

## Annual Risk of Tuberculosis Infection Among the Tribal Children of Jhabua, Madhya Pradesh

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A cross sectional tuberculin survey was undertaken to estimate the Annual Risk of Tuberculosis Infection (ARTI) amongst tribal children aged 1-9 years in Jhabua district, Madhya Pradesh, India. Of the 1056 test-read children, 774 (73.3 %) had no BCG scar. The prevalence of infection was estimated as 6.3% (95% CI: 4.8-7.7) and ARTI as 1.2 % (95% CI: 0.9-1.5). The findings suggest that the tuberculosis situation in the tribal population of Jhabua district is not that different from the situation among the non-tribal population in the country. However, there is a need to further intensify tuberculosis control measures in the area.

**Key words:** Annual risk of tuberculosis infection, India, Prevalence, Tuberculosis.

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**T**uberculosis (TB) remains a major public health problem globally and in India [1]. The information on TB situation amongst tribal populations in India – an underprivileged group – is limited but for a few studies [2-5]. As there is very little information from this population in the state of Madhya Pradesh, we carried out a tuberculin survey in the state's tribal population to estimate the prevalence of TB infection and annual risk of TB infection (ARTI). ARTI is defined as the probability of acquiring a new TB infection during the course of 1 year and is computed from the estimated prevalence of infection among younger children. The fieldwork for the study was undertaken in 11 randomly selected districts of the state, including Jhabua district. This is a predominantly tribal district, with about 85% tribal population (mostly *Bhils* and *Bhilalas*), located in the western part of Madhya Pradesh. As the sample size was substantial in the district, the estimate of prevalence of infection and ARTI specific to the tribal communities of the district assume relevance.

### METHODS

This cross sectional study was carried out during August – September 2006 in Jhabua district among tribal children aged 1-9 years using standard methodology [6]. The estimated sample size of children was distributed over the 11 randomly selected districts in direct proportion to the district populations. The sample size was estimated using the prevalence of infection of 8.5% as estimated for the west zone as a part of the ARTI nation-wide sample survey, a precision of 20% at 95% confidence level with a design effect of two for cluster sampling and coverage for examination of minimum 90% for testing and reading, and a BCG coverage of 26%, as previously seen in Jhabua district of the state [7]. The proportionate sample size for Jhabua district was estimated as 935 children. Stratified cluster sampling was adopted for the survey. Two taluks (25% of the total taluks) were randomly selected from the district.

The required number of villages was selected randomly from these taluks using probability

proportional to the size of the two taluks in the district. A house to house census was carried out and all children aged 1-9 years in the household were registered and a pre-tested questionnaire filled. The left/right hand shoulder of the identified child was examined for the presence of BCG scar and recorded. Each child was given intra-dermal test of 1 TU RT 23 PPD on the mid-volar aspect of the left forearm (Statens Serum Institute, Copenhagen). The tuberculin reader, who was trained in the methodology at TRC, read the maximum transverse diameter of the reaction sizes after 72 hours. The data on tuberculin reactions was analyzed using SPSS package version 13.0. The number of infected children was obtained by using both the statistical ('anti-mode' as well as 'mode') methods [8]. All reactions greater than or equal to the identified cut-off point (anti-mode) were considered to be due to tuberculous infection. It was also done by locating the mode at the right hand side of the frequency distribution of reaction sizes of children. To get the number of children infected ( $n$ ), the number of children above the mode was doubled and added to the number of children at the mode. The ARTI was computed from the formula  $ARTI = 1 - (1-p)^{1/a}$ , where 'p' is the prevalence of infection and 'a' is the mean age of the children test read.

The study was approved by ethics committee of the Regional Medical Research Centre for Tribals (RMRCT), Jabalpur. Informed consent was obtained from the parents/guardian of all children included in the survey.

## RESULTS

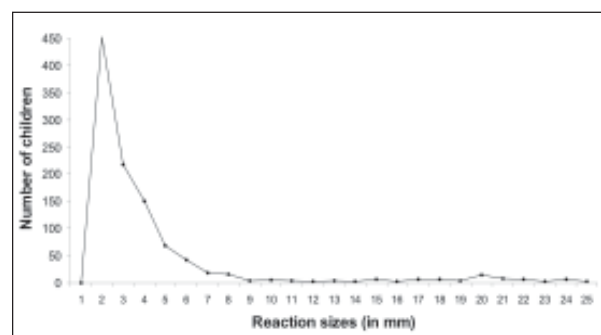
A total of 1112 children aged 1-9 years were registered. Of these, 1075 (96.67%) were subjected to tuberculin testing and the test was read in 1056 children (98.23%), giving a test-read coverage of 94.96%. Of these 1056 children, 774 (73.3 %) had no BCG scar. The mode was located at 20 mm in the right hand side of the frequency distribution of reaction sizes of children (**Fig. 1**). Using mirror-image method(9), 66 children were found to be infected and the prevalence of infection in children was estimated as 6.3% (95% CI: 4.8-7.7). The ARTI was computed as 1.2 % (95% CI: 0.9-1.5). There was no difference in risk of infection between male and

female children (1.1%; 95% CI:0.7-1.5 vs 1.2%; 95% C.I: 0.8-1.6). The prevalence of infection was significantly higher among children aged 5-9 years compared to those aged 1-4 years (2.1%; 95% CI: 0.7-3.4 vs 9.2%; 95% CI: 6.9-11.5) ( $P < 0.001$ ).

The anti-mode was visible at 9-10 mm. in the frequency distribution of reaction sizes (**Fig. 1**). Using the anti-mode at 10 mm, 87 children were found to be infected and the prevalence of infection was estimated as 8.2% (95% CI: 6.6-9.9). The ARTI was computed as 1.6% (95% CI: 1.2-1.9). The difference in the prevalence of infection estimated by the anti-mode method using the cut-off at 10mm and mirror-image method using the mode at 20 mm was statistically not significant ( $P > 0.05$ ).

## DISCUSSION

The results of the study throw light on the current TB situation amongst the tribal communities of Jhabua district and will serve as a baseline data for evaluating the impact of disease control measures and epidemiological trends in the coming years. The ARTI of 1.6% is much higher than the rates of  $< 0.1\%$  seen in most developed countries [10]. In India, in a Nation-wide survey conducted during 2000-03, the ARTI rates ranged from 1.0 to 1.9% in the different zones of the country [11]. A recent study found that the TB situation in terms of risk of infection and ARTI (6.8% and 1.3%, respectively) in the wider tribal population of Madhya Pradesh was not different from other areas of the country [12]. The findings of the present study suggest that the risk of TB infection in the tribal population in Jhabua district is similar to that of the wider population.



**FIG. 1** Frequency distribution of reaction sizes among children irrespective of BCG scar.

### WHAT THIS STUDY ADDS?

- The study provides a baseline data on prevalence of tuberculosis infection and ARTI amongst tribal communities of Jhabua district of Madhya Pradesh.

A limitation of the study was that the prevalence was estimated based on a small population and may not be as precise as that would have been obtained from a larger population.

Information available on the ARTI among tribal communities in the country shows a varied picture. A previous survey in the tribal population of North Arcot district in southern India showed a prevalence of infection of 5% and an ARTI of 1.1% [2]. An earlier survey in the tribal community of the Car Nicobar islands however showed a much higher prevalence of infection (16.4%) and ARTI (2.4%) [4]. A recent survey among the Saharia tribal community of Madhya Pradesh also found high rates of prevalence of infection at 20.4% and an ARTI of 3.9% [5]. The reasons for this varied picture amongst the different tribal populations need to be studied further for better understanding of the situation.

The study findings suggest that the TB situation amongst the Bhils and Bhilalas of Jhabua district, Madhya Pradesh, is similar to that amongst the non-tribal population in India. The Revised National TB Control Programme (RNTCP) was implemented in this district only in 2003 and is expected to have an impact on the TB situation. However, there is a need to strengthen and further intensify TB control measures in the area.

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