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Contact Tracing of Children Living With Sputum Positive Adult Cases of Pulmonary Tuberculosis, In Urban Ghaziabad: A Hospital Based Cross Sectional Study

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Abstract –

Background: Contact investigation of tuberculosis (TB) is active case finding strategy for the diagnosis of tuberculosis in contact and is an important component of detection of TB & core part of TB detection program. In high incidence setting like India, the yield of household contact screening and approaches is limited.

Objective: Household contact screening of newly diagnosed pulmonary TB index cases & factors associated with it.

Material and Methods: Details of index cases were collected from the DOTS centre Ghaziabad. Telephonic calls were conducted to identify newly diagnosed pulmonary index cases of TB with their household contacts. Standardized protocol were used to screen symptoms of active TB in household contacts aged 0-18years with sputum for acid fast bacilli (AFB) examination & chest X-ray examination with Mantoux test.

Result: A total of 778 household contacts of 160 index cases of pulmonary TB were identified, in which 74 (9.5%) were symptomatic. Among these, 54 (73.6%) were evaluated for sputum examination, resulting in 16(29.1%) of sputum smear positive TB with 4 (7.4%) were sputum smear negative TB.

Conclusion: While following standard protocol & systematic implementation for conducting household contact investigation, additional TB cases in community can be identified and can provide great support for chasing the dream of "TB free INDIA 2025".

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INTRODUCTION

Investigations to find out active TB in the household contacts of an adult TB patients has been internationally accepted as a reliable method for recognizing the children at high risk of developing tuberculosis.[1] The other benefits of this approach are, it being cost effective and convenient opportunity for early TB case detection long before clinical feature become severe enough to be noticed and patient being brought to the medical facility. Unimmunized, undernourished children (the household contacts) are at high risk of contracting TB than the member of general population.[2] We all know that it is not easy to prove that this particular child who is having low grade fever for some days with mild cough and poor appetite and thin built is actually suffering from TB. Reasons range from paucibacillary TB in children leading to poor yield of AFB demonstration in sputum, lymph nodes FNAC and gastric aspirate or non-specific radiological finding in chest X-rays.

In low resource developing countries where the burden of TB is high, unfortunately screening of contacts of open adult cases is still highly inadequate and incomplete despite National policy and the Revised National Tuberculosis Control Programme of India (RNTCP). The clear recommendations states that on contact screening, if the child is found to be harboring TB is started on anti-tuberculosis therapy (ATT) while those found

to be negative on contact screening for TB are prescribed isoniazid chemoprophylaxis (children less than 6 yrs of age) for 6 months.

Various studies from India have shown that active contact screening detects as many as 2.3% positive pediatric cases of pulmonary tuberculosis among closed contact in low economic and middle economic countries.[1] In China with similar high burden in India, the yield of subjects diagnosed with tuberculosis after thorough contact tracing ranged from 0 to 6.9% in household contact.[3]

Diligent screening ensures

- early detection of disease
- prompt initiation of treatment thus reduce disease burden
- decreased risk of disease transmission and poor treatment outcomes.

The present study will be beneficial to the society and will help in achieving national goal of TB free India. Analysis of published data from South India revealed that there is unsatisfactory execution of screening and isoniazid prophylaxis application under routine program condition.[4,5] Thus the present study was planned to study the status of contact screening in the locality being catered by us.

The risk of developing TB in a contact child is based on the following factors

- infectiousness of the index patient (open with high bacterial load)
- duration of exposure (higher the risk, longer is the exposure)
- proximity (higher the risk if index cases is household) [6,7]
- susceptibility of the contact (unimmunized undernourished are more susceptible)[6,7]

The various modalities used for contact screening include symptom screening, chest radiography, sputum smear and culture examination, Rapid molecular diagnostic test – GeneXpert, tuberculin skin test and Interferon Y release assay.[2]

The pooled sensitivity of chest x-ray reading (98%) was higher compared to screening of symptoms (87%). A sequential screening algorithm with chest x-ray as a second screen for TB symptomatic show a sensitivity and specificity of 90% and 56%.[5] Contact investigation also provides the window to preclude the advancement to active disease among person with dormant TB infection.[7]

Analysis of published data from South India revealed that there is unsatisfactory execution of screening and isoniazid prophylaxis application under routine program condition.[4,5] However, there is scarcity of data on contact screening in Indian population. Bearing the above stated facts, the present study was planned with following aim to serve as a diligent contact survey of an adult index case of tuberculosis: a golden opportunity to prevent childhood TB.

OBJECTIVES

1) To investigate all child contacts of newly diagnosed adults TB patients

2) To analyze if the child is having active TB disease (will be started on ATT)

3) To analyze if child is although exposed but not having TB (will be started on INH prophylaxis.

4) To determine the proportion of household contacts (aged <6yrs) who will be initiated on Isoniazid preventive treatment.

5) To determine the proportion of household contacts having active disease will be started on ATT.

6) To compare the local data with the state and national data.

MATERIAL AND METHODS

The present study was approved by Institutional ethical committee and review board.

- **STUDY DESIGN-**cross sectional study

PLACE OF STUDY

The cases were enrolled in the proposed study from both General Paediatric OPD as well as DOTS Unit, a part of RNTCP DMC (designated microscopic centre) situated at Santosh Medical College and Hospital, Ghaziabad, UP.

SAMPLING-All consecutive eligible tuberculosis subjects with willingness to participate were enrolled after written informed consent.

SAMPLE SIZE-Sample size was calculated using the formula

$$n = Z^2P(1-P)/d^2$$

Where n is the sample size, Z is the statistic corresponding to level of confidence, P is expected prevalence and d is precision (corresponding to effect size).

In a cross-sectional analysis of paediatric TB cases was carried out during 1year study period in year 2018-19, at the Paediatric department, Santosh Medical College and Hospital, Ghaziabad, UP. India Tb Report 2019 (released in Feb 2019) states the prevalence of TB in UP to be approximately 20%. Using the above formula, at 95% confidence interval (CI), with prevalence (P) of 20% and precision (d) of 4% was taken.

Sample Size = 0.95×0.95×0.2×0.8/0.0016

=90.25

=90

However, we were able to study a sample of 160.

INCLUSION CRITERIA

All children up to age of 18 years with contact of sputum smear –positive TB cases diagnosed in Santosh Hospital as well as DOTS Unit.

EXCLUSION CRITERIA

- Doubtful cases due to incomplete workup.
- All extra-pulmonary tuberculosis index cases.

METHODOLOGY

Details of open sputum, AFB positive adult cases were taken from hospital's DOTS centre. A total of 163 such cases identified. The eligible contacts (1-18 years age group) from these index cases were identified.

All eligible children aged 1-18 years having a history of contact with sputum smear positive TB cases and all diagnosed adult TB cases attending general pediatric OPD/DOTS centres of Santosh Hospital were enrolled. Enrolled individuals were subjected to the following.

1. A detailed history was taken.
2. All adult cases enrolled in the DOTS center were contacted to extract data about their children details.
3. Index cases were advised to bring all children to the hospital and if not then counseling with instruction and telephonic reminder.

The firstly identified sputum smear positive cases in a domiciliary were identified as Index cases. While all of the members sharing the common kitchen with index cases were stated to be as Household contact Following investigations were done to confirm the diagnosis: sputum smear for AFB, chest x-ray (PA view), mantoux test and complete blood count.

Positive cases were treated as per RNTCP and for negative cases with only abnormal chest x-ray. course of antibiotics was started and repeat chest x-ray was advised after 15 days with regular follow up. All asymptomatic contacts aged less than 6yrs which were found negative on screening of age were started with *isoniazid* chemoprophylaxis with 5mg/kg/day for 6 months.

STATISTICAL ANALYSIS

Statistical analysis was done by STATA/SE 9.1. Association of x-ray chest abnormality, socio economic status & tuberculosis among contact was analyzed by Chi- square test. Variable were selected on basis of significance on univariate analysis. The level of significance was 5%, confidence interval was 95% used to interpret statistical significance.

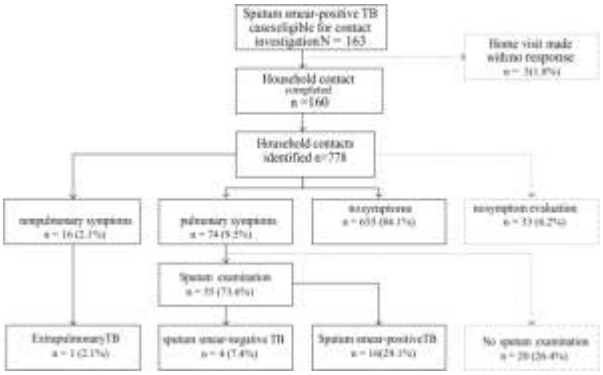

Figure 1: flow diagram showing household contact investigation outcome, Ghaziabad district

RESULTS

Table 1: Demographic characteristics and clinical presentation amongst household contact of sputum smear positive TB, Ghaziabad

Characteristic	No symptoms n (%)	Pulmonary TB symptoms n (%)	Non pulmonary symptoms n (%)	Directly detected from TB cases n(%)	Passive detection n(%)
Age (Years)					
0-6	113(16.4)	16(21)	4(23)	0	0
7-12	127(18.6)	25(33)	5(29)	1(12)	0
12-18	447(65)	33(44)	7(41)	7(87)	5
Male	320(46.5)	31(42)	9(53)	5	3
Female	368(53.5)	43(58)	8(47)	3	2
Total	688	74	17	8	5

Of 163 eligible index cases, 3 cases did not report for follow up and hence were excluded from the study. A total 778 household cases were identified. Complete evaluation was not done for 33(4.2%) cases as they were lost to follow-up despite telephonic reminders. Median age of index cases

was 33yrs (25-45yrs). A total of 74 (9.4%) contacts had pulmonary TB symptoms, with most being 12-18 years of age. Laboratory test register depicted 55 (73.6%) symptomatic contacts underwent sputum examination and 16 (29.1%) had positive sputum result. A total of 27/160 (8.7%) had at least one household contact, among 160 index cases. Among 133 household contact between 0-6 years, evaluation of TB successfully done for 76 (65.2%).

DISCUSSION

A standard modus operandi and methodical execution was done on household contact investigation showed effective and precise monitoring of contact cases. A total of 74 cases went for sputum examination, this reveals tough challenges of implementing field investigation.

Some portion of contacts (26.4%) did not report to DOTS center for investigations. so this people might have reported to private hospitals or lab for evaluation of TB.

TB progression is variable and we were not able to screen latent tuberculosis. The yield of active tuberculosis cases is 0 -6.9% in high burden countries. Sputum screening and chest x-rays show high sensitivity for presumptive diagnosis of TB. Risk of infection depends on duration of exposure, contact during exposure and environmental factors. First degree relatives, family history of TB, HLA association has strong connection with presumptive TB (11).

Study strength

1) The laboratory facilities for investigations and chest x-ray were available in hospital for all the household contacts.

2) The methodology for systemic data collection was robust due to DOTS center facility in hospital.

Limitation

1) The present study was done in clinical setting in hospital, hence might not be a representative sample of population. Thus, the present study has questionable external validity.

2) Only active pulmonary TB index cases included, so latent and extra pulmonary cases were missed, probably missing the accurate burden of TB in community.

CONCLUSION

A standard protocol and systematic implementation done on household contact investigation showed effective and precise monitoring of contact case.

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