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# Risk Factors Associated with Gestational Diabetes Mellitus Among Antenatal Mothers-Case Control Study.

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**ABSTRACT**

Gestational diabetes mellitus is one among the complications associated with pregnancy. Knowing the underlying cause of GDM is important for the effective diagnosis and prevention of adverse maternal and fetal outcomes. This study was conducted to identify the risk factors associated with GDM. The study enrolled 100 antenatal mothers at a tertiary care hospital, Sivagangai, Tamilnadu. 50 pregnant women found negative for Gestational diabetes mellitus in all the tree trimesters were taken in control group. 50 women with impaired glucose tolerance test value were included in the case group. Maternal age (χ2-11.11, p-0.001), parity (χ2-13.75, p-0.005) and previous history of Gestational diabetes mellitus (χ2-13.276 p-=0.005) were found to have significant association with developing GDM.

**Keywords:** Gestational diabetes mellitus, Risk factors, Pregnancy complications

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## INTRODUCTION

Diabetes prevalence has been rising more rapidly in middle and low income countries [1]. It has been estimated that about 180 million people in the world suffer from diabetes today and more than two-thirds of them live in developing countries [2]. The prevalence of diabetes is increasing in India with projected rates of 79.4 million in 2030 from 31.7million in 2000. Diabetes mellitus complicates 1%-20% of all pregnancies worldwide which include pre gestational diabetes mellitus and gestational diabetes mellitus [3]. Gestational diabetes mellitus is a degree of glucose intolerance with onset or first recognition during pregnancy [4]. A recent meta-analysis shows that women with Gestational Diabetes Mellitus have an increased risk of developing Type2 Diabetes Mellitus (RR 7.43, 95% CI: 4.79-11.51) [5]. In a random survey performed in various cities in India in 2002-2003, an overall gestational diabetes mellitus prevalence of 16.55 per cent was observed [6]. In another study done in Tamil Nadu, Gestational diabetes mellitus was detected in 17.8 per cent women in urban, 13.8 per cent women in semi-urban and 9.9 per cent women in rural areas [7]. Indian women have a 3-fold increased lifetime risk of developing Type2 Diabetes Mellitus compared to pregnant women without gestational diabetes mellitus 16 years after index pregnancy [8]. Children exposed to maternal diabetes in-utero, are known to have higher risk of obesity and diabetes compared to their unexposed siblings, suggesting non-genetic factors for the increased risk amongst exposed offspring [9]. Persons diagnosed with impaired glucose tolerance can be prevented from developing Type2 Diabetes Mellitus by primary prevention strategies like lifestyle modifications, diet modifications with or without any pharmacological interventions. Such interventions can be applied on women with history of gestational diabetes mellitus and their children since they are at high risk of developing diabetes in future. Hence, this study was aimed to identify the risk factors associated with gestational diabetes mellitus so that early intervention could be provided, which in turn would reduce the risk of developing Gestational Diabetes Mellitus.

### Null hypothesis (H0)

There is no significant difference between the risk factors among the pregnant women with gestational diabetes mellitus and those without gestational diabetes mellitus.

### Objectives

- To identify the risk factors associated with Gestational Diabetes Mellitus.
- To find the correlation of Gestational Diabetes Mellitus with various risk factors.

## METHODOLOGY

### Inclusion criteria

**Cases:** Pregnant women who have been diagnosed with gestational diabetes mellitus any time during the gestational period and have consented for the study.

**Controls:** Pregnant women in their third trimester of pregnancy who have not developed gestational diabetes mellitus and have consented for the study.

### Exclusion criteria

Pregnant women with pre-existing diabetes mellitus, major chronic diseases like carcinoma, tuberculosis, congestive cardiac failure, renal failure, and liver failure will be excluded from this study.

### Type of study

Case-control Analytical Study.

### Study population

All pregnant women attending obstetric outpatient department.

**Study Area**

Obstetric outpatient department in Government tertiary care hospital.

**Study Period**

2 months between May 2017 and September 2017.

**Sample Size**

Sample size for unmatched case control study will be determined using the formula described in Kelsey et. al., [10].

$$n1 = \frac{r+1\ p^*(1-p^*)\ (z\beta+z\alpha/2)\ 2}{r\ (p1-p2)2}$$

$$n2 = r \times n1$$

Where,
n1= Number of cases
n2= Number of controls
r = Ratio of controls to cases. (Taken as 1)
P*= Average proportion exposed = proportion of exposed cases +proportion of controls exposed / 2
p1-p2= Effect size or different in proportion expected based on previous studies. P1 is proportion in cases and p2 is proportion in control.
Zβ= Standard normal deviate for power (power kept as 90%)
Zα/2= Standard normal deviate for level of significance (95% confidence interval =1.96).

Priyanka Kalra et al.,11 in the study conducted at Rajasthan in 2013 identified the proportion of cases and controls with family history of diabetes mellitus to be 33.33 and 5.35 respectively.

Using these proportions in the above formula, the sample size was calculated to be 42 for each group which was rounded to 50 in each group.

According to National Health Mission the ideal time to screen for gestational diabetes mellitus would be 12-16 weeks or at the first visit to the antenatal clinic. If she was found normal in the first visit, the next screening was done between 24 and 28 weeks of gestation and later at 32-34 weeks. Thus, pregnant women found negative in the third screening test and consented for the study were taken in control group.

After enrolment of eligible subjects, a pre tested, semi structured questionnaire will be used to obtain data on socio economic status (According to Modified B.G Prasad classification), maternal age at conception, family history of diabetes mellitus (among first degree relatives), previous medical history, obstetric data like parity, previous history of gestational diabetes mellitus, still births, abortions were attained.

The raw data was entered in to MS- excel sheet and was analysed using statistical package SPSS 21.0. Data were presented using frequency, percentage, and graphs. Further statistical analysis was done using Chi-square test to assess the association between gestational diabetes mellitus and the possible risk factors. Level of significance was set at 5%. All p values less than or equal to 0.05 were treated as significant.

## RESULTS

In this case control study 100 antenatal mothers were enrolled (50 antenatal mothers in each group). The mean maternal age of the study group was found to be 31 years (SD 4.303) ranging from 27-37 years. The mean maternal age of the control group was found to be 26 years (SD 3.597) range from 18-32 years.

Out of the 50 antenatal mothers in the control group, 24 (48%) were diagnosed with GDM in the first visit (within 16 weeks of gestation) whereas the remaining 26 (52%) were diagnosed during the screening conducted between 24 – 28 weeks of gestation.

Of the total participants, 44 (88%) cases and 47(94%) controls have studied up to high school. Previous history of macrosomia (weighing >4000gms) and still birth were not reported in both the groups.

Univariate analysis was performed by considering gestational diabetes mellitus as dependent variable and taking maternal age (>30 years), occupation, obesity, parity, previous history of gestational diabetes mellitus, abortion, still birth, preterm, macrosomia (weighing >4000gms) , and family history of diabetes mellitus as the independent variable. Maternal age ($\chi 2$ 11.11, p-0.001), parity ($\chi 2$ 13.75., p value 0.005)and previous history of gestational diabetes mellitus ($\chi 2$ -13.279, p value-0.005) were found to have statistically significant association with gestational diabetes mellitus (shown in the Table).

**Table: Association of Gestational Diabetes Mellitus with various risk factors**

| Variable | | Case (%) | Control (%) | Chi square value | p-value |
|---|---|---|---|---|---|
| **Maternal age** | <30 years | 24 (37.5%) | 40 (62.5%) | 11.11 | 0.001** |
| | >30 years | 26 (72.2%) | 10 (27.8%) | | |
| **Employment status** | Yes | 2 (33.3%) | 4 (66.7%) | 0.709 | 0.339 |
| | No | 48 (51.1%) | 46 (48.9%) | | |
| **Parity** | Multipara | 28 (73.7%) | 10 (26.3%) | 13.75 | 0.005** |
| | Primipara | 22 (35.5%) | 40 (64.5%) | | |
| **Family history of DM** | Present | 24 (60%) | 16 (40%) | 2.667 | 0.076 |
| | Absent | 26 (43.3%) | 34 (56.7%) | | |
| **Previous history of GDM** | Present | 16 (88.9%) | 2 (11.1%) | 13.279 | 0.005** |
| | Absent | 34 (41.5%) | 48 (58.5%) | | |
| **Previous history of abortion** | Present | 15 (53.6%) | 13 (46.4%) | 0.198 | 0.412 |
| | Absent | 35 (48.6%) | 37 (51.4%) | | |
| **Previous history of preterm baby** | Present | 0 (0%) | 1 (1%) | 1.010 | 0.5 |
| | Absent | 50 (50%) | 49 (49.2%) | | |

**Implications**

Knowledge about the risk factors associated with gestational diabetes mellitus will help in early screening, prompt initiation of lifestyle modifications, diet modifications and treatment plans necessary for keeping the glycaemic status under control or preventing the complications due to gestational Diabetes Mellitus for both mother and baby and the development of Type2 Diabetes Mellitus.

## DISCUSSION

The present study was conducted with the aim to identify the risk factors associated with gestational diabetes mellitus. This could help in providing early intervention which in turn reduce the risk of developing gestational diabetes. The major risk factors found to be associated with gestational diabetes mellitus were maternal age, parity, and previous history of gestational diabetes mellitus.

In the current study advanced maternal age was found to be strongly associated with GDM. This is like the studies conducted by DiCianni et al [11], KeshavarzM et al [12] and Karcaaltincaba et al [13], Nava Gen et al [14]. It was found that advanced maternal age changes the glucose and lipid metabolism differences and the hormonal levels in females. Elderly pregnant women also have reduced insulin secretion and in increased insulin antagonist [15]. In another study reported by Seshiah et al [6]. It was found that the odds of a woman above 25 years to develop GDM was 2.1 times higher than that of a woman below 25 years. This was like the current study.

The current study results showed that high parity was significantly associated with development of GDM (chi – 13.75, p-0.005). Similar association was found in few other studies [16, 17]. This was comparable to the study conducted by Perez Ferre et al [24]., and Moses et.al [25] who also reported significant association between GDM and multiparity.

In the current study there was no association between employment status and GDM. In the study conducted by Yang et al [15]. stated that there was no association between higher socioeconomic status and GDM whereas Keshaverz et al., [12] reported an association between low economic level in pregnant mothers.

Many studies reported family history of diabetes to have significant association with developing GDM [6, 17-19]. This contrasted with the current study which did not give an association (chi – 2.667, p-0.076) between family history of diabetes and developing GDM.

History of GDM in the past pregnancy is considered a danger sign for GDM in successive pregnancies. The current study finding (chi – 13.28, p – 0.005) was found to be in line with the studies conducted by Ben-Haroush et al., Mc Guaire et.al., who also reported the presence of significant association [20, 21].

History of macrosomia was considered as a risk factor for gestational diabetes mellitus. In a study conducted by Grassi et al., on neonates with macrosomia reported that around 79% of the children with macrosomia were found to have mothers who were not suffering from glucose intolerance [23]. However, in the current study baby with macrosomia was not reported in both groups of antenatal mothers.

The results of this study revealed that the risk of developing GDM was not associated with history of abortion, still birth or preterm labor. Studies conducted by Tian et. al, reported that higher the number of miscarriages higher was the risk of developing GDM [26]. Women with multiple abortions were found to have poor living habits, lower socioeconomic status, and education which had the greater risk of developing GDM [27].

**Limitations**

Many studies showed significant association between physical activity and GDM. The current study failed to assess the association of physical activity with development of GDM. Moreover, it also failed to find the association of socioeconomic status and GDM.

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