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Original Research Article

A prospective study to determine the predictive ability of hypertensive disorders during pregnancy-gestosis score for the development of pre-eclampsia

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ABSTRACT

Background: Hypertensive disorders during pregnancy **(**HDP)-gestosis score is a risk scoring system (score 1-3) for the development of pre-eclampsia. When a pregnant woman's total score is equal to or greater than 3, she is labelled as "at risk for pre-eclampsia" and is managed accordingly. Objectives were to determine the sensitivity, specificity, and diagnostic accuracy of HDP-gestosis score for predicting pre-eclampsia (PE).
Methods: This prospective study included 100 pregnant women who presented at the department of obstetrics and gynaecology. After 20 weeks of pregnancy, the patients were assessed for the development of pre-eclampsia. Details of age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, duration of marriage, parity, past medical and surgical intervention, previous/present medication, and family history were taken. Gestosis score was calculated and classified into mild (score of 1), moderate (score of 2) and high risk (score of ≥ 3) for the development of PE. Sensitivity, specificity, and diagnostic accuracy of HDP-gestosis score for predicting the development of PE were determined.
Results: The mean age, gestational age, and body mass index (BMI) of the women were 28.4±6.8 years, 11.5±2.04 weeks, and 24.5±3.7 kg/m^2, respectively. The gestosis score was 2 in 43.13% of the participants, 1 in 42.28%, and ≥3 in 14.59% of the women. PE developed in 15.01% (n=71) participants. The sensitivity, specificity, PPV, NPV, and diagnostic accuracy of HDP-gestosis score for predicting PE were 83.1%, 97.51%, 85.51%, 97.03% and 95.35%, respectively.
Conclusions: Gestosis score is a novel early marker for prediction of the development of PE allowing for a prompt management for the patients, thereby curbing the adverse consequences.

Keywords: HDP score, Gestosis, Preeclampsia, Prediction

INTRODUCTION

Pre-eclampsia (PE) is one of the commonest complications of pregnancy, affecting 4.6% pregnancies worldwide[1] and 1.8-16.7% pregnancies in the developing countries.[2] It is identified by systolic blood pressure (SBP) and diastolic blood pressure (DBP) greater than 140 mm Hg and 90 mm Hg, respectively, after 20 completed weeks of pregnancy. As reported in an Indian study, the overall pooled prevalence of PE in India was 11%.[3]

A simple risk model named HDP-gestosis score has been devised for effective screening and prediction of PE.[4] This score considers all of the pregnant woman's present and emerging risk factors. Each clinical risk factor is given a score of 1, 2, or 3 based on its severity in the development of PE. A total score is obtained from detailed history and examination of the woman. When a pregnant woman's total score is equal to or greater than 3, she is labelled as "at risk for PE" and is managed accordingly.[4]

Very few studies have been conducted in the practical setting to determine the diagnostic accuracy and sensitivity of prediction of PE for HDP-gestosis score. So, this study was conducted wherein HDP-gestosis score was applied and the pregnant women were followed-up to confirm and note the predictive ability for the development of PE.

Objective

Objectives were to determine the sensitivity, specificity, and diagnostic accuracy of HDP-gestosis score for predicting PE.

Methodology

This is a prospective observational study conducted at MVJ medical college and research hospital, from August 2023 to August 2024 and included 100 pregnant women who presented at the department of obstetrics and gynaecology.

Inclusion criteria

Patients aged over 18 and scheduled births with the first prenatal appointment during the first 11 weeks of pregnancy and singleton pregnancy were included.

Exclusion criteria

Patients with drug abuse, cancer, liver disease, alcohol consumption, or smoking habits and multiple pregnancies, molar pregnancy were excluded.

Study participants were included in the study by purposive sampling technique. After 20 weeks of pregnancy, the patients were assessed for the development of PE. A detailed demographic history about age, gravida, obstetric history, menstrual cycle regularity, polycystic ovarian disease history, duration of marriage, parity, past medical and surgical intervention, previous/present medication, and family history were taken, followed by a routine clinical obstetric examination as per protocol. Gestosis score was calculated and classified into mild (score of 1), moderate (score of 2) and high risk (score of ≥3) for the development of PE. Sensitivity, specificity, and diagnostic accuracy of HDP-gestosis score for predicting the development of PE were determined. Clearance from the institutional ethical committee was taken before starting the study.

Estimation of sample size

On the basis of statistics obtained from department of obstetrics and gynaecology, MVJ MC and RH, an average of 8 cases per month fitting the criteria of the study with study duration of 18 months, we can expect to have N=108. Based on this population size, using Yamane equation, for a known population size, sample size (n) equal to

n=N/1+Ne2

n=sample size, N=population size, e=margin of error (for 95% of confidence level, margin error=0.05)

n=108/1+108×0.05×0.05= 108/1.27=85

Therefore, after approximating, the sample size of the study participants was fixed at 100.

Statistical analysis

The data was collected and compiled in MS excel. Descriptive statistics has been used to present the data. To analyse the data SPSS (Version 26.0) was used. Significance level was fixed as 5% (α=0.05. Qualitative variables are expressed as frequency and percentages and quantitative variables are expressed as mean and standard deviation. To compare the proportion between groups, chi-square test was applied.

Table 1: HDP gestosis score.

Risk factors	Score
Age >35 years	1
Age <19 years	1
Maternal anaemia	1
Obesitv (BMI > 30)	1
Primigravida	1
Short duration or sperm exposure (cohabitation)	1
Woman born as small for gestational age	1
Family history of cardiovascular disease	1
Polycystic ovary syndrome	1
Inter pregnancy interval more than 7 years	1
Conceived with assisted reproductive (IVF/ICSI) treatment	1
MAP > 85 mm of Hg	1
Chronic vascular disease (dyslipidemia)	1
Excessise weight gain during pregnancy	1
Maternal hypothyroidism	2
Family history of preeclampsia	2
Gestational diabetes mellitus	2
Obesitv (BMI > 35 kg/m^2)	2
Multifetal pregnancy	2
Hypertensive disease during previous pregnancy	2
Pregestational diabetes mellitus	3
Chronic hypertension	3
Mental disorders	3
Inherited/acquired thrombo hilia	3
Maternal chronic kidney disease	3
Autoimmune disease (SLE/APLAS/RA)	3
Pregnancy with assisted reproductive (OD or surrogacy)	3
Treatment for hypertensive disease of pregnancy	3

RESULTS

The mean age was found to be 25.63±5.6. The mean gestational age was found to be 10.2±0.79 weeks. 66% of the study participants were primigravida. The mean BMI was found to be 24.9±3.6 kg/m^2. The mean systolic and DSP was found to be 117.6±10.4 and 77.6±5.7 respectively.

Table 2: Patient characteristics

Variables		N
Age (in years), mean±SD		25.63± 5.6
Gestational age (in weeks), mean±SD		10.2±0.79
Gravida	Primigravida	66 (66%)
	Multigravida	34 (34%)
BMI (kg/m^2), mean±SD		24.9±3.6
SBP (mmHg), mean±SD		117.6 ±10.4
DBP (mmHg), mean±SD		77.6±5.7

Table 3: HDP gestosis score.

Score	N
Less than 3	67
More than or equal to 3	33

The 33% of the study participants had HDP gestosis score more than or equal to 3.

Table 4: Incidence of PE.

PE	N
Yes	18
No	82

The incidence of PE in the present study was found to be 18%.

Table 5: Association of HDP gestosis score with incidence of PE.

HDP gestosis score	PE		Total	P value
	Yes	No		
≥3	14	19	33	<0.00001
<3	4	63	67	

The 77% of the study participants with PE were found to have HDP gestosis score more than or equal to 3. The chi square statistic is 19.9065. The p<0.00001.

From all patients, 67 had gestosis score less than 3 and 33 had score more than 3 (Figure 1). The 18% had PE, 82% had no PE (Figure 2). Out of 18 who had PE, 14 had higher gestosis score and out of 82 who did not have preeclampsia, 63 did not fulfil the gestosis criteria (Figure 3).

Table 6: Predictive value of gestosis score ≥3 for predicting PE.

HDP gestosis score	Value	95% CI
Sensitivity	77.78%	52.36% to 93.59%
Specificity	76.83%	66.20% to 85.44%
Positive likelihood ratio	3.36	2.11 to 5.34
Negative likelihood ratio	0.29	0.12 to 0.69
Disease prevalence*	18.00%	11.03% to 26.95%
Positive predictive value*	42.42%	31.64% to 53.98%
Negative predictive value*	94.03%	86.81% to 97.42%
Accuracy*	77.00%	67.51% to 84.83%

*The sensitivity, specificity, PPV, NPV, and diagnostic accuracy of HDP-gestosis score for predicting PE were 77.78%, 76.83%, 42.42%, 94.03% and 77.00%, respectively.

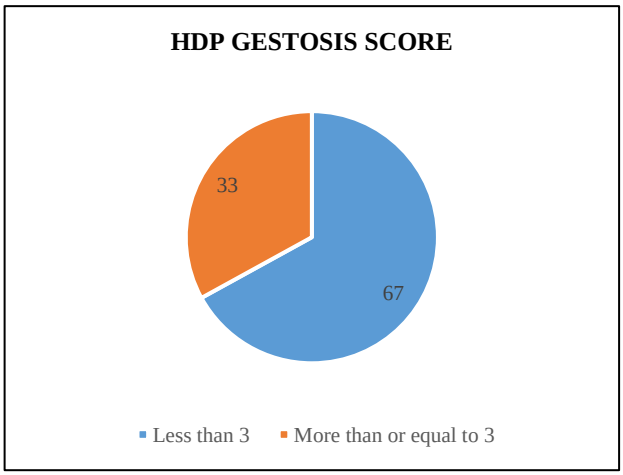

Figure 1: HDP gestosis score.

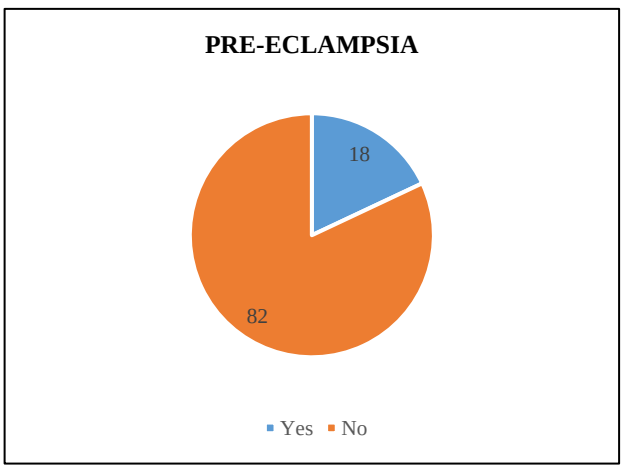

Figure 2: Pre-eclampsia.

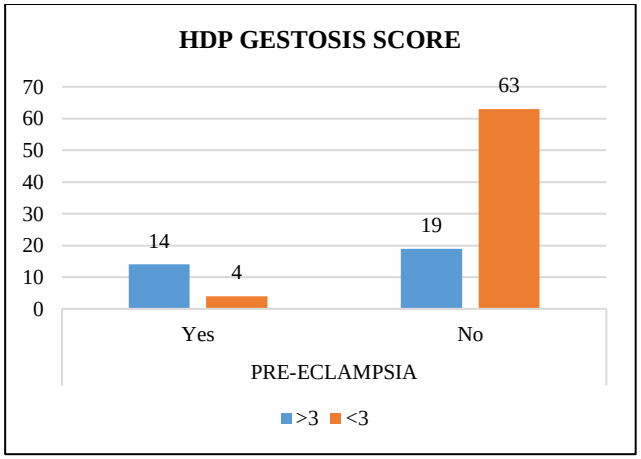

Figure 3: HDP gestosis score.

DISCUSSION

In our study, the mean age of the study participants was found to be 25.63±5.6 and the mean gestational age was found to be 10.2±0.79 weeks. Similarly, a prospective study conducted by Imam et al also showed that the mean age and the gestational age of the women were 25.71±5.9 years and 11.9±2.19 weeks respectively.[5]

The incidence of PE in the present study was found to be 18%. Similarly, around 17% of the study participants developed PE during the follow up study done by Imam et al.[5] Recently, Gupta et al also found that the rate of PE in his study was 15.01%.[6] Similarly, Mishra et al also reported incidence of HDP to be 15.4% among Indian women.[7] Majority of the study participants (77%) in our study with PE were found to have HDP gestosis score more than or equal to 3. Also, in the prospective study done by Imam et al around 68% of the study participants with PE had HDP gestosis score of more than or equal to 3.[5]

The sensitivity and the specificity of HDP gestosis score for predicting PE in our study were 77.78% and 76.83% respectively. A study done by Ruman et al revealed that a score of 3 or above on the HDP gestosis score had a sensitivity of 60% and specificity of 85.51% for detecting PE.[8] In a study by Manhar et al also found out that the sensitivity and specificity of this score test to be 50% and 96.43% respectively.[9] Whereas the study done by Gupta et al has found that the sensitivity and specificity of HDP gestosis (≥3) for predicting PE were 83.1%, and 97.51%, respectively.[6] Imam et al also revealed that sensitivity and specificity of the score test as 86.66% and 96.49% respectively.[5] The screening test indicators value in our study was found to be slightly reduced when compared to the other studies. Even though, this HDP gestosis score (more than or equal to 3) has been found to be a better screening test in an outpatient clinical setup (high sensitivity and specificity) for earlier prediction of hypertensive disorders in pregnancy. Those with HDP gestosis score of 2 can be monitored routinely since they are also at intermediate risk of developing hypertensive disorders.

The literature search shows that one such screening scoring system is already validated in the international community which inculcate mean arterial pressure (MAP), uterine artery PI (UTPI) and serum PLGF or PAPP-A. HDP gestosis score avoids the use of biomarkers and USG and makes the scoring easy at the grassroot level by including the maternal history and baseline tests.[10] Hence HDP gestosis score is more convenient and also an inexpensive way which can be applied practically and used in low resource setting.[11-14] Also studies have shown that gestosis score is influenced by many other factors and have individually found risk association with these factors, thereby justifying the inclusion of these factors in gestosis score.[15-18]

Limitations

Our study is conducted at a single tertiary hospital so our findings cannot be generalized to entire female population. Moreover, our sample size is less which might impact the accuracy of data. Fetomaternal outcome has not been assessed. Hence more studies which are multicentric with greater sample size are required to increase the accuracy of prediction.

CONCLUSION

It is recommended that health workers should use HDP gestosis score as a screening tool for PE prediction allowing for a prompt management for the patients, thereby allowing to curb the adverse consequences. Moreover, this method is useful in low resource countries as other proven markers for prediction are expensive and unavailable.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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