

FETAL MALNUTRITION IN INFANTS BORN TO DIABETIC MOTHERS*

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During the past decade great emphasis has been placed on fetal malnutrition^{1,2}. There are many well known causes for malnutrition related both to the mother and the fetus²⁻⁴. However, there are other causes that can also result in fetal malnutrition. Infants born to diabetic mothers are usually known to have large birthweights for their gestational age⁵⁻⁷, but maternal diabetes can also cause fetal malnutrition in the offspring.

In this study a large number of infants born to diabetic mothers were reviewed, and it was felt that the fifteen cases with fetal malnutrition and the factors associated with diabetic pregnancies and deliveries deserved presentation.

Occurrence of late neurological abnormalities⁸ and the incidence of congenital malformations⁹ observed in the group of infants born to diabetic mothers were previously published. In this paper only the cases of fetal malnutrition will be presented.

Material and Methods

During a ten-year period at the Buffalo General Hospital in Buffalo, New York, 124 living children were born to 56 diabetic mothers. Perinatal history and measurements of the infants were available for 104 children. For the evaluation of intrauterine growth, Lubchenco's¹⁰ growth chart was used. Hospital perinatal charts were reviewed for information regarding complications of pregnancy and delivery due to maternal diabetes.

Findings

Although among the 104 infants most of the babies' birthweights were above the 50th percentile and 30 of them above the 90th percentile, 15 infants were found to be malnourished and as low as the 10th to 25th percentile according to Lubchenco's

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intrauterine growth chart. These findings are given in Figure 1. The birthweights in six of 15 cases were below the 10th percentile. Table I shows the summary of the 15 cases with fetal malnutrition born to diabetic mothers.

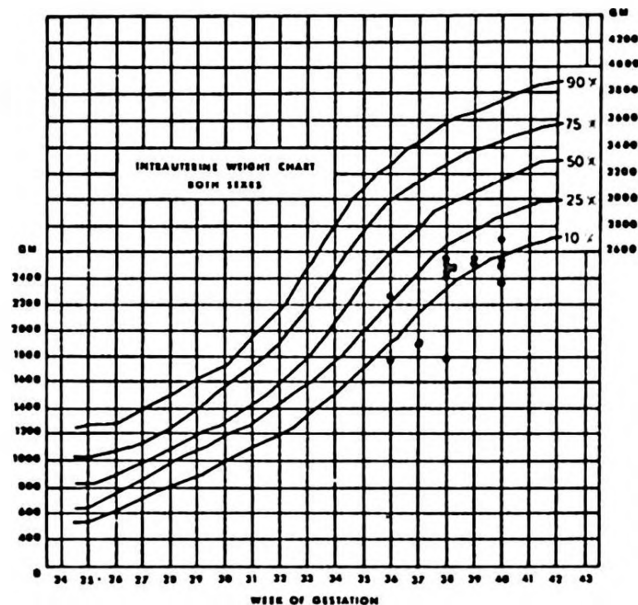


Figure 1.
Fetal malnutrition in infants born to diabetic mothers.

Seven of the 15 diabetic mothers were in Class C diabetes, two in B and one in Class D. The mothers of the five other children, four of whom were siblings, were in Class A.

The gestational age in two cases was 36 weeks and of the other infants between 37 and 40 weeks.

Eight babies had been born by vaginal delivery and seven by cesarean section.

During pregnancy, eclampsia, hypertension and toxemia had been observed in four cases, hydramnios and acidosis in one case each. Only two infants had congenital abnormalities (Table I, Cases 29-1 and 63-3).

Discussion

In general, babies born with a birthweight less than the 10th percentile on Lubchenco's intrauterine growth chart are defined as fetally malnourished. However, babies of diabetic mothers are usually overweight, and therefore those with birthweights less than the 25th percentile are considered to demonstrate growth retardation and have also been presented as cases of fetal malnutrition in this study.

An increased prevalence of small-for-dates infants among infants born to diabetic mothers was reported previously by Farquhar¹¹ and in the Collaborative Perinatal Study¹².

TABLE I

Summary of 15 Cases with Fetal Malnutrition Born to Diabetic Mothers

<u>Case No.</u>	<u>Diabetic Classification</u>	<u>Gestation Period</u>	<u>Birth Weight</u>	<u>Type of Delivery</u>	<u>Complications of Pregnancy</u>	<u>Outcome</u>
3— 4	B	36	2268	Vag	—	—
41— 1	A	38	2410	CS	Eclampsia	—
49— 3	D	38	1790	CS	—	—
9— 2	A	38	2500	Vag	—	—
29— 5	C	38	2523	CS	Hydramnios	—
9—10	A	39	2500	Vag	Hypertension	—
9— 6	A	39	2500	Vag	—	—
1— 1	C	40	2693	Vag	—	—
9—11	A	40	2500	Vag	—	—
32— 1	C	36	1786	Vag	Eclampsia	—
40— 2	C	38	2438	CS	Acidosis	—
6— 1	B	38	2495	CS	—	—
29— 1	C	40	2480	CS	—	Tetralogy of Fallot, deafness
1— 2	C	40	2380	Breech	—	—
63— 3	C	37	1900	CS	Toxemia	Bilateral kidney agenesis

Increased incidence of fetal malnutrition in infants born with gestational ages between 37-40 weeks was demonstrated later¹³. This finding was also reflected in the present study (Table I). In 99 diabetic pregnancies, a progressive decrease in relative birthweight has been shown as gestations progressed beyond 37 weeks (cited in Ref. 14). This suggests that placental insufficiency can be present more often in diabetic pregnancies near term than in non-diabetic pregnancies.

Hypertension, eclampsia, toxemia and acidosis were complications in five cases, which can also be the result of fetal malnutrition.

In a quantitative morphologic study done in infants born to diabetic mothers by Naeye¹⁴, he found significant differences in organ weights and cellular structures between overweight and underweight infants. He also found that body weight of individual infants was proportional to the mass of pancreatic islet tissue. The four underweight infants in his study had a smaller mass of islet tissue than the overweight infants.

Congenital abnormalities were present in only two of these cases (tetralogy of Fallot and bilateral kidney agenesis, respectively) and in the total series the incidence of congenital abnormality was 17.8%⁹.

The most striking diabetic class in mothers was Class C, where the duration of diabetes is between 10 and 19 years and onset of diabetes is before ten years of age. The mother of four cases who were siblings was in Class A. Fetal malnutrition in this mother's children could be due to some other prenatal causes in addition to her diabetes since she had hypertension in one of her pregnancies (Case 9-10).

In conclusion, we would like to emphasize that infants born to diabetic mothers are not always overweight at birth. Some diabetic pregnancies may result in fetal malnutrition in the offspring. This is especially possible when diabetic mothers are in Class C and when the duration of pregnancy is beyond 37 weeks, near term.

Summary

Fifteen babies born with fetal malnutrition to diabetic mothers are presented. Complications of diabetic pregnancies and the relation of the severity of diabetes to fetal malnutrition in the offspring are discussed.

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