

Maternal and fetal nutrition in south India

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Summary and conclusions

The relation between the nutrition of the mother and that of her baby was assessed in a south Indian community where malnutrition is common and women do not smoke. Unselected mothers and their infants of over 37 weeks' gestation were studied in two groups: those who paid for their care (150) and a poorer group who did not (172). There were significant differences between the paying and non-paying groups in maternal triceps skinfold thickness, infant weight, and infant length. Overall there was a significant positive correlation between maternal triceps thickness and infant weight, length, and triceps and subscapular skinfold thickness. The correlation with the infant head circumference was less significant.

These findings are further evidence that the nutrition of the mother has an important effect on the nutrition of her baby and that malnutrition is an important reason why Indian babies are lighter than European ones.

Introduction

There has been much debate about the effects of maternal nutrition on the baby. Ounsted¹ thought the effect slight and found no serious malnutrition in the mothers of her growth-retarded infants, and Smith² and Antonov³ found only small changes in birth weight among infants of starved mothers in Holland and Leningrad during the second world war. More recently, however, Stein⁴ found significantly low maternal albumin concentrations in the small-for-gestational-age infants of underprivileged urban Africans, and Whitelaw⁵ showed that maternal obesity correlated well with the amount of subcutaneous fat in the newborn. Moreover, Kapur *et al*⁶ found that maternal and infant weight were positively correlated.

In south India both malnutrition and intrauterine growth retardation are serious problems. Women do not smoke tobacco, but many do heavy manual work. We have therefore studied in a Tamil Nadu population the effect of maternal nutrition, as gauged by triceps skinfold thickness, on infant nutrition, as gauged by standard anthropometric measurements.

Subjects and methods

Mothers and their babies were studied at two hospitals in Vellore, Tamil Nadu, south India: the Christian Medical College Hospital and the Government Pentland Hospital. All mothers of singleton infants over 37 weeks' gestation born on unselected days were studied from August to October 1977.

Two groups were compared: those who paid for their care (150 mothers) and those poorer mothers who did not (172 mothers). The first group were the wives of professional and business men, land-

owners, and owners of larger shops. In contrast, the non-paying group were the wives of rural and urban labourers, peons, and workers in small factories. The food intake of many of the latter group was inadequate. Their diet was largely vegetarian, with rice, millet, and pulses as the main constituents. As the cultural pattern in south India is for women to eat only after the men and children have finished what they want, these mothers suffered particularly from the financial restraints.

As the information we obtained on gestation was often inaccurate, the gestational age of the infants was assessed by the method of Parkin *et al*.⁷ All but eight of the infants were over 39 weeks' gestation. There were no apparent differences in gestational ages between the paying and non-paying groups (mean: term+3 days and term+4 days respectively). Although the information we collected on maternal age was also unreliable, there were no apparent differences between the two groups (mean 24.3 and 25.2 years). None of the mothers smoked tobacco.

The mothers and infants were measured within 36 hours of birth by one observer (JRS). Interns posted to the child health department helped with Tamil translation. Maternal left triceps skinfold thickness was measured by a Holtain caliper using the method of Tanner and Whitehouse.⁸ Maternal height was also measured. Birth weight was recorded by midwives on beam scales, crown-to-heel-length measured by Cardiff neonatometer, and occipitofrontal head circumference measured with a paper tape measure. Infant skinfold thickness was measured by a Holtain caliper (reading to 0.1 mm) at the left triceps and subscapular sites using the methods of Oakley *et al*.⁹ With all skinfold measurements the caliper was applied until the reading was stable. The data were analysed with the help of the IBM-370/155-11 computer at the Indian Institute of Technology, Madras.

Results

In considering the whole group of 322 mothers there was a positive correlation between maternal triceps skinfold thickness and the weight, length, triceps and subscapular skinfold thicknesses ($P < 0.001$), and head circumference ($P < 0.01$) of their infants. There was also a significant correlation between maternal height and infant length and weight (table I).

TABLE I—Correlation between maternal characteristics and infant anthropometric data (in 322 cases)

Infant characteristic	Maternal triceps thickness		Maternal height	
	Correlation coefficient	Significance level (P)	Correlation coefficient	Significance level (P)
Weight	0.306	<0.001	0.174	<0.01
Length	0.188	<0.001	0.254	<0.001
Head circumference	0.141	<0.01	0.013	NS
Triceps skinfold thickness	0.235	<0.001	-0.017	NS
Subscapular skinfold thickness	0.262	<0.001	0.044	NS

NS = Not significant.

TABLE II—Infant anthropometric values according to skinfold thickness of their mothers. Values are means \pm SD

	Infants with maternal triceps <7 mm (n=76)	Infants with maternal triceps >12.1 mm (n=80)	t	Significance level
Weight (g)	2650.5 \pm 385.7	2913.2 \pm 464.0	12.16	P < 0.001
Length (cm)	47.18 \pm 2.27	47.89 \pm 2.12	2.01	P < 0.05
Head circumference (cm)	32.91 \pm 1.44	33.49 \pm 1.29	2.63	P < 0.01
Triceps (mm)	3.37 \pm 0.68	3.75 \pm 0.79	3.29	P < 0.01
Subscapular (mm)	3.23 \pm 0.56	3.68 \pm 0.80	4.05	P < 0.001

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The infants of mothers with skinfold thicknesses less than 7 mm (less than 25th percentile for the whole group) had significantly smaller anthropometric measurements than those of mothers with skinfold thicknesses greater than 12.1 mm (greater than 75th percentile) (see table II).

There were significant differences between the paying and non-paying groups in infant weight and length and maternal height and triceps skinfold thickness (see table III). Infants weighing under 2500 g constituted 24% of the whole group, 15% of the paying group, and 30% of the non-paying group.

TABLE III—Infant anthropometric values in paying and non-paying groups. Values are means \pm SD

	Paying (150 cases)	Non-paying (172 cases)	Significance level (P)
Infant weight (g)	2904.0 \pm 431.5	2697.7 \pm 386.9	<0.001
Infant length (cm)	47.931 \pm 2.16	47.35 \pm 2.19	<0.05
Infant head circumference (cm)	33.38 \pm 1.58	33.14 \pm 1.50	NS
Infant triceps skinfold (mm)	3.65 \pm 0.77	3.52 \pm 0.65	<0.1 (NS)
Infant subscapular skinfold (mm)	3.55 \pm 0.82	3.41 \pm 0.59	<0.1 (NS)
Maternal height (cm)	153.1 \pm 6.36	150.0 \pm 5.27	<0.001
Maternal skinfold thickness	11.64 \pm 5.36	8.68 \pm 4.09	<0.001

Discussion

The positive correlation we found between maternal triceps skinfold thickness and infant anthropometric measurements is further evidence that the nutrition of the mother affects the nutrition of her baby. The social class differences in these measurements confirm this point, as many of our mothers were appreciably malnourished. Indeed, the mean maternal triceps skinfold thickness in our non-paying group was only 8.7 mm compared with the 16 mm found by Turner and Whitehouse⁸ in British young women. Furthermore, the fetal growth retarding factor of maternal smoking was absent in our mothers.

Perinatal mortality in south India is as high as 68.8 per 1000 rural population and 62.8 per 1000 urban population.¹⁰ This high rate is due partly to problems of intrauterine growth

retardation. Our results emphasise the need to pay attention to maternal nutrition in developing countries. Indeed, at least two studies^{11,12} have shown that dietary supplementation during pregnancy benefits the growth of the infants.

In Britain Trussell¹³ and Smalley and Bissenden¹⁴ have also emphasised the importance of an adequate diet during pregnancy, particularly among immigrants. Furthermore, Davies *et al*¹⁵ have suggested that the growth-retarding effect of maternal smoking is due to poor food intake during pregnancy. Our work has added to the evidence that an adequate maternal diet is necessary for adequate fetal growth—a fact that is important for the West as well as developing countries.

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Haemolytic-uraemic syndrome complicating shigella dysentery in south Indian children

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Summary and conclusions

Shigella dysentery caused 65% of all cases of acute renal failure (ARF) seen in children treated at the Christian Medical College Hospital, Vellore, during the 33 months ending September 1977. In the 40 children with ARF

secondary to shigella dysentery, haematological findings suggested that they were suffering from the haemolytic-uraemic syndrome, and glomerular hypercellularity and fibrin deposition were present in all 12 patients whose renal histology could be studied. Peritoneal dialysis was the main element of treatment: 43% of children who underwent dialysis improved, compared with only 25% of those who did not undergo dialysis.

The haemolytic-uraemic syndrome precipitated by bacillary dysentery is therefore the most important cause of ARF in children aged under 5 years in Tamil Nadu and the adjoining area of Andhra Pradesh.

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Introduction

In Tamil Nadu and the adjoining area of Andhra Pradesh shigella dysentery is a common cause of acute renal failure