International Journal of Clinical Obstetrics and Gynaecology

ISSN (P): 2522-6614
ISSN (E): 2522-6622

www.gynaecologyjournal.com
2019; 3(4): 88-91
Received: 17-05-2019
Accepted: 19-06-2019

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Obstetric outcomes in gestational diabetes mellitus: A hospital based study in Goa

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DOI: https://doi.org/10.33545/gynae.2019.v3.i4b.296

Abstract
Background and objectives: Gestational Diabetes Mellitus (GDM) is known to be associated with adverse obstetric outcomes. This study was focussed on assessing the obstetric outcomes in women with GDM.
Methods: This was a hospital based longitudinal study in which 7717 antenatal women who delivered at Goa Medical College between1st November 2014 – 30th April 2016 were enrolled. 424 women among them who were diagnosed with GDM were started on Medical Nutritional Therapy (MNT). Insulin was started if glycemic control was not achieved with MNT. Maternal outcomes were studied among these women and compared with 424 randomly selected non GDM antenatal women.
Results: Maternal complications like genitourinary infections (10.4%), preterm labour (17%) and premature rupture of membranes (12%) were significantly higher in the GDM study population as compared to non- GDM group. 68.2% of women with GDM were controlled on split meals while 31.8% required insulin. Majority of women with GDM delivered between 38 – 39 weeks of gestation (34.7%). It was noted that Caesarean section rates were higher in GDM group as compared to the non GDM group (38.4%). No significant increase in the incidence of postpartum haemorrhage was noted in GDM group. However the incidence of puerperal sepsis was significantly higher among pregnant women with GDM (9.9%).
Conclusion: GDM is a high risk obstetric condition significantly associated with multiple maternal complications. Majority of the pregnant women with GDM can be managed with MNT and lifestyle modification alone. Early diagnosis and timely management of GDM is the mainstay of treatment for GDM.

Keywords: GDM, obstetric outcomes, MNT, insulin

Introduction
The prevalence of hyperglycemia in pregnancy has been on the rise globally, especially in South East Asia. The prevalence of Gestational Diabetes Mellitus (GDM) in South East Asia was found to 24.2% in the year 2017 [1]. GDM is associated with a number of unfavourable maternal outcomes and may increase the risk of obesity and type II diabetes in offspring later in life [2].
Studies have shown that women with GDM are at increased risk of developing pre-eclampsia. The development of hypertensive disorders in pregnancy is attributed to the effect of hyperinsulinemia on increasing weight, and renal sodium retention [3]. The HAPO study showed that 5.2% of women with GDM had preeclampsia, 6.9% of women with GDM had preterm birth and 1.3% had shoulder dystocia. Also, 17.3% of the GDM women had a primary Caesarean delivery which was found to be associated with increased post OGTT maternal glucose and fasting glucose levels [4]. In the long run, women with GDM have 7.3 times more likelihood of developing type 2 DM in future as compared to women without GDM [5]. Thus early diagnosis and timely treatment of GDM can help to circumvent these adverse outcomes. Studies have shown that 70–85% of women diagnosed with GDM under Carpenter-Coustan or National Diabetes Data Group (NDDG) criteria can control GDM with lifestyle modification alone. It is predicted that this percentage will be higher if the lower diagnostic thresholds by International Association of the Diabetes and Pregnancy Study Groups (IADPSG) are used [6]. This study was taken up with aim of identifying and analysing the burden of complications and the obstetric outcomes among women with GDM.

Materials and Methods

A tertiary hospital based prospective longitudinal study was conducted in the Department of Obstetrics and Gynaecology at Goa Medical College over 18 months (November 2014 – April 2016). Approval of the Institutional Ethical Committee of GMC was obtained prior to commencement of the study. Informed consent was taken from all the study participants.

The study participants included all the antenatal women who were registered in the antenatal clinic of Goa Medical College as well as those referred from other health care facilities who delivered at GMC during the study period. Those who did not give consent and those with overt diabetes mellitus, cardiac failure, liver failure, chronic renal disease, tuberculosis and those with multiple gestations were excluded. Booked cases in GMC who delivered elsewhere were not included as study participants.

Screening and diagnostic tests: All the antenatal women attending OPD in GMC were universally screened for GDM using oral glucose challenge test (OGCT) with 50g glucose at the first visit. The plasma glucose value measured at the end of 1 hour if found to be more than 140mg/dl, then Oral Glucose tolerance test (OGTT) with 100g glucose was advised. If the screening test was negative at first visit, then it was repeated at 24 – 28 weeks of gestation. In presence of any high risk factors, OGTT with 100g glucose was done at the first antenatal visit.

The diagnosis of GDM was made using according to the diagnostic criteria implemented by the Fifth International Workshop Conference on Gestational Diabetes Mellitus [7]:

Plasma glucose value –

- Fasting 95 mg/dl,
- 1hour-180 mg/dl,
- 2hours- 155 mg/dl and
- 3 hours- 140 mg/dl.

If any of the 2 values were abnormal then patient was labelled as GDM. Once GDM was diagnosed, the patients were advised medical nutritional therapy - split meals, exercises and were followed up every 15 days for evaluation of glucose control. On admission, their fasting and 2hours postmeal sugars were checked. If FBSL >95 mg/dl and postmeal RBSL > 120 mg/dl, insulin therapy was initiated and sugar profile was repeated. After obtaining sugar control these women were discharged and followed up every 15 days for sugar profile. Antenatal women diagnosed with GDM were advised to maintain strict daily fetal movement count at home. During the antenatal surveillance of the mother, we looked for development of maternal complications like genitourinary infections, preeclampsia, preterm labour, preterm prelabour rupture of membranes, polyhydramnios, etc.

Growth monitoring charts were maintained for all antenatal women. Those women that were well controlled on diet or insulin were admitted at 37 weeks of gestation. Those with uncontrolled diabetes mellitus or having any of the above complications were hospitalized and kept under strict observation. In case of patients referred from other hospitals, the antenatal follow up data was obtained. Similar policies were followed by the referral centres.

All women with GDM that did not go into spontaneous labour by 38 weeks of gestation were induced. The course in labour, intrapartum complications and mode of delivery was observed. Postnatal complications such as postpartum hemorrhage and puerperal sepsis were noted. The obstetric outcomes were compared to the same number of randomly chosen antenatal women without GDM who had delivered in the hospital during the same time period of 18 months. The results were analyzed using SPSS (version 22). Chi square test was applied and p value < 0.05 was considered statistically significant.

Results

A total of 424 women diagnosed with GDM during the study period were enrolled as study participants. Their obstetric outcomes were compared with 424 women without GDM.

Table 1: Maternal complication in women with and without GDM

Maternal Complications	GDM group (n=424)	Non- GDM group (n= 424)	P value	Interpretation
1 Preeclampsia	98 (23.1%)	81 (19.1%)	0.1782	Not significant
2 Infections	44(10.4%)	21 (5%)	0.0045	Significant
3 Preterm labour	72(17%)	42(9.9%)	0.0035	Significant
4 PROM	51 (12%)	30 (7%)	0.0195	Significant
5 Polyhydramnios	13(3.1%)	10 (2.3%)	0.6724	Not significant
6 Congenital anomalies	9 (2.1%)	3 (0.7%)	0.1460	Not significant
7 Stillbirth	13 (3%)	12(2.8%)	1.0000	Not significant

Table 1 shows the relationship of GDM with various maternal complications. It was observed that a marginally higher percentage of pregnant women with GDM i.e. 23.1% had preeclampsia as compared to 19.1% women in the non-GDM group. However, this correlation was not found to be statistically significant (p=0.1782). Genitourinary infections were found to be significantly more in women with GDM (10.4%) as compared to those without GDM. A significantly higher number of women with GDM (17%) went in preterm labour as compared to the control group (9.9%). The percentage of women developing premature rupture of membranes (PROM) was significantly higher in GDM group (12%) as against the non GDM group (7%). 13 women with GDM developed polyhydramnios as compared to 10 women without GDM, suggesting that polyhydramnios was not a significant complication in women with GDM. Also fetal congenital anomalies on imaging studies were diagnosed in only 2.1% of women with GDM, which was not a statistically significant finding. Percentage of stillbirths was found to be 3% in GDM group, while it was 2.8% in the non GDM group; however this association was not statistically significant.

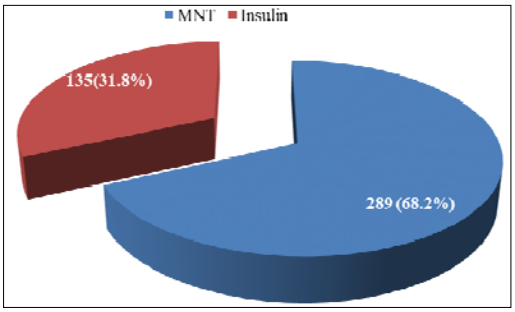


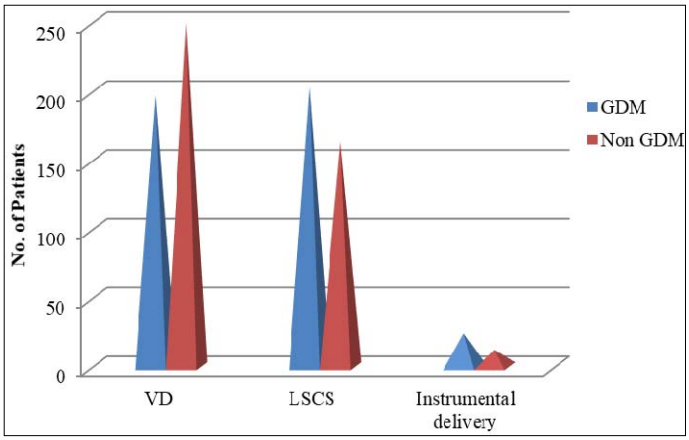
Fig 1: Treatment modalities of GDM

As seen in figure 1, 68.2% of antenatal women with GDM were controlled on Medical Nutrition Therapy (MNT), while 31.8% needed insulin therapy for achieving glycemic control.

Table 2: Period of gestation at delivery among women with and without GDM

Gestation (weeks)	GDM		non- GDM	
	No. of patients	Percentage (%)	No. of patients	Percentage (%)
< 37	72	17	42	9.9
37- 38	81	19.1	112	26.4
38.1 – 39	147	34.7	138	32.6
39.1 – 40	121	28.5	120	28.3
> 40	3	0.7	12	2.8

It was observed that almost one third of the study population (34.7%) delivered between 38.1 - 39 weeks of gestation as seen in Table 2.



Vaginal delivery, LSCS- Lower segment caesarean section

Fig 2: Comparison of mode of delivery in GDM and non-GDM

As shown in figure2, it was observed in our study that the caesarean rate was higher in GDM group (47.9%) as compared to non-GDM group (38.4%). 5.7 % of women in GDM group needed instrumentation during delivery as compared to 2.8% in the non-GDM group. Thus GDM significantly increased the risk of operative intervention in labour. (p=0.0069)

In our study, 6.1% of women with GDM had postpartum haemorrhage (PPH) as compared to 4.5% women without GDM. There was no significant increase in the incidence of PPH in women with GDM. Table 3 shows a significant increase in the incidence of puerperal sepsis among women with GDM (9.9%) as compared to the non-GDM group (5.4%).

Table 3: Percentage of puerperal sepsis in women with and without GDM

GDM			non - GDM		
Puerperal Sepsis	No. of patients	Percentage (%)	Puerperal Sepsis	No. of patients	Percentage (%)
Present	42	9.9	Present	23	5.4
Absent	382	90.1	Absent	401	94.6

Discussion

GDM is a common complication during pregnancy due to rising prevalence of obesity, lifestyle changes, advancing maternal age amongst other factors. The HAPO study has confirmed that there are significant adverse maternal and fetal outcomes associated with rising blood glucose levels such as macrosomia, preeclampsia, preterm delivery, shoulder dystocia, birth injuries and increased caesarean delivery rates [4].

In our study we found that antenatal complications such as genitourinary infections, preterm labour and PROM were significantly higher among antenatal women with GDM. K Dahiya *et al* [8], Ameya D *et al* [9] found a significant rise in incidence of genitourinary infections among women with GDM. However Rajesh Kumari *et al* [10] reported no significant risk of genitourinary infections in women with GDM, but there was a significant rise in incidence of preterm labour in women with GDM. Similar findings were reported by Thiruvikrama *et al* [11], K Dahiya *et al* [8], Ameya D *et al*. [9], Amidha S *et al* [12] and Deepali *et al* [13] showed no significant association between GDM and preterm labour. This difference could be because there was an increased incidence of genitourinary infections in our study which precipitated preterm labour. Thiruvikrama *et al* [11] also showed that there was a significant correlation between GDM and PROM like our study. This could be attributed to increased incidence of infections among GDM patients.

Preclampsia was observed in 23.1% of women with GDM in our study. However there was no significant increase in the risk of preeclampsia in the study population as compared to the control group. Similar finding was also noted by K Dahiya *et al* [8], Amidha S *et al* [12] and Deepali *et al* [13] However several other studies showed a significant association between GDM and pre-eclampsia [10-11].

Polyhydramnios was seen in only 3.1% of women with GDM, which was not a significant finding. Similar finding was noted

by Rajesh Kumari *et al* [10], Thiruvikrama *et al* [11] and Deepali *et al* [13] However, K Dahiya *et al* [8] and Amidha S *et al* [12] found a significant percentage of women with GDM developing polyhydramnios. Early detection, prompt management of GDM and good antenatal surveillance in our hospital setup probably contributed towards less percentage of GDM women developing pregnancy complications like preeclampsia and polyhydramnios.
The present study showed that 2.1% of women with GDM were diagnosed with congenital anomalies in the fetus, however this correlation was not statistically significant. Similar observations were made by Amidha S *et al* [12] and Deepali *et al* [13]. This could be attributed to the fact that congenital anomalies are more frequently observed in women with pre-gestational diabetes as compared to GDM.
The incidence of stillbirths was found to be 3% among women with GDM as compared to 2.8% women without GDM which was not found to be a statistically significant finding and was comparable to the findings in other Indian studies [12-13].
In the present study 68.2% of women with GDM were controlled on Medical Nutrition Therapy alone, while 31.8% required insulin for achieving glycemic control. Ameya D *et al*. [9] showed that 90% of GDM women were controlled on MNT alone. Rajesh Kumari *et al*. [10] and Amidha S *et al*. [12] found that 79.4% and 83.75% of antenatal women with GDM respectively were managed with MNT and did not require insulin. Studies by Thiruvikrama *et al*. [11] and Deepali *et al*. [13] showed that a higher percentage of women with GDM (58% and 83.78% respectively) required insulin for glycemic control. A significantly higher percentage of women in our study were controlled with dietary modification alone due to thorough dietary counselling of GDM patients by the Obstetricians and also due to the support of Dieticians available in the Department of Dietetics at our institution. Also our study participants had a higher literacy rate as compared to participants in other studies conducted in other states.
In our present study it was observed that 47.9% of women with GDM underwent caesarean section while 46.4 % delivered vaginally and 5.7% had instrumental vaginal delivery. On the other hand in the control group caesarean rate was found to be 38.4%, while 58.7 % women delivered vaginally and 2.8% had instrumental deliveries. On analysing the data, it was found that caesarean rate was significantly higher in women with GDM (p=0.0069) which was comparable to other studies by Ameya D *et al* (52%) [9] and Amidha S *et al* (40%). [12] Rajesh Kumari *et al* [10] reported that 50% of women with GDM underwent caesarean section. Thus in our study there was no significant difference in the mode of delivery between GDM and non-GDM groups.
In the present study there was no significant difference noted in incidence of PPH in women with GDM like in other studies. [9-10]
In the present study 9.9% of women with GDM developed puerperal sepsis which implied that puerperal sepsis is significantly associated with GDM. Rajesh Kumari *et al* [10] showed no significant increase incidence of puerperal sepsis with GDM. This difference in the observations could be due to increased incidence of operative intervention in antenatal women with GDM in our study as compared to the study conducted by Rajesh Kumari *et al* [10].

Conclusions

Antenatal women with GDM are at high risk of developing serious maternal complications. Thus with the increasing incidence of GDM it is mandatory to implement universal screening of GDM. Early diagnosis, meticulous antenatal surveillance and prompt management are the major steps that we need to undertake to reduce maternal morbidity and mortality associated with GDM and improve health care facilities in the state.

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