



MEDICO RESEARCH CHRONICLES

ISSN NO. 2394-3971

DOI No. 10.26838/MEDRECH.2024.11.1.711

Contents available at www.medrech.com

A study of the complications in infants of diabetic mothers in a rural hospital in Western Maharashtra

Dr. Jayna Dinesh Mehta¹, Dr. Jayashree. P. Jadhav²

1. Post graduate student, Department of Pediatrics, Dr. B V P Rural Medical College, PIMS-DU, Loni, Maharashtra, India.

2. Professor and Head of Department, Department of Pediatrics, Dr. B V P Rural Medical College, PIMS-DU, Loni, Maharashtra, India

ARTICLE INFO

Article History

Received: November 2023

Accepted: January 2024

Key Words:

Hypoglycemia, macrosomia, congenital malformations, polycythemia, birth asphyxia, glycemic control, neonatal sepsis

ABSTRACT

Background: Diabetes Mellitus is a group of metabolic diseases characterized by chronic hyperglycaemia associated with disturbances of carbohydrate, fat and protein metabolism due to absolute or relative deficiency in insulin secretion and or action. Historically, infants of diabetic mothers (IDMs) have been at significantly greater risk for spontaneous abortion, still birth, congenital malformations and perinatal morbidity and mortality. IDMs have quadruple the incidence of admission to a new-born intensive care unit.

Aims and objectives: To know complications in infants of diabetic mothers.

Methods: This is a descriptive cross-sectional study that was conducted at the department of paediatrics, Dr. Vitthalrao Vikhe Patil Pravara Rural hospital Loni, Maharashtra, India, performed on infants born to diabetic mothers from Feb 2022 to Dec 2023.

Results: 34 infants were included in the study. 2 infants were born of twin pregnancy. So totally 33 mothers formed mothers of the sample size. Low birth weight (<2.5 Kg) was observed in 20.6 % of babies and macrosomia (>4 Kgs) was seen in 6% of the babies. 44.1 % weighed between 3-4 Kgs at birth. Hypoglycaemia was the commonest complication seen in 28 (84.8%) IDMs followed by respiratory distress in 11 (33.3%) and congenital anomalies in 11 (32.4%) IDMs. Hypocalcaemia was the least common complication seen in 1 (3%) IDM. None of the IDMs sustained any birth injuries. One baby with a major congenital malformation (sirenomelia) dies within 20 minutes of birth. Hypoglycaemia was more commonly observed in IDMs with birth weight <2.5 Kgs (83.3%) and >3 Kgs (100%) whereas this complication was least common in IDMs weighing 2.5-3 Kgs at birth (P<0.049). Hypoglycaemia was most commonly observed in IDMs at less than 6 hours of postnatal age whereas it was less common at 6-24 hours

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Corresponding author

Dr. J. D. Mehta

(12.1%) and 24-48 hours (9.1%) of postnatal age ($P < 0.000$). This observation was highly statistically significant. ASD was most common cardiac anomaly observed in IDMs (27.3%) and only 1 (3.0%) IDM had combination of ASD, VSD, and PDA ($P < 0.01$).

Conclusion: The neonatal complications commonly seen in infants of diabetic mothers are macrosomia, birth asphyxia, congenital anomalies, respiratory distress, hypoglycaemia, hypocalcaemia, hyperbilirubinemia, and polycythaemia. There are no significant differences in neonatal morbidity profiles of IDMs born to pre-gestational and gestational diabetic mothers. Management goals in pregnancies complicated by diabetes mellitus should be to achieve optimal glycaemic control, as neonatal complications are more common in women with suboptimal glycaemic control.

2024, www.medrech.com**INTRODUCTION:**

Diabetes mellitus is defined as a group of metabolic diseases that are characterized by hyperglycaemia resulting from defects in insulin secretion, action or both. Gestational diabetes mellitus is defined as glucose intolerance that begins or is first detected during pregnancy. Potential morbidities in the infant of a diabetic mother are congenital anomalies (skeletal, central nervous system, cardiac, renal, gastrointestinal, single umbilical artery), macrosomia, birth injury, asphyxia, hypoglycaemia, hypocalcaemia, hyperbilirubinemia, increased blood volume, organomegaly, polycythaemia, respiratory distress, etc. The Pederson hypothesis states that maternal hypoglycaemia results in foetal hyperglycaemia because glucose readily traverses the placenta and causes hypertrophy of foetal pancreatic islets and hyperinsulinemia. The incidence of infants with birth weight > 4000 g is approximately 8% in non-diabetic women and about 26% in women with diabetes. Insulin and insulin like growth factors (IGF 1 & 2) play a role in regulation of foetal growth.

Hypoglycaemia is known to occur in 47% of macrosomic and in about 20% of non-macrosomic IDMs. Appropriately monitored toward stability with a narrow range to achieve tight metabolic control, ambulatory glycaemia

in pregnancy is associated with a decreased risk of maternal and foetal complications. The incidence of shoulder dystocia ranges from 0.2-2.8 % in the general population compared to 3-9% in infants of women with GDM. Hypoglycaemia is defined as a blood glucose level less than 40 mg/dl in any infant, regardless of gestational age and whether symptomatic or not. Clinical signs include irritability, lethargy, apnoea, poor feeding, hypothermia, seizure. The incidence of hypoglycaemia in the IDM are reported to range from 25% to 40%, therefore it is clear that the IDM must be screened carefully in the early hours of life for blood sugar levels. Besides hypoglycaemia, hypocalcaemia and hypomagnesemia rank as one of the most common metabolic derangements observed in IDM. Polycythaemia, defined as central haemoglobin concentrations more than 20 g/dl and haematocrit levels more than 65% and is present in 20- 30% of IDMs at birth. Polycythaemia is a result of increased erythropoietin induced in response to foetal hypoxia which is a consequence of hyperinsulinemia in IDMs. IDMs are at increased risk for hyperbilirubinemia because of an expanded red cell mass, ineffective erythropoiesis and relative immaturity of hepatic bilirubin conjugation and excretion.

Respiratory distress syndrome is a frequent complication in the IDM because of later onset of maturity of the type 2 alveolar cells. The goal of foetal surveillance differs with gestational age, wherein the 1st trimester goal is to verify viability, whereas structural integrity is validated during the second trimester. The goal during the third trimester is to monitor foetal growth and ensure foetal well-being. IDMs remain a high-risk population although there has been continuous improvement in outcome for these IDMs. Optimal results are obtained when meticulous medical-obstetric care throughout pregnancy is combined with expert neonatal supervision.

MATERIAL AND METHODS:

All consecutive live born babies born to diabetic mothers in Dr. Vitthalrao Vikhe Patil Pravara Rural hospital Loni, Maharashtra, India, during the study period (Feb 2022 to Dec 2023) formed the study population (inclusion criteria). The glycemic status of the diabetic mothers was ascertained based on the serial estimation of fasting and post prandial glucose levels. Exclusion criteria : Still-born babies of diabetic mothers, abortions of diabetic mothers. All babies born to diabetic mothers were shifted to NICU for monitoring and treatment. Data regarding detailed examination of the new born was collected in a preformed proforma. History, clinical examination was followed by blood investigation, chest x-ray, ecg, 2D echocardiography. The findings were analysed using standard statistical methods. The findings were then compared to multiple studies already published regarding the same components. All the statistical operations were done through SPSS for Windows, SPSS Inc. New York.

STATISTICAL ANALYSIS:

Data obtained in history, clinical examination and investigation proforma was entered in excel sheet and subjected to appropriate statistical analysis. Data obtained in history, clinical examination and investigation proforma was entered in excel sheet and analysis using SPSS software for ver 25.0.

RESULTS:

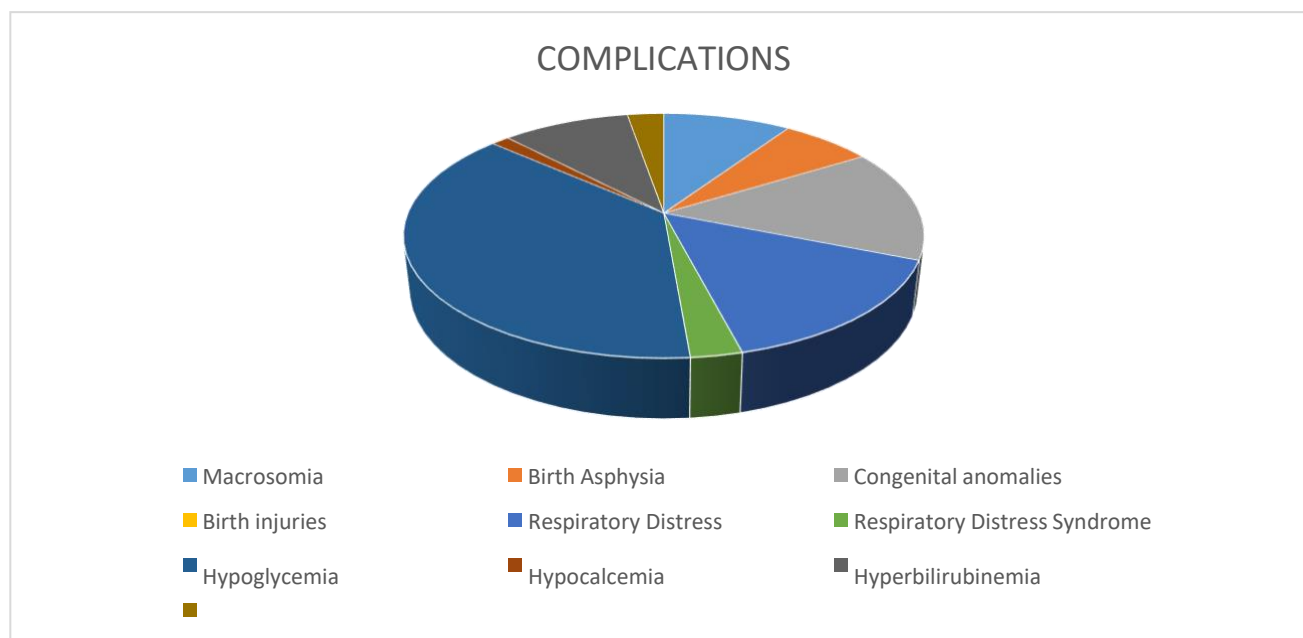
34 infants were included in the study. 2 infants were born of twin pregnancy. So totally 33 mothers formed mothers of the sample size. Low birth weight (<2.5 Kg) was observed in 20.6 % of babies and macrosomia (>4 Kgs) was seen in 6% of the babies. 44.1 % weighed between 3-4 Kgs at birth. Hypoglycaemia was the commonest complication seen in 28 (84.8%) IDMs followed by respiratory distress in 11 (33.3%) and congenital anomalies in 11 (32.4%) IDMs. Hypocalcaemia was the least common complication seen in 1 (3%) IDM. None of the IDMs sustained any birth injuries. One baby with a major congenital malformation (sirenomelia) dies within 20 minutes of birth. Hypoglycaemia was more commonly observed in IDMs with birth weight <2.5 Kgs (83.3%) and >3 Kgs (100%) whereas this complication was least common in IDMs weighing 2.5-3 Kgs at birth ($P < 0.049$). Hypoglycaemia was most commonly observed in IDMs at less than 6 hours of postnatal age whereas it was less common at 6-24 hours (12.1%) and 24-48 hours (9.1%) of postnatal age ($P < 0.000$). This observation was highly statistically significant. 2 newborns had polycythemia. ASD was most common cardiac anomaly observed in IDMs (27.3%) and only 1 (3.0%) IDM had combination of ASD, VSD, and PDA ($P < 0.01$).

Table no. 1: Distribution of the patients

Gender	Number
MALE	22 (66.7%)
FEMALE	11 (33.3%)
TOTAL	33 (100%)

Table no. 2: Birth Weight and Associated Conditions: Hypoglycemia, Polycythemia, and Hyperbilirubinemia Distribution

Birth weight	Number	Hypoglycaemia	Polycythemia	Hyperbilirubinemia
SGA	7 (20.6%)	1	0	0
AGA	10(29.4%)	20	1	6
LGA	17(50%)	7	1	1
TOTAL	34 (100%)	28(84.8%)	2(6.1%)	7(21.2%)

**Graph :** Complications seen in infants of diabetic mothers**DISCUSSION:**

Diabetes mellitus is the most common medical complication of pregnancy. The IDMs are at an increased risk of complications compared to infants of non-diabetic mothers. The causes of the foetal and neonatal sequelae of maternal diabetes are likely multifactorial; however, many of the perinatal complications can be traced to the effect of the maternal glycaemic control on the foetus. In the present study, 30.3% of the mothers had optimal glycaemic control during pregnancy and 69.7% had suboptimal control. In the present study, incidence of prematurity was 44.1%, which is different from the study done by Gabbe SG et al in 1978 and of LGA IDMs was 20.6% which correlates with the study done by Deorari et al in 1991. The rate of congenital anomalies was also high in the present study.

The incidence of macrosomia in IDMs of pre-gestational was higher than gestational diabetes, like the studies done by Ranade et al and Deorari et al in 1995. Respiratory distress was seen more commonly in infants of gestational diabetic mothers compared to pre-gestational diabetic mothers like the study by Sudarshan et al in 1987.

Conflict of interest: we have no conflict of interest.

Funding: no funding sources.

Ethical approval: the study was approved by the institutional ethics committee.

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