most likely responsible for the observed arrhythmia.

The maternal infection was most likely a recurrent one, as maternal serology for HSV II was positive by CFT but negative for IgM(4). A maternal cervical swab taken following confirmation of the baby's infection was negative. This does not, however, exclude the presence of such an infection at the time of rupture of membranes, since there was an interval of 8 days between rupture of the membranes and obtaining the maternal swab. Previous studies have shown average durations of viral shedding to be 4 days for recurrent infections and 12 days for primary infections(4).

Most clinicians are aware of the potential risks of ascending bacterial infection associated with prolonged rupture of the membranes, particularly in the premature newborn. The present case highlights the possible additional hazard of viral infection in such situations. If it had been known that the mother was actively shedding HSV at the time of rupture of membranes, it is possible that delivery by cesarean section within 4-6 hours may have avoided this devastating infection(1). The advanced progression of the disease process by the time of delivery in the present case made successful treatment with antiviral therapy very unlikely.

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Maternal Nutritional Status and Neonatal Head Circumference

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Head circumference (HC) is an indirect way of measuring the growth of brain *in utero* as well as after birth(1,2). Maternal malnutrition has been shown to influence the function of the central nervous system in children at a later age(3). We conducted this study with the objective to assess the role of maternal nutritional status over HC of their offsprings.

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Received for publication: October 28, 1991; Accepted: August 13, 1992

Material and Methods

This study was conducted as a cross-sectional survey between May 1990 and December 1990 at the Hospital for Women and Children, Madras. Six hundred and fifteen mothers, up to 4th gravida in the age group of 20 - 28 years, were selected consecutively. Mothers with chronic diseases or complicated pregnancy were excluded.

The maternal nutritional status was assessed by height, weight and weight height product index (WHPI). Height of the mother was recorded to the nearest of 0.5 cm and the weight was recorded, using a bathroom weighing scale, to the nearest of 0.5 kg. WHPI was calculated using the following formula(4):

$$\frac{\text{weight (kg)} \times \text{height (cm)}}{45 \text{ kg} \times 150 \text{ cm}} \times 100$$

The measurements were made on the third postpartum day. WHPI was utilized in dividing the mothers into 3 groups. When it was more than the mean value, the mothers were considered well nourished. When it fell between the mean value and –1 SD, mothers were considered moderately malnourished and when it was less than –1 SD the mothers were considered severely malnourished. The levels of maternal hemoglobin and serum albumin were estimated.

The HC of the neonate was measured on the third day to avoid spurious measurements secondary to scalp edema. Babies with cephalhematoma were excluded. HC was taken with a non-stretchable tape placed just over the glabella anteriorly and occipital prominence posteriorly, excluding both the ears. Weight of the newborn was taken immediately after birth using a baby weighing scale to the nearest of 50 g. To avoid inter-observer variation one investigator took the measurements throughout the study. The weighing machines were periodically checked up for accuracy with standard weights.

Mean HC of the babies born to the three groups of mothers were calculated. The statistical significance for the observed difference in HC among these groups was arrived at using Student 't' test. The p value <0.05 was considered as statistically significant. Correlations between HC and maternal weight, height, WHPI, hemoglobin and albumin were assessed. SPSS/PC + software was used for statistical analysis.

Results

Of the 615 mothers, 285 were well nourished (WHPI greater than 102.6), 245 were moderately malnourished (WHPI between 83.7 and 102.5), and 85 were severely malnourished (WHPI less than 83.6).

Among the 615 newborns, the HC ranged from 26.5 cm to 40 cm (mean 33.1 ± 1.5 cm). The distribution of these values is shown in *Fig. 1.* The mean (SD) HC of babies born to well nourished, moderately malnourished and severely malnourished mothers were 33.86 (1.4) cm, 32.97 (1.4) cm and 32.86 (1.8) cm, respectively. The mean (SD) birth weights were 2.84 (0.43) kg, 2.75 (0.39) kg and 2.5 (0.45) kg respectively.

The differences observed between the mean HC of babies born to well nourished mothers and that of babies from severely malnourished and moderately malnourished groups were statistically significant ($p<0.05$). The HC of babies born to the moderately malnourished mothers did not differ signficantly from those born to the severely malnourished mothers. The difference observed in the birth weights among the three groups was statistically significant ($p<0.05$).

There was a positive correlation ($r = 0.6$) between HC and birth weight of the child. A positive correlation of lesser

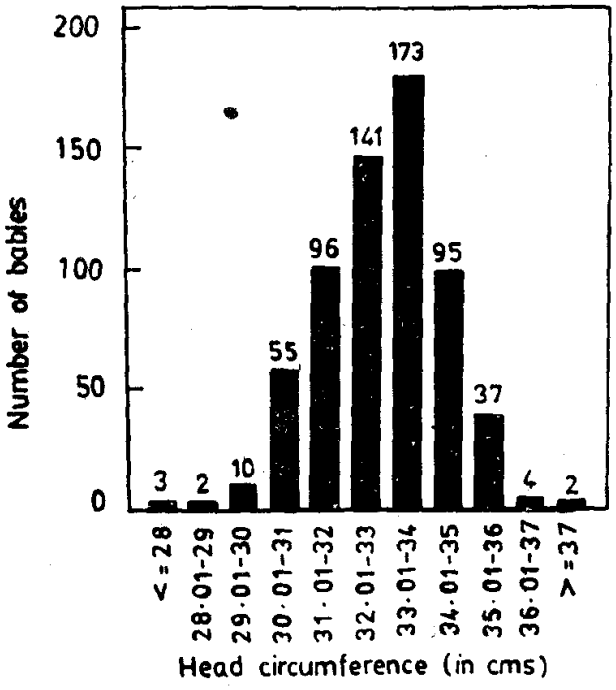

Fig. 1. Distribution of head circumference of new born babies. The HC of our study population ranges from 28 cm - 37 cm. The mode of HC is 33.5 cm.

magnitude (r = 0.2) was also observed between HC of newborns and both maternal weight and maternal height. The HC did not correlate with the maternal serum albumin or hemoglobin levels (*Table*).

With regression analysis, keeping HC at X axis and WHPI at Y axis, an intercept (Bo) of 30.5 and a slope (B1) of 2.17 was obtained. Yi = 30.5 + 2.17(Xi). Using this equation, HC could be predicted from WHPI, in malnourished mothers; this equation did not hold good in well nourished mothers.

Discussion

The influence of maternal nutritional status on the HC of their newborn has not been well evaluated. The mean(SD) HC observed in this study, 33.1 (1.5) cm was lower when compared to earlier studies by Bhat and Serenuis and higher than Bhatia's observation(5,7). This could be explained

TABLE–*Correlation of Maternal Factors and Birth Weight with Head Circumference (HC)*

Factors compared	R value	Significance*
HC and birth weight	0.6	$p < 0.01$
HC and maternal weight	0.2	$p < 0.01$
HC and weight height product index	0.2	$p < 0.01$
HC and maternal height	0.1	$p < 0.01$
HC and maternal hemoglobin	0.05	$p > 0.05$
HC and maternal albumin	0.02	$p > 0.05$

* Student 't' test.

by the fact that these studies were conducted in different ethnic groups and regions(8).

In our study, the difference in mean HC values observed among the three nutritionally different groups of mothers was not clinically significant, but a statistically significant trend was seen in one direction, meaning when the maternal nutritional status was poor, the HC of the offspring was low. If our sample had included more severely malnourished mothers we would have observed a larger difference in HC among the offspring, of the three groups of mothers.

WHPI had been taken as an indicator of nutritional status in mothers. No earlier study so far has attempted to correlate neonatal HC with maternal nutritional status having WHPI as an indicator. From the WHPI of malnourished mothers, HC of their offspring can be predicted using the equation derived in this study, but the equation has no predictive value in well nourished mothers. This is understandable, because any further improvement in the nutritional status of a well nourished mother will not increase the HC of her child beyond the normal value.

We conclude that the nutritional status

of the mother influences the HC of the child at birth. The trend of increasing HC with increasing height and weight of mothers indicates that the maternal nutritional status is important for brain growth of the neonate.

Acknowledgement

The authors thank the Director and Superintendent of the Hospital for Women and Children, Madras, for permission to conduct the study. The Project was supported by the Indian Council of Medical Research, New Delhi.

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Fracture and Aspiration of Tracheostomy Tube: A Rare Complication

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Tracheostomy has found wide clinical application during the last 4-5 decades. Prolonged tracheostomy requires specific care to avoid complications. Late complications like tracheal stenosis, tracheomalacia, erosion of innominate artery, *etc.* have been well described. However, fracture and aspi-

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Received for publication: September 21, 1992; Accepted: January 5, 1993