

# Morbidity and mortality of infants of diabetic mothers born at the Maternity Hospital, Kuala Lumpur

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## Summary

A prospective study was carried out in the Maternity Hospital, Kuala Lumpur in 1989 to determine the morbidity and mortality of infants of diabetic mothers. Out of 24,856 neonates born during the study period, 54 neonates (2.2 per 1000 livebirths) were born to mothers who were diagnosed to have diabetes mellitus before the current pregnancy or who had impaired glucose tolerance test during the current pregnancy. Almost a third (29.6 percent) of these infants of diabetic mothers had birthweight of 4000 grams and above, and 37.0 percent of the 54 babies were large-for-gestational age. Hypoglycemia occurred in 9/54 (16.7 percent) of the neonates, respiratory distress syndrome in 5/54 (9.3 percent), shoulder dystocia in 7/54 (13.0 percent), and congenital abnormalities in 4/54 (7.4 percent). Three (5.6 percent) neonates died during the neonatal period. The results of this study suggest a need to intensify control of maternal diabetes mellitus during pregnancy in order to reduce the rates of morbidity and mortality of their infants.

*Key words:* Infants of diabetic mothers, Malaysian neonates, morbidity and mortality.

## Introduction

In recent years, with good control of maternal diabetes mellitus during pregnancy, perinatal morbidity and mortality rates in infants of diabetic mothers have decreased markedly in the developed countries.<sup>1</sup> In Malaysia, diabetes mellitus is not an uncommon condition. The objectives of this study were to determine the rates of morbidity and mortality of Malaysian infants of diabetic mothers born in the Maternity Hospital, Kuala Lumpur.

## Method

The study was carried out over a one-year period, between 1 January to 31 December 1989. In the Maternity Hospital, Kuala Lumpur, neonates whose mothers were diagnosed to have diabetes mellitus were routinely admitted to the Special Care Nursery after birth for observation during the first day of life to monitor for hypoglycemia and other problems associated with infants of diabetic mothers. During the study period, all neonates born to mothers who were diagnosed to have diabetes mellitus before pregnancy or who were found to have impaired glucose tolerance test during pregnancy (gestational diabetes) were included in the study. Of the 24,856 livebirths delivered in the hospital during this period, 54 singleton neonates (2.2 per 1000 livebirths) were born to diabetic mothers. Only two mothers (2/54 or 3.7 percent) were diagnosed to have diabetes mellitus before pregnancy and were on insulin therapy. The remainder 52 mothers had gestational diabetes. Insulin therapy was given to 2/52 mothers with gestational diabetes during pregnancy. 50/54 (92.6 percent) of the diabetic mothers were on dietary control only.

Of the 54 neonates, 33 of them were males and 22 were females. Upon admission to the Special Care Nursery, their blood glucose levels were monitored closely by testing the blood obtained by heel prick

with Dextrostrix strips at hourly to four hourly intervals. A full physical examination was carried out on each baby to detect the presence of macrosomia, congenital malformations, birth injury, and respiratory distress. Well babies with good sucking reflex were offered bottle feeding within 1 to 2 hours after delivery to prevent the onset of hypoglycemia. Intravenous infusion of 10 percent dextrose solution were commenced on babies who had poor sucking reflex, or were ill-looking or had respiratory distress while their blood glucose levels were being monitored at regular intervals. A specimen of venous blood was obtained from the baby and sent to the laboratory to verify the blood glucose levels when the dextrostrix read levels of 2.1 mmol/L or less on any specimen of blood obtained by heel prick. Hypoglycemia was diagnosed when the random blood sugar was less than 2.1 mmol/L. The haemoglobin and hematocrit levels of each baby were measured after admission. Babies who developed jaundice were monitored for hyperbilirubinemia.

A diagnosis of large-for-gestation was made when the birthweight of the neonate was above the 90th centile for the gestation age based on the centile chart of Gairdner et al.<sup>2</sup>

## Results

There was no significant difference in the incidence of infants of diabetic mothers among the three racial groups (Malays versus Chinese  $p=0.69$ , Chinese versus Indians  $p=0.11$ , Malays versus Indians  $p=0.12$ ) (Table I). Almost one-third (29.6 percent) of the infants of diabetic mothers had birthweights of 4000 grams and above. The incidence of infants of diabetic mothers among neonates with birthweight 4000 grams and above were significantly higher when compared with neonates of lower birthweights ( $p < 0.001$ ). A large proportion of the babies (40.7 percent) had to be delivered by lower segment Caesarean section. The incidence of infants of diabetic mothers among neonates delivered by LSCS in the hospital was significantly higher when compared with those who were delivered by spontaneous vertex delivery ( $p < 0.001$ ). Large-for-gestational age neonates accounted for more than one-third (37.0 percent) of the affected babies (Table II).

**Table I**  
**Incidence of infants of diabetic mothers according to ethnic origins, birthweight distribution and modes of delivery in the Maternity Hospital, Kuala Lumpur, 1989**

	Total livebirths no.	Infants of Diabetic Mothers no.	(%)	Incidence per 1000 livebirths
<b>Ethnic origins</b>				
Malay	14,986	33	(61.1)	0.22
Chinese	4,566	8	(14.8)	0.18
Indians	3,373	13	(24.1)	0.39
Others	1,931	0	( 0.0)	0.00
<b>Birthweight</b>				
< 2500	2,654	4	( 7.4)	1.5
2500 – 3999	21,482	34	(63.0)	1.6
4000 and above	720	16	(29.6)	22.2
<b>Modes of Delivery</b>				
spontaneous vertex delivery	20,891	30	(55.6)	1.4
forceps	525	2	( 3.7)	3.8
LSCS	2,240	22	(40.7)	9.8

Note: LSCS = Lower Segment Caesarean Section

**Table II**  
**Gestation and birthweight-gestation distribution of infants of diabetic mothers in Maternity Hospital, Kuala Lumpur, 1989**

Gestation in weeks	Infants of diabetic mothers	
	no.	(%)
< 37	9	(16.7)
37 – 41	43	(79.6)
> 42	2	( 3.7)
Birthweight-gestation classification		
appropriate for gestation	33	(61.1)
large for gestation	20	(37.0)
small for gestation	1	( 1.9)

Table III shows the types of morbidity present in the neonates of diabetic mothers. Hypoglycemia, hyperbilirubinemia, shoulder dystocia, birth trauma and congenital malformations were common.

**Table III**  
**Types of clinical problems present in infants of diabetic mothers born in the Maternity Hospital, Kuala Lumpur, 1989**

Types of problems	Infants of diabetic mothers	
	no.	(%)
Hypoglycemia	9	(16.7)
Neonatal jaundice	27	(50.0)
Respiratory distress syndrome	5	( 9.3)
Meconium aspiration syndrome	3	( 5.6)
Hypoxic-ischemic encephalopathy	2	( 3.7)
Shoulder dystocia	7	(13.0)
Erbs' Palsy	3	( 5.6)
Fracture of clavicle	1	( 1.9)
Multiple congenital anomalies	2	( 3.7)
Microcephaly	2	( 3.7)
Gastroschisis	1	( 1.9)
Hypertrophic cardiomyopathy	1	( 1.9)

Three neonates died: one from multiple congenital abnormalities, one from idiopathic respiratory distress syndrome, and one from pneumothorax during ventilatory support for treatment of respiratory diseases syndrome.

Of the four mothers on insulin treatment during pregnancy, three of them produced babies weighing 4000 grams or more. Of these three large babies, two of them died, while the third baby who survived was found to have hypertrophic cardiomyopathy.

## Discussion

Experience in the developed countries has shown that with good control of maternal diabetes mellitus during pregnancy, problems such as large-for-gestational age, macrosomia, shoulder dystocia, birth injury, hypoglycemia, hyperbilirubinemia, meconium aspiration syndrome and birth asphyxia could be avoided.<sup>1,3-16</sup> The high incidence of large babies, difficult delivery, hypoglycemia and congenital abnormalities among the infants of diabetic mothers in this hospital, therefore, suggests poor control of maternal diabetes mellitus during pregnancy. Based on the results of this study, there is a need to review the problems associated with poor control of maternal diabetes and to refine the protocol in the monitoring of women with diabetes mellitus who deliver in the Maternity Hospital, Kuala Lumpur.

## References

1. Pildes RS. Infants of diabetic mothers. In: Avery GB, ed. *Neonatology: Pathophysiology and management of the newborn*. Philadelphia, J.B. Lippincott Co., 1987; 332-57.
2. Gairdner D, Pearson J. Growth chart for premature and other infants. *Arch Dis Child* 1971; 46: 783-87.
3. Kitzmiller JL, Cloherty JP, Graham CA. Management of diabetes and pregnancy. In: Kozak GP, ed. *Clinical Diabetes Mellitus*. Saunders, 1982.
4. Buchanan TA, Unterman TG, Metzger BE. The medical management of diabetes in pregnancy. *Clin Perinatol* 1985; 12: 625-50.
5. Miller E, Have JW, Cloherty JP. Elevated maternal hemoglobin A1c in early pregnancy and major congenital anomalies in infants of diabetic mothers. *N Engl J Med* 1983; 304: 1331-4.
6. Ylinen K, Aula P, Stenman U-H. Risk of minor and major fetal malformations in diabetics with high haemoglobin A1c values in early pregnancy. *Br Med J* 1984; 289: 345-6.
7. Coustan DR, Lewis SB. Insulin therapy for gestational diabetes. *Obstet Gynecol* 1978; 51: 306-10.
8. Coustan DR, Berkowitz RL, Hobbins JC. Tight metabolic control of overt diabetes in pregnancy. *Am J Med* 1980; 68: 845-52.
9. Freinkel N, Metzger BE, Phelps RL. Gestational diabetes mellitus: heterogeneity of maternal age, weight, insulin secretion, HLA antigens, and islet cell antibodies and the impact of maternal metabolism on pancreatic B-cell and somatic development in the offspring. *Diabetes* 1985; 34 (Suppl 2): 1-7.
10. Gillmer MDG, Beard RW, Oakley NW. Carbohydrate metabolism in pregnancy Part II-Relation between maternal glucose tolerance and glucose metabolism in the newborn. *BMJ* 1975; 3: 402-4.
11. Gillmer, MDG, Persson B. Metabolism during normal and diabetic pregnancy and its effect on neonatal outcome. In: *Pregnancy metabolism, diabetes and the fetus*. Ciba Foundation Symposium No. 63, Excerpta Medica, Amsterdam, 1979; 93 - 126.
12. Jovanovic L, Druzin M, Peterson CM. Effect of euglycemia on the outcome of pregnancy in insulin-dependent diabetic women as compared with normal control subjects. *Am J Med* 1981; 71: 921 - 7.
13. Metzger BE, Phelps RL, Freinkel N. Predictive value of fasting plasma glucose in gestational diabetes mellitus. *Diabetes* 1981; 30 (Suppl 1): 4A.
14. O'Sullivan JB, Gellis SS, Dandrow RV. The potential diabetic and her treatment during pregnancy. *Obstet Gynecol* 1966; 27: 683-9.
15. Roversi GD, Gargiulo M, Nicolini U. A new approach to the treatment of diabetic pregnant women: a report of 479 cases seen from 1963-1975. *Am J Obstet Gynecol* 1979; 135: 567-76.
16. Widness JA, Schwartz HC, Thompson D. Haemoglobin A1c (glycosylated hemoglobin) in diabetic pregnancy: An indicator of glucose control and fetal size. *Br J Obstet Gynaecol* 1978; 85: 812-7.