

# Comparison of Development of Pre-Eclampsia in Second and Third Trimester in Obese versus Non-Obese Pregnant Women

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## ABSTRACT

**Aim:** To compare the frequency of pre-eclampsia in second and third trimester in obese versus non-obese women.

**Methods:** It was a Cohort study conducted at Department of Obstetrics and Gynaecology, Bahawal Victoria Hospital Bahawalpur. A total of 62 obese (BMI >30) and 62 non-obese (BMI<30) having, singleton pregnancy were registered for the study at their book visit at ~14-20 weeks of gestation. Women having family history of obesity and chronic ailments and those with age >35 or parity > 5 were excluded. Chi-square test was applied to determine statistical significance. A p-value of < 0.05 was considered significant.

**Results:** Mean age was calculated as 28.12±2.72 in obese and 27.89±2.34 in non-obese group. Parity was 3-4 in 50% (n=31) in obese and 46.8 % (n=29) in non-obese group. Development of pre-eclampsia was subsequently observed in 27.4% (n=17) of obese and 9.7%(n=6) of non-obese women.

**Conclusion:** It is concluded that pre-eclampsia develops significantly higher in second and third trimester in obese women as compared to non-obese women as assessed by BMI in early pregnancy.

**Keywords:** Obesity, BMI, Pre-eclampsia, Pregnancy

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## INTRODUCTION

Among young women, obesity is especially important because maternal obesity confers an increased risk of preeclampsia, a hypertensive disorder of pregnancy and a leading cause of maternal and fetal morbidity and mortality. These conditions might be related through common features related to oxidative stress, inflammation and altered vascular function. Recently, extensive vascular infiltration of neutrophils and vascular inflammation has been reported in both preeclamptic women and obese women. Therefore, if the vasculature of obese women is inflamed, they could be at increased risk of developing preeclampsia when they become pregnant and are exposed to the additional burdens of pregnancy<sup>1</sup>.

Arterial blood pressure, hemoconcentration, and cardiac function are all altered by the hemodynamic changes brought about by obesity. Some investigators have suggested a 10-fold higher rate of chronic hypertension in obese compared with normal-weight women<sup>2,3</sup>.

The risk of pregnancy-induced hypertension or preeclampsia are significantly greater if the mother is overweight as assessed by BMI in early pregnancy<sup>4,5</sup>.

Studies suggest a two- to threefold increased risk for preeclampsia with a BMI of greater than 30. Sattar and colleagues<sup>6</sup> reported the results of the risk of hypertensive complications of pregnancy in association with a waist circumference of greater than 80 cm in data from 1,142 pregnant women. The risk of pregnancy-induced hypertension was twofold greater (OR 1; 89% CI 1.1–2.9) and preeclampsia threefold (OR 2.7; 95% CI 1.1–6.8) greater in association with visceral obesity. Waist circumference was demonstrated to be a more sensitive risk marker than BMI.

In a study of 287,213 pregnancies, Sebire and colleagues<sup>3</sup> included 176,923 (61.6%) normal weight (BMI 20–24.9), 79,014(27.5%) overweight (BMI 25–29.9), and 31,276(10.9%) obese (BMI R30) women. Obese women were two to three times more likely to develop proteinuric preeclampsia.

## PATIENTS AND METHODS

It was a cohort study conducted in the Department of Obstetrics and Gynaecology Bahawal Victoria Hospital Bahawalpur from April to December 2012 on sixty-two subjects in each group (obese and non-obese). Sampling technique was non probability purposive sampling. Inclusion criteria in Group A (obese) was patient with a singleton pregnancy presented for booking at 14–20 completed weeks of gestations having BMI≥30 kg/m<sup>2</sup> and in Group B (non-obese) patients with a singleton pregnancy

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presented for booking at 14–20 completed weeks of gestations having BMI<30 kg/m<sup>2</sup>.

**Exclusion Criteria:**

- Women having any associated medical disorder like ch. hypertension, DM, or clotting disorder.
- Women WITH H/O obesity, hypertension, diabetes mellitus or thromboembolic disease.
- Women having history of GDM, PE or thromboembolism in previous pregnancy.
- Women of age more than 35 years.
- Women of parity more than 5.
- Women having history of smoking, alcohol intake or any other drug abuse.

**Data collection procedure:** Subjects reaching the department of Obstetrics and Gynaecology Bahawal Victoria Hospital, Bahawalpur through Outpatient department fulfilling the inclusion and exclusion criteria were included in the study after taking the informed verbal consent. According to their BMI, patients were placed in one of the two groups, BMI ≥30 (Exposed group), BMI <30 (Non Exposed group) as mentioned in the inclusion criteria. All the patients were followed up to 42 weeks of gestation or up to delivery, if delivered before. Follow up was done by researcher herself on the Outdoor basis. If any patient developed complications, she was admitted in ward for further management. A separate proforma was used for every patient to record the particulars, BMI and any antenatal maternal complication mentioned in the operational definition. Age, parity and period of gestation of every patient kept in mind and their effect on the prenatal outcome was noted.

**Data analysis:** Data was analyzed using SPSS version 16. Descriptive statistics were used to analyze the data. Mean and standard deviation was calculated for quantitative data i.e. age, parity and period of gestation. Percentages and frequencies were calculated for qualitative data i.e. development of gestational diabetes, pre-eclampsia and deep vein thrombosis. Tables were made. Differences between two groups were noted and subjected to statistical significance. Chi-square test was used as the test of significance. The level of statistical significance, (α) was taken as 0.05. Stratification was done with regards to age, parity and period of gestation to see their effect on outcome.

**RESULTS**

In this study, a total of 124 patients were recruited after fulfilling the inclusion/exclusion criteria mentioned above. Mean age of women was 28.12±2.72 years in obese and 27.89±2.34 years in non-obese group. Table 1 shows age distribution of patients in both groups and their stratification into various age-groups. Statistical significance was

observed neither in the mean age nor in the frequency of patients in various age groups between the two study groups. Parity was 3-4 in 50% (n=20) in obese and 47.5% (n=19) in non-obese group (Table 2). Again, there was no statistical significance was observed in parity between the two groups.

Development of pre-eclampsia was in 17 (27.42%) of obese pregnant women and in only 6 (9.68%) in non-obese women, while 72.58% (n=45) in obese and 90.32% (n=56) in non-obese group had no findings of pre-eclampsia as shown in Table 3. There was statistically significant higher frequency of pre-eclampsia among obese group (p value 0.01).

Table 1 Age Distribution of the subjects

Age (Yrs)	Obese (62)	Non-obese(n=62)
20-25	27(43.55%)	29(46.77%)
26-30	23(37.10%)	24(38.71%)
31-35	12(19.35%)	09(14.52%)
Mean	28.12±2.72	27.89±2.34

P value: > 0.05

Table 2 Parity of the subjects

Para	Obese (62)	Non-obese(n=62)
0-2	17(27.42%)	21(33.88%)
3-4	31(50%)	29(46.77%)
5	14(22.58%)	12(19.35%)
Mean	3.21±1.43	3.78±1.87

P value: >0.05

Table 3 Comparison of frequency of pre-eclampsia between obese vs. non-obese women

Preeclampsia	Obese (62)	Non-obese(n=62)
Yes	17(27.42%)	6(9.68%)
No	45(72.58%)	56(90.32%)

P value: 0.01

**DISCUSSION**

The average weight gain of a healthy nulliparous woman is around 12.5kg however large variations are seen. In west, average weight gain ranges from 10-16kg<sup>7</sup>. The optimum weight gain in terms of minimum peri-natal mortality is 7.3kg for overweight women, 9.1kg for women of normal weight & 13.6 kg for underweight women.<sup>8</sup> Obesity is associated with many pre-natal, natal and post natal complications of pregnancy.<sup>9,10</sup> Various methods are used to evaluate nutritional status, but the body mass index [BMI= weight (kg)/height (m)<sup>2</sup>] is generally used for its simplicity and strong correlation to body fat. The World Health Organization (WHO) defines normal weight as a BMI of 18.5-24.9, overweight as a BMI of 25-29, and obesity as a BMI of 30 or greater. Obesity is further characterized by BMI into class I (30- 34.9), class II (35-39.9), and class III (greater than 40)<sup>11</sup>.

Rates of obesity have increased exponentially worldwide to almost epidemic proportions. Eating

habit modifications and sedentary life style has resulted in rapid increase in overweight populations. In particular, maternal obesity is linked to numerous metabolic complications including subfertility, gestational diabetes, hypertensive disorders of pregnancy and thromboembolism, with potential long-term health consequences for both mother and child. The underlying pathophysiology linking maternal obesity and adverse outcomes is complex but is likely to involve alterations in glucose and lipid metabolism, inflammation, adipokines and vascular dysfunction, all seen in obese women. Intervention studies are underway to determine whether alteration of maternal lifestyle can improve maternal and fetal outcomes.

Pre-eclampsia developed in 27.42% (n=17) of obese and 9.68% (n=6) of non-obese women in current study. This gross difference between obese and non obese is consistent with many of the previous studies from within the country and abroad. Sattar and colleagues reported the risk of pregnancy-induced hypertension as twofold greater (OR 1; 89% CI 1.1–2.9) and preeclampsia threefold (OR 2.7; 95% CI 1.1–6.8) greater in association with visceral obesity<sup>12</sup>. In study by Sebire and colleagues, obese women were found to be two to three times more likely to develop proteinuric preeclampsia as compared to non-obese women<sup>3</sup>. According to Bianco and colleagues reported a fourfold increased risk for preeclampsia in the age and parity matched obese women.<sup>13</sup> Stone and colleagues reported that the only risk factor associated with the development of severe preeclampsia was severe obesity in all patients (OR 3.5, 95% CI 1.6–7.4)<sup>14</sup>. Another study revealed pre-eclampsia developing in 14 – 25% of obese pregnant women.<sup>10</sup> Studies by Robinson et al<sup>15</sup> and Leonie et al.<sup>16</sup> showed that obese women are at high risk for pre-eclampsia which is in line with the results of this study. Similar results have been reported by Ushakiran et al<sup>17</sup>, Heather et al<sup>18</sup>, Bhattacharya et al<sup>19</sup> and Callaway et al<sup>20</sup>.

## CONCLUSIONS

Pre-eclampsia develops significantly more frequently in second and third trimester in obese pregnant women as compared to non-obese pregnant women, as assessed by BMI in early pregnancy.

## REFERENCES

1. Walsh SW. Obesity: a risk factor for preeclampsia. HYPERLINK "<http://www.ncbi.nlm.nih.gov/pubmed/18023357>" "Trends in endocrinology and metabolism: TEM." *Trends Endocrinol Metab.* 2007;(10):365-70.
2. Lederman S. Pregnancy weight gain and postpartum loss: avoiding obesity while optimizing the growth and

- development of the fetus. *JAMA* 2001;56:53–8.
3. Sebire NJ, Jolly M, Harris JP. Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. *Int J Obes* 2001;25:1175–82.
4. Sibai BM, Gordon T, Thom E. Risk factors for preeclampsia in healthy nulliparous women: a prospective multicenter study. The National Institute of Child Health and Human Development Network of Maternal-Fetal Medicine Units. *Am J Obstet Gynecol* 1995;172:642–8.
5. Sibai BM, Ewell M, Levine RJ. Risk factors associated with preeclampsia in healthy nulliparous women. The Calcium for Preeclampsia Prevention (CPEP) Study Group. *Am J Obstet Gynecol* 1997;177:1003–10.
6. Sattar N, Clark P, Holmes A. Antenatal waist circumference and hypertension risk. *Obstet Gynecol* 2001;97:268–71.
7. Johnson SR, Kolberg BH, Varner MW, Railsback LD. Maternal obesity and pregnancy. *Surg Gynecol Obstet* 1987;164:431–7.
8. Le Thai N, Lefevre G, Stella V, et al. Grossesse et obésité. A propos d'une étude de 148 cas. (pregnancy and obesity. A case control study of 148 cases.) *J Gynecol Obstet Biol Reprod* 1992;21:563-7 (in French).
9. Linne Y. Effects of obesity on women's reproduction and complications during pregnancy. *Obes Rev.* 2004;5:137-43.
10. Castro L, Avina R. Maternal obesity and pregnancy outcomes. *Curr Opin Obstet Gynaecol.* 2002;14:601-6.
11. World Health Organization. Obesity: preventing and managing a global epidemic. *World Health Organ Tech Rep Ser* 2000;894:1-4.
12. Sattar N, Greer IA. Pregnancy complications and maternal cardiovascular risk: opportunities for intervention and screening? *Br Med J* 2002;325:157.
13. Bianco AT, Smilen SW, Davis Y. Pregnancy outcome and weight gain recommendations for the morbidly obese woman. *Obstet Gynecol* 1998;91:97–102.
14. Stone JL, Lockwood CJ, Berkowitz GS. Risk factors for severe preeclampsia. *Obstet Gynecol* 1994;83(3):357.
15. Robinson HE, Dconnell CM, Joseph KS, Mcleod NL. Maternal outcomes in Pregnancies complicated by obesity. *Obstetric & Gynecology* 2005;160(6):1357.
16. Leonie KC, Johannes BP, Allan MC, McIntyre D. The prevalence and impact of overweight and obesity in an Australian obstetric population. *MJA* 2006;184(2):56-9.
17. Ushakiran TS, Hemmadi S, Bethel J, Evans J. Outcome of pregnancy in women with an increased body mass index. *International Journal of Obstetrics and Gynecology* 2005;112(6):768-72.
18. Hosseini M, Nastaran J. Relationship between pregnancy outcome and maternal BMI and weight gain. *International Congress Series* 2004;1271:380-3.
19. Bhattacharya S, Campbell DM, Listion WA, Bhattacharya S. Effect of body Mass index On Pregnancy outcomes in Nulliparous women delivering singleton babies. *BMC Public Health* 2007;7:168.
20. Cunningham FG, Leveno KJ. *Williams Obstetrics*, Twenty. second edition. Mc Graw-Hill Medical Publishing Division; 2005:1007-17.

