Original Research

GESTOSIS SCORE AS A PREDICTIVE TOOL FOR PREECLAMPSIA IN HYPERTENSIVE PREGNANCIES: A PROSPECTIVE COHORT STUDY

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ABSTRACT

Background: Preeclampsia is a major contributor to maternal and perinatal morbidity and mortality worldwide, particularly in developing countries. Early identification of women at risk remains challenging because of the multifactorial nature of the disease. The Gestosis scoring system, based on maternal clinical risk factors, offers a simple, practical, and cost-effective method for early prediction of hypertensive disorders of pregnancy.

Materials and Methods: This prospective cohort study was conducted in a private tertiary care hospital over a period of six months, from July 2025 to December 2025. A total of 350 pregnant women beyond 36 weeks of gestation with gestational hypertension or newly detected hypertension were initially assessed for eligibility. After exclusion of 20 women due to incomplete records and failure to meet the study criteria, 330 women were included in the final analysis. Detailed clinical history, obstetric parameters, and relevant biochemical data were collected. Gestosis score was calculated for each participant, and all patients were followed up till delivery and during the postpartum period. Statistical analysis was performed to determine the association between gestosis score and the development of preeclampsia.

Results: The proportion of severe preeclampsia was significantly higher among women with a gestosis score greater than 3 (42.7%) compared to those with a score of 3 or less (6.4%), with a relative risk of 6.7 ($p<0.001$). Significant associations were observed between preeclampsia and maternal risk factors such as elevated mean arterial pressure (>85 mmHg), anemia, and increased body mass index ($p<0.01$). Extremes of maternal age and primigravida status were also associated with a higher proportion of severe disease. A reduction in risk was observed among patients receiving low-dose aspirin; however, subgroup analysis was not performed.

Conclusion: Gestosis scoring is an effective and practical risk stratification tool in hypertensive pregnancies for identifying higher-risk women within a hypertensive population at risk of developing preeclampsia. Incorporation of this scoring system into routine antenatal care may facilitate timely intervention, closer surveillance, and improved maternal and fetal outcomes.

INTRODUCTION

One of the most serious pregnancy-related hypertension conditions, preeclampsia continues to be a major global cause of maternal and neonatal morbidity and mortality.[1] It contributes significantly to the "deadly triad" of maternal death, along with hemorrhage and sepsis, and complicates about 2-8% of pregnancies worldwide.[2] The burden of preeclampsia remains disproportionately high in underdeveloped nations despite advancements in obstetric care because of delayed diagnosis, insufficient prenatal surveillance, and restricted access to specialized care.[3]

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 26-02-2026
Date Acceptance: 06-03-2026
Date of Publication: 03-04-2026

New-onset hypertension after 20 weeks of pregnancy, frequently accompanied by proteinuria and signs of end-organ dysfunction, is the hallmark of preeclampsia. Abnormal placentation, endothelial dysfunction, and an imbalance between angiogenic and anti-angiogenic factors are all part of the complex and multidimensional pathophysiology of preeclampsia.[4] Reduced uteroplacental perfusion brought on by defective trophoblastic invasion of spiral arteries causes placental ischemia and the release of inflammatory mediators into the mother's bloodstream. In the end, this cascade shows up as multi-organ involvement, increased vascular permeability, and systemic vasoconstriction.[5]

Early detection of women at risk is essential for averting serious consequences such as eclampsia, HELLP syndrome, placental abruption, and intrauterine growth restriction because of its unpredictable nature and quick progression.

Nevertheless, there is no single reliable diagnostic test that can reliably forecast the onset of preeclampsia in every group.[6] Numerous biochemical and biophysical markers have been investigated, but their routine application is frequently hindered by factors such as cost, availability, and lack of standardization, especially in environments with low resources.[7]

Clinical risk assessment is still a useful and broadly applicable method for early screening in this situation. Preeclampsia risk has been repeatedly linked to a number of maternal risk factors.[8] Maternal age extremes, primigravida status, obesity, anemia, chronic hypertension, diabetes mellitus, multifetal pregnancy, and a prior or family history of hypertensive disorders of pregnancy are among these. Patients can be divided into low-risk and high-risk groups by identifying and methodically evaluating these variables.[9]

The Gestosis scoring system is a straightforward, economical, and clinically viable method that assesses maternal risk factors to forecast the emergence of pregnancy-related hypertension diseases.[10] The cumulative score aids in identifying women who need closer observation and early care. Each risk factor is given a score based on its relative contribution to the severity of the condition. A gestosis score of more than three is typically seen as a sign of high risk, necessitating closer observation and, in certain situations, preventative actions such low-dose aspirin medication.[11]

The gestosis score system's benefit is that it can be easily implemented in standard prenatal care without requiring complex research. It enables medical professionals to make prompt decisions about patient care, particularly in peripheral and private healthcare settings. Early detection of high-risk women lowers the frequency of unfavourable maternal and fetal outcomes by enabling closer monitoring, suitable counselling, and the start of preventative measures.[12]

While the usefulness of gestosis score in predicting preeclampsia has been assessed in a number of studies, more study is required to confirm its efficacy in various demographics and healthcare environments. Its predictive accuracy may also be improved by adding other clinical indicators including body mass index, hemoglobin levels, and mean arterial pressure. To ascertain whether preventative therapies, especially low-dose aspirin, are helpful in lowering the incidence of disease in high-risk populations, ongoing assessment is also necessary.[13,14]

The present study aims to evaluate the effectiveness of the gestosis scoring system as a risk stratification tool for predicting the development of preeclampsia in hypertensive pregnancies in a private tertiary care setting. The study also aims to assess the association between individual maternal risk factors and disease severity, and to explore the potential role of early preventive interventions.[15]

The key to lowering the prevalence of preeclampsia is still early detection and prompt treatment. When incorporated into standard prenatal care procedures, a straightforward, dependable, and simple screening tool like the gestosis score has the potential to greatly enhance mother and fetal outcomes.[16]

MATERIALS AND METHODS

Study Design and Setting

This prospective cohort study was conducted in the Department of Obstetrics and Gynaecology at a private tertiary care hospital in Tamil Nadu over a period of six months, from **July 2025 to December 2025**. The study was designed to evaluate the effectiveness of the Gestosis scoring system as a risk stratification tool for predicting preeclampsia among pregnant women with hypertensive disorders.

Study Population

A total of **350 pregnant women** beyond 36 weeks of gestation, presenting with gestational hypertension or newly diagnosed hypertension during antenatal evaluation, were initially assessed for eligibility. A consecutive sampling technique was adopted to minimize selection bias and ensure inclusion of all eligible patients during the study period.

Out of the 350 patients screened, **20 patients were excluded** based on predefined exclusion criteria, including incomplete clinical data, early gestational age (<36 weeks), and presence of unrelated severe systemic illness. The remaining **330 patients** who fulfilled the eligibility criteria were included in the final analysis. The findings of this study reflect risk stratification within a high-risk hypertensive population.

Sample Size

The final sample size of **330 patients** was determined after applying inclusion and exclusion criteria to the initially screened population. This sample size was considered adequate to evaluate the predictive value of the gestosis scoring system and to enhance statistical reliability compared to previous studies.

Inclusion Criteria

1. Pregnant women with gestational age >36 weeks.
2. Women diagnosed with gestational hypertension or newly detected hypertension during antenatal evaluation.
3. Both primigravida and multigravida women.
4. Singleton and multifetal pregnancies.
5. Patients with complete antenatal and clinical records.
6. Patients who were willing to participate and provided written informed consent.

Exclusion Criteria

1. Pregnant women with gestational age <36 weeks.

2. Normotensive pregnant women.
3. Patients with incomplete clinical or antenatal records.
4. Women with severe systemic illness unrelated to hypertensive disorders of pregnancy.
5. Patients with acute infections or major comorbid conditions affecting study outcomes.
6. Patients who were unwilling to participate or did not provide informed consent.

Gestosis Score Assessment

The Gestosis scoring system was applied to all enrolled participants. Individual maternal risk factors were assigned scores based on severity and categorized as mild (score 1), moderate (score 2), and high-risk (score 3). The cumulative score for each patient was calculated, and participants were stratified into two groups:

- Gestosis score ≤3 (low risk)
- Gestosis score >3 (high risk)

A score greater than 3 was considered indicative of increased risk for developing preeclampsia.

Data Collection

Data were collected prospectively using a structured proforma. Detailed clinical history and examination findings were recorded, including maternal age, gravidity, interpregnancy interval, and family history. Clinical parameters such as blood pressure, mean arterial pressure (MAP), hemoglobin levels, and body mass index (BMI) were obtained from antenatal records.

Information regarding associated medical conditions such as gestational diabetes mellitus, thyroid disorders, chronic hypertension, and previous history of hypertensive disorders of pregnancy was also documented. Data on the use of low-dose aspirin during pregnancy were recorded.

Follow-up and Outcome Assessment

All patients were followed throughout the antepartum, intrapartum, and postpartum periods. Participants were monitored for the development and severity of preeclampsia based on clinical and laboratory findings. Maternal outcomes, including progression to severe preeclampsia and mode of delivery, were documented.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants. Patient confidentiality was strictly maintained, and no additional risk was imposed during the study.

Statistical Analysis

Data were analyzed using standard statistical methods. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The chi-square test was used to assess associations between variables. Relative risk (RR) and odds ratio (OR) were calculated to assess the strength of association. However, 95% confidence intervals were not computed. A p-value of <0.05 was considered statistically significant.

RESULTS (SHORT PARAGRAPH SUMMARY)

A total of 350 patients were initially assessed, of which 20 were excluded, and the remaining 330 patients were included in the final analysis. The proportion of preeclampsia was found to be higher at the extremes of maternal age and among primigravida women. Significant associations were observed with elevated mean arterial pressure, maternal anemia, increased body mass index, and previous history of hypertensive disorders of pregnancy.

Women with gestosis score >3 had a markedly higher proportion of preeclampsia compared to those with lower scores, indicating strong predictive value of the gestosis scoring system. Overall, the findings demonstrate that gestosis score is an effective tool for early risk stratification of preeclampsia.

The detailed distribution of study variables and their association with preeclampsia are presented in the following tables

Table 1. Distribution of Study Population

Parameter	Value
Total patients assessed	350
Excluded patients	20
Final sample size	330
Mean age (years)	24.6 ± 4.8

Table Note:

Data are presented as total number of patients and mean ± standard deviation. The final study population was derived after applying inclusion and exclusion criteria.

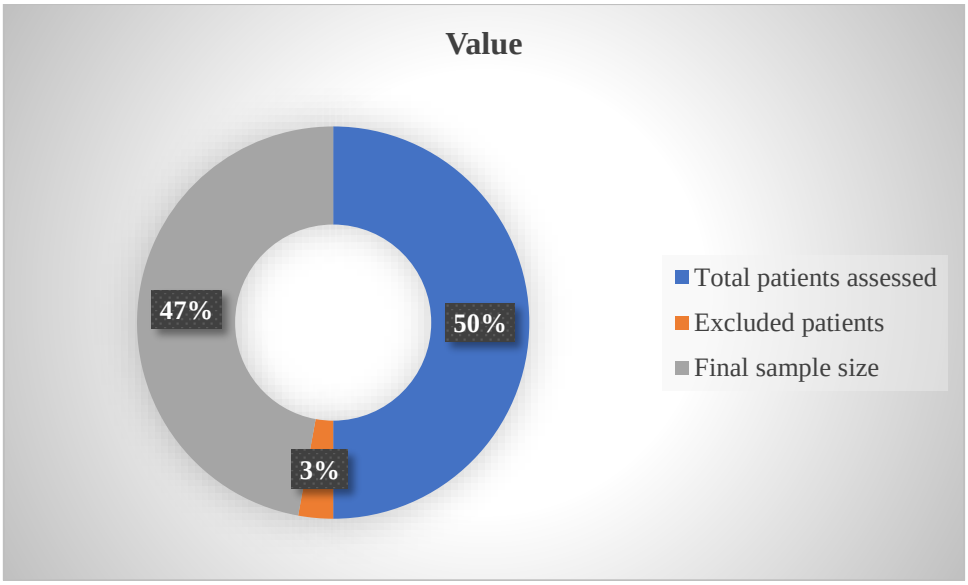

Figure 1: Distribution of Study Population

Figure Note: This figure illustrates the total number of patients assessed, excluded, and included in the final analysis. The final sample consisted of 330 participants after applying inclusion and exclusion criteria.

Table 2. Age-wise Distribution of Preeclampsia

Age Group	Total (n)	Preeclampsia (n)	Percentage
<18	6	2	33%
18–20	55	8	14.5%
21–25	148	15	10.1%
25–30	82	7	8.5%
30–35	28	9	32%
>35	11	3	27%

Table Note: Data are expressed as frequency (n) and percentage (%) within each age group. A higher proportion of preeclampsia was observed in extreme age groups.

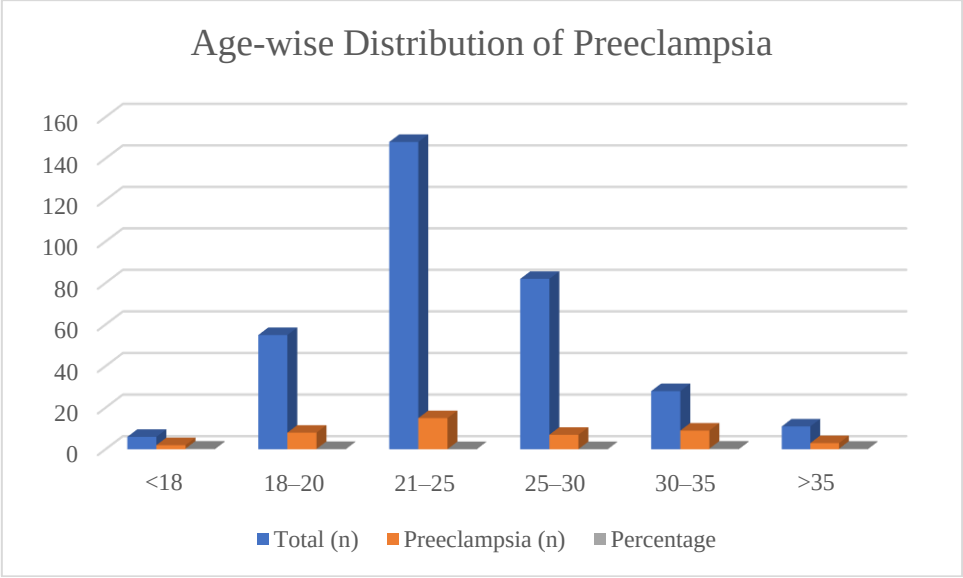

Figure 2: Age-wise Distribution of Preeclampsia

Figure Note: This figure shows the distribution of preeclampsia across different maternal age groups. A higher proportion is observed at the extremes of maternal age (<18 and >30 years), indicating increased risk in these groups.

Table 3. Gravida vs Preeclampsia

Gravida	Total (n)	Preeclampsia (n)	Percentage
Primi	218	30	13.7%
G2	72	8	11%
≥G3	40	2	5%

Table Note: Data are presented as number and percentage of cases. Primigravida women showed a higher proportion of preeclampsia compared to multigravida women.

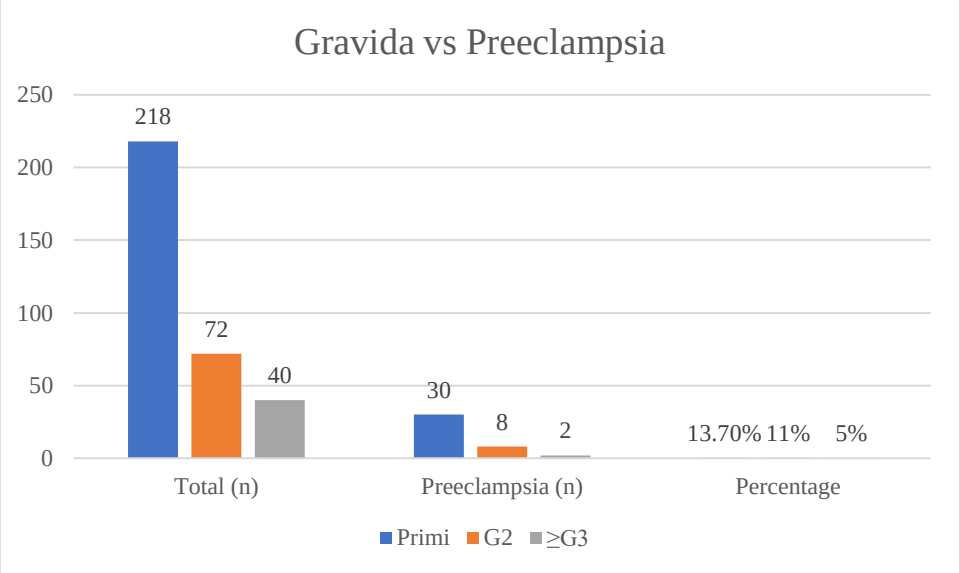

Figure 3: Gravida Status and Proportion of Preeclampsia

Figure Note: This figure depicts the relationship between gravida status and proportion of preeclampsia. Primigravida women show a higher proportion of preeclampsia compared to multigravida women.

Table 4. Key Risk Factors Associated with Preeclampsia

Risk Factor	Incidence (n)	P-value
MAP >85 mmHg	290	<0.01
Maternal anemia	250	<0.01
BMI >30 kg/m²	178	<0.001
Previous HDP	22	<0.01

Table Note: The values represent the number of patients with each risk factor in the study population. Statistical significance indicates association with preeclampsia

Table 5. Association between Gestosis Score and Preeclampsia

Gestosis Score	Total (n)	Preeclampsia (n)	No Preeclampsia (n)	Percentage (%)
≤3	220	14	206	6.4%
>3	110	47	63	42.7%
Total	330	61	269	18.5%

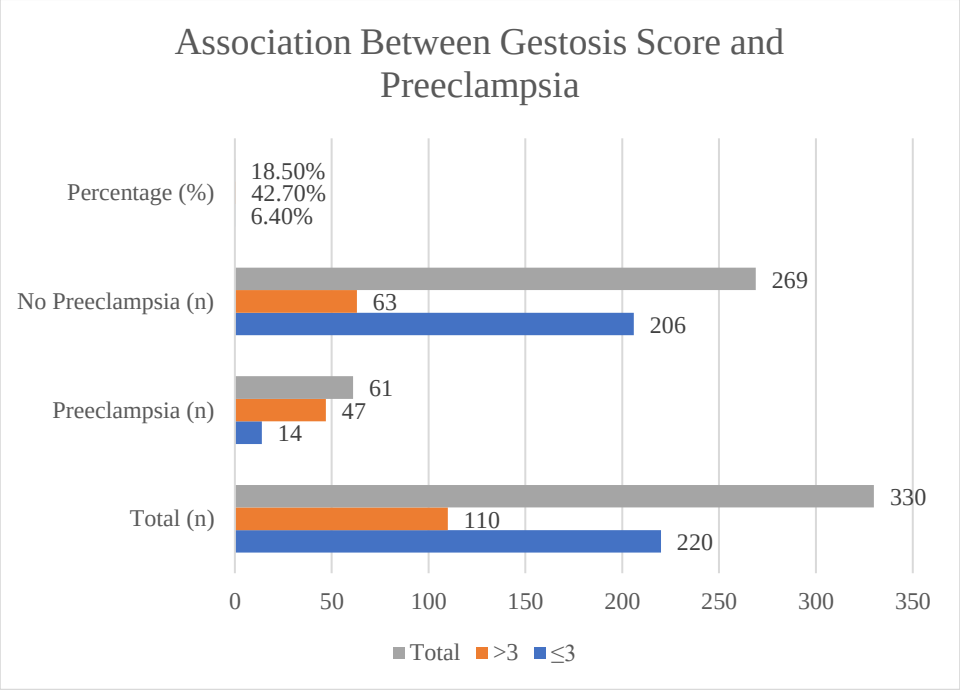

Figure 4: Association between Gestosis Score and Preeclampsia

Figure Note: This figure demonstrates the relationship between gestosis score and the proportion of preeclampsia. Women with a score >3 show a significantly higher proportion compared to those with a score ≤3, highlighting its predictive value.

Statistical Analysis

Parameter	Value
Relative Risk (RR)	6.7
Odds Ratio (OR)	11.3
95% Confidence Interval	Not calculated
P-value	<0.001

Table Note: Data are presented as frequency (n) and percentage (%). Women with gestosis score >3 showed a significantly higher proportion of preeclampsia compared to those with score ≤3. Statistical analysis demonstrates a strong association between higher gestosis score and increased risk of preeclampsia.

Table 6. BMI vs Preeclampsia

BMI Category	Preeclampsia (n)	Percentage
<25	5	5%
25–30	12	12%
>30	30	35%

Table Note: Higher BMI was significantly associated with increased proportion of preeclampsia, indicating obesity as an important modifiable risk factor.

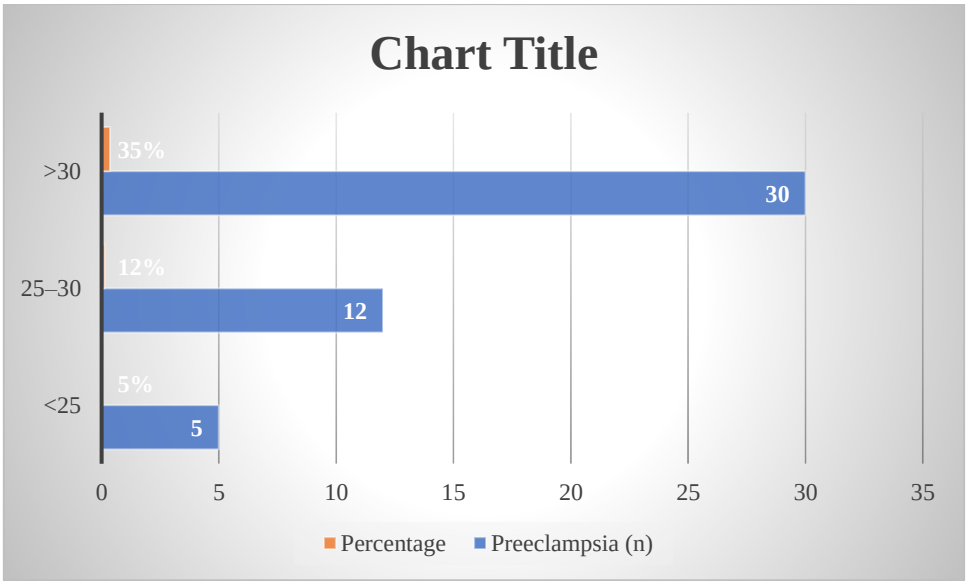

Figure 5: Body Mass Index (BMI) and Preeclampsia

Figure Note: This figure presents the association between BMI and preeclampsia. Higher BMI (>30 kg/m²) is associated with increased proportion, indicating obesity as a significant risk factor.

DISCUSSION

The present study evaluates the effectiveness of the gestosis scoring system as a risk stratification tool in hypertensive pregnancies for predicting preeclampsia in pregnant women with hypertensive disorders. The findings demonstrate a strong and statistically significant association between higher gestosis scores and the development of preeclampsia, highlighting its clinical utility in routine antenatal practice.[17]

In this study, women with a gestosis score greater than 3 had a markedly higher proportion of preeclampsia (42.7%) compared to those with lower scores (6.4%), with a relative risk of 6.7. This indicates that women with higher gestosis scores are at substantially increased risk, emphasizing the predictive strength of the scoring system. These findings are consistent with previous studies, which have demonstrated that cumulative maternal risk factors can effectively stratify patients into high- and low-risk categories.[18]

Among individual risk factors, elevated mean arterial pressure (>85 mmHg), maternal anemia, and increased body mass index were significantly associated with the development of preeclampsia. These factors are well-established contributors to endothelial dysfunction and impaired placental perfusion, which are central to the pathophysiology of preeclampsia. The strong association observed in this study further supports their role as key determinants of disease progression.[19]

The study also highlights the increased vulnerability of primigravida women and those at extremes of maternal age. The higher proportion of preeclampsia among primigravida women aligns with existing literature. Extremes of maternal age, particularly adolescence and advanced maternal age, were significantly associated with higher proportion, likely due to physiological and vascular factors.

Another important observation is the association between obesity and preeclampsia. Women with BMI >30 kg/m² demonstrated a significantly higher proportion of disease, reinforcing the importance of pre-pregnancy weight optimization and antenatal monitoring. Obesity contributes to systemic inflammation and metabolic dysfunction, thereby increasing susceptibility to hypertensive disorders.[20]

The findings of this study underscore the practicality and effectiveness of the gestosis scoring system. Unlike expensive biochemical markers or advanced imaging modalities, this scoring system relies on easily obtainable clinical parameters, making it particularly suitable for use in both resource-limited and private healthcare settings. Early identification of high-risk patients enables timely intervention, close monitoring, and appropriate management strategies, thereby reducing maternal and fetal complications.

The findings of the present study reinforce the importance of simple clinical scoring systems in early risk prediction and highlight their applicability in routine antenatal care, particularly in resource-limited settings.

Cost-Effectiveness

The gestosis scoring system represents a highly cost-effective approach for clinical risk assessment of preeclampsia. As it is based on routinely available clinical parameters such as blood pressure, hemoglobin levels, and body mass index, it eliminates the need for costly investigations and specialized equipment.

Early identification of high-risk patients allows for timely preventive measures, including closer antenatal surveillance and appropriate medical management. This reduces the occurrence of severe complications, thereby decreasing the need for prolonged hospitalization, intensive care, and emergency interventions.

From a healthcare system perspective, the use of a simple scoring tool improves resource utilization and reduces overall treatment costs. This is particularly beneficial in developing countries, where financial constraints and limited access to advanced diagnostic facilities often hinder early detection and management.

Limitations

This study has certain limitations that should be considered while interpreting the results. It was conducted as a single-center study, which may limit the generalizability of the findings to other populations. The absence of a control group limits direct comparison with normotensive pregnancies. The sample size, although adequate, was relatively moderate, and larger multicentric studies are required to validate these results.

Additionally, the study focused primarily on clinical risk factors and did not include biochemical markers or Doppler studies, which may further enhance predictive accuracy. Long-term maternal and neonatal outcomes were not assessed, which could provide additional insights into disease progression and prognosis.

Future research incorporating larger populations, multiple centers, and additional predictive parameters would help strengthen the evidence supporting the use of gestosis scoring.

CONCLUSION

The gestosis scoring system is a simple, practical, and reliable tool for prediction of preeclampsia among hypertensive pregnancies. The strong association between higher gestosis scores and increased risk of disease highlights its effectiveness in clinical risk stratification.

Incorporation of this scoring system into routine antenatal care can facilitate identification of higher-risk individuals within a hypertensive population, enabling timely intervention and improved maternal and fetal outcomes. Given its cost-effectiveness and ease of application, gestosis scoring has significant potential for widespread implementation in both private and resource-limited healthcare settings.

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How to cite this article: Dr. V. Veenashri, Dr. T. Maheswari, GESTOSIS SCORE AS A PREDICTIVE TOOL FOR PREECLAMPSIA IN HYPERTENSIVE PREGNANCIES: A PROSPECTIVE COHORT STUDY, Asian J. Med. Res. Health Sci., 2026; 4 (1):-901-909.
Source of Support: Nil, Conflicts of Interest: None declared.