



Prospective Observational Study

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Maternal Weight Gain and its Relation with Pregnancy Outcome

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Abstract:

Background: Both pre conceptional body mass index (BMI) and the maternal weight gain in pregnancy are thought to affect the perinatal outcome. We have planned this study to observe the effect of weight gain on perinatal outcome in primigravidas who had normal BMI during the first trimester.

Material and Methods: It was prospective observational study; the data was calculated from 01/01/2021 till 30/10/2021. It was done in Dr. Sulaiman Al Habib Hospital Sweidi, which is a 350 bedded tertiary care Hospital.

All the primigravidas, having singleton pregnancy and BMI between 18.5-24.9 kg/m² at the time of the booking were enrolled to the trial. They were followed throughout the course of pregnancy and delivery. Primary outcomes were, the rate of caesarean section, the risk of operative vaginal delivery and the incidence of preeclampsia and gestational diabetes. Secondary outcomes were, neonatal birth weight, Apgar score and NICU admission.

Results: The mean age of the patients in the study population was 26 years, range was of 19-40 years and with standard deviation of 4.108. The difference of the rate of LSCS (lower segment caesarean section) and operative vaginal delivery among the two groups was not found to be statistically significant. The rate of gestational diabetes was 15.1% (n=42) in group A while it was 49.05% (n=26) in group B and similarly the rate of pre-eclampsia was also noticed to be significantly higher in group B, 37.7% (n=20) compared to 21.6% (n=60) in group A. The P-value showed that the difference among the two groups is statistically significant. The 33.9% (n=18) of the neonates born to the mothers in group B gained more than 3.5 kg of the weight, while in group A it was 7.2% (n=20). The difference of the birth weight was found to be statistically significant. The difference of neonatal outcome in terms of the neonatal intensive care unit (NICU) admission and the Apgar score was not statistically significant among the two groups.

Conclusion: We hereby conclude that the net weight gain in pregnancy doesn't affect the rate of LSCS and the rate of operative vaginal delivery. However, if the net gain in pregnancy is more than 16 kg then significantly increased risk of gestational diabetes and the pre-eclampsia was observed. Neonatal outcome in terms of the NICU admission and the Apgar score was not affected, hence increased birth weight was found to be associated with the maternal weight gain of more than 16 kg.

Key Words: BMI, Caesarean section, Maternal weight, Gestational weight gain

Introduction

Both pre conceptional body mass index (BMI) and the maternal weight gain in pregnancy are thought to affect the perinatal outcome. For example, the obese women (having BMI of 30 and above) are supposed to gain weight less in pregnancy as compared to the women with the normal pre pregnancy weight. Similarly, the weight gain in pregnancy is higher in the women who were underweight at the time of conception. We have planned this study to observe the effect of increase weight gain in patients who have normal pre pregnancy BMI. The patients having the normal body mass index (BMI) i.e., between 18.5-24.9kg/m², (1) are supposed to gain weight between 11.5-16 kg during pregnancy. (2)

The weight gain in pregnancy is considered as a modifiable risk factor for number of the maternal and neonatal complications, the meta-analyses of the randomized controlled trials report that diet or exercise interventions during pregnancy can help reduce the excessive weight gain, however it has been noticed that it has limited effectiveness in overweight and obese women. (3) The purpose of the study was to observe the effect of maternal weight gain on pregnancy outcome. Primary outcomes were, the rate of caesarean section, the risk of operative vaginal delivery and the incidence of preeclampsia and gestational diabetes. Secondary outcomes were, neonatal birth weight, Apgar score and NICU admission. Our hypothesis was that if maternal weight gain in pregnancy is more than 16 kg then it is associated with the increased risk of caesarean section, macrosomia, preeclampsia and gestational diabetes. The patients who increased weight gain during pregnancy can be counselled pre hand about all the risks and for delivery in a tertiary care center.

Materials and Methods

It was prospective observational study; the data was calculated from 01/01/2021 till 30/10/2021. It was done in Dr. Sulaiman Al Habib Hospital Sweidi, which is a 350 bedded tertiary care Hospital. All the primigravidas, having singleton, term pregnancy with cephalic presentation and BMI between 18.5-24.9kg/m² at the time of the booking, were enrolled to the trial. The total number of the patients initially enrolled were 412. Out of which 3.3% (n=14), came out to be known diabetic, 1.9 % (n=8) and 2.4% (n=10) were found to be known hypertensive and known case of hypothyroidism respectively and were excluded from the trial. Out of the remaining 380 patients, 3% (n=12) had miscarriage in the first three months of the pregnancy, 4.12% (n=17) delivered prematurely and 5.09% (n=21) patients were booked for the elective LSCS (due to breech, transverse lie, etc.) so were excluded from the trial. The total number of the patients who were included in the trial were 330.

For calculating the weight gain in pregnancy, the starting weight was the weight documented during the first prenatal visit, if the patient is booked with in first 3 months of pregnancy, in case of late booking we used self-reported pre conceptional weight. (3) The end point of the weight was taken at the labour

ward once the patient is admitted for the delivery. The difference calculated was the weight gain during pregnancy. The data was collected prospectively with the help of the predesigned proforma. Once the data collection was completed, the data was entered in the SPSS program version 26 for the analysis. For the purpose of the study, we have divided all the primigravidas in two groups, group A included all the patients with weight gain of 16 kg or less in the pregnancy, the primigravidas who gained more than 16 kg weight in the pregnancy were encompassed in group B. The primary and the secondary outcomes were compared. The qualitative data was analyzed by using the CHISQUARE TEST while STUDENT T test was applied to the quantitative data. The P- value of 0.05 was considered as significant.

Results

The total number of the patients reaching term and included in the trial were 330.

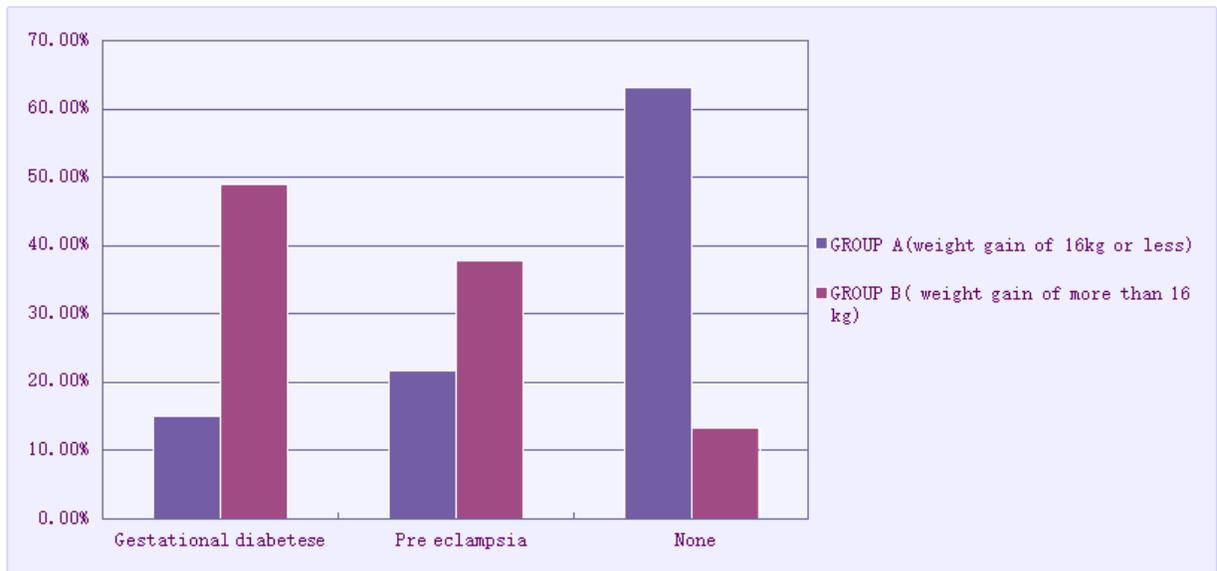
The mean age of the patients in the study population was 26 years, range was of 19-40 years and with standard deviation of 4.108. The rate of LSCS when compared among the groups, was found to be 29.6% (n=82) and 41.5% (n=22) in groups A and B respectively. While the rate of the operative vaginal delivery was 8.3%(n=23) in group A and 3.7% (n=2) in group B, as shown in the table 1. The P-value was calculated after applying the chi-square test and was found to be 0.165, which showed that the difference is statistically insignificant.

MODE OF DELIVERY	GROUP A (Weight gain of 16kg or less)	GROUP B (Weight gain of more than 16 kg)	TOTAL
SVD	62.09% (n=172)	54.7% (n=29)	60.9% (n=201)
LSCS	29.6% (n=82)	41.5% (n=22)	31.5 % (n=104)
INSTRUMENTAL DELIVERY	8.3% (n=23)	3.7% (n=2)	7.5%(n=25)
TOTAL	100% (n=277)	100% (n=53)	100% (n=330)

Table 1: Comparison of mode of delivery according to the weight gain in pregnancy

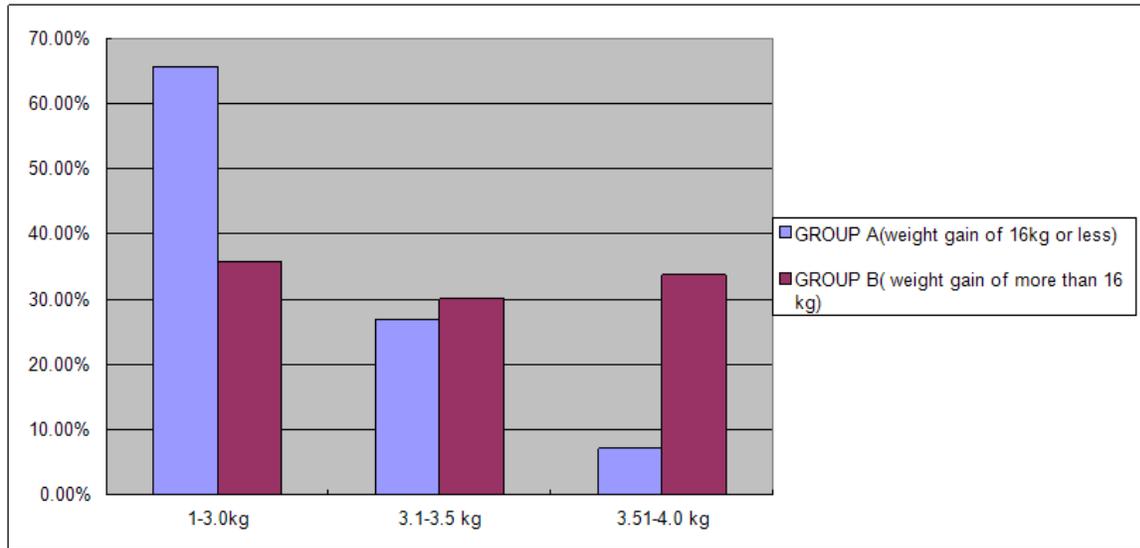
The incidence of the preeclampsia and the gestational diabetes is calculated in all the patients and the comparison among the two groups is shown in the graph:1.

The rate of gestational diabetes was 15.1% (n=42) in group A while it was 49.05(n=26) in group B and similarly the rate of preeclampsia was also noticed to be significantly higher in group B, 37.7% (n=20) compared to 21.6%(n=60) in group A. The P-value calculated after applying the Chi-Square test was 0.000, which showed that the difference among the two groups is statistically significant.



Graph 1: Rate of the maternal complications in two groups

Our secondary outcomes were the birth weight, Apgar score and the NICU admissions. The difference of the birth weight was found to be statistically significant in both the groups as P-Value was 0.00. The P-value was calculated after applying the independent student T-test. The 33.9% (n=18) of the neonates born to the mothers in group B gained more than 3.5 kg of the weight, while in group A it was 7.2%(n=20), as shown in the graph 2.



Graph 2: Effect of maternal weight gain on neonatal weight gain

The rate of neonatal admission in the NICU was not significantly different in both the groups as the P-Value was 0.682 when calculated after applying the Chi-Square test. As shown in the table 2 below.

Admission to NICU	GROUP A (Weight gain of 16kg or less)	GROUP B (Weight gain of more than 16 kg)	TOTAL
Yes	2.9% (n=8)	1.9% (n=1)	2.7% (n=9)
No	97.1% (n=269)	98% (n=52)	97.3% (n=321)
TOTAL	100% (n=277)	100% (n=53)	100% (n=330)

Table 2: Rate of admission to NICU in both the groups

Similarly, the 5-minute Apgar score was also not found statistically different in both the groups as depicted by the P-Value after applying the independent Student T test which was found to be 0.258, as shown in Table 3.

Apgar score	GROUP A (Weight gain of 16kg or less)	GROUP B (Weight gain of more than 16 kg)	TOTAL
6-7	1.08%(n=3)	1.9% (n=1)	1.2%(n=4)
8-10	98.9% (n=274)	98% (n=52)	98.7%(n=326)
TOTAL	100% (n=277)	100% (n=53)	100% (n=330)

Table 3: Effect of maternal weight gain on the Apgar score

Literature Review

Excess weight gain in pregnancy was found to be associated with adverse maternal and perinatal outcomes only in females who had pre pregnancy BMI in the normal range and below, surprisingly it was found that the females who are overweight prior to pregnancy and gained excess weight as well in pregnancy do not have elevated risks of maternal and perinatal morbidity when compared to the overweight females with optimal weight gain in the pregnancy. (4) We have done the study in primiparas who had normal BMI at booking and calculated their weight gain in pregnancy to see the pregnancy outcome.

In the current study we observed that there is no significant increase in the rate of LSCS and operative delivery in patients who gained more than 16 kg in the pregnancy, the results were contradictory to what Mamun and colleagues found, they found increased risk of LSCS with gestational weight gain. (5) In another study done in Canada the risk of LSCS was also found to be raised in nulliparous women who gained more weight in pregnancy. (6) Increased risk of caesarean section is observed in patients with increased weight gain in pregnancy as well. (7,8)

It was observed in the current study that the patients who gained more than 16 kg weight in pregnancy had a significant increase in the neonatal birth weight. The findings are supported by the DeVadar et al, who concluded that the females who have normal pre pregnancy BMI and gained weight of more than 15.9 kg in pregnancy had an almost 2.5 times increased risk of delivering a macrosomic baby. (7,9) Chang also had the same observations but he found that these observed outcomes are potentially modifiable by achieving the normal weight gain in pregnancy. (10) Our results were also supported by

Heud et al who found that the increased weight gain in pregnancy alone, without the changes in the blood pressure and blood sugars often get less attention by the obstetrician and is associated with the increased risk of macrosomic baby than in other woman. (11)

We support the findings of Tela FG and colleagues who found that the weight gain in pregnancy have significant effect on the neonatal birth weight. (12)

Gestational weight gain is also being blamed of having the ante partum complications like preeclampsia. (13,14) Different pregnancy interventions are proposed earlier to limit the gestational weight gain to prevent the hypertensive disorders of the pregnancy, however, it's still unclear whether increased gestational weight gain is associated with the development of the hypertensive disorder in pregnancy. It was found in the current study that the group of the patients who gained more than 16 kg weight have significantly increased risk of gestational diabetes and the preeclampsia. The findings of the Mac Donald and colleagues also supports our results, they found that increased gestational weight gain is associated with the concurrent blood pressure changes in pregnancy. (15) Increased weight gain in the pregnancy, especially early in pregnancy may increase the women's risk of gestational diabetes mellitus (GDM). Gestational weight gain during early pregnancy can be considered as a modifiable risk factor for GDM and should be given more attention. (16) Gestational weight gain and its association with the GDM and preeclampsia has been found by Nohr et al (17) Thorsdottir I et al (18) and Cedergren (19) but they could not suggest any causal interpretation of this relationship. Contrary to the findings of the study under discussion, Gibbson et al suggested that gestational weight gain is a significant risk factor for GDM in patients who were overweight or obese but not in patients who had normal pre pregnancy BMI. (20)

Conclusion

We hereby conclude that the net weight gain in pregnancy doesn't affect the rate of LSCS and the rate of operative vaginal delivery. However, if the net gain in pregnancy is more than 16 kg then statistically significant risk of gestational diabetes and the pre-eclampsia was observed. Neonatal outcome in terms of the NICU admission and the Apgar score was not affected, hence increased birth weight was found to be associated with the maternal weight gain of more than 16 kg. However larger studies with a greater number of patients are required to verify the results further.

Strengths and limitations of the study

The strength of the study is the selection of the study population of the primigravidas with normal BMI which ruled out the parity and the effect of pre pregnancy or early pregnancy BMI on weight gain of the

females in pregnancy which acted as a confounding factor in many studies done earlier. The limitation of the study is that we did not check the cord pH for the neonatal outcome

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