Original article

Effect of prepregnancy body mass index and gestational weight gain on obstetric and neonatal outcomes – A pilot study

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Abstract

Objectives: The study was undertaken to explore the effects of prepregnancy body mass index (BMI) and excess weight gain on maternal and neonatal outcomes different maternal and neonatal outcomes. ***Methods:*** Obstetrics records of 496 singleton pregnant women delivered between 2007 and 2009 in IBN SINA Medical College Hospital were reviewed. On the basis of BMI on their first visit the patients were divided into 3 groups; Mat BMI Gr 1, normal (BMI 20–24.9 Kg/m^2, n=366), Mat BMI Gr 2, overweight (BMI 25-29.9 Kg/m^2, n=102), Mat BMI Gr 3, obese (BMI >30 Kg/m^2, n=28). On the basis of gestational weight gain, the subject divided into 2 categories, Gets WtGain Gr A, gestational weight gain 8–15.9 Kg (n=315), Gest WtGain Gr B, gestational weight gain >16 Kg weight gain (n=181). Data were expressed as number (percentage). Proportion test was performed for comparison between two groups. P value <0.05 was taken as level of significance. ***Results:*** of the total 496 pregnant women 74.59% were between 19-34 years of age. Among all the women 64.11% had high school education of different grade. Of all the pregnancies 23.18% were nulliparous. Of the total 496 women 366 (79.79%) were normal weight, 102 (20.56%) overweight and 28 (5.64%) obese. Obese women group had significantly higher proportion of hypertensive cases compared to the normal weight (p<0.001) and overweight (p<0.01) group. Relatively higher proportion of macrosomia, birth trauma, shoulder dystocia and NICU admission among babies of obese women (p=ns). One hundred and eighty one (36.49%) of study subjects had gestational weight gain above the cut-off (>16 kg) value (p<0.001). Women with weight gain bout the cut-off level had relatively higher proportion of macrosomic babies (p=ns). ***Conclusions:*** The data reconfirmed that obesity is associated with hypertension. Significant proportion of women had weight gain more than cut-off value which needs to be addressed to ensure sound maternal and fetal wellbeing. However, a multicentre large scale study is warranted which may help the researchers to conclusively comment on the issue and thus plan future strategies for health care during pregnancy.

Key words: Prepregnancy body mass index, gestational weight gain, obstetrics outcomes.

Introduction

Maternal nutritional status is important for health and quality of life in women and growing fetus. Maternal weight gain in pregnancy can offer a good means of assessing the wellbeing of the pregnant mother and by influence of her baby[1]. Inadequate prenatal weight gain is a significant risk factor for intrauterine growth restriction, preterm delivery and low birth weight in infants[2-5]. Obesity and excessive weight gain on the other hand can lead to adverse maternal and fetal outcomes[6,7]. Various recommendations have been made about weight gain during pregnancy. The Institute of Medicine (IOM) published recommended weight gains by prepregnancy BMI which have been the standard for subsequent research[8]. These recommendations are for BMI <19.8 Kg/m^2, total weight gain between 12.5 to 18 kg; BMI=19.8 to 26.0 Kg/m^2, total weight gain between 11.5 to 16 Kg ; BMI >26.0 to 29.0 kg/m^2, total weight gain between 7.0 to 11.5 Kg and for BMI >29.0 Kg/m^2, total body weight gain of 7.0 kg.

This study was done to find out the effects of pregnancy weight gain in different BMI groups on maternal and neonatal outcomes in women delivering singleton babies at term.

Materials and Methods

Subjects

Medial records of all 496 women started their antenatal care in the first trimester, attended for antenatal care at least four occasions and delivered in department of Obstetrics and Gynaecology, IBN SINA Medical College Hospital during the period of 2007 and 2009 were reviewed. Women carrying singleton pregnancies and delivered between 37 and 42 completed weeks were included in the study.

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The research protocol was approved by the institutional 'Research and Ethics Committee'.

Methods

Body mass index (BMI) on the first visit was taken as prepregnancy BMI. Subjects were subgrouped on the basis of their prepregnancy BMI. Mat BMI Gr 1 (normal), maternal BMI 20–24.9 Kg/m^2, n=366); Mat BMI Gr 2 (overweight), maternal BMI 25–29.9 Kg/m^2, n=102); Mat BMI Gr 3 (Obese), maternal BMI >30 kg/m2) (n=28)[9].

Gestational weight gain was defined as the difference between the maternal weights measured within one week prior to delivery from that of the first visit in the hospital. According to gestational weight gain they wee subdivided into Gest WtGain Gr A, mater gestational weight gain 8–15.9 Kg (n=315) and Gest WtGain Gr B, maternal gestational weight gain >16 Kg (n=181)[10].

Statistical methods

Data were expressed as number (percentage). Proportion test was performed for comparison between two groups. P value <0.05 was taken as level of significance.

Results

Age (yrs, mean±SD) of all the women was 26.3±5.7. Of all the women 10.48% were below 18 years of age. Among the rest 74.59% were between 19-34 years and 14.91% over 34 years. Of all the pregnant women 76.81% were multiparous and remaining (23.18%) nuliparous. Regarding educational showed that 12.9% were illiterate, 64.11% had high school level education and 22.9% were graduate and/ or higher education (Table 1).

Table 1: Age distribution, educational status of the pregnant women

	Number	Percentage
Age group		
<18 yrs	52	10.48%
19 -34 yrs	370	74.59%
>34 yrs	74	14.91%
Parity		
Nulliparous	115	23.18%
Multiparous	381	76.81%
Education		
Illiterate	64	12.90%
High School	218	64.11%
Graduate and higher	114	22.98%

Of the total 496 women 366 (79.79%) had normal BMI (20-24.9 Kg/m^2), 102 (20.56%) were overweight (BMI 25-29.9 Kg/m^2) and 28 (5.64%) obese (BMI >30 Kg/m^2). Frequency of gestational diabetes mellitus, hypertension, preeclamsia and Caesarian delivery did not show significant difference in the three groups.

Women with hypertension in maternal BMI group 3 was 53.5% which was significantly higher compared to the maternal BMI group 1 (p<001) and group 2 (p<0.01) (Table 2). Induction of labour mostly (61.2%) found in maternal BMI group 1. Labour was induced either by oxytocin or prostaglandin.

Table 2: Pregnancy and neonatal outcome according to body mass index

Variable	Mat BMI Gr 1 *N (%)*	Mat BMI Gr 2 *N (%)*	Mat BMI Gr 3 *N (%)*
Subjects	366 (73.79)	102 (20.56)	28 (5.64)
GDM [N (%)]	16 (4.3%)	18 (17.6%)	4 (14.2%)
Hypertension [N (%)]	11 (3%)	14 (13.7%)	15 (53.5%)[b]
Preeclampsia [N (%)]	5 (1.3%)	3 (2.9%)	3 (10.7%)
Induction of labour [N (%)]	224 (61.2%)	43 (42.1%)[a]	11 (39.2%)
Caesarian delivery [N (%)]	174 (47.5%)	57 (55.8%)	19 (67.8%)
Meconium stained fluid [N (%)]	26 (7.1%)	8 (7.8%)	1 (3.5%)
Macrosomia (>4000g)	42 (11.4%)	20 (19.6%)	7 (25%)
Low birth weight (<2500g.)	45 (12.29%)	16 (15.68%)	5 (17.85%)
Birth trauma [N (%)]	12 (3.2%)	4 (3.9%)	2 (7.14%)
Shoulder dystocia [N (%)]	4 (1.09%)	3 (2.9%)	3 (10.7%)
NICU admission [N (%)]	14 (3.8%)	7 (6.8%)	4 (14.2%)

Results were expressed as number (percent). Proportion test was performed to calculate between two groups.
[a]Significantly different compared to Mat BMI Gr 1; [b]Significantly different compared to Mat BMI gr 1 and 2;
**Mat BMI Br 1, maternal BMI 20-24.9 Kg/m^2; Mat BMI Gr 2, maternal BMI 25-29.9 Kg/m^2; Mat BMI Gr 3, maternal BMI >30 Kg/m^2; GDM, gestational diabetes mellitus; NICU, neonatal intensive care unit.*

Frequency of neonate related variables maconium stained fluid, macrosomia, birth trauma, shoulder dystocia and NICU admission did not show statistical difference in the three groups (Table 2).

Table 3: Pregnancy and neonatal outcomes according to gestational weight gain

	Gest WtGain Gr A *N (%)*	Gest WtGain Gr B *N (%)*
Subjects	***315 (63.50)***	***181 (36.49)***
Gestational DM [N (%)]	20 (6.34%)	18 (9.94%)
Hypertension [N (%)]	21 (6.6%)	19 (10.4%)
Preeclampsia [N (%)]	5 (1.53%)	6 (3.31%)
Meconium stained fluid [N (%)]	19 (6.03%)	16 (8.8%)
Macrosomia (>4000g)	28 (8.8%)	41 (22.6%)
Low birth weight (<2500g.)	38 (12.06%)	28 (15.46%)
Shoulder dystocia [N (%)]	4 (1.2%)	6 (3.3%)
Birth trauma [N (%)]	8 (2.04%)	10 (5.52%)
NICU admission [N (%)]	11 (3.49%)	14 (7.7%)

Results were expressed as number (percent). Proportion test was performed to calculate between two groups.
Gest WtGain Gr 1, maternal weight gain during pregnancy 8-15.9 Kg; Gest WtGain Gr B, maternal weight gain during pregnancy >16 Kg.

Out of total 496 pregnant women 181 (36.49%) had weight beyond the cut-off (>16 Kg) of value ($p<0.001$). Frequency of obstetrics and neonate related variables in the gestational weight gain group A and B was almost similar except the macrosomic babies. In the gestational weight gain group B there was 22.6% macrosomic baby against 8.8% in the gestational weight gain group A ($p=0.11$) (Table 3).

Discussion

Obesity is increasing especially among females. Maternal obesity has been correlated with an increased risk of chronic hypertension and diabetes prior to pregnancy and adverse pregnancy outcomes including Pre-eclampsia, gestational diabetes, fetal macrosomia and caesarian deliveries[11,12]. The perinatal problems that have been identified with maternal obesity and pregnancy include an increased risk of birth asphyxia, birth trauma and neonatal hypoglycaemia[13].

Definitions of overweight, obesity and underweight vary in different reports. But recently BMI is widely accepted as a better measure of over or underweight[14]. In our study we searched the effects of prepregnancy body mass index and gestational weight gain on perinatal outcomes. Some results were similar but few differences were observed. Birthweight was significantly affected by excessive gestational weight gain. Cedergen[15] studied the effects of low and high gestational weight gain on obstetrics and neonatal outcomes in different maternal BMI classes. They concluded that the effects of high or low gestational weight gain differ depending on maternal BMI. In their data, increasing BMI showed decreasing gestational weight gain. Therefore we should consider both prepregnancy BMI and gestational weight gain during follow up in pregnancy. High prepregnancy BMI and high gestational weight gain may have more adverse obstetrics outcomes.

The current guidelines provide gestational weight gain ranges based on prepregnancy BMI and were recommended by the Institute of Medicine (IOM) to limit the adverse pregnancy outcomes. However, the current IOM guidelines for obese women (Prepregnancy BMI greater than or equal to 30 Kg/m^2) do not provide an upper limit on gestational weight gain, only advising women to gain at least 15 Ibs (6.75kg) and don't distinguished between the different levels of obesity as defined by the National Institute of Health (NIH)[16].

The effects of maternal underweight on obstetrics performance are less clear. Some researchers[17,18] have found increased incidences of preterm delivery, low birth weight, and increased perinatal loss in these women, others[19] have reported a protective effects of maternal underweight on certain pregnancy complications and interventions. In our retrospective analysis, these were not sufficient number of underweight women or women low gestational weight gain. Therefore the subjects were divided into 02 groups based on gestational weight gain and 3 groups based on BMI.

Conclusions

This study has shown that high prepregnancy BMI had adverse obstetric outcomes such as increased risk of gestational diabetes, gestational hypertension, preeclampsia, macrosomia and cesarean delivery and increased frequency to admission in neonatal internsive care. It appears that higher prepregnancy BMI had more adverse effects on obstetrics outcomes in our study. We should consider both prepregnancy BMI and gestational weight gain during follow up in pregnancy and before pregnancy. Women with high BMI should be advised to lose weight and not to gain much weight during pregnancy.

Further prospective studies with large populations are needed for ideal weight gain in pregnancy due to different prepregnancy BMI classes.

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