ORIGINAL ARTICLE

Hypertensive Disorders in Pregnancy – Gestosis Scoring can Predict the Launching of a Deadly Missile—Preeclampsia

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Abstract

Introduction: The hypertensive disorders in pregnancy (HDP) – gestosis score is a risk scoring system for developing preeclampsia (PE). It has a range of scores from 1 to 3. A pregnant woman is marked as "at risk for preeclampsia" if her overall score is 3 or higher. She is then managed accordingly.

Aims: To predict PE, we assessed the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of the HDP–gestosis score.

Materials and methods: A prospective research based on a hospital done for a duration of 1 year. Ninety-four pregnant women after 20 weeks of pregnancy were evaluated for the development of PE based on collected information on the patient's age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, length of the marriage, parity, prior medical and surgical intervention, prior/current medications, and family history. Gestosis score was determined and grouped into the following three risk categories: Mild (score of 1), moderate (score of 2), and high risk (score of 3 or more). Data were entered into Microsoft Excel 2007 and analyzed in statistical package for the social sciences (SPSS) software, version 2007 (IBM Corp., New York, USA).

Results: The mean age, gestational age and body mass index (BMI) of the women were 24.34 ± 4.1 years, 13.7 ± 1.7 weeks, and 21.45 ± 1.9 kg/m^2, respectively. The gestosis score was 2 in 46.8% ($n = 44$) of the participants, 1 in 30.9% ($n = 29$), and ≥3 in 22.3% ($n = 21$) of the women. Preeclampsia developed in 23.4% ($n = 22$) of participants. The sensitivity, specificity, PPV, NPV, and diagnostic accuracy of HDP–gestosis score ≥3 for predicting PE were 86.36, 97.22, 90.84, 95.89, and 94.68%, respectively.

Conclusion: Gestosis score is a useful clinical marker for PE development that enables patients to receive quick care, reducing the burden of developing PE.

Keywords: Diagnosis, Gestosis, Preeclampsia, Prediction.

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Introduction

The term hypertensive disorders in pregnancy (HDP) encompasses conditions ranging from prepregnancy or chronic hypertension to complex multisystem needs like preeclampsia (PE). It also includes complications such as eclampsia, hemolysis, elevated liver enzymes, low platelet count (HELLP) syndrome, acute renal failure, pulmonary edema, stroke, and left ventricular failure. Severe PE and these complications are one of the pivotal causes of maternal and perinatal morbidity and mortality.[1] Also, HDP is responsible for around 19% of all maternal deaths despite the increased antenatal care taken by pregnant ladies. Eclampsia is liable for 4–6% of maternal deaths (Table 1).

Hypertensive disorders in pregnancy have many different varieties of presentation ranging from mild to very severe, making it difficult to manage. Even if there was any tool to predict the disease that means who may develop the disease, we could be in a better position to prevent it or initiate any early treatment. However, no specific predictive tool has yet been invented.

In a study conducted in India, the prevalence of PE was around 11%.[2] Ethnicity, maternal age of more than 45 years, extremes of parity, maternal comorbidities such as chronic hypertension, chronic kidney disease, obesity, positive family history, and prior HDP, all these wide ranges of factors are associated with the development of HDP. Also, abnormal uterine artery Doppler velocimetry, placental growth factor, and pregnancy-associated plasma protein -A (PAPP-A) are shown to be associated with PE severity. [3]

International Federation of Gynecology and Obstetrics (FIGO) recommends universal screening for HDP for the obstetrics population, but as mentioned before, there are many practical tools. Also, FIGO recommends combined tests, maternal risk factors, and biomarkers as a one-step procedure. The best-combined test is maternal risk factors, mean arterial pressure (MAP)

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Table 1: The HDP–Gestosis score

Risk factor	*Score*
Woman born as small for gestational age	1
Maternal anemia	1
Age older than 35 years	1
Age younger than 19 years	1
Obesity (BMI >30)	1
Nulligravida	1
Short duration of paternity (cohabitation)	1
Family history of PE	1
Family history (H/O) of cardiovascular disease	1
Polycystic ovary syndrome	1
Interpregnancy interval of more than 5 years	1
Assisted reproductive (IVF/ICSI)	1
Treatment	
Maternal hypothyroidism	1
Chronic vascular disease (dyslipidemia)	1
Excessive weight gain during pregnancy	1
MAP >85	1
Gestational diabetes mellitus	2
Obesity (BMI >40)	2
Multiple pregnancy	2
Hypertensive disease during previous pregnancy	2
Pregestational diabetes mellitus	3
Chronic hypertension	3
Mental disorders (e.g., schizophrenia)	3
Inherited/acquired thrombophilia	3
Maternal chronic kidney disease	3
Autoimmune disease (SLE/APLAS/RA)	3
Assisted reproductive (OD) treatment	3

BMI, body mass index; MAP, mean arterial pressure

measurement, serum placental growth factor (PLGF), and uterine artery pulsatility index. Due to cost and unavailability, most of the time, Doppler and PLGF are impossible to do. We can use maternal risk factors and MAP.[4,5] The National Institute for Health and Clinical Excellence (NICE), UK, and the American College of Obstetricians and Gynecology (ACOG) now identify demographic characteristics and medical history.[6]

In low-resource settings, biomarkers are only sometimes available and affordable. Also, uterine artery Doppler is expensive, and trained radiologists are unavailable everywhere. So, in this situation, according to NICE and ACOG, a simple risk model can be applied for universal screening.

Hypertensive disorders in pregnancy–gestosis score for effective PE screening and prognosis is a simple risk assessment tool. This score consists of known and potential risk factors for the pregnant lady. A score of each risk factor is indicated as 1, 2, and 3 according to their possibility of developing PE. It is complemented by a precise history and examination of the patient to reach a final score. A score of 3 or more is considered a high risk for developing PE (Table 2).

Aim

In the HDP–gestosis score, all the risk factors included are well enquired and they are really found to have an association with the development of HDP. Due to racial differences, the risk factors of Bangladesh may differ from other countries. This study intends to inquire about the predictive capacity of HDP–gestosis score for developing hypertension and PE/eclampsia.

Table 2: Demographic characteristics of the study subject

Demographic characteristics	*Minimum*	*Maximum*	*Mean ± standard deviation*
Age	18	34	24.37 ± 4.194
Gestational age	7.3	13.7	10.614 ± 1.7824
BMI	18.4	27.5	21.450 ± 1.8641
SBP	110.3	128.9	119 ± 3.8
DBP	50.4	85.7	68.39 ± 8.8

Materials and Methods

The inclusion criteria were age more than 18 years and booked cases with the first antenatal appointment within the first 11 weeks.

We excluded women who were expecting and had COVID-19 illness, drug abuse, cancer, liver disease, alcohol consumption, or smoking habits.

From August 2021 to January 2023, 94 pregnant patients who presented at the Department of Obstetrics and Gynecology of East West Medical College Hospital were included in this study. It was a prospective research. After 20 weeks of pregnancy, every pregnant woman was evaluated for development of PE. In a preformed data sheet, we collected information on the patient's age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, length of the marriage, parity, prior medical and surgical intervention, prior/current medications, and family history. Gestosis score was determined and grouped into the following three risk categories: Mild (score of 1), moderate (score of 2), and high risk (score of 3 or more). All data were entered in a Microsoft Excel sheet and analyzed in SPSS software, version 2007 (IBM Corp., New York, USA). The HDP–gestosis score's sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were assessed for predicting the onset of PE (Table 3).

Results

In Table 2, we can see that the average age of patients is 24.37 ± 4.194 years. The average gestational duration was 11 weeks. Average blood pressure was 120/69 mm Hg.

Gestosis score 1 was 30.9%, score 2 was 46.8%, and score 3 was 22. Also, 22% had a score of 3 which was marked as high risk.

Among 94 cases, in our study, 23.4% developed PE.

In our study, the total PE developed 22 whereas the total number of participants was 94. Participants with gestational score ≤2 were 72 and those with gestational score ≥3 is 22. Participants with gestational score ≥3 also developed PE at 19, which is 86.4% and highly significant (Chi-square test < 0.001) (Table 4).

Discussion

Our study's prevalence of PE was 23.40% overall. According to Meeta Gupta et al.,[7] there were 15.01% of PE cases worldwide. The incidence rate is currently 14.4%, according to Mou et al.[8] However, according to a current study, Sweden and China had lower PE

Table 3: Gestosis score

Gestosis score	*Frequency*	*Percentage*
1	29	30.9
2	44	46.8
3	21	22.3
Total	94	100

Table 4: Preeclampsia score

Preeclampsia score	*Frequency*	*Percentage*
No	72	76.6
Yes	22	23.4
Total	94	100.0

Table 5: Preeclampsia findings in gestosis score

	PE		
	Yes	*No*	*Total*
Gestosis score = 3			
No			
Count	3	70	73
% within PE	13.6%	97.2%	77.7%
Yes			
Count	19	2	21
% within PE	86.4%	2.8%	22.3%
Total			
Count	22	72	94
% within PE	100.0%	100.0%	100.0%

prevalence rates (3.98% and 4.02%, respectively.[9] The incidence of HDP among Indian women was 15.4%, according to the study by Mishra et al.[10] Furthermore, PE is more prevalent in underdeveloped nations, ranging from 3 to 23% overall (Table 5).

These studies aim to educate individuals on predicting PE and how a straightforward grading system can assist. It can offer a chance for patient management to stop PE's adverse effects appropriately.

Obstetric emergencies include PE. In our investigation, an HDP–gestosis score of 3 had an 85.51% specificity for predicting PE and a sensitivity of 60%. In contrast, the study by Imam ST[11] revealed that a score of 3 or above on the HDP–gestosis score had a sensitivity of 86.66% for detecting PE. High specificity means that the development of PE is effectively ruled out by the HDP score of 3. Therefore, these patients require preventative treatments and routine monitoring.

The literature review reveals that this screening scoring system, which incorporates mean arterial pressure, uterine artery PI (UTPI), and serum PLAF or PAPP, has already received international validation.[12] By omitting USG and biomarkers and using the maternal history and baseline test, the gestosis score varies from this method by making scoring simple at the base level.

The outcome was essential for raising public awareness of the fatal PE prevalence and the potential application of a simple scoring system for a more effective patient cure and decrease PE-related complications (Table 6).

Table 6: Ability of gestosis score (score ≥3) to predict PE

Statistic	*Value (%)*	*95% Confidence interval*
Sensitivity	60.00	32.29–83.66%
Specificity	85.51	74.96–92.83%
PPV	47.37	30.75–64.59%
NPV	90.77	84.00–94.85%
Accuracy	80.95	70.92–88.70%

Table 7: Risk factors that are significantly associated with PE

Risk factors	*Number of patients*
Maternal anemia	4
Primigravida	6
Age >35 years	5
Age <19 years	2
Obesity (BMI >30)	2
Short duration of cohabitation	3
Family H/O cardiovascular disease	1
Polycystic ovarian syndrome	3
Interval between pregnancy >5 years	1
ART (IVF/ICSI)	1
Maternal hypothyroidism	1
Gestational diabetes mellitus	21
Obesity (>40)	4
Multifetal pregnancy	3
Hypertension in previous pregnancy	16
Diabetes mellitus	8
Chronic hypertension	6
Maternal chronic kidney disease	1
Inherited or acquired thrombophilia	1
Mental disorders (e.g., schizophrenia)	2
Autoimmune disease	3

BMI, body mass index

Many causes underlie the increased risk of developing PE associated with these factors, including arterial stiffening, endothelial dysfunction, uterine vessel compliance, placental functioning, placental maladaptation, depletion of maternal nutrients, and maternal inflammatory response. Reduced antioxidant levels, an antipaternal immune response, and genetic or epigenetic effects increase lipid oxidation (Table 7).

The research had merit because it supported a scoring system that may be applied in obstetric practice. As a single-center study without connections between fetomaternal outcomes and gestosis score, we should understand the survey within those constraints.

Conclusion

Gestosis score 3 showed sensitivity, specificity, PPV, and NPV of 60.00, 85.51, 47.37, 97.98, and 90.77%, respectively, for predicting the start of PE. Overall, it seems to be a distinct early signal that can anticipate the development of PE with a diagnostic accuracy of 80.95 percent, allowing for adequate patient management and minimizing the harmful effects.

Ethical Approval

The study was approved by the institutional ethics committee.

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