

## PAEDIATRIC TUBERCULOSIS AMONG THE HOUSEHOLD AND NEIGHBOURHOOD CONTACTS OF ADULT TUBERCULOSIS PATIENTS IN A MUNICIPALITY TOWN OF WEST BENGAL

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### ABSTRACT

#### BACKGROUND

Tuberculosis though recognised as a major public health problem in our country, TB in children is a neglected disease. The main source of infection of the children are the active cases of tuberculosis living in their proximity. Children with TB are usually hidden in community. They need to be actively searched for.

#### MATERIALS AND METHODS

Keeping above things in mind, a research was planned with the aim of finding out the Mantoux (TST) positivity and looking for signs and symptoms of active tuberculosis in children living with adult cases of tuberculosis. 90 children were identified who were either living with adult cases of active TB or were living in a separate house but close enough to a case. Socio-demographic information was obtained from the guardian of the eligible children. Height, weight and mid-upper arm circumference were also measured.

#### RESULTS

In 41% of the households, overcrowding was present implying that children living in those houses are in close contacts with cases of adult TB. 18% of the children are exposed to passive smoking. 8% of the children were TST positive. 37% of the children had cough or fever or both during the data collection period.

#### CONCLUSION

We can conclude that the paediatric contacts of adult TB cases have higher incidence of symptoms suggestive of tuberculosis.

#### KEYWORDS

Childhood TB, Prevalence, Contact Tracing, Mantoux Test, Tuberculin Skin Test.

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#### BACKGROUND

Tuberculosis is a global health emergency.<sup>1</sup> Without treatment nearly half of HIV-TB coinfecting patients will die.<sup>2</sup> TB in children means that the TB bacilli is actively circulating in the surroundings. Paediatric tuberculosis has been an area of challenges for the Paediatricians for ages. The clinical profile of a child with tuberculosis varies greatly from that of an adult. The physical signs are less conspicuous as compared to those in adults. Most cases of pulmonary tuberculosis are sputum negative and paucibacillary, making a bacteriological confirmation and so proper diagnosis difficult in population of less than 14 years of age. The extra-pulmonary forms of the disease, namely tubercular

meningitis, military tuberculosis, are often very severe and almost nearly has fatal outcome. The lack of any consensus guideline among the Paediatricians leads to putting the patient often on 'Empirical ATD'. This led to inadvertent drug toxicities in children and also emergence of drug resistance, as many of the times this 'Empirical ATD' comprises of incomplete regimen, as the treatment is not enrolled under 'DOTS' strategy of RNTCP.

The distribution and trends of adult tuberculosis in the world has been extensively described in several publications over many years. There were 10.4 million active TB cases in the world in 2016.<sup>3</sup> Many studies have highlighted the fact that tuberculosis is less a disease of the individual and more strikingly a disease of the family and of the community.<sup>4,5</sup> This is even more the case with tuberculosis in children.<sup>6</sup>

It has been known that childhood tuberculosis is a reflection of on-going transmission of Mycobacterium tuberculosis in the community. Several researchers have defined paediatric tuberculosis a hidden epidemic in India.<sup>7,8</sup> Estimating the burden of TB in children is challenging for different reasons. No standard case definition is known that may be easily applied to childhood TB. Limited resources often prohibit establishing a confirmatory diagnosis. In

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addition to these, traditionally childhood tuberculosis was given a lower public health priority as compared to adult disease as they were thought to be non-infectious.

Although childhood TB usually represents less than 5% of active TB disease in the industrialised countries, the burden of disease borne by children may be as high as 39% in less developed or developing countries.<sup>9</sup> Corbett and colleagues have generated age-specific estimates describing the global estimates of TB.<sup>10</sup> A major problem area regarding paediatric tuberculosis is lack of epidemiological data. A correct extent of the disease is not known among the children due to lack of epidemiological studies pertaining to the diagnostic difficulties.

In India, the only national survey conducted by the ICMR, included children of age more than 6 years. The methodology did not include tuberculin test and hence neither the prevalence of infection nor the annual risk of infection could be known.<sup>11</sup> Hence there is no national data regarding prevalence of TB in Children of age less than 5 years.

However, over the past few years the challenges regarding Paediatric tuberculosis is being recognised at all levels. This has led to the development of consensus guidelines among the Paediatricians and also incorporation of the same in the National Programme. This study was undertaken to determine the true extent of the TB disease among children who were in contact with adult cases of tuberculosis. The aim was also to find out the different determinants of the TB disease among children.

## MATERIALS AND METHODS

The study was a cross-sectional epidemiological study. Study was conducted in Kalyani. Kalyani is a municipality town in Nadia district of the state of West Bengal. The total population of the town is 100, 575 as per census 2011 with a population density of 3500.<sup>12</sup> It is situated around 50 Kms. from Kolkata city. The medical college located in the town is a new one and started functioning in 2010. It is attached to a tertiary care hospital providing health services to the local residents as well as patients coming from adjoining districts. The college is under the ownership and administrative control of the West Bengal University of Health Sciences (WBUHS). The target population was all children less than 14 years of age of India.

The Kalyani tuberculosis unit caters to a population of nearly 5 lakh individuals. The headquarters of the Kalyani TU is located in the College of Medicine and JNM Hospital (COMJNMH). The designated microscopy centre is also located in the hospital premises. Kalyani TU serves the population of Kalyani and Gayespur municipality. It also serves the rural area under the block Haringhata. The TB register is maintained at the DOTS room of the COMJNMH. The TU has all the designated staff like STS and STLS. Children of age less than 14 years belonging to household and neighbourhood contacts of cases of adult tuberculosis enrolled at the DOTS centres of the College of Medicine and JNM Hospital, Kalyani, Nadia were the study population.

100 registered adult tuberculosis patients whose treatment under DOTS regimen was started not earlier than 2 months preceding the date of evaluating the child contact for TB were contacted. Household visits of these TB cases were made and eligible children in those households or neighbourhood were enrolled in the study. All eligible children in the household or neighbourhood were selected for the study.

## Inclusion Criteria

Under - 14 years' household and neighbourhood contacts of cases of adult tuberculosis enrolled at the DOTS centres of the College of Medicine and JNM Hospital, Kalyani, Nadia, contact of Pulmonary TB case, residing in the same house as the adult case, parent/ legal guardian giving the informed written consent.

## Exclusion Criteria

Children who had been previously treated for tubercular infection, children with concurrent conditions identified as risk factors for tuberculosis (HIV infection, haematological, or reticuloendothelial system malignancies), children who were previously or currently on immunosuppressive drugs including corticosteroids. The index case (index patient) was defined as initially identified case of new or previously treated TB in an adult person in a specific household or other comparable setting in which others may have been exposed.

The contact was any person who has been exposed to an index case (as defined above). The household contact was a person who shares the same enclosed living space for one or more nights or for frequent or extended periods during the day with the index case presently and during the 3 months before commencement of the current treatment episode. The close contact was a person who is not in the household but shared an enclosed space, such as a social gathering place, workplace or facility, for extended periods during the day with the index case presently and during the 3 months before commencement of the current treatment episode

Address and contact details of all the patients receiving anti-tubercular drugs (ATD) from the COMJNMH DOTS centre were collected from the TB register. Household visits of those cases were done, and children less than 14 years of age searched in the houses and neighbourhood of these cases. After obtaining informed written consent from the parents and assent from the children (if they were more than 7 years of age) they were screened for active tuberculosis. The children were brought to the Paediatrics OPD at the College of Medicine and JNM Hospital, Kalyani, Nadia if required.

The children were evaluated as per the updated National Guideline for Paediatric Tuberculosis, 2012. First, the children were subjected to clinical examination including a detailed history and anthropometry. Sputum smear examination was done, if clinically indicated. For symptomatic children chest X-ray and Montoux test were done, if indicated. Further attempt to confirm the

bacteriological diagnosis were done by performing procedures like gastric lavage, induced sputum or broncho-alveolar lavage, if there were persistent symptoms or persistent shadows in the chest x-ray.

Two sputum samples were collected from children of age more than 3 years. First sputum was collected on the spot and second sputum the next morning in a wide mouthed container. These samples were then sent to the DMC of the COMJNMH for smear microscopy under LED microscope. The induced sputum was obtained in the Paediatrics OPD and DOTS Centre at COMJNMH, Kalyani.

For gastric lavage the child was admitted to the paediatrics ward and a nasogastric tube was placed in the early morning. Then a gastric aspirate was collected in empty stomach and sent to the DOTS centre for further evaluation for Acid-Fast Bacilli. The procedure was repeated for 2 consecutive days. Alkalinisation of the specimen was done if there was a delay in sending the specimen.

Chest X-ray was done in the Department of Radiology, COMJNMH after proper requisition from the outpatient department of the hospital. Broncho-alveolar lavage was done in selected patients with the help of a faculty member from the Department of Pulmonary Medicine, College of Medicine & JNM Hospital. Children of age 6 years and less, who were contacts of cases of tuberculosis and were found negative of active tuberculosis were put on prophylaxis for tuberculosis as per RNTCP guidelines.

Ethical clearance was taken from the Institutional Ethics Committee of COMJNMH. Consent forms in English and local languages were made. The parents and the children were told in detail about the study and the procedures to be performed on the children. The children were enrolled only when the parents gave written consent after fully understanding the study. The assent of the children more than 7 years of age was taken. The participants were free to opt out of the study at any time they felt like. Safety of research participants was foremost. Usual care was given to any participant who refused to participate. Identified TB cases were enrolled in Kalyani TU and were put on RNTCP regimen as appropriate.

After full data collection, data were entered into MS Excel 2010 sheet. The data were analysed with the help of IBM SPSS 22.0(R)® software using simple proportions and percentages.

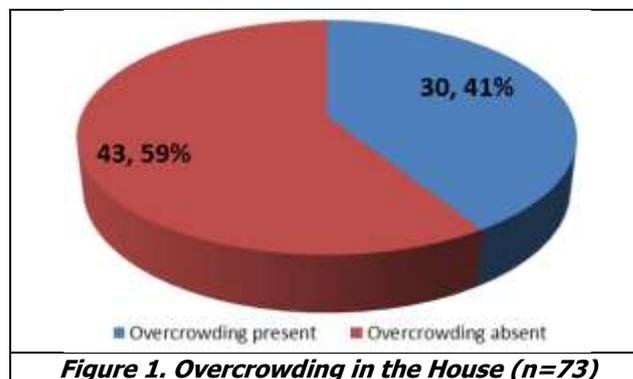
**RESULTS**

In total 90 children were evaluated for tuberculosis during the data collection period. 62% of the children were males. Table 1 shows that occupation of father of the enrolled children. Majority of them were daily wage earners. All mothers were housewives. The mean (SD) age of the children was 7.8 (4.1) years. The minimum and maximum age was 1 and 14 years. The mean (SD) monthly family income of the households was 3434 (2167) rupees. The minimum and maximum monthly family income was 2000 and 20000 rupees.

Occupation	Frequency	Percentage
Daily Wage Earner	78	86.7
Salaried	7	7.8
Driver	4	4.4
Private Tutor	1	1.1
Total	90	100

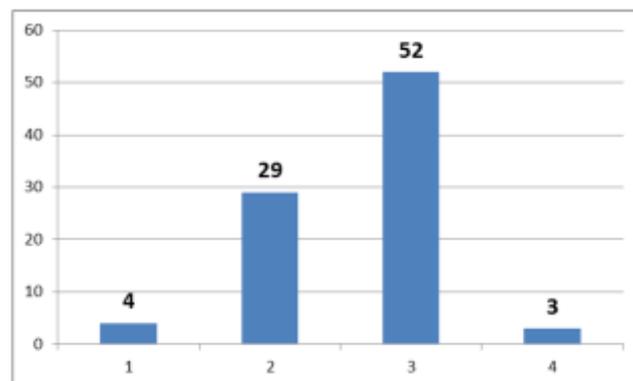
**Table 1. Occupation of Father**

In nearly 50% of the houses, coal is still used for cooking purpose. Overcrowding was present in 41% of the households (figure 1).



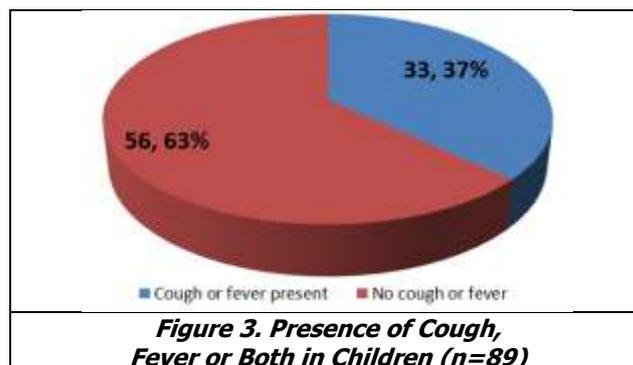
**Figure 1. Overcrowding in the House (n=73)**

In 18% of the household, passive smoking was present. Majority of children eats three major meals a day (figure 2).



**Figure 2. Number of Meals Eaten by Children in a Day (n=78)**

Majority (44%) of children eats two snacks per day. Majority (69%) of children do not take any milk or health drinks in a day. 37% of the children had cough or fever or both on the day of the data collection (figure 3).



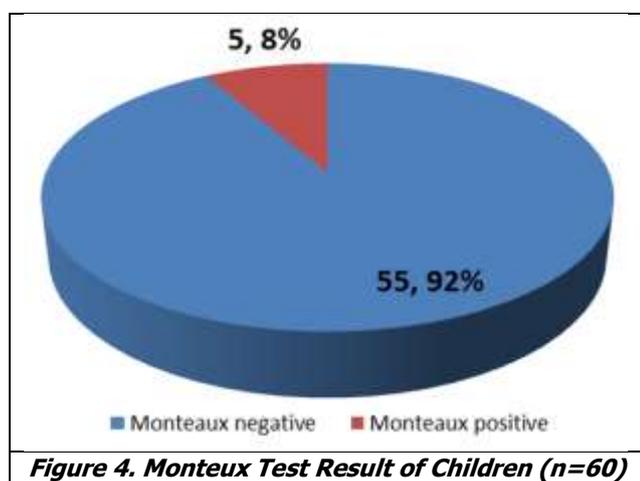
**Figure 3. Presence of Cough, Fever or Both in Children (n=89)**

Only one child's parent stated that her weight has decreased in past month. Except one child all children were given BCG vaccination. The anthropometric details of the children are shown in table 2.

Anthropometry	Mean	SD	Range	Sample size
Height (in cm)	102	35.6	29 - 162	67
Weight (in kg)	21.3	9.9	7 - 47.2	65
Mid Upper Arm Circumference (in cm)	12.1	3.2	6 - 16	23

**Table 2. Anthropometric Measures of Children**

8% of the children had Montoux test positive (figure 4).



**DISCUSSION**

Kalyani TU located in the hospital premise of College of Medicine and JNM Hospital serves a population of around 4.5 lakh individuals. We identified 100 cases of adult tuberculosis registered in the TU at the start of the study. We visited those houses after locating them with the help of TB health visitor. We looked for children living in the house or nearby children interacting regularly with the adult case of active TB. Those children were screened for tuberculosis. We found out the high prevalence of risk factors for development of tuberculosis in those households. 8% of the children were TST positive. 37% of the children had symptoms of either cough, fever or both. Singh et al did TST in children under the age of 5 years who were in household contact with 200 consecutive adults with pulmonary tuberculosis. They defined transverse induration of greater than 10 mm as positive tuberculin test suggestive of tubercular infection.<sup>13</sup> They found out that tuberculin test was positive in 95 of 281 contacts (33.8%), of which 65 were contacts of sputum positive patients, while 30 were contacts of sputum negative patients. Nine of these children were diagnosed as having tuberculosis based on clinical features and/or recovery of acid-fast bacilli; seven were in contact with sputum positive adults. The important risk factors for transmission of infection were younger age, severe malnutrition, absence of BCG vaccination, contact with an adult who was sputum positive, and exposure to environmental tobacco smoke. In our study the positivity

rate of TST is low. The reason may be higher age of the children enrolled in our study.

The study has many strengths. Some of them are, rigorous methodology was used to screen the children, paediatrician himself screened the children in community, being a community-based study, the investigator could see the houses and neighbourhood of the children and 5 TU PPD test was administered. There are few limitations of the study. These are, there was loss to follow up of many children, BAL and gastric lavage of many eligible children could not be done and sample size is too small to generalise the results.

Based upon the results, following recommendations can be made: there should be active search of TB cases in contacts of active TB particularly children who are exposed to sputum positive pulmonary TB, nutrition status of children should be improved so that probability of development of active TB in latent tuberculosis infection cases are reduced and more such research with large sample size should be conducted.

**CONCLUSION**

The TST positivity rate is high in children of contacts of active tuberculosis in the municipality town of Kalyani in West Bengal. The risk factors for development of TB is also high in the community. There is a high probability of development of active TB infection in these children later in their life.

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