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## Study of outcome of infant born to diabetic mothers

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**Abstract**

Diabetes in pregnancy is associated with an increased risk of foetal, neonatal and long-term complications in offspring. Maternal diabetes may be pre gestational (Type 1 or Type 2) and diabetes diagnosed during pregnancy (gdm). objective is to study the occurrence of metabolic, hematologic and congenital anomalies in infant of diabetic mothers. A Retrospective study conducted at tertiary care centre with Neonates born to diabetic mothers who fulfil inclusion criteria both gestational and pregestational diabetes treated with Insulin or dietary modification at Hospital. Data was analysed as per standard statistical test like chi-square. All the metabolic complications Hypoglycaemia, Hyperbilirubinemia was common in neonates with mother having PGDM compared to mother with GDM with Odd's ratio was significant. Common systemic anomaly was seen involving cardiac system 52% neonates had cardiac anomaly. Common cardiac anomaly was PDA 28% followed by ASD 26%. VSD was seen in 4% of the neonates. The infants of diabetic mother continue to be a high-risk population. Hence, they are best delivered and managed at a tertiary care centre capable of providing intensive monitoring.

**Keywords:** infant of diabetic mother, gestational diabetes, pregestational diabetes mellitus

### 1. Introduction

Diabetes in pregnancy is associated with an increased risk of foetal, neonatal and long-term complications in offspring. Women are separated into those who were known to have diabetes before pregnancy as Pregestational or overt, and those diagnosed during pregnancy as Gestational. Prevalence rate of pregestational diabetes is approximately 1.8% and gestational diabetes mellitus is 7.5%. The outcome is generally related to the onset and duration of glucose intolerance during pregnancy and severity of mother's disease. Abnormal fetal metabolism during pregnancy complicated by pregestational or gestational diabetes mellitus results in multiple neonatal sequelae, including abnormalities of growth, glucose and calcium metabolism, hematologic status, cardio respiratory function, bilirubin metabolism, and congenital anomalies.

### 2. Materials and methods:

#### 2.1 Objectives

- To study the occurrence of metabolic, hematologic and congenital anomalies in infant of diabetic mothers.
- To compare the outcome in infants of GDM mothers and Pre-gestational DM mothers.
- To compare the outcome between infants of pregestational and gestational diabetes mellitus with reference to glycaemic control.

#### 2.2 Methodology:

- Study design: Retrospective observational study
- Sample size: 97 diabetic women
- Period: 2 years
- Inclusion criteria: both gestational and pregestational (Known / established diabetic), treated with Insulin or dietary modification at public health hospital
- Exclusion criteria: Diabetic mothers on oral hypoglycaemic therapy, with coexisting heart disease and neonates referred from other hospital were excluded.
- Data was analyzed as per standard statistical analyzing system

Women were separated into those who were known to have diabetes before pregnancy-pre-gestational or established, those diagnosed during pregnancy-gestational.

The diagnosis of gestational diabetes was by oral glucose tolerance test with criteria laid out by Carpenter and Couston.

Mothers having HbA1C < 7 had good glycemic control whereas mothers having HbA1C value > 7 classified as having poor glycemic control.

A screening physical examination for the presence of major and minor congenital anomalies, birth injuries and general systemic examination was performed.

Blood glucose levels were checked at 0, 1, 2, 6, 12, 24, 48, and 72 hours by Glucostix (capillary blood glucose).

Chest X ray and 2 D- Echo cardiography, X ray Lumbosacral spine was done as per unit protocol in each neonate born to diabetic mother. Ultrasonography of abdomen and pelvic organ and cranium was done in all neonates.

**3. Results and discussion**

This study showed that out of total 95 women who were included 32 were found to have pregestational diabetes while 63 of them were found to have gestational diabetes. If we look at distribution of the neonates according to birth weight and the diabetic status of the mother, 37.5% of the newborns having weight >3.5kg were born to the mothers having pregestational diabetes. On the other hand, number as high as 65% of the newborns having weight between 2.5

to 3.5kg were born to the mothers having gestational diabetic mothers.

In this study (29.4 %) of all neonates born to mother having Diabetes had external congenital anomaly present rest (70.6%) of neonates had no external congenital anomaly? (Table no.1)

Study most common external congenital anomaly seen was hairy pinna in 20 (21%) neonates followed by epidermal nevus,hypospadias,polydactaly,penoscrotal transposition.(table no.2)

Most common cardiac anomaly being PDA seen in 27 (28%) of neonates followed by second most common was ASD seen in 25(26%) neonates. Others were PPHN, VSD, PAH, PFO, TGA in neonates. (Table no.3)

Looking at metabolic spectrum of the abnormalities seen in infants born to diabetic mother's hyperbilirubinemia was most common (35%) followed by hypoglycemia and hypocalcemia. Also, hyperbilirubinemia was more common with infants born to mothers having pre gestational diabetes. (Table no.6)

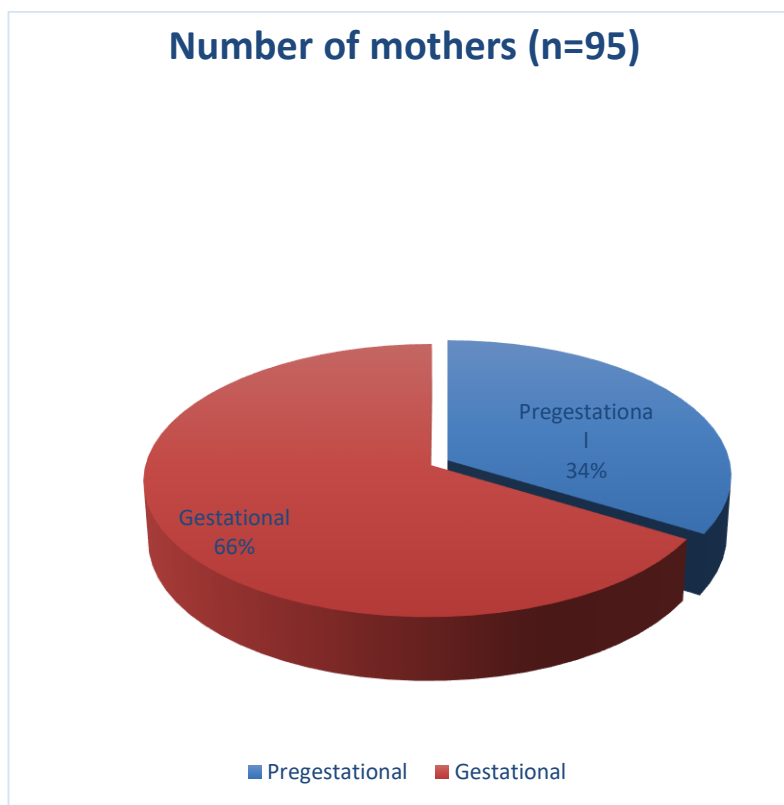
Congenital anomalies were mostly involving cardio vascular system in the newborns followed by musculoskelele system and renal system. (Table no.7)

Most common clinical manifestation seen was icterus (46%), respiratory distress (21%), jitteriness (20%), polycythemia (15%),TTNB,sepsis, birth asphyxia, convulsions,cyanosis.(table no.8)

**4. Tables and Figures**

**Table. 1:** Distribution of mother according to diabetic status.

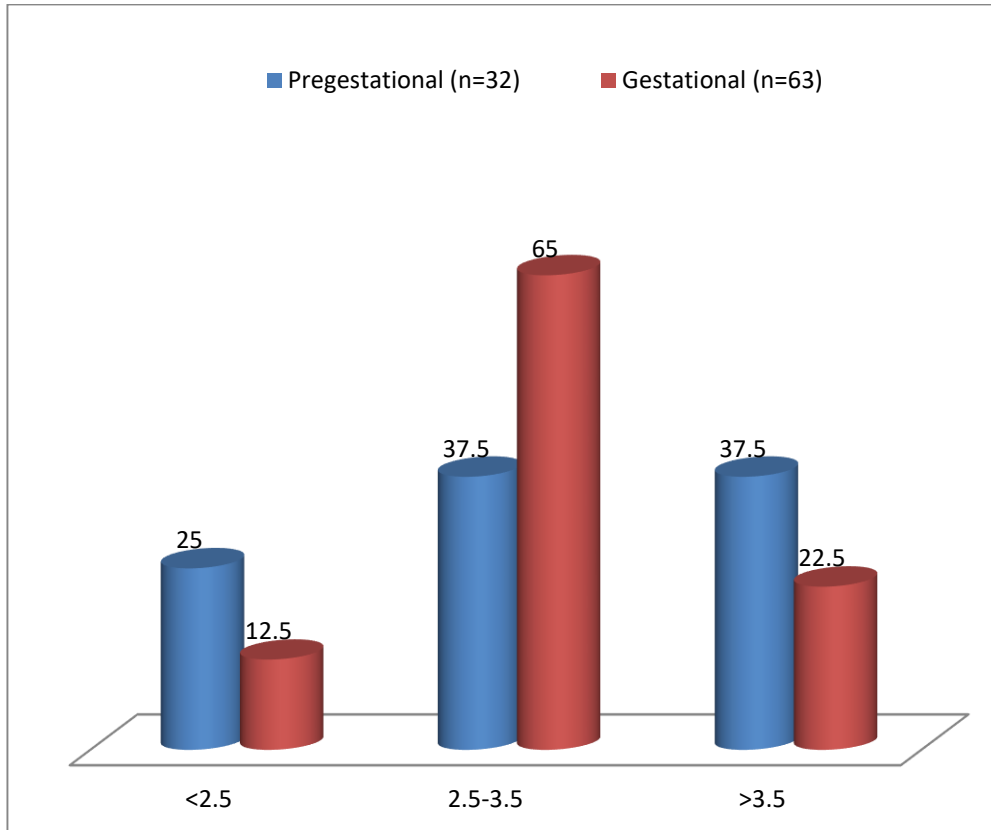
Type of DM	Number of mothers (n=95)	%
Pre-gestational	32	34
Gestational	63	66



**Fig. 1**

**Table. 2:** Distribution according to birth weight and diabetic status.

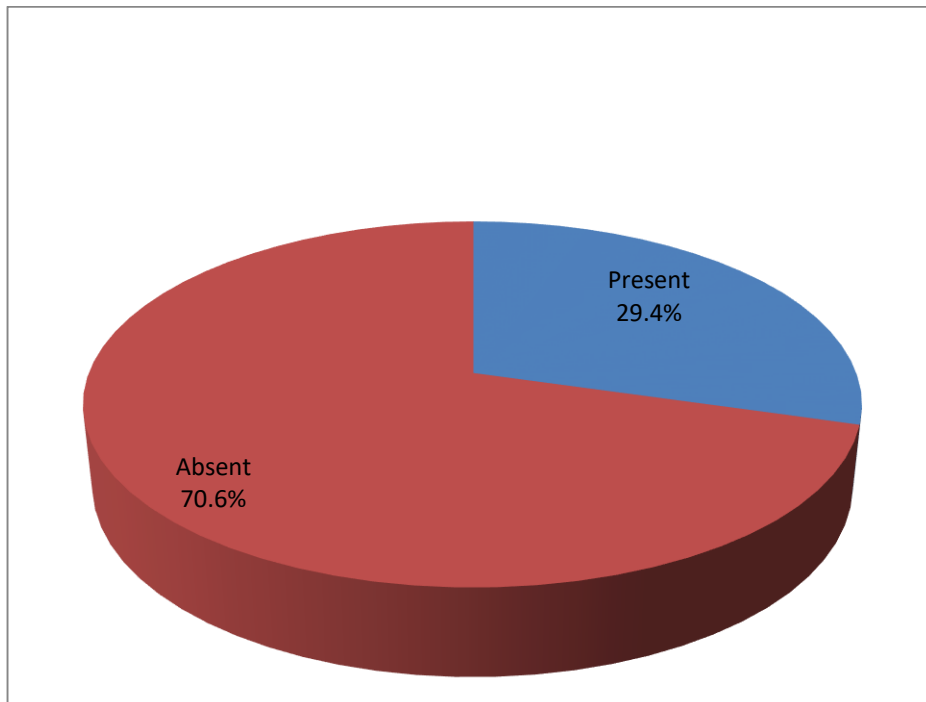
Birth weight (kg)	Number of newborns (n=95)	Pre-gestational (n=32)	Gestational (n=63)	p value
<2.5	16 (17%)	8 (25%)	8 (12.5%)	P=0.036
2.5-3.5	53 (56%)	12 (37.5%)	41 (65%)	
>3.5	26 (27%)	12 (37.5%)	14 (22.5%)	



**Fig. 2**

**Table. 3:** Problems noted at birth (external congenital anomalies).

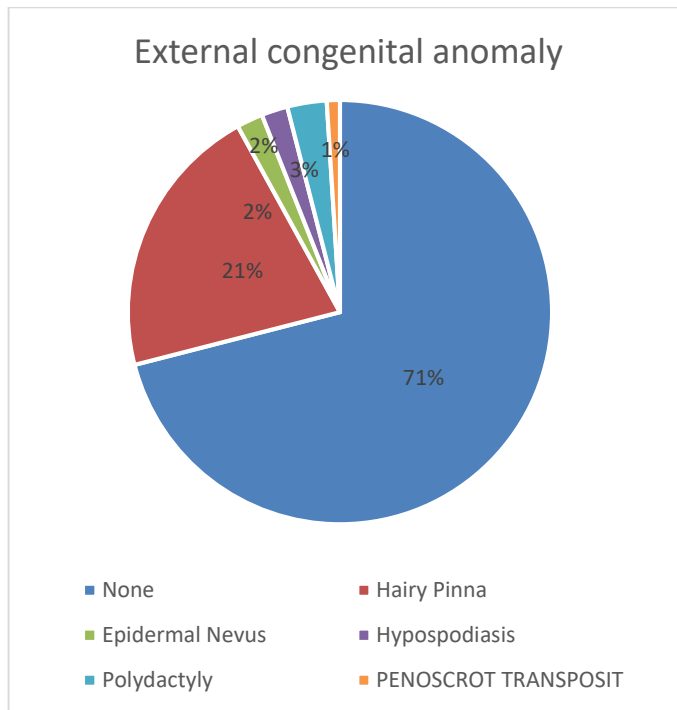
External congenital anomaly	Number of newborns (n=95)	%
Present	28	29.4
Absent	67	70.6



**Fig. 3**

**Table. 4:** Spectrum of external congenital anomalies.

External congenital anomaly	Number of infants (n=95)	%
None	67	71%
Present	28	29%
Hairy Pinna	20	21%
Epidermal Nevus	2	2%
Hypospadias	2	2%
Polydactyly	3	3%
Penoscrot Transposition	1	1%



**Fig. 4**

**Table 5:** Spectrum of cardiac anomalies.

Cardiac anomalies	Number of infants (n=95)	%
None	46	48
Yes	49	52
ASD	25	26
PDA	27	28
PPHN	4	4
VSD	4	4
PAH	2	2
Aortic Stenosis with Bicuspid aortic Valve	1	1
Aorto Pulmonary Window	1	1
PFO	3	3
TGA	1	1

**Table.6:** spectrum of metabolic anomalies

Metabolic abnormality	Number of newborns (n=95)	Pre-gestational (n=32)	Gestational (n=63)	p value	Odd's Ratio (OR)
Hypoglycemia	29 (12.6%)	13	16 (25%)	P=0.127	OR=2
Hypocalcemia	17 (17.9%)	4 (12.5%)	13 (20.6%)	P=0.324	OR=0.54
Hyperbilirubinemia	35 (36.8%)	14 (43.8%)	21 (33.3%)	P=0.3198	OR=1.55

**Table.7:** Distribution of congenital anomalies and Maternal Diabetic status

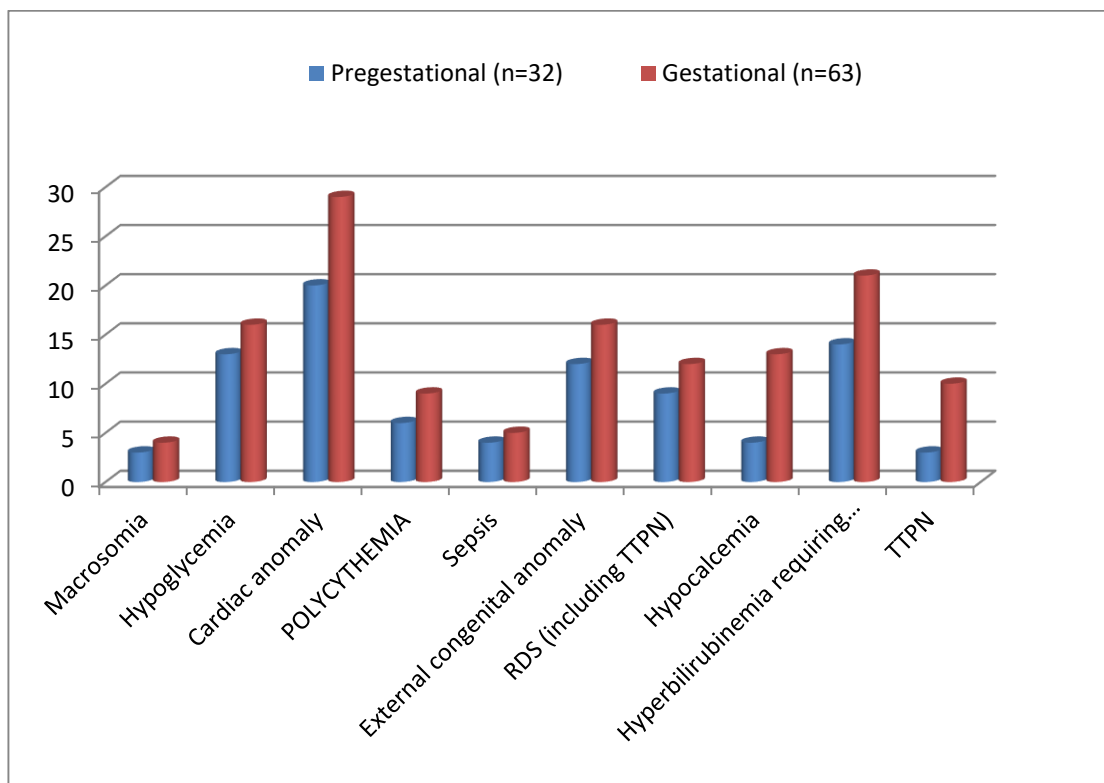
Congenital anomalies	No. of neonates (n=95)	Pre-gestational (n=32)	Gestational (n=63)
Cardiovascular system	49 (51.5)	20 (62.5%)	29 (46%)
Central nervous system	0	0	0
Musculoskeletal	2 (2.1)	1 (3.1%)	1 (1.5%)
Renal system	1 (1.05)	1 ()	0

**Table.8:** clinical manifestation in neonates admitted in NICU

Problems in NICU	Number of infants (n=95)	%
None	20	21
Present	75	79
Icterus	44	46
Jitteriness	20	21
RDS	21	22
TTNB	13	14
Sepsis	9	9
Polycythemia	15	16
Birthasphyxia	3	3
Convulsion	2	2
Cyanosis	4	4

**Table.9:** Spectrum Complications of neonates with reference to Maternal Diabetic status

Complication	All subjects (n=95)	Pre-gestational (n=32)	Gestational (n=63)	p value	Odd's ratio (OR)
Macrosomia	7 (7.3%)	3 (9.3 %)	4 (6.3%)	P=0.2	OR=1.52
Hypoglycemia	29 (30.53%)	13 (40.63%)	16 (25.4%)	p =0.1276	OR=2
Cardiac anomaly	49 (51.6%)	20 (62.5%)	29 (46%)	P=0.129	OR=1.95
POLYCYTHEMIA	15 (15.8%)	6 (18.7%)	9 (14.3%)	P=0.572	OR=1.38
External congenital anomaly	28 (29.5%)	12 (37.5%)	16 (25.3%)	P=0.221	OR=1.76
Hypocalcemia	17 (17.9%)	4 (12.5%)	13 (20.6%)	P=1.84	OR=0.54
Hyperbilirubinemia requiring phototherapy	35 (36.8%)	14 (43.8%)	21 (33.3%)	P=0.319	OR=1.55



**Fig. 5**

**5. Conclusion**

Our retrospective observational study has shown that in spite of intensive management of maternal diabetes the infants of diabetic mother continue to be a high-risk population. They are prone to develop problems both at the time of birth and after admission to the NICU. Hence, they are best delivered and managed at a tertiary care centre capable of providing intensive monitoring and therapy. The major congenital anomalies were cardiac occurring in as high as 52% of the neonates included in the study suggest necessity for a thorough cardiac examination supplemented by 2 D- Echo cardiography if required in all

these infants.

There was more risk of congenital anomalies, Hypoglycemia, Polycythemia, and Hyperbilirubinemia in neonates born to mother with PGDM as compared to GDM. IDMs may not require prolonged NICU, especially if asymptomatic. Short term follows up showed no significant morbidity even in infants who developed hypoglycemia. However, long term follows up studies may be required to assess for future neurodevelopmental outcome.

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