Glycemic control and its associated factors among women with gestational diabetes mellitus in a tertiary care Centre, Puducherry, South India

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ABSTRACT

Background: Worldwide, one in ten pregnancies is related with diabetes; 87.6% of which are gestational diabetes mellitus (GDM). Maternal hyperglycaemia affects the successful progression of pregnancy. Objectives: To determine the proportion and the factors associated with poor glycemic control among women with gestational diabetes. Methods: This hospital-based cross-sectional study was conducted in a tertiary care hospital, Puducherry, South India from September to October 2019. Pregnant women diagnosed as GDM and on treatment for at least one month were approached consecutively for the study. A fasting blood sugar (FBS) ≥92 mg/dl and postprandial blood sugar (PPBS) 1 hour ≥180 mg/dl or PPBS 2 hour ≥153 mg/dl were considered as poor glycaemic control. Results: A total of 301 women with GDM were included and the mean (SD) age was 27 (5) years. Of total, 29 (10%) reported GDM during their previous pregnancy and 95 (32%) got diagnosed before reaching the tertiary care hospital. Lifestyle modifications (77%) were the most common mode of management for GDM. Of total, 116 (38.5%; 95% CI 33%‑44.3%) had poor glycaemic control. Multigravida women (46.9%) and those on pharmacological treatment for GDM had poor glycaemic control. Conclusion: One-third of women with GDM at a tertiary care centre had poor glycaemic control. Therefore, a novel approach to improve awareness about GDM control both among pregnant women and the medical fraternity is needed.

Keywords: Gestational diabetes Mellitus, FBS, PPBS, poor glycaemic control, prevalence
Glycemic control is important in pregnant women since even minor changes in blood glucose levels can have adverse effects on the mother and child. Globally, GDM is one of the major reasons for mortality and morbidity of both the mother and new-born. Age of the mother and a family history of diabetes are widely considered as the risk factors associated with GDM.[10] The risk of developing subsequent type 2 DM (T2DM) and cardiovascular diseases are significantly higher among women with a history of GDM. The prevalence of poor glycemic control among women with GDM under medical care is not much explored. Although glycemic control can be achieved through diet modification and physical activity, around 30-40% of the pregnant women required medical intervention.[12] A study from USA reported that 22% of the pregnant women had poor glycemic control and hypertension and history of preterm deliveries were associated with it.[13] Early identification of pregnant women with poor glycemic control can help to prevent and minimize foetal and maternal morbidity.[14] Glycemic control can prevent or reduce the risk of pre‑clampsia, macrosomia and shoulder dystocia.[15]

Women with GDM need more intensive care than other diabetes patients and studies on their glycemic control across the country is limited. So in this study, we aimed to assess the prevalence of poor glycaemic control among women with GDM and the factors associated with it.

**Methods**

**Study design, population, and setting**

This hospital-based cross-sectional analytical study was conducted in the department of Obstetrics and Gynaecology (OB&G) at a tertiary care center, Puducherry, South India during September and October 2019. The average number of deliveries conducted per year is over 15000. Screening for GDM is offered to all pregnant women and laboratory investigations are provided free of cost to all mothers. This tertiary care center follows the criteria proposed by International Association of Diabetes in Pregnancy Study Group (IADPSG) for diagnosis of GDM. As per IADPSG criteria Oral glucose tolerance test (OGTT) was done by using 75 g of glucose (fasting) at first visit to the hospital.

**Study participants**

Pregnant women diagnosed as GDM and on treatment for at least one month were included. Women with a diagnosis of diabetes before pregnancy (overt diabetes) were excluded.

**Sample size and sampling technique**

Using OpenEpi version 3.01, assuming the expected proportion with poor glycemic control among GDM mothers as 21.8%,[16] absolute precision of 5%, the sample size was 262. Considering the non-response rate as 15%, we need 308 participants for this study. Consecutive eligible mothers were included.

**Study procedure**

Information on socio-demographic, obstetrics and treatment characteristics, type of management (drug/lifestyle modifications), duration of drug treatment, and hospitalization during this pregnancy were collected using a semi-structured questionnaire. Details about glycemic control were extracted from individual case records. All participants were diagnosed as GDM using the IADPSG criteria. A fasting plasma glucose (FPG) ≥92 mg/dl, or 1-hour plasma glucose ≥180 mg/dl or 2-hour plasma glucose ≥153 mg/dl considered as poor glycemic control. Those mothers without reports on blood glucose in the last two months, we advised FBG/PPBG measurements and collected the reports from hospital management and information system (HMIS). Ethical clearance was obtained from the Institutional Ethics Committee (JIP/IEC/2019/0309, Date of approval of ethics is 29/07/2019) of Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India.

**Statistical analysis**

Data entry was done with EpiData Manager Version 4.2 and was STATA version 14 (StataCorp. Texas, United States) was used for analysis. Continuous variables like age, fasting blood sugar (FBS), postprandial blood sugar (PPBS) 1 hour and PPBS 2-hour, duration of drug treatment for GDM, period of gestation (POG) at the time of diagnosis of GDM were summarized as mean (SD). Women with poor glycemic control were summarized as percentages with 95% confidence interval (CI). Association of socio-demographic and clinical parameters with poor glycemic control was assessed using Chi-square test and unadjusted prevalence ratio with 95% CI were calculated as measures of association. A P value less than 0.05 was considered statistically significant.

**Results**

A total of 301 women were included and the mean (standard deviation) age was 28 (4.5) years. Sociodemographic and obstetric characteristics are summarized in Table 1. Of total, 120 women (40%) were graduates, one third (n = 102) had a family history of diabetes, 57 (19%) had a family history of hypertension, and about half (n = 154) were primigravida. Multigravida mothers with history of abortions and GDM in their previous pregnancy was 15% (n = 47) and 19% (n = 28) respectively. The mean (SD) gestational age at the time of diagnosis of GDM was 26.3 (6.2) weeks. Of total, 23% were insulin or metformin and the rest 77% were advised diet modification.

Of total, 116 women had poor glycemic control (38.5%; 95%CI 33.0-44.3). Table 2 describes the association of socio-demographic and obstetric characteristics with poor glycemic control. Prevalence of poor glycemic control was higher in women aged more than 30 years (PR 1.31 95% CI; 0.91-1.85), without formal education (PR 1.70 (95% CI; 0.83-3.44), employed (PR 1.17 95% CI; 0.74-1.83), multi
gravida (PR 1.53 95% CI; 1.14-2.06), with family history of hypertension (PR 1.05 95% CI; 0.74-1.5) and with any other comorbidities (PR1.01 95% CI; 0.73-1.41).

**Discussion**

The present study assessed the level of glycemic control among mothers with GDM at a public tertiary care centre in South India and also examined factors associated with poor glycemic control. We found more than one third of mothers had poor glycemic control and multigravida mothers had higher level of poor glycemic control.

There is limited evidence of glycemic control among GDM mothers in India, though studies are available for glycemic control in general population. To our knowledge, this is one of the first estimates from Indian population. A study conducted in Saudi Arabia[7] reported a similar prevalence (46.9%) using HbA1c for assessing glycemic control. Our findings were much higher than the results reported by Sciﬁres et al. from Pittsburgh, United States (21.8%).[13] The possible reason for this difference could be due to a differences in knowledge of GDM and behaviour of mothers, quality of diabetes care and definitions used to quantify glycemic control. Our study used a lower cut off for target glucose value might be the reason for high prevalence of uncontrolled GDM. This could be a better strategy to decrease GDM related complications.[12] The effect of glycemic control on foetal growth abnormalities, adverse maternal outcomes and increased chances for future type 2 DM encourages further investigation on poor glycemic control during pregnancy.[11]

In the present study, women aged more than 30 years had higher prevalence of poor glycemic control compared to younger age
groups. This finding was similar to the study by Buhary et al.[17] Advancing age is a major risk factor for GDM and greater average age among the pregnant women who are carriers of the metabolic disturbance leading to poor glycemic control.[16] Our study found that multigravida had 1.5 times higher risk for poor glycemic control compared to primigravida. These results being similar to the study conducted at Pittsburgh.[13] Multigravida women were more obese compared to primigravida women and GDM is more common in overweight and obese women than normal-weight women. Similarly, multigravida pregnancy has more chances of being a late pregnancy than the primi.[17]

In our setting, lifestyle modification was most common mode of first-line management for mothers. But it is important to achieve the target levels of glycemic control with the use of insulin or metformin.[14] Also, those mothers who are aged over 30 years, having a family history of hypertension, and/or being multigravida need to be followed-up more frequently to achieve the glycemic targets. Primary health care personnel need to be trained in management of GDM especially in diet counselling and follow up so that GDM mothers can make frequent follow visits to primary health facilities which will be closer to their home. In pregnant women with a history of uncontrolled GDM, primary care center should test their glycemic status six weeks after delivery to rule out diabetes and pre-diabetes. Also breastfeeding should be encouraged for at least 3 months to reduce the risk of diabetes.[19] India’s guidelines regarding management of GDM recommends the above strategy (GDM guidelines, India).[20]

As this was a hospital-based study from a single tertiary care setting, which is expected to receive high-risk cases, findings cannot be generalized to primary care settings. We did not have information on adherence to diet modifications which could have explained high levels of poor glycemic control. We defined glycemic control based on fasting and postprandial blood glucose levels; HbA1c measurements would have been better. However, the study was conducted in real world setting and reflects the realities in managing GDM in public tertiary referral hospital.

**Conclusion**

More than one third of women with GDM at a tertiary care centre had poor glycemic control. Multigravida and women with a family history of hypertension were associated with poor glycemic control. Insulin therapy along with lifestyle modification needs to be emphasized. It is necessary to improve awareness about GDM and its control measures among medical fraternity, patients and their family members. As majority of the pregnant women as seeking antenatal care from primary care centers, this study highlights the importance of primary care physicians to screen pregnant women for GDM and to check their control status at regular intervals. It is also important to suggest lifestyle modifications and other control measures to tackle at GDM at primary care level.

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**Conflicts of interest**

There are no conflicts of interest.

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