

Study of Risk Factors and Foeto-maternal Outcome of Gestational Diabetes Mellitus

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is a common pregnancy complication with complex disease mechanism. Several risk factors may contribute to its onset. Based on recent evidence up-to 15% of all pregnancies may be affected by GDM. Untreated GDM is a severe threat to maternal and neonatal health

Objectives: To determine the risk factors and foeto-maternal outcome of GDM.

Methods: This prospective observational study was conducted on patients who were admitted in Obstetrics & Gynaecology department of CMH, Bogura from June 2020 to May 2021 with the diagnosis of GDM. Data were collected from the patients as well as from the antenatal records in a preformed questionnaire and risk factors and outcomes measured.

Results: A total of 679 patients were admitted during the period of 1 year from June 2020 to May 2021. Among them 50 patients were admitted with GDM. The prevalence of GDM was 7.36%. GDM risks were higher in women aged between 25-29 years and in those with maternal overweight and obesity (58%). Newborns of GDM mother had an increased risk of hypoglycemia (10%), macrosomia (20%), respiratory distress syndrome (8 %) and 42% required NICU admission. Most of the patients (92%) needed cesarean section.

Conclusion: Pre-pregnancy BMI and family history of diabetes in first degree relatives and high parity were the predominant risk factor of GDM in this study. GDM patients are of increase risk of delivery by cesarean section, preterm birth, Newborns of GDM mother are at risk of RDS (Respiratory distress syndrome), macrosomia and neonatal hypoglycemia.

Key words: Gestational diabetes mellitus, Risk factors, Maternal outcome, Neonatal outcome.

Introduction

Gestational diabetes mellitus (GDM) refers to any degree of hyperglycemia that is recognized for the first

time during pregnancy. This definition includes cases of un-diagnosed type 2 diabetes mellitus identified early in pregnancy and true gestational diabetes mellitus (GDM) which develops later¹. GDM is one of the most frequent complications during pregnancy. The incidence of GDM has risen over the last few decades. The worldwide incidence of GDM is up-to 11% using IADPSG criteria (International association of diabetes and pregnancy study group criteria)². According to recommendation of International Association of Diabetes in pregnancy Study Group (IADPSG), GDM should be diagnosed at any time in pregnancy if one or more of the following criteria are met. Fasting plasma glucose 5.1mmol/L or more, 1 hour result of 10mmol/L or more and 2 hours plasma glucose 8.5mmol/L or more following 75 gram of oral glucose load³. Studies found a very high prevalence of gestational diabetes mellitus among the Asian population about 11.5%⁴. In recent years with the delay in child bearing age and changes in dietary habits and life style, the incidence of gestational diabetes mellitus has increased significantly⁵.

Pregnancy affected by GDM imposes a risk for mother and fetus. The overall pregnancy outcome among GDM mothers is poorer with higher risk of spontaneous miscarriage, pre-term labor and cesarean section. Risk of macrosomia, low APGAR score, need for intensive care unit admission, hypoglycemia, congenital malformation and RDS are also higher among the newborns of GDM mothers⁶. Apart from this, women with a history of GDM are also at significantly higher risk of developing subsequent type 2 diabetes mellitus and cardiovascular disease⁷. The most commonly reported risk factors for GDM are older age, pre-pregnancy obesity, high parity, family history of diabetes specially in first degree relatives, previous history of GDM and previous obstetrics outcome history (Macrosomic infant, congenital malformation and recurrent abortion)⁸. The recognition of risk factors of GDM is therefore important to identify women at risk, make up an early diagnosis and instituting intensive management protocol to control blood glucose to reduce the likelihood of problem of GDM. Hence the study was conducted to determine the risk factors and foeto-maternal outcome of GDM.

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Materials and Methods

This prospective observational study was conducted among antenatal mothers who were admitted with the diagnosis of gestational diabetes mellitus (GDM) in Obstetrics and Gynaecology department of CMH, Bogura during the period of one year from June 2020 to May 2021. The data's on demographic, risk factors and foeto-maternal outcomes were collected from patients and existing antenatal records in a preformed questionnaire. Patients were followed from the time of admission to the time of discharge and their outcomes noted. At this institution in all the pregnant ladies irrespective of high risk for GDM the universal screening test done at first antenatal visit and again between 24-28 weeks of pregnancy. All those women who had their antenatal check-up done outside and those who missed screening at that time were screened for GDM whenever they came for antenatal check-up at any gestational age. Some patients, with irregular or no antenatal check-up who were admitted for some other reason were also screened for GDM after admission. Fasting blood glucose value of 5.1mmol/L or more and 2 hours after 75 gram of glucose value of 8.5mmol/L or more at any gestational age were leveled as GDM and included in this study. Patients having preexisting diabetes mellitus have been excluded. Patients were initially treated from outdoor either by diet or metformin or insulin or both by joint consultation with endocrinologist. Most of the patients with controlled blood sugar were admitted around 37 weeks for delivery. Women with uncontrolled GDM were admitted earlier for blood sugar control. Dose of metformin and insulin was individualized and adjusted according to need of the patients.

The goal of glycemic control was to achieve pre-prandial blood sugar <5.3 and post prandial blood sugar of <6.7mmol/L. Patients with controlled diabetes were delivered at and around 37th completed weeks. Induction of labor was carried out in patient with controlled gestational diabetes mellitus without any obstetric complication. Elective cesarean sections were done for fetal macrosomia and other indications like previous history of Cesarean delivery, malpresentation etc. Emergency cesarean sections were done for indications like fetal distress, failed induction etc. All neonates were seen by neonatologist immediately after delivery. Glucose monitoring was done in all neonates. Other neonatal complications like hypoglycemia, respiratory distress syndrome (RDS) including transient tachypnea were considered and stay of 24 hours or more in neonatal intensive care unit (NICU) were also obtained from medical records. All analysis were done using Social package for the social science (SPSS) version 21 software.

Results

A total of 679 patients were admitted for delivery during the study period from June 2020 to May 2021 in the Obstetrics and Gynecology department of CMH, Bogura. Out of which 50(7.63%) patients were diagnosed as GDM (Figure-1). The majority of the patients 22(44%) were aged between 25-29 years .There were significant association between GDM and age group, parity, maternal obesity, first degree relatives with DM, previous history of GDM, history of recurrent abortion (Table-I). Older age multiparity, overweight and obesity were the predominant risk factors of GDM in this study. Majority of the women 40(80%) delivered at gestational age>37 weeks and 10(20%) delivered at <37weeks. Lower segment cesarean section (LSCS) were performed in most of the cases 46(92%) (Table-II). Most common maternal complications were pregnancy induced hypertension 13(26%) (Table-III). Intrauterine fetal death occurred in 2(4%) patients who got admitted for delivery during the study period. Ten (20%) neonates were born macrosomic (Birth weight >4kg), 21(42%) neonates needed NICU admission, 4(8%) neonates developed RDS (Respiratory distress syndrome) and 5(10%) developed hypoglycemia (Table-IV).

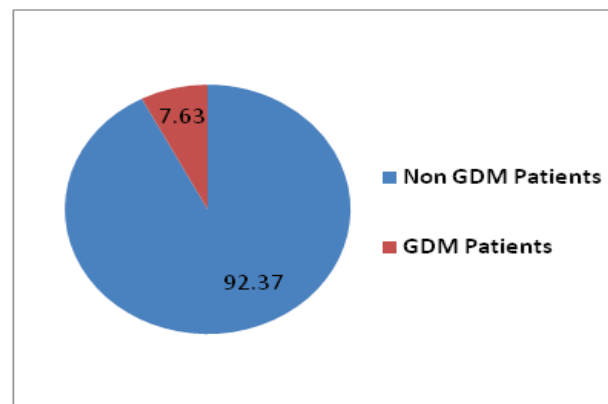


Figure-1: Prevalence of gestational diabetes mellitus (GDM)

Table-I: Risk factors Of GDM (n=50)

Risk factors		n	%
Age	20-24 years	6	12
	25-29 years	22	44
	30-34years	17	34
	35-40 years	5	10
BMI	Obese(≥ 30)	7	14
	Overweight (25-29.9)	22	44
	Non-obese(<25)	21	42
Gravida	Primigravida	3	6
	Multigravida	47	94
First degree relative with GDM	Yes	26	52
	No	24	48
H/O of GDM in previous pregnancy (n=47)	Yes	17	36.17
	No	30	63.82
H/O of Abortion 2 or more (n=47)	Yes	9	19.14
	No	38	80.85
H/O IUD (Intrauterine death)(n=47)	Yes	2	4.25
	No	45	95.7

Table-II: Data on labor and delivery

Characteristics		Number of patients	Percentage
Gestational age at delivery (n=50)	Preterm < 37 weeks	10	20
	Term > 37 weeks	40	80
Mode of delivery(n=50)	Spontaneous vaginal Delivery	3	6
	Induction of labor	1	2
	LSCS	46	92
Indication of LSCS(n=46)	Past history of c/s	31	67.39
	Failed induction	5	10.86
	Severe PIH	4	8.69
	Fetal distress	3	6.52
	CPD	1	2.17
	Malpresentation	1	2.17
	APH due to Placenta previa	1	2.17

Table-III: Data on Maternal outcome (n=50)

Complications	Number of patients	Percentage
Pregnancy induced hypertension	13	26
Preterm labor	10	20
PROM	2	4
Polyhydramnios	5	10
Cesarean wound infection	2	4
Urinary tract infection	3	6
Vulvovaginitis	4	8
No complication	11	22

Table-IV: Data on Fetal and neonatal outcome (n=50)

Characteristics		Number of newborn	Percentage
Birth weight	Normal weight	39	78
	Underweight (<2.5 kg)	1	2
	Macrosomia (>4kg)	10	20
Gestational age at the time of delivery	<37 weeks	10	20
	>37 Weeks	40	80
Complications	None	27	54
	Intrauterine fetal death	2	4
NICU admission	RDS	4	8
	Shoulder dystocia	1	2
	Neonatal hypoglycemia	5	10
	Neonatal hyperbilirubinemia	3	6
	Meconium stained liquor	7	14
	Low birth weight	1	2

Discussion

Total 679 patients were admitted during the study period for delivery. The prevalence of GDM in this study is 7.36% which is slightly lower than a study done by Kalany et al at central India where the prevalence has shown 8.33 % using the same diagnostic criteria (IADPSG)⁹. This may be due to COVID-19 pandemic lockdown during the study period as many patients did not come for antenatal check-up and delivery. Several studies showed that significant associated variables are maternal age, obesity, previous history of GDM and first degree family history of diabetes¹⁰. Glucose tolerance is a function of insulin sensitivity and insulin secretion. Pancreatic β -cell function and insulin sensitivity fall with age, women who are elder more likely to have an inadequate B-cell response to stimulation and be more insulin resistant than younger women which make gestational diabetes more likely¹¹. In this study, GDM risk was

also found higher (44%) in women between 25-29 years which is consistent with a recent study in Bangladesh where 40.5% of women of GDM were more than 25 years of age¹². One study done in India showed that most of the GDM patients were primigravida (55%) and 45% were multigravida¹³. In this study, only 6% women were primigravida and most of them (94%) were multigravida. This finding differs from the results of the previous study but similar to another study done in Bangladesh¹².

Family history of GDM in first degree relative is also a contributing risk factor in this study (52%). Several studies also found that strong family history of diabetes is one of the risk factor for GDM^{14,15}. In a study by Rajput et al, 16.3% of the women with GDM had family history of DM¹⁶. Risk of GDM is also higher among obese women. In obese women, there is insulin resistance which is also aggravated by the pregnancy induced increase in diabetogenic hormones. It should also be noted that women over the years has become increasingly obese. In this study, BMI>25kg/m² was observed in 58% of patients of which 14% were obese (BMI>30kg/m²) and 44% were overweight which is more or less consistent with another study by Torloni et al where BMI>25kg/m² was observed in 48.39% of women, 9.4% women were found obese and 34% were overweight¹⁷.

Pregnancy induced hypertension was found to be more common among mothers affected by GDM. In the present study, 26% patients of GDM complicated with pregnancy induced hypertension. The result is consistent with one study done by Puttaraju et al where 25.9% of GDM mothers complicated with pregnancy induced hypertension¹⁸. GDM women have a higher risk of having operative delivery compared to non-GDM women¹⁹. Many studies have found high Cesarean delivery rates in GDM patients despite good maternal glucose control during pregnancy. In a study by Das V et al, 56% of women of GDM underwent lower segment cesarean section and main indications were previous history of c/s followed by macrosomia, non-reassuring fetal heart tracing and failure to progress of labor²⁰. In this study, 92% of women of GDM delivered by cesarean section. The rate is higher than previous study though the main indication is previous history of c/s (67.39%) like previous study²⁰. This is because of higher rate of primary cesarean section in our country. Among the indication of primary cesarean section, failed inductions are 10.86% and fetal distress 6.52%.

Preterm labour and PROM (Premature rupture of membrane) are another complication of GDM. In one study by Johnstone et al, 20.7% of mothers affected by GDM reported delivery of preterm baby²¹. This study revealed 20% of women delivered preterm which is in

consistent with previous study²¹. Sudden intrauterine fetal death is the most important complication of GDM especially when it is poorly controlled. In this study 2(4%) intrauterine fetal death occurred in GDM mothers who were admitted for delivery. Among them, one patient admitted with the diagnosis of intrauterine death at 38 weeks who did not come for regular antenatal check-up during late pregnancy. Another intrauterine death occurred in admitted patient with poorly controlled GDM at 35 weeks. The rate is higher than other studies where there is no intrauterine fetal death^{20,21}. This unexpected fetal death may be due to irregular antenatal check-up done by the patients due to fear of COVID-19 pandemic during study period.

Fetal macrosomia is another complication of GDM mother especially when it is not well controlled. Most of the studies showed fetal macrosomia in 10-20% of infants born to GDM mother²¹. In this study, the incidence of macrosomia is (20)% which is consistent with other study. In GDM increase number of pregnancy risk factors and fetal complication appear to cause significant number of NICU admission >24 hours. In the present study, 42% of newborn needed admission in NICU for various reason which is higher than 28.7% reported in one study done by Ostlund I et al²². This study revealed that 4(8%) neonates developed RDS (Respiratory distress syndrome) and 5(10%) newborns had hypoglycemia which is in concordance with one study done by Bajracharya et al where the incidence is 4.4% and 8.89% respectively²³. There is no congenital anomaly or neonatal death in this study due to universal screening and early diagnosis and strict blood sugar control during antenatal period. Some studies concluded that even very mild alteration in glucose tolerance can result in abnormal fetal growth which can be prevented by simple but aggressive control of blood sugar in order to ameliorate many complications for the mother and the baby²⁴.

Conclusion

The study is important in providing information about the risk factors, maternal and neonatal outcome of gestational diabetes mellitus. By proper monitoring and good glycemic control during antenatal period and timely delivery, the adverse maternal and neonatal complication of gestational diabetes mellitus can be reduced. Hence more efforts to ensure early recognition and strict sugar control during pregnancy are recommended.

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