

# A Clinical Overview on Hypertension in Pregnancy

Moses Salifu

Department of general medicine, Ghana institute of Medical Sciences, Ghana

## ABSTRACT

Hypertension in pregnancy is a worldwide health problem for women and their infants accounting for 10% of pregnancies and associated with increased maternal and neonatal morbidity and mortality. HDP are a leading cause of maternal mortality in the major health institutions in Ghana and causes about 30% of maternal deaths. Hypertensive pregnancy in the mother have short term complications which include cerebrovascular complications such cerebral hemorrhage and seizures, pulmonary edema and kidney failure. Other maternal complications of hypertensive pregnancy include hepatocellular injury, thrombocytopenia, central nervous system dysfunction, oliguria, disseminated intravascular coagulation and placental abruption. Perinatal complications regarding the fetus include preterm birth, small for gestational age (SGA) neonate, intrauterine growth restriction, low birth weight neonate, intrauterine and perinatal death. Although maternal hypertensive pregnancy disorders pose great threats to the life of the mother and may cause fetal developmental abnormalities, they have attracted relatively little research interest.

## INTRODUCTION

Snake bites are well known medical emergencies in many parts of the world, especially in rural areas. India is estimated to have the highest snake bite mortality in the world. World Health Organisation (WHO) estimates places the number of bites to be 83,000 per annum with 11,000 deaths (1). In India, the common species of snakes seen are Elapidae which includes common cobra, king cobra and krait, Viperidae which includes Russell's viper, pit viper and saw-scaled viper and Hydrophidae (the sea snakes) (2).

Early morning neuromuscular syndrome (EMNS) or locked-in syndrome is a rare presentation of elapid bite that is commonly seen among farmers and slum dwellers that sleep out in open environment (3). These patients are brought to the hospital with a history of ptosis and paralysis with no bite marks or local skin changes on the body. This is characteristic of the nocturnally active kraits whose bites are generally painless with minimal to no skin changes. Kularatna et al found that 60-70% of snakebites occurred while the patients were asleep with 17% of these having undetectable bite marks on the body (4).

There have been various case reports on neurological manifestations mimicking brain death in krait bite - "Is the patient brain dead" by R Agarwal et al, "Snake bite mimicking brain death" by Joseph John et al, "Early morning neuromuscular syndrome" by Mohd Haneef, "Suppression of brain stem reflexes in snake bite" by JP Goyal et al, two cases of locked in syndrome in snake bite reported by S Prakash et al and two cases of early morning neuromuscular syndrome (EMNS) in the Tropics - masquerading as brain death by RK Anadure et al (5-9)

Elapid neurotoxicosis acts at the peripheral neuromuscular junctions either post-synaptically or pre-synaptically causing paralysis. This paralysis is first detected as bilateral ptosis and external ophthalmoplegia (10), gradually progressing to involve muscles of palate, jaw, tongue, larynx, neck and muscles of deglutition - usually but strictly not in that order (11). The proximal muscles of the limbs are involved earlier than the distal, and there can be complete quadriplegia and locked-in state (8). Patients with acute respiratory failure are categorised as severe envenomation (6). This generalized flaccid paralysis may occur with consciousness provided the patient is not in circulatory failure. The pre-paralytic symptoms may include numbness and paraesthesia. The neurotoxic effects

\*Correspondence to: Salifu M, Department of general medicine, Ghana institute of Medical Sciences, Ghana; Tel No: 9515181107; E-Mail: salifumoses87@gmail.com

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spontaneously resolve over several days, median time of onset for recovery for respiratory failure is 2 days or in response to anti venom and anticholinesterase (6).

**Keywords:** Pregnancy, Hypertension, thrombocytopenia, nulliparity, pathophysiology

## METHODS

Hypertension is a non-communicable disease that is associated with high morbidity and mortality. The disease affects up to one third of world population, representing a great threat to people all over the world [1]. According to the world health organization, hypertension caused greater than 7 million deaths globally in 2010. Hypertension increases the risk of developing cardiovascular diseases and renal failure. Pregnant women suffer much greater complications with devastating effects on the health of the pregnant woman and the fetus. Hypertensive disorders in pregnancy are a worldwide health problem for women and their infants accounting for 10% of pregnancies and associated with increased maternal and neonatal morbidity and mortality [2]. It has been estimated that the hypertensive disorders of pregnancy cause 30,000 maternal deaths annually [3]. Hypertensive disorders of pregnancy are noted as the second commonest cause of direct maternal death in developed countries [4]. The incidence of HDP varies from country to country and is also affected by the definition or classification used. Generally the problem is more common in the developing countries than it is in the developed countries. Several studies have shown that nulliparity, extreme ages, race and others as risk factors for this problem [5]. According to the American college of obstetricians and gynecologists, hypertension in pregnancy is one of the significant causes of maternal and perinatal morbidity and mortality worldwide, complicating up to 10% of all pregnancies. Hypertensive disorders of pregnancy remains a critical health issue for women and their infants worldwide, especially in developing countries.

In Ghana, hypertensive disorders in pregnancy are a leading cause of maternal mortality in the major health institutions and causes about 30% of maternal deaths [6]. Similar occurrences have been recorded in some African countries such as Nigeria, Cameroon and South Africa [7]. Although maternal hypertensive pregnancy disorders pose great threats to the life of the mother and may cause fetal developmental abnormalities, they have attracted relatively little research interest.

## DIAGNOSIS AND CLASSIFICATION OF BLOOD PRESSURE

Hypertension in pregnancy is defined as systolic blood pressure (SBP)  $\geq 140$  mmHg and/or diastolic blood pressure (DBP)  $\geq 90$  mmHg. According to the levels of BP, hypertension is mild if SBP is measured between 140–149 mmHg and DBP 90–99 mmHg, moderate if SBP is 150–159 and DBP 100–109 mmHg and severe if SBP is equal or greater than 160 mmHg and DBP than 110 mmHg [2]. Pre-hypertension was also introduced by the 7th Joint National Committee on Prevention, Detection, Evaluation and Treatment of Hypertension as a new class of blood pressure [1]. The committee proposed that a systolic BP

between 120 and 139 mmHg and/or diastolic BP between 80 and 89 mmHg is indicative of a pre-hypertensive state. Hypertensive disorders of pregnancy is not a single disorder but represent a broad range of conditions including chronic hypertension (pre-existing hypertension), gestational hypertension (hypertension after 20 weeks gestation), pre-eclampsia (gestational hypertension with proteinuria  $>0.3$  g/24 h) and eclampsia (pre-eclampsia with seizures).

## RISK FACTORS FOR HYPERTENSION IN PREGNANCY

Risk factors for developing hypertensive disorders of pregnancy include parity, age, gestational age, obesity and diabetes mellitus [8]. In a recent epidemiological study, markedly increased risk for all hypertensive disorders in pregnancy has been found in Black and some Hispanic women compared to non-Hispanic white women, while Asian women are found to have a relatively decreased risk. The same study showed a positive correlation between pre-pregnancy weight and risk of HDP, whereas parity and smoking were shown to be protective for pre-eclampsia development [9]. There is however conflicting data for parity, as both nulliparity and multiparity seem to be predisposing factors to higher risk for pre-eclampsia. Maternal age  $>30$  years and increased body mass index (BMI) have been found to be positively correlated to risk for HDP in Arab women [10]. Increased pre-pregnancy BMI has also been found to be a risk factor for pre-eclampsia in twin pregnancies. Furthermore, excessive weight gain during pregnancy was shown to be positively correlated to pre-eclampsia risk [11]. Genetics and family history of PE are considered significant risk factors for PE in pregnancy [12].

## COMPLICATIONS OF HYPERTENSIVE DISORDERS OF PREGNANCY

Complications associated with hypertensive disorders of pregnancy result in one-tenth of maternal death in Africa and one quarter in Latin America [13]. Hypertensive pregnancy in mothers have short term complications which include cerebrovascular complications such cerebral hemorrhage and seizures, pulmonary edema and kidney failure [14]. It has also been found that women with history of hypertension in pregnancy have increased risk of long-term cardiovascular diseases [15]. Another study showed that hemolysis, elevated liver enzyme low platelet count (HELLP) is the most common cause of death in cases of pre-eclampsia [16]. Other maternal complications of hypertensive pregnancy include hepatocellular injury, thrombocytopenia, central nervous system dysfunction, oliguria, disseminated intravascular coagulation and placental abruption [17]. Perinatal complications regarding the fetus include preterm birth, small for gestational age (SGA) neonate, intrauterine growth restriction, low birth weight neonate, intrauterine and perinatal death (Studies et al., 2017; Butalia et al., 2018). About 9% of recorded stillbirths occurred in pregnancies complicated by hypertensive disorders [8]. Children born of hypertensive pregnant women are reported to have increased long term health risks which include hypertension in

childhood and adulthood and a possibility of impaired lipid profile, a 2-fold higher risk of stroke [19]. It has also been found out that maternal hypertensive disorders during pregnancy have deleterious effects on the mental health and cognitive ability of the offspring later in life [20].

In Ghana, hypertensive disorders of pregnancy is now the leading cause of maternal mortality in major health care institutions [7]. Maternal mortality ratio in the country is excessively high and HDP cause about 9% of maternal death (Ghana maternal health survey, 2007). A study conducted at the Korle Bu Teaching Hospital found the prevalence of HDP to be 21.4% [7].

## PATHOPHYSIOLOGY OF HYPERTENSION IN PREGNANCY

Hypertension in pregnancy has a multifaceted pathophysiology. Sufficient blood supply to the developing embryo and maintenance of normal fetal intrauterine growth occurs as result of cardiovascular and hemodynamic changes which occur significantly early in pregnancy. These changes include increased cardiac output and heart rate, increased maternal plasma volume, and decreased maternal systemic vascular resistance and arterial blood pressure [8]. The increased maternal plasma volume is caused by the renin-angiotensin-aldosterone system. Vasodilator synthesis is also increased as a compensatory mechanism in order to maintain normal blood pressure. These vasodilators include the kallikrein-kinin system, prostacyclin, nitric oxide and vascular-endothelial growth factor (VEGF) [21]. In hypertensive disorders of pregnancy, these normal physiological adaptations fail to maintain normal blood pressure resulting in associated complications.

Placental ischemia is widely accepted to be profoundly involved in the development of hypertension in pregnancy. This is based on the fact that the placenta is rich in blood vessels and therefore are the basis for developing placental ischemia. The developing fetus is connected to the uterine system through the placenta which play several important roles in the survival of the fetus by transporting gases, nutrients and waste between the maternal and fetal circulation systems, providing immunological protection and releasing of factors necessary for pregnancy [22]. Many theories about the pathogenesis of hypertension in pregnancy have been developed over the years and the role of the placenta is central to all. The pathophysiology of hypertension in pregnancy has been described generally by a concept known as the 'two-stage theory'. A number of factors including genetic, immunological and environmental influences, might result in abnormal placentation and subsequently reduce blood flow, leading to placental ischemia [23]. This constitutes the first stage. Then, during the second stage the poorly perfused placenta releases certain chemicals into the circulation. These molecules include antiangiogenic factors [such as soluble fmslike tyrosine kinase-1 (sFlt1) and soluble endoglin (sEng)], inflammatory mediators and angiotensin II type I receptor activating autoantibodies (AT1-AA) [24]. Excessive inflammatory response is caused by these chemicals and cause an oxidative stress environment in the vasculature, resulting in a cascade of endothelial activation and

dysfunction, with manifestations of increased vasoconstriction and decreased vasodilatation [25]. The increased vasoconstriction and decreased vasodilation eventually results in the hypertension in the pregnant woman.

## CONCLUSION AND RECOMMENDATION

Hypertension in pregnancy is a common health problem which is mostly neglected as no much research has been done on it. It is therefore recommended that there is the need to educate women on the causes of hypertensive disorders of pregnancy, ways of preventing them, and why they should engage in healthy practices to avoid or reduce the risk of getting those disorders that could threaten the lives of the mother and that of the fetus. Accurate data collection and records of hypertension among pregnant women should be undertaken, using globally recognized classification. Accurate data management is crucial in estimating the true burden of HDP and this will help improve maternal health by enhancing and directing appropriate strategies necessary for prevention and treatment. Women should be advised to visit the ANC regularly when pregnant for routine antenatal BP measurement to help identify hypertensive women and provide immediate treatment. Government should provide resources to help prevent and provide treatment for hypertensive pregnant women. Government should also strengthen and expand the nursing and midwifery workforce by training and educating primary healthcare nurses and midwives.

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