

Association of Complications in Hypertensive Disease of Pregnancy with Body Mass Index

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ABSTRACT

Introduction: About 12.3% of all maternal deaths occur due to hypertensive disease of pregnancy (HDP). Obesity as measured by the body mass index (BMI) is a major risk factor for development and progression of HDP. The objective of the study was to evaluate the association of the various maternal and neonatal complications with the BMI in women with HDP.

Materials and methods: Primigravida women were recruited at their first visit and BMI noted. Examination and all relevant investigations were done at all visits. A total of 45 women who developed HDP were included in the study. Any maternal or neonatal complication was recorded.

Results: Most maternal complications like abruptio placentae and pulmonary edema were more in those women with higher BMI. Fetal growth restriction and neonatal complications were also observed more in women with BMI >24.9 kg/m².

Conclusion: Maternal and neonatal complications are significantly more in overweight women. Close monitoring of the blood pressure from the earliest of these women should be done.

Clinical significance: Primary preventive measures by weight reduction prior to pregnancy and close monitoring of overweight women will help prevent the maternal and neonatal complications and improve outcome.

Keywords: Abruptio placentae, Asphyxia, Hypertensive disease of pregnancy, Preeclampsia.

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INTRODUCTION

Hypertensive disease of pregnancy (HDP) contributes to 12.3% of all maternal deaths.¹ Various complications that occur due to HDP sometimes indicate immediate delivery.² The etiology of HDP still remains unclear. There are many risk factors that precipitate HDP. The pre-pregnancy body mass index (BMI) may be associated with HDP.³ This factor is modifiable. Management is usually done at the secondary prevention level, which includes early detection and screening. However, the aim should be to identify the primary maternal risk factors that are modifiable, BMI being one of them. The objective of the study was to evaluate the association of the various maternal and neonatal complications in HDP with BMI.

MATERIALS AND METHODS

The observational study was done at SMS Medical College, Jaipur, over 6 months from June 2019 to November 2019. The institutional research review board and ethical committee clearance was taken. Singleton pregnant women at their first visit were enrolled and followed till delivery to study the effect of BMI. Only primigravidae were selected since parity is reported to be an independent predictor of perinatal mortality.⁴

The exclusion criteria were: women with preexisting chronic hypertension, chronic renal, heart, liver, pulmonary disease, diabetes mellitus and gestational diabetes mellitus, anti-phospholipid syndrome, women on drugs affecting weight, and conceived after assisted reproduction. These ruled out the confounding factors due to their effects on HDP.

An informed consent was taken of all. The BMI was recorded at first visit. Weight and blood pressure measurements, investigations, and routine examination were done at first and at all antenatal clinic (ANC) visits.

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Development of HDP was considered as inclusion criteria. Hypertensive disease of pregnancy was labeled if a women with no previous history developed systolic >140 mm Hg and diastolic >90 mm Hg after 20 weeks of gestation on two readings taken 6 hours apart.

Sample size was calculated at 80% study power and alpha error of 0.05 assuming prevalence of BMI ≥ 25 in 3% of controls and odds ratio of 11.27 as per results of Ganesh et al.⁵ Hence, 45 pregnant women with HDP required for the present study were included in the study. Women were admitted if they developed severe HDP or had any complications.

The BMI, which is calculated as weight (kg) per height (m) squared, is the international standard measurement for obesity.⁶ This can be used as a parameter to find association of obesity with HDP. It was categorized as normal weight –18.5–24.9 kg/m² and overweight –25–29.9 kg/m².

All 45 women included in the study were followed till delivery and any maternal, fetal, or neonatal complications were noted.

Nominal/categorical variables were expressed as percentages. The *p* value <0.05 was taken as significant. The Medcalc 16.4 version software was used for all statistical calculations.

RESULTS

A total of 45 women had HDP; 60% of these had BMI ≥25 kg/m². No woman had BMI >30 kg/m². Twenty-two women who developed severe HDP were admitted in the hospital and tablet Labetolol was given and further management was done according to the control of blood pressure or occurrence of complications. Despite treatment, pregnancy was terminated early due to uncontrolled blood pressure (2), eclampsia (3), and abruptio placentae (4).

Complications were fewer as the women were under close vigilance. About 20% women had abruptio placentae, 77% of whom were overweight. Hemolysis, elevated liver enzymes, and low platelet count (HELLP) is an entity often associated with proteinuria and hypertension and generally resolves after delivery. About 13.33% women developed HELLP syndrome or pulmonary edema; two-thirds of these were overweight. Eclampsia and renal failure, seen in 8.88% each, were also more in overweight women.

Comparing the women in the groups, 25.9% had abruptio placentae and 14.8% had HELLP syndrome or pulmonary edema as compared to 11.11% in women with normal weight (Table 1).

Preterm delivery was mostly induced than spontaneous due to severity of HDP or due to the complications when termination of pregnancy was preferred, mainly due to development of eclampsia or abruptio placentae.

About 20% women in our study had delivery before 36 weeks; two-thirds of these were overweight. About 22% of overweight women as compared to 16.66% of normal weight women had preterm delivery (Table 2).

The cesarean section was performed on 18 women (40%), 10 of whom were obese. Of the 27 obese women, cesarean was performed on 37%. The optimal timing and the route of delivery depended on the onset and severity of HDP. In severe HDP remote from term, termination by the cesarean section was preferred. In uncomplicated mild HDP, induction of labor was done near term, with good maternal and neonatal outcomes.

There were less number of neonatal complications too as the women in the study were under close vigilance. About 11.11% (5) women had stillbirths of which 60% were overweight. Apgar score of 12.5% neonates was <4 at 1 minute; 80% of these were of overweight women. About 27.5% neonates weighed under 2.5 kg; 63.6% of these were of overweight women (Table 3).

Comparing the two groups, the stillbirth rate of 11.11% and the NICU admission rate of 25% of both were same; however, the neonates with Apgar score <4 were 16.66% of overweight vs 6.25% of women with normal weight and neonates with low birth weight were 29.16% vs 25%. These differences were statistically significant.

About 25% of the 40 neonates were admitted in the neonatal intensive care unit (NICU) due to low birth weight or birth asphyxia/meconium aspiration syndrome; 60% of these were of overweight women (Table 4).

DISCUSSION

Preeclampsia is associated with maternal complications. The most common reported by us and various authors⁷⁻⁹ include disseminated coagulopathy, hemolysis, elevated liver enzymes—AST, ALT (≥72 IU/L)—and low platelets count (<100,000/mm³) (HELLP) syndrome, pulmonary edema, acute kidney injury, and placental abruption.

Obesity increases the overall risk of HDP by approximately two to threefold.¹⁰ The risk and severity and hence complications of HDP increase progressively with increasing BMI, even when within the normal range.³ Obesity is associated with metabolic changes. The mechanism of obesity causing HDP is multifactorial. The adipose tissue is hormonally active tissue that releases adipokines and cytokines. These create pro-inflammatory, pro-thrombotic milieu and oxidative stress.¹¹

Also C-reactive protein (CRP) is an inflammatory mediator produced by the liver and adipocytes and hence is higher in obese women.¹² Tumor necrosis factor-alpha is also produced in the adipose tissue and is associated with insulin resistance, endothelial damage, and oxidative stress. Their circulating levels are increased with obesity.¹³

Table 1: Association of occurrence of maternal complications in hypertensive disease of pregnancy with body mass index

Maternal complications	BMI (kg/m ²)	
	<25 (n = 18)	≥25 (n = 27)
HELLP syndrome	2	4
Pulmonary edema	2	4
Renal failure	1	3
Abruptio placentae	2	7
Eclampsia	1	3

Table 2: Gestational age at delivery in hypertensive disease of pregnancy and body mass index

Gestational age at delivery	BMI (kg/m ²)	
	<25 (n = 18)	≥25 (n = 27)
<32 weeks	–	3
<36 weeks	3	3
>36 weeks	15	21
Mean age (weeks, days)	39 weeks 1 day	38 weeks

Table 3: Association of neonatal outcome in hypertensive disease of pregnancy with body mass index

Neonatal outcome	BMI (kg/m ²)	
	<25 (n = 18)	≥25 (n = 27)
Stillbirth	2	3
Apgar score <4	1	4
Apgar score 4–7	4	3
Apgar score >7	11	17
Birth weight <2.5 kg	4	7
Birth weight >2.5 kg	14	20
NICU admissions	4	6

Table 4: Reasons for NICU admissions

Reason	BMI (kg/m ²)	
	<25 (n = 18)	≥25 (n = 27)
Low birth weight	2	3
Birth asphyxia/meconium aspiration syndrome	2	3

Leptin and adiponectin are also produced by the adipose tissue. Circulating leptin is increased in HDP and is correlated with maternal BMI.⁶ Oxidative stress so-created leads to altered endothelial function resulting in vascular dysfunction, which may ultimately lead to multiorgan damage.¹⁴ These factors lead to severe diseases and greater complication rates in women with higher BMI.

CONCLUSION

Maternal and neonatal complications are significantly more in overweight women. Close monitoring of the blood pressure from the earliest of these women should be done.

CLINICAL SIGNIFICANCE

Primary preventive measures by weight reduction prior to pregnancy and thus modification of preconceptional BMI to prevent HDP and its complications and close monitoring of overweight women will help prevent the maternal and neonatal complications and improve outcome.

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