

# Early Predictors of Preeclampsia: A Prospective Screening Study

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## ABSTRACT

**Introduction:** Hypertensive disorders of pregnancy comprise a spectrum of diseases that include chronic hypertension, gestational hypertension, preeclampsia, eclampsia and HELLP syndrome- are uniquely challenging as its pathology and management simultaneously affects both the mother and baby. Preeclampsia (PE) is an important cause of maternal and perinatal morbidity and mortality and is a most feared complication of pregnancy. In India the incidence of PE is reported to be 2%-8%.

**Material and methods:** In this study 200 pregnant women were enrolled from March 2018 – November 2019 for a period of 21 months in Lalla Ded hospital department of Obstetrics and Gynaecology Government Medical College Srinagar. Inclusion criteria, first trimester of pregnancy (8 – 12 weeks), singleton gestation, pregnancies with aneuploidies ruled out. A detailed history taking and examination was done. History regarding their age, parity, smoking and past medical history of hypertension was taken and their mean arterial pressure (MAP) was taken.

**Results:** In our study out of 200 patients enrolled in first trimester 14 developed Pre Eclampsia (PE) in third trimester. Out of which majority were in the age group of 15-20 years (10%) and > 35 years (9%), 12.7% were nulliparous, 15.5% had a MAP of more than 89 mmHg, 11.5% of them were smokers majority, 10% of them had past history of hypertension and 30.7% of them had BMI of more than 30 kg/m<sup>2</sup>.

**Conclusion:** It can be concluded from the study that these risk factors can be used as a screening method for preeclampsia prediction and its early diagnosis, thus allowing time for intervention and thereby decreasing maternal mortality and morbidity.

**Keywords:** MAP, Nulliparous, Pre Eclampsia, Hypertension

## INTRODUCTION

Hypertensive disorders of pregnancy comprise a spectrum of diseases that include chronic hypertension, gestational hypertension, preeclampsia, eclampsia and HELLP syndrome- are uniquely challenging as its pathology and management simultaneously affects both the mother and baby.<sup>1</sup>

Preeclampsia (PE) is an important cause of maternal and perinatal morbidity and mortality and is a most feared complication of pregnancy. In India the incidence of PE is reported to be 2%-8%.<sup>2</sup>

Preeclampsia (PE) is a disorder of pregnancy characterised by hypertension and proteinuria, which affects after 20 weeks of gestation in previously normotensive women. There is a considerable evidence that the risk of adverse outcome in relation to PE is much higher when the disease is severe and

of early onset.<sup>3-6</sup>

The cause of PE still remains debatable, although clinical and pathological studies suggest abnormal placentation is central to its pathogenesis. Presently there is role of placental anti angiogenic factors in pathogenesis of maternal syndrome of preeclampsia. An important challenge in obstetrics is to identify pregnancies at high risk of early onset PE and thus take necessary measures to improve placentation and thereby decrease the prevalence of the disease.

According to the guidelines of the UK National Institute for Health and Clinical Excellence (NICE) and the American Congress of Obstetricians and Gynecologists (ACOG), the approach to assess women with risk of developing PE is to ascertain risk factors from their medical histories and demographic features. This kind of screening method remains recommended for clinical use.

Although the pathogenesis is complex, evidence suggests that early diagnosis and treatment will minimize maternal and perinatal morbidity and mortality. Therefore the need for predictors of hypertensive disorder are particularly greatest in our population. These predictors should be reliable and suitable for implementation.

## MATERIAL AND METHODS

In this study 200 pregnant women were enrolled from March 2018 – November 2019 for a period of 21 months in Lalla Ded hospital department of Obstetrics and Gynaecology Government Medical College Srinagar. Inclusion criteria

- first trimester of pregnancy (8 – 12 weeks)
- singleton gestation
- pregnancies with aneuploidies ruled out

A detailed history taking and examination was done. History regarding their age, parity, smoking and past medical history of hypertension was taken and their mean arterial pressure (MAP) was taken.

MAP is defined as the average arterial pressure during a single cardiac cycle, and is calculated by the following formula:  $MAP = 2/3 \text{ diastolic blood pressure} + 1/3 \text{ systolic blood pressure}$ . It was measured in accordance with a standardized

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protocol.<sup>7</sup> Blood pressure was taken by automatic blood pressure monitor which were calibrated regularly. The patients were in a sitting position. Their arms were kept at an arm-rest, and a properly fitted cuff was applied on their right arm at the level of the heart. After a five-minutes rest, blood pressure was measured till two stable measurements were obtained. And then we calculated the MAP by the average of the last two stable measurements.

For this study, PE was defined as new onset of hypertension ( $\geq 140$  mmHg systolic blood pressure and/or  $\geq 90$  mmHg diastolic blood pressure on  $\geq 2$  separate occasions 4 h apart) occurred after 20 weeks gestation together with proteinuria ( $\geq 300$  mg/24 h collection of urine or urinary protein to creatinine ratio of  $\geq 0.30$ , or two readings of at least + on dipstick analysis of a midstream or catheter urine specimen) in a previously normotensive patient.

## RESULTS

In our study out of 200 patients enrolled in first trimester 14 developed Preeclampsia (PE) in third trimester. Out of which majority were in the age group of 15-20 years (10%) and > 35 years (9%) (Table-1).

In our study out of 200 patients enrolled in first trimester 14 developed Preeclampsia (PE) in third trimester. Out of which majority were nulliparous (12.7%) (Table-2).

In our study out of 200 patients enrolled in first trimester 14 developed Preeclampsia (PE) in third trimester. Out of which majority had a MAP of more than 89 mmHg (15.5%) (Table-3).

In our study out of 200 patients enrolled in first trimester 14 developed Preeclampsia (PE) in third trimester and majority of them were smokers (11.5%) (Table-4).

In our study out of 200 patients enrolled in first trimester 14 developed Pre Eclampsia (PE) in third trimester and majority (10%) of them had past history of hypertension (Table-5).

In our study out of 200 patients enrolled in first trimester 14

| Age  | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|--|-----------------|---|----------------|
| 15-20  | 40              | 4   | 10%            |
| 21-25  | 40              | 3   | 7.5%           |
| 26-30  | 40              | 1   | 2.5%           |
| 31-35  | 25              | 1   | 4%             |
| >35  | 55              | 5   | 9%             |
| Total  | 200             | 14  | 7%             |
| ANOVA P Value: 0.015   |                 |   |                |
| <b>Table-1:</b> Age wise distribution of women with and without PE |                 |   |                |

| Parity  | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|---|-----------------|---|----------------|
| Nulliparous   | 118             | 11  | 12.7%          |
| Multiparous   | 92              | 3   | 8.6%           |
| Total   | 200             | 14  | 7%             |
| ANOVA P Value: 0.010  |                 |   |                |
| <b>Table-2:</b> Parity wise distribution of women with and without PE |                 |   |                |

| MAP   | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|---|-----------------|---|----------------|
| <79 mmHg  | 12              | 1   | 8.3%           |
| 79-83 mmHg  | 38              | 1   | 2.6%           |
| 84-88 mmHg  | 105             | 3   | 2.8%           |
| >89 mmHg  | 45              | 7   | 15.5%          |
| Total   | 200             | 14  | 7%             |
| ANOVA P Value: 0.030  |                 |   |                |
| <b>Table-3:</b> MAP distribution of women with and without PE |                 |   |                |

| Smokers   | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|---|-----------------|---|----------------|
| Yes   | 78              | 9   | 11.5%          |
| No  | 122             | 5   | 4%             |
| Total   | 200             | 14  | 7%             |
| ANOVA P Value: 0.070  |                 |   |                |
| <b>Table-4:</b> Distribution of women with and without PE with history of smoking |                 |   |                |

| Past history of hypertension  | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|---|-----------------|---|----------------|
| Yes   | 120             | 12  | 10%            |
| No  | 80              | 2   | 2.5%           |
| Total   | 200             | 14  | 7%             |
| ANOVA P Value: 0.05   |                 |   |                |
| <b>Table-5:</b> Distribution of women with and without PE with past history of hypertension |                 |   |                |

| BMI (kg/ m <sup>2</sup> )  | No. of patients | Patients developing PE in third trimester | Percentage (%) |
|--|-----------------|---|----------------|
| 18.5-25  | 30              | Nil                                       | Nil            |
| 25-30  | 144             | 6   | 4.1%           |
| >30  | 26              | 8   | 30.7%          |
| Total  | 200             | 14  | 7%             |
| ANOVA P Value: 0.001   |                 |   |                |
| <b>Table-6:</b> BMI wise distribution of women with and without PE |                 |   |                |

developed Preeclampsia (PE) in third trimester and majority (30.7%) of them had BMI of more than 30 kg/ m<sup>2</sup> (Table-6).

## DISCUSSION

In our study age is an important predictor of preeclampsia as reported by Zibaenazhad et al. And Sheraz et al. that PE is more common in patients younger than 21 years of age and in patients more than 35 years of age. Kumar et al. documented that pregnant women of age less than 20 year were 3.87 times at risk of developing pre-eclampsia compared to age of more than 20 years. Duckitt et al observed teenage pregnancy to be one of the risk factors for PIH & eclampsia.<sup>8-11</sup>

Nulliparous pregnancies are a risk factor of preeclampsia as observed by Luo ZC et al, Duckitt K et al, Deis S et al in their study.<sup>12-14</sup> Our analyses provided some evidence of a potential weak positive association between prenatal

smoking exposure and developing some manifestations of preeclampsia, however, this association was not significant over all confounder adjustments. Maternal smoking during pregnancy is known to increase the risk of low birth weight and preterm birth, which in turn have been found in several studies to be associated with preeclampsia or gestational hypertension.<sup>20-25</sup> Smoking during pregnancy has in previous research consistently been shown, in a dose response manner, to reduce the risk of preeclampsia,<sup>15-17</sup> however not if the woman quit smoking before the last trimester. Smoking women who do develop preeclampsia, however, tend to develop severe preeclampsia with worse perinatal outcomes, although there are studies finding the contrary.<sup>18,19</sup> Average MAP during the first trimester was strongly associated with risk of preeclampsia, independent of other maternal characteristics. However, it only weakly discriminated between women who did and did not develop the disease. This demonstrates that extremely strong associations are needed for a risk factor to be a useful screen for disease. One retrospective cohort study investigated first-trimester MAP as a predictor of severe preeclampsia among 1998 women with single gestations. Several studies examined relationships between preeclampsia and second-trimester MAP.<sup>26-32</sup>

Women who reported a past history of hypertension were significantly associated with preeclampsia. Our observation of an association between past history of chronic hypertension and risk of preeclampsia is consistent with several previous reports.<sup>33</sup> High BMI (>30 kg/m<sup>2</sup>) was found to be highly significant ( $p = 0.001$ ) predictor of PIH in our study. O Brian et al, Bartsch E et al, Robillard PY et al, Tranquilli AL et al had also concluded that maternal obesity is an important risk factor for development of PIH. They determined strong association between pre pregnant high body mass and risk of preeclampsia.<sup>34-36</sup>

## CONCLUSION

It can be concluded from the study that these risk factors can be used as a screening method for preeclampsia prediction and its early diagnosis. Thus allowing time for intervention and thereby decreasing maternal mortality and morbidity.

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