important thing you can do for you and your baby [16].

**Consequences of Hypertension in Pregnancy:** Hypertension in pregnancy is a major cause of maternal morbidity and mortality in Pakistan. There is approximately one maternal death due to preeclampsia-eclampsia per 100,000 live births, with a case-fatality rate of 6.4 deaths per 10,000 cases. The outcome of hypertension in pregnancy is, not surprisingly, affected by multiple factors [17]. These embrace (but are not limited to) gestational age at onset, severity of disease, and the presence of co morbid conditions including diabetes mellitus, renal disease, thrombophilia, or preexisting hypertension. Adverse outcomes related to hypertension in pregnancy can be divided into short-term versus long-term complications. While short-term complications can be further sub grouped into maternal and fetal complications, long-term outcomes are mainly maternal [18].

**Short-Term Complications:**

***a. Maternal.*** Outcomes for pregnancy complicated by hypertension range from uneventful pregnancy in women with chronic, controlled hypertension to death in cases of preeclampsia-eclampsia. The major adverse outcomes include central nervous system (CNS) injuries such as seizures (eclampsia), hemorrhagic and ischemic strokes, hepatic damage ranging from transaminase elevation, the so-called

"HELLP syndrome" (hemolysis, elevated liver enzymes, and low platelets) [19].

***b. Fetal.*** The effects of chronic, controlled hypertension in pregnancy on the fetus are minimal. However, preeclampsia-eclampsia can lead to higher frequency of induced labor, fetal growth restriction, neonatal respiratory difficulties, and increased frequency admission to neonatal intensive care unit [20]. Hypertension in pregnancy, even in its more severe forms, causes only minimal increased risk for perinatal or fetal death.

**Long-Term Complications:** Though hypertension in pregnancy/preeclampsia is usually thought of as a short-term problem that resolves itself with delivery, it still carries significant risk for remote complications.

***a. Risk of Recurrence.*** The risk of recurrent preeclampsia in subsequent pregnancies varies with the severity and time of onset of the acute episode. It is estimated that women with severe, early preeclampsia during their first pregnancy will have a high risk of recurrent preeclampsia in their subsequent pregnancies (25–65%).

***b. Cardiovascular Complications.*** The association between preeclampsia and cardiovascular diseases is both well described and well documented. Women with history of preeclampsia are at significantly increased risk to develop hypertension, ischemic heart disease, stroke, type II diabetes, and venous thromboembolism in comparison with women without history of the disease.

***c. Renal Disease.*** More renal biopsies are undertaken in victims of preeclampsia than in unaffected women. There is also an increased risk for women with history of preeclampsia to develop end-stage renal disease (ESRD), though the absolute risk appears to be low.

***d. Cancer.*** Multiple observational studies evaluated the possible association between hypertension in pregnancy and cancer risk. Overall, women with preeclampsia were found to be at reduced risk or had no excess risk of cancer when followed by extended periods postpartum.

**Treatment of Hypertension:** The first principle of treatment of hypertension in pregnancy is to correctly diagnose the category and severity of the hypertension. Implicit to this guide is the aforementioned limited value of attempting to completely normalize the blood pressure in this setting. The second and perhaps even more important principle is to understand the potential vulnerability of the fetus to treatment.

***Chronic Hypertension:*** The estimated prevalence of chronic hypertension in pregnancy in Pakistan is 3% and has been increasing over time. This increase in prevalence has been attributed to the increased prevalence of obesity and delay in childbearing to ages, when chronic hypertension is more common.

Women with the following conditions are at increased risk for maternal and fetal complications and should have a lower threshold for treatment.

- underlying renal disease.
- secondary hypertension.
- end-organ damage (e.g., ventricular dysfunction, retinopathy);
- maternal age over forty years old.
- micro vascular disease.
- history of stroke
- previous perinatal loss.
- diabetes.

***Gestational Hypertension:*** Gestational hypertension is elevated blood pressure, which develops after 20 weeks of gestation in a previously normotensive woman, though without proteinuria. It complicates 6% of all pregnancies. These women are at high risk for developing preeclampsia that can occur at any time including the first postpartum week and need close monitoring. Approximately 15–45% will eventually develop preeclampsia The goal of treatment is same as chronic hypertension.

***Preeclampsia:*** The general principles as outlined to guide the treatment of women with chronic hypertension are applicable to the preeclamptic

patients. Close monitoring to recognize fetal distress while receiving treatment is essential. Early onset preeclampsia (less than thirty-four weeks) requires careful use of antihypertensive medications, bed rest, and in-hospital monitoring of both mother and fetus. This approach may help delay delivery and thus improve fetal outcome [21]. Often these patients are intravascularly depleted and are more susceptible to precipitous, drug-induced drops in blood pressure. If signs of other fetal or maternal distress are noted, delivery is the definitive treatment [22]. Concerns about hypotension and decreased uteroplacental blood flow are central to the treatment of the preeclamptic patient, since placental ischemia is the focal point of preeclampsia pathophysiology. In most instances, delivery of preeclamptics is indicated after 37 weeks of gestation or when fetal lung maturity has been confirmed [23].

***Superimposed Preeclampsia***: Superimposed preeclampsia complicates approximately 25% of pregnancies in women with chronic hypertension [24] Principles of management are the same as outlined earlier for preeclampsia, although these women have more likelihood of developing severe hypertension, requiring multiple antihypertensive medications.

**Conclusion**: Hypertension is most frequently encountered complication in pregnancy. Hypertension is the most common medical disorder encountered during pregnancy. Hypertensive disorders are one of the major causes of pregnancy-related maternal deaths. It can be fatal for mother and it can cause severe morbidity and mortality in infant as well, if it is failed to provide appropriate therapy. Thus, early diagnosis, treatment and knowledge of conditions with hazardous potential will play an important role in reducing maternal and fetal morbidity and mortality We are hopeful that this in depth critique will stimulate the blossoming research in the field and assist practitioners to identify women at risk and more effectively treat affected individuals.

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