

A Prospective Observational Study Assessing the Effect of Pregnancy Induced Hypertension on Maternal and Fetal Outcomes

Vidya Paul¹, Seema²

¹Senior Resident, Department of Obstetrics and Gynecology, Darbhanga Medical College and Hospital, Darbhanga, Laheriasarai, Bihar, India

²Associate Professor, Department of Obstetrics and Gynecology, Darbhanga Medical College and Hospital, Darbhanga, Laheriasarai, Bihar, India

Received: 10-01-2023 Revised: 20-02-2023 / Accepted: 15-03-2023

Corresponding author: Dr. Vidya Paul

Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the effect of pregnancy induced hypertension on maternal and fetal outcomes.

Methods: A prospective observational study One hundred women with pregnancy-related hypertensive disorders admitted for delivery were included in the study.

Results: A total of 2,000 births were performed within the designated timeframe at the hospital under investigation. Among the whole sample, a subset of 100 cases (5%) were identified as instances of pregnancy-related hypertension disorders, and these patients were selected for inclusion in the research. The average age of the participants was 22 ± 6 years. The average systolic pressure was found to be 158.92 ± 13.87 mmHg, while the average diastolic pressure was measured at 104.66 ± 6.34 mmHg. Additionally, the mean gestational age was determined to be 35.95 ± 2.849 weeks. The primary hypertension condition associated with pregnancy was eclampsia, accounting for 43% (n=43) of cases, followed by preeclampsia, which accounted for 25% (n=25) of cases. All of these ladies were monitored for the occurrence of any complications. Complications did not arise in 33% of the women. Postpartum haemorrhage (PPH) emerged as the most prevalent complication among the cohort of women who had one or more problems during or after childbirth. The majority of women diagnosed with postpartum haemorrhage (PPH) had symptoms of either preeclampsia or eclampsia. Following postpartum haemorrhage (PPH), placental abruption emerged as the second most prevalent maternal complication. The majority of women who had placental abruption were diagnosed with pregnancy-induced hypertension (PIH).

Conclusion: The hypertension diseases that were most often seen in this study were preeclampsia and eclampsia. Placental abruption and postpartum haemorrhage were identified as the most often seen maternal problems. The foetal problems most often seen were meconium aspiration syndrome, followed by preterm delivery, intrauterine growth restriction (IUGR), and low birth weight (LBW).

Keywords: pregnancy induced hypertension, maternal and fetal outcomes

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Pregnancy-related hypertension diseases have a prevalence rate ranging from 6% to 8% among all pregnancies. [1] Maternal and foetal outcomes are well recognized to be negatively influenced by this factor on a worldwide scale, particularly in regions with limited resources and infrastructure. [2] Hypertensive disorders of pregnancy include a range of conditions that span from slightly raised blood pressure to the malfunctioning of many organs. [3] Pregnancy-related hypertensive disorders have been categorized into four distinct classifications by reputable organizations such as the American College of Obstetricians and Gynaecologists (ACOG) and the United Nations Organization. These classifications include chronic

hypertension (HTN), pregnancy-induced hypertension (PIH), preeclampsia/eclampsia, and superimposed preeclampsia/eclampsia. [4,5] Hypertension (HTN) accompanied by proteinuria, often diagnosed as preeclampsia, typically manifests from the 20th week of gestation and onwards, and is known to complicate between 2% to 8% of pregnancies. [6]

Pregnancy-related hypertensive emergencies may present as HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome or eclampsia (preeclampsia with seizures). [3] After hemorrhage, preeclampsia and eclampsia are considered the most significant causes of maternal and perinatal

mortality and morbidity. [3,7] Global literature has identified various risk factors for hypertensive disorders in pregnancy, such as obesity, family history of HTN, alcohol use, heart failure, stroke, smoking, and left ventricular hypertrophy. [8-10] When these high-risk pregnancies are followed until childbirth, up to 22% of pregnancies resulted in maternal and fetal complications. [11] The risk of adverse events in newborns depends on the severity of hypertensive disorders during pregnancy. [12]

Hypertensive pregnancies have increased risks of fetal growth restriction, placental abruption, preterm birth, cesarean delivery, and preeclampsia, which is a dangerous complication accompanied by proteinuria and may result in serious adverse consequences for the mother and fetus. [13-15] Preeclampsia is also associated with persistent postpartum cardiovascular impairment. [16] Therefore, advice for pregnancies with hypertension meeting previous criteria (systolic blood pressure [SBP] ≥ 140 mm Hg or a diastolic blood pressure [DBP] ≥ 90 mm Hg) included achieving blood pressure (BP) control with medications and lifestyle modification. [17]

The aim of the present study was to assess the effect of pregnancy induced hypertension on maternal and fetal outcomes.

Materials and Methods

A prospective observational study was conducted in the Department of Obstetrics and Gynaecology Darbhanga Medical College and Hospital, Darbhanga, Laheriasarai, Bihar, India for the period of one year. One hundred women with pregnancy-related hypertensive disorders admitted for delivery were included in the study.

The study population consisted of patients who met the criteria for inclusion, which required a diagnosis of at least one hypertensive illness associated to pregnancy (such as chronic hypertension, chronic hypertension superimposed on preeclampsia, pregnancy-induced hypertension, preeclampsia, eclampsia, or HELLP syndrome). These patients were admitted to the department for the purpose of delivery or expulsion. The diagnosis of hypertensive disease of pregnancy was made according to the criteria provided by the American College of Obstetricians and Gynaecologists (ACOG). The research excluded patients who did not have a pregnancy-related hypertension illness, patients who did not provide permission to participate, and patients who were received in an emergency state of delirium, rendering them unable to talk. The demographic characteristics of the patients, including their age, gestational age as determined by ultrasound, blood pressure measurements, and the specific kind of pregnancy-related hypertension disease, were documented for all individuals included in the study. The patients were monitored for the occurrence of any complications during their hospitalization, including the periods before, during, and after birth or evacuation. The maternal result was documented, and the occurrence of any neonatal problem was detected.

Data were analyzed using IBM SPSS Statistics for Windows, Version 22.0. (IBM Corp., Armonk, NY). The mean and standard deviation was calculated for numerical values such as age and blood pressure at the time of admission. Frequencies were calculated for hypertensive disorders of pregnancy, as well as maternal and fetal complications.

Results

Table 1: Frequencies of hypertensive disorders

Hypertensive Disorder	Frequency (%)
Pregnancy-induced hypertension	24 (24%)
Preeclampsia	25 (25%)
Eclampsia	43 (43%)
Chronic hypertension	5 (5%)
Chronic hypertension superimposed	2 (2%)
HELLP	1 (1%)
Total	100 (100%)

There were 2,000 deliveries conducted in the hospital during the study period. Out of these, 100 (5%) were diagnosed cases of pregnancy-related hypertensive disorders, which were included in the study. The mean age of participants was 22 ± 6 years. Mean systolic pressure was 158.92 ± 13.87

mmHg, mean diastolic pressure was 104.66 ± 6.34 mmHg, and mean gestational age was 35.95 ± 2.849 weeks. The major pregnancy-related hypertensive disorder was eclampsia (n=43; 43%) and preeclampsia (n=25; 25%).

Table 2: Maternal complications

Pregnancy-related HTN disorders (N=100)	Maternal Complications								
	Placental abruption	DIC	PPH	ARF	ARDS	PRES	P. edema	CVA	No complication
PIH (n=24; 24%)	8 (33.3%)	0	8 (33.33%)	0	0	0	2 (8.33%)	0	4 (16.66%)
Preeclampsia (n=25; 25%)	5 (20%)	2 (8%)	8 (32%)	2 (8%)	2 (8%)	0	1 (4%)	0	5 (20%)
Eclampsia (n=43; 43%)	2 (4.65%)	0	10 (23.25%)	3 (6.97%)	1 (2.32%)	2 (4.65%)	3 (6.97%)	3 (6.97%)	19 (44.18%)
HELLP (n=1; 1%)	0	0	0	1 (50%)	1 (50%)	0	0	0	0 (%)
Chronic HTN (n=4=5; 4=5%)	0	0	0	0	0	0	0	0	5 (100%)
Chronic HTN superimposed (n=2; 2%)	0	1 (50%)	0	1 (50%)	0	0	0	0	0
Total (N=100; 100%)	15	3	26	7	4	2	6	3	33

All of these women were observed for the development of any complication. There were no complications in 33 (33%) women. Among the women who developed one or more complications during or after delivery, postpartum hemorrhage (PPH) was the most frequent. Most of the women

with PPH were either preeclamptic or eclamptic. After PPH, placental abruption was the second most frequent maternal complication. Most of the women who developed placental abruption had PIH.

Table 3: Fetal complications

Pregnancy-related HTN disorders (N=100)	Neonatal Complications								
	IUGR	Preterm	RDS	Meconium aspiration	IUD	Stillbirth	LBW	NND	No complication
PIH (n=24; 24%)	1 (4.16%)	0	1 (4.16%)	4 (16.66%)	3 (12.5%)	0	3 (12.5%)	2 (8.33%)	10 (41.66%)
Preeclampsia (n=25; 25%)	1 (4%)	3 (12%)	3 (12%)	3 (12%)	2 (8%)	0	4 (16%)	0	9 (36%)
Eclampsia (n=43; 43%)	8 (18.60%)	7 (16.27%)	1 (2.32%)	6 (13.95%)	5 (11.62%)	4 (9.30%)	2 (4.65%)	0	10 (23.25%)
HELLP (n=1; 1%)	0	1 (100%)	0	0	0	0	0	0	0
Chronic HTN (n=5; 5%)	0	0	0	0	0	0	0	0	5 (100%)
Chronic HTN superimposed (n=2; 2%)	0	0	0	0	0	0	0	0	2 (100%)
Total (N=100; 100%)	10	11	5	13	10	4	9	2	36

Among the newborns with complications, 13 babies were diagnosed with meconium aspiration syndrome, 11 were preterm, 9 had low birth weight (LBW), 10 had intrauterine growth restriction (IUGR), and five were diagnosed with respiratory distress syndrome (RDS). No complications were seen in the babies of mothers with chronic HTN and chronic HTN superimposed.

Discussion

Hypertension during pregnancy is defined as having a systolic blood pressure equal to or more than 140 mmHg, a diastolic blood pressure equal to or greater than 90 mmHg, or both. The assessment of Pregnancy induced hypertension necessitates consideration of both elevations in systolic and diastolic blood pressure. [18] Pregnancy induced hypertension (PIH) refers to the development of

high blood pressure in women who had previously maintained normal blood pressure levels, occurring specifically after the 20th week of gestation. During pregnancy, pregnancy-induced hypertension may be broadly classified into three categories: gestational hypertension, pre-eclampsia, and eclampsia. [19] Severe preeclampsia during pregnancy is defined as having a systolic blood pressure equal to or more than 160 mmHg, a diastolic blood pressure equal to or greater than 110 mmHg, or both. Eclampsia is a very severe manifestation of pregnancy-induced hypertension, occurring in about one out of every 1,600 pregnancies and often manifesting in the latter stages of gestation. Pregnancy induced hypertension situations are characterized by three basic features, namely elevated blood pressure,

presence of protein in the urine, and the development of pathologic edema. [20-22]

There were 2,000 deliveries conducted in the hospital during the study period. Out of these, 100 (5%) were diagnosed cases of pregnancy-related hypertensive disorders, which were included in the study. The mean age of participants was 22 ± 6 years. Mean systolic pressure was 158.92 ± 13.87 mmHg, mean diastolic pressure was 104.66 ± 6.34 mmHg, and mean gestational age was 35.95 ± 2.849 weeks. The major pregnancy-related hypertensive disorder was eclampsia ($n=43$; 43%) and preeclampsia ($n=25$; 25%). All of these women were observed for the development of any complication. There were no complications in 33 (33%) women. Among the women who developed one or more complications during or after delivery, postpartum hemorrhage (PPH) was the most frequent. Most of the women with PPH were either preeclamptic or eclamptic. After PPH, placental abruption was the second most frequent maternal complication. Most of the women who developed placental abruption had PIH. Preeclampsia and eclampsia are the major causes of high morbidity and mortality for both mother and baby, particularly in developing countries. [23] Placental abruption and PPH were the most common maternal complications in pregnant women with preeclampsia and eclampsia in this study. Other complications experienced were disseminated intravascular coagulation, acute renal failure, acute RDS, posterior reversible encephalopathy syndrome, and pulmonary edema. This result was comparable to the results of studies conducted in India, which also reported placental abruption as a major concern. [24] Pregnancy-related hypertensive disorders are not only a concern for maternal health but also fetal health. The most common neonatal complication seen in preeclampsia in this study was LBW. In his study, Xiong et al. found a positive association not only between LBW and preeclampsia but also between gestational age and preeclampsia. [25] The most common fetal complications in pregnant women with eclampsia in this study were IUGR and preterm birth. A study published in Tehran also identified eclampsia as a risk factor for preterm birth. [26]

Among the newborns with complications, 13 babies were diagnosed with meconium aspiration syndrome, 11 were preterm, 9 had low birth weight (LBW), 10 had intrauterine growth restriction (IUGR), and five were diagnosed with respiratory distress syndrome (RDS). No complications were seen in the babies of mothers with chronic HTN and chronic HTN superimposed.

Conclusion

The hypertension diseases that were most often seen in this study were preeclampsia and eclampsia. Placental abruption and postpartum haemorrhage were identified as the most often seen maternal problems. The foetal problems most often seen were meconium aspiration syndrome, followed by preterm delivery, intrauterine growth restriction (IUGR), and low birth weight (LBW). There is a need to implement strategies aimed at mitigating the risk factors associated with the elevated prevalence of preeclampsia and eclampsia at the community level. It is important to ensure that there is widespread awareness and sufficient allocation of resources at all levels in order to effectively mitigate the maternal and foetal problems that arise from hypertensive disorders of pregnancy. It is recommended that the implementation of programmes aimed at increasing community knowledge be considered, with the provision of well-equipped health facilities capable of effectively detecting and managing preeclampsia and other hypertension illnesses in their early stages.

References

1. Program NH. Report of the national high blood pressure education program working group on high blood pressure in pregnancy. American journal of obstetrics and gynecology. 2000 Jul 1;183(1):s1-22.
2. Vigil-De Gracia P, Montufar-Rueda C, Ruiz J. Expectant management of severe preeclampsia and preeclampsia superimposed on chronic hypertension between 24- and 34-weeks' gestation. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2003 Mar 26;107(1):24-7.
3. Yücesoy G, Özkan S, Bodur H, Tan T, Çalışkan E, Vural B, Çorakçı A. Maternal and perinatal outcome in pregnancies complicated with hypertensive disorder of pregnancy: a seven-year experience of a tertiary care center. Archives of gynecology and obstetrics. 2005 Nov; 273:43-9.
4. McCaw Binns AM, MacGillivray I, Hawkins N, Golding J, Ashley DE. International variation in the incidence of hypertension in pregnancy among primiparae: the Jamaican experience abstract. WEST INDIAN MED. J. 1997:29-.
5. Schroeder BM. ACOG practice bulletin on diagnosing and managing preeclampsia and eclampsia. American family physician. 2002 Jul 15;66(2):330-1.
6. Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. Obstetrics & Gynecology. 2003 Jul 1;102(1): 181-92.
7. Zhang WH, Alexander S, Bouvier-Colle MH, Macfarlane A, MOMS-B Group. Incidence of

- severe pre-eclampsia, postpartum haemorrhage and sepsis as a surrogate marker for severe maternal morbidity in a European population-based study: the MOMS-B survey. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2005 Jan;112(1):89-96.
8. Shey Wiysonge CU, Ngu Blackett K, Mbuagbaw JN. Risk factors and complications of hypertension in Yaounde, Cameroon: cardiovascular topics. *Cardiovascular Journal of South Africa*. 2004 Sep 1;15(5):215-9.
 9. Pridjian G, Puschett JB. Preeclampsia. Part 1: clinical and pathophysiologic considerations. *Obstetrical & gynecological survey*. 2002 Sep 1;57(9):598-618.
 10. Leeners B, Rath W, Kuse S, Irawan C, Imthurn B, Neumaier-Wagner P. BMI: new aspects of a classical risk factor for hypertensive disorders in pregnancy. *Clinical Science*. 2006 Jul 1;111(1):81-6.
 11. Singhal SR, Deepika A, Nanda S: Maternal and perinatal outcome in severe pre-eclampsia and eclampsia. *J South Asian Fed Obstet Gynecol*. 2009, 1:25-28.
 12. Shen M, Smith GN, Rodger M, White RR, Walker MC, Wen SW. Comparison of risk factors and outcomes of gestational hypertension and pre-eclampsia. *PloS one*. 2017 Apr 24;12(4):e0175914.
 13. Rana S, Lemoine E, Granger JP, Karumanchi SA. Preeclampsia: pathophysiology, challenges, and perspectives. *Circulation research*. 2019 Mar 29;124(7):1094-112.
 14. Morisaki N, Ogawa K, Urayama KY, Sago H, Sato S, Saito S. Preeclampsia mediates the association between shorter height and increased risk of preterm delivery. *International Journal of Epidemiology*. 2017 Oct 1;46(5):1690-8.
 15. Ankumah NA, Cantu J, Jauk V, Biggio J, Hauth J, Andrews W, Tita AT. Risk of adverse pregnancy outcomes in women with mild chronic hypertension before 20 weeks of gestation. *Obstetrics & Gynecology*. 2014 May 1;123(5):966-72.
 16. Melchiorre K, Sutherland GR, Liberati M, Thilaganathan B. Preeclampsia is associated with persistent postpartum cardiovascular impairment. *Hypertension*. 2011 Oct;58(4):709-15.
 17. National Collaborating Centre for Women's and Children's Health (UK). Hypertension in pregnancy: the management of hypertensive disorders during pregnancy.
 18. Kacica M, Dennison B, Aubrey R, Kus C, White J. Hypertensive Disorders in Pregnancy guideline summary. New York state department of health. 2013.
 19. Paola Aghajanian P, Ainbinder S, Andrew E, Vicki VB, Heather B, Helene B et al. *Current Diagnosis and Treatment in Obstetrics and Gynecology*, the McGraw-Hill., 2006.
 20. Menzies J, Magee LA, Li J, MacNab YC, Yin R, Stuart H, Baraty B, Lam E, Hamilton T, Lee SK, von Dadelszen P. Instituting surveillance guidelines and adverse outcomes in preeclampsia. *Obstetrics & Gynecology*. 2007 Jul 1;110(1):121-7.
 21. Parmar MT, Solanki HM, Gosalia VV. Study of risk factors of perinatal death in pregnancy induced hypertension (PIH). *National Journal of Community Medicine*. 2012 Dec 31;3(04):703-7.
 22. Yazbeck C, Thiebaugeorges O, Moreau T, Goua V, Debotte G, Sahuquillo J, Forhan A, Foliguet B, Magnin G, Slama R, Charles MA. Maternal blood lead levels and the risk of pregnancy-induced hypertension: the EDEN cohort study. *Environmental health perspectives*. 2009 Oct;117(10):1526-30.
 23. Vanderjagt DJ, Patel RJ, El-Nafaty AU, Melah GS, Crossey MJ, Glew RH. High-density lipoprotein and homocysteine levels correlate inversely in preeclamptic women in northern Nigeria. *Acta obstetrica et gynecologica Scandinavica*. 2004 Jan 1;83(6):536-42.
 24. Nankali A, Malek-Khosravi SH, Zangeneh M, Rezaei M, Hemati Z, Kohzadi M. Maternal complications associated with severe preeclampsia. *The Journal of Obstetrics and Gynecology of India*. 2013 Apr; 63:112-5.
 25. Xiong X, Demianczuk NN, Saunders LD, Wang FL, Fraser WD. Impact of preeclampsia and gestational hypertension on birth weight by gestational age. *American journal of epidemiology*. 2002 Feb 1;155(3):203-9.
 26. Safari S, Hamrah MP. Epidemiology and related risk factors of preterm labor as an obstetrics emergency. *Emergency*. 2017;5(1).