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## **Original Research Article**

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# Tuberculin sensitivity among inmates of children's home

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## **ABSTRACT**

**Background:** Tuberculin sensitivity and its relationship to nutritional status in inmates of children's home.

**Methods:** Tuberculin sensitivity was checked in 180 apparently healthy orphan children and its relationship with nutritional status, previous vaccination status was studied. setting: children's home run by NGOs participants: all inmates of children's home aged 2-15 years who meet inclusion and exclusion criteria.

**Results:** Out of 180 apparently healthy children 27 (15%) were tuberculin positive. 109 (60.5%) were undernourished children out of which 15 (55.56%) were tuberculin positive. Out of 71 normal nourished children, 12 (44.4%) were tuberculin positive. BCG scar was present in 120 (66.6%) children out of which 19 were tuberculin positive and BCG scar was absent in 60% children out of which 8 were tuberculin positive. 8 children had history of contact with TB and 6 of them were tuberculin positive.

**Conclusions:** Tuberculin sensitivity testing using 5 TU PPD-RT23 is a simple feasible method to screen inmates of children home at the time of entry and it is not influenced by nutritional status or previous BCG vaccination. Early diagnosis and treatment of TB will go a long way in reducing the burden of TB in our country.

Keywords: BCG vaccination, Nutritional status, Tuberculin sensitivity

## INTRODUCTION

Tuberculosis is a chronic infectious disease caused by mycobacterium TB. It is a major public health problem throughout the world, especially in developing countries. Currently TB is the leading cause of mortality among infectious diseases worldwide.

High risk group for TB infection include malnourished children, Children with retroviral disease, contact with adults with active TB, low socio-economic status, residents of homeless shelters, inmates of hostels/children's home. Inmates of children home constitute a high-risk group for acquisition of TB infection and development of TB compared to general population due to overcrowding, closed living conditions, inadequate ventilation, low socioeconomic status, poor nutrition etc. I.2 The best way to prevent tuberculosis in

children is early identification and treatment of infected patients. Case notification of tuberculosis in children usually has been 6 to 20% of all registered TB cases with the National Tuberculosis Program (NTP).

The annual risk of tubercular infection is 1.5 in the country and 40 % of children by 1.6 years acquire infection. Nearly 10 percent of infected eventually develop disease. Five percent of these are expected to develop tuberculosis in the first two years of life. This large pool of infected children means that TB will continue to be a major problem in the foreseeable future. The childhood tuberculosis is often under diagnosed even in high risk population. Even though there are many studies on tuberculin sensitivity among children of urban slums, healthy under five and school going children, there are not many studies on children residing at orphan homes. In this context, the study was

undertaken to understand the tuberculin sensitivity and the nutritional status of inmates of children homes in our city to establish if there is any correlation between the nutritional status and tuberculin sensitivity and previous BCG vaccination and tuberculin sensitivity.

#### **METHODS**

The study of tuberculin sensitivity in 180 apparently healthy orphan children was undertaken in children's homes of our city.

#### Inclusion criteria

 All the inmates of children home belonging to age group 2-15yrs.

#### Exclusion criteria

- Known case of tuberculosis
- History of having taken anti tubercular drugs
- Evidence of tuberculosis on detailed clinical examination.

All children included under the study were subjected for thorough clinical examination, assessed for nutritional status, weight, height, weight for height, mid arm circumference and body mass index. The children were specifically examined for BCG scar and asked about the parental status and history of contact with tuberculosis and the same was entered in the proforma.

Tuberculin skin test (TST) was performed according to WHO protocol. The children were given PPD-S 0.1 ml of standard 5 TU of PPD RT23 80 using a disposable plastic tuberculin syringe intradermally on volar surface of the left forearm. A discrete, pale elevation of the skin (wheal) of 6 to 10 mm was produced.

The test was read after 48 hours of injection. The maximum transverse diameter of the induration was measured. Cut off value of 10 or more was considered diagnostic of TB infection. Statistical methods applied were descriptive statistics, chi square test and contingency table analysis.

## **RESULTS**

Out of 180 children included in the study, 76 (42.2%) were male and 104 (57.7%) were female (Table 1).

**Table 1: Gender wise distribution.** 

Total no. of children	Male	Female
180	76	104

7.2~% of children were less than 5 years of age.60.5% were between 5 to 10 % and 32.2% were between 11-15% (Table 2).

**Table 2: Age wise distribution.** 

Age (years)	Male	Female	Total	%
<5	9	4	13	7.22
5-10	58	51	109	60.55
11-15	9	49	58	32.22
Total	76	104	180	100

71 (39.4%) out of 180 children are normal while 109 (60.5%) out of 180 are undernourished.

Out of 27 children with tuberculin positivity, 12 (44.44%) had normal nutritional status while 15 (55.56%) were malnourished (Table 3).

Table 3: Tuberculin sensitivity and nutritional status.

Tuberculin sensitivity	Normal	Under- nourished	Total	%
Negative	59	94	153	85
Positive	12	15	27	15
Total	71	109	180	100

Out of 27 tuberculin positive, BCG scar was present in 19 (70.4%) and absent in 8 (29.6%) (Table 4). 25 out of 27 tuberculin positivity (92.59%) were >5 years of age (Table 5).

Table 4: Tuberculin sensitivity and presence of BCG scar.

BCG scar	Total	Tubercul	Tuberculin sensitivity		
		+ve	-ve		
Absent	60	8	52		
Present	120	19	101		
Total	180	27	153		

Table 5: Tuberculin positivity and age and gender wise distribution.

Age (years)	Male	Female	Total	%
<5	0	2	2	7.41
5 -10	6	8	14	51.85
11-15	7	4	11	40.74
Total	13	14	27	100

History of contact with tuberculosis was present in 8 children, out of which 6 of them were tuberculin positive.

### **DISCUSSION**

Tuberculin positivity in children is an indirect measure of the ongoing transmission in the community.

Tuberculin test mainly indicates infection but doesn't give definite clues regarding active disease.

In this above Table 6, tuberculin positivity in various studies depicted.<sup>4-9</sup> Tuberculin positivity varies from 6.9% to 20.4%.

In the present study, 15% were tuberculin positive which is comparable to the study done by Serene VT et al (18.6%)

Table 6: Tuberculin Positivity in various studies.

Studies	Age (years)	Cut-off point of induration size (mm)	Total no. of children	Tuberculin positive	%
Koscik M et al 5 TU PPD RT 23	6-9	≥10	1398	147	10.5
Serene VT et al 1 TU PPD RT 23	5-9	≥10	500	93	18.6
Shashidharan et al 1 TU PPD RT 23	1-9	≥10	10.191	703	6.9
Chadha et al 1 TU PPD RT 23	5-9	≥20	3636	349	9.6
Gopi et al 1 TU PPD RT 23	1-9	≥10	7098	746	10.5
Rao et al 1 TU PPD RT 23	1-9	≥10	1341	274	20.4
Present study 5 TU PPD-S RT 23	2-12	≥10	120	13	15%

This wide variation among studies with respect to tuberculin sensitivity may be due to difference in age groups, cut off values and tuberculin strengths.

The cut-off points of induration size varied from  $\geq 5$  mm to  $\geq 20$  mm. In a study done by Miret P et al cutoff of  $\geq 5$  mm and in a study by Chadha  $\geq 20$  mm was taken as

positive. The PPD used were also of different strengths ranging from 1TU PPD RT 23to 5 TU PPD RT 23. (Table 6).

Out of 180 children, undernourishment was noted in 109 (60.5%) in present study, whereas studies of Chada et al and Serene et al, reported 29.9% and 9.2% respectively.

Table 7: Nutritional status and tuberculin sensitivity in various studies.

Studies	No. of normal children	Tuberculin test positive	%	Mal- nutrition	Tuberculin test positive	%
Chadha et al 1 TU PPD RT23	3131	172	5.5	1444	59	4.1
Serene VT et al 1 TU PPD RT23	461	82	17.7	39	11	23.2
Present study 5 TU PPD-S RT23	71	12	16.9	109	15	13.7

Malnutrition is one of the causes for false negative reactions. In developing countries like India, the effect of malnutrition on tuberculin sensitivity is very relevant. The present study result has shown that 12 children were tuberculin positive out of 71 normal children (16.9%) and 15 children were tuberculin positive out of 109 malnourished children (13.7%). Though there were more number of tuberculin positives among the normal children compared to malnourished children, the result was not significant.

The mean induration size among tuberculin positive was observed to be more in malnourished children (22.8 mm) as compared to normal children (19.5 mm). Whereas the mean induration size among tuberculin negative children was observed to be similar in malnourished (1.12 mm) as compared to normal children (1.09 mm) children (p=0.277, not significant). Malnutrition is one of the causes of false negative tuberculin reaction.

In most studies, tuberculin sensitivity was more in malnourished children group as compared to normal children.

In present study, tuberculin positive was more among normal children in comparison to malnourished children similar to observations made by Chada et al.<sup>10</sup> Therefore tuberculin sensitivity is not influenced by nutritional status among apparently healthy orphan children.

Previous vaccination with BCG can cause a reaction to tuberculin test. Approximately one half of the infants who had received BCG vaccine develop reactive tuberculin skin test at 6-12 months of age. But this reaction wanes by 2-3 years. Older children and adults develop tuberculin reactivity, but most loose the reactivity by 5 to 10 years after vaccination. When skin reactivity is present, it usually causes <10 mm of induration size.

In present study, 19 out of 120 children with BCG scar were tuberculin positive. Out of 60 children without BCG scar 8 were tuberculin positive. Thus, the present study indicates that BCG scar status does not affect the proportion of children who react significantly to tuberculin test.

The mean induration size in tuberculin positive children was 19.6 mm with BCG scar and 21.5 mm without BCG scar. Whereas in tuberculin negative children mean induration size with BCG scar was 1.3 mm and without BCG scar was 0.61 mm.

In the above the relationship between BCG status and tuberculin sensitivity in various studies is shown. The percentage of tuberculin positivity with BCG scar group varied from 16.7% to 18.2%. In present study, tuberculin positivity among children with BCG scar is 15%.

Tuberculin positive children were considered as TB suspects. Chest X-ray, ESR, Sputum AFB was done based on which the children were treated with ATT drugs.

#### **CONCLUSION**

Tuberculin sensitivity testing using 5 TU PPD-RT 23 is a simple feasible method to screen inmates of children home at the time of entry and it is not influenced by nutritional status or previous BCG vaccination such as early diagnosis and treatment of TB will go a long way in reducing the burden of TB in our country.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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