

## Pulmonary tuberculosis - a health problem amongst *Saharia* tribe in Madhya Pradesh

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**Background & objectives:** The information on tuberculosis (TB) situation amongst *Saharia*, one of the particularly vulnerable tribal groups (PVTGs) in Madhya Pradesh, is not available from Gwalior division of the State. Hence, this study was undertaken to estimate the prevalence of pulmonary tuberculosis (PTB) disease amongst them.

**Methods:** A community based cross-sectional TB prevalence survey was undertaken among *Saharia* PVTG in Gwalior district of Madhya Pradesh. A random sample of villages predominated by *Saharia* tribe was selected from all the blocks in proportion to the size of *Saharia* population in each block of the district. All eligible individuals were questioned for chest symptoms relating to TB. Two sputum samples were collected from each of the eligible individuals, transported to the laboratory, and were examined by Ziehl-Neelsen (ZN) smear microscopy and solid media culture methods.

**Results:** Of the total 10,259 individuals eligible for screening, 9,653 (94.1%) were screened for symptoms. Overall prevalence of PTB was found to be 3294 per 100,000. The prevalence increased with age and the trend was significant ( $P < 0.001$ ). The prevalence of TB was significantly higher amongst males (5497/100,000) as compared to females (1376/100,000) ( $P < 0.001$ ).

**Interpretation & conclusions:** The study results provide vital information on the current situation of pulmonary TB disease among the *Saharia* tribal community in Gwalior district of Madhya Pradesh. In view of high PTB disease prevalence among this PVTG, there is an urgent need to improve and further intensify TB control measures in this area.

**Key words** Madhya Pradesh - prevalence - pulmonary tuberculosis - *Saharia* - tribal

Tuberculosis (TB) remains the major killer infectious disease affecting adults in developing countries<sup>1</sup>. It is estimated that about 3.5 million new cases of TB continue to occur each year and about 480,000 people die of this disease annually, most of these in five countries, namely, Bangladesh, India, Indonesia, Myanmar and Thailand<sup>2</sup>. India is the highest

TB burden country in the world and accounts for one fifth of the world's new TB cases and two thirds of the cases in the South-East Asia region<sup>3</sup>. Epidemiological information on tuberculosis is vital for planning the control strategies. However, this information amongst the tribal populations of the country is limited to a few studies carried out in some tribal groups<sup>4-8</sup>.

Tribal population is an underprivileged group of society, often having poor access to the health care delivery systems. Geographical isolation, unique cultural and social practices, lack of formal education and treatment seeking behaviour, poverty, *etc.* make these populations vulnerable to several health problems including tuberculosis. Tribal population constitutes around 8.6 per cent of the total population of the country and of the total tribal population, around 80 per cent is found in central India<sup>9</sup>. It accounts for about a quarter of the total population in the State of Madhya Pradesh. There are 46 ethnic groups in the State and three among them have been categorized as particularly vulnerable tribal groups (PVTGs), earlier called as primitive tribal groups. The *Saharias* are one of these three PVTGs. They are mainly located in Gwalior and Chambal divisions of Madhya Pradesh, and literacy rate among *Saharia* is low at 23.2 per cent<sup>10</sup>.

Tuberculosis has been found to be a major public health problem among *Saharias* of Sheopur district in Chambal divisions of the State with TB disease prevalence of 1,518 per 100,000 and annual risk of tuberculosis infection (ARTI) of 3.9 per cent<sup>11,12</sup>. However, no information regarding the TB situation in this tribal community from Gwalior division of the State is available. This study was carried out to assess the TB disease situation, particularly prevalence of pulmonary TB (PTB) in this PVTG in Gwalior district of Madhya Pradesh.

### Material & Methods

*Study area:* A community based cross-sectional TB prevalence survey was carried out by National Institute for Research in Tribal Health (NIRTH), Jabalpur in Gwalior district of Madhya Pradesh during December 2012 to August 2013. All the four blocks of district *viz.* Morar, Ghatigaon (Barai), Dabara and Bhitwar were covered in the survey. The terrain was difficult, with most of the villages located in remote forest areas having poor connectivity by road, which remained cut-off from the surrounding areas during the rainy season.

The population of *Saharia* primitive tribe in the district was 33,213 as per Census, 2001<sup>13</sup>. The projected population for the year 2011 was 40,310 (assuming 2% annual growth rate) with estimated adult population (15+ yr) of 26,200 (65% of total population). The sample size was estimated to be 14,020 adults aged  $\geq 15$  yr. It was estimated based on the prevalence of 15/1000 bacteriologically positive tuberculosis<sup>11</sup>, a

relative precision of 20 per cent at 95 % confidence level, design effect 2 and a coverage for examination of at least 90 per cent. Looking into the small projected adult population of the district, the desired sample size was adjusted for the population size. Considering this, the adjusted sample size was estimated as 9132.

*Sampling design and procedure:* The villages in all four blocks of Gwalior district were arranged in descending order of the *Saharia* tribal population and a list of the villages predominantly covered by *Saharia* tribe (80% and above) in these blocks was prepared. A village was considered as a sampling unit for the study. The required number of villages was selected randomly from these blocks in proportion to the size of the *Saharia* tribe in each block of the district in order to cover the estimated sample size.

*Census and registration:* Planning visits were made to the villages prior to the survey by the team leaders to inform village leaders regarding the purpose of the survey. Group meetings were also conducted to explain the community about the purpose of the study. A house to house census was carried out and all individuals in the household were registered. All the individuals aged  $\geq 15$  yr and belonging to *Saharia* tribe were included in the study. Individuals who were not permanent resident of the study area and those who refused to give informed written consent were excluded from the study. Relevant data pertaining to an individual were collected on individual card in a pre-coded form. Informed written consent was obtained from all individuals included in the survey. The study was approved by the ethics committee of the Institute.

*Symptom screening, sputum collection and examination:* All individuals aged 15 yr and above were questioned for chest symptoms relating to tuberculosis, namely: persistent cough for two weeks or more; chest pain for one month or more; fever for one month or more; and haemoptysis anytime in the last six months. Persons with any of these symptoms and also those with a previous history of anti-TB treatment, were considered eligible for sputum collection. Two sputum samples, one spot and one overnight were collected in sterilized McCartney's bottles from each eligible individual. The samples were sent to the laboratory for examination and were kept at +4°C until processing was done. Smears were prepared from the concentrated samples and stained by using Ziehl-Neelsen (Z-N) method<sup>14</sup>. All positive smears and 20 per cent random sample of negatives were read once again for quality check.

All these specimens were also processed for culture by modified Petroff's method<sup>15</sup>, inoculated on two slopes of Lowenstein-Jensen (L-J) medium and were examined for growth of *Mycobacterium tuberculosis* once a week for up to eight weeks. The growth was confirmed as *M. tuberculosis* using niacin test, 68°C catalase test, and growth on L-J medium with para nitro benzoic acid (PNB) (500 µg/ml).

**Case definition & treatment:** A pulmonary tuberculosis (PTB) case was defined as an individual in whom any of the two sputum specimens was positive for acid fast bacilli (AFB) by Z-N microscopy and/or growth of *M.tuberculosis* by culture examination. All bacteriologically positive cases were referred to the concerned health authorities for anti-TB treatment under the Revised National Tuberculosis Control Programme (RNTCP) using its standardized treatment regimens<sup>16</sup>.

**Statistical analysis:** The data were analyzed using SPSS package (20.0 version) (SPSS Inc., Chicago, USA) and EPI-Info 7.0. (EPI Info Inc., Atlanta, USA) The chi-square test was applied to the difference in proportions of symptomatic individuals and cases among different classifications.

## Results

Of the total 10,259 individuals eligible for screening, 9,653 (94.1%) were screened for symptoms. Of these, 1,100 (11.4%) individuals were found to be symptomatic. Sputum was collected from 1071 (97.4%) symptomatic individuals who were eligible for sputum

collection (Table I). Thus, the coverage for symptom elicitation and sputum collection was above 90 per cent. Remaining could not be covered as they were not present at home during the three consecutive visits by the survey team. The proportion of symptomatic individuals increased with age from 5.1 per cent in the 15-24 yr age group to 19.0 per cent in the 55+ yr age group ( $P<0.001$ ) (Table I). The proportion of males eligible for sputum collection was higher (16.9%) than that of females (6.6%) ( $P<0.001$ ) (Table II).

**Prevalence of pulmonary TB:** Of the 1071 individuals examined for sputum, 273 (24.5%) were positive by smear and 243 (22.7%) individuals were culture positive. A total of 318 (29.7%) individuals were bacteriologically positive by smear and/or culture. Overall prevalence of PTB was found to be 3294 per 100,000. The prevalence of TB was significantly higher amongst males (5497/100,000) than females (1376/100,000) ( $P<0.001$ ) (Table II). The prevalence increased with age from 1200/100,000 in 15-24 to 4947/100,000 in 35-44 year age group. It remained similar (4940/100,000) in 45-54 yr age group and declined in 55+ yr age group. (Table I and Figure).

## Discussion

Tuberculosis remains a major health problem in India particularly amongst the disadvantaged and marginalized groups. The need for surveillance by documenting the burden of TB in indigenous communities has been emphasized by the Strategic Framework for Action on TB Control in indigenous

**Table I.** Age-wise prevalence of tuberculosis

Age group (yr)	Individuals eligible for screening	Number examined (%)	Eligible for sputum (%)	Number examined (%)	Sputum positive individuals	Prevalence per 100,000 (95% CI)
15-24	3027	2916 (96.3)	148(5.1)	140(94.6)	35	1200 (804.7-1595.2)
25-34	2749	2582 (93.9)	266(10.3)	262(98.5)	84	3253 (2568.7-3937.3)
35-44	1938	1779 (91.8)	255(14.3)	248(97.3)	88	4947 (3939.3-5954.7)
45-54	1273	1174 (92.2)	203(17.3)	199(98.0)	58	4940 (3700.4-6179.6)
55+	1272	1202 (94.5)	228(19.0)	222(97.4)	53	4409 (3248.4-5569.6)
Total	10259	9653 (94.1)	1100(11.4)	1071(97.4)	318	3294 (2937.9-3650.1)

**Table II.** Prevalence of tuberculosis among *Saharia* men and women

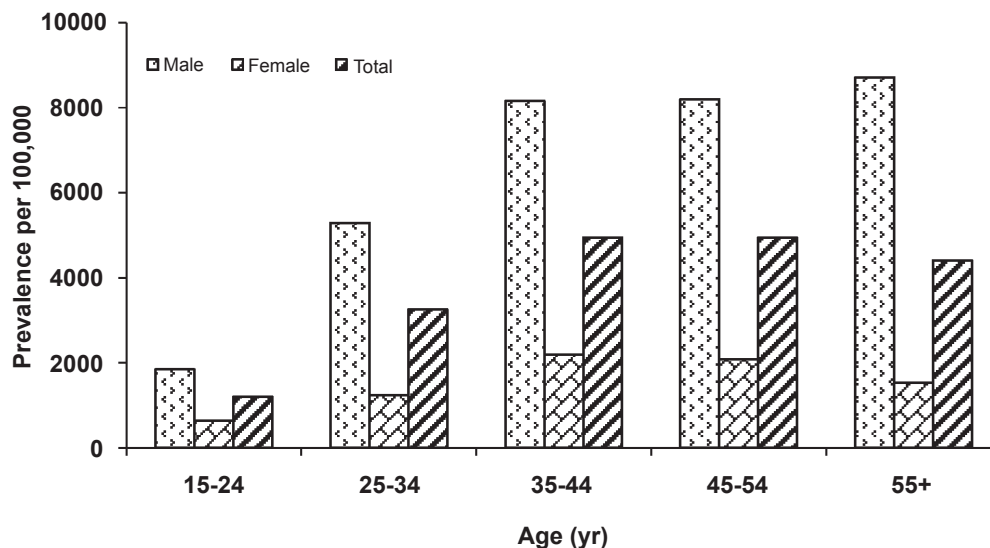
Sex	Individual eligible for screening	Number examined (%)	Eligible for sputum (%)	Number examined (%)	Sputum positive individuals	Prevalence per 100,000 (95% C.I)
Females	5349	5160(96.5)	342(6.6)	332(97.1)	71	1376 (1058.1-1693.9)
Males	4910	4493(91.5)	758(16.9)*	739(97.5)	247	5497 (4830.5-6163.5)
Total	10259	9653(94.1)	1100(11.4)	1071(97.4)	318	3294 (2937.9-3650.1)

\**P*<0.001 compared with females

communities<sup>17</sup>. Though community based disease prevalence surveys are costly and laborious, but these provide direct measurement of prevalence and trends, and are justified in high-burden countries where many cases and deaths are missed by surveillance systems<sup>18</sup>. The prevalence of PTB in the present study was 3294 per 100,000 population. Though migration to other areas is common in this community, it is unlikely that it would have had a major impact on the estimated disease prevalence as high coverage for symptom screening was achieved.

The National sample survey carried out by the Indian Council of Medical Research (ICMR) in general population during 1955-1958 reported the prevalence of bacteriologically positive cases ranging between 200 to 800 per 100,000 with the average of 400/100,000 population<sup>19</sup>. TB prevalence surveys amongst tribal

communities are limited and have been carried out in a few isolated tribal communities mostly from central India<sup>4-8,11,20-23</sup>. The findings of these studies show wide variation in TB disease prevalence amongst different tribal communities in the country ranging from 133 per 100,000 amongst the tribal population in Wardha district, Maharashtra<sup>8</sup> to 1518 per 100,000 amongst the *Saharia* primitive tribe of Sheopur in Madhya Pradesh<sup>11</sup>. A systematic review on the burden of tuberculosis in indigenous people showed higher rates of TB disease among them than in the non-indigenous population<sup>24</sup>. The present study found an alarmingly high disease prevalence rate of 3294 per 100,000 population which was more than double as compared to previous finding from *Saharias* in Sheopur<sup>11</sup>. The present study indicated tuberculosis as a major health problem amongst *Saharia* tribe of Gwalior division.



**Fig.** Age and sex-wise prevalence of pulmonary tuberculosis.

The finding that the prevalence increased with age and was higher in males than in females was consistent with the findings of other studies<sup>20,25,26</sup>. Similar findings have also been reported amongst the *Saharia* tribe from Sheopur district<sup>4,11,23</sup>. This could be due to biological differences in susceptibility to TB between men and women<sup>27</sup>. Apart from possible biological reasons, there could be several other factors associated with the observed gender bias in TB prevalence such as healthcare seeking behaviour and access to health care services, smoking, alcohol use and exposure to indoor dusts and air pollution<sup>27-29</sup>. The higher prevalence of tobacco smoking and alcohol consumption particularly among men has been reported among this tribe<sup>30</sup>.

The high prevalence of TB disease in this ethnic group particularly in those aged between 25 to 54 yr needs to be further understood in light of the estimated prevalence of 230 per 100,000 population in the country<sup>3</sup>, and also the findings from other two PVTGs in the State of Madhya Pradesh showing comparable and even lower prevalence of TB disease compared to the TB situation in other parts of the country<sup>21,22</sup>. Similar findings have been reported amongst the wider tribal population of Madhya Pradesh<sup>20</sup>.

The effective implementation of RNTCP has shown to result in a significant decrease in TB disease<sup>31</sup>. The implementation of DOTS under the RNTCP has improved treatment success rates and probably led to a decline in the duration of disease<sup>32</sup>. The RNTCP however, has been implemented from 2004 in the survey area. It is, therefore, unlikely that the TB prevalence in this area has yet been affected by the programme.

The limitations of the study need to be considered while interpreting the results. The findings are based on the symptom elicitation alone. Chest X-ray was not done due to unavailability of mobile X-ray unit. In view of the findings that the symptom screening alone picks up about two-third of the cases<sup>33</sup>, the observed prevalence may be underestimation of the true prevalence in the study area. It indicates that substantial numbers of additional cases would have been detected if chest X-ray screening had been included in the study methodology. In addition, there was no information relating to childhood TB, HIV-TB and diabetes mellitus (DM)-TB in this area. In spite of these limitations, the findings provide vital information on the current TB situation among the *Saharia* tribal community in Gwalior district of Madhya Pradesh. In view of high

PTB disease prevalence among this PVTG, there is an urgent need to improve and further intensify TB control measures in this area.

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