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Dr. Maturu Sudha Kumari
Associate Professor, Department of Obstetrics and Gynaecology, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh, India

Corresponding Author:
Dr. Maturu Sudha Kumari
Associate Professor, Department of Obstetrics and Gynaecology, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh, India

A prospective study on the maternal and perinatal outcome in gestational *Diabetes mellitus*

Dr. Maturu Sudha Kumari

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Abstract
Background and Objective: Gestational Diabetes mellitus (GDM) is the most prevalent among Asian population. There are specific risks and complications of uncontrolled diabetes in pregnancy affecting both mother and fetus. Gestational Diabetes mellitus has increased risk of Type 2 Diabetes mellitus and obesity in off springs. The main objective of the present study was to determine the maternal and fetal outcome in Gestational Diabetes Mellitus subjects studied during pregnancy.
Materials and Methods: A total of 130 (n=130) antenatal cases with diagnosed Gestational Diabetes Mellitus condition registered at Department of Obstetrics and Gynaecology, Maharajah's Institute of Medical Sciences Hospital, Nellimarla, Vizianagaram Dist., Andhra Pradesh, were selected for the present study. The study subjects were selected after screening for GDM by using single step Oral Glucose Challenge Test (OGCT) procedure according to recent DIPSI guidelines, between 24-28 weeks of gestation, on outpatient department (OPD) basis. The cut-off value for OGCT was 140 mg/dL. All the patients were followed up, treated for GDM with diet / OHA / insulin therapy till delivery and maternal and perinatal outcome was observed in all the subjects.
Results: In this study, obesity, family history of DM was more common risk factors in GDM population as compared to normal population. 47.69% patients belonged to age group between 26 to 30 years. 53.8% subjects had history of fetal loss prior to this pregnancy like abortion, still birth, intra uterine death (IUD). The outcome of subjects with GDM showed 66.9% subjects underwent Lower Segment Caesarean Section (LSCS), 33.1% subjects had preterm delivery and 1.5% had intra uterine death. 8.5% neonates born to GDM mothers had Neonatal Intensive Care Unit (NICU) admission.
Conclusion: In the present study GDM incidence was more in the age group between 26-30 years. More than 50% of subjects had history of fetal loss. Obesity, family history of diabetes mellitus and preeclampsia history had statistically significant risk factors in GDM patients. More than 2/3rd of patients underwent LSCS. Perinatal complications like prematurity, NICU admission, IUFD was seen.

Keywords: complications, gestational diabetes mellitus, oral glucose tolerance test, risk factors

Introduction
Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy and may be associated with adverse maternal and perinatal outcome. The word gestational implies that diabetes is induced by pregnancy, ostensibly because of exaggerated physiological changes in glucose metabolism [1]. Incidence of gestational diabetes mellitus (GDM) varies globally from 2 - 14%. These cases in India are also increasing and emerging as a major public health problem. The prevalence of GDM among urban and rural population of India has been reported as 16% and 17.8% respectively [2]. The known risk factors for Gestational diabetes mellitus are age, obesity, sedentary lifestyle, excessive gestational weight gain, central body fat deposition, family history of diabetes, hypertension, or preeclampsia in current pregnancy, Poly Cystic Ovarian Syndrome (PCOS), GDM during prior pregnancies [3]. Nearly 50% of women with GDM will become overt diabetes (Type-2) over a period of 5 - 20 years [4]. GDM was most prevalent among Asian Indians (19.3%) [5].
Indians have an eleven-fold risk of developing DM during the pregnancy [6]. India leads the world with the largest number of diabetic patients, earning the dubious distinction of "the diabetes capital of the world" [7]. In general, specific risks of uncontrolled diabetes in pregnancy include spontaneous abortion, fetal anomalies, preeclampsia, fetal demise, macrosomia, neonatal hypoglycaemia, and neonatal hyperbilirubinemia among others. In addition, diabetes in pregnancy may increase the risk of obesity and type 2 diabetes in offspring later in life.

Observational studies show an increased risk of diabetic embryopathy, especially anencephaly, microcephaly, congenital heart disease and caudal regression which is directly proportional to elevations in HbA1C during first 10 weeks of pregnancy [8]. Universal screening of all pregnant women for GDM had been endorsed by both the American Diabetes Association Position Statement and by the First (1979), Second (1984) and Third (1990) International Workshop-Conferences on GDM. The Fourth International Workshop-Conference on Gestational Diabetes (March 14th, 1997, Chicago, Illinois) subsequently endorsed these selective screening criteria [9-12].

The objective of the present study was to identify the risk factors, to study the maternal and perinatal outcome in patients (subjects) with Gestational Diabetes Mellitus.

Materials and Methods

The present study was conducted in the Department of Obstetrics and Gynaecology, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram (Dist.), Andhra Pradesh state, India for over a period of two years. The subjects for the current study consisted of patients selected from the registered antenatal patients of 24 to 28 weeks gestational age with singleton / multiple gestation attending out patient department, antenatal wards, labor room, postnatal wards, pediatric wards and newborn intensive care unit (NICU) of Maharajah's Institute of Medical Sciences Hospital, Nellimarla, Vizianagaram, Andhra Pradesh and screened for GDM using 75gm glucose, two-hour single step oral glucose challenge test according to recent DIPSI and followed up till after delivery.

Even one abnormal value was considered as impaired glucose tolerance (IGT) and if two or more values were abnormal the patient was considered as GDM based on the criteria (fasting blood sugar [BS] ≥92 mg/dl, 1 h BS ≥180 mg/dl, and 2 h BS ≥153 mg/dl). Initially, patients were started on diabetic diet with some physical exercises.

Patients with GDM were advised medical nutrition therapy (MNT), blood sugar levels were checked after 12 to 14 days. Diet was followed according to the dietician's prescription / advice. If blood sugar levels were not controlled on diabetic diet, then the women were either started on oral hypoglycemic agent or insulin therapy in collaboration with the endocrinologist. All the patients were followed up till delivery and maternal and perinatal outcomes were recorded.

A total n = 196 pregnant women who had an Oral Glucose Tolerance Test OGTT were included in the study and divided into 2 groups: a) subjects with Gestational diabetes mellitus n= 130 women (Experimental or investigated group), b) Control group with negative OGTT, subjects without Gestational diabetes mellitus n= 66 women.

In this study a total of n = 130 GDM patients were selected who were managed and delivered in the Hospital center. These subjects were selected after screening for GDM by a single step Oral Glucose Challenge Test (OGCT) procedure according to recent DIPSI guidelines, between 24-28 weeks of gestation, on outpatient department (OPD) basis. The cut-off value for oral glucose tolerance test (OGTT) was 140 mg / dL, where fasting 1, 2 and 3 hr sugar values were estimated.

In addition to routine investigations and blood sugar estimation, renal and liver function test, platelet count estimation done to assess the mother and serial USS along with other antepartum fetal surveillance tests done to assess the fetus. The fetal well-being was assessed from 28 to 30 weeks onwards. Doppler ultrasound was done only in selected cases. Earlier admission was done in case of any maternal or fetal complications. Uncomplicated cases were allowed to go into spontaneous labor or wait till date. Early termination was done in poorly controlled GDM subjects and at times of fetal jeopardy. As a protocol, labor was induced at 38 weeks if GDM patient was on insulin and those controlled on diet were induced at 40-week period of gestation. Normoglycemia was maintained during labor also. Close monitoring of mother and fetus was done during labor and use of partogram helped to avoid prolongation of labor.

Ethical Committee approval was obtained from the Institutional Ethic Committee and permission obtained from HOD, Department of Obstetrics and Gynecology to conduct the study and informed consent was taken from all participants before initiating the study.

Statistical analysis

$$\text{Sample Size (n)} = \frac{Z^2(1-\alpha/2)\,P.Q}{d^2}$$

- n = expected sample size
- P = Prevalence of GDM from previous study [65]
- Statistical analysis was performed with help of Epi Info (TM)
- X^2 test was used to test the association of different study variables with the study groups.

  Sample size = n = 130 with allowable error of 4%

Results

The study was conducted at Dept. of Obstetrics and Gynaecology, Maharajah's Maharajah's Institute of Medical Sciences Hospital, Nellimarla, Vizianagaram (Dist.), Andhra Pradesh state, India for over a period of 2 years.

The distribution of characteristics of the selected gestational diabetic mellitus (Experimental group) subjects is presented in Table 1. Among the total n = 130 experimental group subjects selected for the study, n = 62 (47.69%) subjects were aged 26 to 30 yrs and 32 (24.62%) subjects aged 19 to 25 yrs. 47.69% of the subjects belong to the high risk group (26 to 30 yrs). Out of n = 130 subjects GDM was recorded more in multigravida in n = 93 (71.5%) and less in primigravida n = 37 (28.5%). Out of n = 130 subjects at delivery, n = 37 (28.5%) subjects were of gestational age 37 weeks, n = 32 (24.6%) patients were of 38 weeks, n = 28 (21.5%) subjects of 36 weeks, n = 18 (13.9%) were <36 weeks gestation.

The data presented in Table 1 shows among n = 130 subjects, n = 94 (72.3%) subjects had no co-morbidities whereas, n = 22 (16.9%) had associated PE (preeclampsia), n = 7 (5.4%) subjects had hypothyroidism, n = 4 (3.1%) subjects anemia, n = 3 (2.3%) PIH (pregnancy induced hypertension). Here most patients had GDM associated with preeclampsia.

Out of n = 130 subjects, n = 70 (53.8%) subjects had history of fetal loss prior to this pregnancy like abortion, still birth, intra uterine death (IUD). Of n = 130 subjects under study, n = 46 (35.4%) subjects had family history of diabetes mellitus. Out of n = 130 subjects, n = 24 (18.5%) subjects had obesity as risk factor.

Out of n = 130 subjects, n = 56 (43.1%) had normal body mass index (BMI), n = 50 (38.5%) subjects were overweight-at risk, n = 20 (15.4%) were overweight- obese I, n = 4 (3.1%) were overweight- obese II. Mean and standard deviation BMI of all the subjects was 23.71 ± 2.09. Mean and standard deviation OGCT and FBS was 146.32 ± 6.75 and 97.25 ±16.78 respectively.

Among the total n = 130 subjects studied, n = 60 (46.2%) were on diabetic diet followed by n = 37 (28.5%) subjects were on insulin, n = 31 (23.8%) were on Oral Hypoglycemic Agent (OHA) and n = 2 (1.6%) on insulin and OHA. In the present study maximum patients were on diabetic diet where glucose levels were under control.

Table 1: Distribution of Experimental group subjects

Characters	Frequency (number)	Percentage (%)
Age (years)		
19-25	32	24.62
26 to 30 yrs	62	47.69
31 to 35 yrs	33	25.38
36 to 40 yrs	3	2.31
Mean ± SD	28.47 ± 3.983	28.52 ± 3.259
Obstretic history		
Primigravida	37	28.5
Multigravida	93	71.5
Gestational age (weeks)		
34	8	6.2
35	10	7.7
36	28	21.5
37	37	28.5
38	32	24.6
39	12	9.2
40	3	2.3
Comorbidity		
Anemia	4	3.1
Hypothyroid	7	5.4
Normal	94	72.3
PE	22	16.9
PIH	3	2.3
Fetal loss history		
Yes	70	53.8
No	60	46.2
Family history of DM		
Yes	46	35.4
No	84	64.6
Obesity		
Yes	24	18.5
No	106	81.5
BMI (according to ASEAN classification)		
Normal	56	43.1
Overweight- at risk	50	38.5
Overweight- obese I	20	15.4
Overweight- obese II	4	3.1
Mean ± SD	23.71 ± 2.09	
OGCT	146.32 ± 6.757	
FBS	97.25 ± 16.786	
Treatment		
Diet	60	46.2
Insulin	37	28.5
Insulin, OHA	2	1.6
OHA	31	23.8

SD- standard deviation, PE- preeclampsia, PIH- pregnancy induced hypertension, DM- diabetes mellitus, BMI- body mass index, OGCT- Oral Glucose Challenge Test, FBS- fasting blood sugar, OHA- Oral Hypoglycemic Agent

The data of distribution of the subjects based on the prematurity is presented in the Table 2 shows that out of n = 130 cases studied, n = 45 (34.6%) subjects delivered prematurely (<37 weeks). Hence, GDM has increased incidence of prematurity.

Table 2: Distribution of the subjects based on prematurity

Prematurity	Frequency (number)	Percentage (%)
Yes	45	34.6
No	85	65.4

The distribution of the subjects based on Amniotic Fluid Index (AFI) and Expected Fetal Weight (EFW) according to scan reports is presented in Table 3. Out of total n = 130 subjects studied, n = 10 (7.6%) subjects had AFI more than 24 cm (polyhydramnios). Mean Expected fetal weight according to scan was recorded 3.10 ± 0.44.

Table 3: Distribution of the subjects based on AFI and EFW according to scan

AFI	Frequency (number)	Percentage (%)
Less than 24 cm	120	92.3
More than 24 cm	10	7.6
Mean ± SD	13.164 ± 3.3910	
EFW Mean ± SD	3.10 ± 0.44	

AFI- amniotic fluid index, EFW- expected fetal weight, SD- standard deviation

The data of distribution of the subjects based on mode of delivery is represented in Table 4. Among the total n = 130 subjects, n = 87 (66.9%) subjects had Lower Segment Caesarean Section (LSCS), n = 37 (28.5%) had Full Term Normal Delivery (FTND) and n = 6 (4.6%) had Preterm Vaginal Delivery (PTVD).

Table 4: Distribution of the subjects based on mode of delivery

Mode of delivery	Frequency (number)	Percentage (%)
FTND	37	28.5
LSCS	87	66.9
PTVD	6	4.6

FTND- Full Term Normal Delivery, LSCS- Lower Segment Caesarean Section, PTVD- Preterm Vaginal Delivery

The data on the mean birth weight of the neonates is presented in Table 5. The mean actual birth weight (in Kgs) of the neonate born is 2.89 ± 0.479.

Table 5: Mean Birth Weight (in kgs) distribution of the subjects

Birth weight (kgs)	Mean	Standard deviation
Weight (kgs)	2.893	0.479

The data of the distribution of the subjects based on fetal outcome is shown in Table 6. Of the total n = 130 subjects, n = 85 (65.4%) subjects had Term delivery, n = 43 (33.1%) subjects had preterm delivery and n = 2 (1.5%) had IUD.

Table 6: Distribution of the subjects based on fetal outcome

Mode of delivery	Frequency (number)	Percentage (%)
IUD	2	1.5
PT	43	33.1
T	85	65.4

IUD-intra uterine death, PT- preterm delivery, T- term delivery

The data of the distribution of the subjects based on Neonatal Intensive Care Unit (NICU) admission is shown in Table 7. Out of n = 130 subjects studied, n = 11 (8.5%) neonates had NICU admission.

Table 7: Distribution of the subjects based on Neonatal Intensive Care Unit admission

NICU admission	Frequency (number)	Percentage (%)
Yes	11	8.5
No	119	91.5

NICU- Neonatal Intensive Care Unit

The data of the distribution of the subjects based on labour complications is presented in Table 8. Out of total n = 130 subjects, n = 12 (9.2%) subjects each had Premature Rupture of Membranes (PROM) and vaginitis, n = 3 (2.3%) had abruption, n = 5 (3.8%) had Post Partum Hemorrhage (PPH), n = 4 (3.1%) subjects had shoulder dystocia during vaginal delivery and n = 94 (72.3%) subjects had no complications.

Table 8: Distribution of the subjects based on labour complications

Complications	Frequency (number)	Percentage (%)
Abruption	3	2.3
Nil	94	72.3
PPH	5	3.8
PROM	12	9.2
Shoulder dystocia	4	3.1
Vaginitis	12	9.2

PPH- Post Partum Hemorrhage, PROM- Premature Rupture of Membranes

Discussion

A universal recommendation for the ideal approach for screening and diagnosis of GDM remains elusive. Abnormal glucose tolerance during pregnancy is associated with pregnancy morbidity and also increases the likelihood of subsequent diabetes in two generations, mother and offspring, cardiovascular disease and metabolic syndrome. Early diagnosis and treatment of GDM gives a long term pay off in the primary prevention of obesity and diabetes in the offspring. Asian ethnic background is one of the risk factor and hence, screening is offered to all pregnant women for GDM.

Glucose intolerance in continuum during pregnancy predisposes the offspring to a higher risk of immediate complications like macrosomia, hypoglycemia, jaundice, respiratory distress syndrome, polycythemia, and hypocalcemia and if the child is a girl there are high chances of her devoloping pre-GDM and GDM. Early recognition of GDM is of utmost important because therapy, including diet, life-style modification, exercise, insulin when necessary and antepartum fetal surveillance can reduce GDM associated perinatal morbidity and mortality. There is no universal agreement on the screening strategies and diagnostic criteria of GDM.

In our study 130 pregnant patients who are known cases of GDM are followed till delivery to know the maternal and fetal outcome. Mean age distribution in our study subjects was 28.47 years. The prevalence proportion increased with age from 24.62% in the age group 19-25 years to 47.69% in the age groups 25-30 years and 25.38% population belong to age group 31-35 years. According to a study conducted by Kumari, Rani, Usha, *et al.* [14] the most common age group was between 25 to 30 years with 42 cases (50%). In this present study, the age group subjects between 25-30 years were at highest risk.

In this study, among total n = 130 subjects, n = 93 (71.5%) were multigravida and n = 37 (28.5%) primigravida. Similar results were reported earlier where primigravida was 36% and multigravida 72% by Dudhwadkar *et al.* [15]. In the study by Amidha Shukla *et al.* [16] observed primigravida were 5% and multigravida 34% in GDM group cases.

In the current study, out of total n = 130 subjects, at delivery, n = 37 (28.5%) subjects were of gestational age 37 weeks, n = 32 (24.6%) patients were of 38 weeks, n = 28 (21.5%) subjects of 36 weeks, n = 18 (13.9%) were <36 weeks gestation. In the earlier study done by Amidha Shukla *et al.*, [16] mean gestational age at delivery was 38.6 weeks. Dahiya *et al.*, [13] study reported gestational age at time of delivery was, <37 weeks in 8.6% and ≥37 weeks in 91.4% subjects. In this study, among n = 130 subjects, n = 94 (72.3%) subjects had no co-morbidities whereas n = 22 (16.9%) had associated PE, n = 7 (5.4%) subjects had hypothyroidism, n = 4 (3.1%) subjects had anemia, n = 3 (2.3%) had PIH (pregnancy induced hypertension). Aditi Phulpagar *et al.*, [17] study reports showed only 0.3% and 0.9% had a history of PIH and asthma respectively. In a study conducted by Amidha Shukla *et al.* [16] 18% patients with GDM had complications like pregnancy induced hypertension. In study report by Sridevi *et al.* [18] ante natal care (ANC) risk factors were detected in 90% patients, preeclampsia complicating pregnancy was noticed in 26% patients and hypothyroidism 6% cases.

In the present, among n = 130 subjects, n = 45 (34.6%) subjects delivered prematurely (<37 weeks). Dahiya *et al.* [13] reported preterm delivery in 8.6% subjects. Amidha Shukla *et al.* [16] study reported 12% subjects had preterm delivery. --- [19] reported the most common cause of premature delivery in GDM was preeclampsia in 60% cases, multiple pregnancy and fetal malpresentation in 20% cases, hemolytic disease in 6.7% cases and placental abruption in 6.7% cases.

Among the total n = 130 subjects in this study, n = 70 (53.8%) subjects had history of fetal loss prior to this pregnancy like abortion, still birth, IUD. Gandhewar *et al.* [20] observed history of perinatal loss associated with a statistically significant risk of GDM. In a study conducted by Shridevi [18], BOH (h/o fetal less after 20 weeks, unexplained loss, IUD) was found in 39.13% subjects. Dudhwakar *et al.*, [15] reported history of IUFD was 8.0% and history of previous abortion/s was 10.0%.

In the present study, out of n = 130 subjects, n = 24 (18.5%) had obesity. Distribution of the subjects was made based on BMI. Out of n = 130 subjects, n = 56 (43.1%) had normal BMI, n = 50 (38.5%) subjects were overweight and at risk, n = 20 (15.4%) were overweight- obese I, n = 4 (3.1%) were overweight- obese II category. Poornima *et al.* [21] reported the prevalence of GDM increased with pre pregnancy BMI. Prevalence was highest in the BMI 25 - 29.9 kg/m2 group. Gestational diabetes mellitus was more prevalent in women with greater weight gain. In the present study mean BMI of the subjects was 23.71 ± 2.09 whereas, in the study done by Aditi Phulpagar *et al.* [17] mean Body Mass Index of subjects with GDM was 24.45±3.64, ranging from 16.64 to 38.36. In study conducted by Dahiya *et al.* [13] BMI ≥ 30 kg/m^2 was seen in 20% subjects.

Shridevi *et al.* [18] study reports showed BMI range seen in subjects with GDM were, <18.5kg/m^2 in 26% subjects, 18.5-24.9 kg/m^2 in 43% subjects and ≥ 25 kg/m^2 in 31% subjects. Obesity as a significant risk factor for GDM is supported by several study findings that overweight or obesity at the start of pregnancy predispose to GDM. Das *et al.* [22] and Gomez *et al.* [23] found that 25% and 50% of women with GDM had obesity. This is due to increased demand on maternal metabolism during pregnancy due to excess weight, imbalance in carbohydrate regulation mechanisms, and insulin sensitivity. Nilofer *et al.* [24] study results reported that obesity is a risk factor in 88.89% of GDM patients. In a study conducted by Gandhewar *et al.* [20] 24 out of the 31 women had BMI above 25 kg/m^2 as compared to 30 kg/m^2 women in the non GDM group and the difference

between the two groups was statistically significant. Thus, obesity was found to be a significant risk factor in developing GDM.

In this study, mean OGCT value is 146.32 ± 6.75 and mean FBS is 97.25 ±16.78. Fasting glucose levels are usually significantly higher in women with further need for insulin than those who need only diet and exercise.

In the present study, out of n = 130 subjects, n = 60 (46.2%) were on diabetic diet followed by n = 37 (28.5%) subjects on insulin, n = 31 (23.8%) subjects on OHA and n = 2 (1.6%) subjects on insulin and OHA. Rowan *et al.* [25] study reports showed 363 women assigned to metformin, 92.6% continued to receive metformin until delivery and 46.3% received supplemental insulin. In this study, mean AFI of the subjects according to scan was 13.16 ± 3.39. Out of n = 130 subjects, n = 10 (7.6%) subjects had AFI more than 24 cm (polyhydramnios). Dahiya *et al.* [13], study results reported 17.1% subjects had polyhydramnios in GDM group compared to 1.8% in normal group. Gandhewar *et al.* [20] reported polyhydramnios developed in 6 women each among 31 GDM subjects and 30 non GDM subjects and was not statistically significant. Polyhydramnios was reported in 20% cases in study conducted by Dudhwadkar *et al.* [15] and 8% in Amidha Shukla *et al.* study reports [16].

In the present study, mean expected fetal weight according to scan was 3.10 ± 0.44 and mean actual birth weight (in Kg) of the neonate born 2.89 ± 0.479. 14% was the incidence of macrosomia in reported results of Amidha Shukla *et al.*, [16] 11.4% in study by Dahiya *et al.* [13] and in study by Gandhewar *et al.* [20] the mean birth weight in GDM group was higher than in the non GDM group. Fetal macrosomia may affect 12% of newborns of normal women and 15–45% of newborns of women with gestational diabetes mellitus (GDM) [26].

Table 9: Comparison of birth weight range between Dudhwadkar *et al.* study n present study.

Birth Weight (KG)	Dudhwadkar *et al.* [n=50]	Present study [n=130]
1.5-2.5	10	22
2.51-3	8	56
3-3.5	12	31
>3.5	20	11

In the present study, of n = 130 subjects, n = 87 (66.9%) subjects had LSCS, n = 37 (28.5%) had FTND and n = 6 (4.6%) subjects had PTVD.

Table 10: Mode of delivery among the cases in Aditi Phulpagar *et al.* study and present study

Delivery	Present study	Aditi Phulpagar *et al.*
FTND	28.5%	92.2%
LSCS	66.9%	6.7%
PTND	4.6%	0.9%
IUFD	1.5%	0.3%

In study done by Amidha Shukla *et al.* [16] among GDM group 26% delivered by FTND and 40% by LSCS. In study reports by Dudhwadkar *et al.* [15] 46% patients delivered vaginally. Vacuum assisted delivery was seen in 2% patients. 52% patients underwent Lower segment caesarean section (LSCS). 34% were elective while 18% were emergency LSCS.

In the present study, out of n = 130 subjects, n = 85 (65.4%) subjects had term delivery, n = 43 (33.1%) subjects had preterm delivery and n = 2 (1.5%) had IUD. In study done by Amidha Shukla *et al.*, 12% was preterm delivery rate [16]. Dudhwadkar *et al.* [15] reported their study results that most of the babies delivered 78% were full term, but 22% were preterm.

In this study, among the total n = 130 subjects, n = 12 (9.2%) subjects each had PROM and vaginitis, n = 3 (2.3%) subjects had abruption, n = 5 (3.8%) subjects had PPH, n = 4 (3.1%) subjects had shoulder dystocia during vaginal delivery and n = 94 (72.3%) subjects had no complications. Out of n = 130 cases studied, n = 11 (8.5%) neonates had NICU admission. Gandhewar *et al.* [20] reported that there was one shoulder dystocia in the GDM group McRoberts manoeuvre was successful in delivering the shoulders. However, the newborn later on developed Erbs palsy. In study done by Dahiya *et al.* [13] vaginal infections were in 11.4% cases, admission to NICU in 14.3% patients. In study done by Amidha Shukla *et al.* [16] NICU admission >24hrs was in 16% patients. In study by Aditi Pulphagar *et al.* [17] shoulder dystocia was seen in 2.6% cases.

Conclusion

- Obesity, family history of DM was statistically more common risk factors in GDM population as compared to normal population.
- One third of the subjects delivered prematurely.
- More than 50% subjects delivered via LSCS.
- Adverse maternal and fetal outcome can be reduced because of early diagnosis and appropriate management.

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