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ORIGINAL ARTICLE

A CLINICAL STUDY OF GESTATIONAL DIABETES MELLITUS IN A TEACHING HOSPITAL IN KERALA

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ABSTRACT: Incidence of gestational diabetes mellitus varies between 0.5–5% and is defined as carbohydrate intolerance of variable severity with onset during pregnancy. The present study comprised of patients with GDM who were referred to Department of Medicine in a teaching hospital in Kerala. Total of 3678 pregnant women were screened during the study period, out of which 40 patients who had GDM according to criteria set by O. Sullivan and Mahan, were taken for the study. The clinical profile and response to insulin therapy were analyzed; also insulin required in our population was compared with that of western population. Incidence of GDM in the study was 1.09%. GDM cases were maximum in 26–30 years age group. 47.5% of patients gave a significant family history of diabetes mellitus. Regarding the type of labor 67.5% patients were subjected to LSCS. Bad obstetric history and previous LSCS remained the major indications for this (74%). Majority of cases were managed with insulin in the dose of 8–20 units per day. The incidence of GDM is in the range (0.5-5 %) as per literature. Maximum cases were in second gravida followed by primi and third gravid. Hence, parity does not seem to influence the glucose tolerance. A higher incidence of GDM was seen in the 25 – 29 years age group. Significant family history of diabetes mellitus was relevant in the study. Regarding the obstetric outcome, majority of patients had to undergo LSCS. Macrosomia was not a significant problem where majority babies had normal birth weight. Insulin was required as the mainstay of treatment in the study to control glycemic status. Majority of cases were managed with low dose insulin. This was in contrast to western population where the insulin requirement was around 90 units per day for glycemic control.

KEYWORDS: Gestational Diabetes Mellitus, Glucose Challenge Test, Oral Glucose Tolerance Test.

INTRODUCTION: Gestational diabetes mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during the pregnancy[1, 2]. It is associated with increased morbidity and mortality in both mother and fetus. Studies have proved that more than 50% of mothers who develop GDM are liable to have diabetes mellitus in future[3]. Clinical studies in GDM during the past few decades have emphasized the need for early recognition and proper management of this condition in pregnancy to avoid complications and achieve brighter outcome in pregnancies [4]. Majority of cases, patients with GDM will show a normal fasting glucose value. Hence some challenge of glucose must be undertaken to detect this abnormality[1].

Traditionally, history and clinical risk factors were relied on to select those patients with GDM. These groups include those patients who have family history of diabetes mellitus, unexplained still births, macrosomia, obesity, hypertension, glycosuria or maternal age more than 35 years. It is of interest that over half of all patients who exhibit an abnormal glucose tolerance lack these risk factors[5]. Coustan and Colleagues have reported that if only high risks are screened, about 35% of GDM patients would be missed. This emphasizes the need to have a universal screening protocol for every

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pregnant woman, though the issue is still controversial. The ideal screening test for GDM is glucose challenge test, which should be reliable and most acceptable to patients. It has an excellent sensitivity (79%) and specificity (87%). If GCT was positive, they were subjected to three hour 100gms glucose tolerance test[6] and if this test was also positive, they were labeled and managed as GDM patients. It is seen that as pregnancy advances over 28 weeks, the detection rate is more. This may be due to the factor of increasing insulin resistance as a result of diabetogenic factors like Human Placental Lactogen, Progesterone, Prolactin, Estradiol etc[2, 7]. In GDM, the physiological changes occurring in normal pregnancy reach pathological proportion[8]. The anti-insulin factors like HPL, Cortisol, Progesterone, Prolactin etc. overtake the pancreatic insulin production and pancreas with borderline dysfunction is not able to rise to the occasion leading to glucose intolerance and development of GDM (Kubl et al, 1984). Macrosomia is defined as birth weight of more than 4000 gms. Early in gestation, fetal weight of >90 percentile for the age at any point is considered macrosomia[9]. According to these definitions macrosomia is observed in as many 50% of GDM patients. It should be avoided as it is associated with concomitant birth trauma due to shoulder dystocia. Macrosomia in these infants is due to fetal hyperinsulinemia secondary to maternal hyperglycemia[10] which stimulates excessive somatic growth.

AIM: Objective of this study was to analyze the clinical pattern, complications and treatment response to plain insulin in patients with GDM. Also, the study aimed to compare the dose of insulin required in our patients having GDM with that of western population.

MATERIALS AND METHODS: This study comprised of women with GDM who were referred to the department of Medicine from outpatient as well as inpatients from Obstetrics dept of Travancore Medical College, Kollam, Kerala during the year 2009 – 2011. A total of 3678 pregnant patients who attended the Obstetrics department were screened during the study period, out of which 40 patients had GDM according to criteria set by O.Sullivan and Mahan. Incidence of GDM in the study was 1.09%. Patients were subjected to screening for detection of GDM with Glucose Challenge Test in the gestational age of 28 – 32 weeks. GCT was done with 50 gms of glucose in 200 ml of water. One hour later, a venous sample was obtained for plasma glucose estimation. The test was considered abnormal if the value was above 140 mg/dl. These patients were then subjected to oral glucose tolerance test (OGTT). At first, a fasting sample for plasma glucose was obtained. Then 100 gms glucose was administered orally and additional samples were drawn at 1, 2 and 3 hours after the drink. The patients were instructed to rest comfortably without any additional food during the test period. The threshold for OGTT was taken as follows according to criteria set by O. Sullivan and Mahan published in 1964, which was further modified by Carpenter & Coustan in 1982. (Table.1)

Time	Venous plasma (Somogi Nelson) mg/dl	Plasma (glu. Oxidase) mg/dl
Fasting	105	95
1 hr.	190	180
2 hr.	165	155
3 hr.	145	140

Table -1: Modified criteria of Sullivan and Mahan by Carpenter & Coustan

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Each patient was then followed up through the antenatal period till delivery and postpartum period. The response of blood glucose to dietary therapy with or without insulin was charted. The dose of insulin required to maintain normoglycemia was studied. Routine ultrasound scan to ascertain maternal and fetal risks were done. Though HbA1c estimation was planned, because of financial constraint, it was given up in most of the cases.

RESULTS: Forty cases of gestational diabetes mellitus were subjected for detailed study. These cases have been detected after universal GCT followed by OGTT. This screening was done between 28 – 32 weeks of gestation. Age of the patients varied between 20 and 40 years. GDM cases were maximum in 26 – 30 years age group (37.8%) followed by those in 31-35 years age group (28%) and 21 – 25 years (26.8%).

Primi	12	30%
Gravida 2	18	45%
Gravida 3	7	17.5%
Gravida 4	3	7.5%

Table-2: Gravida wise distribution of GDM

Weight in kg	No. of patients	Percentage
40 – 45	6	15
46 – 50	10	25
51 – 55	16	40
56 – 60	5	2.5
61 – 65	3	7.5

Table-3: Maternal weight in GDM

Nineteen out of forty patients (47.5%) gave a significant family history of diabetes mellitus in father, mother or siblings. Seven patients gave history of diabetes mellitus in mother; nine patients gave diabetic history in father and three in siblings.

Regarding the management protocol, diet alone was prescribed in four cases and the rest required insulin therapy with human plain insulin in varying doses.

Plain insulin (dose) IU/day	No. of cases	Percentage
0 – 9	21	52.5
10 – 19	15	37.5
20 – 39	3	7.5
More than 40	1	2.5

Table – 4: Dose of human regular insulin required

Regarding the type of labor in the study, twenty seven patients out of forty (67.5%) were subjected to LSCS, Bad obstetric history and previous LSCS remained the major indication for this (74%). Rest were due to PIH, fetal distress, macrosomia, CPD and dysfunctional labor (26%).

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Birth Weight in gms	No. of babies	Percentage
< 2000	Nil	Nil
2000 – 2500	3	7.5
2500 – 3000	14	35
3000 – 3500	16	40
3500 - 4000	6	15
>4000	1	2.5

Table-5: Fetal characteristics in GDM patients

DISCUSSION: The early detection of gestational diabetes mellitus and starting of ideal treatment to prevent hyperglycemia in the mother is very important to prevent maternal and fetal complications [3]. Incidence of GDM in this study was 1.09% which was in the range of 1 – 5% as in literature reported by Carpenter and Coustan[5]. In the forty cases screened, 45% cases were second gravida, 30% primi gravida, rest 17.5% and 7.5% were third and fourth gravida respectively. It was therefore seen that parity does not influence the glucose tolerance. Regarding the age distribution, it was seen that there was a higher incidence of GDM in the 25–29 years age group. It was seen that as pregnancy advances over 28 weeks, the detection rate was more. This may be due to the factor of increasing insulin resistance as a result of diabetogenic factors like Human Placental Lactogen, Progesterone, Prolactin, Estradiol etc[2, 7]. In GDM, the physiological changes occurring in normal pregnancy reach pathological proportion[9]. The anti-insulin factors like HPL, Cortisol, Progesterone, Prolactin etc. overtakes the pancreatic insulin production and pancreas with borderline dysfunction is not able to rise to the occasion leading to glucose intolerance and development of GDM (Kubl et al, 1984). Regarding the maternal body weight, the highest incidence was in 50 – 55 kg group. Around 19 cases (47.5%) had significant history of diabetes mellitus in the family, which was relevant in the study. Regarding the obstetric outcome, majority of patients had to undergo LSCS (67.5%), normal delivery in rest 30% and vacuum extraction in one patient. Macrosomia is defined as birth weight of more than 4000 gms. Early in gestation, fetal weight of >90 percentile for the age at any point is considered macrosomia. According to these definitions macrosomia was observed in as many 50% of GDM patients. It should be avoided as it is associated with concomitant birth trauma due to shoulder dystocia. Macrosomia in these infants is due to fetal hyperinsulinemia secondary to maternal hyperglycemia[10] which stimulates excessive somatic growth. Majority (40%) of babies in the study had a birth weight between 3 and 3.5 kg.

Coming to the management, patients were managed with diet alone or diet and insulin combination. Diet alone was used in only four cases and the rest thirty six patients required insulin therapy. The dose of human regular insulin arranged from 4 – 30 units per day in majority of cases. Only one patient required insulin more than 40 units per day. Majority of cases were managed with insulin in the dose of 8 – 20 units per day. This was in contrast to the study from western population where the insulin requirement was around 90 units per day for glycemic control[11, 12].

CONCLUSION: The incidence of GDM in the study was 1.09 percent, well in the range of 1-5 % as in literature reported by Carpenter and Coustan. Maximum cases were seen in second gravida followed by primi and third gravida respectively hence it was seen that parity does not influence the glucose tolerance. A higher incidence of GDM was seen in the 25 – 29 year age group. It was seen that as

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pregnancy advances over 28 weeks, the detection rate was more. Significant family history of diabetes mellitus was relevant in the study. Regarding the obstetric outcome, majority of patients had to undergo LSCS. Macrosomia was not a significant problem as seen in this study where majority babies had a normal birth weight. Insulin was required as the mainstay of treatment in the study to control glycemic status. Majority of cases were managed with low dose insulin (8 – 20 units per day). This was in contrast to the study from western population where the insulin requirement was around 90 units per day for glycemic control

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