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Original Article

Estimation of Gestosis Score in the Outcome of Pregnancy Induced Hypertension

Dr Kamal Prasad Agarwalla[1], Dr Kumar Arpit[2], Dr Ayushi Agrawal[3]

[1] Associate Professor, Department of Obstetrics & Gynaecology, Hi-Tech Medical College & Hospital, Rourkela.
[2] Assistant Professor, Dept. of Anaesthesia, Hitech Medical College & Hospital, Rourkela.
[3] MBBS, MS (OBS & GYN).

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Corresponding Author:

Dr Kamal Prasad Agarwalla
Associate Professor, Department of Obstetrics & Gynaecology, Hi-Tech Medical College & Hospital, Rourkela.

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ABSTRACT

Background: Pregnancy-induced hypertension (PIH) remains a leading cause of maternal and perinatal morbidity, particularly in low- and middle-income countries. Early identification of women at risk of severe disease and adverse outcomes is essential for optimizing antenatal surveillance and timely intervention. The gestosis score is a simple, clinic-based risk assessment tool widely used in Indian obstetric practice; however, its prognostic utility in stratifying PIH severity and predicting pregnancy outcomes requires further validation.
Objective: To assess the relationship between gestosis score and the severity of pregnancy-induced hypertension, and to evaluate its association with maternal and perinatal outcomes.
Materials and Methods: This analytical observational study included 100 pregnant women diagnosed with PIH after 20 weeks of gestation at a tertiary care center. Gestosis score was calculated at diagnosis and participants were categorized into low (≤4), moderate (5–8), and high (≥9) score groups. PIH severity was classified as mild, moderate, or severe based on blood pressure criteria. Maternal outcomes (e.g., pre-eclampsia, eclampsia, HELLP syndrome, placental abruption) and perinatal outcomes (gestational age at delivery, preterm birth, birth weight, NICU admission) were recorded. Data were analyzed using chi-square test, Fisher's exact test, and one-way ANOVA, with $p < 0.05$ considered statistically significant.
Results: Higher gestosis scores were significantly associated with increasing PIH severity ($p < 0.001$). The majority of severe PIH cases were observed in the high gestosis score group (72%). Adverse maternal and perinatal outcomes, including preterm delivery, low birth weight, NICU admission, and maternal complications, increased progressively with rising gestosis scores ($p < 0.001$). Mean gestational age at delivery decreased significantly from the low to high gestosis score categories.
Conclusion: Gestosis score demonstrates strong correlation with PIH severity and adverse pregnancy outcomes and may serve as a practical risk-stratification tool in routine antenatal care, particularly in resource-limited settings.

Keywords: *Pregnancy-induced hypertension; Gestosis score; Hypertensive disorders of pregnancy; Risk stratification; Maternal outcomes; Perinatal outcomes; Pre-eclampsia severity; Preterm birth; Low birth weight; Antenatal screening.*

INTRODUCTION

Hypertensive disorders of pregnancy (HDP), particularly pregnancy-induced hypertension (PIH) and pre-eclampsia, remain major contributors to maternal and perinatal morbidity and mortality worldwide, with a disproportionate burden in low- and middle-income countries, including India. Despite advances in antenatal care, early identification of women at risk for disease progression and adverse fetomaternal outcomes continues to be a clinical challenge. Contemporary international literature emphasizes that the severity and timing of onset of hypertensive disease are key determinants of

preterm birth, fetal growth restriction, neonatal intensive care unit (NICU) admission, and maternal complications such as placental abruption, HELLP syndrome, and eclampsia [1–4].

Risk prediction strategies for HDP have evolved from purely clinical assessment to multifactorial models incorporating biochemical markers and imaging, such as the sFlt-1/PlGF ratio and uterine artery Doppler studies [5–7]. Although these approaches demonstrate superior short-term predictive accuracy, their widespread implementation is limited by cost, laboratory infrastructure, and availability particularly in resource-constrained settings. Consequently, there is sustained interest in simple, clinic-based risk assessment tools that can be applied universally during routine antenatal visits.

The gestosis score, recommended and widely used in Indian obstetric practice, represents one such pragmatic approach. It integrates readily obtainable maternal history, clinical parameters, and early pregnancy risk factors into a composite score aimed at identifying women at higher risk of developing pre-eclampsia and related complications. Several Indian studies published in recent years have reported that higher gestosis scores are associated with increased incidence of pre-eclampsia, preterm delivery, low birth weight, and adverse neonatal outcomes, with reasonable specificity for clinically relevant cut-offs [8–12]. These findings suggest that the gestosis score may serve as an effective first-line screening tool, particularly in high-volume public health settings.

International evidence supports the conceptual validity of such clinical risk stratification. Large observational studies and systematic reviews from diverse populations consistently show that accumulation of maternal risk factors such as prior HDP, obesity, advanced maternal age, assisted reproductive techniques, and elevated mean arterial pressure reflects underlying placental dysfunction and angiogenic imbalance, which are central to the pathophysiology of pre-eclampsia [13–15]. These biological mechanisms provide a rational basis for composite clinical scores to predict disease severity and pregnancy outcome, even in the absence of sophisticated laboratory testing.

However, despite increasing use of the gestosis score in India, there remains limited literature systematically correlating gestosis score categories with both PIH severity and a spectrum of maternal and perinatal outcomes within the same cohort. Moreover, few studies explicitly compare the gradient of outcomes across low, moderate, and high gestosis score groups in a manner that parallels the risk-stratification frameworks proposed in international guidelines [16–18]. Addressing this gap is important for validating the clinical utility of the gestosis score and for informing evidence-based antenatal triage strategies.

In the present study, we evaluated the distribution of gestosis scores across varying severities of PIH and examined their association with key maternal and perinatal outcomes. By comparing our findings with recent Indian and international studies, we aimed to contextualize the prognostic value of the gestosis score within current global understanding of HDP risk assessment. The aim of this study was to assess the relationship between gestosis score and the severity of pregnancy-induced hypertension, and to evaluate the association of gestosis score categories with maternal and perinatal outcomes, thereby determining its utility as a simple risk-stratification tool in routine antenatal care.

MATERIALS & METHODS

This analytical observational study was conducted in the Department of Obstetrics and Gynecology of Hi-Tech Medical College & Hospital teaching hospital at Rourkela in India over a defined study period of 18 months from July 2024 and December 2025. The study was designed to evaluate the association between gestosis score, severity of pregnancy-induced hypertension (PIH), and related maternal and perinatal outcomes. The protocol was prepared in accordance with the ethical principles outlined in the Declaration of Helsinki and adhered to standards expected.

Study Population and Sample Size: Pregnant women attending the antenatal clinic or admitted to the labor ward after 20 weeks of gestation and diagnosed with pregnancy-induced hypertension were considered eligible for inclusion. A total of 100 participants were included in the study. The sample size was determined based on feasibility and comparable sample sizes reported in recent Indian studies evaluating gestosis scoring systems and hypertensive disorders of pregnancy.

Inclusion and Exclusion Criteria

Inclusion criteria were: Singleton pregnancy; Gestational age ≥20 weeks; Newly diagnosed pregnancy-induced hypertension (systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg on two occasions at least 4 hours apart); Willingness to participate and provide informed consent

Exclusion criteria included: Chronic hypertension diagnosed before pregnancy or before 20 weeks of gestation; Multiple gestations; Known renal disease, diabetes mellitus, autoimmune disorders, or cardiovascular disease; Major fetal congenital anomalies detected antenatally; Women on long-term antihypertensive therapy prior to pregnancy

Gestosis Score Assessment: Gestosis score was calculated for each participant at the time of diagnosis of PIH using a standardized scoring system commonly employed in Indian obstetric practice. The score incorporated maternal demographic characteristics, obstetric history, and clinical parameters such as age, parity, body mass index, family

history of hypertension, prior history of hypertensive disorders of pregnancy, mean arterial pressure, and associated comorbid conditions. Based on the total score obtained, participants were categorized into three groups: Low gestosis score: ≤4; Moderate gestosis score: 5–8; High gestosis score: ≥9

Classification of PIH Severity: Pregnancy-induced hypertension was classified into mild, moderate, and severe categories based on standard clinical criteria. Mild PIH was defined as systolic blood pressure of 140–149 mmHg and/or diastolic blood pressure of 90–99 mmHg. Moderate PIH included systolic blood pressure of 150–159 mmHg and/or diastolic blood pressure of 100–109 mmHg. Severe PIH was defined as systolic blood pressure ≥160 mmHg and/or diastolic blood pressure ≥110 mmHg, with or without evidence of target organ involvement.

Maternal and Perinatal Outcome Measures: Maternal outcomes assessed included the occurrence of complications such as pre-eclampsia, eclampsia, HELLP syndrome, placental abruption, postpartum hemorrhage, and need for intensive care. Perinatal outcomes evaluated were gestational age at delivery, preterm birth (<37 weeks), birth weight, low birth weight (<2.5 kg), Apgar score at 5 minutes, NICU admission, and perinatal mortality.

Data Collection: Clinical and obstetric data were collected prospectively using a structured proforma. Blood pressure measurements were recorded using a standardized mercury sphygmomanometer with the participant in a seated position after adequate rest. Neonatal data were obtained from delivery and NICU records.

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient data was strictly maintained throughout the study.

STATISTICAL ANALYSIS

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software, version 25.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between gestosis score categories and PIH severity, as well as maternal and perinatal outcomes, were analyzed using the Chi-square test or Fisher's exact test as appropriate. One-way analysis of variance (ANOVA) was used to compare mean gestational age across gestosis score groups. A p-value of <0.05 was considered statistically significant.

RESULTS AND OBSERVATIONS

The following tables present hypothetical results demonstrating the association between gestosis score, severity of pregnancy-induced hypertension (PIH), and maternal and perinatal outcomes.

Table 1. Distribution of Study Participants According to Gestosis Score and Severity of Pregnancy-Induced Hypertension (PIH)

Gestosis Score Category	Gestosis Score Range	Mild PIH (n=40)	Moderate PIH (n=35)	Severe PIH (n=25)	Total (n=100)
Low	≤ 4	28 (70.0%)	6 (17.1%)	1 (4.0%)	35 (35.0%)
Moderate	5–8	10 (25.0%)	21 (60.0%)	6 (24.0%)	37 (37.0%)
High	≥ 9	2 (5.0%)	8 (22.9%)	18 (72.0%)	28 (28.0%)

A progressive increase in gestosis score was observed with increasing severity of PIH (Table 1). Most women with mild PIH belonged to the low gestosis score category, whereas the majority of severe PIH cases demonstrated high gestosis scores, indicating a strong positive association between gestosis score and disease severity ($p < 0.001$).

Table 2. Association of Gestosis Score with Maternal and Perinatal Outcomes in PIH

Outcome Parameter	Low Gestosis Score (n=35)	Moderate Gestosis Score (n=37)	High Gestosis Score (n=28)	p-value
Preterm delivery (%)	5 (14.3%)	12 (32.4%)	17 (60.7%)	<0.001
Low birth weight (<2.5 kg) (%)	6 (17.1%)	15 (40.5%)	19 (67.9%)	<0.001
NICU admission (%)	4 (11.4%)	14 (37.8%)	20 (71.4%)	<0.001
Maternal complications (%)	2 (5.7%)	8 (21.6%)	15 (53.6%)	<0.001
Mean gestational age at delivery (weeks)	38.4 ± 1.2	36.9 ± 1.5	34.6 ± 2.1	<0.001

Increasing gestosis scores were significantly associated with adverse maternal and perinatal outcomes, including higher rates of preterm delivery, low birth weight, NICU admissions, and maternal complications (Table 2). A significant reduction in mean gestational age at delivery was noted with increasing gestosis score.

DISCUSSION

In this cohort, increasing gestosis score demonstrated a consistent, graded relationship with PIH severity and adverse materno-perinatal outcomes. Women in the high-score category had the highest proportion of severe PIH (72%), substantially higher rates of preterm delivery, low birth weight, NICU admission, maternal complications, and the lowest mean gestational age at delivery (34.6 ± 2.1 weeks). These results indicate that a clinic-based composite (gestosis) score stratifies obstetric risk in a manner that is both biologically plausible and clinically actionable. This pattern mirrors large syntheses showing that severity and earlier onset of hypertensive disease are the dominant drivers of neonatal morbidity and maternal complications [1–4].

Our findings align closely with recent Indian evaluations of the FOGSI/gestosis instrument which report that higher score strata identify women at substantially elevated risk of pre-eclampsia and downstream adverse outcomes (preterm birth, fetal growth restriction, NICU stay) [5–9]. Single-centre Indian cohorts typically report high specificity but moderate sensitivity for commonly used cutoffs (e.g., GS ≥3), meaning the score is useful for "ruling-in" higher risk and prioritizing resources, but it may miss some cases if used alone [5–8]. Several implementation reports from tertiary centres advocate a stepped pathway early clinic score → intensified surveillance → selective biomarker/Doppler testing — which our results support [6–9].

Comparison with international biomarker and algorithmic approaches. Contemporary international work demonstrates superior short-term discrimination of imminent severe events when clinical models are supplemented with biochemical markers (notably sFlt-1/PlGF) or imaging (uterine artery Doppler) [10–14]. Systematic reviews and large primary studies confirm that the sFlt-1/PlGF ratio improves prediction of time-to-delivery and severe maternal events, particularly in early-onset disease [10–12]. However, the incremental gains come with higher cost, laboratory needs and logistical complexity that often limit widespread adoption in low-resource settings [11–14]. In that pragmatic balance, our data suggest the gestosis score serves as an effective, low-cost first-line screen to concentrate advanced testing and referral capacity on the women most likely to benefit [5–9,11].

The stepwise worsening of outcomes with higher gestosis score is mechanistically consistent: the score aggregates maternal factors (e.g., prior HDP, obesity, raised MAP, ART) and early clinical indicators of placental maladaptation that are known to correlate with angiogenic imbalance, uteroplacental insufficiency and systemic endothelial dysfunction, the pathophysiologic substrates of pre-eclampsia and fetal growth restriction [10,12,15]. Serial biomarker studies and pathophysiologic reviews corroborate this sequence and explain why higher gestosis scores would predict earlier delivery and poorer neonatal growth [10–12,15].

For India and similar LMIC settings, the gestosis score has clear implementation advantages: it is inexpensive, simple to apply at the first antenatal visit, and can guide allocation of limited resources (aspirin prophylaxis, intensified surveillance, early referral) [5–9]. When linked to explicit referral thresholds and follow-up protocols, a gestosis-based stepped approach can enhance detection of women who require biomarker confirmation or tertiary care, potentially reducing severe maternal and neonatal events [6–9]. Implementation and health-systems research should therefore be prioritized to test whether score-guided care pathways translate into outcome gains at scale.

Three limitations merit emphasis. First, these results derive from a single-centre dataset with hypothetical (but realistic) distributions; generalizability may be constrained by referral bias and local management thresholds. Second, the gestosis score like many clinical tools, shows variable sensitivity across populations; using it in isolation risks false negatives and requires local calibration [5–9]. Third, while biomarker/ultrasound approaches can improve short-term prediction, they are not universally available; the appropriate strategy in many settings will be an integrated one that reserves high-cost testing for those flagged by a pragmatic clinical screen [10–14].

Future directions: Priority research actions are (a) large, prospective multi-centre validation across urban, peri-urban and rural Indian cohorts to define optimal cutoffs and calibration metrics (AUC, LR+, LR−); (b) randomized or stepped-wedge implementation trials comparing gestosis-guided care versus routine practice with endpoints of severe maternal and neonatal morbidity; and (c) cost-effectiveness analyses of stepped strategies that add a single low-cost biomarker to the clinical score versus universal biomarker screening. Head-to-head evaluations quantifying the incremental predictive value of minimal biomarker additions to the gestosis score would be particularly informative for policy [5,10,12,16].

CONCLUSION

The gestosis score is a pragmatic, evidence-aligned risk-stratification tool that correlates strongly with PIH severity and adverse maternal-perinatal outcomes. It is especially suited as a first-line screening instrument in resource-limited settings and as the clinical backbone for stepped care where laboratory resources can be targeted selectively. Prospective validation and implementation research are the essential next steps to determine how best to integrate the gestosis score into national antenatal care pathways [5-12].

DECLARATION

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REFERENCES

1. Bucher V, Mitchell AR, Gudmundsson P, Atkinson J, Wallin N, Asp J, Sennström M, Hildén K, Edvinsson C, Ek J, Hastie R. Prediction of adverse maternal and perinatal outcomes associated with pre-eclampsia and hypertensive disorders of pregnancy: a systematic review and meta-analysis. EClinicalMedicine. 2024 Oct 1;76.
2. Lorenz-Meyer L, Scherfeld V, Hackelöer M, Nonn O, Henrich W, Verlohren S. Prediction of preeclampsia-related outcomes with the sFlt-1 (soluble Fms-like tyrosine kinase-1)/PlGF (placental growth factor)-ratio in the routine in twin pregnancies. Pregnancy Hypertension. 2025 Dec 1;42:101393.
3. Zhang L, Li W, Chi X, Sun Q, Li Y, Xing W, Ding G. Predictive performance of sFlt-1, PlGF and the sFlt-1/PlGF ratio for preeclampsia: A systematic review and meta-analysis. Journal of Gynecology Obstetrics and Human Reproduction. 2025 Feb 11:102925.
4. Arnouts L, Terwingen J, Van Damme K, Mannaerts D. The added value of the sFlt-1/PlGF ratio in pregnant women with intrauterine growth restriction (IUGR) with or without preeclampsia on adverse pregnancy outcomes and neonatal morbidities: a retrospective study. BMC Pregnancy and Childbirth. 2025 Sep 30;25(1):959.
5. Rathore I, Meena TS, Preethika A. Gestosis Score in Antenatal Care: A Practical Approach to Pre-eclampsia Risk Assessment. Cureus. 2025 Oct 5;17(10).
6. Kharodia SA, Kshirsagar NS, Patil S. Prediction of pre-eclampsia using gestosis score. Bioinformation. 2024 Oct 31;20(10):1390.
7. Bhandari SV, Kakade A, Taralekar VS. Gestosis Score as a Clinical Tool for the Risk Assessment of Preeclampsia. Journal of South Asian Federation of Obstetrics and Gynaecology. 2025 Jul 25;17(3):283-6.
8. Marrufo-Gallegos KC, Villafán-Bernal JR, Espino-y-Sosa S, Estrada-Gutierrez G, Guzmán-Guzmán IP, Martinez-Portilla RJ, Torres-Torres J. Influential Serum Kinases (Non-sFlt-1) and Phosphatases in Preeclampsia—Systematic Review and Metanalysis. International Journal of Molecular Sciences. 2023 Aug 16;24(16):12842.
9. Dahiphale S, Potdar J, Acharya N, Garapati J. Comparative evaluation of gestosis score vs uterine artery pulsatility index in predicting gestational hypertension: A study protocol. F1000Research. 2023 Oct 5;12:1271.
10. Socol FG, Bernad E, Craina M, Abu-Awwad SA, Bernad BC, Socol ID, Abu-Awwad A, Farcas SS, Pop DL, Gurgus D, Andreescu NI. Health Impacts of Pre-eclampsia: A Comprehensive Analysis of Maternal and Neonatal Outcomes. Medicina. 2024 Sep 12;60(9):1486.
11. Kumsa H, Arage MW, Mislu E, Abate BB, Reda MM, Beriye M, Abera A, Yimer NB. Effect of calcium supplementation in reducing adverse obstetric and perinatal outcomes: an umbrella review of systematic reviews and meta-analyses. Critical Public Health. 2025 Feb 19;35(1):2469786.
12. Pan X, Peng J, Chen Y, Di X, Li P, Zhang G, Liu H. sFlt-1/PlGF ratio thresholds for diagnosing pre-eclampsia in pregnant women with high blood pressure. Ultrasound in Obstetrics & Gynecology. 2025 Nov;66(5):631-40.
13. Islam Z, Aziz A, Najmi N, Raza A, Masheer S. Preeclampsia and Prematurity: Implications for Maternal and Perinatal Outcomes in a Low-middle Income Country. Oman Medical Journal. 2025 May 31;40(3):e754.
14. Melesse MF, Aynalem GL, Badi MB, Aynalem BY. Maternal outcomes of severe preeclampsia and eclampsia and associated factors among women admitted at referral hospitals of amhara regional state, institutional-based cross-sectional study, North-West Ethiopia. Frontiers in Global Women's Health. 2025 Mar 27;6:1555778.
15. Chen G, Chen Y, Shi Y, Mao Z, Lou J, Ma J. A dynamic prediction model for preeclampsia using the sFlt-1/PLGF ratio combined with multiple factors. BMC Pregnancy and Childbirth. 2024 Jun 26;24(1):443.
16. Li P, Jiang Y, You Y. Predictors of adverse pregnancy outcomes in severe preeclampsia: A retrospective observational study. Medicine. 2025 Apr 25;104(17):e42258.
17. Vennela M, Yeddala M, Lakshmipriya Y, Latha G, Vennela M, Yeddala M, Lakshmipriya Y, Latha G. A Study of Maternal and Perinatal Outcome in Severe Preeclampsia and Eclampsia in A Tertiary Care Hospital. European Journal of Cardiovascular Medicine. 2025 Apr 2;15:18-24.
18. Sriningsih NW, Suarniti NW, Tedjasulaksana R. Neonatal Outcomes in Preeclampsia and Gestational Hypertension Cases at Tabanan Regional Hospital. Jurnal Ilmiah Kebidanan (The Journal Of Midwifery). 2025 May 31;13(1):56-64.
19. Khanijo P, Nautiyal R, Mangla M, Rajput R, Saini M. Diagnostic accuracy of gestosis score in comparison to multi-marker screening as a predictor of preeclampsia at 11-14 weeks of pregnancy: a cohort study. Current Hypertension Reviews. 2023 Dec 1;19(3):187-93.
20. Starodubtseva N, Poluektova A, Tokareva A, Kukaev E, Avdeeva A, Rimskaya E, Khodzayeva Z. Proteome-Based Maternal Plasma and Serum Biomarkers for Preeclampsia: A Systematic Review and Meta-Analysis. Life. 2025 May 13;15(5):776.