

**THE ROLE OF GESTATIONAL DIABETES MELLITUS AND PREGNANCY WEIGHT GAIN ON RISK OF LARGE FOR GESTATIONAL AGE INFANTS: A RETROSPECTIVE STUDY**

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**Abstract**

**Background**

It is important to identify the most important determinants of excessive fetal growth in our population. In healthy women, excessive gestational weight gain is a risk factor for large for gestational age infants as well as other perinatal and maternal complications [1, 2] The prevalence of LGA infants born to women with Type 2 DM has been reported to be 50% [3, 4] The aim of the study was to evaluate the independent role of gestational weight gain and gestational diabetes on the risk of large for gestational age infants.

**Methods**

A retrospective was conducted on maternal diabetic status and gestational weight gain and maternal and perinatal outcomes on large for gestational age infants delivered in Father Mullers Hospital, a tertiary referral centre from January 2014 to July 2014. Multiple pregnancies and pre term deliveries were excluded. Sample included 102 women with complete records. Association between exposure variables and Large for gestational age was analyzed with Chi square test. Multiple logistic regression models were built to analyze the independent association between potential predictors and large for gestational age.

**Results**

Maternal excessive weight gain (20.58 %) and gestational diabetes (29.41 %) resulted to be independent factors for large for gestational age. The mode of delivery was operational for majority of the cases (50 %). Neonatal outcomes showed need for NICU care for (46 %) and low apgar scores.

**Conclusions**

Our findings indicate that excess of maternal gestational weight gain and gestational diabetes should be considered as independent risk factors for large for gestational age. To adequately evaluate the clinical evolution of pregnancy, all the variables need to be carefully assessed and monitored.

## Introduction

The incidence of obesity and gestational diabetes is rising worldwide. The incidence of morbid obesity in India is around 5 % [5] the incidence of gestational diabetes is also increasing worldwide affecting 5-7% pregnancies.

It is already well known that both obesity and GDM are relative risk factors for adverse maternal and neonatal outcome, being related to an increased occurrence of large for gestational age fetuses and macrosomia (neonates with birth weight more than 4000g) Although macrosomia can be influenced by both genetic and environmental factors, the increased prevalence can be attributed to environmental factors [6] Among these maternal overweight and related metabolic changes such as GDM seem to be crucially important. The prevalence of LGA infants born to women with Type II DM has been reported to be 50% [3, 4]

Many cohort studies have assessed the effect of gestational weight gain on neonatal birth weight. In healthy women, excessive gestational weight gain is a risk factor for large for gestational age infants as well as other perinatal and maternal complications [1, 2]

The gestational weight gain is an expression of fetal-maternal physiologic changes combined with genetic and nutritional factors. The fetal contribution (fetal weight, placenta and amniotic fluid) accounts for 30-40 % of maternal weight gain [7] while maternal factors (plasmatic volume expansion, breast and uterine pregnancy growth, maternal fat deposits available for breast feeding and extracellular fluid volume account for 60-70% [8]

Evidences suggest that maternal diabetes increases the occurrence of large for gestational age (defined as neonatal birth-weight more than 90 percentile) and its contribution may increase the incidence upto 28.5% as demonstrated by DIEP study in 1991[9]

Thus the aim of the present study was to identify the most important risk factors determining large for gestational age infants and to evaluate the independent role of gestational weight gain (GWG) and gestational diabetes in increasing the risk of excessive fetal growth. It is important to identify the most important determinants of excessive fetal growth in our population.

## Methods

A retrospective study was conducted on all large for gestational infants ( defined as neonatal birthweight more than 90 percentile) born in department of OBG, Father muller medical college hospital, a tertiary referral centre from the month of January 2014 to July 2014. The study was conducted after obtaining permission for data access from hospital administration. Patients consented for review of the records. Information regarding maternal age, parity, BMI, weight gain during pregnancy and presence of gestational diabetes were recorded. Gestational diabetes was diagnosed if oral glucose tolerance test done showed 2 or more elevated values. (95, 180,155,140 mg /dl) GDM detected mothers were started with diet control, oral hypoglycemic agents or insulin.

The Body Mass Index was calculated as weight in kg/ (height in meters) Data on height; pre-gestational weight and weight at delivery were collected for each woman. Pre-pregnancy BMI was classified using the World Health Organization criteria as underweight (inferior to 18.5), Normal (18.5 to 24.9), overweight (25.0 to 29.9) and obese (equal or superior to 30). Pregnancy weight gain was classified as defined by Institute of Medicine (IOM) guidelines [10]. According to this statement, recommended pregnancy weight gain was differentiated based on prepregnancy BMI: 12.5-18.0 kg for underweight women,11.5-16.0 kg for normal-weight, 7.0-11.5 kg for overweight and 4.5.0-9.0 kg for obese.

“The role of gestational diabetes mellitus and pregnancy weight gain on risk of large for gestational age infants: A retrospective study”

Only cases with a complete collection of the variables described above were included in the statistical analysis. Multiple pregnancies were excluded as women were more likely to gain excess weight and neonatal

birthweight were more likely to be lower than in single pregnancies. Preterm deliveries and preeclampsia were also excluded.

Table 1 showing patient characteristics

| SAMPLE DESCRIPTION         | Number | Percentage |
|----------------------------|--------|------------|
| <b>AGE</b>                 |        |            |
| < 20                       | 3      | 2.83       |
| 21-35                      | 94     | 92.2       |
| >35                        | 5      | 4.9        |
| <b>PARITY</b>              |        |            |
| PRIMI                      | 35     | 34.3       |
| MULTI                      | 67     | 65.7       |
| <b>GEST AGE</b>            |        |            |
| 37-40 WKS                  | 69     | 67.6       |
| > 40 WKS                   | 33     | 32.4       |
| <b>WEIGHT GAIN (IOM)</b>   |        |            |
| NORMAL WEIGHT GAIN         | 72     | 70.6       |
| EXCESSIVE WEIGHT GAIN      | 30     | 29.4       |
| <b>INFANT BIRTH WEIGHT</b> |        |            |
| < 4000 g                   | 66     | 64.7       |
| >4000 g                    | 36     | 35.3       |
| <b>GDM</b>                 | 21     | 20.6       |
| <b>NON GDM</b>             | 81     | 79.4       |
| <b>GDM+ GWG</b>            | 5      |            |

The correlation between variables was analyzed by using chi square test.

**Results:**

Table 2 showing risk of LGA

|         | NUMBER | % of LGA     |
|---------|--------|--------------|
| GDM     | 21     | 20.58        |
| EL. GWG | 30     | 29.41        |
|         |        | P : 0.208 NS |

GDM and GWG are seen to be equally important contributing factors for risk of LGA.

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Table 3 showing risk for LSCS

| LSCS   | NUMBER<br>46 | %                      |
|--------|--------------|------------------------|
| GDM    | 9            | 19.56                  |
| EL.GWG | 15           | 32.6<br>P: 0.221<br>NS |

GDM and GWG are seen to be equally important contributing factors for need for LSCS.

Table 4 showing nicu admissions

| NICU           | NUMBER<br>15 | %    |
|----------------|--------------|------|
| GDM            | 2            | 13.3 |
| EL.GWG         | 5            | 33.3 |
| GDM+<br>EL.GWG | 1            | 6.66 |

Table 7 showing low APGAR

| LO W<br>APGAR <5 | NUMBER<br>5 | %    |
|------------------|-------------|------|
| GDM              | 1           | 20   |
| EL.GWG           | 3           | 60   |
| GDM +<br>EL.GWG  | 1           | 6.66 |

### Discussion

Our findings suggest that excessive weight gain and diabetes are independent valuable predictors of large for gestational age infants. Among women affected by gestational or pre gestational diabetes, excessive weight gain was an independent risk factor for large for gestational age infants. Among women with normal or elevated BMI, gestational weight gain was

the most crucial factor for the risk of developing large for gestational age infants. In a recent study by Di Benedetto A et al, the incidence of macrosomia among overweight women with a normal gestational weight gain was around 4.8%, which is similar to that in normal weight women with normal gestational weight gain, while incidence increased to 13% in

“The role of gestational diabetes mellitus and pregnancy weight gain on risk of large for gestational age infants: A retrospective study”

overweight women with excessive weight gain [11]

Excessive gestational weight gain has been extensively proven to be an important risk factor for the development of macrosomia independent of pre gestational BMI [10, 12]. This finding is confirmed by our results that support the crucial role of pregnancy weight gain, according to IOM cutoffs, in determining fetal weight in general population, regardless of nutritional and diabetic status. In our population of pregnant women gestational weight gain below the recommended range was found to be protective with respect to macrosomia. The observation confirms previously published results.

Excessive weight gain is considered as an independent risk factor for macrosomia in both obese and non obese women. These findings are confirmed by another study [13] a very careful reassessment of ideal gestational weight gain in obese women with gestational diabetes should be carried out. In these patients, some patients with weight gain below IOM recommendations had less incidence of large for gestational age infants.

#### Constraints

- A proper analysis on glycemic control, gestational age at the onset of diabetes, mode of management etc could not be included in this study.
- Sample size studied was also limited, considering the number of variables involved.

#### Conclusions

Our findings indicate that excessive gestational weight gain and diabetes should be considered independent risk factors for newborn macrosomia. Therefore, to adequately evaluate the clinical evolution of pregnancy, all variables need to be carefully assessed and monitored.

- A careful reassessment of ideal gestational weight gain in women with gestational diabetes is relevant to stress its importance in our society.

- These two factors need to be carefully assessed and monitored in all mothers as proactive diagnosis.
- Gestational weight gain is a modifiable risk factor, independent of diabetes treatment that can decrease risk of large for gestational age infants.

Main focus of care should be on both glycemic control and maternal weight gain in diabetic mothers rather than on only glycemic control.

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