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Study and Evaluate the Maternal Fetal and Perinatal Outcome in Patients Diagnosed with Gestational Diabetes Mellitus Considering the Type of Treatment and Control Achieved

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ABSTRACT
Gestational Diabetes Mellitus has been found to be associated with various maternal complications like pre-eclampsia, polyhydramnios, recurrent urinary tract infections, type 2 diabetes later in life, fetal complications including sudden intrauterine fetal death, macrosomia, respiratory distress syndrome, hypoglycemia, hypocalcemia. The off-springs will have a life-long increased risk of glucose intolerance, obesity and metabolic syndrome. The study was conducted in a teaching hospital in Mumbai. Five hundred pregnant women were enrolled and screened for Gestational Diabetes Mellitus by doing Oral Glucose Tolerance Test. Pregnant women with high risk factors and those who register late (>28wks) were directly evaluated by Oral Glucose Tolerance Test and treatment offered as per the algorithm. Eleven patients with fetal congenital anomalies 3 (2.9%) were identified. Out of 105 babies 32 (30.5%) were admitted to NICU, 8 were pre-term (25%), 8 for baby blood sugar monitoring in view of Gestational Diabetes Mellitus mother on Insulin (25%), 7 with Meconium Stained Amniotic Fluid for observation (22%), fetal distress 4 (13%), Low Birth Weight with Preterm 2 (6%), others were 3 (9%). In spite of appropriate glycaemic control, the Macrosomia is high in the Gestational Diabetes Mellitus population. Sudden unexplained still birth can occur in spite of a well glycemic control. The cases with Gestational Diabetes Mellitus are associated with co-morbidities like Subclinical Hypothyroidism.

INTRODUCTION

Gestational Diabetes Mellitus is also known as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy[1]. Gestational Diabetes Mellitus has been found to be associated with various maternal complications like pre-eclampsia, polyhydramnios, recurrent urinary tract infections, recurrent reproductive tract infections(candidiasis), shoulder dystocia, increased risk of type 2 diabetes later in life, fetal complications including sudden intrauterine fetal death, macrosomia, respiratory distress syndrome, hypoglycaemia, hypocalcemia. The off-springs will have a life-long increased risk of glucose intolerance, obesity and metabolic syndrome whereas the mothers will have a higher risk of metabolic syndrome and diabetes in the future[2]. The Diabetes in Pregnancy Study group India (DIPSI) has recommended practice guidelines for Gestational Diabetes Mellitus in the Indian environment. But the cut offs are not based on obstetric and perinatal outcomes. To standardize the diagnosis of Gestational Diabetes Mellitus, the World Health Organisation (WHO) proposed using a 2 hour 75 gms Oral Glucose Tolerance Test with a threshold plasma glucose concentration of greater than 140 mg dL^{-1} at 2 hour, similar to that of Impaired Glucose Tolerance (IGT), outside pregnancy. All these recommendations (DIPSI and WHO) have not projected the influence of the glycaemic level on fetal outcome[3]. With newer diagnostic threshold the prevalence of Gestational Diabetes Mellitus in the general obstetric population may be upto18%[4]. The Hyperglycaemia and Pregnancy Outcomes (HAPO) study confirmed that adverse pregnancy outcomes occurred with increasing maternal glucose in continuous association, even below the traditional cut-offs for Gestational Diabetes Mellitus[5]. This has led to lowering of the diagnostic criteria for Gestational Diabetes Mellitus by the International Association of Diabetes in Pregnancy Study Group (IADPSG).

There are many studies on the prevalence of Gestational Diabetes Mellitus in our population and its association with adverse obstetric outcomes and the role of Oral Glucose Tolerance Test in diagnosis of Gestational Diabetes Mellitus. However, there is no study in Indian population for diagnosis of Gestational Diabetes Mellitus using the newer criteria for cut off as put forth by the International Association of Diabetes in Pregnancy and Study Group (IADPSG). Therefore, the above study was conducted to Study and evaluate the maternal fetal and perinatal outcome in patients diagnosed with Gestational Diabetes Mellitus considering the type of treatment and control achieved.

MATERIALS AND METHODS

Study Place: The study was conducted at teaching hospital (Nowrosjee Wadia Maternity Hospital) in Central Mumbai, over a period of eleven months (25th October 2013 to November 2014).

Study Design: Retrospective observational study.

Inclusion Criteria: All pregnant women registered for antenatal care and subsequently delivered and discharged from Nowrosjee Wadia Maternity Hospital willing to give informed consent.

Exclusion Criteria: Patients with pre-gestational diabetes and those who registered for antenatal care but subsequently delivered outside the Nowrosjee Wadia Maternity Hospital.

Sample Size: 500 pregnant women.

Data Analysis: Data was analysed and entered using Microsoft SPSS 21 version. The results were expressed as number and percentages. $p<0.05$ were considered significant.

Ethical Considerations: Institutional Ethics committee clearance was obtained before starting the study. All pregnant women (<24weeks) who register for first time were screened by fasting blood sugar levels for Gestational Diabetes Mellitus. Those with normal fasting sugars were further evaluated by glucose tolerance test at 24-28 weeks .Pregnant women with high risk factors and those who register late (>28wks) were directly evaluated by Oral Glucose Tolerance Test. In special conditions like polyhydramnios or suspected macrosomia the Oral Glucose Tolerance Test was repeated even if it was normal at 24-28 weeks. All antenatal records were evaluated and recorded after taking informed consent of the participants.

RESULTS

Out of 105 patients with Gestational Diabetes Mellitus of which 7 (6.7%) were with polyhydramnios, whereas 7 (1.7%) of Non-Gestational Diabetes Mellitus were with polyhydramnios. Thus, the association of polyhydramnios with Gestational Diabetes Mellitus is significant in the study. Subclinical Hypothyroidism were 59 out of which 20 (19%) are Gestational Diabetes Mellitus whereas 39 (9.9%) are Non-Gestational Diabetes Mellitus. The association of Subclinical Hypothyroidism with Gestational Diabetes Mellitus is significant in this study. In the table, in Gestational Diabetes Mellitus group (105), 56 (53.3%) were associated with other co-morbidities (Medical or Obstetric risk factors), whereas 49 (46.7%) were not associated with other co-morbidities.

Table 1: Co-relation of gestational diabetes mellitus and polyhydramnios

	Gestational diabetes mellitus		
Amniotic fluid index	Yes	No	Total
Polyhydramnios (>20cm)	7 (6.7%)	7 (1.7%)	14 (2.8%)
Normal (5-19.9cm)	98 (93.3%)	386 (97.7%)	484 (96.8%)
Oligohydramnios (<5cm)	0 (0.0%)	2 (0.6%)	2 (0.6%)
Total	105 (100.0%)	395 (100.0%)	500 (100.0%)

Pearson x^2 value = 7.79, df = 2, p = 0.020 (Significant)

Table 2: Co-relation of subclinical hypothyroidism with gestational diabetes mellitus and non gestational diabetes mellitus group

	Gestational diabetes mellitus		
Subclinical hypothyroidism	Yes	No	Total
Yes	20 (19.0%)	39 (9.9%)	59 (11.8%)
No	85 (81.0%)	356 (90.1%)	441(88.2%)
Total	105 (100%)	395 (100%)	500 (100%)

Pearson x^2 value = 6.708 , df = 1, p = 0.010 (Significant)

Table 3: Distribution of obstetric and medical risk factors (n = 500)

Medical And Obstetric Risk Factors	GDM	Non-GDM	Total
Present	56(53.3%)	195(49.3%)	251(50.2%)
Absent	49(46.7%)	200(50.7%)	249(49.8%)
Total	105(100%)	395(100%)	500(100%)
Obstetrics & Medical Problems			
	GDM Frequency	NON-GDM Frequency	Total
Hypothyroidism	20	39	59
Previous LSCS	11	41	52
Elderly	8	11	19
Thrombophilia (anti-thrombin III and Pt'n S deficiency, hyperhomocysteinemia)	4	10	14
Pre-eclampsia	4	20	24
Anaemia	6	28	34
Gestational HTN	2	5	7
Cholestasis of pregnancy	2	4	6
Others	6	37	43
No any other obstetric and Medical Problems	45 (GDM)	202	247

Table 4: Indications Of Caesarean Section In Our Study Group i.e, Gestational Diabetes Mellitus and Non- Gestational Diabetes Mellitus (N-= 251)

	GDM		NON- GDM		
Indications	Frequency	Percentage	Frequency	Percentage	Total
Meconium stained liquor	15	26.3	49	25.2	64
Previous LSCS	11	19.2	47	24.2	58
Non progress of labour	7	12.2	23	11.8	30
Fetal distress	6	10.5	32	16.5	38
Cephalopelvic disproportion	4	7.0	25	12.8	29
Severe pre-eclampsia with IUGR or worsening of the disease	4	7.0	7	3.6	11
Placenta praevia with APH	3	5.2	3	1.5	6
Breech presentation	2	3.5	14	7.2	16
High floating head	2	3.5	3	1.5	5
Cord prolapse	1	1.7	0	0.0	1
Previous myomectomy in labour	1	1.7	0	0.0	1
Transverse lie	1	1.7	1	0.5	2
Other	0	0.0	13	6.7	13
Total	57	100.0%	217	100.0%	274

Table 5: Co-relation of birth weight in gestational diabetes mellitus and non gestational diabetes mellitus group

	Gestational diabetes mellitus		
Birth weight	Yes	No	Total
Macrosomia	20 (19.0%)	37 (9.4%)	57 (11.4%)
Normal (71.6%)	71 (67.6%)	287 (72.7%)	358
SGA	14 (13.3%)	71 (18.0%)	85 (17.0%)
Total (100%)	105 (100%)	395 (100%)	500

Pearson x^2 value = 8.164, df = 2, p = 0.017 (Significant)

Table 6: Nicu admission in gestational diabetes mellitus and non gestational diabetes mellitus group

	Gestational diabetes mellitus		
NICU admission	Yes	No	Total
Yes	32 (30.5)	120 (30.4)	152 (30.4)
No	73 (69.5)	275 (69.6)	348 (69.6)
Total	105	395	500

Table 7: Distribution of neonatal complication in gestational diabetes mellitus and non gestational diabetes mellitus group

Neonatal complications	Yes	No	Total
Yes	3 (2.9%)	7 (1.8%)	10 (2.0%)
No	102 (97.1%)	387 (98.0%)	
489(97.8%)			
NND	0 (0.0%)	1 (0.2%)	1 (0.2%)
Total	105 (100%)	395 (100%)	500
(100%)			

The other co-morbidities were Subclinical Hypothyroid 20, previous LSCS 11, Elderly 8, Anaemia 6, Thrombophilia 4, Pre-eclmpsia-4, Gestational Hypertension-2, Cholestasis of Pregnancy-2, Others-4(Breech (1), Low lying placenta (20), Fibroid uterus(2), ß-Thalassemia(1)).

In Non-GDM group 195(49.3%) were associated with Medical or Obstetric risk factors and 200(50.7%) were completely low risk cases. The associated medical or obstetric risk factors were Subclinical Hypothyroid 39, previous LSCS 41, Elderly 11, Anaemia 28, Pre-eclmpsia-20, Thrombophilia 10, Gestational Hypertension-5, Cholestasis of Pregnancy-4, Others -37[Breech-8, IUGR-5, HBsAg positive-5, ß-Thalassemia-4, os-tightening-2, short stature-2,Fibroid uterus-2, PPROM-1, Placenta previa with Anhydramnios-1, Seropositive-1, Previous IUFD-1, Anterior vaginal wall cyst-1, Abruption with Scar dehiscence-1, Oligohydramnios-1, Congenital Diaphragmatic Hernia-1, Left Facial Nerve palsy-1].

As can be seen from the above table of indications of LSCS in Gestational Diabetes Mellitus Group, the common indications were Meconium Stained Liquor 15 (26.3%), Previous LSCS 11 (19.2%), Non-progress of Labour 7 (12.2%), Fetal Distress 6 (10.5%), Cephalopelvic Disproportion 4 (7.05%), Severe Pre-eclampsia(with IUGR or worsening of the disease) 4 (7.055), Placenta praevia with APH 3 (5.2%), followed by Breech Presentation 2 (3.5%).Indications of LSCS in Non-Gestational Diabetes Mellitus Group, the common indications were Meconium Stained Liquor 49 (25.2%), Previous LSCS 47 (24.2%), Non-progress of Labour 23 (11.8%), Fetal Distress 32(16.5%), Cephalopelvic Disproportion 25 (12.8%), Breech Presentation 14 (7.2%), followed by Placenta Praevia alone or with APH 3 (1.5%), and severe Pre-eclampsia with APH or IUGR 3 (1.5%), Transverse lie 1 (0.5%), Others 13 (CDH 1 (0.5%), Oblique lie 4 (2.0%), Oligohydramnios 2 (1.0%), Prolonged PROM 2(1.0%), Patient refused for continuation of induction of labour 1 (0.5%),previous baby with perinatal hypoxia1 (0.5%), Deep Transverse Arrest 1 (0.5%), Hydrocephalus 1 (0.5%). Macrosomic babies in Gestational Diabetes Mellitus were (20%) whereas in Non-Gestational Diabetes Mellitus were (9.4%) which is significant. The NICU admission were 32 of Gestational Diabetes Mellitus group (30.5%) and 120 of Non-Gestational Diabetes Mellitus group(30.4%), which is non-significant. There were total 3 (2.9%) (hyperbilirubinemia, grunting and infection) neonatal complications in Gestational Diabetes Mellitus group and 7 (1.8%) in Non-Gestational Diabetes Mellitus group. This is non-significant (Table 1-7).

DISCUSSIONS

In above study, Subclinical Hypothyroidism was found in 20 (19%), hypertensive disorders of pregnancy (preeclampsia and gestational hypertension) in 6 (5.7%), anaemia in 6 (5.7%), previous IUFD in 3 (2.8%), Thrombophilia in 4(3.8%). In above study, all the obstetric complications associated with Gestational Diabetes Mellitus were on the lower side, may be due early diagnosis and prompt treatment of Gestational Diabetes Mellitus with Medical Nutrition Therapy and Life-style Modifications and well controlled sugars. In study conducted by Priyanka *et al*.[6] the hypertensive disorders of pregnancy 9 (27%), antepartum haemorrhage was 7(21%) and rate of LSCS were observed to be high 26 (76%).

In above study, we studied mode of delivery in Gestational Diabetes Mellitus patients. Amongst 105 patients with Gestational Diabetes Mellitus, 57 patients (54.3%) were delivered by caesarean section and 46 patients (46%) were delivered vaginally, 2 (1.9%) had instrumental delivery. In above study LSCS rates were 54.3% and the most common indication of LSCS was Meconium Stained Amniotic Fluid, previous LSCS, fetal distress, non-progress of labour, etc. Most text books and reviews state that, Meconium Stained Amniotic Fluid per se may not be an indication for caesarean section. however in our hospital where the continuous cardio-tocography (CTG) is not available and if there is thick meconium in early labour in the presence of Gestational Diabetes Mellitus or other co-morbidities, caesarean section is often performed in the hope to reduce the incidence of meconium aspiration syndrome in the neonates where outcome is often poor in our setup. In spite of all these, 3 babies had Meconium Aspiration Syndrome. However, the aspiration was not so severe and the outcome was good.

Also in above study, when we compared the Birth weight in patients with Gestational Diabetes Mellitus-20 patients (19%) had macrosomic baby (>3.4kg), 71 patients (67.6%) had normal weight babies(2.4-3.4kg) whereas 14 had low birth weight (2.4kg) babies, none of the babies with extremely LBW(<1kg). In above study, there was one full term

unexplained intrauterine fetal demise(still-birth) the patient was Elderly with Precious pregnancy and with Gestational Diabetes Mellitus on diet control and had controlled sugars. In study done by Priyanka et al.6 still-birth were found to be 3 (9.09%) and 3 (4.84%) in study conducted by Wahi *et al*.[7]

Out of 105 babies born 32 babies (30.5%) were admitted in NICU. Most common reason for NICU admission was preterm delivery followed by babies of mothers with Gestational Diabetes Mellitus on Insulin for sugar monitoring, etc. Macrosomic babies were high 20 (19.0%) in present study, whereas 6% band 7% in other studies. There were no Hypoglycaemia or Shoulder Dystocia in our present study, it was seen in other studies. Neonatal hyperbilirubinemia is also on lower side 1 (0.6%) in present study but was high, 6 (10.12%) in Priyanka *et al*.[6]

CONCLUSION

Since the cut offs of this criteria are based on perinatal outcomes, we believe that by using this criteria, we can reduce the perinatal morbidity and mortality. In spite of appropriate glycaemic control, the Macrosomia is high in the Gestational Diabetes Mellitus population. Sudden unexplained still birth can occur in spite of a well glycaemic control. The cases with Gestational Diabetes Mellitus are associated with co-morbidities like Subclinical Hypothyroidism, thus the screening for thyroid should be done.

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