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# A Prospective Study on Single Step 75 Grams Oral Glucose Tolerance Test for Screening and Diagnosis of Gestational Diabetes Mellitus and its Fetomaternal Outcome at a Tertiary Care Centre

**Mortha Sulochana, N Swetha Goud, O Balajojamma***

*Department of Obstetrics & Gynecology, Ayaan Institute of Medical Sciences, Kanakamamidi, Telangana, India*

## ABSTRACT

*Gestational diabetes is defined as "carbohydrate intolerance of variable severity with onset or first recognition during pregnancy irrespective of the treatment with diet or insulin". The prevalence of GDM in India varies from 3.8 to 21% in different parts of the country. The incidence of GDM is expected to increase to 20% i.e., one in every 5 pregnant women is likely to have GDM. The pregnancy is believed to unmask the tendency toward type 2 diabetes, and it should be noted that the 5-year risk of developing type 2 diabetes in women with GDM is as high as 60%. Women with GDM are at an increased risk for hypertensive disorders during pregnancy compared to those without GDM. It is evident from several studies that GDM per se is an independent risk factor for hypertensive disorders during pregnancy, with an increased relative risk ranging from 1.4 to 2. Clinical recognition of GDM is important because timely intervention can reduce the well-described associated maternal and fetal complications.*

*The study was conducted at Department of Obstetrics & Gynaecology, Ayaan Institute of Medical Sciences, Kanakamamidi, Telangana conducted with sample size of 400. All the antenatal women attending outpatient department during the study period are included as per the Inclusion & Exclusion criteria.*

*400 women had undergone 75 grams OGTT test at 24 weeks of gestational age and were followed up till 7 days of postpartum for maternal and fetal outcome. In initial screening, 19 women had GDM out of 400 women accounting for 4.7%. After rescreening in 183 high risk women for GDM, 2 had GDM out of accounting for 1%. Out of 400 cases, 21 had GDM. GDM incidence was 5.2% using the DIPSI method. The mean maternal age of women in the study with GDM was years 26 ± 2 years (mean ± 2SD). Youngest woman with GDM was 22 years old and the oldest woman with GDM was 32 years old. There was significant correlation between age >26 years and GDM. Incidence of GDM among primigravida was 5% and among multigravida was 5.4%. There was no significant correlation between gravida and incidence of GDM. Number of women who had pregnancy complications like gest. HTN, polyhydramnios, preterm labour, PPH in GDM group were 6(28.5%), 3(14.2%), 3(14.2%), 3(14.2%), Whereas in the non GDM women number of women having these complications were 27(7.1%), 10(2.6%), 17(4.4%), 15(3.9%). There was a significant correlation between GDM and developing pregnancy complications.*

*Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycemia. In our study out of 400 patients, 21 mothers were diagnosed as GDM; its prevalence is 5.2% in our hospital. Similarly, diabetes complicates 3-4 % of pregnancies in most World Series, but where intensive screening has become a part of routine antenatal care; more cases are being detected with a range of 1-14%. However, it varies among different populations of different geographical origins and ethnic backgrounds. Some of the local factors contributing to this high incidence are poverty and ignorance. People are usually not aware of the nutritional and caloric values of food and its implication on body weight and health.*

**Key words:** OGTT (Oral Glucose Tolerance Test), GDM (Gestational Diabetes Mellitus), Hypertension, Feto-maternal complications

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**Corresponding author:** O Balajojamma
**e-mail** ✉ :medicalresearch2020@gmail.com
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## INTRODUCTION

Gestational diabetes is defined as "carbohydrate intolerance of variable severity with onset or first recognition during pregnancy irrespective of the treatment with diet or insulin" [1]. The prevalence of GDM

in India varies from 3.8 to 21% in different parts of the country [2]. The incidence of GDM is expected to increase to 20% i.e., one in every 5 pregnant women is likely to have GDM [3]. The pregnancy is believed to unmask the tendency toward type 2 diabetes, and it should be noted that the 5-year risk of developing type 2 diabetes in women with GDM is as high as 60% [4].

During human pregnancy, several metabolic changes occur to promote efficient glucose transport, from the mother to the foetus. When this physiologic process interacts with the modern lifestyle with a carbohydrate rich diet and an obesity epidemic, GDM is the Result [5]. Several placental-derived hormones such as Cortisol, Leptin and hPGH are believed to play a role in insulin resistance [5]. Pregnancies complicated by GDM stimulate the dysregulation of metabolic vascular and inflammatory Pathways by increasing concentrations of inflammatory molecules [6].

Glucose crosses the placenta by facilitated diffusion. The main transporter in the placenta is glucose transporter 1 (GLUT1). GLUT1 function does not depend on the presence of insulin. Therefore, fetal glucose levels parallel maternal glucose levels, but it is 10mg/dl lower compared to mother [7].

The factors that have been postulated to influence the risk of GDM among mothers include a positive family history of diabetes, treatment for infertility, recurrent, urinary tract infections, macrosomic infant, unexplained neonatal death, prematurity, pre-eclampsia, diabetes in previous pregnancy, and advancing maternal age [8].

Women with GDM are at an increased risk for hypertensive disorders during pregnancy compared to those without GDM. It is evident from several studies that GDM per se is an independent risk factor for hypertensive disorders during pregnancy, with an increased relative risk ranging from 1.4 to 2 [9-12]. Conditions associated with increased insulin resistance, such as gestational diabetes, polycystic ovary syndrome and obesity were also found to be risk factors for developing hypertension during pregnancy13. Laboratory parameters, associated with the metabolic syndrome of insulin resistance, are also observed more frequently in women with hypertension during pregnancy, such as: hyperinsulinemia, hyperlipidaemia and elevated levels of Plasminogen Activator Inhibitor-1, Leptin and TNF [13].

GDM is a risk factor for Cesarean sections and operative deliveries, and is independent of birth weight, associated with Cesarean delivery rate of up to approximately 30% [11,14,15]. The degree of glucose intolerance (determined by FPG > 105mg/dl) and maternal weight are independent variables that significantly increase the risk for operative delivery [15]. The diagnosis of postpartum T2DM can be made shortly after delivery, suggesting it to be pre-existing overt diabetes and not GDM, or weeks, months, and years after delivery [16,17]. The prevalence of abnormal carbohydrate tolerance following a pregnancy with GDM was evaluated in numerous studies [18-23].

Clinical recognition of GDM is important because timely intervention can reduce the well-described associated maternal and fetal complications. Non- communicable diseases are programmed and imprinted during pregnancy, diagnosis and management may help turn the tide of diabetes-NCD pandemic [9]. We should aim for "Diabetes Free Generation - Focus on the Fetus for the Future". 1.5 to 3-fold higher risk of perinatal death of offspring of women with GDM compared to those of nondiabetic pregnancies [24]. The American Diabetes Association (ADA) position statement suggests that a threshold of fasting hyperglycemia (which objectively reflects level of disease severity) of >105 mg/dl (5.8 mmol/L) may be associated with an increased risk of late (last 4-8 weeks of pregnancy) intrauterine fetal death in women with GDM [25]. The key pathway leading to intrauterine fetal death is chronic hypoxia.

The aim of the present study was to evaluate the prevalence of GDM in the antenatal women using "single step procedure of 75 grams OGTT" and estimating plasma glucose at 2 hours and to evaluate and compare the occurrence of GDM in normal antenatal women and in women with risk factors for GDM; To follow up patients and study correlation between GDM and fetomaternal outcome; To study the diagnostic value of single step 75 grams glucose tolerance test in the prediction of GDM and adverse Fetomaternal outcome.

## MATERIALS AND METHODS

The study was conducted at Department of Obstetrics & Gynaecology, Ayaan Institute of Medical Sciences, Kanakamamidi, Telangana from April 2021 to December 2021 after obtaining Institutional Ethical Clearance. It was a hospital based prospective study conducted with sample size of 400. All the antenatal women attending outpatient department at Department of Obstetrics & Gynaecology, Ayaan Institute of Medical Sciences, Kanakamamidi, Telangana during the period is included as per the Inclusion & Exclusion criteria. All the Antenatal women with singleton pregnancy with gestation age more than 24 weeks (24-40 weeks), not fulfilling the exclusion criteria and those participants who gave informed consent are included for the study. Exclusion criteria are Gestational age less than 24 weeks, Twin gestation, History of GDM or pre-existing diabetes mellitus (DM), Abnormal gestational diabetes (>=135 mg/dl) testing prior to 24 weeks gestation, Asthma requiring medication, Current or planned beta adrenergic therapy, Chronic hypertension requiring medication within 6 months of or during pregnancy, Chronic medical conditions such as HIV/AIDS, kidney disease, or CHD, Hematologic or autoimmune disease such as SCD, other hemoglobinopathies, lupus, APLA and taking medications such as corticosteroids, antipsychotics, Participant not willing to take OGTT (24–28 gestational weeks), or not willing to have a series of prenatal care visits and deliver in our hospital.

Informed and written consent of all cases for single step 75 grams OGTT testing were taken after explaining the procedure and its complications. Each mother at 24-28

**Table 3: Patient characteristics (obstetrics status).**

| Gravida | Total cases | GDM | % | Non GDM | % | P value |
|---|---|---|---|---|---|---|
| G1 | 198 | 10 | 5% | 188 | 95% | 0.859 |
| G2 | 154 | 8 | 5.10% | 146 | 94.90% | 0.968 |
| >/=G3 | 48 | 3 | 6.20% | 45 | 93.80% | 0.74 |
| Total | 400 | 21 | 5.20% | 379 | 94.80% | |

**Table 4: 75 grams OGTT values.**

| 75 grams OGTT value | Total cases | % |
|---|---|---|
| <140 | 379 | 94.75% |
| 140-149 | 2 | 0.50% |
| 150-159 | 6 | 1.50% |
| 160-169 | 4 | 1% |
| 170-179 | 3 | 0.75% |
| 180-189 | 4 | 1% |
| 190-199 | 2 | 0.50% |
| Total | 400 | 100% |

**Table 5: Pregnancy complications associated with gestational diabetes.**

| | GDM | % | Non GDM | % | P value |
|---|---|---|---|---|---|
| Vaginal candidiasis | 5 | 23.80% | 33 | 8.70% | 0.02 |
| Gestational Hypertension | 6 | 28.50% | 27 | 7.10% | 0.0005 |
| Polyhydramnios | 3 | 14.20% | 10 | 2.60% | 0.003 |
| Preterm labour | 3 | 14.20% | 17 | 4.40% | 0.04 |
| PPH | 3 | 14.20% | 15 | 3.90% | 0.02 |
| APH | 0 | - | 5 | 1.30% | - |

Pregnancy complications: Number of women who had pregnancy complications like gest. HTN, polyhydramnios, preterm labour, PPH in GDM group were 6(28.5%), 3(14.2%), 3(14.2%), 3(14.2%), Whereas in the non GDM women number of women having these complications were 27(7.1%), 10(2.6%), 17(4.4%), 15(3.9%). There was a significant correlation between GDM and developing pregnancy complications (Table 6).

**Table 6: Various modes of delivery in gestational diabetes. P value for C-section in GDM is 0.02 which is significant.**

| Mode of delivery | GDM | % | Non GDM | % |
|---|---|---|---|---|
| Normal vaginal Delivery | 7 | 33.30% | 243 | 64.10% |
| Operative vaginal delivery | 3 | 14.20% | 24 | 6.30% |
| Caesarean section | 11 | 52.30% | 112 | 29.50% |

Mode of delivery: Out of 21 GDM women, 11(52.3%), delivered by C-section.

Treatment: Out of 21 women diagnosed with GDM, glycemic targets were achieved with MNT in 17(81%) women and 4(19%) required insulin to achieve glycemic targets.

Fetal outcome: In the present study, mothers with fetal complications were 8(38%) in the GDM group and in non GDM group were 59(15.5%). There was a significant correlation between GDM and their neonates having complications. There was a significant correlation between GDM and neonatal hypoglycaemia, shoulder dystocia and macrosomia. Complications such as SGA, neonatal asphyxia, jaundice requiring phototherapy had more incidence in GDM women (14.2%, 14.2%, 14.2%) than in non GDM women (9%, 2.9%, 4.7%) (Table 7).

**Table 7: Present pregnancy fetal outcome.**

| Proportion of mothers whose babies experienced the described outcome | | | | | |
|---|---|---|---|---|---|
| **Complications** | **GDM** | **%** | **Non GDM** | **%** | **P value** |
| Proportion of mothers with Fetal/neonatal complications | 8 | 38% | 59 | 15.50% | 0.007 |
| Macrosomia | 3 | 14.20% | 8 | 2.10% | 0.0008 |
| Perinatal death | 0 | 0 | 6 | 1.50% | - |
| Shoulder dystocia | 1 | 4.70% | 2 | 0.50% | 0.02 |
| Hypoglycemia | 3 | 14.20% | 14 | 3.90% | 0.01 |
| Congenital anomaly | 0 | 0 | 6 | 1.50% | - |
| SGA | 3 | 14.20% | 34 | 9% | 0.41 |
| asphyxia | 3 | 14.20% | 11 | 2.90% | 0.005 |
| Jaundice requiring phototherapy | 3 | 14.20% | 18 | 4.70% | 0.05 |

## DISCUSSION

The prevalence of GDM in India varies from 3.8 to 21% in different parts of the country2. Both short term and long-term morbidity in the offspring increases with increasing maternal glycemic levels; however, the mode change occurs at the inflection point of maternal 2 hour plasma glucose >140 mg/dl [26]. The Diabetes in Pregnancy Study Group India (DIPSI) recommended a 'single step' diagnostic procedure for all patients (universal screening) [26]. Single step approach is more feasible, economical, reliable, patient tolerant and serves as a screening as well as a diagnostic method. GDM is associated with maternal and fetal morbidity, early diagnosis and treatment with MNT/ insulin may prevent maternal and fetal complications. The importance of GDM is that two generations are at risk of developing diabetes. Non communicable diseases are programmed and imprinted during pregnancy, diagnosis and management may help turn the tide of diabetes-NCD pandemic [15].

Incidence of GDM: In the present study with study population 400 conducted at a tertiary care centre in Hyderabad, the number of women with GDM was 21(5.2%). In the initial screening at 24 weeks of gestational age, 19(4.7%) women had GDM. After rescreening of 183 women with high-risk characteristics, 2(1%) had GDM. The total incidence of GDM was 21(5.2%) women. In a study done by Sujata et al. with study population 500 at Odisha in 2017, the number of women with GDM were 25(5%), initial screening diagnosed 23(4.6%) and rescreening diagnosed 2 (0.8%) out of 250 women with high-risk characteristics [27]. A study done by Alpana et al with the study population of 400, at Hyderabad in 2013 had a 5.7% incidence of GDM [28].

Age distribution: In the present study, the mean maternal age of women in the study with GDM was years 26 ± 2 years (mean ± 2SD). The youngest woman in the study was 17 years old and the oldest woman was 36 years old. Youngest woman with GDM was 22 years old and the oldest woman with GDM was 32 years old. Most women in the study were in the age group of 20-25 years. A total of 286 (71.5%) cases were screened at the age of 20-25 years and 20 (5.0%) cases were above 30 years of age. 38 cases (9.5%) were less than 20 years of age. No cases of GDM were seen below 20 years or above 35 years of age group. The incidence of GDM was 4.1% in the 20-25 age groups. The incidence of GDM was more in 26-30 and >30 years age group. The incidence of GDM was 10.7% and 15% in the 26-30 and > 30 years age group. There was a significant correlation between age >26 years and GDM.

In the study by Sujata et al. a total of 382 (76.4%) cases were screened at the age of 20-30 years and 25 cases (5%) of GDM were diagnosed at the age group between 20-35 years. No cases of GDM were seen below 20 years. The incidence of GDM was 5.76% in the age group of 20-30 years. The mean maternal age of the patients with GDM was 30.42 years [29]. In the study done by Rajani et al. with a study population of 225 at Uttar Pradesh in 2015, the mean age of women was 25.46 years. Out of 225 pregnant women, 22 women (9.7%) were diagnosed as GDM using DIPSI recommended 75 gems OGTT. Gestational diabetes mellitus was found to occur more in women above 25 years of age. The mean maternal age of the women was 25.46 years.

With age the incidence of GDM was increasing. The incidence of GDM above 30 years age group was 23.5%. The incidence of GDM was 8.6% and 13.8% in the age groups 20-25 and 26-3029. In the study done by Alpana et al. The mean maternal age of pregnant patients was 22.20 (S.D 2.96). Most patients were in the age group of 20-25 years. The incidence of GDM was 30% above the age group of 30. The incidence of GDM was 5.5% and 8.3% in the age groups of 20-25 and 26-30. There was a significant correlation between age >30 years and GDM28.

Distribution of cases according to gravida and occurrence of GDM: In the present study, 49.5% were primigravida, 50.5% of women were multigravida. The incidence of

GDM among primigravida was 5% and among multigravida was 5.4%. No case of GDM was detected in the grand multigravida. Among women with gravida 2, the incidence of GDM was 5.1%. With increasing gravida, the incidence of GDM was increasing, but there was no significant correlation between gravida and incidence of GDM. In the study by Sujata et al. [15] cases (5.3%) of GDM were detected in primigravida, 10 cases (5.55%) of GDM were detected in multigravida and no case of GDM was detected in grand multigravida [27]. In the study by Alpana et al., most of the cases were primigravida (50%), however, there was no statistically significant association between gravida and GDM. The incidence of GDM among primigravida was 7%. In women with gravida 2 incidence of GDM was 4.5% [28].

In the present study 22(11%) women were illiterate and women who had completed high school/ higher education were 129(32.2%). There was no significant correlation between education and GDM. Regarding education, GDM was more common in uneducated (9%) and those having higher education (6.2%), than women having low education (4.41%). In the study by Sujata et al. GDM was more common in uneducated (6%) and those having higher education (18.66%), than women having low education (2.13%)27. In the present study, no woman in the study was in SES class 1. Most women were in SES class 4 (39%). GDM was more in higher SES class 2(11%) than in lower SES classes 3, 4, 5(5.1%). There was no significant correlation between SES and GDM incidence. In the study done by Rajani et al. most women diagnosed to have GDM belonged to the upper class showing a positive co-relation [29].

GDM incidence in relation to BMI: In the present study, most women were in the normal weight group (54%), 36(9%) women were underweight, 117(29.25%) women were overweight and 31(7.5%) were obese. There was no case of GDM in underweight women. Among the normal weight group, the incidence of GDM was 3.1%. The incidence of GDM increased with increasing weight. The incidence of GDM among overweight women was 8.5%. Among obese women, the incidence of GDM was 12.9%. There was a significant correlation between obesity and the incidence of GDM.

In the study by Sujata et al. 263 patients had a normal weight (BMI 18.5-24.9), 195 were overweight (BMI 25-29.9) and 37 patients were moderately obese (BMI 30-39.9), 5 patients were severely obese (BMI >40). There was no case of GDM in underweight women. Amongst 37 overweight patients, 2 (5.4%) patients had GDM. Among normal- weight women, 12(4.18%) had GDM27.

Family history of diabetes mellitus: In this study, 8(38%) of GDM women had a family history of diabetes mellitus, 23(6%) women without GDM had a family history of DM. There was a significant correlation between family history of DM and the incidence of GDM. In the study by Sujata et al. in the GDM group, 10 patients out of 25 had a family history of DM, which constitutes 40% of the patients [27]. It is consistent with international studies, which report that only 45% of women found to have carbohydrate intolerance have defined features of potential diabetes. It signifies that practice in antenatal clinics, of only performing a GTT on a mother if she has one of the features of potential diabetes is both time consuming and incomplete and 55-58% of the eases may be missed by that strategy [27]. So universal screening as proposed by DIPSI is more feasible, less time consuming and more efficacious. In the study done by Sudipta et al. 46% of GDM mothers had a positive family history for diabetes as compared to 20% Non GDM mothers [30].

In the present study history of giving birth to a macrosomic baby was there in 1(4.7%) of GDM women, 3(0.8%) in non GDM women. History of previous abortions and perinatal deaths was more in GDM women (9.5%, 9.5%) than in non GDM women(5.5%, 1.8%). history of taking treatment for infertility had a significant correlation with the incidence of GDM. Among the women who had developed GDM 2(9.5%) had a history of taking treatment for infertility and in Non GDM women, 4(1%) had a history of taking treatment for infertility. In the study done by Dudhwadkar et al. with a study population of 500 with 5% incidence of GDM conducted at Mumbai, macrosomia was seen in 18% of women, history of perinatal death in previous pregnancy in 8% of women and abortion history was there in 10% women in the GDM group30. In the study done by Alpana et al., 8.7% of women among GDM group had a history of previous abortion [28].

In the present study, 4(19%) women required insulin to achieve euglycemic targets. In a similar study, Crowther et al. found that 20 percent of women with GDM need antenatal insulin treatment (AIT) to achieve good glycemic control [31].

Pregnancy complications: In the present study, 5(23.8%) women had vaginal candidiasis in GDM group. There was a significant correlation between GDM and vaginal candidiasis. Gestational hypertension developed among 6(28.5%) women in GDM group. There was a significant correlation between GDM and developing gestational hypertension as a pregnancy complication. Number of women who had pregnancy complications like polyhydramnios, in the GDM group were 3(14.2%), whereas in the non GDM women number of women having polyhydramnios were 10(2.6%). The number of women who had preterm labour in the GDM group was 3(14.2%). The number of women who had PPH in the GDM group was 3(14.2%), There was a significant correlation between GDM and developing pregnancy complications such as polyhydramnios, preterm labour, PPH. Among the GDM women, no one had APH.

In a study done by Mannan et al. with a study population of 960 at a Bangladesh urban hospital, the incidence of gestational hypertension among GDM women was 25%. The percentage of women who had polyhydramnios in GDM group was 33.3.%, the percentage of women who had preterm labour in the GDM group was 16.7%. 13.9% of women had PPH in the GDM group [32]. In the study done by Xinhong et al. the prevalence of vaginal

candidiasis in GDM women was 22.6%33 like our study. In the study done by Sujata et al. in the GDM group, vaginal candidiasis was seen in 9(36%) women and gestational hypertension was seen in 6(24%). Polyhydramnios was seen in 3(12%) GDM women. 2(8%) women in the GDM group had preterm labour. No women in the GDM group had APH. PPH was seen in 3(12%) GDM women [27].

In the present study among the non GDM women number of women having polyhydramnios was 10(2.6%). The number of women having vaginal candidiasis in the non GDM group was 33(8.7%). The number of women who had developed gestational hypertension in the non GDM group was 27(7.1%). The number of women who had polyhydramnios in the non GDM group was 10(2.6%). Number of women who had delivered preterm was 17(4.4%) in the non GDM group. The number of women who had APH and PPH in the non GDM group was 15(3.9%) and 5(1.3%) respectively. In the study done by Xinhong et al. the prevalence of vaginal candidiasis in non GDM women was 9.7% [33]. In a study done by Sneha et al. at Mumbai the incidence of APH was 1.31%, which is like our incidence of 1.3% [34].

Mode of delivery: In the present study, among the 21 GDM women, 3(14.2%) had an operative vaginal delivery. 2 had delivered by vacuum-assisted vaginal delivery and 1 had delivery by forceps assisted vaginal delivery. 11(52.3%) women had delivered via Cesarean section. There was a significant correlation between C-section as a mode of delivery and GDM. In the study done by Mannan et al. in the GDM group, 48.6% had delivered via Cesarean section35. In the study done by Sujata et al. among the GDM group, 6(24%) had an operative vaginal delivery and 14(56%) had delivered via Cesarean section [27].

## SUMMARY AND CONCLUSIONS

Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycemia. In our study out of 400 patients, 21 mothers were diagnosed as GDM; its prevalence is 5.2% in our hospital. Similarly, diabetes complicates 3-4 % of pregnancies in most World Series, but where intensive screening has become a part of routine antenatal care; more cases are being detected with a range of 1-14%36. However, it varies among different populations of different geographical origins and ethnic backgrounds. Some of the local factors contributing to this high incidence are poverty and ignorance. People are usually not aware of the nutritional and caloric values of food and its implication on body weight and health. Carbohydrate based food is cheap and taken as a staple diet, whereas fat is used to add to the taste of the food. Moreover, a lack of awareness regarding weight control puts them in the habit of excessive eating. The situation is further accentuated during pregnancy, where the women are customarily advised to take the food for 'two'. This leads to obesity and unfortunately, this is taken as a sign of beauty and health in most of the rural populations. These facts put our population at higher risk for the development of diabetes and the importance of intensive screening for the detection of pre-clinical disease. Universal screening will be more practical to overcome the burden. The age group at risk of getting gestational diabetes in this study was >25 years. This was like other studies where age was equal or more than 25 years and was considered as a high risk for screening.

In present study women over the age of 35 years were significantly less. It is because fewer women opt for pregnancy during the later years of life, although more of them develop overt diabetes mellitus. Age and obesity influence the likelihood of GDM. All the mothers with gestational diabetes were of low parity (that is para 1-3). Similar studies have shown that increased parity was less consistently associated with increased risk for developing gestational diabetes mellitus.

In our study, it was seen that women in the uneducated group were more likely to develop GDM than their counterparts. This can be explained as these groups are not health conscious and they don't know the right food pattern during pregnancy. In this study, nearly 66.6% of mothers with gestational diabetes had a body mass index of greater than 25. This finding confirms the earlier conclusions made by other studies that women who are obese were at high risk of getting gestational diabetes mellitus in pregnancy. Family history of diabetes and association with other disorders like hypertension was present in many cases as is reported in other studies. In our study, significant numbers of cases were detected by rescreening at 32 to 36 weeks who are screen negative during the initial screening procedure (i.e., 9.5% in GDM group). It is because the glucose intolerance increases with advancing gestational age. The patients with healthier pancreas were detected after 32 weeks of gestation. These findings are consistent with international reports75. Likewise, mothers with gestational diabetes mellitus were four times more likely to have hypertension and three times more likely to have vaginal candidiasis than the controls. The high body mass index or obesity of women with gestational diabetes predisposed them to hypertension.

However, this was not surprising because even the fourth International Workshop Conference on gestational diabetes suggested that since the onset of hyperglycemia occurs late in pregnancy when organogenesis is complete, it is not associated with an increased incidence of congenital malformations37. Most of the GDM mothers 17 (80.9%) showed a good response to MNT, but a few 4 (19%) had required insulin during the period. This indicates the importance of MNT in GDM women; this view is supported by various national and international studies.

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