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Maternal Outcome of Pregnancy with New onset Stage 1 Hypertension (ACC) after 20 Weeks of Gestation

Prerna Chhabra[1]*, Tapan Pattnaik[1], Rachita Pravalina[1], Ritu Priya Chaudhury [2]

[1]Department of Obstetrics and Gynaecology, IMS and SUM Hospital, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India, [2]Department of Pathology, IMS and SUM Hospital, Siksha 'O' Anusandhan University, Bhubaneswar, Odisha, India. *Corresponding Author's Email: prerna258@gmail.com

Abstract

In 2017, "The American College of Cardiology and the American Heart Association" introduced a new, lower threshold for diagnosing hypertension, which did not include pregnant women. This study examines the outcomes for normotensive pregnant women in comparison to those with new-onset hypertension, defined as systolic blood pressure (SBP) between 130–139 mm Hg and diastolic blood pressure (DBP) between 80–89 mm Hg, observed after 20 weeks of gestation. Conducted at the department of Obstetrics and Gynecology at IMS and SUM Hospital, Bhubaneswar, this prospective observational study involved 220 patients over an 18-month period.15.8% of the case developed pre-eclampsia, 10.8% were diagnosed as Gestational Hypertension, 2.5 % had eclampsia and 1.66% were diagnosed as HELLP Syndrome. 2 of them needed ICU admission. The statistical analysis indicated that women with Stage 1 hypertension experienced pre-eclampsia at a higher rate compared to those in the normotensive group.

Keywords: Eclampsia, Hypertensive Disorders of Pregnancy, Pre-Eclampsia, Stage 1 Hypertension.

Introduction

Hypertensive disorders of pregnancy (HDP) rank among the top causes of maternal mortality worldwide, affecting 5 to 10% of women of reproductive age (1,2). HDP encompasses four conditions: pre-eclampsia, eclampsia, gestational hypertension, and chronic hypertension. In 2017, "The American Heart Association (AHA) and the American College of Cardiology (ACC)" revised the diagnostic criteria for hypertension, introducing a lower threshold for diagnosis. The updated criteria include: i) Elevated blood pressure, defined as a "systolic blood pressure (SBP) of 120 to 129 mm Hg and a diastolic blood pressure (DBP) of less than 80 mm Hg"; ii) Stage 1 hypertension, defined as an "SBP of 130 to 139 mm Hg and a DBP of 80 to 89 mm Hg"; and iii) Stage 2 hypertension, defined as an SBP of 140 mm Hg or higher and a DBP of 90 mm Hg or higher. These guidelines are based on data from non-pregnant individuals, where a gradual increase in blood pressure over time is linked to a higher risk of cardiovascular diseases and other health issues. The ACC/AHA guidelines now recommend a target blood pressure of below 130/80 mm Hg for adults to more aggressively manage these risks. This advice is supported by data that indicates lowering blood pressure can significantly lessen the risk of cardiovascular disease. "The ACC/AHA guidelines use the Atherosclerotic Cardiovascular Disease Risk (ASCVD) calculator" to estimate cardiovascular risk more thoroughly. This emphasizes how crucial is a thorough risk assessment. The ACC/AHA guidelines provide a more uniform treatment objective for a variety of populations, streamlining the management of hypertension. Decision-making is made simpler, which could be beneficial for practitioners who collaborate with clinicians (3,4). This study aims to examine the short-term outcomes for normotensive pregnant women in comparison to those with new-onset hypertension, defined as systolic blood pressure (SBP) between 130–139 mm Hg and diastolic blood pressure (DBP) between 80–89 mm Hg, observed after 20 weeks of gestation.

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Methodology

The study involved 220 patients and was conducted in the "department of Obstetrics and Gynaecology at IMS and SUM Hospital in Bhubaneswar" over a period of one and a half years, from December 2020 to July 2022. It was designed as a prospective observational comparative study.

Inclusion Criteria

The study included all pregnant women who regularly attended antenatal check-ups from the first trimester at IMS and SUM Hospital, Bhubaneswar, and who also delivered at the same institution.

Exclusion Criteria

having two or more blood pressure readings exceeding 130/80 mm Hg before 20 weeks of gestation, pregnancies involving twins or more, absence of blood pressure monitoring records before 20 weeks of gestation, overt diabetes mellitus, a previous pregnancy complicated by pre-eclampsia, chronic renal disease, on-going treatment for chronic hypertension, and any seizure disorders.

Sample size calculation-

- Sample size formula with desired error of margin:

$$n = \frac{Z^2_{\alpha/2} . P.(1-P)}{d^2}$$

Where,

- $Z_{\alpha/2}$ is the level of significance at 5% i.e. 95% confidence interval= 1.96
- P = Prevalence of Stage 1 hypertension among adults aged 18-39 is 22.4% which is 0.224 (5).
- D= desired error of margin = 7% =0.07
- $n = \frac{1.96^2 \times 0.224 \times (1-0.224)}{0.07^2}$
- n= 120
- 120 patients needed in the study
- The sample size of 120 was considered in the study.

Method of collection of data- Women with BP recording of less than130/80 mm Hg before 20 weeks of pregnancy were labelled as normotensive. Documentation of blood pressure was done using mercury sphygmomanometer with standard cuff size. Patient was asked to lie down and rest for 10 minutes, then BP was recorded in right arm. The systolic blood pressure was determined by the appearance of Korotkoff I sounds, while the diastolic blood pressure was recorded at the disappearance of Korotkoff V sounds. Patients were monitored throughout their pregnancy, with blood pressure recordings taken at intervals of 20-24 weeks, 28-32 weeks, and 34-36 weeks. These gestational ages for BP recordings were selected as per hospital's antenatal check-up protocol. The exposure group was defined as pregnant women who were normotensive before 20 weeks of gestation but later on developed Stage 1 hypertension in subsequent antenatal visit. The control group was defined as pregnant women with BP recording of less than 130/80 mm Hg during her antenatal as well as postnatal period. Maternal outcomes were compared between case and control groups. The maternal outcomes included intensive care unit (ICU) admission, gestational hypertension, pre-eclampsia, eclampsia, HELLP syndrome and maternal death. "The criteria for diagnosing gestational hypertension include a blood pressure reading of 140/90 mm Hg or higher for the first time after 20 weeks of pregnancy, without the presence of proteinuria". Preeclampsia is defined as gestational hypertension accompanied by signs of multiorgan involvement, such as pulmonary edema, renal or liver dysfunction, thrombocytopenia, or disturbances of the central nervous system. Eclampsia is the entity used to describe any convulsion event in a preeclamptic lady that cannot be attributed to another cause. The HELLP syndrome, which is suggestive of hepatocellular necrosis, was coined by Weinstein in 1982 for the combination of hemolysis, thrombocytopenia, and severe preeclampsia that followed excessively increased blood liver transaminase levels (6). Women admitted to the intensive care unit required interventions such as invasive monitoring, ventilatory support, or pharmaceutical maintenance of circulation during the prenatal or postnatal period. Maternal mortality is defined as the death of a woman while pregnant or within 42 days of pregnancy termination, due to any cause related to or aggravated by the pregnancy or its management, excluding deaths from accidental or incidental causes (7). MS Excel sheets were used to record the data, and SPSS version 23 (SPSS Inc.) was used for statistical analysis. The means, medians, standard deviations, and rates (%) were utilized to convey the findings. The Chi Square test was used to determine the significance of the data.

Results

This prospective observational comparative study was conducted to examine maternal and fetal outcomes among women newly diagnosed with Stage 1 hypertension after 20 weeks of gestation. The study spanned over one and a half years and took place in the "Department of Obstetrics and Gynaecology at IMS & SUM Hospital, Bhubaneswar". 120 people were identified as having Stage 1 hypertension in total during this study time period. However, 100 normotensive pregnant women were observed and analyzed. Outcomes of both groups of patients were compared and analyzed. As shown in Table 1 and 2, maximum numbers of patients in our study belong to the age group of 25-30 years with mean age of 27.76 ± 0.33 years and in control group with mean age of 27.78 ± 0.35 years. And the P-value was found out to be >0.05, which was not significant.

Table 1: Age Distribution

S. No.	Age (years)	Cases (N=120)	Percentage (%))	Control (N=100)	Percentage (%)
1.	18-24	28	23.3	22	22
2.	25-30	57	47.5	50	50
3.	31-34	35	29.1	28	28

Table 2: Comparison of Age Distribution

Group	Minimum (years)	Maximum(years)	Median (years)	Mean (years)	Standard Deviation	Standard Error Of Mean	P-value
Case	20	34	28	27.7583	3.57159	0.32604	>0.05
Control	20	34	28	27.7800	3.51499	0.35150	

Table 3: -Parity Distribution

S. No.	Parity	Case(N=120)	Percentage (%)	Control(N=10)	Percentage (%)
1.	Primigravida	76	63.3	64	64
2.	Multigravida	32	26.7	28	28
3.	Grandmultigravida	12	10	8	8.0

Table 4: Chi Square Test for Parity Distribution

	Value	df (Degrees of Freedom)	Asymptotic Significance (2 sided)	P- value
Pearson Chi-square	0.279	2	0.870	0.05

As shown in Table 3 and 4, Primigravida accounted for 63.3% and 26.7% were accounted by multigravida. Among control, primigravida accounted for 64% and multigravida accounted for 28%. P- Value was >0.05, which was not significant. As shown in Table 5 and 6, maximum number of patients which was 67% of cases was belonging to BMI group of 25-29.9 kg/m^2. 61% of controls were in BMI category of 25-29.9 kg/m^2. As P-value was >0.05, which was not significant.

Table 5: BMI Distribution

S.No.	BMI(kg/m2)	Cases(N=120)	Percentage (%)	Control(N=100)	Percentage (%)
1.	18-24.9	50	41.7	39	39
2.	25-29.9	67	55.8	61	61
3.	30-34.9	3	2.5	0	0

Table 6: Comparing BMI Distribution

Group	Minimum (kg/m2)	Maximum (kg/m2)	Median (kg/m2)	Mean (kg/m2	Standard Deviation	Standard Error of Mean	P-Value
Case	20.00	30.20	25.5000	25.6250	1.90392	0.17380	>0.05
Control	21.90	29.50	25.3500	25.4990	1.50819	0.15082	

Table 7: Mode of Delivery

S. No.	Mode of Delivery	Cases(N=120)	Percentage (%)	Control (N=100)	Percentage (%)	P-value
1.	LSCS	56	46.7	43	43	>0.05
2.	VD	64	53.3	57	57	

Table 8: Maternal Outcomes

S. No.	Maternal Outcomes	Case (N=120)	Percentage (%)	Control (N=100)	Percentage (%)	P- value
1.	Gestational Hypertension	13	10.8	8	8	>0.05
2.	Preeclampsia	19	15.8	5	5	<0.01
3.	Eclampsia	2	1.7	1	1	>0.05
4.	HELLP Syndrome	1	0.8	0	0	>0.05
5.	ICU Admission	2	1.6	0	0	>0.05
6.	Maternal Death	0	0	0	0	>0.05

As shown in Table 7, 46.7 % of patients underwent LSCS and 53.3% of patients delivered by vaginal delivery. And in control group, 43 % of patients underwent LSCS and 57 % delivered by vaginal delivery. P-value was calculated to be >0.05, which was not significant. High number of LSCS could be explained as study is being done in a tertiary hospital, most of the cases are complicated which leads to increased number of Cesarean sections overall. As shown in Table 8, Among 120 cases, maximum percentage which is 15.8% developed preeclampsia in comparison to cases only 5 % developed preeclampsia. P- value was < 0.01 which means result is significant at 1 %. Among cases, 10.8 % developed gestational hypertension and among controls, only 8 % developed gestational hypertension. P- value calculated was >0.05 which means result was not significant. 1.7% of cases developed eclampsia and 0.8% were diagnosed as HELLP Syndrome. 2 of them needed intensive care unit admission. 69.1% of women with Stage 1 hypertension had uneventful prenatal and postnatal period.

Discussion

Hypertensive disorders during pregnancy are the second leading cause of maternal mortality globally, following maternal haemorrhage (8). “These disorders represent the most significant cause of both short-term and long-term morbidity in mothers. Gestational hypertension is the most common type of hypertensive disorder in pregnancy, affecting 6–15% of nulliparous women and 2–4% of multiparous women. Additionally, elevated blood pressure during pregnancy, even when below the threshold for hypertension diagnosis, is associated with complications such as babies being small for gestational age, low birth weight, and an increased risk of preterm delivery” (9,10). Pregnancy-induced hypertension or PIH was the older term for HDPs, and it was thought to be a very benign disorder (11). Later, it was shown that pregnancy outcomes in PIH were not always benign and that the phrase "pregnancy induced hypertension" is misleading because it encompasses all types of hypertension during pregnancy. An outcome of severe gestational hypertension was way more serious than that of mild pre-eclampsia (12-14). A secondary analysis of a prospective cohort study, conducted from 2007 to 2010 with 3,422 women in their first trimester in Baltimore, MD, assessed blood pressure at 11-14 weeks. Blood pressure was categorized into three groups: normotensive (below 130/80 mmHg), “Stage 1 hypertensive (systolic blood pressure of 130-139 or diastolic blood pressure of 80-89 mmHg), and hypertensive (systolic blood pressure 140 or higher or diastolic blood pressure 90 or higher).” The findings indicated that 20.2% of participants were categorized as Stage 1 hypertensive based on the 2017 “American College of Cardiology-American Heart Association” criteria. This group was found to have a threefold increased risk of developing preeclampsia compared to normotensive women, with an adjusted relative risk (aRR) of 3.70 and a 95% confidence interval (CI) ranging from 2.40 to 5.70. Although Stage 1 hypertensive women exhibited a lower risk of preeclampsia than those classified as hypertensive by ACOG criteria, the difference was not statistically significant (15). However, in our study there was no significant association of age, parity, BMI or mode of delivery with development of Hypertensive disorder of pregnancy. In a study

by Darwin *et al*, mean BMI for normotensive group of patients was 24.9 kg/m ^{2} and mean BMI for Stage 1 hypertensive women was 30.0 kg/ kg/m ^{2} and P- value was < 0.001 (16). Another study conducted by Tesfalul *et al.,* which showed mean BMI of 23.2 $\pm$ 5.1kg/ square metre for normotensive group and mean BMI of 26.2 $\pm$7.5 kg/ square metre. P value calculated for this comparison was <0.001 (17). The new recommendations decreased the threshold for hypertension which will aid in early detection and intervention. Recent studies that have compared risk of HDPs in normotensive women and women diagnosed with stage 1 hypertension suggested higher risk of pre-eclampsia in patients who are newly diagnosed as stage 1 hypertension in pregnancy in comparison with normotensive women (5). However, timing of disease occurrence is unknown. When stage 1 hypertension in pregnancy is diagnosed, patients who are at high risk can be identified and the clinicians recommended care can be given to the newly diagnosed hypertensive women.

Conclusion

Maternal baseline characteristics like age, parity, BMI, Mode of delivery are comparable in both Stage 1 Hypertension and Normotensive group of women. Although greater number of women with stage 1 hypertension developed pre-eclampsia in comparison to normotensive group of women, which was found statistically significant whereas incidence of gestational hypertension in Stage 1 hypertension was not found to be significant.

Abbreviations

ACC: American College of Cardiology, ACOG: American College of Obstetricians and Gynaecologists, AHA: American Heart Association, HDP: Hypertensive disorders of Pregnancy, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, mm: Millimetre, Hg: Mercury, HELLP: Haemolysis Elevated Liver Enzymes and Low Platelet count.

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Author Contributions

Dr Prerna Chhabra, Dr Tapan Pattnaik and Dr Ritu Priya Chauduary: Data collection and drafting of the article; Dr Prerna Chhabra and Dr Tapan Pattnaik: Interpretation of data; Dr Prerna Chhabra, Dr Tapan Pattnaik and Dr Rachita Pravalina: Concept and design and final approval of the version to be published.

Conflict of Interest

All the authors of the Study have no conflict of interest pertaining to this study.

Ethics Approval

After due ethical considerations, the committee has approved the study. Letter number: IEC/IMS.SH/SOA/2021/202.

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References

1. Regitz-Zagrosek V, Roos-Hesselink JW, Bauersachs J, *et al*. 2018 ESC Guidelines for the management of cardiovascular diseases during pregnancy. European Heart Journal. 2018;39(34):3165-3241.
2. Umesawa M, Kobashi G. Epidemiology of hypertensive disorders in pregnancy: prevalence, risk factors, predictors and prognosis. Hypertension Research. 2016;40(3):213-220.
3. Whelton PK, Carey RM. The 2017 Clinical Practice Guideline for High Blood Pressure. JAMA. 2017;318(21):2073.
4. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. European Heart Journal. 2018;39(33):3021-3104.
5. Hypertension Prevalence Among Adults Aged 18 and Over: United States, 2017-2018. PubMed. 2020 April 1. https://pubmed.ncbi.nlm.nih.gov/32487290}';/
6. Dusse LM, Alpoim PN, Silva JT, Rios DRA, Brandão AH, Cabral ACV. Revisiting HELLP syndrome. Clinica Chimica Acta. 2015;451:117-120.
7. World Health Organization: WHO. Maternal mortality. 2024 April 26. https://www.who.int/news-room/fact sheets/detail/maternal-mortality
8. ACOG Practice Bulletin No. 203: Chronic Hypertension in Pregnancy. Obstetrics and Gynecology. 2019;133(1):e26-e50.
9. Naghavi M, Kassebaum NJ, Barber RM, Hay SI, Lim SS, Pinho C, Dandona L, Vos T, Larson HJ, Lopez LD, Steiner C. Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. 2021;388:1775-1812.
10. Teng H, Wang Y, Han B, *et al*. Gestational systolic blood pressure trajectories and risk of adverse maternal and perinatal outcomes in Chinese women. BMC Pregnancy and Childbirth. 2021;21(1):1-0.

11. Bakker R, Steegers EA, Hofman A, Jaddoe VW. Blood pressure in different gestational trimesters, fetal growth, and the risk of adverse birth outcomes: the generation R study. American Journal of Epidemiology. 2011 Oct;174(7):797-806.
12. Goddard J, Wee MYK, Vinayakarao L. Update on hypertensive disorders in pregnancy. BJA Education. 2020;20(12):411-416.
13. Willy D, Willy K, Köster H, *et al*. Blood Pressure Levels and Maternal Outcome in Women with Preeclampsia – a Retrospective Study from a Large Tertiary Obstetric Centre. 2022. https://www.semanticscholar.org/paper/Blood-Pressure-Levels-and-Maternal-Outcome-in-Women-Willy-Willy/7d4e02a240f7599eceeab5f9b1fd1317c1d598e6
14. Braunthal S, Brateanu A. Hypertension in pregnancy: Pathophysiology and treatment. SAGE Open Medicine. 2019 Apr; 10;7:2050312119843700. doi: 10.1177/2050312119843700.
15. Luger RK, Kight BP. Hypertension In Pregnancy. StatPearls - NCBI Bookshelf. 2022 October 3. https://www.ncbi.nlm.nih.gov/books/NBK430839/
16. Darwin KC, Federspiel JJ, Schuh BL, Baschat AA, Vaught AJ. ACC-AHA Diagnostic Criteria for Hypertension in Pregnancy Identifies Patients at Intermediate Risk of Adverse Outcomes. American Journal of Perinatology. 2020;38(S 01):e249-e255.
17. Motedayen M, Rafiei M, Tavirani MR, Sayehmiri K, Dousti M. The relationship between body mass index and preeclampsia: A systematic review and meta-analysis. International journal of reproductive biomedicine. 2019 Jul;17(7):463.