

Gestational Diabetes Mellitus: A Prospective Study

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Abstract

Background: Maternal hyperglycemia is considered a risk factor for both fetus and mother which can lead to significant morbidity and sometimes, even mortality. Here, we present a two years study of gestational diabetes which was intended to see the incidence and its determinants in the Patan Hospital, Kathmandu, Nepal. Patan Hospital is a tertiary care level teaching hospital.

Subjects and Methods: All pregnant women visiting ANC clinic or admitted to the ward with the diagnosis of GDM from July 2005 to June 2007 at Patan Hospital were taken for the study. In Patan Hospital, pregnant ladies are routinely screened for diabetes with 50 gm glucose challenge test (GCT) and if the value is more than 140 mg/dl, they are subjected to 100 gm Oral Glucose Tolerance Test (OGTT). If two or more than two values are increased, they are managed as gestational diabetes. These cases of gestational diabetes are enrolled for the study. Data was collected by interview and laboratory investigations using standard set of questioner.

Results: Out of 13,382 consecutive deliveries, 53 patients were admitted with the diagnosis of gestational diabetes mellitus (GDM). Among them, 40.4% were Brahmin, 38.5% Newar, 11.5% Chettri and 9.6% from other cast. GDM was more common in the age group 26 to 35 years and was more prevalent in urban population than rural (urban 84.6% vs rural 15.4%). Similarly, it was more common in multipara patients. Only 28.8% of the cases were having polyhydramnios on ultrasound. Mean weight gain in pregnancy was 8.96 kg with a range of 3 to 20 kg approximately, 58% of patients had family history of diabetes, 48.7% of patients had history of GDM in previous pregnancy and 7.7% of patients had overt diabetes. Most of the patients needed insulin (92.3%) and only 7.7% of patients were managed with only diet and exercise. No significant fetomaternal complication was observed in our study.

Conclusion: There was significant number of cases diagnosed as GDM. All patients who were diagnosed early and treated accordingly had less complications related to mother and child.

Keywords: Gestational diabetes mellitus, maternal hyperglycemia, incidence, determinants.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of varying degrees of severity with onset or first recognition during pregnancy.¹ The definition applies whether insulin or only diet modification is used for the treatment and whether or not the condition persists after pregnancy. It does not exclude the possibility that unrecognized glucose intolerance may have antedated or begun concomitantly with the pregnancy.²

The magnitude of GDM varies according to the country and their ethnical groups. The lifestyles, educational status, history of diabetes in family and many other factors play an important role.³⁻⁷ Many studies have been done in western world and Asian countries to find out the magnitude of the disease and their associated factors. Those studies reveal remarkable percentage of GDM detected in pregnancy, which would otherwise have been undetected or complicated the pregnancy. We did not find any study related to this in our context regarding incidence in our population and its associated factors. So some pregnancy going undetected in first might complicate in the proceeding pregnancy or even in the same

pregnancy it is detected when it gets complicated. This is preventable and can be prevented.

Early recognition of GDM is very essential to prevent maternal morbidity and mortality. GDM may complicate during the pregnancy, intrapartum or postpartum. Birth trauma and poor fetal outcome are important complications. GDM doubles the risk of serious injury at birth, triples the likelihood of cesarean delivery and quadruples the incidence of newborn intensive care unit admission.⁸ These complications can be prevented if GDM is detected earlier and treated. In developing country like us, early detection and prevention will be more cost-effective.

Since, we do not have the figures regarding the gestational diabetes, this study had been designed to find out the disease burden in our context as well as its associated factors.

LITERATURE REVIEW

Gestational diabetes mellitus is one of the common medical conditions during pregnancy, some of them are overt and other are gestational diabetes. Gestational diabetes is detected first time during pregnancy and becomes normoglycemic in postpartum period. Due to increased level of human placental

lactogen, steroid hormones there is marked insulin resistance during pregnancy and some of these ladies will come in the boundary of gestational diabetes. Glucose tolerance deteriorates in human pregnancy, but about 97 to 98% of all pregnant women retain a normal glucose tolerance and only 2 to 3% develop GDM.⁹ Although the blood sugar level comes to normal level during postpartum, these ladies have high chance of developing overt diabetes in their future life.

A study done in India reported the prevalence of known diabetes and GDM to be 1.19 and 0.56%, respectively.⁸ Based on the National Diabetes Data Group criteria, the percentage of pregnant nondiabetic women who had GDM was 4%.¹⁰ However, the Fourth International Workshop-Conference on Gestational Diabetes showed that the percentage of non-diabetic pregnant women having GDM increased to 7% resulting in more than 200,000 cases annually.¹¹ Similar study done in Australia in 2005-06, diagnosed GDM in 4.6% of women aged 15 to 49 years.¹²

The risk of GDM increases with age, from 1% among 15 to 19 year-old women to 13% among women aged 44 to 49 years. Women aged 30 to 34 years accounted for more than one-third of GDM cases in 2005-06.¹² The overall prevalence may range from 1 to 14% of all pregnancies, depending on the population studied and the diagnostic tests employed. In women with defined low-risk factors, such as white ethnic origin, age younger than 25 years, and a body mass index (BMI) of less than 25 kg/m², prevalence of GDM ranges from 1.4% to 2.8%.^{3-6,13} The prevalence in women with defined high-risk factors, such as age older than 25 years, obesity, or a family history of diabetes, ranges from 3.3% to 6.1%.⁶ Higher rates have been reported in certain ethnic groups.^{14,15}

Another study described diabetes (prevalence and types) and pregnancy outcomes among women with diabetes in a multiethnic population (Asian, African and Norwegian). The proportion of pregnancies with diabetes among women 15 to 49 years was seven times higher in the Asia/Africa group (1.8%, 95% CI = 1.6-2.1) than in the group of ethnic Norwegians (0.3%, 95% CI = 0.2-0.3). Gestational diabetes made up 80% of the diabetes cases among women born in Asia/Africa (13% of type 2 and 5% of type 1) and 48% of the cases among women born in Norway (5% were type 2 and 45% were type 1). A study showed the frequency of recurrent GDM in subsequent pregnancies was 45% (95% CI = 35.6-54.4%). Women with impaired fasting glucose and/or impaired glucose tolerance two months postpartum were at increased risk for recurrent GDM (Relative risk = 2.31, 95% CI = 1.24-4.30).¹⁶

GDM is suspected when the glucose challenge test (GCT) shows a high value, usually 140 mg/dl and which is confirmed by 100 gm OGTT. If we take a cut off value of 140 mg/dl in GCT it will cover 98% of gestational diabetes and if we take 130 mg as cut off it will cover almost 93% of the expected gestational diabetes. GCT is a good screening test to diagnose gestational diabetes. For the screening, GCT is easy and quick. This screening test is recommended to be done between 24th to 28th gestational weeks.¹⁷

Increased frequency of congenital anomalies and stillbirth were reported as a complication of GDM.^{18,19} Macrosomia, hypoglycemia, jaundice, respiratory distress syndrome, polycythemia and hypocalcemia have been reported in infants of women with GDM.²⁰ Macrosomia affects 20 to 30 percent of infants whose mothers have GDM.²¹ In one of the study comparing different ethnicity African/Asian with Norwegian almost 10% of the newborns in both groups had birth weight >4500 gm.

Gestational diabetes mellitus is a common but controversial disorder. While no large randomized controlled trials show that screening for and treating gestational diabetes affect perinatal outcomes, multiple studies have documented an increase in adverse pregnancy outcomes in patients with the disorder. Data on perinatal mortality, however, are inconsistent. In some prospective studies, treatment of gestational diabetes has resulted in a decrease in shoulder dystocia (a frequently discussed perinatal outcome), but cesarean delivery has not shown to reduce perinatal morbidity. In the same study discussed above the percentage of cesarean section was 37 in the Asia/Africa-group and 42 in the Norway-group. The trial compared active induction of labor at 38 completed weeks of pregnancy, to expectant management until 42 weeks. The risk of cesarean section was not statistically different between groups [relative risk (RR) 0.81, 95% confidence interval (CI) 0.52-1.26]. The risk of macrosomia was reduced in the active induction group (RR 0.56, 95% CI 0.32-0.98). Three cases of mild shoulder dystocia were reported in the expectant management group. No other perinatal morbidity was reported.

AIMS AND OBJECTIVES

The aim of this study was to investigate the incidence of gestational diabetes mellitus (GDM) and the associated factors for the development of GDM in pregnant women visiting ANC at Patan Hospital, Nepal. The possible associated factor explored includes age of the mother, socioeconomic condition and the education level of the patient and her husband. This will also see the relationship with parity, family history of diabetes, previous history of gestational diabetes, overt diabetes, polyhydramnios, mode of delivery and birth weight.

METHODOLOGY

In this prospective hospital-based study done at Patan Hospital, all pregnant women visiting antenatal clinic or admitted to the ward with the diagnosis of GDM from July 2005 to June 2007 were included. Informed consent was taken from each patient. Data were collected by interview using a standard set of questioner. Patients were followed till delivery.

Screening was carried out at 24 to 28 gestational weeks. Venous blood was taken and GDM was suspected when the 50 gm glucose challenge test (GCT) showed a high value, usually 140 mg/dl and which was confirmed by 100 gm OGTT. If ≥ 2 values were abnormal, the patient was admitted to the ward for further management. Patients were managed in the

ward with consultation with diabetologist. According to the advice made by diabetologist, these patients were managed by diet alone or with insulin. After being stable blood sugar value they were discharged and followed in the OPD and after 34 weeks they were readmitted and kept as in-patients till delivery. In the hospital they are followed with blood sugar monitoring, glycosylated hemoglobin, serial ultrasound and by nonstress test. Delivery was planned after 37 weeks of gestation and mode of delivery mainly depended on the size of the baby, presentation, presence of other high-risk factors and cervical score.

Patients were classified according to cast as Brahmin, Chettri, Newar and others. The patients coming from VDC were taken as rural and others were taken as urban. Education of the patient and her husband was divided as studying or completed university level, school level and illiterate. Polyhydramnios was diagnosed by ultrasonography. Amniotic fluid index more than 5 mm of single pocket and more than 10 mm in four pockets was taken as cut off point for the polyhydramnios.

The women with GDM were followed and the birth weight of children after delivery was recorded which was taken into consideration to evaluate macrosomia (based on a cut-off point > 4000 gm birth weight as per the norm followed in the Toronto Tri-Hospital Gestational Diabetes Project). Congenital anomalies in newborns and stillborns were also looked for.

Statistical analysis was done using SPSS version 10.0. Chi-square test was used to find out statistical significance.

RESULTS

Out of 13,382 consecutive deliveries, 53 patients were admitted with the diagnosis of GDM out of which one left against medical advice. So, only 52 patients could be followed till delivery. The incidence of GDM in our setup is 0.4%. In our study 40.4% of patients were Brahmin, 38.5% Newar, 11.5% Chettri and 9.6% from other casts (Fig. 1).

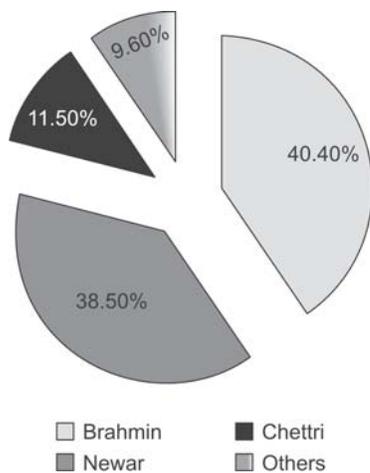


Fig. 1: Percentage distribution of GDM according to cast

Table 1: Frequency table showing distribution of GDM as per age

Age group	Frequency	Percentage
20-25	8	15.4
26-30	21	40.4
31-35	15	28.8
36-40	8	15.4

The age distribution of the study population was divided into the class interval. GDM was more common in the age group 26 to 35 years (Table 1) and was found to be more prevalent in urban population than rural (urban 84.6% vs rural 15.4%). GDM was diagnosed more in literate patients than illiterate possibly due to awareness or screening program, education of husband also played a similar role.

Table 2: Frequency table showing distribution of GDM as per parity

Parity	Frequency	Percentage
Primipara	12	23.1
Multipara	36	69.2
Grand multipara	4	7.7

GDM was more common in multiparous pregnant women. The GDM in multipara in our study includes the newly diagnosed as well as previously diagnosed. GDM was diagnosed in 69.2% of multipara, 23.1% of primipara and 7.7% of grand multipara (Table 2).

Birth weight newborns of the mother with GDM in our study was between 2500 to 3500 grams (Fig. 2). A few cases were reported to have birth weight of less than 2000 grams and more than 4000 grams.

71.2% of patients diagnosed as GDM did not have polyhydramnios. Mean weight gain in pregnancy was 8.96 kg with a range from 3 kg minimum to 20 kg maximum. 57.7% of patients had family history of diabetes. 48.7% of patients had history of GDM in previous pregnancy and 7.7% of patients had overt diabetes. 92.3% of patients were managed with insulin

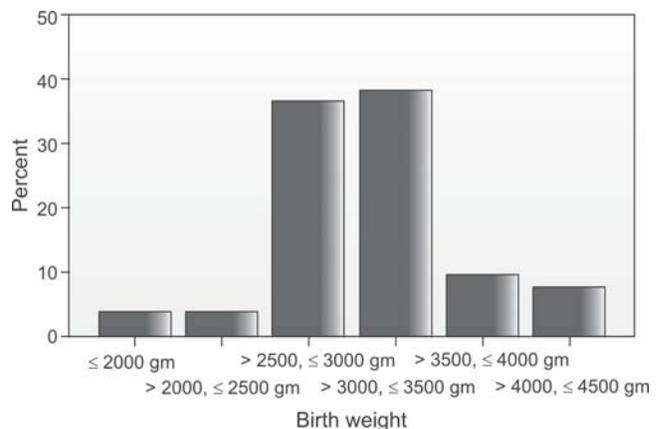


Fig. 2: Bar chart showing birth weight distributions in GDM

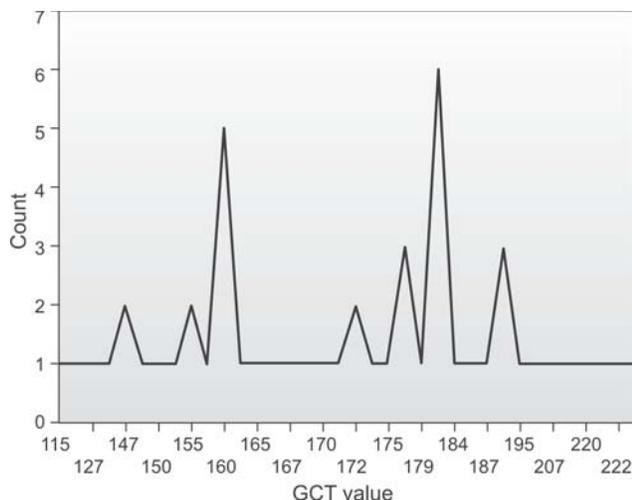


Fig. 3: Histogram showing relationship GCT value and GDM

and 7.7% of patients were managed with only diet and exercise. No fetal complication was observed in our study. Birth weight and GCT value observed is given below.

Two peaks were observed where most of the patients with GDM lie (Fig. 3). First peak was between the GCT value 155 to 165 mg/dl and second peak was in-between 180 to 184 mg/dl.

Crossable Chi-square test done between the level of GCT value and cast, age, socioeconomic condition, education level of the patient and husband, polyhydramnios, parity, weight gain, family history of diabetes, overt diabetes, GDM in pregnancy was not statistically significant ($p > 0.05$).

DISCUSSION

The prevalence of GDM in our study was 0.20% per year which was less than what we have observed in studies around world.¹⁷ However, we cannot deny the fact that the fertility rate also plays a significant role in the calculation of incidence of GDM. Taking this fact into account, total 52 GDM detected over two years time is significant finding in our study.

Different studies have suggested the prevalence of gestational diabetes varies according to ethnicity.² In our study also most of the patients were from Brahmin and Newar community. However, this may be due to the accessibility of that community to the hospital. Since Patan Hospital is situated in the community, where most of the residents are Newars, this may have affected the observation in our study. Most of the GDM were detected in the age group 26 to 35 years which accounted more than 50% of total GDM detected which is consistent with the age group described in the literature.¹²

Maternal and fetal complications like polyhydramnios, macrosomias related to GDM were found to be relatively low in our study possibly due to early diagnosis and planned elective cesarian section. Mean weight gain in our study was 8.96 kg. A randomized controlled trial showed increased risk of complication with maternal age more than 18 years.⁶⁻⁸ This shows the necessity of early diagnosis and planned management for

GDM. Complications can be prevented with the proper management and hospital delivery.²

The study shows only 7% of the study population had the history of overt diabetes. Others who were diagnosed as GDM did not have history of diabetes. This further highlights the necessity of screening pregnant women for GDM.

CONCLUSION

There was significant number of cases diagnosed as GDM. All patients who were diagnosed early and treated accordingly had less complications related to mother and child. So in the developing country like Nepal early diagnosis with GCT is very helpful. GCT is very cost effective and easy to perform also. In the view of maternal morbidity and mortality as well as fetal complications early diagnosis and its treatment accordingly is an utmost necessity of the present situation. This study also signifies the further need of a multicenter and a bigger study to find out the incidence and prevalence of GDM as well as impact of the disease on our community.

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