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Original Research Article

Correlation of HDP gestosis score with severity of hypertensive disorder of pregnancy

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ABSTRACT

Background: Hypertensive disorder of pregnancy (HDP) is the leading cause of maternal and perinatal mortality and morbidity. Among all maternal deaths, 19% deaths are due to hypertension in pregnancy. To calculate HDP gestosis score in women diagnosed with hypertensive disorder of pregnancy and find its correlation with severity of disease.
Methods: The study was conducted in the department of obstetrics and gynaecology, Pt. JNM Medical College Raipur. It is a hospital based prospective observational study. Women with hypertensive disorder of pregnancy admitted in hospital after 20 weeks of gestation were taken as study population. Previous ANC records and medical records were analysed and direct questions were asked to collect data and HDP gestosis score was calculated and its correlation with severity of hypertensive disorder was seen.
Results: The mean HDP gestosis score in patients of GHTN, Preeclampsia, Eclampsia, HELLP Syndrome was 4.28, 4.38, 4.36 and 3.5 respectively (p value 0.857- no significant association). Patients with BMI>30, excessive weight gain during pregnancy, obesity and patients with previous history of HDP have greater risk of developing severe form of disease.
Conclusions: HDP gestosis score is not a good indicator to detect severity of disease though it helps in identification of hypertensive disorder of pregnancy.

Keywords: Hypertensive disorder in pregnancy, HDP Gestosis score, Severity

INTRODUCTION

Around 5 to 10 percent of pregnancies might become complicated by hypertensive disorders of pregnancy (HDP), which together with haemorrhage and infection make up the lethal trio that increases maternal mortality and morbidity.[1] The prevalence of Pre-eclampsia(PE) in India is 11%.[2] Although the precise pathophysiology is still unclear, it has been related to aberrant trophoblast cell invasion, inflammation, unfavourable endothelial cell injury and compromised coagulation and fibrinolysis systems.[1] The pathophysiology and aetiology are multi factorial.[3] Pre-eclampsia (PE) is caused by a number of factors, including genetic, immunological, inflammatory and systemic endothelial damage.[1] The pathophysiology of pre-eclampsia has been explained by various mechanisms such as abnormal spiral artery remodeling, improper trophoblast differentiation and abnormal trophoblast growth, abnormal placentation with the resulting hypoxia, placental hypo perfusion and ischemia.[1]

Continuous efforts are made to conduct screening tests so that prompt preventive and prophylactic therapies can be tried to avoid such pregnancy-related problems. The National Institute for Health (NICE), UK and the American College of Obstetrics currently use maternal

demographic information and medical history to determine risk factors for hypertensive disorder.[4] NICE recommendations state that women with two moderate risk factors (nulliparity, age greater than 40, BMI greater than 35 kg, family history of pre-eclampsia and inter-pregnancy interval greater than ten years) or any one high risk factors (hypertensive disorder of previous pregnancy, chronic hypertension, chronic renal disease, diabetes mellitus or autoimmune disease) should be regarded as having a high risk of developing pre-eclampsia.[5]

ACOG recommends 81 mg/day of aspirin from 12 weeks of pregnancy for women with one or more high risk factors(history of pre-eclampsia, renal disease, autoimmune disease, diabetes mellitus and chronic hypertension) or more than one of moderate risk factors(first pregnancy, age>35years, BMI>30kg/m^2, family history of pre-eclampsia).[4] Further screening with Biochemical markers, uterine artery doppler, doppler examination of ophthalmic artery and SFLT/PIGF RATIO can be done for at risk population.

For the purpose of screening of hypertensive disorder in pregnancy (HDP), the HDP gestosis score is an objective, dynamic and straightforward quantification of maternal risk factors.[6]

The present study is to know the correlation of HDP gestosis score with severity of disease in hypertensive disorder of pregnancy if any. This study may help in prevention of complication related to severe disease in a low resource setting.

METHODS

Present prospective cohort observational study was conducted from July 2021 to December 2022 in the department of obstetrics and gynecology in Pt. JNM Medical college of Raipur, Chhattisgarh, India.

157 cases with hypertensive disorder of pregnancy admitted in department of obstetrics & gynaecology were taken as study population after taking informed consent. Cases with chronic hypertension not developing pre-eclampsia were excluded. The control group had 50 patients all were non hypertensive and around 75.5 % were with gestational age of>37 weeks,18.4% between 28-34 weeks, 2% between 34-37 weeks and 4.1%between gestational age of 40-42 week. Both the cases and control were patients who were treated in wards and labour room on inpatient basis and outpatient were not included in the study.

Age, gravida, parity, inter pregnancy interval, duration of cohabitation, duration of marriage, previous menstrual cycle, conception with or without the use of ART, family history of pre-eclampsia or cardiovascular disease and self-birth weight, past medical or surgical intervention were questions that were asked to record data. The following conditions were looked in the ANC records and prior medical records: Hb%, BMI, Serum lipid profile, Thyroid status, PCOS, diabetes mellitus, Chronic hypertension, Mental illness (including mood, anxiety disorders or on medications like antidepressants, anxiolytics), Chronic Kidney Disease, pregnancy history with HDP, diagnosed autoimmune conditions such as SLE, APLA and thrombophilia.

Blood pressure of the patient was taken in sitting position with their arms well supported at the level of heart and an appropriate sized adult cuff was used to record blood pressure after 5 minutes of rest in both the arms simultaneously. Two sets of recordings taken at 1 minute interval and MAP was calculated.

Excessive maternal weight gain was considered based on the revised gestational weight gain guidelines given by the Institute of Medicine (IOM) that are based on pre pregnancy BMI ranges from underweight, normal weight , overweight and obese women recommended by the world health organization.[7] Trimester wise weight gain could not be assessed as the study was conducted in a tertiary care centre and many unbooked cases were part of the study.

Pre-eclampsia screening and prediction using the HDP Gestosis Score: Dr. Gorakh Mandrupkar created a risk model known as the HDP-gestosis score, which was later improvised by a committee that included Dr. Sanjay Gupte, Dr. Suchitra Pandit, Dr. Alpesh Gandhi and Dr. Girija Wagh.[6] This score accounts for all past and present risk factors in a pregnant woman depending on how seriously they contribute to the development of pre-eclampsia, risk factors are assigned a score of 1, 2 or 3. Through a thorough history and examination of the woman, a final score is determined. A pregnant woman is classified as "at risk for pre-eclampsia" if her total score is 3 or higher and managed accordingly.[6]

Using the app (https://m.apkpure.com/hdp-gestosis-score/hdp.gestosis.score), gestosis score was calculated after taking into account all risk factors and it was then divided into three categories: mild (score of 1), moderate (score of 2) and high risk (score of equal to or more than 3) for the development of HDP.[8]

For each patient, a total score was computed once the gestosis score's parameters were all evaluated based on their history and investigations. The risk factors that can result in an HDP Gestosis score of 1, 2 or 3 are displayed in Table 1. Patients with GHTN were considered as mild form while PE, Eclampsia(E) and HELLP syndrome were taken as moderate to severe form of disease. Statistical analysis was carried out using statistical packages for IBM SPSS vs 22 for windows.

RESULTS

The majority (45.2%) of HDP cases were in the age range of 21 to 25 years, with a mean age of 25.58+-4.76. Only 7.6% cases belonged to age>35 years of age. 86.6% cases

were literate and 61% cases belong to rural background. 75.8% belong to middle socioeconomic status. 63.1% of study population was primigravida and it was observed that HDP is more common in primigravida than multigravida.

Mean weight in study population was 62.87±9.23kg, mean BMI in HDP study population was 27.50±3.82kg/m^2. 52.24% cases were between gestational age (GA) of 37-40 week followed by gestational age of 28-34 weeks (31%).

In similar manner among controls maximum number of women presented with GA>37 weeks (58.57%). HDP cases were divided in 4 subgroups, Preeclampsia (49.97%) is the most common hypertensive disorder in study population followed by GHTN (33.8%), eclampsia (14%), 2.5% with HELLP Syndrome.

The SBP, DBP, MAP have p value 0.002, 0.015, 0.004 respectively when compared in all 4 subgroups of HDP. Difference is statistically very significant. Gradual rise of blood pressure is seen from mild to severe form of disease (Figure 1).

In the hypertensive group, the mean HDP score is 4.32 compared to 1.5 in the control group, with a p value of 0.001 being statistically very significant (Figure 2). Mean HDP Gestosis score in HDP subgroups were found to be-GHTN 4.28, Preeclampsia 4.38, Eclampsia 4.36 and HELLP Syndrome 3.50 which was statistically not significantly different.

31/157 (20.4% cases) had score≤2 but these cases developed hypertensive disorder of pregnancy, out of which 11 patients developed GHTN, 15 developed pre-eclampsia and 2 patients even had eclampsia and 3 cases presented with HELLP syndrome (Table 2).

All teenagers participated had hypertensive disorder of pregnancy and 61% cases among participants with age>35 years had pre-eclampsia. 22% of total study population in HDP group had maternal anemia. Non hypertensive cases were not anemic (Table 3).

Primigravida and obesity were common risk factor in all cases of hypertension. Inter pregnancy interval>5 years is found to be risk factors common in cases of GHTN and Eclampsia. Multifetal pregnancy is associated with development of GHTN.

Risk factors like age>35 years, dyslipidaemia, maternal hypothyroidism and hypertensive disorder in previous pregnancy were seen in development of preeclampsia. All patients with hypertensive disorder have MAP>85.

The ROC curve drawn between mild and moderate-severe form of disease shows a sensitivity+specificity=4.5, Area under curve (AUC) 0.543 (Figure 3) in comparison to sensitivity+specificity of 5.5 and AUC 0.6 for ROC curve drawn between cases and control.

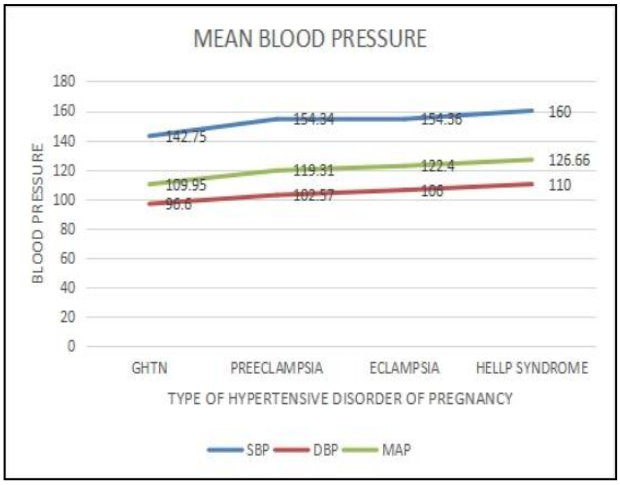

Figure 1: Mean blood pressure in hypertensive group.

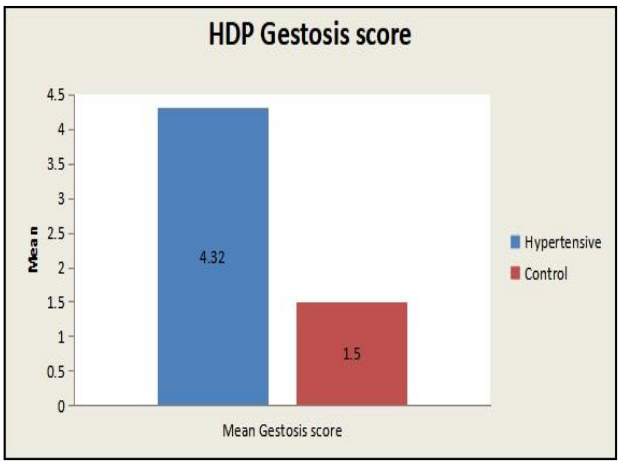

Figure 2: Mean HDP gestosis score between hypertensive group and control.

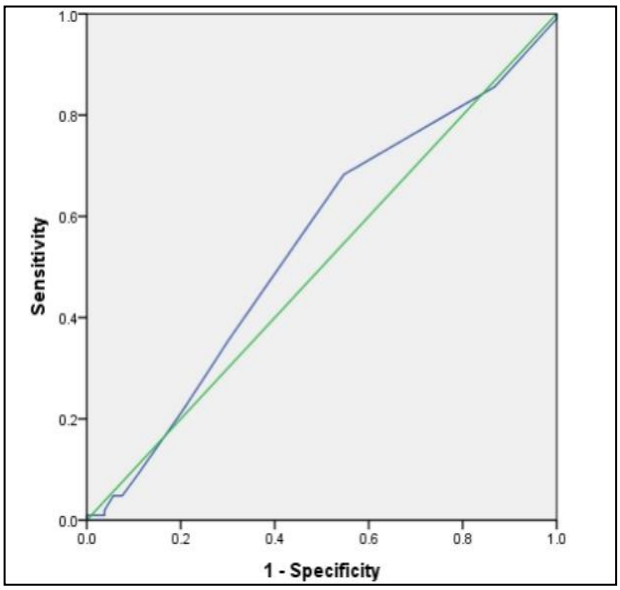

Figure 3: ROC curve of HDP gestosis score in mild and moderate-severe disease.

Table 1: HDP gestosis score.

Risk factors	Score
Age older than 35years	1
Age younger than 19 years	1
Maternal anemia	1
Obesity (BMI>30)	1
Primigravida	1
Short duration of paternity	1
Woman born as small for gestational age	1
Family history of cardiovascular disease	1
PCOS	1
Interpregnancy interval>5 years	1
Conceived with art (IVF/ICSI)	1
MAP>85	1
Chronic vascular disease (Dyslipidimea)	1
Excessive weight gain during pregnancy	1
Maternal hypothyroidism	2
Family H/O preeclampsia	2
Gestational diabetes mellitus	2
Multiple Pregnancy	2
Obesity BMI>35	2
Hypertensive disease during 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/APLAS/RA)	3
Pregnancy with ART (OD or Surrogacy)	3

Table 2: Comparison of HDP gestosis score in study population.

HDP gestosis score	Control	Hypertensive group			
		GHTN	Preeclampsia	Eclampsia	HELLP Syndrome
1	16	0	1	0	0
2	9	11	15	2	3
3	1	18	16	5	0
4	0	12	25	9	0
5	0	4	9	2	1
6	0	3	4	5	0
7	0	2	3	0	0
8	0	2	0	0	0
9	0	0	4	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	2	1	0	0
Minimum score	1	2	1	2	2
Maximum score	3	12	12	6	6
Mean HDP gestosis score	1.50±0.63	4.28±2.20	4.38±2.06	4.36±1.25	3.50±1.73

Table 3: Descriptive statistics of HDP gestosis score in the four groups.

S. no.	Risk factor	Total	Control (n=50)	GHTN (n=53)	Pre-eclampsia (n=78)	Eclampsia (n=22)	HELLP (n=4)
1	Age >35 years	18	0	6	11	1	0
2	Age <19 years	10	0	4	5	1	0
3	Maternal anemia	35	0	7	18	8	2
4	Obesity (BMI>30)	22	2	6	11	4	1
5	Primigravida	62	19	18	30	13	1
6	Short duration of sperm exposure (Cohabitation)	29	0	9	15	5	0
7	Women born as small for gestational age	0	0	0	0	0	0
8	Family history of cardiovascular disease	6	0	0	1	5	0
9	Polycystic ovary syndrome	18	0	0	3	15	0
10	Inter pregnancy interval	14	0	0	6	8	0
11	Conceived after ART	2	0	1	0	1	0
12	Chronic vascular disease (dyslipidemia)	43	2	19	22	5	0
13	Excessive maternal weight gain in pregnancy	10	2	4	4	2	0
14	Maternal hypothyroidism	21	4	6	11	3	1
15	Family history of preeclampsia	1	0	0	1	0	0
16	Gestational diabetes mellitus	4	0	1	0	3	0
17	Obesity (BMI>30)	115	0	36	60	19	0
18	Multifetal pregnancy	5	2	5	0	0	0
19	Hypertensive disorder in previous pregnancy	18	2	2	13	3	0
20	Pregestational diabetes mellitus	3	0	1	2	0	0
21	Chronic hypertension	5	2	1	3	1	0
22	Mental disorder	1	0	1	0	0	0
23	Inherited acquired thrombophilia	0	0	0	0	0	0
24	Maternal chronic kidney disease	0	0	0	0	0	0
25	Autoimmune SLE/RA	0	0	0	0	0	0
26	Pregnancy with ART	0	0		0	0	0

DISCUSSION

Hypertensive disorder of pregnancy remains one of the most important cause for maternal mortality and morbidity. Early identification of hypertensive disorder and its corrective measures to prevent further complication can reduce the disease burden. It was observed in the present study that pre-eclampsia (49.7%) is the most common form of hypertensive disorder. Similar results were found in study conducted by Romero et al, where 37.3% presented with GHTN and 62.7% had pre-eclampsia.[9] The incidence of severe form of disease was more in comparison to GHTN as the centre caters a lot of referrals from the periphery. HDP gestosis score was employed as a straightforward, objective method of quantifying maternal risk variables for HDP screening. The mean HDP gestosis score in hypertensive group is more in comparison with control group which signifies HDP gestosis score is a simple tool which can be used by health care worker and score>/=3 predicts the possibility of developing HDP. In present study the HDP gestosis score in most of hypertensive patients were more than >/=3 but it was also found that cases with score ≤2 also developed hypertensive disorder of pregnancy. This may be due to the fact that certain risk factors are dynamic and there can be recall bias for certain risk factors. So, the score

needs to be revised every time the patient comes to the hospital. HDP gestosis score (score of 9) was found to be associated with preeclampsia, according to Mishra et al.[10]

According to a study by Gupta et al, HDP gestosis score >/3 showed sensitivity, specificity, PPV and NPV of 83.1%, 97.51%, 85.51% and 97.03%, respectively, for predicting pre-eclampsia.[11] Study by Imam showed the sensitivity, specificity, PPV, NPV and diagnostic accuracy of HDP-Gestosis score for predicting pre-eclampsia were 86.66%, 96.49%, 86.91%, 97.98% and 96.12%, respectively.[12]

HDP gestosis score of >/=3 was associated with various types of HDP but the higher HDP score was not having any association with severity of disease as the maximum score of 6 was found in Eclampsia and HELLP Syndrome group while maximum HDP Gestosis score of 12 was seen in GHTN and Pre-eclampsia group. Increasing score has no correlation with severity of disease. Getting more high risk factors has no relation with severity of disease. Various high risk factors may have no additive effect. Among controls, there were no case with score>3 and all controls had score≤3 and only 1 control with score of 3 and was non hypertensive.

In present study, we tried to find correlation of severity of hypertensive disorder with various risk factors in which we have found that few risk factors like BMI>30, primigravida, dyslipidemia, maternal hypothyroidism, BMI>35, hypertensive disorder in previous pregnancy have more chance of developing severe form of HDP (PE, E, HELLP) with odds ratio 1.106, 1.019, 1.17, 1.08, 1.26. 4.41 respectively.

Hypertensive disorder in previous pregnancy, excessive maternal weight gain during pregnancy and obesity shows statistical significance with p value 0.026, 0.027 and 0.001 respectively which means patient with these risk factors have a high chance of developing severe form of disease.

Hinkosa et al, in his study concluded that primigravida pregnancies had 3.40 times higher odds of developing hypertensive disorders.[12] In study conducted by Gasse et al, obesity was associated with greater risk of HDP (22.5 versus 0.6%, p<0.001), pre-eclampsia (10.2 versus 4.3%. p<0.001).[14] Women having a history of hypertension disorder in previous pregnancy (OR:7.6, 95% CI:3.5; p=0.0001) had a higher chance of developing hypertensive disorder in current pregnancy, according to a study by Tebyu et al.[15] Surprisingly in present study, multi fetal gestation with odds ratio 0.45 have less chance of developing severe form of disease. Mishra et al, indicated that twin pregnancy increases the odds by five folds of developing pre-eclampsia compared to singleton pregnancy. Since the present study population had only 5 cases with multi fetal gestation, further study with larger study population may be required to see whether multiple pregnancy is related with mild form of hypertensive disorder of pregnancy.[10] Pregnancy with surrogacy or OD is also a risk factor for developing HDP these pregnancies support immunological basis of developing HDP as the oocyte recipient is unrelated with the donor.[16] Evidence from pregnancy with ovum donation and surrogacy suggests that there is impair modification of spiral arteries due to immunological changes in decidua basalis and extravillous trophoblast.

The ROC curve drawn for HDP Gestosis score between cases and control shows that it is good indicator to predict hypertensive disorder of pregnancy (p<0.05, sensitivity+ specificity=5.5). ROC curve shows that HDP Gestosis score is not a good indicator (p>0.05) to detect severity of disease. The best cut-off that maximizes (sensitivity+ specificity) is 4.5. The strength of the study was that it tried to find the correlation of HDP gestosis score with all types of HDP and not with PE alone.

There are other tool like full PIERS score which helps in identifying adverse maternal outcome in women with upto 34+6 days. Currently there is no screening tool that can accurately predict the hypertensive disorders and its severity. In a study conducted by Hromadnikova et al, the predictive model for HELLP syndrome was based on whole peripheral venous blood microRNA biomarkers and maternal clinical characteristics which can be implemented in routine first trimester screening programs.[17]

HDP gestosis score can definitely help in identifying at risk population in low resource setting along with MAP and positive screen women should undergo further evaluation.

CONCLUSION

HDP gestosis score>-3 is a good predictor of hypertensive disorder of pregnancy in a low resource setting but HDP gestosis score may not help in identifying severity. The present study did not consider prophylactic medication like low dose aspirin for prevention of development of HDP. A prospective study can be done in this respect. Around 50 % cases were within the viable range so further study with large sample size with patients in early gestational age can be done and reassigning the score in each visit or advancing gestational age could be beneficial.

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

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