

PERINATAL OUTCOME OF INFANTS BORN TO DIABETIC MOTHERS

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The effective control of diabetes mellitus with insulin has led to an increasing number of diabetic women entering the reproductive age. Their infants are predisposed to increased morbidity and mortality. In developed countries, there has been a significant improvement in the outcome of diabetic pregnancy due to improvement in the antepartum fetal surveillance, better metabolic control and improved neonatal care. The management of newborns born to diabetic mothers still poses a major challenge in our country(1). There are scanty reports on infants born to diabetic mothers from India(1-3). The aim of this publication is to highlight the specific problems of infants born to diabetic mothers.

Material and Methods

An analysis of infants born to diabetic mothers over a period of 5 years (1985-89) at All India Institute of Medical Sciences, New Delhi, was undertaken. In our hospital only high risk pregnancies are registered for delivery. All the pregnant women are screened for diabetes mellitus during antenatal period by doing fasting and post prandial blood sugar levels. The borderline cases are subjected to complete oral glucose tolerance test. Infants born to mothers known to have diabetes mellitus before conception were classified as infants of diabetic mothers (IDM) and infants born to women who developed glucose

ABSTRACT

Two hundred and sixty three pregnant diabetic mothers' perinatal outcome was evaluated. Two hundred and twenty five infants were born to gestational diabetic mothers (IGDM) and 38 infants to mothers with established diabetes mellitus (IDM). In IGDM group, 34 babies (15%) were preterm and 45 (20%) were low birth weight (<2500 g). Thirty eight babies (17%) were large-for-dates (LFD) and 14 (6.2%) were small-for-dates (SFD). Among IDM group, 8 (21%) babies were preterm and 8 (21%) were low birth weight (<2500 g). Fifteen babies (39.5%) were LFD and 3 (8%) were SFD. Out of all babies, hypoglycemia occurred in 43 (16%), birth asphyxia in 24 (9%) and respiratory distress in 21 (8%). Nearly half of respiratory distress were due to hyaline membrane disease. Perinatal mortality rate was significantly higher ($p < 0.001$) in IDM (237/1000 live birth) as compared to IGDM (40/1000 live birth).

Key words: Maternal diabetes, Gestational diabetes, Infant of diabetic mothers, Infant of gestational diabetic mothers.

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intolerance during pregnancy were termed as infants of gestational diabetic mothers (IGDM). The criteria for diagnosis of diabetic mothers were as proposed by the National Diabetic Data Group(4). Gestation and weight of each baby were recorded and grouped as appropriate-for-dates (AFD), large-for-dates (LFD) and small-for-dates (SFD) by using the local intrauterine growth chart(5).

Neonates were examined for malformations at birth, 24 hours of age and at discharge. All infants born to diabetic mothers were observed in the neonatal intensive care unit for atleast 24 hours. Blood sugar was routinely estimated using dextrostix (Miles, India), at 2, 8, 12, 24, $48 \pm 1/2$ hours of age, and even more frequently if abnormal. Hypoglycemia (<40 mg/dl) was managed by using a standard protocol(6). Echocardiography was carried out in 31 neonates born to diabetic mothers and 37 control infants matched for weight and gestational age. Monitoring was done to identify other neonatal complications, in particular, hypocalcemia, polycythemia, respiratory distress, etc. and managed according to the current routines in our unit(6).

Results

Out of a total of 8752 mothers delivered at AIIMS during 5 year period, 263 (3%) mothers were diagnosed to be suffering from glucose intolerance. Thirty eight (0.4%) mothers were known diabetic before conception and 225 (2.6%) developed glucose intolerance during pregnancy. In IDM group, 8 (21%) babies were preterm, and 8 (21%) were low birth weight (<2500 g). Fifteen babies (39.5%) were LFD and 3 (8%) were SFD. Among IGDM group 34 babies (15%) were preterm and 45 (20%) were low birth weight. Thirty eight babies

(17%) were LFD and 14 (6.2%) were SFD. Thirteen (34.2%) of IDM babies were delivered by spontaneous vaginal delivery (SVD), 24 (63%) by lower segment cesarian section (LSCS) and remaining by forceps. In IGDM group 104 (46.2%) were delivered by SVD, 113 (50%) by LSCS and remaining by forceps. The pattern of neonatal morbidity is shown in *Table I*, and the mortality indices in *Table II*. Hypoglycemia was the commonest problem, followed by birth asphyxia, hyperbilirubinemia, respiratory distress syndrome (RDS), malformations and septicemia. Among the major malformations, cardiovascular anomalies were the commonest (*Table III*). Perinatal mortality rate was 237/1000 in IDM babies as opposed to 40/1000 in IGDM babies ($p < 0.001$).

The interventricular septum was significantly thicker ($p < 0.001$) in infants born to diabetic mothers (4.77 ± 1.4 mm) compared to those in control babies (2.5 ± 0.7 mm). In eight it was more than 5 mm, but had regressed in six over a period of three months follow up.

Discussion

The incidence of glucose intolerance among pregnant women in the present study was 3% which is more than the figure of 0.8% reported during 1979-83(2). The increase is accounted by the increase in the number of mothers with gestational diabetes. It appears that more rigorous routine screening of all pregnancies for glucose intolerance has led to the increased incidence of IGDM. The comparative incidence of diabetes reported during pregnancy from other studies in India varies from 0.48 to 2.1%(2,7,8).

Approximately one-half of the IDM babies were LFD. The reported incidence

TABLE I—Neonatal Morbidity Among IDM and IGDM Babies

Morbidity	IDM		IGDM		Total	
	(n=38)	(%)	(n=225)	(%)	(n=263)	(%)
Hypoglycemia (Blood sugar <40 mg/dl)	8	(21)	35	(16)	43	(16)
Birth asphyxia (1 min Apgar ≤6)	7	(18)	17	(8)	24	(9)
Resp. distress	4	(11)	17	(8)	21	(8)
HMD *	2		8		10	
TTNB **	2		9		11	
Hyperbilirubinemia	4	(11)	18	(8)	22	(8)
Major malformations	2	(5)	8	(4)	10	(4)
Hypocalcemia	5	(13)	—		5	(2)
Polycythemia	4	(11)	—		4	(2)
Sepsis	6	(8)	3	(2)	6	(2)

*Hyaline membrane disease

**Transient tachypnea of newborn

TABLE II—Mortality Indices Among IDM and IGDM Babies

Deaths	IDM (n=38)	IGDM (n=225)	Total (n=263)
Still births	6	4	10
Early neonatal (1 to 7 days)	3	5	8
Late neonatal (8 to 28 days)	0	1	1
PNMR*/1000 LB**	237/1000 ^a	40/1000 ^b	77/1000

a vs b $p < 0.001$

*Perinatal mortality rate

**Live birth

of LFD babies varies from 25-41% (2,3,7,9,10). The pathogenesis of macrosomia is not completely understood. Pederson (11) hypothesised that maternal hyperglycemia leads to fetal hyperinsulinemia which in turn causes neonatal macrosomia. More recently, somatomedins or insulin-like growth factors have been

identified. These stimulate cellular proliferation resulting in macrosomia (12).

The incidence of metabolic problems such as hypoglycemia, hypocalcemia, hyperbilirubinemia and polycythemia was lower as compared to earlier report (3). The frequency and severity of these problems is directly related to the severity of

TABLE III—Malformations Among IDM and IGDM Babies

<i>Minor malformations (n=36)</i>	
Hairy pinna	8
Pre-auricular tag	4
Hemangioma	12
Pilonidal sinus	2
<i>Major malformations (n=9)</i>	
CHD*	4
Hypospadias	2
Hirschsprung's disease	1
Cleft lip	1
Cleft lip and plate	1

* Congenital heart disease.

maternal diabetes, gestation of baby and associated problems such as birth asphyxia(1). Ten per cent of infants of diabetic mothers suffered from birth asphyxia. IDM's are more prone for respiratory distress because of increased incidence of hyaline membrane disease (HMD). Transient tachypnea of newborns (TTNB), birth asphyxia, congenital malformations and metabolic conditions such as hypoglycemia are other causes of respiratory distress. We have reported transient cardiomyopathy as an unusual cause of respiratory distress in IDM/IGDM elsewhere(13). Out of 31 neonates born to diabetic mothers, interventricular septum was significantly thicker in study group ($p < 0.001$); in eight neonates it was more than 5 mm, but had regressed in six over a period of three months indicating transient nature of this condition(13).

In the present study, the incidence of major congenital malformations was 5.3% among IDMs. Hairy pinna was the most common minor malformation in infants born to diabetic mothers. It was suggested

that external ears of all newborns should be routinely examined for excessive hairiness which can serve as a useful clinical marker for IDMs(15,16). The teratogenicity is not genetic and factors that contribute to diabetic embryopathy include hyperglycemia, ketoacidosis, somatomedin inhibitors and vasculopathy(14). Malformations can be reduced to a minimum with optimum control of maternal glucose homeostasis during preconceptional period and throughout pregnancy(17).

Perinatal mortality in IDMs was 237 per 1000 live births which is significantly higher than that in the IGDM (40 per 1000) and normal population. Early detection of the complications, their appropriate treatment and satisfactory metabolic control of maternal diabetes are crucial for reduction of perinatal mortality.

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NOTES AND NEWS

NATIONAL WORKSHOP ON PROBLEMS IN PEDIATRIC UROLOGY

First National Workshop on Problems in Pediatric Urology will be held at AIIMS, New Delhi from *January 27-30, 1992*. Faculty will include Pediatric Surgeons from USA, UK and India. The Registration Fee is Rs. 500/-. The number of participants will be limited to about 40-50 only. Hostel type of accommodation near AIIMS will be provided on request on nominal charges.

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