Original Research Article

Prevalence and clinical burden of Gestational diabetes mellitus at a tertiary care centre in Kozhikode Kerala, India

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Abstract

Background: Gestational diabetes mellitus (GDM) is one of the most common medical complications of pregnancy. It has serious health implications like preeclampsia, caesarean delivery and Type 2 diabetes in mother later. This research was done to assess the prevalence , risk factors and foetal birth weights of mothers with GDM in a tertiary care in North Kerala. **Methods**: Descriptive cross sectional study conducted in Department of OBG, KMCT Medical College Kozhikode ,Kerala from Jan 2018 -Jan 2021 where 189 women who are diagnosed to have GDM were studied to assess the maternal and foetal outcome. Maternal and foetal outcome was studied. **Results**: The incidence of GDM in the population studied was 5.78%. 44.4% were in 25-29 years group. 63% of these diabetic mothers were overweight and obese. Pre-eclampsia complicating pregnancy was noted in 26% patients. 65.6% needed insulin therapy with MNT and exercise. Weight gain of 9- 12 kg was noted in 69.8% of GDM mothers. Mean baby weight was 3185.85gms. 55.55% patients delivered vaginally. 18 /189 deliveries were vacuum assisted. 46 % patients underwent LSCS. **Conclusions**: Gestational diabetes complicating pregnancy has both adverse maternal and foetal outcome. Timely identification and counselling regarding glycaemic control of mothers and surveillance of foetus will avert maternal and neonatal morbidity .

Keywords: Gestational diabetes, Maternal, Foetal, Risk.

Introduction

Pregnancy induces progressive changes in maternal carbohydrate metabolism. Insulin resistance and diabetogenic stress due to placental hormones necessitate compensatory escalation in insulin secretion towards term. Gestational diabetes mellitus (GDM) develops due to inadequate
compensation. Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance that occurs for the first time or is first detected during pregnancy. It has become a global public health burden. Diabetes complicates 1-20% of all pregnancies worldwide[1]. Indian women are ethnically predisposed to develop diabetes and compared to European women, the prevalence of gestational diabetes in India has increased 11-fold[2].

The increasing prevalence of type 2 diabetes in general and in younger people in particular has led to an increase in number of pregnancies with this complication. India has an estimated 62 million people with type 2 diabetes mellitus (DM); this number is expected to go up to 79.4 million by 2025[3]. The prevalence of diabetes in Kerala is as high as 20% which is double the national average of 8% and hence Kerala is known as the diabetic capital of India. Kerala has a paradoxical increase of diabetes in rural dwellers and showed a prevalence of 11-19% in men and 15-22% in women in contrary to the national data showing the prevalence of diabetes is double in urban areas[4].

A universal recommendation for the ideal approach for screening and diagnosis of GDM remains elusive. Significant questions remain regarding the implications of GDM diagnosis on the pregnant woman and her family, the effect of diagnosis on obstetric interventions, and whether the early identification and treatment of GDM will improve perinatal, neonatal, and maternal outcomes besides overall health care costs.

The prevalence of GDM range from 1-14% depending on the population and the diagnostic tests employed[5]. Evidence is that the suboptimal glycaemic control in women with GDM is associated with adverse maternal & neonatal outcomes [6-12]. Women with a history of GDM are at an increased risk of both adverse maternal, perinatal and neonatal outcomes and also there as an increased risk of future diabetes predominantly Type II in mothers as well as their children and therefore there are two generations at risk[13]. Foetal and neonatal complications include foetal malformation, macrosomia perinatal morbidity like prematurity, respiratory distress syndrome (RDS), neonatal hypoglycemia, hypocalcemia and hyperbilirubinemia ,perinatal morbidity like intrauterine death (IUD)./ stillbirth (SB) and neonatal death (NND). Euglycemia means glucose levels are at target level throughout the whole day which can be achieved by medical nutrition therapy (MNT) insulin therapy, exercise, metformin and foetal and maternal monitoring[14]. Therefore careful monitoring of blood glucose levels and initiation of appropriate treatment are essential in the care of women with GDM[11,13] . Hence the present study was to done to look into the prevalence ,risk factors ,morbidities , mode of outcomes of delivery and weight of new-born at birth in GDM mothers in Kozhikode as GDM management is crucial in pregnancy to reduce the burden of prospective diabetes in South Indian women.

Methodology

This study was conducted in OBG Department KMCT Medical College Kozhikode during a period of three year from January 2018

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to January 2021.Total deliveries during that period was 3267 of which 189 cases had GDM.

Inclusion Criteria

A total of 3267 pregnant women were screened during their 16–32th weeks of pregnancy by oral glucose test (75 gm GTT), and screen positive.>130 mg/dl.

Sample Size

A hospital based cross-sectional study was carried out at a tertiary care teaching institute of Kozhikode district, Kerala. The sample size was calculated using the formulae of $(Z\alpha + Z\beta)\ 2 \times 2 \times P \times Q / d2$ where P is p1 + p2/2, Q= 100-P, d= p1-p2, Zα - alpha error as 1.96 and Zβ - beta error as 0.84.

From a previous study the proportion of GDM cases with BMI more than 30 is taken as p1 - 22% and proportion of normal pregnancy with BMI more than 30 as p2 - 4%. The calculated sample size was 108 and consecutive sampling technique was used for data collection.

Procedure

Diagnosis of GDM primarily depends on the results of an oral glucose tolerance test (OGTT). The OGTT can be carried out via a 75-g two-hour test. The 75-g two-hour OGTT is a one-step approach. A diagnosis of GDM is made when the glucose value was elevated for the 75-g two-hour OGTT >= 130mg %. Patients with GDM were advised MNT and blood sugar was checked after 14days.The IADPSG criteria is the most commonly used threshold for defining elevated values recently following the Hyper-glycemia and Adverse Pregnancy Outcome (HAPO) study[15]. Overall, the 75-g two-hour test is more practical and convenient compared with the 100-g three-hour test. It appears to be more sensitive in predicting the pregnancy's complication like gestational hypertension, preeclampsia and macrosomia than the 100-g three-hour test[16] and is mainly that only one elevated glucose value is needed to diagnose GDM in 75-g two-hour test compared to 100-g three-hour test which requires two abnormal glucose values[15].

Management options included Medical nutrition therapy (MNT), Insulin therapy and exercise for control of sugar and foetal and maternal monitoring. International workshop on GDM concluded that failed MNT where FBS>95mg/dl and PPBS>120mg/dl, mean glucose >105mg/dl are indications to start insulin.

In addition to routine investigations and blood sugar estimation, serial USG along with other antepartum foetal surveillance tests were done to assess the foetus. Doppler ultrasound was done only in selected cases. Admission to the hospital was done if there was any maternal or foetal compromise. Uncomplicated cases are allowed to go into spontaneous labour. Poorly controlled GDM and IFC (impending foetal compromise) were delivered earlier. GDM on insulin were delivered at 38-39 weeks.

A semi-structured questionnaire containing sociodemographic and obstetrics details were used as a study tool and an interview schedule was used for data collection. Pre-gestational BMI was taken as a BMI calculated at first antenatal visit. Gestational weight gain was calculated by subtracting pre gestational weight from gestational weight of last trimester. The institutional ethical clearance was obtained prior to the study and written informed consent was obtained from individual patient. The maternal determinants analysed were maternal age at delivery, parity, BMI ,Weight gain in pregnancy. GDM on MNT / insulin/metformin, maternal complications, mode of delivery , indications of caesarean were noted. New-born of GDM mother looked for baby weight at birth, term /preterm and Apgar scores at birth.

The collected data was entered in Microsoft Excel and analysed using SPSS 23 version. The categorical variables were expressed in proportion and continuous variables were expressed as mean and standard deviation.

Results

Out of the 3267 deliveries during the period of study 189 (5.78 %) cases had GDM. Majority was between 25 and 29 years with a mean of 25.49 years. (Table 1)

Table 1: Maternal age and GDM

Age group	Frequency	Percentage
<20	24	12.7
21-24	54	28.6
25-29	84	44.4
30-34	22	11.6
>35	5	2.6
Total	189	100.0

47.3 % were first -time mothers and 52.7 % were multi gravid. (Table 2)

Table 2: Parity and GDM

Parity	Frequency (n=110)	Percentage
Nullipara	52	47.3
P2	45	40.9
P3	11	10.0
>P3	2	1.8
Total	110	100.0

50.8% were obese ,12.2% were overweight while 34.9% were of normal BMI.(Table 3)

Table 3: BMI and GDM

BMI	Frequency	Percentage
Under weight	4	2.1
Normal	66	34.9
Over weight	23	12.2
Obese	96	50.8
Total	189	100.0

4 underweight GDM mothers accounted for 2.1% . 69.8% gained weight of 10-12 kg while 2.1% gained more than 14 kg in their pregnancy .3.7% gained less than 9 kg in their pregnancy. (Table 4)

Table 4: GDM and pattern of weight gain

Weight gain	Frequency	Percentage
<9	7	3.7
10-12	132	69.8
12-14	46	24.3

>14	4	2.1
Total	189	100.0

- Normoglycemia was achieved with diet alone in 35 (18.5%) ,MNT and insulin therapy in 124 (65.6 %) mothers. Along with MNT, metformin also was used in 30 cases. (Figure 1)

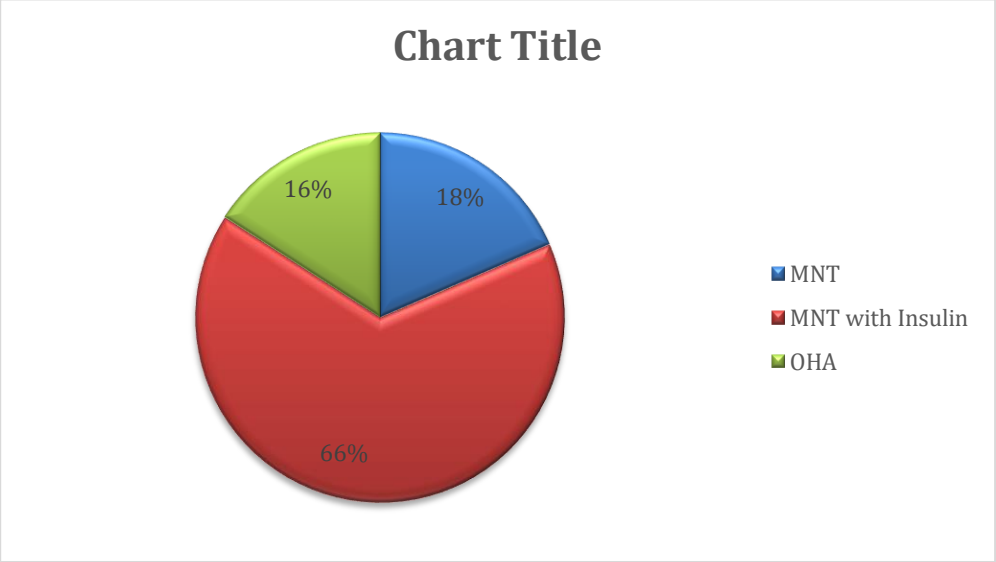

Fig.1: Severity of GDM

Maternal morbidities included Hypertensive disorder of pregnancy 50 /189 (26.5) cases, Anaemia in 10 mothers with abnormal GTT, Polyhydramnios in 04, UTI in 35 cases, Hypothyroidism in 39 cases(20.6).There was FGR in 5 babies born to GDM mothers.(Table 5)

Table 5: Morbidity in GDM mothers

Morbidity	Frequency	Percentage
Anemia	10	5.3
Urinary tract infection	35	18.5
Hypothyroidism	39	20.6
Polyhydramnios	4	2.1
FGR- Fetal growth restriction	5	2.6
Hypertensive disorders of Pregnancy	50	26.5

Regarding duration of pregnancy, 87cases (46 %) delivered preterm and 102 (54%) of patients had term delivery.(Table 6)

Table 6: Gestational age at birth

Gestational age at birth	Frequency	Percentage
>37 weeks Term	102	54.0
<37 weeks Preterm	87	46.0
Total	189	100.0

9.5% had Operative vaginal delivery .87 mothers with gestational diabetes needed Caesarean delivery. There were 84 mothers with Vaginal delivery as their mode of outcome. No patients were allowed to go past date. LSCS done for 46.03% cases, common indications being previous caesarean section, cephalopelvic disproportion, preeclampsia, FGR with failed induction, and failed induction and foetal distress. 71.3% needed Emergency caesarean delivery in view of Non reassuring fetal hear t rates, Failed induction, CPD, Impending eclampsia ,Previous caesarean .PPROM was seen in 7 cases which accounted for early preterm caesareans .(Table 7)

Table 7: GDM and Mode of outcome of delivery

Mode of outcome of delivery	Frequency	Percentage
Vaginal birth	84	44.44
Emergency caesarean	62	46.0
Elective cesarean	25	
Assisted vaginal birth	18	9.52
Total	189	100.0

Ten babies (5.3%) had weight 1.5-2.499kg and 59 babies (31.2%) had 2.5-2.99 weight. There were 45 babies (23.8) with >3.5kg. Majority (39.7% of the babies weighed 3-3.499 kg . (Table 8)

Table 8: GDM and Birth weight

Birth weight	Frequency	Percentage
1.5-2.499	10	5.3
2.5-2.99	59	31.2
3.0-3.499	75	39.7
>3.5	45	23.8
Total	189	100.0

Mean maternal age was 25.49. Mean BMI was 25.206. Mean weight gained in GDM mother was 11.75 kg . Baby of a GDM mother weighed 3185.85 grams.(Table 9)

Table 9: Mean of important variables

Variable	N	Mean
Age	189	25.49
BMI	189	25.206
Weight gain	189	11.75
Baby weight	189	3185.85

Discussion

GDM is the most common metabolic disorder complicating pregnancy. According to Seshiah et al in India –an important public health priority in the prevention of diabetes must be directed to address maternal health both during the antepartum and post-partum period[17]. Approximately 3-5% of all pregnancies are complicated by diabetes and 90 % of these are GDM and rest is pregestational. In German study- the Gestational diabetes mellitus (GDM) complicated ~4% of pregnancies[18]. Present study included 189 GDM cases and incidence being 5.7 %. Seshiah et al in Chennai, Wahi et al. in Jammu, and Gajjar et al in Baroda, Gujarat noted high prevalence of GDM in various similar studies[19,20,21]. This may be attributed to differences in age and/or socioeconomic status of pregnant women in these areas. About 4 million women are affected by GDM in India, at any given time point are affected by GDM[22,23]. According to Hold M et al[24] GDM is linked to several maternal, foetal and neonatal complications the characteristics of which are same is that of pregestational diabetes. Green MF[25] recommends 50gm OGCT as screening test. If the value is >= 130 mg/dl 100 gm oral glucose tolerance test (OGTT) done as a diagnostic test. O Sullivan et al[26] recommends 100 gm GTT for diagnosis which is the most commonly used one.4 One abnormal value was considered as impaired glucose tolerance test and if two or more values abnormal as GDM. Management options included Medical nutrition therapy (MNT), Insulin therapy and exercise for control of sugar and foetal and maternal monitoring. Langer O et al suggests that Metformin can be used as an alternative therapy[27].

Maternal age is an established risk factor for GDM, but there is no consensus on age's relation to increased risk of GDM. This is supported by the present study showing that the odds of GDM by age ≥ 25 . Majority were between 25 and 29 years with a mean of 25.49 years in the present study while it was 26.56±4.473 in Ennazhiyil SV et al[28].

BMI is commonly used in risk-based screening for GDM. Coming to BMI, 50.8% were obese, 12.2% were overweight while 34.9% were of Normal BMI in the present study. South Asian women were older and more obese among GDM patients[29]. Therefore, advancing age, increasing BMI and racial group are associated to the high prevalence of GDM in Asia. It could also be due to a genetic predisposition of Asians to have a higher risk of insulin resistance compared to Caucasian[30].

The risk factors of GDM were those with multiparity ≥2 in the present study as well as in Ennazhiyil SV et al[28]. Previous history of GDM, congenital anomalies, stillbirth, abortion, preterm delivery, macrosomia, having concurrent PIH, PCOS, age ≥ 25, BMI ≥25, and family history of diabetes were predictors of GDM according to Lee at al[31]. Similarly, to those with history of macrosomia and PIH have 4 times and 3 times for odds to have higher insulin resistance which is consistent with the finding as in the present study[32,33]. London MB[34] et al opined foetal surveillance should be started at 28-32wks which could avert stillbirth, foetal compromise and preterm delivery. Kofinas A et al[35] in their study recommended Doppler ultrasound study as a clinical tool for foetal surveillance in GDM with placental vascular compromise.

Normoglycemia was achieved with diet alone in 35 (18.5%),MNT and insulin therapy in 124 (65.6 %) mothers. Along with MNT, metformin also was used in 30 cases. Normoglycemia was achieved with diet alone in 44 (32.8%) diet plus insulin in 87 (64.92%) and metformin with insulin therapy was needed for glycaemic control in 3 cases in Sathiamma P K et al[36].

In the present study, maternal morbidities included Hypertensive disorder of pregnancy (26.5) cases, Anaemia in 10 mothers, Polyhydramnios , UTI , Hypothyroidism (20.6). In Sathiamma P K et al[36], polyhydramnios, both macrosomia (2.9%), FGR, UTI, PIH was seen in 11.9%. In the present study 46 % delivered preterm. 9.5% needed Assisted vaginal births .87 mothers with gestational diabetes needed Caesarean delivery. 71.3% needed Emergency caesarean delivery in view of Non reassuring fetal heart rates(NRFHR), Failed induction, FGR with abnormal doppler patterns ,CPD, Impending eclampsia and Previous caesareans

Person B[37] et al proved that even with good glycaemic control , there was increased risk of maternal complications. Rasmussen MJ[38] et al opined that delivery before full term is not recommended unless there is evidence of macrosomia, polyhydramnios, FGR and poor glycaemic control . 62.68% of patients had spontaneous onset of labour and elective termination was done in 37.32%. Delivery was by vaginal route in 41% cases. Caesarean rate was 59%, 22% elective and 78% were emergency caesareans.

Conclusions

We emphasise that the risk factors for GDM are recognized so that the clinicians are able to pick those prone to develop GDM for early diagnosis and start intensive lifestyle modification and treatment . Antenatal screening for GDM should be made mandatory for all the pregnant mothers with risk factors using one-step screening method which is efficient and repeat if negative at 28 and 32 weeks of gestation.

Recommendations

Increase in the prevalence of GDM in the rural areas of North Kerala would initiate necessary health awareness programs among adult female and assist early detection of GDM and prevent or ameliorate adverse complications.

Limitations

Larger sample size and comparison groups would have given better predictability.

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Ethical approval

The study was approved by the Institutional Ethics Committee, KMCT Medical College.

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