

Original Research Article

Epidemiological, clinical and diagnostic characteristics of tuberculosis in adolescents

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ABSTRACT

Background: Though the risk of tuberculosis is expected to increase during adolescence, the exact burden of the disease in this age group is often underrepresented and understudied in literature.

Methods: We did a retrospective analysis of hospital records of adolescents aged 10-19 years admitted with tuberculosis at Apollo Children's Hospital, Chennai between January 2014 and March 2022, after ethical board clearance.

Results: Out of 54 cases, 42 were in the young adolescent group and 12 belonged to the older adolescent group. Sex distribution showed slightly higher incidence in females (55.6% vs 44.4%). Fever was the most common presenting complaint (72.2%) followed by loss of weight (51.9%) and cough (48.1%). Out of total 54 cases, 16 were pulmonary TB, 28 were extrapulmonary and 16 were disseminated. Consolidation was the predominant radiological feature (31.48%) followed by mediastinal lymphadenopathy (25.92%) and cavity (16.66%). Cartridge based nucleic acid amplification test was positive in 68.5% of the cases while smear was positive only in 9 cases (16.7%) and histopathology positive in 5 cases (9.2%).

Conclusions: Adolescent tuberculosis occurs mostly in the young adolescent group. This group should be recognized as a key risk period and not clubbed in with childhood.

Keywords: Tuberculosis, Adolescents, Disease burden, Clinical profile, Radiological features, CBNAAT

INTRODUCTION

Young adolescents frequently develop infectious forms of tuberculosis in contrast to children aged 0-4 years.¹ While the source of infection in children less than 2 years is a positive household contact in most of the cases, older children who developed tuberculosis did not have a positive household contact.² They are presumed to have been infected from the community because of their wider social contacts. Thus, tuberculosis among adolescents

have a significant social impact. Adding to the disease burden, many co-morbidities that may be relevant to tuberculosis like HIV, diabetes, and substance abuse emerge and exacerbate during the adolescent period. They also face specific age-related challenges in accessing appropriate healthcare as they transition between child and adult health services. There are no published estimates of tuberculosis disease burden among adolescents and young adults. The majority of the studies on tuberculosis divide the population into two age groups, 0-14 years (referred to as "children") and ≥ 15 years (referred to as "adults"),

ignoring adolescents and young adults as a distinct separate group.¹ Ours is a large tertiary care pediatric hospital in South India with long standing experience in treating microbiologically confirmed TB cases, and studying the adolescent TB in our population may add important information in this regard. Hence, we intended to study the epidemiological, clinical and diagnostic characteristics of adolescent TB in our population.

METHODS

Retrospective analysis of hospital records, on adolescents between 10-19 years of age admitted with tuberculosis at Apollo Children's Hospital between January 2014 and March 2022, was done after ethical board clearance.

Inclusion and exclusion criteria

Inclusion criteria was adolescents between age 10-19 years of age, admitted with tuberculosis at Apollo Children's Hospital between January 2014 and March 2022. Exclusion criteria was cases with insufficient hospital records.

According to World Health Organization any person between ages 10 and 19 years belong to adolescent group and are divided into young adolescents (10-14 years) and older adolescents (15-19 years).³ Socio-demographic variables like age, sex, clinical features, epidemiological contacts, radiological characteristics and diagnostic methods used to confirm TB were analysed. The characteristics were compared between the young (10-14 years) and older adolescents (15-19 years). A total of 54 cases for whom adequate medical records were available were included in this study. Statistical analysis was done. Normality of the data was assessed through Shapiro-Wilk's test. Normally distributed variables are expressed as mean±standard deviation (SD), otherwise as median (Interquartile range). Categorical variables are represented by percentage. Comparison of normally distributed continuous variables was done by independent sample t-test if there were two categories. Comparison of categorical variables was done by Chi-square test or Fisher's Exact test based on the number of observations. Data entry was done in a Microsoft Excel sheet. Analysis was carried out by using the statistical software SPSS (IBM, 28.0). All $p < 0.05$ were considered statistically significant.

RESULTS

Out of 54 cases, 42 were in the young adolescent group and 12 belonged to the older adolescent group. Sex distribution showed slightly higher incidence in females (55.6% vs. 44.4%). Fever was the most common presenting complaint (72.2%) followed by loss of weight (51.9%) and cough (48.1%). Contact history was present in 16.7% cases. Out of total 54 cases, 16 (29.6%) were pulmonary TB, 28 (51.8%) were extrapulmonary and 16 (29.6%) were disseminated. Of 16 cases of disseminated

TB, 11 (68.7%) were with pulmonary involvement and 5 (31.3%) without pulmonary involvement. 9 (81.8%) out of 11 cases with pulmonary involvement was seen in the young group.

Most of the symptoms, radiological manifestations and microbiological positivity were similar in both young and older adolescents, except loss of weight and loss of appetite which were commonly seen in young adolescents. Hemoptysis was seen only in one older adolescent. Persistent vomiting and headache and miliary nodules in chest radiograph were seen only in young adolescents. Among radiological features, consolidation was the predominant radiological feature (31.48%) followed by mediastinal lymphadenopathy (25.92%) and cavity (16.66%). CBNAAT was positive in 68.5% of the cases while smear was positive only in 9 cases (16.7%) and histopathology positive in 5 cases (9.2%).

DISCUSSION

An estimated 1.78 million young people (aged 10-24 years) around the world developed tuberculosis in 2012 and young people suffer a considerable burden of tuberculosis.¹ While a majority of national tuberculosis programmers routinely report all notified child tuberculosis cases (0-14 years) each year to the WHO, and increasingly, disaggregate data into the age groups of 0-4 and 5-14 years, the adolescent age group remains obscured by current reporting practices. Young adolescents (10-14 years) are included in the "child" age group, while older adolescents and young adults aged 15-24 years are categorized as "adults".⁴ In our study, tuberculosis occurred more in young adolescents (77.7%) and historical data suggest that the risk of infection with *Mycobacterium tuberculosis* is highest during adolescence and young adulthood.⁵

Younger and older adolescents should be analysed as separate groups when studying and reporting TB, particularly to inform better targeting of TB prevention and care interventions in the future, in order to improve outcomes.³ The most common radiographic findings was consolidation (31.48%) followed by mediastinal node (25.92%), pleural effusion (14.81%), cavity (16.66%) and miliary nodules (3.70%). This was comparable to a study done by Cruz et al, which showed infiltrates (34%), lymphadenopathy (27%), cavitary lesions (26%), pleural effusions (19%) and miliary disease (10%).⁶ 28 of the study population was extra-pulmonary TB which manifested with protean symptoms. Difficulty in diagnosis and increasing trend of extrapulmonary tuberculosis has already been reported.⁷ The most frequently involved extrapulmonary tuberculosis site was central nervous system (CNS). Ours is a hospital based study, and this data is known to be variable in other studies.⁸ 16 cases presented with disseminated TB, 11 with pulmonary involvement and 5 without pulmonary involvement. 9 cases out of 11 pulmonary involvement was seen in the young group. Approximately 10%-15% of patients have

normal chest radiography, so high index of suspicion it helps in early diagnosis.⁹

Table 1: Epidemiological, clinical and diagnostic characteristics of tuberculosis in adolescents.

Group	Characteristics	Young adolescents (N=42)	Older adolescents (N=12)	P value
Sex	Female	21	9	-
	Male	21	3	
Symptoms	Cough	22	4	0.25
	Fever	30	9	0.40
	Loss of weight	18	10	0.014
	Loss of appetite	10	8	0.005
	Difficulty in breathing	3	1	0.89
	Chest pain	2	1	0.31
	Hemoptysis	0	1	-
	Lymph node Swelling	4	0	-
	Productive Sputum	3	1	0.89
	Persistent vomiting	4	0	-
	Headache	6	1	0.59
	Abdominal pain/distension	5	2	0.33
	Others	12	2	0.59
Contact history, N (%)	Yes	8 (19.04)	1 (8.3)	0.18
	No	34 (80.95)	11 (91.6)	
Radiological features	Consolidation	14	3	0.29
	Pleural effusion	5	3	0.12
	Cavity	7	2	0.5
	Mediastinal node	12	2	0.41
	Miliary nodules	2	0	-
Diagnostic tests				
AFB Smear, N (%)	Positive	8 (19.04)	1 (8.3)	0.37
	Negative	34 (80.95)	11 (91.6)	
CBNAAT (Xpert MTB assay), N (%)	Positive	29 (69.04)	8 (66.66)	0.87
	Negative	13 (30.95)	4 (33.33)	
Histopathology, N (%)		4 (9.52)	1 (8.33)	0.44
Others, N (%)		4 (9.52)	1 (8.33)	
Types of tuberculosis, N (%)	Pulmonary	12 (28.6)	3 (25)	0.40
	Extrapulmonary	20 (47.6)	3 (25)	0.08
	Abdomen	4	1	0.60
	Bone including spine	3	1	0.44
	Pleural effusion	3	1	0.44
	Central nervous system (CNS)	8	0	0.17
	Lymph node	2	0	0.57
	Disseminated	10 (23.8)	6 (50)	0.04
	With pulmonary involvement	9	2	
	Without pulmonary involvement	1	4	

In the current study, 16.7% had contact history predominantly associated with in young adolescents (10-14 years) which is comparatively less, could be due to social stigma.¹⁰ A surprising finding in our study was the high detection of disseminated TB, seen more commonly in older adolescents. This may be attributed to the in-patient study population and better investigations,

especially imaging modalities that pick-up organ involvement more efficiently.

Limitations

The limitations of our study include the retrospective design and hospital-based study with referral bias.

CONCLUSION

Current study concludes that adolescent tuberculosis occurs mostly in the young adolescent group and this group should be recognized as a key risk period and not clubbed with childhood. This study draws attention to adolescent TB group who must be considered in scaling up efforts to end the global tuberculosis epidemic. Extrapulmonary TB and disseminated TB are the major clinical presentations in adolescents hospitalized for tuberculosis especially in the young adolescent groups.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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