



African Journal of Biological Sciences



Clinical outcome of neonates born to mothers with Diabetes Mellitus

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Abstract:

Background:

Gestational diabetes mellitus affects upto 5% of all pregnancies and it also serves as the most prevalent medical condition during pregnancy. Neonates born to mothers with diabetes mellitus are at risk for various immediate and long-term health complications. Early detection, effective management, and preventive strategies are crucial in mitigating the associated risks among the neonates. Hence the aim of this study was to examine the clinical outcome of neonates born to mothers with diabetes mellitus.

Methodology:

A prospective study was conducted in the neonatology unit of tertiary care hospital. All babies born after 32 weeks of gestation to overt and gestational diabetic mothers during the study period were included in the study. Pregnant mothers with risk factors like eclampsia, pre-eclampsia and hypothyroidism were excluded. A total of 128 mothers with diabetes were enrolled. The data collected were analysed using IBM SPSS v 21.

Results:

Among the 128 mothers, majority had GDM (75.7%) and almost 78% were managed by diet alone. The mean birth weight was 2.88 ± 0.46 for the babies delivered. 77.3% had babies were Appropriate for age (AGA), however 19.5% were small for age (SGA) and only 3.2% were large for age (LGA). The most common outcome noted in this study is (NNH) neonatal hyperbilirubinemia (37%), followed by TTN (16%) and low birth weight (14.8%).

Conclusion:

To lower morbidity and death, babies born to diabetic mothers should receive adequate care. Reduced perinatal and neonatal problems can be achieved through planned pregnancies, appropriate prenatal care, stringent glycemic control in the mother, and early intervention for diabetic mothers.

Keywords:

Gestational diabetes mellitus, birth weight, macrosomia, hyperbilirubinemia, high-risk

Article History

Volume 6, Issue 14, 2024

Received: 18 June 2024

Accepted: 02 July 2024

Published : 25 August 2024

doi:10.48047/AFJBS.6.14.2024.299-306

Introduction:

Gestational Diabetes Mellitus (GDM) is a prevalent condition in pregnancy, marked by insensitivity to glucose.¹It affects upto 5% of all pregnancies and it also serves as the most prevalent medical condition during pregnancy.²Pre-gestational diabetes, also known as overt diabetes is the diabetic condition existing even before pregnancy, or gestational diabetes may be identified as the cause for the very first time in pregnancy.³

GDM is widespread in South India, with a 17.8% prevalence recorded in Chennai.⁴ Significant both immediate and long-term consequences are associated with maternal diabetes in both the mother and baby. Babies delivered to mothers who have diabetes mellitus are susceptible to a number of short- and long-term health issues. Early detection, effective management and preventive strategies are crucial in mitigating the associated risks among the neonates.

Immediate neonatal outcomes are macrosomia, neonatal hypoglycemia, respiratory distress syndrome, hyperbilirubinemia, polycythemia, cardiomyopathy and congenital anomalies like neural tube defects, congenital heart defects and gastrointestinal anomalies.⁵ The long-term neonatal outcomes are obesity, metabolic syndrome, type-2 diabetes mellitus, potential impacts on cognitive and motor development, and increased propensity for hypertension and cardiovascular disease.^{6,7}

Pregnancy-related blood glucose control has been shown to reduce the risk of neonatal problems like macrosomia and shoulder dystocia.⁸In developing countries like India, it is still a challenge to reduce the mortality and morbidity of outcomes in diabetic pregnancies. Early intervention and ongoing follow-up care are essential to improve the clinical outcomes of these neonates, ensuring better health trajectories into childhood and beyond.⁹Hence the aim of this study was to examine the clinical outcome of neonates born to mothers with diabetes mellitus.

Methodology:

A hospital based prospective study was conducted between October 2022 to March 2023 in the neonatology unit of a tertiary care hospital in Chengalpattu district, Tamil Nadu. After obtaining ethical clearance, all babies born after 32 weeks of gestation to overt and gestational diabetic mothers during the study period were included in the study. GDM

diagnosis was made using the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria where plasma glucose values of more than 92 mg/dl (5.1 mmol/l) in fasting state, 180 mg/dl (10 mmol/l) after 1 hour of meal and 153 mg/dl(8.5mmol/l) after 2 hours of meal.¹⁰ Among these included subjects, babies whose parents gave consent to participate in the study were enrolled and observed. Pregnant mothers with risk factors like eclampsia, pre-eclampsia and hypothyroidism were excluded. A total of 128 mothers with diabetes were enrolled. Detailed examination was done to rule out congenital anomalies, birth weight and other anthropometric measurements were documented. Neonates blood glucose was monitored every 6 hours once for the first 48 hours. In case of complications like NNH, dehydration, sepsis, appropriate management like phototherapy, iv fluids, oxygen supplementation, antibiotics and partial exchange transfusion were done. The data collected were analysed using IBM SPSS v 21.

Results:

Among the 128 mothers, majority had GDM (75.7%) and almost 78% were managed by diet alone. The average mother's age who participated in our research was 27.6 ± 3.9 and they developed diabetes at the age of 26.6 ± 1.4 . 86.7% of the mothers delivered at term and almost 50% had C-section and remaining had normal vaginal delivery. 77.3% had babies were Appropriate for age (AGA), however 19.5% were small for age (SGA) and only 3.2% were large for age (LGA). The mean birth weight was 2.88 ± 0.46 (Table 1)

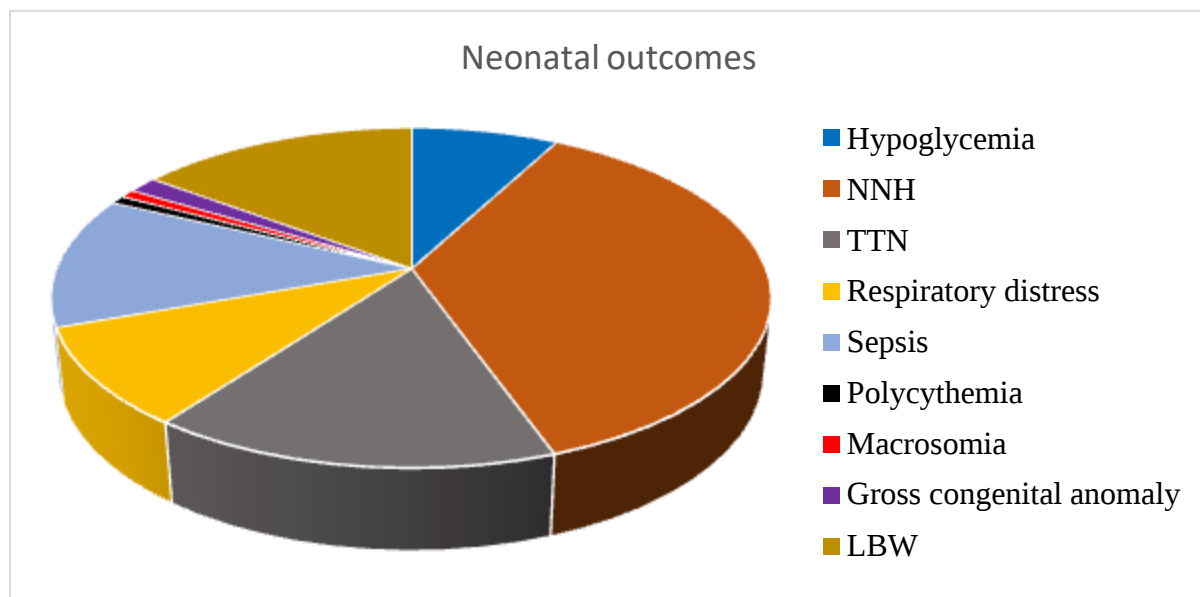
Table 1: Patient profile

Characteristics	Number	Percentage
Diabetic type		
Gestational Diabetes mellitus	97	75.7%
Overt Diabetes mellitus	31	24.3%
Treatment given		
Insulin	21	16.4%
Oral hypoglycaemic drug	7	5.5%
Meal plan	100	78.1%
Gestational age at delivery		
Late preterm	11	8.5%

Term	111	86.7%
Post-term	6	4.8%
Mode of delivery		
Normal vaginal	63	49.2%
C - section	64	50%
Vacuum assisted delivery	1	0.8%
Birth weight		
AGA	99	77.3%
LGA	4	3.2%
SGA	25	19.5%

Table 2: Outcome profile

Characteristics	Number	Percentage
Hypoglycaemia	10	7.8%
NNH	47	37%
Transient tachypnea of the newborn (TTN)	20	16%
Respiratory distress	12	9.3%
Sepsis	16	12.5%
Polycythaemia	1	0.8%
Macrosomia	1	0.8%
Gross congenital anomaly	2	1.6%
LBW	19	14.8%

Figure 1: Neonatal outcomes

The most common outcome noted in this study is (NNH) neonatal hyperbilirubinemia (37%), followed by TTN (16%) and low birth weight (14.8%). Low birth weight (LBW) babies had hypoglycemia at birth and were treated with feeds and intravenous fluids. Majority of neonatal hyperbilirubinemia babies underwent for a maximum of 1 to 2 days. Only 5 babies with respiratory distress required continuous positive airway pressure(CPAP) and Hood Oxygen. The congenital anomaly noted were dislocation of hip and multicystic kidney disease. All those 16 babies with sepsis reported no growth in blood culture (Table 2). No neonatal death was recorded in this study. Though LGA is associated with GDM in our study it was noted that only 3.2% had LGA.

Discussion:

Throughout pregnancy, diabetes mellitus is the most prevalent endocrine disorder. The progeny's fate is determined by the duration, severity, and level of control of the mother's diabetes during her pregnancy. This study's findings, which were in line with those of research by Shirazi H et al.¹¹ (84%), Prabhavathi et al.¹² (87.5%), Anjum SK et al.¹³ (86%) and Hussain M et al.¹⁴ (71.4%), which showed that 76% of the cases had GDM and 24% had pregestational diabetes.

Our study identified an incidence of 8.5% of late preterm deliveries, which is lower than other studies like Prabhavathi et al.¹², wherein the rate of preterm deliveries was 15%, and

Shirazi H et al.¹¹, in which the frequency was estimated to be 19%. However, compared to Thomas N et al¹⁵ (35%) and Anjum SK et al¹³ (35%), our study revealed a lower incidence.

The most common outcome noted in this study is neonatal hyperbilirubinemia (37%), followed by TTN (16%) and low birth weight (14.8%). Neonatal hyperbilirubinemia was found to be the common complication in Dahrig J et al¹⁶ study also. Bilirubin production is enhanced by the activation of microsomal heme oxygenase during starvation. Despite their substantial fat and glycogen reserves, infants of diabetic mothers also seem to exhibit this. In addition to the liver's decreased bilirubin excretion (impaired glucuronization, which results in extended jaundice), polycythemia, which is common among infants of diabetic mothers, can also stimulate bilirubin turnover to some extent.¹⁷

Although macrosomia was discovered in 0.8% of the cases, it had been reported in 40%, 15%, and 16% of the cases in previous studies conducted by Hussain M¹⁴, Anjum SK et al¹³, and Shirazi H et al¹¹ 9.3% of babies had RDS, which is caused by elevated insulin levels that obstruct choline's absorption into lecithin, resulting in a deficit in saturated phosphatidyl choline in the amniotic fluid and lungs.¹⁸

In our study, the prevalence of congenital abnormalities was 1.6%. While studies by Shiraz H et al¹¹ and Anjum SK et al¹³ indicated a higher incidence of 32% and 40% of all infants delivered to diabetic mothers with congenital anomalies, work by Husain M et al¹⁴ demonstrated a reduced prevalence of 4.7 percent and 16.6 percent in Prabhavathi et al¹².

Conclusion:

In view of all the neonatal clinical outcomes, this study suggests that, rather than risk factor screening, universal GDM screening and care should be the top public health priority for all expectant mothers. Reduced perinatal and neonatal problems can be achieved through planned pregnancies, appropriate prenatal care, stringent glycemic control in the mother and early medical management for diabetic mothers. To lower morbidity and death babies born to diabetic mothers should receive adequate care. Also, awareness and education about clinical outcome of neonates born to mothers with diabetes mellitus can help in early detection and better management, ultimately improving the outcome of the child.

References:

1. Kasper, Dennis L. Harrison's principles of internal medicine. 19th edition. New York: McGraw Hill Education; 2015; 2:2399-2427.
2. Jansen C, Greenspoon SJ, Palmer MS. Diabetes mellitus and pregnancy. Current ObstetGynaecolDiag Treatment 9th ed; 2003; 18:317-21.
3. Chmait R, Moore TR. Endocrine disorders in pregnancy: Avery's diseases of the new-born, 8th ed; 2005:71-86.
4. Balaji V, Balaji M, Anjalakshi C, Cynthia A, Arthi T, Seshiah V. Diagnosis of gestational diabetes mellitus in Asian-Indian women. Indian J EndocrMetab2011; 15:187-90.
5. HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008; 358:2061.
6. Kliegman, Stanton. Infants of Diabetic mothers. Nelson textbook of pediatrics. 20th edition; 2015;107(1):897-989.
7. John P Cloharty, Eichenwald;Manual of Neonatal care; Diabetes Mellitus; chapter 2; 7th edition;p 1123.
8. Kalhan SC, Parimi PS, Linsu CA. Pregnancy complicated by diabetes mellitus. In: Fanaroff AA, Mortin RJ, editors. Neonatal perinatal medicine: diseases of foetus and infant. Philadelphia: Mosby; 2002:1357-61.
9. Seshiah V, Balaji V, Balaji MS, Sanjeevi C, Green A. Gestational Diabetes Mellitus in India. 2004;52.
10. IADPSG Consensus Panel; Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, Dyer AR, Leiva Ad, Hod M, Kitzmiller JL, Lowe LP, McIntyre HD, Oats JJ, Omori Y, Schmidt MI. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care. 2010;33(3):676-82.
11. Shirazi H, Raiz S. Neonatal outcome of diabetic pregnancy. Ann Pak Inst Med Sci. 2010;6(2):10712.
12. Prabhavathi R, Basavaraj, Pushpalatha K, Udaykumar S. A study of perinatal and neonatal outcome in infants born to diabetic mothers. Int J Adv Med. 2015;2:246-9.
13. Anjum SK, Yashodha HT. A study of neonatal outcome in infants born to diabetic mothers at a tertiary care hospital. Int J ContempPediatr2018;5:489-92.

14. Hussain M, Irshad M. Frequency of various neonatal complications in infants born to diabetic mothers: a hospital-based study. *JPMI*. 2001;25(3):227-32.
15. Thomas N, Chinta AJ. Perinatal outcome of infants born to diabetic mothers in a developing country comparison of insulin and oral hypoglycaemic agents. *Indian Paediatr*. 2013;50:289-93.
16. Jährig D, Jährig K, Stiete S, Beyersdorff E, Poser H, Hopp H. Neonatal jaundice in infants of diabetic mothers. *Acta Paediatr Scand Suppl*. 1989;360:101-7.
17. Mormile R, De Michele M, Squarcia U, Quaini F. Hyperbilirubinemia in neonates of diabetic mothers: an indirect biomarker of organ damage?. *Journal of Pediatric Endocrinology and Metabolism*. 2014;27(5-6): 577-578.
18. Yildiz Atar H, Baatz JE, Ryan RM. Molecular Mechanisms of Maternal Diabetes Effects on Fetal and Neonatal Surfactant. *Children (Basel)*. 2021 Apr 6;8(4):281.
19. Deori T J, Das J. Prevalence of Diabetes and Patterns of Health Seeking Behaviour Among Known Diabetics in a Rural Area of Lucknow District. *Chettinad Health City Med J*. 2024;13(2):46-53.