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Original Research Article

Prediction of preeclampsia by HDP gestosis score

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ABSTRACT

Background: Preeclampsia is a complex obstetrical syndrome and an important contributor to maternal and perinatal morbidity and mortality. A large number of predictive tests and scoring systems have been proposed but ni low resource settings a cheap, quick and reliable scoring system is desirable to adequately predict the risk for all women. This study aimed to study the role of HDP gestosis score in prediction of preeclampsia.
Methods: The study was done on 400 antenatal women attending Obstetrics and Gynecology outpatient department of SRN hospital, MLNMC Prayagraj. All enrolled participants were assigned a gestosis score calculated by the ANDROID AP at first visit (<18 weeks of gestation). All women were divided in three groups according to gestosis score of 1, 2 and 3 or more. The participants were then followed throughout pregnancy and development of preeclampsia was noted.
Results: Preeclampsia developed in 13.7% of women. THE sensitivity, specificity, positive predictive value, negative predictive value and predictive accuracy of HDP gestosis score were 72.2%, 94.6%, 68.4%, 95.5% and 91.6% respectively.
Conclusions: The HDP gestosis score is a simple, cheap, mobile app. Based scoring system which allows provider to quickly assess individual woman risk-for future development of preeclampsia in busy OPD setting. HDP gestosis score is an effective tool to predict at risk women and initiate pharmacological intervention or intensive maternofetal surveillance.

Keywords: Gestosis, HDP score, Preeclampsia, Prediction

INTRODUCTION

Hypertensive disorders of pregnancy are among the most common cause of maternal morbidity and mortality complicating up to 10% of all the pregnancies globally. The spectrum of hypertensive disorder of pregnancy include gestational hypertension, chronic hypertension, preeclampsia and eclampsia. Preeclampsia affects 3-5% of all pregnancies and is a major contributor to maternal morbidity and mortality.[1] The maternal mortality rate of India according to SRS 2018- 2020 was 97.

The hallmark features of preeclampsia are high blood pressure (hypertension) and endothelial dysfunction, leading to widespread end-organ injury. With delivery the only current cure, preeclampsia also contributes significantly to prematurity, neonatal morbidity and perinatal mortality.

An effective predictive test for preeclampsia would facilitate early diagnosis, targeted surveillance and timely delivery; however, limited options currently exist. Extensive research in the last 20 years, mainly as a consequence of the shift in screening for aneuploidies from the second- to the first-trimester of pregnancy, has identified a series of early biophysical and biochemical markers of impaired placentation.[2] Using a novel Bayes-based method that combines prior information from

maternal characteristics and medical history, uterine artery pulsatility index (PI), mean arterial pressure (MAP), and maternal serum pregnancy-associated plasma protein-A (PAPP-A) and placental growth factor (PIGF) at 11-13 weeks' gestation can identify a high proportion of pregnancies at high-risk for early onset PE.[3,4]

Several professional bodies have issued guidelines on routine antenatal care recommending that, at the booking visit, a woman's level of risk for PE, based on factors in her history, should be determined and women at high-risk are advised to take low-dose aspirin daily from early pregnancy until the birth of the baby. However, the performance of screening by the recommended method and the effectiveness of intervention have not been formally evaluated.

A simple risk model named HDP-gestosis score has been devised by Dr Gorakh Mandrupkar for effective screening and prediction of Pre-eclampsia.[5-8] 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 pre-eclampsia".

So in this study HDP-gestosis score was applied and all antenatal women were followed-for development of preeclampsia.

METHODS

The prospective study was conducted in the Obstetrics and Gynecology department of MLN Medical College Prayagraj from September 2021 to September 2022. An adequate sample size (with 95% confidence level and 5% margin of error) of 400 antenatal women >18 years and at <18 weeks of gestation were enrolled.

A written consent was signed by all enrolled patients. Institutional ethical clearance was obtained for the study.

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 and previous/present medication were taken, followed by a routine clinical obstetric examination as per hospital protocol. Weight and height was measured based on which body mass index was calculated. Venous blood sample (5 ml) was collected in the antenatal visit (at 11-18 weeks of gestation) for assessing complete blood counts, thyroid profile, blood sugar levels, blood grouping. Gestosis score was calculated by using the app (https://m.apkpure.com/hdp-gestosis-score/hdp.gestosis.score) and classified into mild. (score of 1), moderate (score of 2) and high risk (score of equal to or more than 3) for the development of Preeclampsia. Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of HDP-gestosis score for predicting the development of Preeclampsia were determined.

The final outcomes were proportion of women having "at high risk" Gestosis Score and those developing Preeclampsia during the pregnancy.

The final data were entered in Microsoft EXCEL spreadsheet and analysed by "SPSS (Statistical Package for The Social Sciences) version 21.0". A p-value <0.05 was considered statistically significant.

Table 1: HDP gestosis score.

Gestosis score (>or=3 high risk for hypertensive disorders of pregnancy mild risk factors (score 1)
1. Age older than 35 years
2. Age younger than 19 years
3. Maternal anaemia
4.Obesity (BMI >30)
5. Primigravida
6. Short duration of paternity (cohabitation)
7.Woman born as small for G.A.
8. PCOS
9. Interpregnancy interval >5yrs
10. Conceived with ART (IVF/ICSI)
11. MAP>85
12. Chronic vascular disease (dyslipidaemia)
13. Excessive weight gain during pregnancy
Moderate risk factors (score 2)
1. Maternal hypothyroidism
2. Family h/0 preeclampsia
3. GDM
4. Multiple pregnancy
5. Obesity (BMI>35)
6. Hypertensive disease during previous pregnancy
Severe risk factors (score 3)
1. Pregestational DM
2. Chronic hypertension
3. Mental disorder
4. Inherited/acquired thrombophilia
5. Maternal chronic kidney disease
6. Autoimmune disease (SLE/APLAS/RA)
7. Pregnancy with ART (ODor surrogacy)

RESULTS

Out of 400 antenatal women enrolled; seven women were not included (one was COVID 19 positive, two women did not give consent, four women neither returned for follow up nor could be traced telephonically). So, 393 women were analysed for final results. 67.9% women were primigravida and 32% were multigravida. Majority of women (57.5%) belonged to 25-30 years age group. The youngest woman was of 19 years and oldest was 36 years. Amongst all women 48% of women were graduate while only 2.7% were postgraduate which was the least. Most of the women were homemakers (74.5%). Among the total women 38.9% belonged to class Il and 53.4% were in class III (modified KUPPUSWAMY scale 2022). Majority of women (79.6%) were urban dwellers (Table 2).

Table 2: Distribution of women according to demographic characteristics.

Characteristics	Subset	No. of women
Maternal age in years	<20	2
	20-25	157
	25-30	226
	30-35	7
	>35	1
Parity	Primigravida	267
	Multigravida	126
Body mass index (kg/m^2)	18.5-24.9	271
	25-29.9	118
	>30	4
Education	Primary	29
	Secondary	73
	Higher secondary	91
	Graduation	189
	Post graduation	11
Socioeconomic class	1	21
	2	153
	3	210
	4	9
Occupation	Homemaker	293
	Professional	100
Residence	Urban	313
	Rural	80

Out of 393 women 75.5% women had mild anaemia, 5.3% women had mean arterial pressure >85 mmHg, 8.6% women were PCO and 7.8% were ART conception (Table 3).

Table 3: Distribution of women according to clinical risk factors.

Risk factor	Subset	No. of women
Anaemia	Mild	297
	Moderate	96
	Severe	13
PCOS	Yes	34
	No	359
Mean arterial pressure	>85 mm hg	21
	<85 mm hg	372
Pregestational diabetes	Yes	9
	No	384
Chronic hypertension	Yes	3
	No	390
Hypertension in previous pregnancy	Yes	29
	No	364
Art conception	Yes	31
	No	362

The gestosis score was 1 in 102 (25.9%) women, 2 in 234 (59.5%) and >3 (at risk) in 57 (14.5%) of women (Table 4).

Table 4: Distribution of women according to gestosis score.

Gestosis score	No. of women	Percentage
1	102	29.5
2	234	59.5
>3	157	14.5

During follow up 54 (13.7%) participants developed preeclampsia (Table 5).

Table 5: Distribution of women according to development of preeclampsia (n=393).

Gestosis score	Preeclampsia	Percentage
1	3	0.76
2	12	3.05
3	39	9.92

Among 54 women developing preeclampsia 39 were correctly predicted by HDP gestosis score >3 while 12 participants had score of 2 and 3 participants had score of 1. Based on these data the sensitivity, specificity, positive predictive value, negative predictive value and predictive accuracy for HDP gestosis score in our study were 72.2%, 94.6%, 68.4%, 95.5% and 91.6% respectively (Table 6).

Table 6: Indicators of gestosis score (TP=true positive, FP=false positive, TN=true negative, FN=false negative).

Indicator	Formula	Percentage
Sensitivity	TP/TP+FN	72.2
Specificity	TN/TN+FP	94.6
Positive predictive value	TP/TP+FP	68.4
Negative predictive value	TN/TN+FN	95.5
Predictive accuracy	TP+TN/TP+FP+TN+FN	91.6

DISCUSSION

In the present study prevalence of preeclampsia was 13.7%. In the study by Gupta et al and Mishra et al reported incidence of HDP 15.01% and 15.4% among Indian women similar to our study.[7,8]

In our study, HDP gestosis score >3 had sensitivity of 72.2%; contrary to study by Gupta et al which showed a higher sensitivity of 83.1%. Both studies showed a higher specificity of approximately 94% for the score. Thus antenatal women with HDP gestosis score <3 accurately rules out development of preeclampsia.

In the study by Gupta et al positive predictive value for the score was 85.5% which was higher than recorded in our study which was 68.4%. On the contrary both studies showed similar negative predictive values of 97.03% and 95.5% respectively. The predictive accuracy for HDP gestosis score was high in our study (91.6%). Similarly high predictive accuracy was reported in the study by Gupta et al (95.5%).

Mishra et al analysed odds ratio for individual features of gestosis score with significant association for mean arterial pressure >85 mmHg but we analysed the predictive ability of the score.

Literature search showed only few research article based on study validating the HDP gestosis score. One internationally validated scoring system is available which comprises of mean arterial pressure, uterine artery pulsatility index, serum placental growth factor but it incorporates expensive biomarkers and USG markers which limits its application.[9-14] HDP gestosis score is an inexpensive, more convenient in practical especially low resource setting.[15-18]

Only few studies are available as of now, so not much can be discussed but this study can definitely add to existing literature to encourage further studies and gather further experience in this regards. Gestosis score is a convenient tool for prediction of a life threatening complication of pregnancy and thus aid in reduction of maternal mortality.

CONCLUSION

Early identification of women at high risk for Preeclampsia is crucial for clinical obstetrics and in research settings. The HDP gestosis score is a simple, cheap, mobile app.-based scoring system which allows provider to quickly assess individual woman risk in busy OPD setting. This tool with good sensitivity of 72.2%, high specificity 94.6%, high predictive accuracy of 91.6% will help to target subset of high-risk women for pharmacological intervention or intensive surveillance. We propose more multicentric studies with even larger sample size to confirm reproducibility and validate the HDP gestosis score for routine use.

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