Open Access Library Journal

OALib

Maternal and Fetal Outcome in Gestational Diabetes Mellitus—A Study at Tertiary Health Centre in Northern India

Krishna Dahiya[1*], Jyoti Sahu[1], Archit Dahiya[2]

[1]Department of Obstetrics and Gynecology, Pt.BDS, PGIMS, Rohtak, India
[2]SMIMS, India
Email: [*]krishnadahiya@rediffmail.com, [*]drkrishnadahiya@gmail.com

Received 20 April 2014; revised 27 May 2014; accepted 9 June 2014

Abstract

Gestational diabetes mellitus is one of the most common medical disorders found in pregnancy. Clinical recognition of GDM is important because timely intervention by dietary measures or insulin and fetal surveillance can reduce the well described associated maternal and fetal complications. This observational study was done in PGIMS, Rohtak over a period of one year. Single step test using 75 gms oral glucose was used as screening and diagnostic test for GDM. Feto-maternal outcome was studied in all the subjects. Prevalence of GDM was 7%. Age ≥ 25 years, obesity, multigravidity and family history of diabetes mellitus were major risk factors for developing GDM. Maternal and fetal outcomes were poor in GDM group as compared to the control group. In GDM group common maternal complications were polyhydroamnios and recurrent vaginal infections. Rate of caesarean section was higher in GDM group. Babies born to GDM mothers had higher incidence of metabolic complications and macrosomia.

Keywords

Gestational Diabetes Mellitus, Maternal Complications, Fetal Complications

Subject Areas: **Diabetes & Endocrinology, Gynecology & Obstetrics**

1. Introduction

Gestational diabetes mellitus is defined as, carbohydrate intolerance resulting in hyperglycemia of variable severity with onset or first recognition in pregnancy [1]. Gestational diabetes mellitus usually presents late in the second or during the third trimester. Certain populations are especially vulnerable to develop this condition be-

[*]Corresponding author.

How to cite this paper: Dahiya, K., Sahu, J. and Dahiya, A. (2014) Maternal and Fetal Outcome in Gestational Diabetes Mellitus—A Study at Tertiary Health Centre in Northern India. *Open Access Library Journal*, **1**: e500.
http://dx.doi.org/10.4236/oalib.1100500

cause of genetic, social and environmental factors. GDM has serious long term consequences for both baby and the mother, including a predisposition to obesity, metabolic syndrome, Type-2 diabetes and cardiovascular diseases later in life [2]. Early detection and intervention can greatly improve outcome for women and their babies. GDM screening offers an important opportunity for the development, testing and implementation of clinical strategies for diabetes prevention.

Diabetes is one of the most common medical complications of pregnancy. About 1% - 14% of all pregnancies are complicated by diabetes mellitus and 90% of them are Gestational diabetes mellitus. Nearly 50% of women with GDM will become will become overt diabetes (Type-2) over a period of 5 - 20 years [3]. Depending on geographical location and diagnostic methods used, the prevalence of GDM varied from 3.8% - 21% in different parts of the India [4]. As Asian ethnic background has been identified as a risk factor, and hence, screening should be offered to all pregnant women for GDM [5].

The objective of this study was early detection of GDM using single step test for screening and diagnosis to minimize maternal and neonatal complications.

2. Material and Methods

The present prospective study was conducted in the Department of Obstetrics and Gynecology of Pt.B.D. Sharma PGIMS, Rohtak. A total of 500 pregnant women attending antenatal clinic for routine antenatal check up were selected randomly for the study at less than 16 weeks period of gestation. These females were recruited for the study during the period of Jan 2011 and Dec 2011. All the selected women were given a 75 gm anhydrous glucose powder dissolved in a glass of water, to be consumed over 5 minutes, irrespective to the time of last meal. A venous blood sample was collected at 2 hours for estimating plasma glucose by the glucose oxidase peroxidase (GOD-POD) method. The subjects were asked to avoid physical activity and smoking for 2 hrs after intake of glucose. Gestational diabetes mellitus was diagnosed if 2 hrs plasma glucose is >140 mg/dl. If the glucose level was >200 mg/dl, she was labeled as overt diabetes. In women who were found to have normal glucose level at first antenatal visit, the test was repeated at around 24 - 28 wks period of gestation. The women with positive test were treated for control of blood sugar as per hospital protocol, *i.e.* medical nutritional therapy (MNT) for two weeks and if MNT failed to achieve control then insulin was initiated. The patients were followed up till delivery. The foeto-maternal outcome was studied. Pregnant women suffering from chronic renal disease, pancreatic disease, thyroid disorder or other endocrinal disease, known case of diabetes mellitus or patient on medications affecting glucose metabolism such as progesterone, corticosteroids, psychoactive agents, catecholamines and women with substance abuse such as opioids, cocaine, marijuana and benzodiazepines were excluded from study.

Statistical analysis was performed with help of Epi Info (TM) 3.5.3. EPI INFO is a trademark of the Centers for Disease Control and Prevention (CDC). χ^2 test was used to test the association of different study variables with the study groups. Z-test was used to test the significant difference between two proportions of the groups. t-test was used to compare the means. Odds ratio (OR) with 95% Confidence Interval (CI) was calculated to measure the different risk factor. Significance level was set at 0.05 and confidence intervals were at 95 percent level. P value < 0.05 was considered statistically significant.

3. Observations

Out of 500 pregnant women included in the study, 35 (7%) were found to have gestational diabetes and were considered in GDM group and the rest 465 (93%) women were considered as the control group. In the study population of 500 subjects, 302 (60.4%) of the women were aged less than 25 years and remaining 198 (39.6%) belonged to risk factor group (age ≥ 25). There was significant difference in terms of age (<25/≥25 years), residence (urban/rural) and body weight (obese/non-obese) in the study population (**Table 1**). The study population was homogenous in terms of gravidity (primigravida/multigravida) as the difference was not statistically significant. Majority of women 328 (85%) delivered vaginally in control group and 58 (15%) women delivered by caesarean section. Among GDM cases 21 (60%) women delivered vaginally and 14 (40%) delivered by CS. Caesarean section rate was significantly higher in the GDM cases. Of all GDM cases, 18 cases (51.4%) of were well controlled on diet only, where remaining 17 cases (48.6%) needed insulin therapy to control blood sugar. One patient had deranged blood sugar till the delivery despite insulin therapy.

The foeto-maternal outcome was studied in 35 cases and 386 controls. GDM positive females had overall

Table 1. Socio-demographic characteristics of study groups.

Variable	No. of cases (%)	No. of controls (%)
Age distribution of mothers		
<25 years	8 (22.9%)	294 (63.2%)
≥25 years	27 (77.1%)	171 (36.8%)
Residential status		
Rural	13 (37.1%)	262 (56.3%)
Urban	22 (62.9%)	203 (43.7%)
Distribution of parity		
Multigravida	28 (80.0%)	227 (48.8%)
Primigravida	7 (20.0%)	238 (51.2%)
Distribution of obesity (BMI ≥ 30 kg/m^2)	7 (20%)	8 (1.7%)
Gestational age at time of delivery		
<37 weeks	3 (8.6)	21 (5.4)
≥37 weeks	32 (91.4)	365 (94.6)
Mode of delivery		
FTVD	18 (51.4%)	307 (79.6%)
PTVD	3 (8.6%)	21 (5.4%)
LSCS	14 (40.0%)	58 (15.0%)

poor outcome in the present pregnancy and significantly higher incidence of polyhydramnios and recurrent vaginal infections (**Table 2**).

Neonatal outcome was poor in Babies born to GDM positive mothers, with higher incidence of macrosomia and lower apgar scoring at one minute (**Table 3**).

The fetal outcome was compared in both groups and was significantly poor in the GDM positive mothers. The incidence of macrosomia understandably was higher in GDM group. Metabolic derangements like hypoglycemia, hyperbilirubinemia were also higher in GDM positive mothers. Due to all these problems in the newborn the admission to NICU were also proportionately higher in GDM positive females (**Table 4**).

4. Discussion

Out of 500 pregnant females studied, 35 (7%) were diagnosed with GDM. The prevalence of GDM ranges from 0.2% - 12% depending on the population studied. Seshiah *et al.* screened 3674 pregnant women with 2 hr 75 gm test in various parts of the country and the overall prevalence was 16.55% [6]. In a study by Zargar *et al*. determined the prevalence of GDM in Kashmiri women was 3.8% [7]. In present study prevalence of GDM was found to be 7%. The prevalence of this study is comparable to Jindal *et al*. [8] and Das *et al*. [9] studies. The mean age of GDM patients was 27 ± 3.14 years. Seshiah *et al*. in their community based study found the highest prevalence in the age group of 30 - 34 years [10]. Zargar *et al*. also found that GDM prevalence increased steadily with increasing age (from 1.7% in women below 25 years to 18% in women 35 years or older) [7]. In this regard our study corresponds to findings of these authors. In present study the mean BMI of the controls was 24.17 ± 2.21 kg/m^2 with range 20 - 31 kg/m^2 and the mean BMI of the cases was 26.07 ± 3.45 kg/m^2 with range 20.4 - 32.0 kg/m^2. Seven (20%) of cases were obese as compared to only 8 (1.7%) of the control population. Various authors have confirmed that not only obesity but also overweight women have greatly increased risk of developing gestational diabetes [6] [7]. As the carbohydrate intolerance is stressed in later half of pregnancy, majority of cases are diagnosed in this period. In the present study 4 (11.4%) women were diagnosed with GDM on their first visit *i.e.* within 16 weeks of gestation and 31 (88.6%) women on second visit *i.e*. between 24 - 28 weeks of gestation. GDM was diagnosed in 12.4% women within 16 weeks of gestation, 23% between 17 and 23 weeks and remaining 64.6% at more than 24 weeks of gestation by Seshiah *et al*. [10].

Out of 500 women, 421 delivered in our institute. As expected, women with GDM in the present study were found to have higher proportion of obstetric complications including polyhydroamnios (11.2 times), recurrent vaginal infections (4.85 times), intrauterine growth retardation (3.86 times), intrauterine death (1.4 times) preterm labour (1.62 times), preeclampsia (1.91 times) and GCMF (1.86 times). Similar findings were found by

Table 2. Maternal complications in study population.

Maternal outcome	GDM group No (%)		Control group No (%)		Odds ratio with 95% CI
Polyhydramnios	6	17.1	7	1.8	11.20 (3.53, 35.51); P = 0.0001
Preterm labour	3	8.6	21	5.4	1.62 (0.46, 5.75); P = 0.44
PIH	5	14.3	31	8	1.91 (0.69, 5.26); P = 0.20
Vaginal infections	4	11.4	10	2.6	4.85 (1.43, 16.36); P = 0.005
Oligohydramnios	0	0	4	1	NA
APH	0	0	2	0.5	NA
IUGR	2	5.7	6	1.6	3.83 (0.75, 19.77); P = 0.08
GCMF	1	2.9	6	1.6	1.86 (0.21, 15.92); P = 0.56
IUD	2	5.7	16	4.1	1.40 (0.21, 5.61); P = 0.66

Table 3. Neonatal outcome in both study groups.

Birth weight (kg)	GDM group No (%)	Control group No (%)	P-value
<2.5	5 (14.29)	27 (7)	0.21 (NS)
2.5 - 3.99	26 (84.31)	352 (92.2)	0.001 (S)
≥4	4 (11.4)	7 (1.8)	0.001 (S)
Total	35 (100)	386 (100)	
Mean ± SD	3.154 ± 0.282	2.850 ± 0.395	0.01 (S)
Apgar score			
At 1 minute	6.12 ± 0.98	6.82 ± 0.65	<0.001 (S)
At 5 minutes	8.81 ± 0.56	8.76 ± 0.42	>0.53 (NS)

Table 4. Neonatal morbidity in present pregnancy.

Foetal outcome	GDM group		Control group		Odds ratio with 95% CI
	No	(%)	No	(%)	
Macrosomia	4	11.4	7	1.8	6.98 (1.93, 25.17); P = 0.0006
RDS	2	5.7	4	1	5.78 (1.02, 32.78); P = 0.02
Hyperbilirubinemia	4	11.4	9	2.3	5.41 (1.57, 18.55); P = 0.0002
Hypoglycaemia	2	5.7	5	1.3	4.61 (0.86, 24.72); P = 0.05
Admission to NICU	5	14.3	15	3.9	4.12 (1.40, 12.11); P = 0.005

Ganguly *et al*., Turki G. and Odar *et al*. in their respective studies [11]-[13]. In our study 14 (40%) GDM females underwent caesarean section compared to 58 (15%) in the control group. Many studies have found high caesarean delivery rates in GDM patients despite good maternal blood glucose control during pregnancy [14] [15].

The effect of maternal hyperglycaemia at conception or in period of embryogenesis usually manifests itself as congenital anomalies where as glucose intolerance during pregnancy leads to large for gestational age foetuses, metabolic disturbances, foetal demise and need for admission in NICU. Tahir *et al*. found 28.7% rate of macrosomia in a study of GDM patients [16]. The rate of large for gestational age babies in study by Akhlaghi and Hamedi [17] was 14.3% and 16% in Ray *et al*. study [18]. In the present study incidence of macrosomia was 4 (11.4%) in GDM patients as compared to 7 (1.8%) in the control group. Metabolic complications like neonatal hypoglycaemia, polcythaemia, hypocalcaemia and hyperbilirubinemia may complicate GDM babies. In our study GDM babies suffered more of these complications than the babies of the control group. Hypoglycemia was seen in 5.7%, hyperbiliruinemia in 11.4%, respiratory distress syndrome in 5.7% babies born to GDM

mothers. In an Iranian study the incidence of respiratory distress syndrome, hypoglycemia and large for gestational age baby were 3.7%, 18.5% and 14.8% respectively in the GDM population [17].

The importance of GDM is that the two generations are at risk of developing diabetes in the future. They are the ideal group to be targeted for lifestyle modification or pharmacologic intervention in order to delay or postpone the onset of overt diabetes. In conclusion, GDM is a commonly occurring medical disorder in pregnancy, which should be timely diagnosed, appropriately managed and monitored in order to avoid fetomaternal complications.

References

[1] American Diabetes Association (1986) Position Statement—Gestational Diabetes. *Diabetes Care*, **9**, 430-431.

[2] Reece, E.A., Leguizamon, G. and Wiznitzer, A. (2009) Gestational Diabetes: The Need for a Common Ground. *Lancet*, **373**, 1789-1797. http://dx.doi.org/10.1016/S0140-6736(09)60515-8

[3] Ferrara, A. (2007) Increasing Prevalence of Gestational Diabetes Mellitus—A Public Health Perspective. *Diabetes Care*, **30**, 141-146. http://dx.doi.org/10.2337/dc07-s206

[4] Meltzer, S.J., Snyder, J., Penrod, J.R., Nudi, M. and Morin, L. (2010) Gestational Diabetes Mellitus Screening and Diagnosis: A Prospective Randomized Controlled Trial Comparing Costs of One-Step and Two-Step Methods. *British Journal Obstetrics and Gynecology*, **117**, 407-415. http://dx.doi.org/10.1111/j.1471-0528.2009.02475.x

[5] Dornhorst, A., Paterson, C.M., Nicholls, J.S.D., Wadsworth, J., Chiu, D., Elkeles, R., *et al*. (1992) High Prevalence of Gestational Diabetes in Women from Ethnic Minority Groups. *Diabetic Medicine*, **9**, 820-825. http://dx.doi.org/10.1111/j.1464-5491.1992.tb01900.x

[6] Sheshiah, V., Balaji, V. and Balaji, M.S. (2004) Gestational Diabetes Mellitus in India. *Journal of the Association of Physicians of India*, **52**, 707-711.

[7] Zargar, A.H., Sheikh, M.I., Bashir, M.I., Masoodi, S.R., Laway, B.A., Wani, A.I., *et al*. (2004) Prevalence of Gestational Diabetes Mellitus in Kashmiri Women from the Indian Subcontinent. *Diabetes Research and Clinical Practice*, **66**, 139-145. http://dx.doi.org/10.1016/j.diabres.2004.02.023

[8] Jindal, A., Ahmed, F., Bhardwaj, B. and Chaturvedi, B. (2001) Prevalence Clinical Profile and Outcome of Gestational Diabetes Mellitus. *Journal of Obstetrics and Gynecology of India*, **51**, 46-49.

[9] Das, V., Kamra, S., Mishra, A., Agarwal, A. and Agarwal, C.G. (2004) Screening for Gestational Diabetes and Maternal and Fetal Outcome. *Journal of Obstetrics and Gynecology of India*, **54**, 449-451.

[10] Seshiah, V., Balaji, V., Balaji, M.S., Paneerselvam, A., Arthi, T., Thamizharasi, M., *et al*. (2008) Prevalence of Gestational Diabetes Mellitus in South India (Tamil Nadu)—A Community Based Study. *Journal of the Association of Physicians of India*, **56**, 329-333.

[11] Ganguly, A. (1995) A Study of Diabetes Mellitus over 8 yrs. *Journal of Obstetrics and Gynecology of India*, **45**, 27-31.

[12] Gasim, T. (2012) Gestational Diabetes Mellitus: Maternal and Perinatal Outcomes in 220 Saudi Women. *Oman Medical Journal*, **27**, 140-144. http://dx.doi.org/10.5001/omj.2012.29

[13] Odar, E., Wandadwa, J. and Kiondo, P. (2004) Maternal and Fetal Outcome of Gestational Diabetes Mellitus in Mulago Hospital, Uganda. *African Health Sciences*, **4**, 9-14.

[14] Jensen, D.M., Sorensen, B., Feilberg, J.N., Westergaard, J.G. and Beck, N.H. (2000) Maternal and Perinatal Outcomes in 143 Danish Women with Gestational Diabetes Mellitus and 143 Controls with a Similar Risk Profile. *Diabetic Medicine*, **17**, 281-286. http://dx.doi.org/10.1046/j.1464-5491.2000.00268.x

[15] Johns, K., Olynik, C., Mase, R., Kreisman, S. and Tildesley, H. (2006) Gestational Diabetes Mellitus Outcome in 394 Patients. *Journal of Obstetrics and Gynaecology Canada*, **28**, 122-127.

[16] Tahir, S., Zafar, S. and Thontia, S. (2011) Effect of Various Degrees of Maternal Hyperglycemia on Fetal Outcome. *Journal of Surgery Pakistan* (*International*), **16**, 61-66.

[17] Akhlagi, F. and Hamedi, A.B. (2005) Comparison of Maternal and Fetal/Neonatal Complications in Gestational and Pre-Gestational Diabetes Mellitus. *Acta Medica Iranica*, **43**, 263-267.

[18] Ray, J.G., Vermeulen, M.J., Shapiro, J.L. and Kenshole, A.B. (2001) Maternal and Neonatal Outcomes in Pregestational and Gestational Diabetes Mellitus, and the Influence of Maternal Obesity and Weight Gain: The DEPOSIT Study. Diabetes Endocrine Pregnancy Outcome Study in Toronto. *QJM*: *Monthly Journal of the Association of Physicians*, **94**, 347-356. http://dx.doi.org/10.1093/qjmed/94.7.347