

Study of Neonatal Outcome in Infants Born to Mothers with Gestational Diabetes in North Indian Population - A Cross-Sectional Study

Puneesh Agarwal¹, MC Srivastava²

ABSTRACT

Introduction: Since, the prevalence of gestational diabetes mellitus (GDM) in India significantly varies from 3.8 to 21% in different parts of the country, depending on the geographical locations and diagnostic methods used. Current research aimed to study the neonatal outcome in infants born to mothers with gestational diabetes in north Indian population

Material and methods: This was a cross-sectional study. All babies born to mothers with GDM were included in the study. Mothers suffering from pre-gestational diabetes and some other disorders before pregnancy were excluded from the study. A total of 130 mothers/babies were included in the study. Mothers delivered twins were excluded from the study.

Results: The gestational age at diabetes diagnosis was >25 weeks among about half of mothers (49.2%). Majority of mothers belonged to rural area (75.4%). Multi para was among more than half of mothers (60.8%). The gestational age at delivery was >37 weeks among half of mothers. LSCS delivery was in 66.9% of mothers. More than half of babies were males (57.7%). The birth weight of babies was 1000-1500 grms in 34.4%. However, birth weight was 2001-2499 grms in 16.2%. The percentage of normal birth weight babies was 10.8% (≥ 2500 grms). Crying immediately after birth was among more than half of babies (60%). Hypoglycemia was the most common neonatal complication (25.4%) and congenital anomalies was the second the most common neonatal complication (20%).

Conclusion: The current study concludes that GDM is associated with numerous adverse neonatal outcomes and increases the risk of perinatal morbidity and mortality.

Keywords: Neonatal, Morbidity and Mortality

INTRODUCTION

The World Health Organization (WHO) estimates that, the prevalence of diabetes mellitus (DM) will show an alarming stage to draw up 150 to 333 million by 2025. This alarming calendar year will increase in the prevalence of DM, it will occur mainly in the developing country like India and south Asian countries and the child bearing age would be most affected parameter^{1,2}.

The recent data on the prevalence of gestational diabetes mellitus (GDM) in our country prevalence was 16.55% by WHO criteria of 2hr PG ≥ 140 mg/dl. Neonatal mortality rate in diabetic pregnancies is five times more than that of non-diabetic pregnancies^{3,4}.

Neonates born to diabetic mothers are at higher risk for developing congenital anomalies, small for gestational

age (SGA), macrosomia, metabolic abnormalities like hypoglycaemia, hypocalcaemia, hypomagnesemia, haematological complications like hyperbilirubinemia, hyper viscosity secondary to polycythemia, respiratory distress due to antagonistic effect of hyperinsulinemia on cortisol mediated surfactant synthesis⁵.

The prevalence of congenital anomalies in infants of diabetic mothers is 6-10%. Most common fetal structural defects were associated with maternal diabetes are cardiac malformations followed by neural tube defects, renal agenesis and skeletal malformations. Cardiac anomalies specific to GDM include asymmetrical septal hypertrophy^{6,7}.

Cardiomegaly occurs in 30% and cardiac failure in 5-10% of neonates. Macrosomia results showed increased incidence of operative deliveries and shoulder dystocia with potential brachial plexus injury was seen. Strict glycemic control during peri conception and during labour reduces the incidence of anomalies and neonatal hypoglycaemia respectively^{8,9}.

Adequate management of GDM and good glycemic control can improve perinatal outcomes in GDM. Due to increased risk of perinatal morbidity and mortality associated with GDM, neonates born to GDM mothers should be intensively monitored. The present study was designed to study the neonatal outcome in infants born to mothers with gestational diabetes in north Indian population

MATERIAL AND METHODS

This was a cross-sectional study conducted in the Department of Pediatrics, Prasad Institute of Medical Sciences, Lucknow. The study was approved by the Ethical Committee of the Institute and consent was taken from each parent of newborn. All babies born to mothers with GDM were included in the study. Mothers suffering from pre-gestational diabetes and some other disorders before pregnancy were excluded from

¹Assistant Professor, Department of Pediatrics, Prasad Institute of Medical Sciences, Sarai Shahzaidi, Banthra, Lucknow, UP,

²Associate Professor, Department of Medicine, Prasad Institute of Medical Sciences, Sarai Shahzaidi, Banthra, Lucknow, UP

Corresponding author: Dr MC Srivastava, Associate Professor, Department of Medicine, Prasad Institute of Medical Sciences, Sarai Shahzaidi, Banthra, Lucknow, UP, India

How to cite this article: Agarwal P, Srivastava MC. Study of neonatal outcome in infants born to mothers with gestational diabetes in north indian population - a cross-sectional study. International Journal of Contemporary Medical Research 2021;8(7):G17-G20.

DOI: <http://dx.doi.org/10.21276/ijcmr.2021.8.7.10>



the study. A total of 130 mothers/babies were included in the study. Mothers delivered twins were excluded from the study.

Methods

The criteria for diagnosis of gestational diabetes as laid out by DIPSI criteria, diagnosis was based on 2hr venous plasma glucose value >or to 140mg/dl in the non-fasting oral glucose tolerance test .A detailed maternal history including mother’s age, Last menstrual period, medications, first USG for fetal weight and gestational age, mother’s blood group and type of delivery were obtained from maternal antenatal records. Harpenden’s infant meter measures the length of newborn or infant . Weight of newborn was measured by electronic weighing scale. Macrosomia was defined as birth weight more than 4500 g. Head circumference was measured by measuring tape overlying the occiput at back and supraorbital ridges in front. Venous haemoglobin (hb) was measured by automated SLS Hb detection method. Polycythemia was defined as the presence of a venous hematocrit more than 65% or a venous hemoglobin concentration in excess of 22.0 g/dL. Serum calcium level was measured by OCPC(O cresolphthalein complexone) method. Hypocalcemia was defined as total serum calcium level less than 7 mg/dl or ionized Ca concentration <4 mg/dl.

STATISTICAL ANALYSIS

The results are presented in frequencies, percentages and mean±SD. The Chi-square test was used for comparisons. The p-value<0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

The gestational age at diabetes diagnosis was >25 weeks among about half of mothers (49.2%). Majority of mothers belonged to rural area (75.4%). Multi para was among more than half of mothers (60.8%). The gestational age at delivery

Characteristics of mothers	No. (n=130)	%
Gestational age at diagnosis in weeks		
<20	10	7.7
20-25	56	43.1
>25	64	49.2
Place of residence		
Rural	98	75.4
Urban	32	24.6
Parity		
Primi	51	39.2
Multi	79	60.8
Gestational age at delivery in weeks		
<34	4	3.1
34-37	61	46.9
>37	65	50.0
Type of delivery		
LSCS	87	66.9
Vaginal normal delivery	43	33.1

Table-1: Distribution of characteristics of mothers

was >37 weeks among half of mothers. LSCS delivery was in 66.9% of mothers (Table-1).

Table-2 describes the distribution of neonatal outcomes. More than half of babies were males (57.7%). The birth weight of babies was 1000-1500 grms in 34.4%. However, birth weight was 2001-2499 grms in 16.2%. The percentage of normal birth weight babies was 10.8% (≥2500 grms). Crying immediately after birth was among more than half of babies (60%). Hypoglycemia was the most common neonatal complication (25.4%) and congenital anomalies

Neonatal outcomes	No. (n=130)	%
Gender of baby		
Male	75	57.7
Female	55	42.3
Birth weight in grams		
<1000	22	16.9
1000-1500	45	34.6
1501-2000	21	16.2
2001-2499	28	21.5
≥2500	14	10.8
Mean±SD	1711.60±621.07	
Crying immediately		
Yes	78	60.0
No	52	40.0
Neonatal complications#		
Prematurity	16	12.3
Respiratory distress	11	8.5
Fetal demise	12	9.2
Hypoglycemia	33	25.4
Congenital anomalies	26	20.0
Mircosomia	23	17.7
Neonatal sepsis	18	13.8
NICU admission		
Yes	105	80.8
No	25	19.2
Neonatal death		
Yes	9	6.9
No	121	93.1
#Multiple response		

Table-2: Distribution of neonatal outcomes

Maternal complications	No. (n=130)	%
Premature rupture of membranes	8	6.2
Unsatisfactory progress of labor	18	13.8
Perineal tear	9	6.9
Shoulder dystocia	2	1.5

Table-3: Distribution of maternal complications

Biochemical parameters	(Mean±SD)
Serum calcium	9.11±0.88
Hb	19.14±2.44
HCT	66.19±14.55

Table-4: Distribution of babies according to biochemical parameters

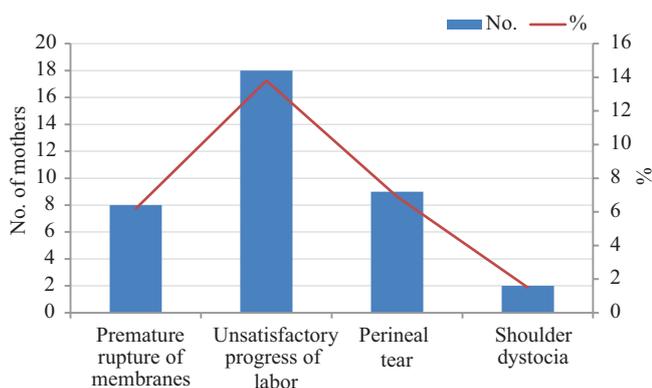


Figure-1: Distribution of maternal complications

was the second the most common neonatal complication (20%). Respiratory distress was the least common neonatal complication (8.5%). NICU admission was required among majority of babies (80.8%). The neonatal death was in 6.9% of babies.

Unsatisfactory progress of labor complication was in 13.8% mothers and perineal tear was in 6.9% of mothers. However, premature rupture of membranes and shoulder dystocia was in 6.2% and 1.5% of mothers respectively (Fig.1).

The mean serum calcium, Hb and HCT was 9.11 ± 0.88 , 19.14 ± 2.44 and 66.19 ± 14.55 respectively (Table-3).

DISCUSSION

The mean birth weight was 1711.60 ± 621.07 grms in this study. The mean birth weight in GDM was found to be 3.17 kg in the study by Naik et al¹⁰. Jayshree et al¹¹ found a mean birth weight of 2.86 kg in the GDM group. Dudhwadkar et al¹² found that 40% of babies born to GDM mothers had birth weight of >3.5 kg.

In the present study, the percentage of neonates born to GDM mothers developing macrosomia was 17.7% which was higher compared to other studies like Naik et al¹⁰ (1.2%), Jayshree et al¹¹ (2.3%), Rafiq et al¹³ (39.8%), Dharmavijaya et al¹⁴ (3.4%), Makwana et al¹⁵ (18.42%), Amidha et al¹⁶ (14%) and Anjum et al¹⁷ (15%).

The present study showed a low incidence of prematurity in neonates born to mothers with GDM (12.3%) than the study by Naik et al¹⁰ (1.2%) in which incidence of prematurity in neonates born to mothers with GDM was 17%. However studies done by Jayshree et al¹¹, Dudhwadkar et al¹² and Amidha et al¹⁶ showed no significant association with prematurity and GDM. This difference was noted because in the present study, a higher incidence of genitourinary infections was observed in mothers with GDM which predisposed them to preterm labour.

RDS was observed in a significantly higher percentage i.e 8.5% of neonates born to GDM mothers in the current study. Similarly, in other studies Dudhwadkar et al¹², Rafiq et al¹³, Makwana et al¹⁵ and Anjum et al¹⁷ reported significant increase in the incidence of RDS in neonates born to GDM mothers. The higher percentage of RDS was attributed to an increased incidence of prematurity associated with GDM.

Neonatal hypoglycemia was observed in a significantly

higher percentage in GDM in this study (11%) which was comparable with findings of other studies^{12,13,15}. In the present study, 13.8% of neonates born to GDM mothers had neonatal sepsis which was higher than that observed by Jayshree et al¹¹ (2.3%), Dudhwadkar et al¹² (4%) and Dharmavijaya et al¹⁴ (7.5%).

The current study observed that there was a significantly high rate of NICU admission (80.8%) in neonates born to GDM mothers. This was attributed to increased incidence of prematurity and neonatal complications like hypoglycemia, RDS and neonatal sepsis. The percentage of NICU admission was higher than the study by Naik et al¹⁰ (32.1%), Jayshree et al¹¹ (27.6%) and Makwana et al¹⁵ (31.58%).

The neonatal mortality in GDM group was significantly high in our study (6.9%). Jayshree et al¹¹ found the neonatal mortality to be 3.5% in GDM group. Dharmavijaya et al¹⁴ reported neonatal mortality of 1.4% in GDM group while Amidha et al¹⁶ reported it to be 6%. However in all these studies the neonatal mortality was not significantly increased in neonates born to mothers with GDM. Increased incidence of prematurity and RDS contributed to this increased neonatal mortality rate in our study.

CONCLUSION

The current study concludes that GDM is associated with numerous adverse neonatal outcomes and increases the risk of perinatal morbidity and mortality. GDM is on the rise in the South East Asian population, especially India. Hence, appropriate measures need to be implemented to prevent, detect and treat GDM early in pregnancy. Universal screening for GDM must be made mandatory. Pregnant women with GDM should be delivered in tertiary care centres or centres with well-equipped and fully staffed neonatal units in order to improve the neonatal morbidity associated with GDM.

REFERENCES

- Haider Shirazi., et al. Neonatal Outcome of Diabetic Pregnancy. *Annals of Pakistan Institute of Medical Sciences* 2010;6: 107-112.
- Farooq MU., et al. Noor Specialist Hospital Makkah, Kingdom of Saudi Arabia Bahawal Victoria Hospital, Bahawalpur- Pakistan. *International Journal of Endocrinology Metabolism* 2007; 3: 109-115.
- Havilah Polur K., et al. Diabetes in Pregnancy Study Group in India (DIPSI)- A Novel Criterion to Diagnose GDM. *International Journal of Biochemistry Research and Review* 2016; 10: 1-6.
- Joanne Yang., et al. Fetal and neonatal outcomes of diabetic pregnancies. *The Journal of Obstetrics and Gynecology* 2006; 108: 644-650.
- Carlo WA and Ambalavanan N. The Endocrine system. In: Kligeman RM, Stanton BF, Geme JW, Schor NF, editors. *Nelson textbook of Pediatrics*. New Delhi: Elsevier 2015; 1: 897-898.
- IDF - International Diabetes Federation. *Annual Report* 2016.
- Williams obstetrics text book of obstetrics, 24th edition, New Delhi 2014: 2351-1388
- Diabetes care. *The Journal of Clinical and Applied*

- Research and Education 2016; 39: 321-322
9. Patt MJ., et al. Outcome of diabetic pregnancies. *Diabetic Medicine* 2003; 20: 82-83.
 10. Naik RR, Pednekar G and Cacodcar J. Analysis of outcomes in neonates of mothers with gestational diabetes mellitus at a tertiary care hospital in Goa. *International Journal of Paediatrics and Geriatrics* 2019; 2: 101-104.
 11. Jayshree M et al. Study of Maternal and Perinatal outcome in Pregnancies Complicated by Gestational Diabetes Mellitus. *Indian journal of Applied Research*. 2016; 6:64-66.
 12. Dudhwadkar AR, Fonseca MN. Maternal and fetal outcome in gestational diabetes mellitus. *Int J Reprod Contracept Obstet Gynecol*. 2016; 5:3317-21.
 13. Rafiq W, Hussain SQ, Jan M, Najjar BA. Clinical and metabolic profile of neonates of diabetic mothers. *Int J Contemp Pediatr*. 2015; 2:114-8.
 14. Dharmavijaya MN, Chandra Mouli, Jyoti Kamda. Analysis of gestational diabetes mellitus from a tertiary care hospital. *Indian Journal of Obstetrics and Gynecology Research*. 2017; 4:17-20.
 15. Makwana M, Bhimwal RK, Ram C, Mathur SL, Lal K, Mourya H. Gestational diabetes mellitus with its maternal and foetal outcome-a clinical study. *Int J Adv Med*. 2017; 4:919-25.
 16. Amidha S, Shankar B, Aarti M. Maternal and fetal outcome in gestational diabetes – A retrospective study. *International Journal of Applied Research*. 2017; 3:305-309.
 17. Anjum SK, Yashodha HT. A study of neonatal outcome in infants born to diabetic mothers at a tertiary care hospital. *Int J Contemp Pediatr*. 2018; 5:489-92.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 20-05-2021; **Accepted:** 12-06-2021; **Published:** 14-07-2021