



ORIGINAL RESEARCH PAPER

Obstetrics and Gynaecology

POSTPARTUM GLYCEMIC STATUS IN WOMEN WITH GESTATIONAL DIABETES MELLITUS – ANALYSIS OF VARIOUS RISK FACTORS

**KEY WORDS:** Gestational diabetes mellitus , type 2 diabetes mellitus ,Oral glucose tolerance test

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ABSTRACT

**INTRODUCTION:**Women diagnosed to have Gestational diabetes mellitus are at increased risk of future Diabetes predominantly Type 2 DM as are their children. Early detection of modifiable risk factors in GDM may prevent or delay the disease process there by improving the quality of life.

**OBJECTIVE:**To study the influence of various factors in the development of postpartum diabetes and thus indentifying the risk factors for the future development of diabetes.

**METHODOLOGY:**study Design:Prospective observational study

**STUDY PLACE:**Kasturba Gandhi Hospital ,MADRAS MEDICAL COLLEGE, CHENNAI

**STUDY POPULATION:**125 Women with Gestational diabetes mellitus.

**RESULTS:**125 patients with gestational diabetes mellitus had a 2-hour 75 gm oral glucose tolerance test done 6 weeks after delivery. .Sixty eight percent (85/125) of results were abnormal. Factors such as maternal age,Previous bad obstetric history, various antenatal risk factors showed a statistically significant association with the abnormal group.(Prediabetic and diabetic). $p < 0.05$ .Women comprising group 2(prediabetic ) and 3 (diabetic)showed a statistical difference in the treatment requirement during their pregnancy. Elevated fasting glucose level ( $p = 0.0001$ ) and earlier gestational age at the time of diagnosis of gestational diabetes ( $p = 0.013$ ) were found to be most predictive of an abnormal postpartum glucose tolerance test result.

**CONCLUSION:**These results support the importance of postpartum oral glucose tolerance testing in women with gestational diabetes mellitus.

**INTRODUCTION:**

Most women with GDM are at a high risk for recurrent GDM, prediabetes (impaired glucose tolerance or impaired fasting glucose), and overt diabetes over the subsequent five years. Optimum interpregnancy care to minimize these risks has not been well-studied in randomized trials One-third to two-thirds of women with GDM will have GDM in a subsequent pregnancy(1) .The risk of GDM in the second pregnancy among women with and without previous GDM is 41 and 4 percent, respectively (2). Women who have a recurrence tend to be older, more parous, and have a greater increase in weight between their pregnancies than women without a recurrence . Higher infant birth weight in the index pregnancy and higher maternal prepregnancy weight have also been associated with recurrent GDM (3)A history of GDM is predictive of an increased risk of developing type 2 diabetes, type 1 diabetes, metabolic syndrome, and cardiovascular disease.Analysis of various risk factors helps us to understand and categorise the GDM group so that appropriate counselling and various management options including lifestyle modifications can be initiated at an early stage .

**MATERIAL AND METHODS:**

125 women who had gestational diabetes mellitus were enrolled in the study after getting informed consent.A prospective observational study was conducted at Kasturba Gandhi hospital,Madras medical college,Chennai over a period of 1 year .A 75 gms OGTT was done at approximately around 6 weeks postpartum.Depending on the various glucose values they were categorised into three groups.

**Criteria for diagnosis:**

An abnormal fasting plasma glucose level is diagnostic of

- A. **Diabetes** if fasting glucose  $\geq 126$  mg/dL
- B. **Impaired fasting glucose (IFG)** if fasting glucose is 100 to 125 mg/dL
- C. **Impaired glucose tolerance (IGT)** is diagnosed if the two-hour value is 140 to 199 mg/dL. Collectively, Impaired fasting glucose and Impaired glucose tolerance were termed as "prediabetic"

**RESULTS:**

125 women with GDM who were enrolled in the study were categorised into three groups depending on the values obtained from 2 hr OGTT done at 6 weeks postpartum.

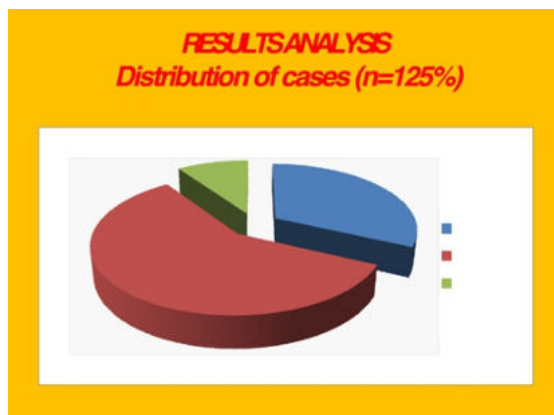
Group 1 comprised women who had GDM but were euglycemic (Normal)in the postpartum period.

Group 2 comprised women who were pre diabetic.

Group 3 consisted of women who were classified as diabetic depending on the cut off values set by ADA and ACOG.

Various factors such as age,previous bad obstetric history,associated antenatal complications (Gestational hypertension,hypothyroidism,anaemia,hydramnios,oligohydramnios)and effect of treatment plan were studied and resulted were analysed using a chi square test for a significant association.Correlation between antepartum fasting plasma glucose and postpartum fasting glucose done during GTT was studied and results analysed.1 hr OGTT values in the antepartum period and its association with postpartum glucose tolerance was also compared.

**DIAGRAM 1 :DISTRIBUTION OF CASES**



NORMAL (Group 1)	PREDIABETIC (Group 2)	DIABETIC (Group 3)	TOTAL
N=40	N=73	N=12	N=125
32%	58.4%	9.6%	

DIAGRAM 2 : AGE DISTRIBUTION

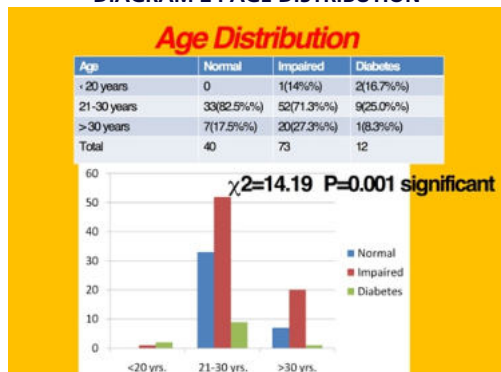


DIAGRAM 3: PREVIOUS BAD OBSTETRIC HISTORY

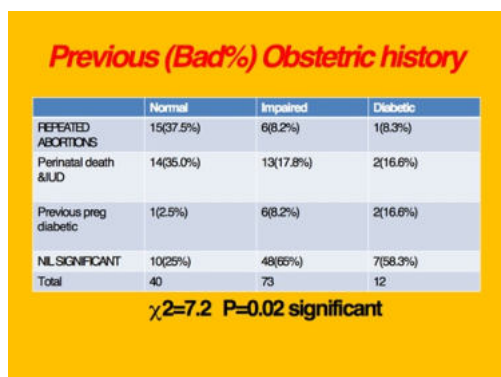


DIAGRAM 4: ASSOCIATED ANTENATAL COMPLICATIONS

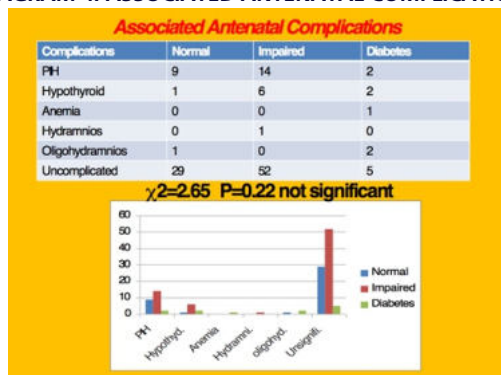


DIAGRAM 5: CORRELATION BETWEEN TYPE OF TREATMENT IN PREGNANCY AND POSTPARTUM GLUCOSE TOLERANCE

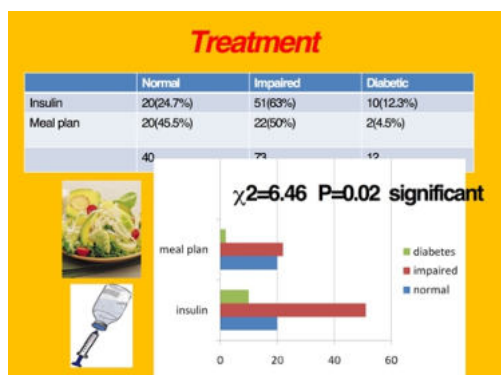


DIAGRAM 6: CORRELATION BETWEEN ANTEPARTUM FASTING PLASMA GLUCOSE AND POSTPARTUM GLUCOSE TOLERANCE

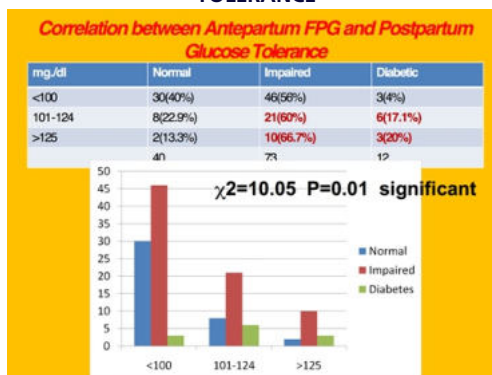


DIAGRAM 7: CORRELATION BETWEEN 1 HOUR GLUCOSE IN ANTEPARTUM OGTT AND POSTPARTUM GLUCOSE TOLERANCE

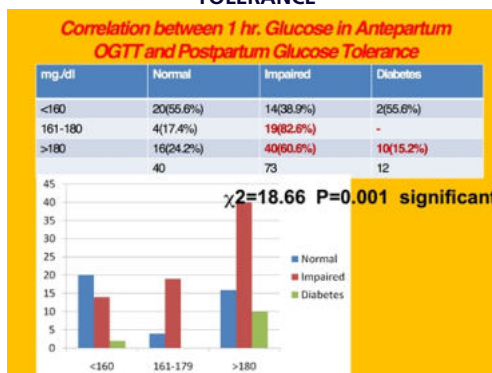
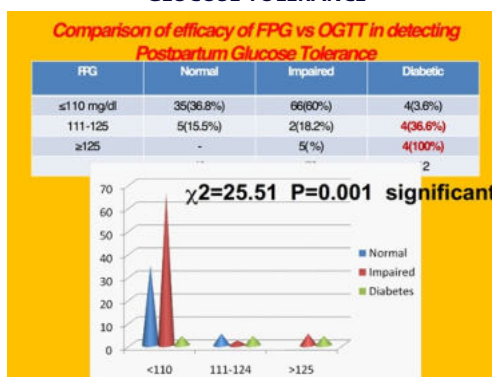


DIAGRAM 8: COMPARISON OF EFFICACY OF FASTING PLASMA GLUCOSE VS OGTT IN DETECTING POSTPARTUM GLUCOSE TOLERANCE



ANALYSIS:

68 % (85/125) of results were abnormal: 12 women showed frank diabetes (GROUP 3) ,73 were prediabetic (GROUP 2) and 40 were euglycemic (GROUP 1). Of the variables studied, the following factors such as age (p=0.001), Previous bad Obstetric history, (p=0.02), Treatment plan (p=0.02), an elevated Fasting plasma glucose (p=0.001) and 1 hour Hyperglycemia (p=0.002) on Antepartum OGTT showed a statistically significant association with the pre diabetic and diabetic group. Variables such as Parity, Family history, Mode and Time of delivery, Fetopathy and Embryopathy were not significant predictors of Abnormal postpartum Glucose Tolerance. Most of the abnormal glucose tolerance was detected in the 2nd and 3rd trimester.

CONCLUSION:

About 60% of the total number of patients included in this study comes under impaired glucose tolerance only because of performing a OGTT in the postpartum period. The High percentage

of Impaired Glucose Tolerance and Diabetes 68% in this study shows high occurrence of abnormal glucose tolerance after GDM. Postpartum OGTT is a must for recognition of this. Awareness of Hyperglycemia and advice about Life Style modification should be explained.

#### DISCUSSION:

A history of GDM is predictive of an increased risk of developing type 2 diabetes, type 1 diabetes, metabolic syndrome, and cardiovascular disease. As many as 20 percent of women with GDM have impaired glucose tolerance during the early postpartum period (4). Women with GDM in their prior pregnancy are more likely to have metabolic syndrome, an atherogenic lipid profile, and early vascular dysfunction at  $\geq 3$  months postpartum than women without previous GDM. In one study of women with mild GDM (ie, normal fasting glucose on GTT), approximately one-third developed metabolic syndrome within 5 to 10 years of delivery (5).

#### Type 2 diabetes:

In a 2009 systematic review and meta-analysis, women with GDM were at significantly higher risk of developing subsequent type 2 diabetes than women with normoglycemic pregnancies (RR 7.43, 95% CI 4.79-11.51; 20 cohort studies including 675,455 women of whom 10,859 had type 2 diabetes). (6) The relative risk was 4.69 within the first five years after delivery and 9.34 more than five years after delivery. The absolute risks were illustrated in a population-based study: the incidence of type 2 diabetes in women with previous GDM was 3.7 percent 9 months postpartum, 4.9 percent 15 months postpartum, 13.1 percent 5 years postpartum, and 18.9 percent 9 years postpartum (versus 2 percent in controls without GDM). Looked at in another way, 10 to 31 percent of parous nonpregnant women with diabetes have experienced a pregnancy complicated by GDM prior to their diagnosis.

Waist circumference and BMI are the strongest anthropometric measures associated with development of type 2 diabetes in women with GDM (6), as they are in women without GDM. Type 2 diabetes develops in 50 to 75 percent of obese (BMI  $\geq 30$  kg/m<sup>2</sup>) women with a history of GDM versus fewer than 25 percent of women with GDM who achieve normal body weight after delivery. (134) Other major risk factors are gestational requirement for insulin and early gestational age at the time of diagnosis (ie, less than 24 weeks of gestation). Additional risk factors for impaired glucose tolerance and overt diabetes later in life include autoantibodies (eg, glutamic acid decarboxylase, insulinoma antigen-2), high fasting blood glucose concentrations during pregnancy and early postpartum, higher fasting plasma glucose at diagnosis of GDM and high glucose levels in oral glucose tolerance testing, neonatal hypoglycemia, and GDM in more than one pregnancy. In one study, an additional pregnancy increased the rate ratio of type 2 diabetes three-fold compared with women without an additional pregnancy (RR 3.34, 95% CI 1.80-6.19) (142) The authors hypothesized that episodes of insulin resistance contribute to the decline in beta-cell function that leads to type 2 diabetes in many high-risk individuals.

Parity, large birth weight, and diabetes in a first-degree relative are less correlated with later diabetes.

#### Type 1 diabetes:

GDM is also a risk factor for the development of type 1 diabetes, particularly in populations with a high prevalence of this disorder. Specific HLA alleles (DR3 or DR4) may predispose to the development of type 1 diabetes postpartum, as does the presence of islet-cell autoantibodies or antibodies against glutamic acid decarboxylase or insulinoma antigen-2. GDM in lean pregnant women, need for insulin treatment of GDM, diabetic ketoacidosis during pregnancy, and postpartum hyperglycemia also suggest preexisting unrecognized type 1 diabetes or high risk of developing type 1 diabetes (7).

Women with GDM are at greater risk of developing cardiovascular disease and developing it at a younger age than women with no

history of GDM. Even mild glucose impairment defined as an abnormal glucose challenge test with a normal glucose tolerance test appears to identify women at increased risk of future development of cardiovascular disease

ACOG, the ADA and the Fifth International Workshop Conference on Gestational Diabetes recommend long-term follow-up of women with GDM. An oral glucose tolerance test 4 to 12 weeks after delivery, using the two-hour 75 g oral glucose tolerance test is done. Since most obstetricians see their patients at 6 weeks postpartum, it makes sense to order the test prior to this visit, so the results are available for counseling and so the test can be rescheduled if it has been missed. A fasting plasma glucose test is a reasonable alternative; glycated hemoglobin (A1C) is an acceptable substitute in patients in whom obtaining a fasting specimen is especially inconvenient (8).

Breast feeding during a glucose tolerance test appears to have a modest effect on glucose levels. In a prospective cohort study of nursing women with previous GDM who underwent a glucose tolerance test 6 to 9 weeks postpartum, mean two-hour glucose levels were 5 percent lower in women who breastfed during the test, which could affect interpretation of a borderline test. The patient should be informed in advance that she might need to repeat the test if this happens so she can make an informed decision about breastfeeding during the test versus planning the test at a time/ later date when breastfeeding can be avoided.

An abnormal fasting plasma glucose level is diagnostic (diabetes if  $\geq 126$  mg/dL, impaired fasting glucose (IFG) if 100 to 125 mg/dL); however, sensitivity for diagnosis of diabetes is low compared with glucose tolerance tests. Impaired glucose tolerance (IGT) is diagnosed if the two-hour value is 140 to 199 mg/dL. Collectively, IFG and IGT are known as "prediabetes."

Women with prediabetes should be counseled about their subsequent risk for developing overt diabetes and referred for discussion of management options (eg, lifestyle modification such as medical nutritional therapy, indications for metformin). They should try to achieve their ideal body weight through diet and exercise and, if possible, they should avoid drugs that may adversely affect glucose tolerance (eg, glucocorticoids). They should have yearly assessment of glycemic status. Women with prediabetes results should also be informed that breastfeeding may decrease their long-term risk of developing type 2 diabetes.

Women with overt diabetes mellitus should receive appropriate education and treatment. They should also be given advice regarding contraception and the planning of future pregnancies. In addition, women with prediabetes or overt diabetes should be counseled regarding the importance of good metabolic control prior to any future pregnancies.

#### Women with normal test results:

Women with normal glucose tolerance should be counseled regarding their risk of developing GDM in subsequent pregnancies and their future risk of developing type 2 diabetes. Lifestyle interventions (diet and exercise) are clearly beneficial for reducing the incidence of type 2 diabetes in persons at increased risk for the disease (ie, individuals with prediabetes). These interventions are also beneficial in women with a history of GDM, whether or not they meet criteria for prediabetes (9). In a randomized trial comparing use of metformin versus lifestyle intervention and placebo in 350 women with previous GDM, the annual incidence of type 2 diabetes was decreased from 15 to 7.5 percent with either intervention (8). The number needed to treat to prevent one case of diabetes over three years was 5 to 6. In a subgroup analysis of former GDMs enrolled in a 16-year prospective observational study (Nurses Health Study II), 14 percent self-reported the development of type 2 diabetes (8). Women with a total physical activity level equivalent to 150 minutes per week of moderate-intensity physical activity or 75 minutes per week of vigorous-intensity physical activity had a 30 to 50 percent lower risk of developing type 2 diabetes compared with women who did not achieve this level of activity, which is the minimum recommended

for United States adults in federal physical activity guidelines (10). BMI at baseline was inversely associated with activity level and adjustment for BMI attenuated the effect of physical activity, although the benefit of physical activity remained statistically significant.

Drug therapy may also have a role in preventing future type 2 diabetes. In a multicenter randomized trial, both intensive lifestyle and metformin therapy reduced the incidence of future diabetes by approximately 50 percent compared to placebo in women with a history of GDM; metformin was much less effective than lifestyle intervention in parous women without previous GDM (8). Women with normal results should also be informed that breastfeeding may decrease their long-term risk of developing type 2 diabetes.

Long-term follow-up is essential. Reassessment of glycemic status should be undertaken at a minimum of every three years. More frequent assessment may be important in women who may become pregnant again, since early detection of diabetes is important to preconception and early prenatal care. More frequent screening (every one or two years) may also be indicated in women with other risk factors for diabetes, such as family history of diabetes, obesity, and need for insulin or oral glucose-lowering medication during pregnancy

The best means of follow-up testing has not been defined. The 75-g oral two-hour glucose tolerance test is the more sensitive test for diagnosis of diabetes and impaired glucose tolerance in most populations, but the fasting plasma glucose is more convenient, specific, and reproducible, and less expensive. Glycated hemoglobin (A1C) is convenient and the preferred test for patients who have not fasted overnight.

Follow-up of women not screened for GDM — In women who did not undergo screening for GDM, but diabetes is suspected postpartum because of infant outcome, postpartum glucose tolerance testing may be considered. However, a normal postpartum GTT only excludes the presence of type 1 or type 2 diabetes or prediabetes at the time of the test; it does not exclude the possibility that glucose impairment was present in association with the metabolic changes occurring during the pregnancy itself.

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