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First trimester maternal BMI and pregnancy outcome

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Abstract

Aim: The aim of the study was to find out relationship of maternal BMI to pregnancy outcome.

Methodology: The study carried out in Srinivas Institute of Medical Sciences and Research Centre and Mangalore Fetal Medicine Centre, from Nov 2016 to Oct 2017 and pregnancy outcomes were analyzed in relation BMI recorded in first trimester of primigravida.

Results: Mean age of pregnant women was 26.2 years. At first booking obese women were significantly older (28.0 years) than others. Family history of diabetes was significantly higher among obese women (8.25%) compared to others. Rates of cesarean sections were higher in obese compared to others. The macrosomia rates were higher in obese compared to other group. The preeclampsia (1.89%), were significantly higher in obese women than others.

Conclusions: Obese women were at a high risk of developing adverse pregnancy outcomes in terms of gestational diabetes, macrosomia, preeclampsia more of cesarean section. Normal weight women have low risk for cesarean section and macrosomia. These results highlight the need for preconception counseling, especially for obese and overweight and have beneficial outcomes in Asian Indian women.

Keywords: Body mass index, Primigravida, Macrosomia, preterm birth, Preeclampsia, cesarean section

Introduction

Now a day's increase in the prevalence of obesity is seen ^[1]. High prepregnancy BMI and/or excessive gestational weight gain (GWG) have negative implications on pregnancy outcomes, and this amplifies the burden of chronic diseases putting health of both mother and the infant at risk ^[2]. Recent studies have reported that prepregnancy BMI is associated with birth weight of the infant ^[3, 4]. Women who are overweight/obese are at high risk of developing preeclampsia and gestational diabetes mellitus. This in turn is found to influence the neonatal outcomes such as perinatal mortality, macrosomia, and congenital anomalies ^[5, 6]. In addition, maternal obesity leads to higher cesarean sections and increased risk of anesthesia. The long-term impact of maternal obesity includes maternal weight retention and exacerbation of obesity ^[7]. In 2009, the Institute of Medicine (IOM), USA, published revised GWG guidelines that are based on prepregnancy ranges for underweight, normal weight, overweight, and obese women ^[8]. These recommendations were, however, based on American women and therefore its generalizability to other populations is unclear as maternal anthropometry varies across different populations ^[9]. The IOM later published a commentary acknowledging that they based their recommendations primarily on the basis of primigravida mothers of high social status and those with no physical activity ^[10]. Some recent studies from Asia have concluded that IOM guidelines are suitable for the Asian population ^[11, 12], whereas others have reported that GWG among Asians is different from what has been recommended by the IOM ^[13, 14]. There are very few studies from India that have looked at the applicability of the IOM guidelines in pregnant women ^[15]. This is mainly because the BMI classification for Asians ^[16] is different from the World Health Organization (WHO) BMI cutoffs recommended for the West.

Methodology

A total of 1506 records of pregnant women attending Srinivas Institute of Medical Sciences and research centre and Mangalore Fetal Medicine Centre with other private maternity centers in Mangalore, from Nov 2016 to Oct 2017 were retrieved. Of the total 1506, a total of 1018 (67.60%) records were available for data analysis after data cleansing. Weight and BMI at early pregnancy in primigravida which was the only feasible option for obtaining reliable information was classified according to WHO Asia Pacific BMI cut points ^[16].

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Table 1: WHO Asia Pacific criteria of BMI

Weight category	BMI (Kg/m ²)
Under weight	<18.5
Normal weight	18.5 - 22.9
Over weight	23 - 24.9
obese	>25

BMI = Body mass index, WHO = World health of organization
Pregnancy outcomes were analyzed in relation to BMI.

Definitions

Preterm birth or premature birth is one that occurs before the start of 37 weeks of pregnancy [17]. Macrosomia is used to describe a newborn who is significantly larger than average; a infant weighing >3.5 kg is considered macrosomic [18].

Statistical analysis

All analyses were done using Windows-based SPSS statistical package estimates were expressed as mean \pm standard deviation.

To compare adverse pregnancy outcomes Chi-square tests were used to test differences in proportions. $P < 0.05$ was considered statistically significant.

Results

Mean age of pregnant women was 26.2 years, mean BMI was 25.8 kg/m², and mean weight gain during pregnancy was 8.1 kg. Family history of type 2 diabetes was seen in 7.1%.

Table 2: Distribution of BMI in study group

WHO Asia Pacific criteria of BMI	Distribution (n= 1018)
Underweight	57 (5.60%)
Normal	321(31.53%)
Overweight	216(21.21%)
Obese	424(41.66%)

As shown in Table 2, 5.60% (n = 57) were underweight, 31.53% (n = 321) normal weight, 21.21% (n = 216) overweight, and the rest 41.66% (n = 424) were obese.

Table 3: Clinical characteristics in study group

Clinical parameter	Underweight (n = 57)	Normal (n= 321)	Overweight (n=216)	Obese (n=424)
Mean age	25.1	27.3	27.5	28.0
Mean weight at booking (Kg)	46.2	53.4	59.3	69.5
Mean weight gain during pregnancy	9.2	9.0	8.8	8.4
Mean BMI at booking (Kg/m ²)	17.1	21.1	23.9	28.8
Mean birth weight (Kg)	2.89	3.03	3.05	3.08
Preterm deliveries (%)	3 (5.26)	19 (5.92)	14(6.48)	30 (7.08)
Gestational diabetes (%)	2 (3.51)	15 (4.67)	12 (5.56)	35 (8.25)
Cesarean rates (%)	6 (10.53)	82(25.55)	65 (30.09)	170 (40.09)
Low birth weight (%)	7 (12.28)	37(11.53)	23 (10.64)	43(10.14)
Macrosomia (%)	3 (5.26)	25(7.79)	25 (11.57)	59 (13.92)
Preeclampsia (%)	1(1.75)	1(0.31)	2 (0.93)	8 (1.89)

Table 3 shows the clinical characteristics and pregnancy outcomes of the women classified according to their BMI at first booking in primigravida. Obese women were significantly older (28.0 years) than overweight, normal weight, and underweight women (27.5, 27.3, and 25.1 years, $P < 0.0001$, respectively). Weight at booking (kg) was significantly higher in obese women when compared to the other three groups.

The mean birth weight of the infants born to normal weight, overweight, and obese women was significantly higher than birth weight of infants of underweight women (3.03 kg, 3.05 kg, 3.08 kg, and 2.89; $P = 0.006$, respectively). Gestational diabetes was significantly higher among obese women (8.25%) compared to the overweight, normal weight, and underweight women (5.56%, 4.67%, and 3.51%, $P < 0.001$, respectively). Rates of cesarean sections were (40.09%, 30.9%, 25.55%, and 10.53%, $P < 0.001$) respectively in obese, overweight, normal and underweight women. The low birth weight rates were 12.28%,

11.53%, 10.64%, 10.14% respectively in underweight, normal, overweight and obese women. The macrosomia rates were (13.92%, 11.57%, 7.79%, and 5.26%, $P = 0.001$), and preeclampsia (1.89%, 0.93%, 0.31%, and 1.75%, $P = 0.004$) were significantly higher in obese women than overweight, normal weight, and underweight women, respectively.

The risk of preterm birth was higher in all the groups although this did not reach statistical significance.

Table 4: IOM recommended weight gain

Weight category / BMI	IOM recommended weight gain (Kg)
Under weight	12 - 18
Normal weight	11.5 - 16
Over weight	7- 11.5
obese	5 - 9

BMI = Body mass index, IOM = Institute of Medicine
Table 4 shows IOM recommended weight gain in pregnancy.

Table 5: Shows weight gain during pregnancy across the different BMI categories in our study group.

Weight category	Recommended weight gain (Kg)	More than recommended weight gain (Kg)	Less than recommended weight gain (Kg)
Under weight (n=57)	17 (29.84%)	3 (5.26%)	37(64.90%)
Normal weight (n = 321)	89 (27.73%)	27 (8.41%)	205(63.86%)
Over weight(n = 216)	52(20.08%)	18 (8.33%)	146(67.59%)
Obese (n = 424)	154(36.32%)	128(30.19%)	142(33.49%)

It was seen that 29.84% of underweight, 27.73% of normal weight, 20.08% overweight, and 36.32% obese women met the recommendations for weight gain. While majority of underweight (64.90%), normal weight women (63.86%), and

overweight women (67.59%) gained weight less than recommended, among obese women, 30.19% of them gained more weight and 33.49% of them gained less than the recommended weight.

Discussion

Our study shows the following findings:

1. Obese women were at a higher risk of preterm delivery, cesarean section, macrosomia, and preeclampsia.
2. Normal weight women had less risk of a cesarean section and macrosomia.
3. Only 30% of women gained weight as per the recommendations.

In Asian population, the prevalence of obesity may be lower than in Europe; the health risks associated with obesity occur at a lower BMI in Asians than compared to the West, thereby making WHO BMI categorization, less relevant to the Asian population. Hence, in 2000, the Regional Office for the Western Pacific of WHO, the International Association for the Study of Obesity, and the International Obesity Task Force together released, the Asia-Pacific Perspective for redefining obesity suggesting diagnostic criteria to identify overweight and obesity in the Asian population^[16]. Maternal obesity is a risk factor for several pregnancy-related complications which may have adverse effects on both the mother and her infant. Obese women have an increased risk of miscarriage early in pregnancy^[19]. A prospective multicenter study of more than 16,000 pregnancy women showed that obese women were 2.5 times and 1.6 times more likely to develop gestational hypertension and preeclampsia, respectively^[20]. In addition to these obstetric problems, obese women are also at an increased risk of undergoing cesarean sections^[21]. Fetal overgrowth also is another major concern in obese women. In Denmark, the percentage of macrosomic infants increased from 16.7% to 20.9% in 10 years, and increasing maternal BMI has been implicated to be one major factor^[22]. Several other studies have also shown an association between increasing BMI, cesarean section, and macrosomia.

Cesarean section is usually influenced by several factors, such as practice behavior of the obstetrician or other pregnancy complications in obese women, may necessitate the need for cesarean section. In our study show that obese women were at a significantly higher risk of cesarean delivery. Our results also show that obese women were at a high risk of preterm labor and macrosomia. Not many studies have reported its association to preterm labor. However, a few studies that have shown association between obese women and preterm labor lacked statistical significance^[23]. Some studies have also reported a negative association between obesity and preterm labor^[24]. These differences may be due to inconsistency in the definition of preterm birth and effect of other confounding variables^[25]. Underweight women are known to deliver preterm infants^[26]. In addition, under weight women were shown to be at two-fold risk of delivering low birth weight infants than those who met the recommendations^[27]. Our results showed that though the risk for low birth weight in underweight women was high, it was not statistically significant. This could be because the number of underweight women studied is less. Although previous studies have reported a higher percentage (26%) of low birth weight infants^[28]. the scenario seems to be fast changing owing to the quality of antenatal care available to pregnant women in the recent past. The other important finding in this study is that though a major proportion of normal weight had a less risk for cesarean sections and macrosomia which is in contrast with previous studies which showed that these women had increased risk for such complications^[29]. This difference could be attributed mainly due to the different BMI criteria used.

Limitations of the study are like small sample size and BMI

measurement done in first trimester where some women will lose the weight because of excessive vomiting. Ideally should be based on prepregnancy weight. However, as seen in several other studies that data are seldom available in routine antenatal records. Some studies rely on the woman's recall of prepregnancy weight.

Conclusion

Preconception counseling, especially for obese and overweight women, emphasizing the importance of proper physical activity and healthy eating to avoid excess weight and its adverse effects, could have beneficial outcomes in pregnant Indian women.

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