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Original Research Article

Role of gestosis score in predicting pregnancy-induced hypertension among primigravid women

Sadia Taskeen^{1*}, Mahabuba Shaki², Most Rokshana Rahat³, Fatema Tasnim Jahan Jhumly⁴, Prianka Halder², Afroza Sultana⁵

¹Department of Obstetrics and Gynecology, TMSS Medical College and Rafatullah Community Hospital (TMC and RCH), Bogura, Bangladesh

²Department of Obstetrics and Gynecology, Sher-E-Bangla Medical College Hospital, Barishal, Bangladesh

³Department of Obstetrics and Gynecology, Shaheed Suhrawardy Medical College and Hospital, Dhaka, Bangladesh

⁴Department of Obstetrics and Gynecology, National Institute of Cancer Research and Hospital (NICRH), Mohakhali Dhaka, Bangladesh

⁵Department of Obstetrics and Gynecology, Mymensingh Medical College, Mymensingh, Bangladesh

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*Correspondence:

Dr. Sadia Taskeen,

E-mail: sadiataskeen16@gmail.com

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ABSTRACT

Background: Pregnancy-induced hypertension (PIH) remains an important cause of maternal and perinatal morbidity. Early identification of women at increased risk may facilitate closer antenatal surveillance and timely intervention. Objective was to evaluate the role of the gestosis score in predicting PIH among primigravid women.

Methods: This prospective observational cohort study was conducted in the department of obstetrics and gynecology, Dhaka Medical College Hospital, Dhaka, Bangladesh, from January to December 2021. A total of 150 primigravid women with singleton or multiple pregnancies presenting before 20 weeks of gestation were enrolled. The gestosis score was calculated at the initial antenatal assessment using predefined maternal risk factors, and participants were categorized according to a cutoff of <3 or ≥ 3 . Women were followed prospectively until delivery for the development of PIH. The discriminatory performance of the score was assessed using sensitivity, specificity, predictive values, diagnostic accuracy, and receiver operating characteristic (ROC) analysis.

Results: PIH developed in 26 (17.3%) participants. Women with a gestosis score ≥ 3 had a significantly higher incidence of PIH than those with a score <3 (35.6% versus 5.5%, $p < 0.001$). Family history of hypertension, family history of pre-eclampsia, and overweight/obesity were significantly associated with PIH. At a cutoff of ≥ 3 , the gestosis score showed 80.8% sensitivity, 69.4% specificity, 35.6% positive predictive value, 94.5% negative predictive value, and 71.3% diagnostic accuracy. The area under the ROC curve was 0.821 (95% CI: 0.738-0.904; $p < 0.001$).

Conclusions: The gestosis score demonstrated good discriminatory performance for PIH among primigravid women and may serve as a simple tool for early risk stratification and targeted antenatal surveillance. However, external validation in larger and more diverse populations is required before its routine clinical implementation.

Keywords: Antenatal surveillance, Gestosis score, Pre-eclampsia, Pregnancy, Pregnancy-induced hypertension, Primigravida, Risk prediction

INTRODUCTION

Hypertensive disorders of pregnancy (HDP) are among the most important complications of pregnancy and remain a major cause of maternal and perinatal morbidity and mortality, particularly in low- and middle-income countries. Pregnancy-induced hypertension (PIH), gestational hypertension, pre-eclampsia, and eclampsia represent clinically important forms of hypertensive disease during pregnancy. Pre-eclampsia is especially concerning because it may lead to serious maternal complications and adverse fetal outcomes. A systematic review of hypertensive disorders in India reported a substantial pooled prevalence of HDP, emphasizing the continuing burden of pregnancy-related hypertension in developing settings.¹ Similarly, a large international study demonstrated that pre-eclampsia is associated with important maternal and neonatal complications and that its prevalence and risk-factor profile may vary between populations.²

Pre-eclampsia is a multisystem disorder that develops after 20 weeks of pregnancy and is characterized by new-onset hypertension with proteinuria and/or other evidence of maternal organ or placental dysfunction. The pathophysiology is complex and involves abnormal placentation, impaired uteroplacental perfusion, maternal cardiovascular maladaptation, and endothelial dysfunction. Because the clinical manifestation can occur after a relatively asymptomatic period, early identification of women at increased risk is an important component of antenatal care.^{3,4} The identification of clinically relevant risk factors during early pregnancy may allow closer surveillance and facilitate timely preventive or therapeutic interventions.

Primigravid or nulliparous women constitute an important group for risk assessment because absence of a previous pregnancy history limits the availability of individual obstetric information, while nulliparity itself has been associated with increased risk of pre-eclampsia. In a large cohort of 1,165 healthy nulliparous women, Mayrink et al reported a 7.5% incidence of pre-eclampsia and found that BMI at the first antenatal assessment and elevated diastolic blood pressure were independently associated with subsequent disease.⁵ In another large population-based study involving 62,562 nulliparous pregnancies, maternal age, BMI, mean arterial pressure, family history, chronic diseases, and other routinely collected antenatal characteristics contributed to prediction of pre-eclampsia.⁶ Furthermore, a study of 64,490 healthy primiparous women found that an increase in diastolic blood pressure from early to mid-pregnancy was associated with an increased risk of pre-eclampsia, demonstrating the importance of blood-pressure-related clinical characteristics in early risk assessment.⁷

The value of combining multiple risk factors has led to the development of several prediction models for pre-eclampsia. De Kat et al, in a systematic review of 68

prediction models from 70 studies involving more than 425,000 participants, found that maternal age, medical history, BMI, blood pressure, parity, and anaemia were among the most frequently used predictors. However, substantial heterogeneity existed among the models and relatively few had undergone internal or external validation.³ Al-Rubaie et al subsequently developed and validated a prediction model specifically for nulliparous women using routinely collected maternal characteristics, supporting the feasibility of risk prediction based on information available during routine antenatal care.⁸ Sandström et al. also demonstrated that routinely collected antenatal data could be incorporated into longitudinal models to update pre-eclampsia risk during pregnancy.⁹

Despite the development of increasingly complex prediction models, many require biochemical markers, specialized ultrasound assessment, or other resources that may not be routinely available in resource-constrained settings. A systematic review by Antwi et al showed that most prediction models combined maternal clinical characteristics with biomarkers and emphasized the need for externally validated models using maternal characteristics in low- and middle-income countries where biomarker assays may not be routinely accessible.¹⁰ This creates an important rationale for simple, inexpensive, and clinically applicable scoring systems that can be incorporated into routine antenatal care.

The gestosis score is a clinical risk-stratification approach developed to identify pregnant women at increased risk of hypertensive disorders of pregnancy, particularly pre-eclampsia. The score combines several maternal, medical, and pregnancy-related risk characteristics rather than relying on a single predictor. In the original study by Mishra et al, several factors incorporated into the scoring system were significantly associated with pre-eclampsia, including elevated mean arterial pressure, advanced maternal age, hypothyroidism, and primigravidity.¹¹ These findings provide a rationale for evaluating the gestosis score among primigravid women. Because the score is based predominantly on information obtainable through routine history and clinical assessment, it may be applicable in settings where more complex prediction approaches are difficult to implement.

Early risk identification is clinically meaningful because women classified as being at increased risk may benefit from more intensive antenatal surveillance and appropriate preventive strategies. A systematic review of preventive interventions reported evidence supporting several approaches for reducing the risk of pre-eclampsia among selected high-risk women.¹² FIGO has also emphasized the importance of first-trimester screening and risk stratification to identify women who may benefit from preventive interventions and enhanced surveillance.⁴ Therefore, a simple scoring system that can identify high-risk women during routine antenatal visits may have practical clinical value.

The burden of pre-eclampsia is particularly relevant in South Asian and other resource-constrained populations. A systematic review and meta-analysis from India estimated a substantial pooled prevalence of hypertensive disorders of pregnancy, while a population-based study from Beijing identified high BMI, multiple gestation, and chronic hypertension among important risk factors for pre-eclampsia.^{1,13} In Bangladesh, Mou et al. reported a 14.4% prevalence of pre-eclampsia among their study population and found that inadequate antenatal care was associated with increased odds of the condition, highlighting the importance of early detection and appropriate antenatal monitoring.¹⁴

Although several studies have examined clinical prediction of pre-eclampsia, evidence specifically evaluating the gestosis score among primigravid women remains limited. Therefore, assessing the role of gestosis score in predicting pregnancy-induced hypertension among primigravid women is clinically relevant. Determining whether a simple composite score can identify women who subsequently develop PIH may provide a practical method for early risk stratification, enabling closer monitoring, timely preventive measures, appropriate referral, and potentially improved maternal and fetal outcomes.

Objectives

The main objective was to evaluate the role of the gestosis score in predicting the development of pregnancy-induced hypertension (PIH) among primigravid women.

METHODS

The prospective observational cohort study was conducted in the department of obstetrics and gynecology, Dhaka Medical College Hospital, Dhaka, Bangladesh. The study was carried out over twelve months from January 2021 to December 2021.

Inclusion criteria

Primigravid women with singleton or multiple pregnancies who attended antenatal care before 20 weeks of gestation were eligible for inclusion. Women without pre-existing or chronic hypertension, those who provided informed written consent to participate, and those willing to attend regular antenatal follow-up until delivery were included in the study.

Exclusion criteria

Multiparous women, women with pre-existing or chronic hypertension, women with chronic cardiac disease, women with major obstetric complications diagnosed at enrollment, and women who were unwilling to participate or unable to complete follow-up were excluded from the study.

A total of 150 primigravid women fulfilling the inclusion and exclusion criteria were enrolled purposively during the study period. At enrollment, detailed demographic, obstetric, medical, and family histories were obtained using a structured data collection sheet. Baseline variables including age, height, weight, body mass index, gestational age, blood pressure, family history of hypertension or pre-eclampsia, anaemia, overweight/obesity, and relevant previous medical risk factors were recorded. Maternal medical conditions and pregnancy-related risk factors, including diabetes mellitus, thyroid disorders, chronic kidney disease, systemic lupus erythematosus (SLE), antiphospholipid antibody syndrome (APLA), and pregnancy following assisted reproductive technology (ART), were also assessed where applicable for determination of the gestosis score.

The gestosis score was calculated for each participant at the initial antenatal assessment using the predefined gestosis scoring system. Relevant maternal, medical, family history, and pregnancy-related risk factors were assessed and assigned their corresponding scores. These included family history of hypertension or pre-eclampsia, previous medical risk factors, maternal diabetes mellitus, thyroid disorders, chronic kidney disease, SLE, APLA, pregnancy following ART, anaemia, overweight/obesity, and other relevant clinical risk factors included in the scoring system. The individual scores were summed to obtain the total gestosis score. Participants were categorized according to their gestosis score into appropriate risk groups based on the predefined cutoff value.

All participants were followed prospectively during routine antenatal visits until delivery. Blood pressure and relevant clinical findings were assessed and documented at each follow-up visit. Participants who developed new-onset hypertension after 20 weeks of gestation were further evaluated for pregnancy-induced hypertension and other hypertensive disorders of pregnancy. The development of pregnancy-induced hypertension (PIH) was considered the primary outcome of the study. The occurrence of pre-eclampsia and other hypertensive complications was also documented.

The association between the gestosis score and subsequent development of PIH was assessed. The incidence of PIH was compared between participants with different gestosis score categories. The predictive performance of the gestosis score for PIH was also evaluated by determining its sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy.

Ethical approval was obtained from the appropriate ethical review committee of Dhaka Medical College Hospital before commencement of the study. Informed written consent was obtained from all participants before enrollment. Confidentiality of participant information was strictly maintained, and the collected data were used solely for research purposes.

Statistical analysis

All data were recorded systematically in a preformed data collection form and analyzed using Statistical Package for the Social Sciences (SPSS), version 22. Quantitative data were expressed as mean and standard deviation, while qualitative data were expressed as frequency distribution and percentage. The association between gestosis score categories and development of PIH was assessed using the Chi-square test or Fisher's exact test, as appropriate. For comparison of quantitative variables between groups, the independent samples t-test was used where applicable. The predictive ability of the gestosis score was evaluated by calculating sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy. Receiver operating characteristic (ROC) curve analysis was performed to assess the overall predictive performance of the gestosis score and to determine the optimal cutoff value. A p value of less than 0.05 was considered statistically significant. Confidentiality of all participant information was strictly maintained.

RESULTS

Table 1 presents the baseline clinical characteristics of the 150 study participants. The largest proportion of participants belonged to the 21-25-year age group (44.7%), followed by those aged 26-30 years (32.0%). Most participants were from urban areas (55.3%). Regarding pregnancy type, the majority had singleton pregnancies (95.3%), while 4.7% had multiple pregnancies. At enrollment, 40.7% of participants were at 12-16 weeks of gestation, 36.0% were below 12 weeks, and 23.3% were at 17-20 weeks.

Table 1: Baseline characteristics of the study participants.

Variables	Frequency (n=150)	Percentage
Age group (years)		
≤20	18	12
21-25	67	44.7
26-30	48	32
>30	17	11.3
Total	150	100
Residence		
Urban	83	55.3
Rural	67	44.7
Total	150	100
Pregnancy type		
Singleton pregnancy	143	95.3
Multiple pregnancy	7	4.7
Gestational age at enrollment (weeks)		
<12	54	36.0
12-16	61	40.7
17-20	35	23.3

Table 2: Distribution of participants according to the clinical examination findings.

Variables	Frequency (n=150)	Percentage
BMI (kg/m²)		
<18.5	12	8.0
18.5-24.9	84	56.0
25.0-29.9	39	26.0
≥30.0	15	10.0
Anemia	27	18.0

Table 2 shows the clinical examination findings of the study participants. More than half of the participants had a normal BMI of 18.5-24.9 kg/m² (56.0%), while 26.0% were overweight, 10.0% were obese, and 8.0% were underweight. Anemia was present in 18.0% of the participants.

Table 3: Distribution of participants according to maternal history and medical risk factors included in the gestosis score.

Maternal risk factors	Frequency (n=150)	Percentage
Family history of hypertension	32	21.3
Maternal pre-existing diabetes mellitus	8	5.3
Maternal thyroid disorder	10	6.7
Maternal chronic kidney disease	2	1.3
Systemic lupus erythematosus (SLE)	2	1.3
Antiphospholipid antibody syndrome (APLA)	1	0.7
Pregnancy following assisted reproductive technology (ART)	1	0.7

Table 3 shows the maternal history and medical risk factors included in the gestosis score among the study participants. Family history of hypertension was the most common risk factor, reported in 21.3% of participants, followed by maternal thyroid disorder (6.7%) and pre-existing diabetes mellitus (5.3%). SLE was present in 1.3% of participants, while chronic kidney disease and APLA syndrome were reported in 1.3% and 0.7%, respectively. Pregnancy following assisted reproductive technology was reported in 0.7% of participants.

Table 4 demonstrates the distribution of participants according to gestosis score category. A score of 1 was observed in 28.0% of participants, while 32.7% had a score of 2. A gestosis score of 3 was observed in 23.3%, whereas 16.0% had a score above 3. Overall, 60.7% of participants had a gestosis score below 3, while 39.3% had a score of 3 or higher. The mean gestosis score was 2.41±1.34.

Table 4: Distribution of participants according to gestosis score.

Gestosis Score category	Frequency (n=150)	Percentage
1	42	28.0
2	49	32.7
3	35	23.3
>3	24	16.0
Total	150	100
Mean gestosis score	2.41±1.34	

Table 5: Development of pregnancy-induced hypertension among the study participants.

PIH status	Frequency (n=150)	Percentage
PIH developed	26	17.3
PIH did not develop	124	82.7
Total	150	100

Table 5 demonstrates the occurrence of pregnancy-induced hypertension during follow-up. Overall, 26 (17.3%) participants developed PIH, while 124 (82.7%) did not develop PIH.

Table 6: Development of PIH according to gestosis score category.

Gestosis score	PIH developed (%)	No PIH (%)	Total	P value
<3	5 (5.5)	86 (94.5)	91	<0.001
≥3	21 (35.6)	38 (64.4)	59	
Total	26 (17.3)	124 (82.7)	150	

Table 6 shows the development of PIH according to gestosis score category. PIH developed in 35.6% of women with a gestosis score ≥3, compared with only 5.5% among those with a score <3. This difference was statistically significant (p<0.001).

Table 7: Predictive performance of gestosis score for PIH.

Predictive parameter	Value
True positive	21
True negative	86
False positive	38
False negative	5
Sensitivity	80.80%
Specificity	69.40%
Positive predictive value	35.60%
Negative predictive value	94.50%
Diagnostic accuracy	71.30%

Table 7 summarizes the predictive performance of the gestosis score for PIH. At a cutoff of ≥3, the score demonstrated a sensitivity of 80.8% and specificity of

69.4%. The positive predictive value was 35.6%, negative predictive value was 94.5%, and overall diagnostic accuracy was 71.3%.

Table 8: ROC analysis of gestosis score for prediction of PIH.

ROC parameter	Value
Area under the curve (AUC)	0.821
95% CI	0.738–0.904
Standard error	0.042
p-value	<0.001
Optimal cutoff	≥3
Sensitivity	80.80%
Specificity	69.40%

Table 8 presents the ROC analysis of the gestosis score for prediction of PIH. The gestosis score demonstrated good discriminatory ability, with an AUC of 0.821 (95% CI: 0.738-0.904; p<0.001). The optimal cutoff was ≥3, with a sensitivity of 80.8% and specificity of 69.4%.

DISCUSSION

The present prospective observational cohort study evaluated the role of the gestosis score in predicting pregnancy-induced hypertension (PIH) among 150 primigravid women. During follow-up, 26 (17.3%) participants developed PIH. The principal finding of the study was that the occurrence of PIH was substantially higher among women with a gestosis score ≥3 than among those with a score <3 (35.6% versus 5.5%, p<0.001). Furthermore, the gestosis score demonstrated good discriminatory performance, with a sensitivity of 80.8%, specificity of 69.4%, positive predictive value of 35.6%, negative predictive value of 94.5%, and diagnostic accuracy of 71.3%. ROC analysis showed an AUC of 0.821 (95% CI: 0.738-0.904; p<0.001). Taken together, these findings indicate that the gestosis score was able to distinguish primigravid women at relatively higher and lower risk of developing PIH in this study population.

The baseline characteristics demonstrated that the study population consisted predominantly of young women, with 44.7% aged 21-25 years and 32.0% aged 26-30 years. More than half of the participants were from urban areas (55.3%). Most participants had singleton pregnancies (95.3%), while 4.7% had multiple pregnancies. Regarding gestational age at enrollment, 40.7% were enrolled at 12-16 weeks and 36.0% before 12 weeks. More than half had a normal BMI (56.0%), whereas 26.0% were overweight and 10.0% were obese. Anaemia was present in 18.0% of participants. These baseline characteristics provide the clinical context in which the gestosis score was evaluated and demonstrate that risk assessment was performed during the antenatal period before the subsequent development of PIH.

The distribution of maternal risk factors showed that family history of hypertension was the most frequently

reported risk factor included in the gestosis score (21.3%). Maternal thyroid disorder and pre-existing diabetes mellitus were reported in 6.7% and 5.3%, respectively. SLE, chronic kidney disease, APLA, and pregnancy following ART were less frequently observed. The presence of a range of maternal medical and familial risk characteristics supports the rationale for using a composite score rather than relying on a single clinical characteristic for risk assessment.

The findings are consistent with the broader literature supporting early clinical risk assessment for hypertensive disorders of pregnancy. De Kat et al in a systematic review of prediction models for pre-eclampsia, identified maternal characteristics such as medical history, BMI, blood pressure, parity, uterine artery pulsatility index, and maternal age among the commonly used predictors. However, substantial heterogeneity was observed between prediction models, together with limitations related to validation and applicability across populations.³ These observations support the use of structured combinations of maternal characteristics for risk stratification, while also highlighting the importance of validating such approaches in the population in which they are intended to be used.

Antwi et al reviewed prediction models for gestational hypertension and pre-eclampsia and reported that many existing models incorporated maternal clinical characteristics together with biomarkers. They also highlighted the relatively limited development and validation of prediction models in low- and middle-income countries and emphasized the need for external validation in these settings.¹⁰ This is relevant to the present study because the gestosis score is based on clinical and maternal characteristics that can be assessed during routine antenatal care without dependence on specialized biomarker testing.

The present study demonstrated a clear difference in PIH occurrence according to gestosis score category. Among women with a score <3, only 5.5% developed PIH, compared with 35.6% among women with a score ≥ 3 . Thus, participants in the higher-score group had a markedly greater observed frequency of PIH, and the difference was statistically significant ($p < 0.001$). This finding suggests that the selected threshold of ≥ 3 provided clinically meaningful risk stratification within the study population.

The discriminatory performance observed in the present study is comparable with that reported for some maternal-characteristic-based prediction approaches. However, direct comparisons should be interpreted cautiously because many previous investigations focused on pre-eclampsia rather than PIH. Sovio and Smith evaluated a simple maternal-characteristic risk score among 4,184 nulliparous women and reported an AUC of 0.846 for prediction of preterm pre-eclampsia.¹⁵ Their findings demonstrated that a relatively simple combination of maternal characteristics could provide useful

discrimination. The AUC of 0.821 observed in the present study was within a similar range, suggesting good discriminatory ability; however, differences in outcome definition, study population, predictors, and modelling methodology prevent direct numerical comparison.

Al-Rubaie et al developed and validated a prediction model for pre-eclampsia among nulliparous women using routinely available maternal characteristics, including maternal age, BMI, family history, autoimmune disease, chronic hypertension, and chronic renal disease. The model demonstrated modest discriminatory performance, with a validation c-statistic of approximately 0.70.8 Compared with that model, the higher AUC observed in the present study may reflect differences in the study population, outcome definition, sample size, predictor selection, and scoring methodology. Nevertheless, both studies support the feasibility of using routinely obtainable maternal characteristics for antenatal risk stratification.

Sandström et al evaluated early pregnancy clinical risk assessment among nulliparous women. They reported that models based on routinely available maternal characteristics could provide useful, although generally modest, prediction of subsequent pre-eclampsia.⁶ Their findings support the principle that information obtained during early antenatal assessment can provide prognostic information before the clinical onset of hypertensive disease. A subsequent longitudinal study demonstrated that sequentially updated models incorporating routinely collected antenatal information could improve prediction as pregnancy progressed.⁹ The present study similarly evaluated risk characteristics before the development of PIH, supporting the concept that early antenatal information may be useful for identifying women who warrant closer observation.

Maternal adiposity is recognized as an important risk characteristic for hypertensive disorders of pregnancy. In the present study, 26.0% of participants were overweight, and 10.0% were obese. Mayrink et al reported that BMI measured at the first medical visit was independently associated with subsequent pre-eclampsia among healthy nulliparous women.⁵ Similarly, Lin et al reported an association between overweight or obesity and increased risk of pre-eclampsia in a large population-based study from Beijing.¹⁴ In the present study, however, BMI was described as a baseline characteristic rather than analysed as an independent predictor of PIH; therefore, no independent association between BMI and PIH is inferred from these data.

The association between maternal adiposity and hypertensive pregnancy disorders is also supported by Meazaw et al, who reported an increased risk of pre-eclampsia/eclampsia among women with higher maternal BMI in a systematic review and meta-analysis of studies from sub-Saharan Africa.¹⁶ The review also identified primiparity and family history among relevant risk characteristics. These findings provide biological and

epidemiological support for considering maternal characteristics such as BMI within broader clinical risk assessment, although the present study did not separately quantify the contribution of individual gestosis score components to PIH.

Family history of hypertension was the most frequently reported individual maternal risk factor in the present study, occurring in 21.3% of participants. Kay et al reviewed evidence regarding family history of hypertension, cardiovascular disease, and diabetes in relation to pre-eclampsia and reported that familial cardiovascular and hypertensive predisposition may contribute to subsequent hypertensive pregnancy disorders.¹⁷ This supports the inclusion of family history within a composite clinical risk assessment; however, because the present study did not report separate statistical testing of family history against PIH, its independent predictive contribution cannot be established from the current results.

Stitterich et al conducted a case-control study among women with pre-eclampsia/eclampsia in Sierra Leone and reported an association between family predisposition and hypertensive pregnancy disease.¹⁸ Although their study evaluated pre-eclampsia/eclampsia rather than PIH, it provides supporting evidence that familial predisposition may be relevant when assessing maternal risk. The present study therefore supports the broader concept of incorporating relevant maternal history into antenatal risk assessment rather than interpreting family history as an independent predictor of PIH.

Blood pressure is another important component of hypertensive-risk assessment. Gunnarsdottir et al investigated 64,490 healthy primiparous women and reported that elevated blood pressure from early to mid-gestation was associated with increased risk of pre-eclampsia.⁷ This finding emphasizes the prognostic importance of early maternal cardiovascular assessment. In the present study, the overall gestosis score, rather than an individual blood-pressure parameter, was evaluated as the predictive measure; therefore, the current results do not establish an independent association between a specific blood-pressure value and subsequent PIH.

The predictive characteristics of the gestosis score deserve particular consideration. At the cutoff of ≥ 3 , the sensitivity was 80.8%, indicating that the score identified most participants who subsequently developed PIH. The specificity of 69.4% demonstrated moderate ability to correctly classify participants who did not develop PIH. The high negative predictive value of 94.5% indicates that participants classified below the cutoff were unlikely to develop PIH in this study population. In contrast, the positive predictive value was 35.6%, indicating that a high score should not be interpreted as diagnostic confirmation of PIH. Therefore, the gestosis score appears more useful for identifying women at lower risk and selecting women

who may require enhanced surveillance than for confirming that PIH will definitely develop.

The diagnostic accuracy of the score was 71.3%, further supporting its moderate overall classification performance. Importantly, the relatively low positive predictive value should be interpreted in the context of the overall PIH prevalence of 17.3% in the study population. Predictive values are influenced by outcome prevalence; therefore, the positive predictive value observed in this cohort may not necessarily be reproduced in populations with a different baseline prevalence of PIH.

The usefulness of combining maternal characteristics rather than relying on a single predictor is supported by Pihl et al., who evaluated BMI, mean arterial pressure, and first-trimester serum markers for prediction of pre-eclampsia in nulliparous women.¹⁹ Their findings demonstrated the potential contribution of maternal characteristics to early risk prediction, although their prediction framework also incorporated biochemical markers. In contrast, the present gestosis score provides a clinically oriented composite approach based on maternal risk characteristics, potentially making it more practical in settings where extensive biomarker-based screening is not routinely available.

Similarly, Yue et al developed and validated a nomogram for early prediction of pre-eclampsia among pregnant Chinese women using variables including BMI, blood pressure, uterine artery ultrasound parameters, and serological indicators.²⁰ This represents a more complex prediction strategy than the clinically based gestosis score evaluated in the present study. The higher complexity of such models may improve prediction in some settings but may also limit routine implementation where specialized investigations are not readily available. The present findings suggest that a simpler clinical score may provide useful preliminary risk stratification, although it should not be considered equivalent to biomarker- or ultrasound-based prediction models.

The findings may also have relevance to the Bangladeshi context. Mou et al reported the prevalence and associated risk factors of pre-eclampsia among pregnant women in Bangladesh, emphasizing the continuing burden of hypertensive disorders of pregnancy in the country. The present study adds to this context by prospectively evaluating a structured clinical scoring approach for PIH among primigravid women in a tertiary-care hospital. A simple risk assessment tool may be particularly useful in antenatal settings where early identification of women requiring closer monitoring is desirable and where advanced predictive investigations may not be universally accessible.

A major strength of the present study is its prospective observational design. The gestosis score was assessed during antenatal care and participants were subsequently followed for the development of PIH, establishing a

temporal sequence between baseline risk assessment and outcome occurrence. This strengthens interpretation of the score as a predictive rather than merely cross-sectional measure. The use of ROC analysis also allowed assessment of the overall discriminatory ability of the score and identification of a clinically relevant cutoff.

Several limitations should nevertheless be considered. First, the study was conducted at a single tertiary-care hospital and included a relatively small sample of 150 participants, which may limit generalizability to other populations and healthcare settings. Second, the study population consisted of primigravid women, and therefore the findings may not be directly applicable to multiparous women. Third, many existing prediction studies have focused on pre-eclampsia or preterm pre-eclampsia rather than PIH, limiting direct comparison with the present findings. Fourth, although the gestosis score demonstrated good discrimination in this cohort, the relatively modest positive predictive value indicates that a high score cannot be considered diagnostic of subsequent PIH. Finally, the score requires external validation in larger, multicentre populations before the cutoff of ≥ 3 can be recommended for routine clinical implementation.

Overall, the present study found that a gestosis score ≥ 3 was associated with a higher incidence of PIH among primigravid women. The incidence of PIH was 35.6% among women with a score ≥ 3 compared with 5.5% among those with a score < 3 ($p < 0.001$). The score showed good discriminatory ability, with an AUC of 0.821, sensitivity of 80.8%, specificity of 69.4%, negative predictive value of 94.5%, and overall diagnostic accuracy of 71.3%. These findings suggest that the gestosis score may have potential utility as a simple clinical tool for antenatal risk stratification and identification of women who may benefit from closer surveillance. However, external validation in larger and more diverse populations is required before the identified cutoff can be recommended for widespread clinical use.

This study has some limitations. The relatively small sample size and single-center design may limit the generalizability of the findings. As only primigravid women were included, the applicability of the gestosis score to multigravid women could not be assessed. In addition, external validation of the identified cutoff was not performed. Larger multicentre studies with independent validation are therefore needed to confirm these findings.

CONCLUSION

The present study demonstrates that the gestosis score has potential utility for early prediction of pregnancy-induced hypertension among primigravid women. A gestosis score ≥ 3 was significantly associated with subsequent development of PIH, and the score demonstrated good discriminatory performance, with an AUC of 0.821, sensitivity of 80.8%, specificity of 69.4%, and negative

predictive value of 94.5%. These findings suggest that a simple, clinically based scoring approach may facilitate early identification of women at increased risk and allow closer antenatal surveillance in routine obstetric practice. However, the score should be considered a risk-stratification tool rather than a diagnostic test, and its clinical applicability should be confirmed through larger multicentre studies and external validation before widespread implementation.

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