

COMPLICATIONS IN INFANT OF DIABETIC MOTHER

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ABSTRACT

Background: Diabetes is the common medical complication in pregnancy. It affects about 0.5-5% of all pregnancies. Infants of diabetic mother are at increased risk of periconceptual, fetal, neonatal and long term complications. **Objective:** To observe and evaluate the significance of the complications seen in Infants of diabetic mothers. **Method:** The study took place in the Neonatology department of AL Yarmouk Teaching Hospital, Baghdad, Iraq, from February 2015 to September 2015, focusing on infants born to diabetic mothers. These infants underwent a comprehensive physical examination, particularly for congenital anomalies and birth injuries, alongside necessary laboratory and imaging tests such as blood sugar levels, serum calcium, hematocrit, and chest X-rays. Specific tests like serum bilirubin and blood cultures were performed based on clinical indications. **Results:** In a study at the NICU of AL Yarmouk Teaching Hospital involving 154 infants, 77 were born to diabetic mothers and 77 served as controls. Infants of diabetic mothers showed higher complication rates, with hypoglycemia (77.9%), macrosomia (39%), and respiratory distress (28.5%) being the most common. Other significant complications included birth trauma, hypocalcemia, polycythemia, hyperbilirubinemia, and birth asphyxia. **Conclusion:** Diabetic moms' babies have several difficulties. Babies of diabetes mothers need strict glycemic control and adequate monitoring to avoid morbidity, death, and long-term problems. Paediatricians should attend births to reduce morbidity and death.

KEYWORDS: Complications, Infant, Diabetic, Mother.

INTRODUCTION

Infants of diabetic mothers (IDMs) represent a special category in neonatology due to the unique risks they face stemming from maternal diabetes mellitus (DM). This is defined as an infant born to a mother who has persistently elevated blood sugar levels during pregnancy. In the etiological classification by the American Diabetes Association as of January 2013, diabetes during pregnancy is categorized mainly into four groups: type 1 DM, type 2 DM, diabetes due to specific mechanisms and diseases, and gestational diabetes mellitus (GDM).^[1,2] Diabetes affects 1-2% of all pregnancies but presents significant prenatal morbidity and mortality risks due to its association with various complications.^[3] The most common issues seen in IDMs include congenital malformations and perinatal morbidity, with serious complications such as spontaneous abortions, stillbirth, and congenital malformations being notably higher in these infants compared to those born to non-diabetic mothers. Historically, fetal and neonatal mortality rates were as high as 65% before the advent of specialized care which

has dramatically improved outcomes over the past three decades.^[4] GDM, defined as carbohydrate intolerance resulting in hyperglycemia of variable severity with onset during pregnancy, is the most prevalent form of diabetes in pregnancy, affecting 88% of diabetic mothers. Despite this, only a small fraction of pregnancies exhibit pregestational diabetes. The high prevalence of GDM underscores the critical need for regular glucose monitoring and management during pregnancy.^[5] Key complications in IDMs include hypoglycemia, macrosomia, and respiratory distress. Hypoglycemia is particularly common, found significantly more frequently in IDMs than in non-diabetic pregnancies. Macrosomia, which results from excessive fetal insulin production due to maternal hyperglycemia, leads to additional risks such as shoulder dystocia, birth injuries, and increased cesarean delivery rates. Clinical guidelines from Canada recommend glucose tolerance testing for all women between 24 and 28 weeks of gestation, with earlier and repeated testing for those at high risk.^[6] Pathophysiologically, the hormonal changes in diabetic pregnancy promote

hyperinsulinemia and hyperglycemia in the fetus. The placenta plays a crucial role here, allowing glucose to pass to the fetus, but not insulin, thus forcing the fetal pancreas to compensate, which can lead to overgrowth and subsequent birth complications. After birth, these infants are prone to metabolic disturbances like hypoglycemia and hypocalcemia due to their sudden disconnection from maternal glucose supply.^[7,8] The long-term outlook for IDMs is concerning with increased risks of developing metabolic syndrome, type 2 diabetes, and obesity later in life. This risk can be mitigated somewhat through optimal glycemic control during pregnancy, underscoring the importance of preconceptional and gestational diabetes management.^[9,10] Moreover, the impact of maternal diabetes on fetal development extends beyond immediate birth complications. Congenital malformations are more prevalent among IDMs, with neural tube defects and heart anomalies being particularly significant. This is thought to be linked to oxidative stress and other teratogenic effects of hyperglycemia during critical periods of fetal development.^[11,12] Aim of study to observe and evaluate the significance of the complications seen in Infants of diabetic mothers.

METHOD

This prospective case-control study was conducted at the neonatal intensive care unit (NICU) of Al-Yarmouk Teaching Hospital in Baghdad City, Iraq, over an eight-month period from February 2015 to September 2015. The study focused on neonates born to mothers with diabetes (either preexisting or gestational) and included neonates who exhibited clinical, biochemical, and radiological signs indicative of complications related to diabetic pregnancies.

A total of 4745 babies were admitted to the aseptic NICU during the study period, of which 154 were selected for inclusion. Among these, 77 neonates were born to mothers with a known history of diabetes, and 77 were control subjects whose mothers did not have diabetes. The study aimed to compare the outcomes and complications between these two groups.

Data Collection: Data were collected from case sheets, including both maternal and neonatal information

- **Maternal Data:** Included type of diabetes (preexisting or gestational), history of previous pregnancies affected by diabetes, previous miscarriages, preterm deliveries, and any complications during the current pregnancy.
- **Neonatal Data:** Gender, parity (primiparous or multiparous), type of delivery (vaginal or cesarean section), gestational age (determined by last

menstrual period and first trimester ultrasound, further assessed by Ballard scoring), birth weight, and any signs of complications such as birth asphyxia, congenital anomalies, birth trauma, hypoglycemia, respiratory distress, hypocalcemia, and polycythemia.

Investigations: Several specific investigations were carried out to diagnose and assess the severity of conditions suspected in neonates

1. **Random Blood Sugar (RBS):** Performed for all infants using a glucometer with samples taken from a peripheral vein.
2. **Total Serum Bilirubin (TSB):** Conducted for 17 babies who exhibited clinical signs of jaundice; samples were obtained through heel prick and measured using a bilirubin meter.
3. **Serum Calcium:** Assessed in 18 babies displaying symptoms like jitteriness or convulsions, with blood samples drawn from a peripheral vein.
4. **Packed Cell Volume (PCV):** Evaluated in 16 babies who appeared plethoric; blood was initially drawn from a peripheral vein and retested if high hematocrit values were found.
5. **Complete Blood Picture (CBP):** Done for five babies via central vein to count platelets and white blood cells.
6. **Blood Culture:** Performed on three infants suspected of neonatal sepsis based on clinical assessments.
7. **Chest X-ray (CXR):** Taken for 22 babies who developed respiratory distress symptoms.

Exclusion Criteria: The study excluded infants whose mothers had other chronic illnesses (such as hypertension or epilepsy) or pregnancy-related problems, as well as babies at risk of jaundice due to ABO or RH incompatibility.

RESULTS

During an eight-month study at the NICU of Al-Yarmouk Teaching Hospital, 4745 babies were admitted, with 154 included in the study; half were infants of diabetic mothers (IDMs) and the other half had non-diabetic mothers. The majority (90.9%) of the neonates were delivered by Cesarean section, with a slightly higher rate among IDMs (92.2%) compared to those delivered via normal vaginal delivery (NVD). Among the mothers of IDMs, 27% had previously affected babies, 31% had preexisting diabetes, and 68% were diagnosed during the current pregnancy. The demographic distribution of babies in terms of gender, parity, and type of delivery was similar between the IDMs and controls, ensuring an equitable comparison in the study. As shown in table 1.

Table 1: Frequency distribution of the sample characteristics (n 154).

Variable		Frequency	Percent (%)
Gender	Male	79	51.3
	Female	75	48.7
Parity	Primi	34	22.1
	Multipara	120	77.9
Type of delivery	NVD	14	9.1
	CS	140	90.9
History of affected baby	Yes	42	27.3
	No	112	72.7
Prolonged 2 nd labor stage	Yes	50	32.5
	No	104	67.5
Type of maternal DM (n 77 cases)	Pre-existing	24	31.2
	Gestational	53	68.8

In the study, 22% of the babies weighed above the 90th percentile, classifying them as large for gestational age, while 68% had normal weights between 2500-4000 grams, and 10% were considered small for gestational age. There was no significant difference in gestational

age between babies of diabetic mothers and controls. However, babies from diabetic mothers had a significantly higher average birth weight compared to controls, with a notable p-value of 0.004. as shown in table 2.

Table 2: Means of the gestational age & the birth weight (n 154).

Variable		N	Mean	±SD	t-test	P value
Gestational age (weeks)	Cases	77	36.48	1.68	- 0.287	0.775 ^(NS)
	Controls	77	36.56	1.69		
Birth weight (grams)	Cases	77	3497	965	2.930	0.004 ^(*)

Macrosomia incidence, indicating a higher prevalence in infants of diabetic mothers with statistical analyses to confirm significance. explores hypoglycemia distribution, showing a significantly higher occurrence in

infants from diabetic pregnancies. examines lethargy among newborns, likely illustrating a greater incidence in the group born to diabetic mothers, with statistical validation of these findings. As shown in table 3.

Table 3: Variables distribution within the cases and controls (n 154).

	Macrosomia				X ²	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	30	39	47	61	25.516	0.0001 ^(*)	11.5
Normal (controls)	4	5.2	73	94.8			
	Hypoglycaemia				X ²	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	60	77.9	17	22.1	74.213	0.0001 ^(*)	35
Normal (controls)	7	9.1	70	90.9			
	Lethargy				X ²	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	20	26	57	74	10.744	0.001 ^(NS)	5
Normal (controls)	5	6.5	72	93.5			

The complications in infants of diabetic mothers compared to controls. a significant association of jitteriness in infants born to diabetic mothers. higher rates of hypocalcemia in the same group, indicating a pronounced metabolic impact. explores polycythemia, finding a higher incidence in infants from diabetic

pregnancies. These findings underscore the increased risk of various neonatal complications in infants of diabetic mothers, highlighting the need for targeted neonatal care and monitoring in this population. As shown in table 4.

Table 4: Variables distribution within the cases and controls (n 154).

	Jitteriness				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	45	58.4	32	41.6	52.633	0.000 ^(*)	14
Normal (controls)	7	9.9	70	91.1			
	Hypocalcaemia				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	14	18.2	63	81.8	4.3	0.014 ^(*)	3
Normal (controls)	3	3.9	74	96.1			
	Polycythaemia				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	11	14.3	66	85.7	5.029	0.025 ^(*)	15
Normal (controls)	3	3.9	74	96.1			

The occurrence of neonatal jaundice between IDM cases and normal controls within the study population of 154 neonates. It reveals that 12 IDM cases (15.6%) exhibited jaundice, compared to 4 controls (5.2%), with a significant statistical association (P = 0.035) suggesting a higher prevalence of jaundice in IDMs. the frequency of respiratory distress among the neonates. It shows that 22 IDM cases (28.5%) experienced respiratory distress,

whereas only 5 control neonates (6.5%) did, indicating a significantly higher incidence of respiratory issues among the IDMs (P = 0.001). the incidence of birth asphyxia. It reports that 7 IDM cases (9.1%) suffered from birth asphyxia, in contrast to only 1 control (1.3%). The statistical analysis indicates a significant association between diabetic maternal status and increased rates of birth asphyxia (P = 0.029). as shown in table 5.

Table 5: Variables distribution within the cases and controls (n 154).

	NNJ				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	12	15.6	65	84.4	4.464	0.035 ^(*)	3
Normal (controls)	4	5.2	73	94.8			
	Respiratory distress				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	22	28.5	55	71.5	12.579	0.001 ^(*)	5.7
Normal (controls)	5	14.3	66	85.7			
	Birth asphyxia				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	7	9.1	70	90.9	4.747	0.029 ^(*)	7.5
Normal (controls)	1	1.3	76	98.7			

The distribution of birth trauma among cases and controls in the study. It shows that 15 out of 77 diabetic mothers' babies (19.5%) experienced birth trauma compared to 5 out of 77 non-diabetic mothers' babies (6.5%). This difference was statistically significant, indicating a higher prevalence of birth trauma among infants of diabetic mothers. The distribution of seizures among the studied groups. It indicates that seizures were found in 3 of the 77 infants from diabetic mothers (3.9%) and 1 out of 77 infants from non-diabetic mothers (1.3%). This difference was not statistically significant,

suggesting that the presence of maternal diabetes did not significantly affect the incidence of seizures among the infants. The distribution of birth defects among cases and controls. The table indicates that birth defects were observed in 3 of the 77 infants from diabetic mothers (3.9%) and 1 out of 77 infants from non-diabetic mothers (1.3%). Like the findings with seizures, this difference was not statistically significant, showing no significant impact of maternal diabetes on the occurrence of birth defects among the newborns. As shown in table 6.

Table 6: Variables distribution within the cases and controls (n 154).

	Birth trauma				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	15	19.5	62	80.5	5.746	0.017 ^(*)	3.5
Normal (controls)	5	6.5	72	93.5			
	Seizures				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	3	3.9	74	96.1	1.027	0.311 ^(*)	1.2
Normal (controls)	1	1.3	76	98.7			
	Birth defect				X^2	P value	OR
	Yes		No				
	No.	%	No.	%			
DM (cases)	3	3.9	74	96.1	1.027	0.311 ^(NS)	1.2
Normal (controls)	1	1.3	76	98.7			

DISCUSSION

This study highlights the persistent challenges and high rates of complications associated with pregnancies complicated by diabetes, particularly gestational diabetes (68.8%) and pregestational diabetes (31.2%). These findings are consistent with those from studies by Opara et al. (61.7% gestational), Shirazi et al. (84% gestational), and Noori et al. (86% gestational), reflecting variability influenced by different study samples. The cesarean section (C/S) rate was notably high at 92.2%, driven by the high prevalence of macrosomia and similar to rates observed in other studies, albeit higher than those reported by Shirazi et al. at 31%. This high rate of C/S is likely due to late antenatal registration and low acceptance of vaginal delivery due to fears of complications, leading to a preference for elective cesareans over emergency procedures.^[13,15] Macrosomia, indicative of poor diabetic control, was significantly more prevalent in infants of diabetic mothers (39%), surpassing rates noted in studies by Shirazi et al. (15%), Noori et al. (24%), and others (89, 91, 90). This condition not only complicates delivery but also poses long-term risks such as obesity and diabetes in the offspring, highlighting the critical need for stringent maternal glucose control during pregnancy.^[14,15] Hypoglycemia emerged as the most common complication (77.9%), exceeding rates found in studies by Opara et al. (63.8%) and Prabhavathi et al. (28%), suggesting that it might be linked to poor maternal control, inadequate antenatal care (ANC), or noncompliance with therapy.^[13,16] Hypocalcemia, affecting 18.2% of infants, was slightly less prevalent than in the study by Shirazi et al. (23.4%) but higher than in other comparative studies. This condition is often attributed to inadequate neonatal parathyroid response and disturbances in vitamin D metabolism, exacerbated by maternal diabetes.^[14] Respiratory distress, noted in 28.5% of cases, was less common than in the study by Noori et al. (40%) but more prevalent than reported by Shirazi et al. (8%). The variability could be due to complications associated with cesarean delivery, hypoglycemia, or delayed surfactant production.^[14,15]

Polycythemia was observed in 14.3% of infants, slightly higher than rates reported by Opera et al. and Noori et al., likely due to increased erythropoiesis triggered by chronic fetal asphyxia.^[13,14] Hyperbilirubinemia affected 15.6% of the infants, a rate lower than most comparative studies except Lasheen et al., which reported a similar prevalence. This condition is frequently related to polycythemia and reflects the broader hematological challenges in these infants.^[17] Birth trauma was reported in 19.5% of cases, significantly higher than in the cohorts studied by Opera et al., Noori et al., and others. This increased incidence is potentially due to the high frequency of macrosomia, which predisposes infants to birth injuries during delivery.^[13,14] Birth asphyxia was present in 9.1% of the cohort, marginally higher than in other studies, and may be attributed to the high prevalence of macrosomia, emphasizing the complications associated with diabetic pregnancies and the critical importance of effective perinatal care.^[18] Overall, this discussion underscores the multifaceted risks and complications associated with diabetic pregnancies, pointing to the need for improved maternal glucose monitoring, better antenatal care, and heightened awareness among healthcare providers to mitigate these risks effectively.

CONCLUSION

The majority of infants born to diabetic mothers (IDMs) were term and were delivered primarily via caesarean section, according to this study. The most prevalent complications observed in IDMs were hypoglycemia and macrosomia, while birth defects were comparatively infrequent. IDMs must undergo prompt screening for hypoglycemia as a result of their susceptibility to a variety of complications. IDMs born to mothers with inadequately controlled diabetes mellitus during pregnancy had a significantly higher incidence of complications, highlighting the need for vigilant management and monitoring in this population.

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