

Maternal and Perinatal Outcomes in Pregnancies Complicated by Gestational Hypertension

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Abstract:

Background: Gestational hypertension is one of the most common hypertensive disorders of pregnancy and is associated with increased maternal and perinatal morbidity. Although considered less severe than preeclampsia, it still contributes significantly to adverse pregnancy outcomes, particularly in developing regions.

Aim: To assess the maternal and perinatal outcomes in pregnancies complicated by gestational hypertension at a tertiary care centre in Ananya College of Medicine & Research, Gandhinagar, Gujarat level.

Methodology: A retrospective cross-sectional study was conducted over one year in the Department of Obstetrics and Gynecology, Ananya College of Medicine & Research, Gujarat, India. A total of 115 pregnant women were included, comprising 45 cases of gestational hypertension and 70 normotensive pregnancies. Data were collected from hospital records and analyzed using SPSS version 24. Statistical tests such as chi-square and logistic regression were applied.

Results: The incidence of cesarean section was significantly higher in women with gestational hypertension (51.1%) compared to normotensive women (28.6%) ($p = 0.01$). Although low birth weight (22.2%) and preterm birth (22.2%) were more frequent in the hypertensive group, these associations were not statistically significant. Advanced maternal age and maternal co-morbidities were more commonly observed in affected women.

Conclusion: Gestational hypertension is associated with an increased risk of cesarean delivery, while its impact on fetal outcomes such as low birth weight and preterm birth appears limited. Early diagnosis and appropriate management are essential to improve maternal and neonatal outcomes.

Keywords: Gestational hypertension, maternal outcomes, perinatal outcomes, cesarean section, low birth weight, preterm birth.

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Introduction

Hypertensive disorders of pregnancy continue to be an important public health problem in the world with significant contributions to maternal and perinatal morbidity and mortality. Hypertensive disorders complicate about 10% of pregnancies worldwide and most of them are gestational hypertension and preeclampsia [1]. These conditions can affect the mother's health during pregnancy and have long-term consequences for mother and child. The burden of hypertensive disorders is especially high in developing regions such as India where the access to health care and early detection may vary.

Gestational hypertension is the development of elevated blood pressure in pregnancy, which is defined as having a systolic blood pressure of ≥ 140 mm Hg

and/or a diastolic blood pressure of ≥ 90 mm Hg, measured on two occasions at least 4 hours apart after 20 weeks of gestation, and without proteinuria or other systemic features suggestive of preeclampsia [2]. It is one of the most frequently seen disorders of pregnancy that affects 5%–10% of pregnancies. Gestational hypertension can be seen as a less severe version of preeclampsia but is certainly a complication that must be monitored closely because it can escalate to more serious conditions.

Preeclampsia, in contrast, is a multisystem disorder in which the pregnant woman develops hypertension with other clinical features including proteinuria and/or mother organ dysfunction or uteroplacental abnormalities [3]. They might be renal insuffi-

ciency, liver dysfunction, neurological disturbance, pulmonary oedema and abnormal blood counts. Moreover, uteroplacental dysfunction is associated with fetal complications, including IUGR, abruption and IUD. The incidence of preeclampsia varies from 2-5% of pregnancies world-wide [4].

Although the total burden of the hypertensive disorders is lower in India compared to low and middle-income countries (LMICs), the burden is disproportionately higher in LMICs because of lack of adequate health care infrastructure, delayed diagnosis and limited antenatal care services. These disorders are important causes of maternal death and poor perinatal outcomes in these contexts. The hypertensive disorders constitute one of the major causes of maternal mortality in India, and therefore the need for early diagnosis, prompt treatment, and good management [5].

Gestational hypertension or pre-eclampsia is linked with poor maternal and perinatal outcomes. The risks for the mother include an elevated rate of cesarean section, placental abruption, postpartum hemorrhage, and cardiovascular problems later in life. While it is not as serious as pre-eclampsia, gestational hypertension is not a benign condition. Research shows that around 17% of women who experience gestational hypertension can develop preeclampsia and encounter problems [6]. Underlines the need for careful surveillance and risk assessment of affected pregnancies.

Hypertensive disorders contribute to many bad outcomes for the fetus, such as preterm birth, low birth weight, intrauterine growth restriction and greater risk of admission to the neonatal intensive care unit (NICU). In more severe cases, these conditions can cause foetal death. In hypertensive disorders, the reduced uteroplacental blood flow is an important factor contributing to these complications, which include fetal growth and development [7].

There are a number of studies from both developed and developing countries that have examined the association between HDP and maternal and perinatal outcomes. These studies help to bring the extent of the problem and the risks involved into perspective. But there's still a lack of region-specific data, especially in an Indian context such as the state of Gujarat. Very few studies that have been conducted are adequately sized or account for other factors that may confound the results (such as maternal age, parity, socioeconomic status, and comorbidities). This restriction can lead to underestimation of risks due to gestational hypertension [8] and lead to biased estimates.

In addition, some studies in selected areas have not used sound statistical methods to compare the outcomes of gestational hypertension with preeclampsia. Inability to generate comprehensive data hinders the development of interventions and clinical rec-

ommendations based on the available evidence, particularly in low-resource areas. Comprehending the burden and outcomes of gestational hypertension is essential in the context of improving healthcare services but is still limited in rapidly developing areas like Gandhinagar, Gujarat, where healthcare providers are still struggling with challenges [9].

Therefore, it is essential to have region-specific evidence to assess the maternal and perinatal outcomes of gestational hypertension. This information can be used to detect high-risk pregnancies, optimize antenatal management and provide clinical decision making to minimize the risks of adverse pregnancy. Further, the results obtained from understanding the difference in outcomes between women having gestational hypertension and those with normal pregnancies will aid with risk stratification and management strategies [10].

Thus, the present study is aimed at evaluating the maternal and perinatal outcome of pregnancies with gestational hypertension at Gandhinagar, Gujarat, India. This study aims to fill in some of the missing pieces in the research on the effects of gestational hypertension on pregnancy outcomes and consider some confounding factors, as this will help to improve the health of mothers and children in the region.

Methodology

Study Design: This study was designed as a retrospective cross-sectional observational study to evaluate maternal and perinatal outcomes among pregnancies complicated by gestational hypertension. The study involved a review of hospital records of pregnant women diagnosed with gestational hypertension and their pregnancy outcomes.

Study Area: The study was conducted in the Department of Obstetrics and Gynecology, Ananya College of Medicine and Research, Gandhinagar, Gujarat, India.

Study Duration: The study was carried out over a period of one year.

Sample Size: The total sample size for the study was 115 pregnant women diagnosed with gestational hypertension and fulfilling the eligibility criteria.

Study Population: The study population consisted of pregnant women who delivered at the Department of Obstetrics and Gynecology, Ananya College of Medicine and Research, Gandhinagar, during the study period and had a documented diagnosis of gestational hypertension. Maternal and neonatal records were reviewed to assess associated maternal and perinatal outcomes.

Data Collection: Data were collected retrospectively from hospital medical records, labour room registers, antenatal clinic records, operation theatre records, and neonatal records. Information was ex-

tracted using a structured data collection form and entered a Microsoft Excel database. Variables collected included maternal demographic characteristics, obstetric history, gestational age at diagnosis, blood pressure measurements, mode of delivery, maternal complications, birth weight, gestational age at delivery, Apgar score, neonatal intensive care unit (NICU) admission, and perinatal outcomes. Double-checking of entries was performed to minimize data entry errors.

Operational Definition of Gestational Hypertension: Gestational hypertension was defined according to standard obstetric guidelines as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg on at least two occasions four hours apart after 20 weeks of gestation in a previously normotensive woman, without significant proteinuria.

Maternal Outcomes

- Mode of delivery (vaginal delivery or cesarean section)
- Preterm labour
- Placental abruption
- Postpartum hemorrhage
- Eclampsia
- Maternal intensive care unit admission
- Maternal mortality

Perinatal Outcomes

- Low birth weight (< 2500 g)
- Preterm birth (< 37 completed weeks)
- Birth asphyxia
- NICU admission
- Stillbirth
- Early neonatal death
- Perinatal mortality

Inclusion Criteria

- Pregnant women diagnosed with gestational hypertension after 20 weeks of gestation.
- Women who delivered at Ananya College of Medicine and Research during the study period.
- Singleton or multiple pregnancies with complete medical records.
- Records containing complete maternal and neonatal outcome data.

Exclusion Criteria

- Women with chronic hypertension diagnosed before pregnancy or before 20 weeks of gestation.
- Pregnancies complicated by preeclampsia, eclampsia, or chronic hypertension with superimposed preeclampsia.
- Women with incomplete or missing medical records.

- Pregnancies ending before fetal viability.
- Cases with major congenital fetal anomalies.

Study Procedure: Hospital records of all eligible women diagnosed with gestational hypertension during the study period were identified. Maternal demographic details, antenatal history, clinical findings, laboratory investigations, treatment received, delivery details, and maternal and neonatal outcomes were extracted. The collected data were reviewed for completeness, coded appropriately, and entered a computerized database. Maternal and perinatal outcomes were subsequently analyzed to determine the impact of gestational hypertension on pregnancy outcomes.

Statistical Analysis: The data collected were cleaned, coded, and entered Statistical Package for Social Sciences (SPSS) version 24.0 for analysis. Descriptive statistics were used to summarize maternal characteristics and pregnancy outcomes. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Associations between gestational hypertension and maternal or perinatal outcomes were assessed using the Chi-square test or Fisher's exact test, as appropriate. Logistic regression analysis was performed to identify factors associated with adverse maternal and perinatal outcomes. Results were expressed as Odds Ratios (ORs) with 95% Confidence Intervals (CIs). A p-value < 0.05 was considered statistically significant".

Result

Table 1 shows the distribution of maternal characteristics among study participants. Prevalence of women more than 30 years old was observed to be higher in the GH group (42.2%) than in the normal pregnancy group (25.7%) and this difference was statistically significant, $p = 0.04$, suggesting that maternal age is a risk factor for GH. No difference in the distribution of parity between the two groups was seen ($p = 0.87$) and so the distribution of parity did not affect the occurrence of gestational hypertension in this study. As for type of pregnancy, most of the women in both groups were singleton cases and there was no significant difference between the groups ($p = 0.29$). Likewise, there was no significant association between the history of previous cesarean section and gestational hypertension ($p = 0.48$). The incidence of maternal co-morbidity was higher in women with gestational hypertension (17.8%) than in women with normal pregnancies (7.1%) and this was found to be borderline significant ($p = 0.05$), indicating that co-morbid conditions may play a role in the occurrence of gestational hypertension.

Table 1: Distribution of Maternal Characteristics				
Maternal Characteristics	Total (N=115)	Normal Pregnancy (n=70)	Gestational Hypertension (n=45)	p-value
Maternal Age				
≤30 years	78 (67.8%)	52 (74.3%)	26 (57.8%)	0.04
>30 years	37 (32.2%)	18 (25.7%)	19 (42.2%)	
Parity				
Primipara	65 (56.5%)	40 (57.1%)	25 (55.6%)	0.87
Multipara	50 (43.5%)	30 (42.9%)	20 (44.4%)	
Type of Pregnancy				
Singleton	108 (93.9%)	67 (95.7%)	41 (91.1%)	0.29
Multiple	7 (6.1%)	3 (4.3%)	4 (8.9%)	
Previous Cesarean Section				
No	98 (85.2%)	61 (87.1%)	37 (82.2%)	0.48
Yes	17 (14.8%)	9 (12.9%)	8 (17.8%)	
Maternal Co-morbidity				
No	102 (88.7%)	65 (92.9%)	37 (82.2%)	0.05
Yes	13 (11.3%)	5 (7.1%)	8 (17.8%)	

Table 2 shows the distribution of the outcome of pregnancy for women experiencing a normal pregnancy compared with those having a pregnancy affected by gestational hypertension. The women with a gestational hypertension had significantly more cesarean sections (51.1%) than women with normal pregnancies (28.6%) ($p = 0.01$). This means that women with gestational hypertension are at higher risk of having an operative delivery. The percentage of low birth weight (<2500 g) was higher among

women with gestational hypertension (22.2%) than the women with normal pregnancy (14.3%) but this difference was not statistically significant ($p = 0.24$). Similarly, there appeared to be a trend for pre-term birth in the gestational hypertension group (22.2%) versus the normal group (12.9%), but this was not significant ($p = 0.18$). The results of this study indicate that gestational hypertension adds to the risk of poor perinatal outcomes, but our results were not significant.

Table 2: Distribution of Pregnancy Outcomes				
Pregnancy Outcomes	Total (N=115)	Normal Pregnancy (n=70)	Gestational Hypertension (n=45)	p-value
Mode of Delivery				
Vaginal	72 (62.6%)	50 (71.4%)	22 (48.9%)	0.01
Cesarean Section	43 (37.4%)	20 (28.6%)	23 (51.1%)	
Birth Weight				
≥2500 g	95 (82.6%)	60 (85.7%)	35 (77.8%)	0.24
<2500 g	20 (17.4%)	10 (14.3%)	10 (22.2%)	
Preterm Birth				
No	96 (83.5%)	61 (87.1%)	35 (77.8%)	0.18
Yes	19 (16.5%)	9 (12.9%)	10 (22.2%)	

Table 3 shows the crude odds ratio (COR) for pregnancy outcomes associated with gestational hypertension. The odds of cesarean section were 2.60 times greater for women with GH than for women with normal pregnancies and the relationship was statistically significant ($p = 0.01$). This suggests that there is a close association between gestational hypertension and a higher rate of cesarean delivery. The odds of delivering low birth weight babies were

1.70 times higher among women with gestational hypertension; however, this association was not statistically significant ($p = 0.25$). Likewise, the risk of preterm delivery was 1.90 times elevated in the gestational hypertension group (but again this was not statistically significant; $p = 0.17$). The results indicate that there is a higher risk of adverse fetal outcomes but are not sufficiently convincing to establish a strong link.

Table 3: Crude Odds Ratio (COR) for Pregnancy Outcomes			
Outcome	COR	95% CI	p-value
Cesarean Section	2.6	1.20 – 5.65	0.01
Low Birth Weight	1.7	0.65 – 4.20	0.25
Preterm Birth	1.9	0.75 – 4.80	0.17

Table 4 presents the adjusted odds ratio (AOR) after controlling for potential confounding factors such as maternal age, parity, previous cesarean section, and maternal co-morbidities. This remained a significant association ($p = 0.02$) after adjusting for other factors, with women with gestational hypertension being 2.45 times more likely to have a cesarean section than women with normal pregnancies. This is the

first study to establish that gestations hypertension is an independent risk for cesarean delivery. After adjustment, the association between gestational hypertension and low birth weight (AOR = 1.50, $p = 0.39$) and preterm birth (AOR = 1.75, $p = 0.24$) were not statistically significant. These risks observed for these outcomes might be affected by other confounding factors besides gestational hypertension.

Table 4: Adjusted Odds Ratio (AOR) for Pregnancy Outcomes

Outcome	AOR	95% CI	p-value
Cesarean Section	2.45	1.10 – 5.40	0.02
Low Birth Weight	1.5	0.58 – 3.95	0.39
Preterm Birth	1.75	0.68 – 4.50	0.24

Discussion

In the present study, adverse maternal and perinatal outcomes, including cesarean section, low birth weight, and preterm birth, were more common among pregnancies complicated by gestational hypertension than among normotensive pregnancies. Women with gestational hypertension had a significantly higher cesarean section rate (51.1%) compared with normotensive women (28.6%) ($p = 0.01$). After adjustment for confounding factors, women with gestational hypertension were 2.45 times more likely to undergo cesarean delivery than women with normal pregnancies. These findings are consistent with previous studies demonstrating an increased likelihood of operative delivery in hypertensive disorders of pregnancy. Shen et al. (2017) [11] reported that women with gestational hypertension were almost twice as likely to undergo cesarean section (OR ≈ 1.89). Similarly, Sachan et al. (2013) observed a higher rate of cesarean delivery among hypertensive pregnant women in the North Indian population, further supporting the association between gestational hypertension and operative delivery.

The increased cesarean section rate observed in our study may be attributed to concerns regarding maternal and fetal complications associated with gestational hypertension, prompting early obstetric intervention and delivery. These findings are in agreement with Sibai (2003), who emphasized that timely delivery is often necessary in hypertensive pregnancies to prevent maternal and fetal complications. Furthermore, obstetricians frequently prefer cesarean delivery in such cases to reduce the risk of fetal distress, placental insufficiency, and other obstetric complications [12].

Regarding maternal characteristics, women aged more than 30 years constituted a significantly higher proportion in the gestational hypertension group (42.2%) compared with the normotensive group (25.7%) ($p = 0.04$). This finding supports previous evidence identifying advanced maternal age as an important risk factor for hypertensive disorders of pregnancy. Steegers et al. (2010) also reported ma-

ternal age as an independent risk factor for gestational hypertension and preeclampsia. However, some studies, such as Lamminpää et al. (2012), have reported variations in this association, possibly due to demographic, ethnic, and population-specific differences [5,13].

With respect to neonatal outcomes, women with gestational hypertension had a higher incidence of low birth weight infants (22.2%) than women with normotensive pregnancies (14.3%); however, this difference was not statistically significant ($p = 0.24$). Similar findings were reported by Xiong et al. (2002), who found no significant difference in birth weight between hypertensive and normotensive pregnancies at term. Likewise, Browne et al. (2015) reported no clear association between gestational hypertension and low birth weight in low-resource settings. In contrast, Adu-Bonsaffoh et al. (2017) observed a significantly higher incidence of low birth weight among women with hypertensive disorders of pregnancy. Such variations across studies may be explained by differences in study populations, maternal nutritional status, quality of antenatal care, and healthcare accessibility [14].

Similarly, women with gestational hypertension experienced a higher incidence of preterm labour (22.2%) than women with normal pregnancies (12.9%), although the difference did not reach statistical significance ($p = 0.18$). These findings are comparable to those reported by Berhe et al. (2020), who demonstrated that gestational hypertension increases the risk of preterm delivery, although the association is less pronounced than that observed with preeclampsia. Mol et al. (2016) further suggested that medically indicated preterm delivery contributes substantially to the increased rate of preterm birth among women with hypertensive disorders. Conversely, several studies have reported statistically significant associations between gestational hypertension and preterm birth, which may reflect differences in disease severity, timing of diagnosis, and clinical management strategies [15].

Several factors may explain the absence of statistically significant associations between gestational hypertension and adverse fetal outcomes, such as low birth weight and preterm birth, in the present study. First, gestational hypertension is generally less severe than preeclampsia and is associated with relatively mild placental dysfunction. Second, adverse outcomes may have been minimized because gestational hypertension was diagnosed early and managed appropriately through timely antenatal care and appropriate obstetric interventions. In addition, unmeasured confounding factors, including maternal nutritional status, pre-pregnancy body mass index, socioeconomic status, and other environmental or healthcare-related factors, may also have influenced these outcomes [16].

Overall, the findings of the present study support existing evidence that gestational hypertension is associated with increased maternal morbidity, particularly a higher likelihood of cesarean delivery, while its impact on perinatal outcomes appears to be less pronounced than that observed in more severe hypertensive disorders, such as preeclampsia. Differences in findings across studies emphasize the importance of generating region-specific epidemiological evidence, as variations in healthcare systems, patient characteristics, clinical practices, and resource availability may substantially influence maternal and neonatal outcomes.

In conclusion, the present study highlights the importance of early diagnosis, regular antenatal surveillance, and evidence-based management of women with gestational hypertension to minimize maternal and perinatal complications. Strengthening antenatal care services and ensuring timely clinical intervention may contribute significantly to improving pregnancy outcomes among women affected by gestational hypertension.

Conclusion

In conclusion, the present study highlights that gestational hypertension is an important contributor to adverse maternal and perinatal outcomes, although its severity is comparatively less than preeclampsia. Results showed that women with gestational hypertension had a significantly higher rate of cesarean section (51.1%) than those of normotensive pregnancies, suggesting that women with GH are more likely to have a cesarean section. The prevalence of low birth weight (22.2%) and preterm birth (22.2%) was similarly greater in pregnancies complicated by hypertension, but none of these comparisons reached statistical significance, indicating that gestational hypertension might not be severely associated with poor fetal outcomes. The maternal factors of advanced age and co-morbidities were shown to be more common in the affected women and therefore could be a risk factor for developing gestational hypertension. The overall conclusion of the study is

that although the condition of gestational hypertension is not as severe as pre-eclampsia, it still carries significant risks and must be monitored, diagnosed early and treated promptly. Improving antenatal care services and risk stratification at tertiary care hospitals such as Ananya college of medicine & research, Gandhinagar, can significantly help in reducing maternal and neonatal complications and improving the pregnancy outcome.

References

1. HO W. World Health Organization recommendations for prevention and treatment of pre-eclampsia and eclampsia. Geneva: World Health Organization. 2011.
2. Tranquilli A, Dekker G, Magee L, Roberts J, Sibai BM, Steyn W, Zeeman GG, Brown MA. The classification, diagnosis and management of the hypertensive disorders of pregnancy: a revised statement from the ISSHP. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*. 2014 Apr 1;4(2):97-104.
3. American College of Obstetricians and Gynecologists. Gestational hypertension and preeclampsia: ACOG practice bulletin, number 222. *Obstet Gynecol*. 2020 Jun 1;135(6):e237-60.
4. Abalos E, Cuesta C, Grosso AL, Chou D, Say L. Global and regional estimates of preeclampsia and eclampsia: a systematic review. *European journal of obstetrics & gynecology and reproductive biology*. 2013 Sep 1;170(1):1-7.
5. Magee LA, Helewa M, Rey E, Cardew S, Côté AM, Douglas MJ, Firoz T, Gibson PS, Gruslin A, Lange I, Leduc L. RETIRED: Diagnosis, Evaluation, and Management of the Hypertensive Disorders of Pregnancy. *Journal of Obstetrics and Gynaecology Canada*. 2008 Mar 1;30(3):S1-2.
6. Duley L. The global impact of pre-eclampsia and eclampsia. In *Seminars in perinatology* 2009 Jun 1 (Vol. 33, No. 3, pp. 130-137). WB Saunders.
7. Bellamy L, Casas JP, Hingorani AD, Williams DJ. Pre-eclampsia and risk of cardiovascular disease and cancer in later life: systematic review and meta-analysis. *Bmj*. 2007 Nov 8;335(7627):974.
8. Brown MC, Best KE, Pearce MS, Waugh J, Robson SC, Bell R. Cardiovascular disease risk in women with pre-eclampsia: systematic review and meta-analysis. *European journal of epidemiology*. 2013 Jan;28(1):1-9.
9. Spracklen CN, Smith CJ, Saftlas AF, Robinson JG, Ryckman KK. Maternal hyperlipidemia and the risk of preeclampsia: a meta-analysis. *American journal of epidemiology*. 2014 Aug 15;180(4):346-58.

10. Herzog EM, Eggink AJ, Reijnierse A, Kerkhof MA, de Krijger RR, Roks AJ, Reiss IK, Nigg AL, Eilers PH, Steegers EA, Steegers-Theunissen RP. Impact of early-and late-onset preeclampsia on features of placental and newborn vascular health. *Placenta*. 2017 Jan 1;49:72-9.
11. 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.
12. Sachan R, Patel ML, Sachan P, Gaurav A, Singh M, Bansal B. Outcomes in hypertensive disorders of pregnancy in the North Indian population. *International journal of women's health*. 2013 Mar 6:101-8.
13. Sibai BM. Maternal and uteroplacental hemodynamics for the classification and prediction of preeclampsia. *Hypertension*. 2008 Nov 1;52(5):805-6.
14. Steegers-Theunissen RP, Verheijden-Paulissen JJ, van Uitert EM, Wildhagen MF, Exalto N, Koning AH, Eggink AJ, Duvekot JJ, Laven JS, Tibboel D, Reiss I. Cohort profile: the Rotterdam periconceptual cohort (predict study). *International Journal of Epidemiology*. 2016 Apr 1;45(2):374-81.
15. Lamminpää R, Vehviläinen-Julkunen K, Gissler M, Heinonen S. Preeclampsia complicated by advanced maternal age: a registry-based study on primiparous women in Finland 1997–2008. *BMC pregnancy and childbirth*. 2012 Jun 11;12(1):47.
16. Zhou A, Xiong C, Hu R, Zhang Y, Bassig BA, Triche E, Yang S, Qiu L, Zhang Y, Yao C, Xu S. Pre-pregnancy BMI, gestational weight gain, and the risk of hypertensive disorders of pregnancy: a cohort study in Wuhan, China. *PloS one*. 2015 Aug 25;10(8):e0136291.