Tuberculin Sensitivity in Low Birth Weight and Malnourished Children

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Neonatal BCG vaccination is an important part of the armamentarium for tuberculosis control. Notwithstanding the controversial reports regarding efficacy and protective value of BCG, it is recommended for control of tuberculosis all over the world(l), more so in developing countries like India.

A significant proportion of newborns in India are low birth weight (LBW) and considered to be immunocompromised and at risk to develop serious infections. The immunity acquired by these LBW babies following vaccination may not be optimal although the response of these infants to DPT and polio vaccination has been found to be as good as for healthy term infants(2). Data on the effectiveness of BCG vaccination in the newborns has been largely based on studies which excluded LBW infants and as such cannot provide information on the effectiveness of BCG vaccination in these infants.

Malnourished children are another group of immunocompromised hosts. Many investigators have demonstrated significant impairment of cell mediated immunity in malnourished children(3-5). While there is little doubt that severe nutritional stress impairs immune functions, the evidence that moderate malnutrition does so is equivocal(5,6). We report here the tuberculin status in the two immunocompromised groups namely LBW and malnourished children who were given BCG at birth.

Material and Methods

The present report is a part of a larger study where BCG induced tuberculin sensitivity of one thousand term babies was evaluated in a longitudinal follow up.

All the babies were given BCG intradermally 0.5 ml on the left deltoid within the first week of life. Serial tuberculin testing was done at 3, 6, 12, 24, 30, and 36 months of age. The strength of PPD used was 5 TU/0.1 ml. A dose of 5 TU was given intradermally using a tuberculin syringe. The test was read 48-72 hours after the injection. An induration of 5 mm or less was taken as negative. On each visit the weight of the children was recorded and malnutrition graded as per the Indian Academy of Pediatrics recommendations(7).

The low birth weight babies, 240 in number, were taken as Group A and compared with controls comprising normal weight babies. The malnourished children formed the other study group (Group B). Their response was compared with children of normal nutritional status.

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The data was statistically analyzed using *'21* test and Student's 't' test.

Results

In the present study, the mean PPD induration size among low birth weight babies was 11 mm at 3 months of age as compared to 10.5 mm in the control group. The difference was statistically not significant (p >0.05). At later ages also the PPD induration size of low birth weight babies did not differ significantly from normal birth weight-ones. The mean PPD induration waned as the age increased in both the groups. By 3 years of age, induration size was 3.7 mm and 4.3 mm in normal and low birth weight babies, respectively *(Table* I).

The PPD induration of normal and malnourished children was compared. There was no child with third degree or severe malnutrition. The mean size of PPD induration in first and second degree malnutrition did not differ significantly (p >0.05) from normally nourished children. This pattern was seen at all ages *(Table II).*

Discussion

Preterm and low birth weight babies are believed to be immunocompromised and their response to vaccination may not be satisfactory. In the present study there was no significant difference in the BCG induced tuberculin response of low birth weight children as compared to normal ones. Bonforte also showed that preterm infants had a capacity to elicit cell mediated immune response

TABLE I- *Mean PPD Induration in Relation to Birth Weight*

Age (mo)	Mean PPD (mm) Group A	Mean PPD (mm) Control
3	11.0	10.5
6	10.1	9.9
12	8.7	8.4
24	6.1	6.3
30	4.8	5.3
36	4.3	3.7

None of the difference between the two groups were significant (p >0.05).

TABLE II–*Mean PPD size in Malnourished and Normal Children*

Age (mo)	Number of malnourished children	Mean PPD size (in mm)		
		First degree malnutrition	Second degree malnutirition	Normal
3	45	10.6	8.7	10.7
6	47	10.2	9.3	9.9
12	19	8.9	9.4	8.4
24	108	6.0	6.8	6.2
36	5	4.0	3.0	3.9

None of the differences between the two groups were significant.

comparable to that of term infants as demonstrated by *in vivo* skin test with phytohemagglutinin(8). Dawodu compared the tuberculin conversion following BCG vaccination in preterm and term infants and observed no significant difference in their conversion rates(2). In contrast, Bade *et al.* reported that neonates weighing less than 4.5 lbs showed a poor response to tuberculin as compared to higher weight groups(9). Manerikar *et al.* also showed that low birth weight infants with severe intrauterine growth retardation have poor tuberculin conversion(10).

Mantoux positivity in malnutrition has been a subject of controversy. Harland suggested that children with subnormal growth had reduced tuberculin reaction after BCG vaccination(3). McMurray *et al.* stated that delayed hypersensitivity reactions to PPD were significantly reduced in all malnourished children eight weeks after giving BCG at birth(4). This is attributed to significant impairment of cell mediated and secretory immune functions as well as deficiencieis in complement levels and phagocytic activity in malnutrition. In this study the PPD induration of normal and of malnourished children was compared and no statistically significant difference was observed. Similar observations were made by Satyanarayana *etal.(6)*.

Seth *et al.* noted that positivity of Mantoux test in normally nourished was 21.9% as compared to 8.3% in severely malnourished children(5). They also evaluated cell mediated immune response in relation to nutritional status among preschool children given BCG at birth. It was observed that mild to moderate malnutrition did not interfere in the elicitation of cell mediated response by Mantoux test and LMIT.

It is concluded that tuberculin sensitivity following neonatal BCG vaccination is not significantly altered in low birth weight .babies as compared to normal ones. It is recommended that low birth weight babies be given BCG vaccination at birth. Tuberculin sensitivity is not affected by first and second degree malnutrition also.

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Asphyxiating Thoracic Dystrophy

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Jeune first described asphyxiating thoracic dystrophy (ATD) in two siblings in 1954, which was subsequently delineated by several other reports. This skeletal dysplasia is characterized by contracted thorax leading to asphyxia neonatorum and repeated chest infections. We report a severe form of one such case.

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Case Report

A first male child of a non-consanguineous parents was delivered normally, developed respiratory distress within a few hours and was referred to M.S. Ramaiah medical teaching hospital. The mother was 26 years old with no antenatal risk factors. There was no ^family history of similar problems.

On examination, the baby was full term AFD. The baby's weight at birth was 2670 g, length 46 cm, head circumference 32 cm, arm span of 44 cm, with US:LS ratio of 1.9:1. The cry and activity of the baby was fair. He had signs of severe respiratory distress with bilateral crepitations. The cardiovascular system was normal. The liver was palpable three cm below the right costal margin. There was no facial dysmorphic features. The chest cage was long and narrow and the limbs appeared short.

Skeletal survey revealed classic features of ATD; the clavicles were highly placed; the thoracic cage was long and narrow with widening in the lower