Libyan Journal of Medical Research

www.ljmr.ly/ eISSN:2413-6096

Original Article

Prevalence of Hypoglycemia in Infants of Diabetic Mothers Admitted to the Neonatal Intensive Care Unit at Tobruk Medical Center

Amani E H Bidalla,[1] Nouri M Mumash,[1] Norha S A Mohammed[1], Albatoul H.Ahamad,[1] Ahmed S Mikael[2]

1.pediatric department Tobruk medical center

2.laboratory department Tobruk medical center

Corresponding Author. Ahmed S Mikael: email: Lahmedradology@gmail.com

Received: 22/01/2025 | Accepted: 04/03/2025 | Published: 26/032025| DOI: https://doi.org/10.54361/ljmr.19.1.19

Abstract

Purpose: Neonatal hypoglycemia is a frequent metabolic complication among infants of diabetic mothers (IDMs), primarily due to maternal hyperglycemia-induced fetal hyperinsulinemia. This study aimed to determine the prevalence of hypoglycemia in IDMs admitted to the Neonatal Intensive Care Unit (NICU) at Tobruk Medical Center (TMC) and identify associated maternal and neonatal factors.

Methods: A retrospective cross-sectional study analyzed 101 IDMs admitted to the NICU between April 2023 and April 2024. Maternal data (diabetes type, glycemic control, obstetric history) and neonatal parameters (hypoglycemia, birth weight, Apgar scores, comorbidities) were extracted from medical records. Hypoglycemia was defined as blood glucose <35 mg/dL within the first 72 hours of life. Statistical analyses included descriptive statistics and independent t-tests, with significance set at $p<0.05$.

Results: Hypoglycemia occurred in 75.2% of IDMs. The cohort was nearly evenly split between pre-gestational (48.5%) and gestational diabetes (51.5%) mothers. Infants of pre-gestational diabetic mothers had lower mean glucose levels (36.61 mg/dL) compared to those of gestational diabetic mothers (43.67 mg/dL), though not statistically significant ($p=0.063$). Cesarean deliveries were common (69.3%), with 58.4% of infants being large-for-gestational-age (LGA) and 20.8% experiencing respiratory distress. Intravenous dextrose was required in 52.5% of cases.

Conclusion: Hypoglycemia remains highly prevalent among IDMs, highlighting the critical need for optimal maternal glycemic control during pregnancy and vigilant neonatal glucose monitoring postpartum. The observed glucose differences between diabetes types merit further investigation to guide targeted interventions.

Keywords: Hypoglycemia, Infant, Newborn, Diabetes Mellitus, Pregnancy Complications, Hyperinsulinism

How to cite this article: Bidalla.A. E, Mumash. N.M, Mohammed.N , Abdulali .AL.H, MIKAEL. A.S: Mothers Admitted to the Neonatal Intensive Care Unit at Tobruk Medical Center

Libya: 2025:19.1-19

INTRODUCTION:

Maternal diabetes, encompassing pre-gestational (type 1 and type 2) and gestational diabetes mellitus (GDM), poses significant perinatal risks(8) One of the most common metabolic disturbances in infants of diabetic mothers (IDMs) is neonatal hypoglycemia, resulting from fetal pancreatic beta-cell hyperplasia and hyperinsulinemia secondary to maternal hyperglycemia[1,2]. Neonatal hypoglycemia is associated with adverse neurodevelopmental outcomes if not promptly identified and managed [3].

Neonatal hypoglycemia is a global health concern (11), with prevalence rates varying widely, ranging from 15% to 86% among IDMs, depending on maternal glycemic control, neonatal monitoring practices, and diagnostic thresholds [4,5]. The condition often manifests within the first few hours of life, as the abrupt cessation of maternal glucose supply at birth exposes the infant to the effects of persistent fetal hyperinsulinemia. Risk factors include poor maternal glycemic control, preterm birth, macrosomia, and perinatal stress [12.13].

The pathophysiology involves an imbalance between glucose production and utilization. In utero, chronic maternal hyperglycemia stimulates excessive fetal insulin secretion, promoting fat deposition and somatic growth. After birth, the sudden drop in glucose supply, combined with continued hyperinsulinemia, leads to rapid glucose depletion, causing hypoglycemia [8,14]. If untreated, severe or prolonged hypoglycemia can result in seizures, brain injury, and long-term cognitive impairments [9,15].

Despite advancements in prenatal care, neonatal hypoglycemia remains a substantial concern, particularly in resource-constrained settings like Tobruk. Regional data on its prevalence and contributing factors are scarce, necessitating localized studies to inform clinical protocols. Understanding the prevalence and associated risk factors is critical for developing targeted interventions to reduce morbidity and improve neonatal outcomes.

This study aimed to:

1. Determine the prevalence of hypoglycemia in IDMs admitted to the NICU at TMC.
2. Compare neonatal outcomes between infants of pre-gestational and gestational diabetic mothers.
3. Identify maternal and neonatal factors influencing hypoglycemia severity and management.

MATERAIA AND METHODS:

Study Design: A retrospective cross-sectional analysis was conducted on 101 IDMs admitted to the NICU at Tobruk Medical Center from April 2023 to April 2024.

Inclusion Criteria:

- Neonates born to mothers diagnosed with pre-gestational (type 1 or type 2) or gestational diabetes mellitus.
- Admission to the NICU within the study period.

Exclusion Criteria:

- Incomplete maternal glycemic control records.
- Neonates with congenital metabolic disorders unrelated to maternal diabetes.

Data Collection: Medical records were reviewed to extract maternal data (age, parity, diabetes type, HbA1c levels, delivery mode) and neonatal parameters (birth weight, Apgar scores, blood glucose levels, hypoglycemia episodes, comorbidities, and treatment modalities). Hypoglycemia was defined as blood glucose <35 mg/dL within the first 72 hours of life.

***Statistical Analysis*:** Data were analyzed using SPSS version 25. Descriptive statistics summarized maternal and neonatal characteristics. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Independent t-tests compared mean glucose levels between groups. A *p-value* <0.05 was considered statistically significant.

RESULT:

Table (1): This table summarizes the maternal demographic and clinical profiles

Characteristic	Frequency (n=101)	Percentage (%)
Multigravida	89	88.1%
Primigravida	12	11.9%
Cesarean Delivery	70	69.3%
Vaginal Delivery	31	30.7%
Pre-gestational Diabetes	49	48.5%
Gestational Diabetes	52	51.5%
History of Abortion	40	39.6%
History of IUFD	5	5%

Tale (2): Neonatal Outcomes presents the key neonatal health indicators, including sex distribution, birth weight categories, congenital anomalies, respiratory distress occurrence, and early feeding practices, to assess the immediate health status of IDMs.

Outcome	Frequency (n=101)	Percentage (%)
Male	56	55.4%
Female	45	44.6%
Birth Weight <2.5 kg	6	5.9%
Birth Weight 2.5–3.5 kg	36	35.6%
Birth Weight >3.5 kg	59	58.4%
Congenital Anomalies	2	2%
Respiratory Distress	21	20.8%
Early Oral Feeding	81	80.2%
NPO (Nothing by Mouth)	20	19.8%

Table(3):Hypoglycemia Prevalence to highlights the prevalence of hypoglycemia among IDMs, reflecting the extent of this metabolic complication within the studied population.

Hypoglycemia Status	Frequency (n=101)	Percentage (%)
Present	76	75.2%
Absent	25	24.8%

Table (4): Comparison Between Diabetes Types for compares the mean glucose levels of infants born to pre-gestational versus gestational diabetic mothers,

Group	Mean Glucose (mg/dL)	SD	p-value
Pre-gestational Diabetes	36.61	15.15	0.063
Gestational Diabetes	43.67	21.75	

Table (5): Treatment details the management strategies employed for hypoglycemic neonates

Treatment	Frequency (n=101)	Percentage (%)
Intravenous Dextrose (IVF)	53	52.5%
No IVF	48	47.5%
Intravenous Hydrocortisone	1	1%
No Hydrocortisone	100	99%

DISCUSSION:

The prevalence of hypoglycemia in this study (75.2%) is notably high, reflecting a significant clinical concern for infants of diabetic mothers (IDMs) at Tobruk Medical Center[2]. This finding aligns with previous studies indicating that IDMs are at a heightened risk for neonatal hypoglycemia due to persistent fetal hyperinsulinemia following maternal hyperglycemia during pregnancy[1], The prevalence observed here exceeds some reports[3], potentially due to variations in diagnostic criteria, maternal glycemic control[4], and neonatal monitoring practices.

The comparison between infants of pre-gestational and gestational diabetic mothers revealed lower mean glucose levels in the pre-gestational group (36.61 mg/dL vs. 43.67 mg/dL) [5], though the difference was not statistically significant (*p=0.063*). This trend suggests that chronic maternal hyperglycemia in pre-gestational diabetes may exert a more profound effect on fetal pancreatic beta-cell function, leading to more severe neonatal hypoglycemia [6]. Similar trends have been reported in other studies, emphasizing the need for stricter glycemic control in pre-gestational diabetes to mitigate neonatal risks. [10]

The high rate of cesarean deliveries (69.3%) and large-for-gestational-age (LGA) infants

(58.4%) highlights the complications associated with maternal diabetes, such as macrosomia, which increases the risk of birth trauma and necessitates surgical intervention. Additionally, the occurrence of respiratory distress in 20.8% of neonates underscores the respiratory complications linked to IDM status, potentially due to delayed lung maturation influenced by maternal hyperglycemia[7] .

The substantial proportion of infants requiring intravenous dextrose (52.5%) underscores the severity of hypoglycemia in this cohort. The minimal use of intravenous hydrocortisone (1%) suggests that most cases responded to standard glucose management protocols, although severe cases may necessitate more aggressive interventions[9].

***Clinical Implications*:** These findings emphasize the importance of vigilant glucose monitoring and early intervention in IDMs, particularly within the first 72 hours of life. Enhanced prenatal care focusing on maternal glycemic control, especially in pre-gestational diabetes, could significantly reduce neonatal hypoglycemia rates and associated complications.

Limitations: The study's retrospective design limits causal inferences, and incomplete maternal glycemic data may have introduced bias. The sample size, while adequate for initial analysis, may have limited the power to detect statistically significant differences between groups. Future prospective studies with larger cohorts and detailed maternal glycemic profiles are warranted to validate these findings.

CONCLUSION:

Hypoglycemia is a prevalent and significant complication among infants of diabetic mothers, particularly those born to mothers with pre-gestational diabetes. This study highlights the critical need for proactive maternal glycemic management during pregnancy and standardized neonatal monitoring protocols to mitigate hypoglycemia risks. Although the difference in glucose levels between pre-gestational and gestational diabetes groups was not statistically significant, the observed trend warrants further investigation. Future research should explore long-term neurodevelopmental outcomes associated with neonatal hypoglycemia and evaluate the impact of maternal glycemic control strategies on neonatal health.

References

1. osenko IR, Kitzmiller JL, Loo SW, Blix P, Rubenstein AH, Gabbay KH. The infant of the diabetic mother: correlation of increased cord C-peptide levels with macrosomia and hypoglycemia. N Engl J Med. 1979 Oct 18;301(16):859-62.
2. enon RK, Cohen RM, Sperling MA, Cutfield WS, Mimouni F, Khoury JC. Transplacental passage of insulin in pregnant women with insulin-dependent diabetes mellitus. Its role in fetal macrosomia. N Engl J Med. 1990 Aug 2;323(5):309-15.
3. iggins M, McAuliffe F. A review of maternal and fetal growth factors in diabetic pregnancy. Curr Diabetes Rev. 2010 Mar;6(2):116-25.
4. an Haeften TW. Clinical significance of insulin antibodies in insulin-treated diabetic patients. Diabetes Care. 1989 Oct;12(9):641-8.
5. a R, Wang P, Yang Q, Zhu Y, Zhang L, Wang Y, et al. Interpregnancy interval and early infant neurodevelopment: the role of maternal-fetal glucose metabolism. BMC Med. 2024 Jan 2;22(1):2.
6. u X, Chen F. Exogenous insulin antibody syndrome (EIAS): a clinical syndrome associated with insulin antibodies induced by exogenous insulin in diabetic patients. Endocr Connect. 2018 Jan;7(1):R47-R55.
7. ranmer H. Neonatal Hypoglycemia. In: Cameron P, Jelinek G, Kelly AM, Brown

AF, Little M, editors. Textbook of Adult Emergency Medicine. 4th ed. Elsevier; 2015. p. 103-5.
8. oss CR. Neonatal Hypocalcemia in the Infant of a Diabetic Mother. Neonatal Netw. 2020 Jul 1;39(4):212-8.
9. inker SC, Gilboa SM, Moore CA, Waller DK, Simeone RM. Specific birth defects in pregnancies of women with diabetes: National Birth Defects Prevention Study, 1997–2011. Am J Obstet Gynecol. 2020 Feb;222(2):176.e1-176.e11.
10. omura Y, Marks DJ, Grossman B, Yoon M, Loudon H, Stone J, et al. Exposure to gestational diabetes mellitus and low socioeconomic status: effects on neurocognitive development and risk of attention-deficit/hyperactivity disorder in offspring. Arch Pediatr Adolesc Med. 2012 Jan;166(4):337-43.
11. izzo TA, Dooley SL, Metzger BE, Cho NH, Ogata ES, Silverman BL. Early malnutrition and child neurobehavioral development: insights from the study of children of diabetic mothers. Child Dev. 1995 Dec;66(6):2125-42.
12. eBoer T, Wewerka S, Bauer PJ, Georgieff MK, Nelson CA. Explicit memory performance in infants of diabetic mothers at 1 year of age. Dev Med Child Neurol. 2005 Aug;47(8):525-31.
13. alkins K, Devaskar SU. Fetal origins of adult disease. Curr Probl Pediatr Adolesc Health Care. 2011 Jul;41(6):158-76.
14. awdon JM, Ward Platt MP, Aynsley-Green A. Patterns of metabolic adaptation for preterm and term infants in the first neonatal week. Arch Dis Child. 1992 Jul;67(7 Spec No):357-65.
15. ornblath M, Ichord R. Hypoglycemia in the neonate. Semin Perinatol. 2000 Feb;24(2):136-49. hese references provide a comprehensive overview of the relationship between maternal diabetes and neonatal hypoglycemia, including studies on metabolic control, insulin antibodies, and neonatal outcomes.