Short communication

ANNUAL RISK OF TUBERCULOSIS INFECTION IN CHENNAI CITY

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Summary

Aim: To study the proportion of children infected with *Mycobacterium Tuberculosis* in Chennai city.
Methodology: A cluster sampling methodology was adopted to select an estimated sample size of 7000 children from five corporation zones selected systematically from ten zones of the city. A total of 7098 children aged 1-9 years were subjected to Mantoux and test read; 1897 (27%) from slum area and 5201 (73%) from non-slum area.
Results: The prevalence of infection among children without BCG scar was estimated to be 10.5 % (ARTI of 2.0%) and was similar to that among children irrespective of scar status. The prevalence of infection was higher among children in slum areas (11.1%; ARTI 2.1%) compared to non-slum areas (8.9%; ARTI 1.7%); but the difference was not statistically different.
Conclusion: The tuberculosis situation in Chennai as measured by risk of infection was higher in urban city area than rural areas and comparable to that found in other cities as reported from earlier studies. This information can be used as baseline information for monitoring the epidemiological trends in Chennai city in future. **[*Indian J Tuberc 2008; 55: 157-161*]**

Key Words: Tuberculosis, Annual Risk of Infection.

INTRODUCTION

The first country-wide survey was conducted by the Indian Council of Medical Research during 1955-1958[1] to estimate the prevalence of TB. Based on the findings of this survey, an .estimate of the burden of TB in India of 3.5 million bacillary cases and 14 million smear negative Chest X-ray abnormal cases suggestive of TB was made at the time of introduction of RNTCP in 1997[2]. A repeat survey of TB, similar to this survey, is not operationally convenient and economically feasible mainly due to the heavy expenditure involved in subjecting the persons to chest radiography. As an alternative, tuberculin surveys and the computed Annual Risk of Tuberculosis Infection (ARTI) provide the indirect method of assessing the extent of tuberculosis in the community[3]. These studies usually conducted among children aged 1-9 years are less expensive compared to TB morbidity prevalence surveys and repeated tuberculin surveys measure the trend of the disease and impact of TB control measures. For

this reason, a national sample survey[4] on ARTI was conducted during 2000-2003 and it has provided valid information on the prevailing epidemiological situation of TB in different zones of India. It has also provided an overall estimate of ARTI (1.5%) at national level. The proportion infected was found to be higher in urban areas compared to rural children. In the south zone[5], the proportion infected was 8.8% (ARTI of 1.6%) in urban and 4.7% (ARTI: 0.8%) in rural population groups. The urban population selected for the south zone included children from peri-urban area of Chennai city and not aimed at measuring the infection in the city. Moreover, epidemiological information on TB in the city is very limited. So, it was proposed to conduct a tuberculin survey in Chennai city to provide a precise estimate of prevalence of infection and ARTI.

MATERIAL AND METHODS

Assuming the prevalence of infection to be 10% (the prevalence obtained for the urban area in south zone of India[6]), the sample size was estimated

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Table: Estimated prevalence of infection among children
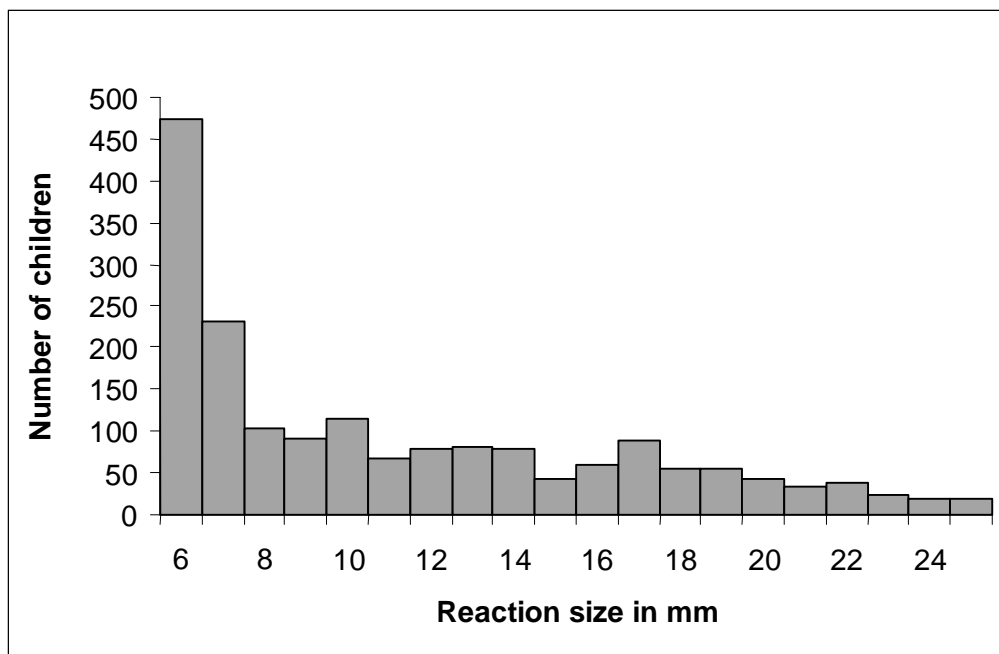

Fig: Distribution of reaction sizes among children aged 1-9 years

to be 900 for a precision of 20% at 5% significance level. Assuming BCG coverage of 70%, test/read coverage of at least 90% and a design effect of two for cluster sampling, the sample size was projected to be 7000 children. A stratified cluster sampling methodology was adopted with proportional allocation to select the sample. First, a systematic random sample of five zones was selected from the ten zones in the city. Next, a 50% random sample of wards was selected and the sample size was distributed among the selected wards proportional to the size of the ward. Subsequently, a random sample of streets was selected from each selected ward in the ratio of slum ('slums' are in any respect unfit for human habitation) to non-slum population (1:3) of the city.

The survey was conducted during the period April-November 2006. A tuberculin testing team consisting of a census taker, tester and supervisory staff visited the zone and sought the co-operation of the zone officials for the study. All children aged 1-9 years in the selected streets were registered after getting the written consent from the parents/guardian of the children. The presence or absence of the BCG scar was ascertained from each child by examining the upper part of the left arm. All children were tested with 1TU of PPD RT 23 with Tween 80 on the volar aspect of the left arm. The reading team, consisting of a reader, secretary to the reader and supervisory staff, visited these children after 72 hrs of testing and read the reaction sizes taking the maximum transverse diameter in mm using a transparent scale. All the information was recorded on individual card for each child, and formed the study meterial. The data generated were scrutinized by keying twice and further corrected for the errors.

The analysis was carried out among three groups, i.e,. those without BCG scar (unvaccinated), those with BCG scar (vaccinated) and those irrespective of BCG scar. The prevalence of infection was estimated using the mirror image technique[7]. The ARTI of children was computed using the formula $1- (1-P)^{1/a}$, where P is the prevalence of infection and 'a' is the mean age of the children. The chi-square test was used to test the difference between the proportions. The 95% Confidence Interval (C.I) was also estimated for each estimate. The statistical significance was set at $p < 0.05$.

RESULTS

Of 7354 children tested, reaction was read in 7098 (96.5%) children. The frequency distribution of reaction sizes of these children is given in figure. The mode at the right hand side is fairly located at 17mm. Using this, the prevalence of infection among unvaccinated, vaccinated children and children irrespective of BCG scar, is estimated to be 10.5% (95% C.I.: 7.4, 13.6), 9.2% (95% C.I.: 7.1, 11.2) and 9.5% (95% C.I.: 7.4, 11.6) respectively. The difference in the proportions of children infected among unvaccinated and vaccinated was not statistically significant. The ARTI computed from the above infection proportions were 2.0 (95% C.I.: 1.4, 2.6), 1.7 (95% C.I.: 1.3, 2.1) and 1.8% (95% C.I.: 1.4, 2.2) respectively. The proportion infected among children in slum being 11.1% (95% C.I.: 7.7, 14.4) was higher than that among children in non-slum 8.9% (95% C.I.: 6.6, 11.1); but the difference was not statistically significant. The corresponding ARTI were 2.1% (95% C.I.: 1.1, 2.8) and 1.7% (95% C.I.: 1.2, 2.1). The infection was significantly higher among children aged 5-9 years compared to children 1-4 years 13.1% (95% C.I.: 10.1, 16.1) vs 4.2% (95% C.I.: 3.1, 5.4); P<0.001. Similarly, proportion infected was more among girls than boys 10.6 (95% C.I.: 8.3, 12.9) and 8.4% (95% C.I.: 6.0, 10.8) and the difference was not statistically significant.

DISCUSSION

The nation-wide tuberculin survey had shown that the ARTI was higher among urban children. In Delhi, the infection was to the extent of 18.7% as reported in the nation-wide survey[4]. In south zone[5], it was 4.7% (95% C.I.: 2.5, 6.8) in rural and 8.8% (95% C.I.: 5.1, 12.4) in urban population.

Narmada et al[8] had reported the tuberculosis situation in Chennai city. In this prospective study in Choolai, Chennai city conducted during April-June

1968, about 4600 unvaccinated children aged one month - 12 years were tuberculin tested with 5 TU of PPD-S. The prevalence and ARTI among children aged below ten years were estimated to be 15.0% and 3.2% respectively. A study[9] conducted in Trivandrum among children aged 10 years showed an ARTI of 0.9%. A study[10] conducted by NTI in Bangalore city estimated an ARTI of 1.8% similar to our findings in Chennai city.

The present study has given a precise estimate of the risk of infection for the first time in Chennai city. ARTI was found to be higher among slum children (2.1%) compared to non-slum children (1.7%). This showed that the tuberculosis situation is higher among children living in congested areas and in poor socio-economic conditions. However, the difference was not statistically significant.

The reason for not getting a clear anti-mode could be due to high non-specific sensitivity prevalent in the city. The BCG coverage to the extent of more than 75% and the fact that the infection estimated by mirror image technique eliminate the cross reaction due to the BCG induced tuberculin sensitivity justified the inclusion of vaccinated children in our analysis. Our present findings of infection among unvaccinated and vaccinated children were similar to the earlier reports [11, 12].

In conclusion, our findings showed that tuberculosis situation was higher in the city than rural areas in terms of prevalence of infection and ARTI The current infection rate could serve as baseline information to study future trends of TB in the city after an intervening period of five years[13].

ACKNOWLEDGEMENTS

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