

## **Risk Factors for Early Onset of Hypertensive Disorders of Pregnancy**

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### **Abstract**

Regular prenatal care is needed to reduce the adverse effects in pregnancy and improve the outcome. Various risk factors need to be evaluated for their role in early onset of hypertensive disorder of pregnancy (HDP) which causes increased fetal and maternal morbidity. The objective was to evaluate body mass index and gestational weight gain as risk factors for early onset of HDP. The observational study was done at a referral centre. Women were enrolled in the study at their first visit. Pre-conceptional weight was used to calculate BMI. Blood pressure measurements, investigations and routine examination were done at all visits. 45 developed HDP and were considered as cases. Equal number of normotensive women were taken as controls. Data collected was analysed.

Of the women with HDP, 57.7% were overweight and only 11.1% were underweight. Among the normotensive, only 20% were overweight. Early onset hypertension was more in women with greater BMI and those with excess gestational weight gain. The associations were statistically highly significant. So, we can conclude that maternal obesity and excess gestational weight gain are risk factors for early onset HDP. Hence pre-pregnancy reduction in weight and controlled weight gain would significantly

help in reducing the risk of early onset hypertension in pregnancy and thus prevent foetal and maternal morbidity.

**Keywords:** body mass index, gestational weight gain, hypertensive disorders of pregnancy, prepregnancy weight.

### **Introduction**

Hypertensive disease of pregnancy (HDP) contributes to 12.3% of all maternal deaths in India<sup>1</sup>. Hypertension which occurs before 34 weeks is known as early onset HDP<sup>2</sup>. Early onset HDP is associated with greater severity of disease and causes increased fetal and maternal morbidity<sup>3</sup>. Identification of risk factors for early onset HDP would help prevent HDP at an earlier gestational age and improve pregnancy outcome. Obesity and greater gestational weight gain are associated with HDP. However, their role in early onset HDP needs to be evaluated.

### **Objective**

To evaluate pre-conceptional body mass index and gestational weight gain as risk factors for early onset of HDP in our population.

### **Methods**

The observational study was done at a referral centre over six months. Singleton pregnant women at their first antenatal visit were enrolled in the study and followed till

delivery. Height and pre-conceptional weight was used to calculate BMI. Blood pressure measurements, investigations and routine examination were done at all visits. Women with pre-existing chronic disease, pre-existing or gestational diabetes mellitus or on drugs affecting weight were excluded from the study.

HDP was labeled if a women with no previous history developed systolic >140mm of Hg and diastolic >90mm of Hg after 20 weeks of gestation on two readings taken 6 hrs apart. 45 women developed HDP and were considered as cases. Equal number of normotensive women were taken as controls.

Pre-conceptional BMI was calculated as pre-conceptional weight (kg) divided by square of height (m<sup>2</sup>). It was categorized into three: Underweight-<18.5 kg/m<sup>2</sup>, normal weight -18.5 to 24.9 kg/m<sup>2</sup>, overweight - 25 to 29.9 kg/m<sup>2</sup>. Gestational weight gain is taken as total weight gain. The rate of weight gain is usually slowest during the first trimester, fairly constant during the second and third trimester and slightly slower towards the end of third trimester. Institute of Medicine (IOM) 2009 recommends different range of gestational weight gain for different BMI range. For BMI <18.5 kg/m<sup>2</sup>, adequate GWG is 12.5-18 kg. For BMI 18.5 to 24.9 kg/m<sup>2</sup>, adequate GWG is 11.5-16 kg For BMI 25-29.9 kg/m<sup>2</sup>, adequate GWG is 7-11.5 kg<sup>4</sup>.

Data collected was tabulated and analysed. P value < 0.05 was taken as significant.

**Results**

It was observed that 81.81% of overweight women with BMI 25-29.9 kg/m<sup>2</sup> developed HDP as compared to 8.33% women with BMI less than 18.5 kg/m<sup>2</sup>. Of the 45 women with HDP, 60% were overweight with BMI=25-29.9 kg/m<sup>2</sup> as compared to only 18.18% among normotensive women. 70.21% developed late-onset HDP i.e. after 34 weeks of pregnancy. Of all women with early

onset HDP 58.33% had BMI> 25. Of all the 27(60%) women with HDP who were overweight, 74.07% developed late onset HDP and 25.92% developed early onset HDP. **Table 1**

Table 1 : Association of Time of Onset of HDP And BMI

Time of Onset	BMI (kg/m <sup>2</sup> )			Total
	<18.5 n=12	18.5-24.9 n=45	25-29.9 n=33	
Early onset HDP	-	5(41.67%)	7(58.33%)	12(29.79%)
Late onset HDP	1(3.03%)	12(36.36%)	20(60.60%)	33(70.21%)
Normotensive	11(91.67%)	28(62.22%)	6(18.18%)	45

In our study, mean weight gain of overweight women with HDP was 11.54±0.86 kg which is higher than the mean GWG in normotensive women which was 10.27 ±1.62 kg. 84.21% of all the women who had excessive GWG had developed HDP. And 86.84% of all the women with inadequate GWG were normotensive. This was statistically significant with P-value=0.01. In our study, mean GWG for early onset HDP was more than in late-onset (13.69±0.76 vs 11.84±1.20) which was statistically also significant. **Table 2**

Table 2: Association of Time of Onset of HDP And Gestational Weight Gain.

GWG(kg)	Early onset HDP	Late onset HDP
	n=12	n= 33
Inadeq	1	3
Adeq	3	17
excess	8	13
Mean ±SD	13.69±0.76	11.84±1.20

As per ACOG 2012, hypertension (systolic blood pressure of 140 mmHg or greater or diastolic blood pressure of 90 mmHg or greater after 20 weeks gestation ) may be mild

hypertension which includes mild and moderate hypertension as per NICE guidelines or severe hypertension (systolic blood pressure of 160 mmHg or greater or diastolic blood pressure of 110 mmHg or greater). Over 80% women with early onset hypertension had severe disease as compared to only 30% in those who had late onset hypertension. **Table 3**

Table 3: Association of Time of Onset of HDP with Severity of HDP

Hypertension	Early onset HDP n=12	Late onset HDP n=33
MILD	2	21
SEVERE	10	12

**Discussion**

Obesity is associated with physiologic and metabolic alterations. Adipose tissue is a hormonally active tissue which produces certain adipokines and cytokines. These mediators have been associated with prothrombotic and proinflammatory state, oxidative stress and insulin resistance. These have been associated with HDP as well<sup>5</sup>. Similar to our study, in the study of Catov et al<sup>6</sup>, almost 34% (95% CI 28.3–40.0) of early onset HDP was associated with the presence of high BMI. Obesity independently contributed 7.6% to the occurrence of early onset HDP.

Jennifer et al<sup>7</sup> in their study also found that weight gain patterns were similar in the first half of pregnancy for women with versus without preeclampsia across all early pregnancy BMI groups. For normal weight and overweight women, significant differences in weight gain were apparent by 25 weeks gestation, with differences of 0.43 and 0.52 kg, respectively. By 40 weeks, these differences had increased to 2.62 and 2.54 kg, respectively. In obese women, the weight gain trajectories of women with and without preeclampsia diverged at a later gestational age, with no significant differences at 25

weeks’ gestation (0.20 kg [-0.18, 0.59]), but a difference of 0.81 kg emerging by 30 weeks, and a difference of 2.02 kg at 40 weeks.

Kelly et al<sup>8</sup> also observed that of the 53.2% of women who had weight gain that exceeded the IOM guidelines in the first 28 weeks, 10.8% developed hypertension during pregnancy.

Early-onset preeclampsia is a placental disease and thus more dependent on underlying abnormal placentation, while late-onset preeclampsia is thought to be a mainly maternal metabolic disease. Early-onset preeclampsia is a leading cause of morbidity and mortality among mothers and infants. It causes hypertension of greater severity and hence greater risks of maternal cardiovascular complications, intrauterine growth restriction and preterm birth<sup>3</sup>.

**Conclusion**

There was a strong relationship of early onset of HDP with high BMI and excess gestational weight gain. Also, the severity was more and the disease progression to preeclampsia and eclampsia was also more in early onset HDP.

Management of HDP is usually done at secondary prevention level which includes early detection and screening. However, the aim should be weight reduction in pre-conceptional period to decrease the risk of developing HDP. Excessive gestational weight gain is associated with early onset of HDP and this too being a modifiable factor, control of weight gain may prevent the early onset of HDP and thus prevent disease of greater severity.

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**How to citation this article:** Kritika Tulani, Nupur Hooja, Premlata Mital, Nimisha Gupta, “Risk Factors for Early Onset of Hypertensive Disorders of Pregnancy”, *IJMACR- March - April - 2020, Vol – 3, Issue -2, P. No. 141 – 144.*

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