

A STUDY OF GESTOSIS SCORE FOR HDP AT 12-20 WEEKS AND IT'S EVALUATION FOR PREDICTION OF PRE-ECLAMPSIA

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Abstract

Background: Pre-eclampsia is major cause of maternal&perinatal morbidity and mortality worldwide. It is a major challenge in modern obstetrics for early identification of pregnancy “at risk for preeclampsia”. Pre-eclampsia lead to the complications like eclampsia, HELLP syndrome, acute renal failure, pulmonary edema, stroke and left ventricular failure. Pre-eclampsia/eclampsia related deaths appear to be increasing over the years. So this study was undertaken to study the risk factors included in Gestosis score and its performance in prediction of pre-eclampsia. Study of risk factors enclosed in HDP gestosis score in antenatal women between 12-20 weeks gestations attending ANC clinic at tertiary care hospital and to evaluate the predictive performance of HDP gestosis score in predictions of preeclampsia. **Materials and Methods:** Prospective observational study conducted in tertiary care center hospital. antenatal women enrolled in ANC clinic during gestation of 12 –20 weeks were evaluated for HDP gestosis score. Gestosis score was calculated and classified into mild (score1) moderate risk (score 2) and high risk (score> 3) for the development of preeclampsia. They were advised for regular ANC visits and were followed upto delivery. **Result:** Among 200 antenatal subjects 87(43.50%) had gestosis score of 1, 29(14.50%) subjects had gestosis score 2 and 22(11%) had gestosis score of >=3, Whereas 62 (31%) of subjects were not having any high risk factors. Subjects who had gestosis score of >=3 where 22(11%) and out of these subjects 12 (54.55%) developed PE, therefore the sensitivity of gestosis score to predict PE was 50%, subjects who had gestosis score of <3 were 178 (89%) and out of these subject 18 (10.11%) developed PE. Hence the specificity of gestosis score 96.43%. The PPV & NPV were 72.73% & 91.11% respectively. **Conclusion:** An early diagnosis is always better as a careful history taken early in 12 to 20 weeks of gestation is effective for prediction and prevention. It is recommended that health workers should use HDP Gestosis score as a screening tool for pre-eclampsia prediction and start preventive measures such as low dose ecosprin and high dose calcium. The results of this study suggest that there are preventable risk factors for development of preeclampsia needs early recognition.

INTRODUCTION

Pre-eclampsia (PE) is the major cause of maternal morbidity (that include abruptio placenta, disseminated intravascular coagulation, pulmonary oedema, acute renal failure, heart rhythm disturbances, and effects on other organs like liver, brain and lungs) as well as perinatal complications (fetal growth retardation, preterm deliveries and fetal deaths) worldwide (Gavali et al, 2021).^[1] A plethora of maternal risk factors have been established to be positively with the development of

PE, which include higher age, parity, co-morbidities, family history, previous personal history, ethnicity, investigative markers like uterine artery Doppler velocimetry, PAPP-A levels, placental IGF levels thyroid profile and certain systemic conditions (Poon et al, 2019).^[2] As these factors are described by individual researchers, taking all of them into account and devising a scoring system for PE prediction were the need of the hour, especially for countries with limited resources and lack of biomarker testing facility.

According to the latest recommendations from the International Society for the Study of Hypertension in Pregnancy (ISSHP), HDP includes pregnancy complicated by chronic hypertension (high blood pressure before pregnancy or increased blood pressure before a gestational age of 20 weeks) and new-onset hypertension [gestational hypertension (GH) or preeclampsia (PE)] (Brown et al,2018).^[3]

A simple risk model named HDP-gestosis score has been devised by Dr. Gorakh Mandrupkar with further modifications by committee. 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 pre-eclampsia. 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 labeled as "at risk for pre-eclampsia" and is managed accordingly (FOGSI-gestosis-ICOG, 2019).^[4]

The present research was designed to study the risk factor for hypertensive disorder of pregnancy (HDP) gestosis score at 12 - 20 weeks and its evaluation for prediction of preeclampsia on follow up of same patients.

MATERIALS AND METHODS

The study was prospective observation study, conducted in Department of Obstetrics and Gynecology at tertiary care hospital, Madhya Pradesh, India from March 2021 to August 2022. Antenatal women at 12-20 weeks of gestation attending ANC clinic were included, whereas already diagnosed cases of HDP and Pregnancy < 12 weeks and > 20 weeks were excluded. Ethical approval taken by institutional ethical committee. Antenatal women enrolled in ANC clinic during gestation of 12 –20 weeks were evaluated for HDP

gestosis score. Detailed history was recorded and direct questions were asked to record the basic data like age, gravida, inter-pregnancy interval, duration of cohabitation, conceived with ART or not, family history of PE or cardiovascular disease. ANC records and previous medical records were analyzed to detect Hemoglobin percentage, BMI, serum lipid profile, thyroid status, pre-gestational and gestational Diabetes mellitus, chronic Hypertension, mental disease, chronic kidney disease, history of HDP in previous pregnancy, diagnosed autoimmune disease like SLE, or APLA Syndrome, Thrombophilia, PCOS and physical examination by assessing blood pressure and calculating mean arterial pressure (MAP = SBP+2DBP/3) at the first antenatal visit. Baseline blood pressure (average of three readings) using a sphygmomanometer was recorded using the auscultatory method. Patients with high gestosis score were managed according to the standard protocols. Patients were then followed up till delivery and analysis regarding development of preeclampsia was done.

RESULTS

In our study out of 200 subjects, 30 developed preeclampsia which was 15% incidence of preeclampsia. Subjects in age group less than 19 years, did not developed preeclampsia, in between 20 -30 years age group 12.9 % developed preeclampsia, whereas in more than 30 years of age group 42.9% developed preeclampsia. This finding was statistically highly significant and indicates higher development of preeclampsia in elderly age group. On statistical analysis, Age wise distribution of subjects and its association with development of preeclampsia was found to be significant p value p=0.001.

Table 1: HDP gestosis score

Risk Factor	Score
Age>35 years	1
Age <19 years	1
Maternal anemia	1
Obesity(BMI>30)	1
Primigravida	1
Short duration of sperm exposure(cohabitation)	1
Women born as small for gestational age	1
Family history of cardiovascular disease	1
Polycystic ovary syndrome	1
Interpregnancy interval >5 years	1
Conceived with ART(IVF/ICSI)	1
MAP>85mmHg	1
Chronic vascular disease(dyslipidemia)	1
Excessive weight gain during pregnancy	1
Maternal hypothyroidism	2
Family history of preeclampsia	2
Gestational Diabetes Mellitus	2
Obesity(BMI>35kg/m2)	2
Multifetal pregnancy	2
Hypertensive disorder in previous pregnancy	2
Pregestational Diabetes Mellitus	3
Chronic hypertension	3
Mental disorder	3

Inherited /Acquired Thrombophilia	3
Maternal Chronic Kidney Disease	3
Autoimmune disease SLE/RA/APLA	3
Pregnancy with ART(OD/Surrogacy)	3
Total	47

Table 2: Distribution of subjects according to history of rapid weight gain during pregnancy and its association with development of pre-eclampsia

Weight gain during pregnancy	No. of patients (n=200)		With pre-eclampsia		Without pre-eclampsia		p-value1
	No.	%	No.	%	No.	%	
H/O rapid weight gain	60	30	28	46.66	32	53.33	0.001
No H/O rapid weight gain	140	70	2	1.42	138	98.57	

At the time of follow-up total 60 subjects had history of rapid weight gain, out of which 28 (46.66%) developed preeclampsia. This finding was statistically highly significant (p=0.001).

Table 3: Distribution of subjects according to BMI with development of pre-eclampsia

BMI (kg/mtr2)	No. of patients (n=200)		With pre-eclampsia		Without pre-eclampsia		p-value1
	No.	%	No.	%	No.	%	
<18.5	2	1.0	0	0.0	2	100.0	0.0001*
18.5-24.99	105	52.5	6	5.7	99	94.3	
25-29.99	74	37.0	9	12.2	65	87.8	
≥30	19	9.5	15	78.9	4	21.1	

In our study, subject with BMI > 30 had higher incidence of preeclampsia that is 78.9% which was statistically highly significant. Increase in preeclampsia cases with increase in BMI was found in our study(p=0.0001).

Table 4: Distribution of subject according to Mean Arterial Pressure (MAP) and its association with development of pre-eclampsia

MAP	No. of patients (n=200)		With pre-eclampsia		Without pre-eclampsia		p-value1
	No.	%	No.	%	No.	%	
>85 mmHG	88	44.0	27	30.7	61	69.3	0.0001*
≤85 mmHG	112	56.0	3	2.7	109	97.3	

In subject with MAP more than 85 mmHg 30.7% developed preeclampsia whereas subject with MAP less than 85 mmHg only 2.7% developed preeclampsia. This finding was statistically highly significant. p(0.0001). This finding suggests development of preeclampsia with raised mean arterial pressure between 12 to 20 weeks gestation.

Table 5: Distribution of various risk factors from gestosis score and its association with development of pre-eclampsia

Various Risk factors	No. of patients (n=200)		With pre-eclampsia		Without pre-eclampsia		p-value1
	No.	%	No.	%	No.	%	
Conceived with ART	1	0.5	1	100.0	0	0.0	0.01*
Multi-fetal pregnancy	5	2.5	3	60.0	2	40.0	0.004*

Only one subject had history of conception with ART and she developed pre-eclampsia. This finding was statistically significant (p=0.01). Out of 5 subject with multi-fetal pregnancy 60% (n=3) developed preeclampsia. This finding was statistically significant (p=0.004).

Table 6: Distribution of subject according to presence of co-morbidity and its association with development of pre-eclampsia

Co-morbidity #	No. of patients (n=200)		With pre-eclampsia		Without pre-eclampsia		p-value1
	No.	%	No.	%	No.	%	
Gestational diabetes mellitus	2	1.0	2	100.0	0	0.0	0.001*
Hypertensive disorder in previous pregnancy	7	3.5	6	85.7	1	14.3	0.001*
Pre-gestational diabetes mellitus	2	1.0	2	100.0	0	0.0	0.001*

[Total 2] subjects had history of pre-gestational diabetes mellitus (overt diabetes mellitus) and 2 subjects develop gestational diabetes mellitus in this pregnancy, all the 4 subjects developed preeclampsia. This finding was statistically highly significant (p=0.001).

[Total 7] subject had history of hypertensive disorder in previous pregnancy, out of which 85.7% (n=6) developed preeclampsia. This finding was statistically highly significant (p=0.001).

Table 7: Total score in predicting pre-eclampsia using gestosis score

Score		No. of patients(n=200)		With preeclampsia=30		Without preeclampsia=170		p-value ¹
		No.	%	No.	%	No.	%	
0	31.00%	62	31.00	5	16.67	57	33.53	0.006
1	43.50%	87	43.50	8	26.67	79	46.47	
2	14.50%	29	14.50	5	16.67	24	14.12	
>=3	11.00%	22	11.00	12	40.00	10	5.88	

This table shows the gestosis score at 12 to 20 weeks of gestation in the subjects and development of pre-eclampsia on follow-up. More number of women with higher score developed preeclampsia. Among 200 antenatal subjects 87 (43.50%) had gestosis score of 1, 29 (14.50%) subjects had gestosis score 2 and 22 (11%) had gestosis score of >=3, Whereas 62 (31%) of subjects were not having any high risk factors. Subjects who had gestosis score of >=3 where 22 (11%) and out of these subjects 12 (54.55%) developed PE. This finding was statistically significant in our study (p=0.006).

Table 8: Predictive Value of Gestosis score > = 3 for predicting PE

Variables	Sensitivity	specificity	PPV	NPV	AUC
Gestosis score>=3	50%	96.43%	72.73%	91.01%	0.95

The Sensitivity, Specificity, PPV, and NPV of HDP-gestosis score >=3 for predicting PE were 50%, 96.43%, 72.73%, and 91.01% respectively.

DISCUSSION

In our study out of 200 subjects, 30 developed preeclampsia which was 15% incidence of pre-eclampsia. Subjects in between 20 -30 years age group 12.9 % developed preeclampsia, whereas in more than 30 years of age group 42.9% developed preeclampsia. This finding was statistically highly significant and indicates higher development of preeclampsia in elderly age group. On statistical analysis, Age wise distribution of subjects and its association with development of preeclampsia was found to be significant p value p=0.001.

Mishra SS et al,^[5] They conducted study of HDP gestosis score as a predictor of PIH in elderly age group, They observed that age more than 35 years and age less than 19 years were significant predictor of pre-eclampsia with odds ratio of 5.21 (95% CI - 2.75 – 9.85) and 4.09 (95% CI- 2.05 – 8.18) respectively.

In our study, At the time of follow-up total 60 subjects had history of rapid gain of weight, out of which 28 (46.66%) developed preeclampsia. This finding was statistically highly significant (p=0.001). Arthur M Baker, Sina Haeriet al,^[6] they observed excessive weight gain in pregnancy was the strongest risk factor for preeclampsia (RR 2.5, 95 % CI 1.4-3.4). Maternal obesity and excessive gestational weight gain place the gravid teen at increased risk for preeclampsia. The modifiable nature of these risk factors permits the possibility of intervention and prevention.

In our study, subject with BMI > 30 had higher incidence of preeclampsia that is 78.9% which was statistically highly significant. Increase in preeclampsia cases with increase in BMI was found in our study (p=0.0001).

Arthur M Baker, Sina Haeri et al,^[6] conducted a retrospective cohort analysis of all teenage deliveries (<=18 years old) at one institution over a 4-

year-period. They included 730 teenage deliveries, in which 65 (8.9 %) women developed preeclampsia and demonstrated a higher pre pregnancy body mass index when compared with controls (32.9 ± 8.4 vs. 30.3 ± 6.1 kg/m²), p = 0.002). Maternal obesity (body mass index ≥30 kg/m²), RR 1.6, 95 % CI 1.0-2.8) were associated with higher risk for development of preeclampsia. The Maternal obesity and excessive gestational weight gain place the gravid teenage at increased risk for preeclampsia. The modifiable nature of these risk factors permits the possibility of intervention and prevention.

In our study, subjects with MAP more than 85 mmHg, 30.7% developed preeclampsia whereas subjects with MAP less than 85 mmHg only 2.7% developed pre-eclampsia. This finding was statistically highly significant suggestive of chances of developing preeclampsia in subjects with raised mean arterial pressure between 12 to 20 weeks gestation.

Jing Zhu, Jun Zhang, Nurul Syaza Razali et al,^[7] A prospective cohort study, they included 926 women with singleton pregnancy less than 14 weeks of gestation. MAP measured at 11–14, 18–22, 28–32 and 34 weeks onward. They found MAP had significantly higher area under the receiver operating characteristic curves (AUCs) for predicting preeclampsia and term preeclampsia throughout gestation. For predicting preeclampsia, MAP had AUCs of 0.86 (95% CI 0.78 to 0.95), 0.87 (95% CI 0.80 to 0.95) and 0.91 (95% CI 0.85 to 0.98) at 11–14, 18–22 and 28–32 weeks, respectively. For predicting term preeclampsia, MAP yielded AUCs of 0.87 (95% CI 0.75 to 0.99), 0.87 (95% CI 0.76 to 0.98) and 0.90 (95% CI 0.80 to 0.99) at 11–14, 18–22 and 28–32 weeks, respectively. MAP is a good predictor for preeclampsia, especially term preeclampsia, in Asian women.

In our study [Total 2] subjects had history of pre-gestational diabetes mellitus (overt diabetes mellitus) and 2 subjects develop gestational diabetes mellitus in this pregnancy, all the 4 subjects developed preeclampsia. This finding was statistically highly significant and Total 7 subject had history of hypertensive disorder in previous pregnancy, out of which 6 (85.7%) developed preeclampsia. This finding was statistically highly significant.

Kartik K Venkatesh, Robert A Strauss et al,^[8] are retrospective analysis from the U.S. The comorbidities were chronic hypertension, pregestational diabetes, gestational diabetes, twin gestation studied in relation to preeclampsia. They included 2217 pregnant women, 50% had comorbidity, namely chronic hypertension (30%), pre-gestational diabetes (8%), gestational diabetes (8%), twin gestation (10%). Adverse maternal and neonatal outcomes were 10% and 12% respectively. Pregnancies with preeclampsia with severe features delivered <34 weeks complicated by gestational diabetes (adjusted risk difference, aRD: -4.9%, 95%CI: -9.11 to -0.71), twin gestation (aRD: -5.1%, 95%CI: -8.63 to -1.73) were less likely to result in adverse maternal outcome.

In our study only one subject had history of conception with ART and she developed preeclampsia. This finding was statistically significant. Amir Almasi- Hashiani, Reza Omani-Samani, et al,^[9] systematic review and meta-analyses was to assess the risk of preeclampsia among women who conceived with assisted reproductive technology (ART). they includes total of 156,246 ART cases (with 14,560 cases of PE) and 6,558,249 non-ART cases (with 202,064 cases of PE) and analysed. The relationship of ART and the risk of PE were estimated using the 48 primary included studies. The pooled estimate of RR in this meta-analysis revealed that ART was significantly associated with a higher risk of PE (pooled RR = 1.708, 95% CI = 1.111–2.624, z = 2.44, p = 0.015), that is, the PE risk in ART group was 1.687 times greater compared to the non-ART group.

In present study Out of 5 subject with multifetal pregnancy, 60% (n=3) developed preeclampsia and 40% (n=2) did not develop preeclampsia. This finding was statistically significant.

Mishra SS et al,^[5] conducted in department of O&G of SCB Medical college, Odisha from January 2019 to December 2019, they concluded that multi-foetal pregnancy showed a highly statistically significant. Abdel Aziem A Ali, Duria A Rayis et al,^[10] retrospective case-control study conducted at Kassala hospital, eastern Sudan. They included 9578 deliveries at Kassala hospital, 4012 (41.8%) women had anaemia and 303 (3.2%) had severe anaemia. The corrected risk for preeclampsia increased only in severe anaemia (OR = 3.6, 95% CI: 1.4-9.1, P = 0.007).

In our study the gestosis score at 12 to 20 weeks of gestation in the subjects and development of pre-

eclampsia on follow-up. More number of women with higher score developed preeclampsia. Among 200 antenatal subjects 87 (43.50%) had gestosis score of 1, 29 (14.50%) subjects had gestosis score 2 and 22 (11%) had gestosis score of >=3, Whereas 62 (31%) of subjects were not having any high risk factors. Subjects who had gestosis score of >=3 where 22 (11%) and out of these subjects 12 (54.55%) developed PE. This finding was statistically highly significant in our study.

In the present study all the existing risk factors of HDP gestosis score are well studied and found to have association for the development of preeclampsia. The result of present study shows the level of association of risk factors enclosed in HDP gestosis score with development of preeclampsia and its predictive performance. In our study, age more than 30 years, rapid weight gain during pregnancy, BMI > 30, MAP >85mmHg, women conceived with ART, Multi foetal pregnancy, Gestational diabetes mellitus and pre-gestational diabetes mellitus were found to statistically highly significant risk factor for development of preeclampsia. primigravida, age less than 19 years, short duration of sperm exposure (cohabitation), polycystic ovary syndrome, inter-pregnancy interval >5 years, maternal hypothyroidism and anaemia was not found to statistically significant. Some factors according to HDP Gestosis Score, obesity BMI > 35, women born as small for gestational age, family history of cardiovascular disease, chronic vascular disease (dyslipidemia), family history of preeclampsia, Inherited /Acquired Thrombophilia, Autoimmune disease SLE/RA/APLA, and Pregnancy with ART(OD/Surrogacy) were not found in any of study subjects in our study.

CONCLUSION

An early diagnosis is always better as a careful history taken early in 12 to 20 weeks of gestation is effective for prediction and prevention for mothers 'at risk' for developing hypertensive disorder of pregnancy. It is recommended that health workers should use HDP Gestosis score as a screening tool for pre-eclampsia prediction and start preventive measures such as low dose ecosprin and high dose calcium. Moreover this method is useful in low resource countries as other proven markers for prediction are expensive and unavailable. The results of this study suggest that there are preventable risk factors for development of preeclampsia needs early recognition.

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