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RESEARCH ARTICLE

Is Body Weight a Telltale of Preeclampsia?

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ABSTRACT

Introduction: Increased body weight is a major epidemic for a developed country, and is also expanding to developing countries. It is measured as the body mass index (BMI). Control of body weight gain, where weight gain in adequate proportion is indicated, is a major challenge before, during, and after pregnancy.

Aim: To find out whether the increased value of BMI as measured at 20 to 24 weeks of gestation can be used to predict the development of preeclampsia.

Objective: To study the role of increased value of BMI in development of preeclampsia in normal pregnancies.

Materials and methods: A case–control retrospective study was conducted on pregnant women who attended the antenatal clinic of Bokaro General Hospital, Jharkhand, India. About 220 pregnant women, who attended the antenatal clinic, in 20 to 24 weeks of gestation, were included after proper written consent for study.

Results: About 220 patients were included in our study, who attended the antenatal clinic between 20th and 24th weeks of pregnancy. In our study, the maximum proportion of participants' BMI ranges between 22 to 24 and 24 to 26 kg/m^2. In our study, we found with increase of BMI value, the percentage of preeclampsia development increases.

Conclusion: In view of our results, counseling about body weight and its management should be known to the women before, during, and after pregnancy.

Keywords: Body mass index, Body weight, Preeclampsia.

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INTRODUCTION

Increased body weight is a major epidemic for a developed country, and is also expanding to developing countries.[1] It is measured as body mass index (BMI). Increased value of BMI is an alarming sign for both the individual and nation as an economic burden. Control of body weight gain where weight gain is in adequate proportions is indicated, which is a major challenge before, during, and after pregnancy.

Numerous studies have been conducted to predict the development of preeclampsia or to distinguish it from more benign hypertensive complications. They include evaluation of circulating or urinary markers and imaging techniques. The World Health Organization,[2] in its 2011 publication, defined criteria for diagnosis of preeclampsia as "onset of a new episode of hypertension during pregnancy, characterized by persistent hypertension (diastolic blood pressure ≥ 90 mm Hg) and substantial proteinuria (>0.3 g/24 hours)."

Whether weight reduction prior to pregnancy or restricting weight gain during pregnancy will reduce the risk of preeclampsia is not established.[3] Many studies were conducted to show the relationship either between preeclampsia or newborn weight or overweight/obesity. A few studies were conducted to show the relationship of BMI in the normal range with development of preeclampsia. So, the present study was conducted to find out if a relation exists between development of preeclampsia and BMI within normal range.

MATERIALS AND METHODS

After institutional ethical approval, this retrospective study was conducted in the Department of Obstetrics and Gynecology, Bokaro General Hospital, Bokaro, India. About 250 pregnant women were approached with a proposal of the study. Among these, 220 patients fulfilling inclusion criteria were included in the study after taking written consent.

After taking demographic details, clinical and customized radiological examination was done. Blood pressure was measured in the high sitting position in the left upper extremity. Blood pressure had been monitored biweekly throughout pregnancy by the researcher. All populations under study were followed up regularly. Patients who were unable for regular antenatal clinic visit were allowed home-based blood pressure monitoring.

To make a meaningful comparison of BMI between pregnant women, body weight was compared as whatever recorded at the 24th week of pregnancy.

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Table 1: Age-wise distribution of patients in both groups

Age range	*Preeclamptic*	*Nonpreeclamptic*
15–20	23	18
20–25	27	39
25–30	24	35
30–35	15	19
35–40	15	05
Total	104	116
Mean ± SD	25.19 ± 4.76	25.52 ± 5.32
Min–Max	17–38	16–38
d.f.	1	
F-statistics	0.23	
p-value	0.24	
χ^2-value	1.33	
t-difference	−0.486	

SD: Standard deviation

Table 2: Body mass index-wise distribution of patients in both groups

BMI (kg/m^2)	*Preeclamptic*	*Nonpreeclamptic*
20–22	6	15
22–24	39	43
24–26	41	41
26–28	18	17
Total	104	116
Mean ± SD	24.36 ± 1.72	24.03 ± 1.85
Min–Max	20.28 – 27.53	20.28 – 27.83
d.f.	1	
F-statistics	1.86	
p-value	0.77	
χ^2-value	0.572	
t difference	1.37	

SD: Standard deviation

Patients whose blood pressure range was ≥140/90 mm of Hg were sent for random urine protein estimation. The random urine protein estimations were performed in the laboratory. The patients whose random urine protein was estimated as ≥300 mg/dL along with blood pressure as ≥140/90 mm of Hg were diagnosed as preeclampsia.

The endpoint of the study was either the development of preeclampsia as per the American Criteria of Obstetrics and Gynecology or end of pregnancy.

RESULTS

Age-wise Distribution of Pregnant Women

For comparing age-wise distribution of pregnant women with preeclampsia and non preeclampsia (Table 1), we used analysis of variance (ANOVA) as statistical tools. The p-value at 95% confidence interval (CI) shows insignificant difference and also the χ^2-value at degree of freedom 1 shows insignificant difference with reference to age, as the table value of χ^2 at 95% CI is 3.84, but the calculated value is 1.33, which is very less. So, we state that the population distribution for preeclampsia and non preeclampsia are homoscedastic with reference to age.

Body Mass Index of Patients

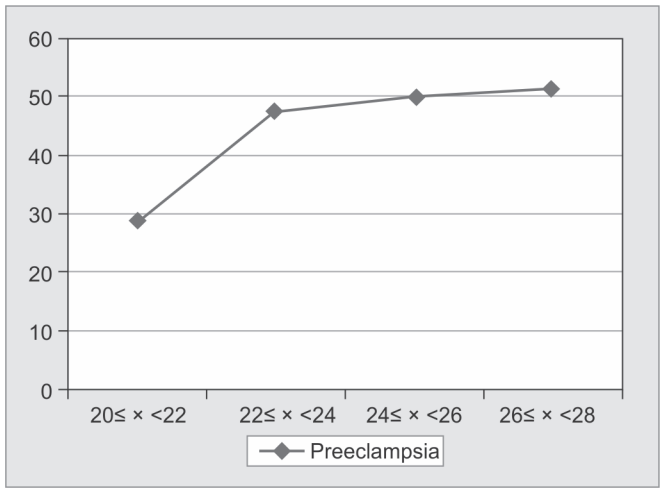
For comparing BMI-wise distribution of pregnant women with preeclampsia and non preeclampsia, we used ANOVA statistical tools. Table 2 shows that mean BMI along with standard deviation of both groups is unequal. The p-value at 95% CI shows insignificant difference, and also the χ^2-value at degree of freedom 1 shows insignificant difference with reference to BMI, as table value of χ^2 at 95% CI is 3.84, but the calculated value is 0.572, which is very less. So, we state that the population distributions for preeclampsia and non preeclampsia are homoscedastic with reference to BMI.

DISCUSSION

In developed countries, obesity is a major epidemic, which has also extended to the developing countries.[1] It is associated with profound metabolic and physiological changes.[4] Preeclampsia, a significant public health threat in both developed and developing countries, contributes to maternal and perinatal morbidity and mortality globally.[5]

Our study, as shown in Graph 1, states that with increase in BMI, percentage of occurrence of preeclampsia increases. Most of the participants' BMI, in our study, was within the normal range, but with increase in BMI within this range, the ratios of development of preeclampsia were increased. This is corroborated with the findings of Belogolovkin et al,[6] who reported that women with the lowest BMI have relatively lower preeclampsia prevalence and are protected against preeclampsia.

Further, Bodnar et al[7] reported that this relationship is not limited to obese and overweight women because increases in BMI in the normal range are also associated with an increased risk of preeclampsia.



Graph 1: The role of BMI in development of preeclampsia

Now, the open question arises as to how obesity increases the chances of preeclampsia? As reported by Roberts et al[3] that the impact of weight gain in women, who subsequently develop preeclampsia, is as likely related to fluid retention as associated with preeclampsia as it is to fat accrual. It is evident from the cardiovascular literature that it is not just fat, but fat distribution, i.e., important. Central obesity, i.e., directly related to visceral obesity presents a much higher risk than peripheral obesity.[8] More recent data indicate production of C-reactive protein (CRP) in adipose tissue, which is higher in obese individuals, is also elevated in early pregnancy in women, who later develop preeclampsia.[9] Visceral fat produces more CRP and inflammatory cytokines[10] and less leptin, contributing to oxidative stress.[11] This stress leads to hypertension through reduced availability of nitrous oxide secondary to increased asymmetric dimethylarginine and oxidative stress, increased sympathetic tone, and increased expression of angiotensinogen by adipose tissue.[12]

The other factor that seems to be a causative factor of preeclampsia in the obese is associated with increased circulating angiogenic factors including vascular endothelial growth factor (VEGF). This likely represents spillover from production by adipose tissue, especially visceral fat.[13] Because of the high circulating concentrations of soluble FMS-like tyrosine kinase 1 (sFlt1) in pregnancy, VEGF is virtually absent in the blood of pregnant women. In contrast to VEGF, placental growth factor is measurable in pregnancy and is significantly lower in midpregnancy in overweight and obese women, and this relationship is evident in women who develop preeclampsia as well as women with uncomplicated pregnancies.[14]

CONCLUSION

Our study concludes that increase in body weight during pregnancy increases the chance of future development of preeclampsia.

RECOMMENDATION

In what proportion weight gain is recommended should be known to every pregnant women before and during pregnancy. Every obstetric and gynecologist should monitor the ratio of weight gain and, if altered, should take attention and also inform the patient to take a major step to control.

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