

# Pre pregnant weight a risk factor for Gestational Diabetes Mellitus

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## Abstract

**Introduction:** Gestational Diabetes Mellitus is defined as glucose intolerance that is first recognized during pregnancy. This is associated with increased risk for adverse perinatal outcomes as well as long term complications of obesity and type 2 diabetes mellitus in mother and their children. The aim of this study was to identify the risk factors for Gestational diabetes mellitus.

## Methodology:

Study design: Prospective nested case control study

Setting: Antenatal Out-Patient Clinic, Antenatal and postnatal Wards, labour room of a Tertiary care hospital

Sample size:With an estimated Odds ratio of 2 for risk factors, we need 100 GDM and 200 controls and with an estimate of 10% as GDM, we recruited a sample of 1000 Primigravidae patients attending the Out Patient Clinic at SAT Hospital, in the first trimester followed up and grouped into cases and controls depending on the GTT results.

**Results:** One thousand Primigravids were recruited and followed up. 960 patients were followed up till delivery and data collected; 240 developed gestational diabetes mellitus (cases ) and the remaining 720 were taken as controls. The mean age of the study population 23.39yrs and that of the cases were 24.68yrs and that of the controls were 22.96yrs with significant difference.

The place of residence urban or rural, the educational status or the socioeconomic status did not show any significant difference for cases and controls in this study. The mean height of the cases was 155.68 cm and that of the controls were 155.40 cm and this did no show a significant difference between the cases and the controls.

There was significant difference with pre -pregnant weight of cases and controls. The mean Pre-pregnant weight of the cases was 56.69 kg and that of the controls were 49.2 kg with a mean difference of 7.48. The mean weight gain in pregnancy of the study population was 13.81 and ranged from 5kg to 29kg The mean Body Mass Index of the cases was 23.330and that of the controls were 20.355with a mean difference of 2.98 .

**Conclusion:** Prevalence of obesity and GDM is increasing worldwide. This Prospective nested case control study conducted at a tertiary care hospital to identify the risk factors for Gestational Diabetes Mellitus has identified pre- pregnant Body Mass index a strong risk factor which can be modified by reducing the pre-pregnant weight. This brings out the importance of health education of young women regarding healthy diet and exercise to prevent Gestational Diabetes mellitus and its adverse pregnancy outcomes, which is hazardous for the mother and the new born.

**Index Terms-** Body mass Index, Gestational Diabetes Mellitus (GDM), Glucose tolerance Test, (GTT), Pre pregnant weight.

## INTRODUCTION

Gestational diabetes Mellitus complicates about 10 – 14% of pregnancies and the incidence is on the increase world wide. GDM is defined as glucose intolerance that is first recognized during pregnancy<sup>(1,2)</sup>.

This is associated with increased risk for adverse perinatal outcomes as well as long term complications of obesity and type 2 diabetes mellitus in mother and their children. The incidence of obesity has doubled according to global estimates in the last four decades, and over 30% of women are obese <sup>(3)</sup>. Adipose tissue is an active metabolic organ and overweight and obesity before pregnancy increase the risk of main pregnancy complications such as hypertension and diabetes mellitus in pregnancy<sup>4</sup>.Maternal

obesity is reported as the strongest risk factor in most studies, but in several studies, overweight was more likely than obesity to increase the risk of these complications<sup>5</sup>.

Pregnancy is a diabetogenic state. Insulin resistance develops during pregnancy and there is considerable increase in the insulin secretion to compensate for this. In Gestational Diabetes the insulin resistance worsens and with reduced pancreatic cell reserve the impaired glucose tolerance is triggered. Excessive adiposity in obese women may promote a pro-inflammatory state and insulin resistance, which contribute to GDM development<sup>6</sup>.

Understanding the risk factors of gestational Diabetes Mellitus can help the clinicians identify those at risk and to make early diagnosis and intervention to reduce maternal and foetal complications.

Aim of this study was to identify the risk factors for Gestational diabetes mellitus among primigravids attending a tertiary care hospital for antenatal care.

## METHODOLOGY

### STUDY DESIGN

Prospective nested case control study

### SETTING

Antenatal Out-Patient Clinic, Antenatal and postnatal Wards, labour room, Department of Obstetrics & Gynecology, Sri Avittom Thirunal Hospital, Medical College Thiruvananthapuram.

### SAMPLE SIZE

With an estimated Odds ratio of 2 for risk factors, we need 100 GDM and 200 controls.

With an estimate of 10% as GDM, we need a sample of 1000 Primigravidae patients attending the Out Patient Clinic at SAT Hospital, in the first trimester.

Primigravida attending the antenatal OPD in first trimester is recruited into the study, 75-gram GTT is done before 12 weeks, at 24 – 26 weeks and at 32 – 34 weeks

### DEFINITION OF CASES AND CONTROLS:

Cases: GDM as defined by WHO criteria; irrespective of gestational age a 75 gm Glucose challenge test in fasting state. Diagnosis of GDM will be made if the 2 hour plasma glucose is  $\geq$  140 mg/dl in the study.

Controls: Pregnancies with euglycemia.

Inclusion criteria: Primigravida

Singleton gestation

Exclusion criteria: Past history of Diabetes Mellitus

Multifoetal gestation

Antenatal women attending the outpatient department of the hospital were recruited into the study after explaining the details of the study and taking an informed written consent. Detailed history taking and physical examination is done and data collected on a structured proforma. A 75 g Glucose tolerance Test (GTT) was done on the first visit and the subject is kept under follow up. Repeat GTT was done at 24-26 weeks of gestation and at 32- 34 weeks. Those who were found to have abnormal value of more than 140mg/dl were labelled as cases and others were taken as controls.

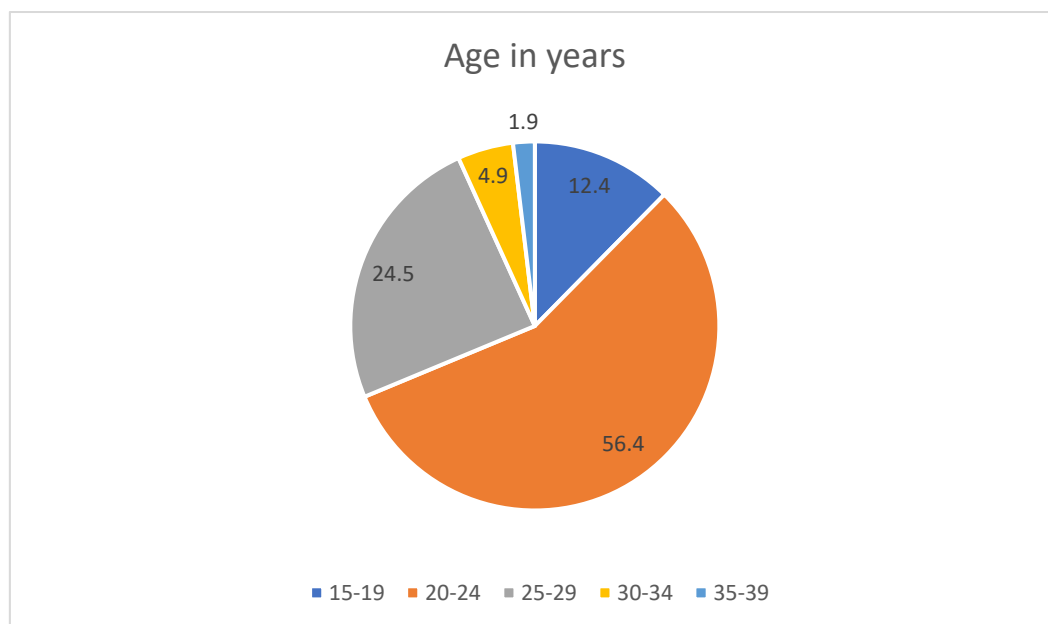
## RESULTS

“Pre pregnant weight a risk factor for Gestational Diabetes Mellitus” was a nested case control study done at SAT hospital, Government Medical College, Trivandrum a tertiary care hospital.

One thousand Primigravids attending antenatal out patient department was recruited and followed up. 960 patients were followed up and data collected; 12 were excluded (multiple pregnancy, abortions, pregnancy of unknown location) and 28 (2.8%) were lost to follow up, Out of the 960 antenatal women who were followed up 240 developed gestational diabetes mellitus (cases) and the remaining 720 were taken as controls.

AGE

The mean age of the study population 23.39yrs and that of the cases were 24.68yrs and that of the controls were 22.96yrs



The majority of the study population 56.4% belonged to the age group of 20 – 24 yrs., 24.5% belonged to 25-29 years; 12.4% belonged to less than 20 years of age; 4.9% in age 30-34 yrs and 1.9% in the age group of 35-39 years.

PLACE OF RESIDENCE

Residence			
	Frequency	Percent	Cumulative Percent
Rural	889	92.6	92.6
Urban	71	7.4	100.0
Total	960	100.0	

The study was done in a tertiary care government hospital which takes care of mainly rural population. 92.6% of the study population were from rural areas and 7.4% resided in Urban areas.

EDUCATION STATUS

Education status	Frequency	Valid Percent
Middle school	9	.9
High school	166	17.3
Intermediate or Diploma	403	42.0
Graduate or Postgraduate	358	37.3
Professional	24	2.5
Total	960	100.0

Majority of the study population. 42% were Intermediate or Diploma holders, 37.3% of the study population were Graduate or Postgraduate; 17.3% High school, 2.5% Professional and 0.9% had middle school education.

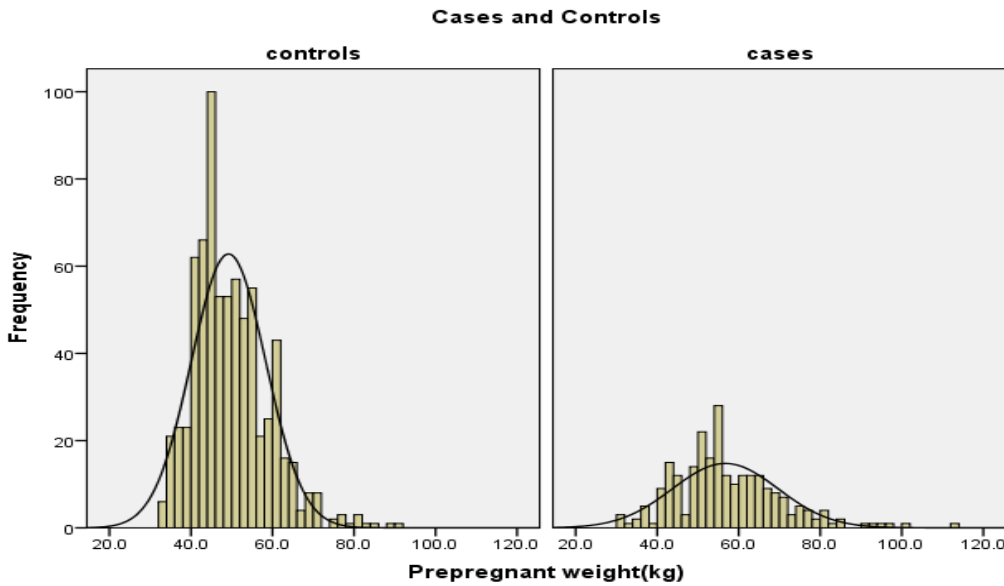
**SOCIOECONOMIC STATUS**

Modified Kuppuswamy’s scale was used to assess the socioeconomic status and majority of the study population 80.5% belonged to upper lower class.

**HEIGHT**

The mean height of the cases was 155.68 cm and that of the controls were 155.40 cm and this did not show a significant difference between the cases and the controls.

**PRE-PREGNANT WEIGHT**



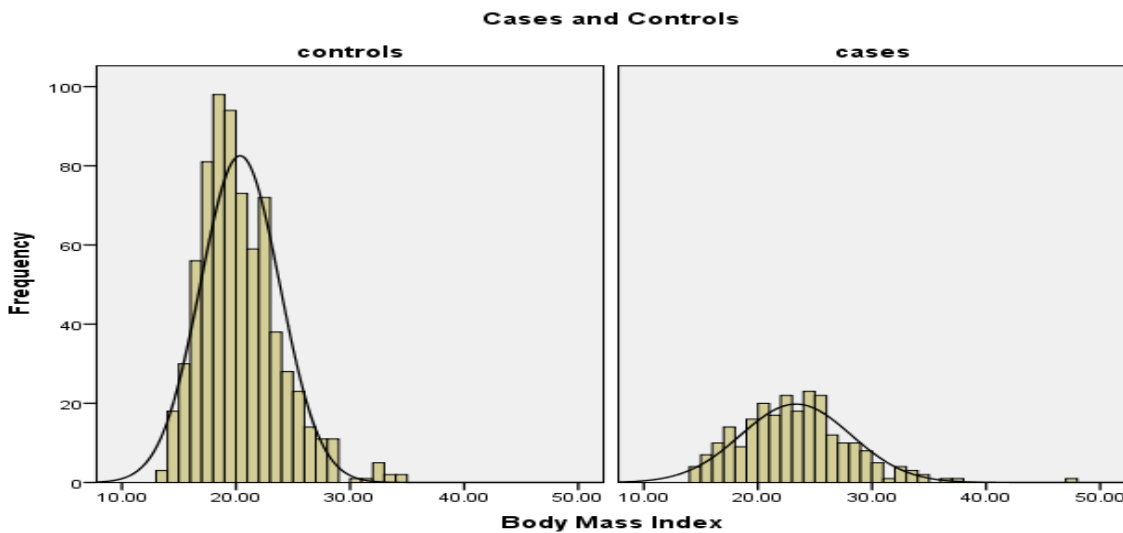
Pre-pregnant weight (kg)	N	Mean	Std. Deviation	Std. Error Mean	Mean difference	95% Confidence Interval of the Difference		t	Significance
						Lower	Upper		
cases	240	56.688	12.9679	0.8371	7.48	5.99	8.98	9.817	0.000
controls	720	49.200	9.1449	0.3408					

Statistical analysis showed significant difference with pre-pregnant weight of cases and controls. The mean Pre-pregnant weight of the cases was 56.69 kg and that of the controls were 49.2 kg with a mean difference of 7.48 (95% confidence interval 5.99 – 8.98) t 9.817; p< 0.001

**BODY MASS INDEX(PRE-PREGNANT)**

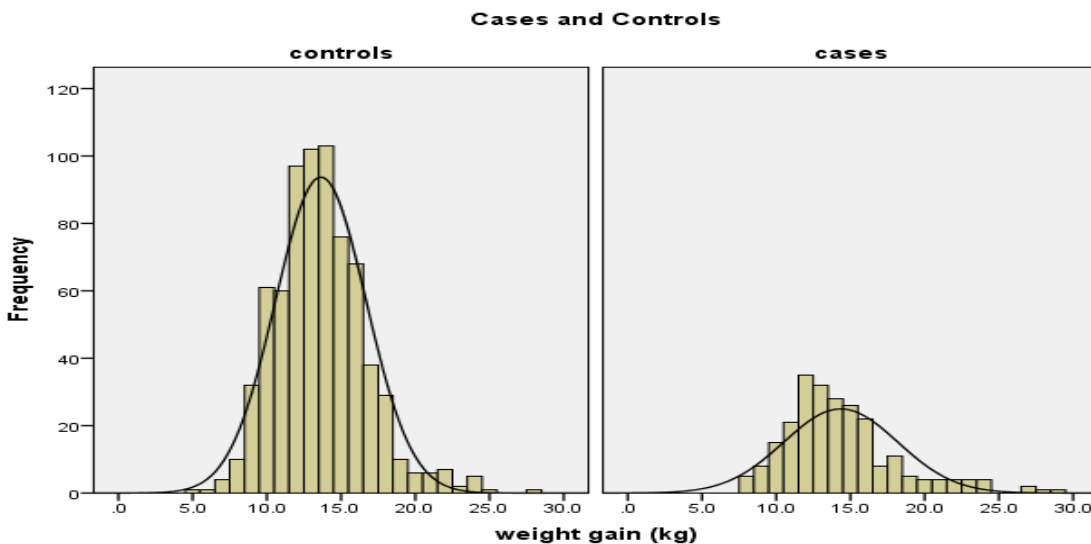
N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
960	33.84	13.38	47.23	21.0994	.13132	4.06893	16.556

The mean pre pregnant Body Mass Index of the study population was 21.099; of the cases was 23.330 and that of the controls were 20.355



The mean Body Mass Index of the cases was 23.330 and that of the controls were 20.355 with a mean difference of 2.98 (95% confidence interval 2.41 – 3.54)  $t$  10.33;  $p < 0.001$

### WEIGHT GAIN IN PREGNANCY



The mean weight gain in pregnancy of the study population was 13.81 and ranged from 5kg to 29kg; the mean of the cases was 14.35 and that of the controls were 13.63 with a mean difference of 0.713 (95% confidence interval 0.23– 1.19)  $t$  2.93;  $p$  0.003

### DISCUSSION

This study was conducted at a tertiary care hospital to identify the risk factors for Gestational Diabetes Mellitus. One thousand Primigravids attending antenatal out patient department was recruited and followed up. 28 (2.8%) women were lost to follow up 12 were excluded as they did not fit the inclusion criteria, Out of the 960 antenatal women who were followed up 240 developed gestational diabetes mellitus (cases ) and the remaining 720 were taken as controls.

The majority of the study population 56.4% belonged to the age group of 20 – 24 yrs and the mean age of the study population 23.39yrs; that of the cases were 24.68yrs and that of the controls were 22.96yrs. The mean difference in age among cases and controls were significant with  $t$  test 6.279;  $p$  value  $< .0001$ . age more than 25yrs is identified as a risk factor in many studies published (7,8)

92.6% of the study population were from rural areas and 7.4% resided in Urban areas there was no significant difference among cases and controls as reported by other study by bhavadharani et al from Tamilnadu (9) Majority of the study population. 42% were Intermediate or Diploma holders, 37.3% of the study population were Graduate or Postgraduate and majority of the study population 80.5% belonged to upper lower class. Studies have reported that women with higher educational level was inversely associated with

risk of gestational diabetes mellitus however no significant association between household income and gestational diabetes was observed<sup>(10)</sup>

The mean height of the cases was 155.68 cm and that of the controls were 155.40 cm and this did not show a significant difference between the cases and the controls. Statistical analysis showed significant difference with pre-pregnant weight of cases and controls. The mean Pre-pregnant weight of the cases was 56.69 kg and that of the controls were 9.2 kg with a mean difference of 7.48 (95% confidence interval 5.99 – 8.98)  $t$  9.817;  $p < 0.001$ . The mean Body Mass Index of the cases was 23.330 and that of the controls were 20.355 with a mean difference of 2.98 (95% confidence interval 2.41 – 3.54)  $t$  10.33;  $p < 0.001$ . An increasing prevalence of GDM among groups with increasing pre-pregnancy BMIs<sup>(11)</sup> Many studies and meta-analyses have noted a relationship between BMI and GDM<sup>(12)</sup> The risk factors identified for gestational diabetes mellitus are important especially the modifiable risk factors. BMI in which the pre-pregnant weight of the women and weight gain during pregnancy are modifiable risk factors which if taken care of can prevent gestational diabetes mellitus and its early and late complications to a large extent.

LIMITATION of the study was that it was done in a Tertiary care hospital where high risk population are dealt with hence there is limitation in generalizing the findings of this study.

### CONCLUSION

The importance of GDM is that it causes adverse pregnancy outcomes, which is hazardous for the mother and the newborn. Prevalence of obesity is increasing worldwide. This Prospective nested case control study conducted at a tertiary care hospital to identify the risk factors for Gestational Diabetes Mellitus has identified Body Mass index at pre-pregnant state as a strong risk factor which can be modified by reducing the pre-pregnant weight.

This brings out the importance of health education of young women regarding healthy diet and exercise to prevent Gestational Diabetes mellitus and its maternal and foetal complications

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