

**To Study Clinical Profile of Neonate Born to Diabetic Mother****Sadhana Panda<sup>1</sup>, Jyoti Ranjan Behera<sup>2</sup>, Bibeka Kumar Panda<sup>3</sup>, Rashmi Ranjan Barik<sup>4</sup>**<sup>1</sup>Professor and Hod Department of Pediatrics, Dharanidhar Medical College and Hospital, Keonjhar, Odisha, India, 758001<sup>2</sup>Assistant Professor, Department of Pediatrics, MKCG Medical, College and Hospital, Berhampur, Ganjam, Odisha, India, 760004<sup>3</sup>Senior Resident, Department of Pediatrics, Fakir Mohan Medical College and Hospital, Balasore, Odisha, India, 756019<sup>4</sup>Assistant Professor, Department of Pediatrics, MKCG Medical College and Hospital, Berhampur, Ganjam, Odisha, India, 760004

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**Abstract:**

**Introduction:** Diabetes mellitus, a chronic metabolic disorder due to either insulin deficiency (relative or absolute) or peripheral tissue resistance to the action of insulin has now become a global pandemic because of sedentary life style, urbanization, changing dietary pattern, increasing incidence of obesity. Women with diabetes in pregnancy (PGDM & GDM) are at increased risk of adverse outcomes with long term complications for baby and mother. For mothers it includes fasting hyperglycemia, preeclampsia, infections, abortion, premature birth, polyhydramnios and unexplained infant death, chronic hypertension. Short term neonatal complications such as hypoglycemia, hypocalcemia, macrosomia, respiratory distress syndrome (RDS), hyperbilirubinemia, birth trauma, congenital anomaly are related mainly to foetal hyperinsulinemia, hypoxia and prematurity.

**Materials And Methods:** The study was commenced after getting Institutional Ethical Committee clearance. An informed consent of the mother was taken, after explaining the details of the study. It was a prospective observational study conducted from NOV 2020 - OCT 2022 in the department of paediatrics M.K.C.G. Medical College and Hospital, Berhampur, Odisha. All neonates born to women known to have diabetes mellitus before conception [infants of pregestational diabetic mother] (IPDM) and those born to women who diagnosed to have diabetes during pregnancy [infants of gestational diabetic mother] (IDM), admitted or came for routine check up to department of paediatrics.

**Results:** During the study period of 2 year from Nov 2020 - Oct 2022 total 98 neonates born to diabetic mothers were studied. Out of these 72 babies (73.46%) were born to mothers who developed glucose intolerance during pregnancy (Gestational Diabetes mellitus) while 26 babies (26.54%) were born to mothers who known to diabetes before conception. Mean age of mothers in GDM group was 26.97 with SD 3.7 & in PGDM group was 25.38 with SD 3.76 and almost equal in both groups. Mean duration of pregnancy in GDM mothers was 37.36 weeks with SD 1.6 and in PGDM mothers was 37.00 with SD 2.38. Out of 98 neonates 53 (54.1%) were male and 45 (45.9%) were female. Respiratory distress was seen in 18 (18.3%) neonates followed by yellowish discoloration 10 (10.2%), seizure 10 (10.2%) were the most common presenting signs. 8 (8.1%) neonates were presented with jitteriness.

**Conclusion:** Gestational diabetes was more common than pregestational diabetes. Most babies were delivered vaginally and were appropriate for gestational age and statically significant association was between LGA & GDM and SGA & PGDM. Respiratory distress followed by jaundice and seizure were the most common presenting signs, but most neonates were asymptomatic. Birth trauma, congenital anomalies, respiratory complications, birth asphyxia was common in infants of GDM mothers and congenital anomaly mostly involved cardiovascular system. Hypoglycemia was most common metabolic complication.

**Keywords:** Pre-gestational diabetes mellitus, Gestational diabetes mellitus, Hyperglycemia.

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**Introduction**

Diabetes mellitus, a chronic metabolic disorder due to either insulin deficiency (relative or absolute) or peripheral tissue resistance to the action of insulin has now become a global pandemic because of

sedentary life style, urbanization, changing dietary pattern, increasing incidence of obesity. [1]

Diabetes in pregnancy is increasing with prevalence of 14% including pre-gestational diabetes mellitus

(PGDM) and gestational diabetes mellitus (GDM) in parallelly with diabetes cases which is increasing by about 15.1%, from 31.7 million in 2000 to 79.4million by 2030 in India. [2]

Women with diabetes in pregnancy (PGDM & GDM) are at increased risk of adverse outcomes with long term complications for baby and mother. for mothers it includes fasting hyperglycemia, preeclampsia, infections, abortion, premature birth, polyhydramnios and unexplained infant death, chronic hypertension. [3]

Short term neonatal complications such as hypoglycemia, hypocalcemia, macrosomia, respiratory distress syndrome (RDS), hyperbilirubinemia, birth trauma, congenital anomaly are related mainly to foetal hyperinsulinemia, hypoxia and prematurity. [4]

Long term complications include an increased rate of childhood and adolescent obesity, impaired glucose tolerance and subtle neuropsychological dysfunction. [5] Insulin has been the primary mode of therapy for diabetes in pregnancy. [6] Some of the adverse effects of pregnancy can be prevented by pre conceptional counselling, careful planning of mode and time of delivery, better glycemic control, early screening for fetal abnormalities and good neonatal care. [7]

Being referral centre in south Odisha, large number of neonates admitted here from nearby districts and adjacent part of Andhra Pradesh. In our hospital no study has been done on neonate of diabetic mother. Our study will give a true insight into the clinical profile of neonate of diabetic mother with reference to type of diabetes .

### Materials and Methods

The study was commenced after getting Institutional Ethical Committee clearance. An informed consent of the mother was taken, after explaining the details of the study. It was a prospective observational study conducted from NOV 2020 - OCT 2022 in the department of paediatrics M.K.C.G. Medical College and Hospital, Berhampur, Odisha.

All neonates born to women known to have diabetes mellitus before conception [infants of pregestational diabetic mother] (IPDM) and those born to women who diagnosed to have diabetes during pregnancy [infants of gestational diabetic mother] (IDM), admitted or came for routine check up to department of paediatrics.

### Exclusion Criteria:

Still birth and brought dead are excluded from this study

### Methods:

Maternal history including age, weight, height, BMI, parity, history of any pregnancy loss, duration of diabetes, HBA1C level, treatment taken, history of any complication like pre-eclampsia, hypothyroidism and mode of delivery were recorded.

Detailed physical examination of baby was done to look for clinical profile, complications & congenital anomalies. This includes need for resuscitation, respiratory distress at birth, birth trauma, birth weight of baby and any evidence of congenital anomaly.

Birth weight of the baby was recorded using digital weighing scale. The babies were grouped as SGA, AGA or LGA depending on the birth weight and gestational age according to standard growth charts. Large for gestational age (LGA) was defined as birth weight greater than 90th percentile for gestational age, macrosomia as birth weight more than 4000 gm, small for gestational age (SGA) as birth weight less than 10th percentile for gestational age.

According to the protocol for the infant of diabetic mother, blood glucose level of baby was monitored at 2, 4, 6, 12, 24 and 48 hours of life using bed side glucometer and 24hrly by using venous blood. The method used was glucose oxidase method. Blood glucose level less than 45 mg/dl was considered hypoglycaemia.

Further management such as NICU stay, need of noninvasive ventilation, mechanical ventilator, inotropes and treatment of all babies were as per our hospital NICU protocol.

A predesigned proforma was prepared for taking detailed maternal history and examination of the neonate. The data obtained was tabulated in excel sheet and subjected to statistical analysis using SPSS software. Descriptive statistical analysis was done.

### Statistical Analysis

Results on continuous variables were presented as Mean± SD (Min-Max). Results on categorical variables were presented in number (%). Chi square test was done comparing the type of diabetes of mother with clinical presentation and complications in the neonate. The level of significance was considered at p value < 0.05.

### Results

**Table 1: Types of Maternal Diabetes**

| Types of Diabetes       | Cases (n=98) | Percentage |
|-------------------------|--------------|------------|
| Gestational Diabetes    | 72           | 73.46%     |
| pregestational Diabetes | 26           | 26.54%     |

During the study period of 2year form Nov 2020 - Oct 2022 total 98 neonates born to diabetic mothers were studied. Out of these 72 babies (73.46%) were born to mothers who developed glucose intolerance during pregnancy (Gestational Diabetes mellitus) while 26 babies (26.54%) were born to mothers who known to diabetes before conception.

**Table 2: Maternal Glycemic Control**

| glycemic control                                | Cases (n=98) | Percentage |
|---|--------------|------------|
| Satisfactory control (HBA <sub>1</sub> C <6.5%) | 74           | 75.51%     |
| Poor control (HBA <sub>1</sub> C ≥ 6.5%)        | 24           | 24.49%     |

24 mothers (25%) had poor glycemic control (HBA<sub>1</sub>C ≥ 6.5%) irrespective of type of diabetes and 74 mothers (75%) had satisfactory control (HBA<sub>1</sub>C <6.5%). (Table 2)

**Table 3: Baseline characteristics of mother and neonate with respective to type of Diabetic mother**

| Variables                        | In total   | Gestational Diabetes (n=72) | Pregestational Diabetes (n=26) |
|----------------------------------|------------|-----------------------------|--------------------------------|
| Age in year(mean±SD)             | 26.55± 3.7 | 26.97±3.77                  | 25.38±3.76                     |
| Gestational weeks(mean±SD)       | 37.27± 1.8 | 37.36±1.6                   | 37.00±2.38                     |
| HBA <sub>1</sub> C (%) (mean±SD) | 6.01± 1.03 | 6.07±1.07                   | 5.86±0.92                      |

Mean age of mothers in GDM group was 26.97 with SD 3.7 & in PGDM group was 25.38 with SD 3.76 and almost equal in both groups. Mean duration of pregnancy in GDM mothers was 37.36weeks with SD 1.6 and in PGDM mothers was 37.00 with SD 2.38. Mean level of glycosylated hemoglobin was

6.01 with SD 1.03 and higher level was seen in mother with gestational diabetes 6.07±1.07than mothers with pregestational diabetes 5.86±0.92. (table3)

**Table4: Sex of Neonates**

| Sex    | Cases (n=98) | Percentage |
|--------|--------------|------------|
| Male   | 53           | 54.1%      |
| Female | 45           | 45.9%      |

Out of 98 neonates 53 (54.1%) were male and 45(45.9%) were female. (table4)

**Table 5: variability of presenting signs and symptoms as per GDM and PGDM**

| Signs and Symptoms   | Gestational Diabetes |            | Pregestational Diabetes |            | P value |
|----------------------|----------------------|------------|-------------------------|------------|---------|
|                      | N=72                 | Percentage | N=26                    | Percentage |         |
| Respiratory Distress | 13                   | 18.1%      | 5                       | 19.2%      | 1.00    |
| Jaundice             | 7                    | 9.8%       | 3                       | 11.5%      | 0.14    |
| Seizure              | 8                    | 11.1%      | 2                       | 7.6%       | 1.0     |
| Jitteriness          | 6                    | 8.3%       | 2                       | 7.6%       | 0.18    |
| Lethargy             | 7                    | 9.8%       | 2                       | 7.6%       | 0.52    |
| Poor Cry After Birth | 6                    | 8.3%       | 3                       | 11.5%      | 0.28    |
| Irritability         | 4                    | 5.6%       | 2                       | 7.6%       | 0.56    |
| Feed Intolerance     | 8                    | 11.1%      | 1                       | 3.8%       | 0.34    |
| Congenital Anomaly   | 12                   | 12.6%      | 1                       | 3.8%       | 0.17    |
| Birth Trauma         | 6                    | 8.3%       | 2                       | 7.6%       | 0.23    |
| Asymptomatic         | 25                   | 34.7%      | 8                       | 11.1%      | 0.87    |

33 (33.6%) neonates were asymptomatic. Respiratory distress was seen in 18(18.3%) neonates followed by yellowish discoloration 10(10.2%), seizure10(10.2%) were the most common presenting signs. 8(8.1%) neonates were presented with jitteriness. With lethargy, poor cry after birth,

feed intolerance 9(9.1%) in each came as their symptoms. (13.2%) neonates had congenital anomaly13, 8(8.1%) neonates came for birth injury. In all complications p value was more than 0.05.(Table 5)

**Table 6: Metabolic Complications with relation to type of diabetic mother**

| Metabolic Complication | Gestational Diabetes |            | Pregestational Diabetes |            | P value |
|------------------------|----------------------|------------|-------------------------|------------|---------|
|                        | N=72                 | Percentage | N=26                    | Percentage |         |
| Hypoglycemia           | 24                   | 33.33%     | 8                       | 30.7%      | 1.00    |
| Hyperbilirubinemia     | 25                   | 34.7%      | 3                       | 11.5%      | 0.02    |
| Hypocalcemia           | 21                   | 29.1%      | 2                       | 7.7%       | 0.03    |
| Polycythemia           | 8                    | 11.11%     | 2                       | 7.7%       | 1.00    |

Table 6 showing 32(32.7%) cases in present study were hypoglycemic, which is most common metabolic complication followed by hyperbilirubinemia28(28.5%), hypocalcemia23(23.4%).with p value of 0.02&0.03 both was associated significantly with GDM group.

**Table 7: Time required for Normoglycemic(hour)**

| Hour | Cases (n= 32) | Percentage |
|------|---------------|------------|
| 1hr  | 15            | 46.87%     |
| 2hr  | 13            | 40.6%      |
| >2hr | 4             | 12.5%      |

15(46.87%) neonates became euglycemic after 1 hour of admission and 13(40,6%) after 2hr.4 (12.5%) neonates required more than 2hr to become euglycemic. (table 7)

**Table 8: Other Comp**

| Complications  | Gestational Diabetes |            | Pregestational Diabetes |            | P value |
|----------------|----------------------|------------|-------------------------|------------|---------|
|                | (N=72)               | Percentage | (N=26)                  | Percentage |         |
| Respiratory    | 16                   | 22.22%     | 2                       | 7.69%      | 0.14    |
| MAS            | 7                    | 9.7%       | 3                       | 11.53%     | 1.0     |
| Birth Asphyxia | 3                    | 4.16%      | 3                       | 11.53%     | 0.18    |
| TTN            | 3                    | 4.16%      | 2                       | 7.69%      | 0.52    |
| HMD            | 2                    | 2.77%      | 2                       | 7.69%      | 0.28    |
| Septicemia     | 3                    | 4.16%      | 0                       | 0          | 0.56    |

lications in relation to type of diabetic mother

**Table 9: Outcomes of Neonates with respect to type Diabetes mother**

| Outcome           | Gestational Diabetes |            | Pregestational Diabetes |            | P value |
|-------------------|----------------------|------------|-------------------------|------------|---------|
|                   | Cases (N=72)         | Percentage | Cases (N=26)            | Percentage |         |
| Discharge         | 64                   | 88.88%     | 24                      | 92.3%      | 0.14    |
| LAMA              | 2                    | 2.77%      | 1                       | 3.84%      | 1.00    |
| Refer for surgery | 3                    | 4.16%      | 0                       |            | 0.56    |
| Death             | 3                    | 4.16%      | 1                       | 3.84%      | 1.00    |

4(4%) babies died out of which 3 had GDM mother.3% neonate referred for surgery ,3(3%) babies left hospital.88 neonates (88.9%) were discharged, among them 64 had newly diagnosed mother, 24 had previously diagnosed mother. No significant association found in outcome of babies born from gestational diabetic and pregestational diabetic mothers but higher percentage of discharge in previously diagnosed diabetic mother. (Table 9)

#### Discussion

In our study incidence of neonates with gestational diabetes mellitus (GDM) mother was72(73.46%) and pregestational diabetes mellitus (PGDM) was 26(26.54%) compared to other studies like Mallick B et al 2021 where GDM was 76.1%, PGDM was 23.9%. [8]

The HbA<sub>1c</sub> has been considered to be a good indicator of the glycemic control of the mothers. Majority of mothers in our study had good glycemic control with having (HBA<sub>1c</sub> < 6.5%) were74 (75.51%) and poor control (HBA<sub>1c</sub> > 6.5%) were 24 (24.49%) similar to studies like Mallick B et al [8] where mothers with HBA<sub>1c</sub> < 6.5% was 77.6%, HBA<sub>1c</sub> >6.5% was 22.4% higher than Basvaranjan et al(HBA<sub>1c</sub> < 6.5% 25% vs HBA<sub>1c</sub> > 6.5% 75%), [9] Anjum et al (HBA<sub>1c</sub> < 6.5% 62% vs HBA<sub>1c</sub> >6.5% 38%) respectively may be due to most of mothers belonged to urban area. [10]

Mean age of mothers in GDM group was 26.97 with SD 3.7 & in PGDM group was 25.38 with SD 3.76 and almost equal in both groups. Mean duration of pregnancy in GDM mothers was 37.36weeks with SD 1.6 and in PGDM mothers was 37.00 with SD 2.38 which was similar to Begum et al 2018

36.79±.07 in GDM and 36.59±1.37 in PGDM. Mean level of glycosylated hemoglobin was 6.01 with SD 1.03 and higher level was seen in mother with gestational diabetes 6.07±1.07 than mothers with pregestational diabetes 5.86±0.92. This may occur due to already diabetes diagnosed mothers had a good compliance to therapy. [11] Out of 98 neonates 53 (54.1%) were male and 45 (45.9%) were female with ratio of 1.17 : 1 but in study like Rafiq et al ratio was 0.97: 1 showed female sex predominance. [12] This can be explained by social norms because of which parents are biased for seeking health care attention for male child while females are neglected. [13]

We found out that cesarean delivery was more in PGDM group and vaginal delivery was more in GDM Group. May be due to poor compliance to treatment, secondly other risk factor like hypertension mostly associated with prolonged diabetes. No significant association found between mode of delivery and type of diabetic mother.

In our study most of infants 52 (53%) of diabetic mothers were appropriate for gestational age similar to Leandro C et al<sup>14</sup> studied 530 IDMs over a period of 2 years and found 36% of babies were LGA, 62% of babies were AGA & only 2% were SGA. But babies having birth weight large for Gestational age birth weight were lower in comparison to studies like Ranade et al [15] and Alam et al [16] where it is 41.5 % and 45 % respectively. which can be explained by majority of mothers in our study had good glycemic control with having HbA1C <6.5% and we had not taken other comorbidities like hypertension which are more likely associated with prolonged diabetes. [17] Out of the 98 neonates born to mother with diabetes 33 (33.6%) were asymptomatic similar to Shah et al 41%. [18]

In our study respiratory complications as commonest complication were seen in 18 (18.3%) and more with neonates born to GDM (22.22%), than PGDM mothers (7.69%) which are similar to other studies like Yashwanth R et al 18.2%, [19] Anjum et al 30%.<sup>10</sup> We found 3 babies had culture proven sepsis, none of the infants developed acute renal failure or necrotising enterocolitis.

The incidence of congenital anomalies in this study was 13.2% similar to Mallick B et al<sup>18</sup> and was lower to Elango et al, attributed to good glycemic control, good compliance among previously diagnosed diabetic mothers, regular antenatal check-ups is another possible factor. [20]

Death occurred mostly neonates of diabetic mother, out of 4 (4%) babies 3 had GDM mother. 3% neonate referred for surgery, 88 neonates (88.9%) were discharged with higher percentage of discharge i.e. 92.3% in previously diagnosed diabetic mothers. [21,22,23]

## Conclusion

Gestational diabetes was more common than pregestational diabetes. Most babies were delivered vaginally and were appropriate for gestational age and statically significant association was between LGA & GDM and SGA & PGDM. Respiratory distress followed by jaundice and seizure were the most common presenting signs, but most neonates were asymptomatic. Birth trauma, congenital anomalies, respiratory complications, birth asphyxia was common in infants of GDM mothers and congenital anomaly mostly involved cardiovascular system. Hypoglycemia was most common metabolic complication. Hyperbilirubinemia and hypocalcemia significantly associated with GDM group. Risk of complications were more in Infants of GDM mother which need to be monitored by antenatal screening, early recognition and treatment of these cases.

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