Original research

CHILDHOOD TUBERCULOSIS IN DUSHANBE, TAJIKISTAN

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ABSTRACT

Children exposed to active tuberculosis (TB), particularly within the household, have an increased risk of developing TB disease. In Tajikistan, a high-priority country for TB, the national policy is that all children <7 years who have been in contact with an active TB case should be screened and given isoniazid preventive therapy (IPT), if not contraindicated. Currently, little information is available on whether this policy is being followed. We aimed to identify the trends in paediatric TB, characteristics and treatment outcomes of paediatric TB, and coverage of contact tracing and IPT delivery in the country

We undertook a retrospective cohort study of notified paediatric TB cases and household contacts in Dushanbe, Tajikistan from 2009 to 2013 to investigate trends in, and characteristics and outcomes of childhood TB cases, contact tracing and the proportion of eligible paediatric contacts who received IPT. During the study period, 380 paediatric TB cases were notified, of which 218 (57%) treatment records were available for analysis.

The majority of cases (*N*=138; 63%) were in the age group of 7–14 years. One hundred thirty-seven cases (63%) had extrapulmonary TB, of which 78 cases had hilar lymph node TB, 20 had peripheral lymph node TB, 19 had tuberculous pleurisy, 10 had bone TB, 8 had intestinal TB and 2 had TB meningitis. Successful treatment outcomes were registered in 94% of cases. Household contacts of 157 (72%) analysed paediatric TB cases were investigated; 61 households were identified with smear-positive pulmonary TB; 44 (76%) out of 58 eligible children (<7 years) received IPT.

We found successful treatment outcomes, contact tracing and IPT coverage. However, strategies could be developed to further scale up active case finding and national protocols, including data linkages, to routinely monitor and evaluate the quality of contact tracing.

Keywords: OPERATIONAL RESEARCH, SORT IT, PAEDIATRICS, CONTACT TRACING

INTRODUCTION

Childhood tuberculosis (TB) has been a neglected area of TB control, despite the fact that children under the age of 15 years account for over half a million of the estimated 9 million new cases of TB occurring worldwide *(1,2)*.

Childhood TB is an important indicator of ongoing transmission within a community. Young children exposed to people with infectious TB, particularly within households, have an increased risk of getting infected and developing TB disease. This risk is the highest through close contact with an infectious person (for example, in the household)

but also in congregate settings such as schools and nurseries *(3)*.

Most children will progress to developing TB disease within one year of being infected. Infants and young children are also particularly prone to developing severe forms of TB disease. Early case detection is thus important for successful treatment. For these reasons, it is vital to rapidly identify the "source case" of infection and investigate contacts around the case so as to interrupt transmission and prevent others from getting infected.

The Republic of Tajikistan is a small country in central Asia with a population of approximately 8 million. It is one of the18 high-priority countries for multidrug-resistant TB (MDR-TB: resistance to both isoniazid and rifampicin) in the World Health Organization (WHO) European Region *(4)*. Resistance in new and previously treated TB cases was reported to be 13% and 56%, respectively, in 2013 *(1)*. In 2013, a total of 6495 patients were registered with TB, including 389 children under the age of 15 years *(4)*. Tajikistan has seen a steady increase in the number of children diagnosed with MDR-TB. According to National Tuberculosis Centre, from 2010 to 2013, there were 80 children with MDR-TB, of whom 12 died *(5)*.

In the Paediatric TB Hospital in Dushanbe, more than half of all children registered with TB came from a household where there was an infected TB case; anecdotal evidence suggests that 2–3 children from the same household were affected *(4)*. This may indicate intense household transmission. Many of the notified cases were passively detected and this implies that delays might have occurred in diagnosing and instituting TB treatment, which may compromise treatment outcomes.

Children who live within a household where there is an infectious TB case should receive isoniazid preventive therapy (IPT), provided they do not have active TB and are not contacts of an MDR-TB case. There is no information on whether this is actually happening in Tajikistan. A PubMed search revealed no literature on these issues from central Asia.

We aimed to report on paediatric TB cases, and management of household contacts in Dushanbe, Tajikistan, between 2009 and 2013. The specific objectives were to report on: the trend in notified cases of childhood TB; the demographic, clinical characteristics and treatment outcomes of these cases; the number (and proportion) that were household contacts of TB cases, and whether IPT was offered to children when there was an infectious household case.

METHODS

STUDY DESIGN

This was a retrospective cohort study of TB among children in Dushanbe, Tajikistan.

SETTING

General setting

The Republic of Tajikistan is a mountainous country with an area of 142.6 km^2; 93% of the country is mountainous. The population is approximately 8 million, of which 5.9 million (73.6%) live in rural areas *(6)*. Tajikistan borders Afghanistan, Uzbekistan, Kyrgyzstan and China. The World Bank classifies it as a low-income country *(7)*. The health system is financed mainly by public taxation. The average life expectancy is 72.8 years *(8)*.

National TB control programme

The Republic of Tajikistan in 2002 adopted the directly observed treatment, short-course (DOTS) strategy. By 2005, it was expanded to cover the entire country, including the prison system. TB control institutions and the primary health-care system carry out anti-TB measures. The civilian sector has the following TB dispensaries: 34 district, 4 regional, 1 national, and 1 urban-level child TB dispensary. Currently, Tajikistan is facing a shortage of paediatricians who specialize in TB: of the 67 specialists required to cover the country, there are only 21 paediatricians who specialize in TB, with 17 of them working in Dushanbe city and Vahdat district, and only four to cover the rest of the country. The national coverage of tuberculin testing in children was increased in 2009 to cover all children at risk of TB, including household contacts of known TB cases. Under the requirements of the National TB Programme for 2010–2015, all cases of childhood TB should be investigated through contact tracing in order to identify the index case as well as to initiate IPT for children <7 years who are in contact with a smear-positive, drug-sensitive pulmonary TB case.

STUDY POPULATION

The study population included children with TB registered in Dushanbe from 2009 to 2013.

DATA COLLECTION, SOURCES AND ANALYSIS

The sources of data were yearly patient registration logbooks and ambulatory patient supervision records. In Tajikistan, all children with TB under the age of 18 years are considered to be paediatric cases. Data variables comprised demographic and clinical characteristics, type of TB and drug sensitivity, treatment outcomes, information on household contact tracing, and whether or not IPT was given. The variable for drug sensitivity was based on drug susceptibility testing in children with culture-confirmed pulmonary TB, and on the basis of treatment regimen for the remaining children. Data were extracted into paper-based forms and then double entered into an electronic database. Data entry, validation and analysis were done using EpiData Entry software (version 3.1, EpiData Association, Odense, Denmark). Data were collected from August to December 2014. Trends in the incidence of TB among children, as well as the other objectives, are described using summary statistics.

ETHICS

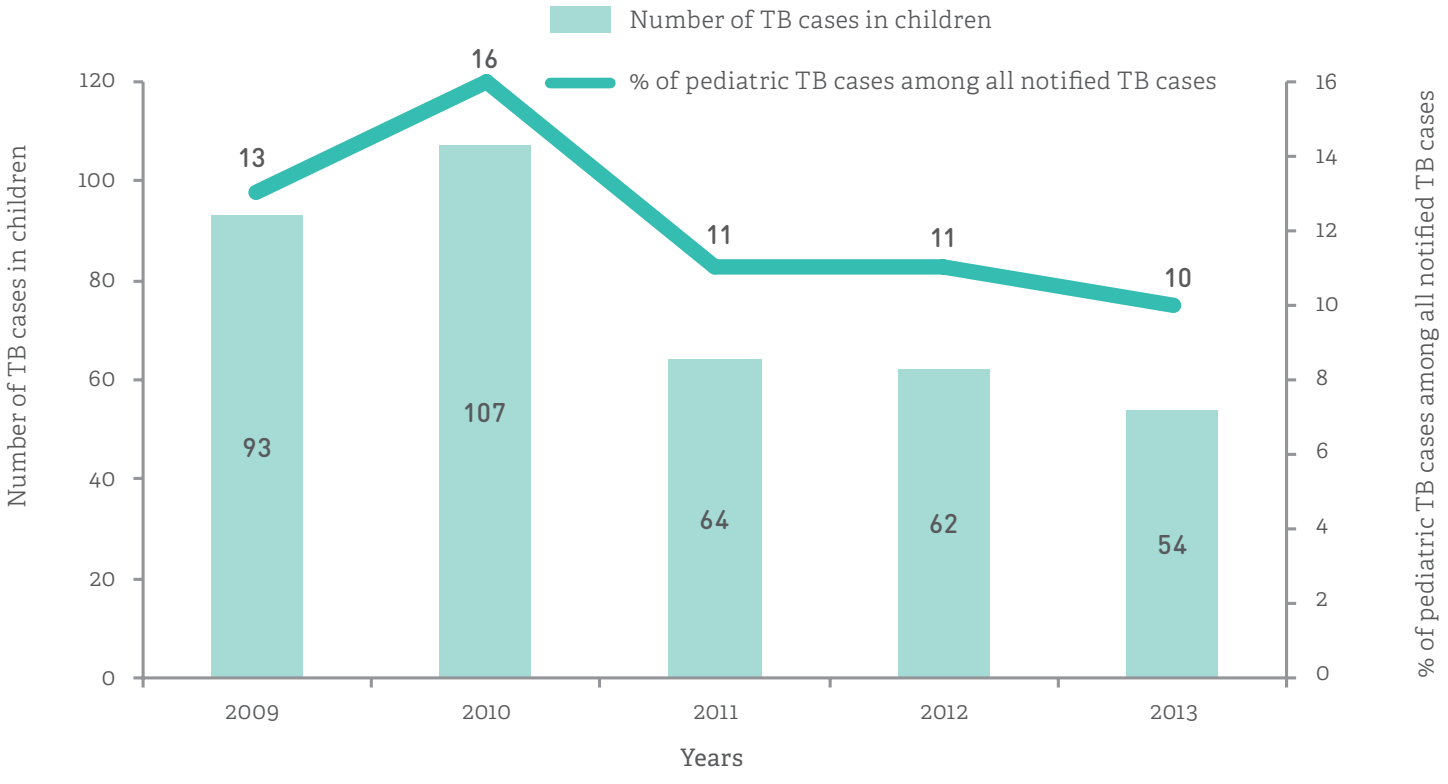
Ethical approval was received from the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan, and from the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France.

RESULTS

In Dushanbe, during the period between 2009 and 2013 the total number of notified childhood TB cases was 380 (12% of all notified TB cases). The number of notified paediatric TB cases and their proportion among all TB cases during the study period is shown in Fig. 1.

Of the 380 notified childhood TB cases, treatment records were available for 218 cases (57% of all paediatric cases notified during the study period),

FIG. 1. NUMBER OF NOTIFIED TUBERCULOSIS CASES IN CHILDREN (AGE <18 YEARS) AND THE PROPORTION OF PAEDIATRIC CASES AMONG TOTAL TB CASES IN DUSHANBE, TAJIKISTAN, 2009–2013



including on an annual basis: 28 cases (30%) in 2009, 51 cases (48%) in 2010, 41 cases (64%) in 2011, 44 cases (71%) in 2012, and 54 cases (100%) in 2013. Of the total cases included in the study, 121 were identified through active case finding (contact-tracing). Demographic and clinical characteristics, drug sensitivity as well as treatment outcomes of these patients are described in Table 1. The median age of all cases was 12 years (interquartile range 7–14 years). The youngest child diagnosed with TB was 4 months old at the time of TB notification.

Successful treatment outcomes (cured or treatment completed) were registered in 94% of children included in the study. Out of 34 children with smear-positive pulmonary TB, 29 (85%) had a successful treatment outcome (22 cases were cured and 7 cases completed treatment). Two children with pulmonary TB (12 and 13 years old) died, including one with smear-positive drug-sensitive recurrent TB. There were three cases of treatment failure: two cases had smear-positive pulmonary and one case had extrapulmonary TB. Seven cases (3% of cases included in the study) were not evaluated, of which 2 cases had smear-positive pulmonary TB.

TABLE 1. GENDER, CLINICAL MANIFESTATIONS, DRUG SENSITIVITY STATUS AND TREATMENT RESULTS STRATIFIED BY AGE GROUP OF CASES OF TUBERCULOSIS IN CHILDREN IN DUSHANBE, TAJIKISTAN, 2009–2013

	Number of cases by age group			Total number (%) of cases	
	<7 years	7–14 years	15–17 years		
Gender					
Male	35	53	9	97	(44)
Female	18	85	18	121	(56)
Type of tuberculosis					
Smear-positive pulmonary	0	29	5	34	(16)
Smear-negative pulmonary	10	30	7	47	(22)
Extrapulmonary	43	79	15	137	(63)
Drug sensitivity					
Sensitive	53	135	27	215	(99)
M/XDR-TB	0	3	0	3	(1)
Treatment outcome					
Cured	0	19	3	22	(10)
Treatment completed	52	109	23	184	(84)
Treatment failed	0	3	0	3	(1)
Died	0	2	0	2	(1)
Lost to follow-up	0	0	0	0	(0)
Not evaluated	1	5	1	7	(3)

M/XDR-TB = multidrug- and extensively drug-resistant tuberculosis

During the study period, household contact investigation was conducted in 157 (72%) childhood TB cases (Fig. 2). Sixty-one households had a case of smear-positive pulmonary TB. In these households, there were 58 child contacts (<7 years) who were eligible for IPT. Of these contacts, 44 (76%) received IPT. The remaining 14 contacts eligible for IPT did not receive it.

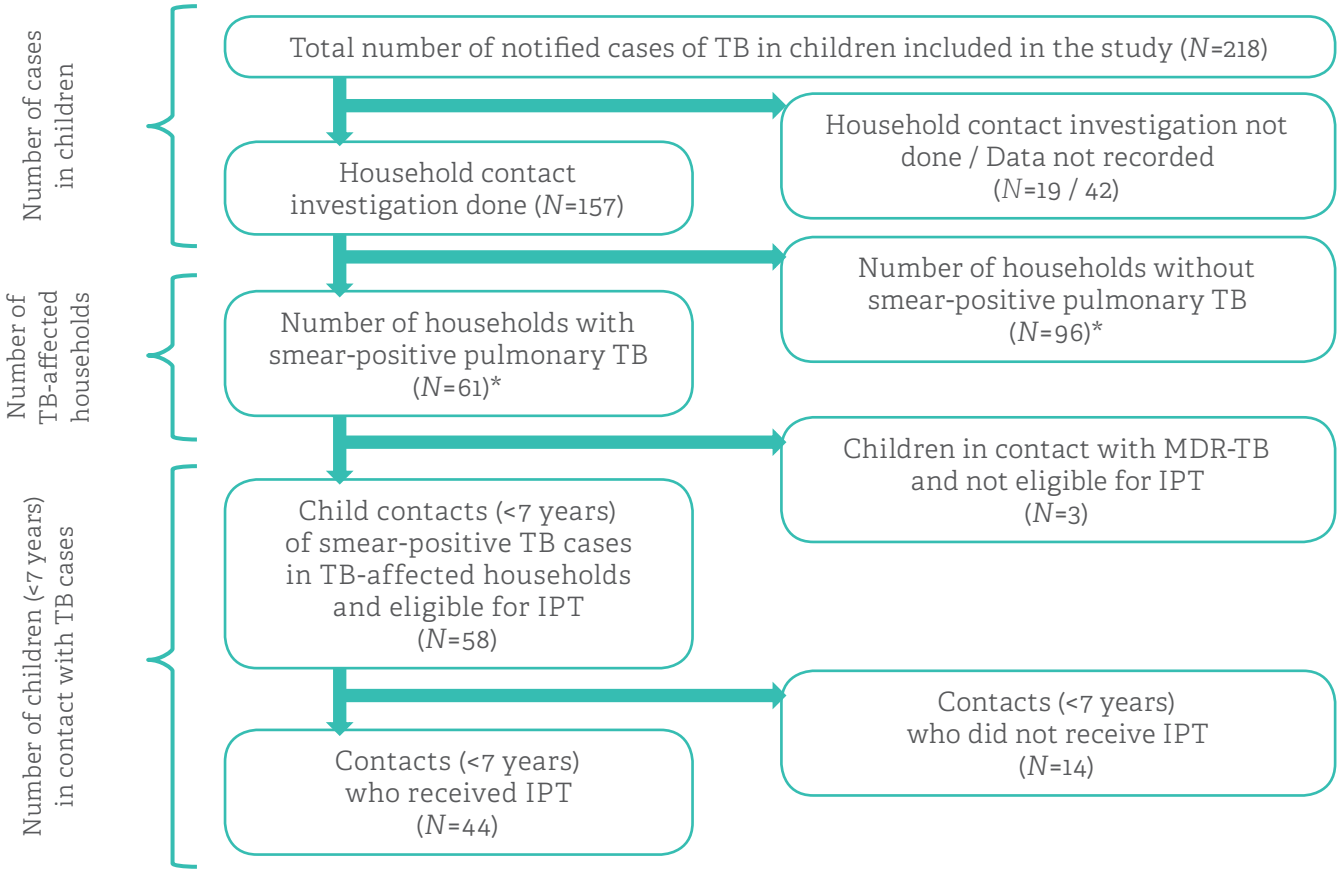
DISCUSSION

This is the first study that assessed childhood TB cases and prophylactic treatment of household contacts in Tajikistan. Among all notified cases of childhood TB included in the study, contact investigation was done in 72% of cases. Of all the eligible contacts identified, 76% received IPT.

Over the study period, the trend in childhood TB in Dushanbe showed an increase in the number of notified cases in 2010, which was also the year with the highest proportion of paediatric cases. This is probably explained by the adoption in 2009 of the National TB Programme to Protect the Public from Tuberculosis for 2010–2015. With the adoption of the National TB Programme, there was an increase in the coverage of tuberculin testing for all children at risk of TB, including those who were household contacts. TB among children is estimated to account for 6% of all incident TB cases *(9)*.

The highest proportion of children with TB was between 7 and 14 years of age (63%). The predominance of extrapulmonary cases in children is consistent with a previous study *(10)*. Although the results of this study demonstrate a high treatment success rate (94% for the total number of cases and 85% for cases with smear-positive pulmonary TB), these data should be interpreted with caution. Given that MDR-TB in Tajikistan accounts for 13% of new cases and 56% of previously treated cases, respectively *(1)*, and taking into account that the variable for drug sensitivity was based on drug susceptibility testing in children with culture-confirmed pulmonary TB, and on the basis of treatment regimen for the remaining children, it is likely that there is considerable underdetection of multidrug resistance among paediatric cases nationally; only 1% of paediatric cases identified in this study had MDR-TB. Thus, the treatment success rate among paediatric

FIG. 2. HOUSEHOLD CONTACT INVESTIGATION AND ISONIAZID PREVENTIVE THERAPY (FOR CHILDREN <7 YEARS) IN HOUSEHOLDS OF CHILDREN DIAGNOSED WITH TUBERCULOSIS IN DUSHANBE, TAJIKISTAN, 2009–2013



* Households counted per case of child tuberculosis
TB: tuberculosis, MDR-TB: multidrug-resistant TB, IPT: isoniazid preventive therapy

cases in this study may have been overestimated. Two registered cases of death in adolescents raise the issue of a possible delay in diagnosis.

The analysis of active case finding (contact-tracing) in households of paediatric TB patients demonstrated the need to intensify this aspect, as 28% of households were not investigated or no information was available on them. In addition, of those households investigated, 76% of children eligible to receive IPT actually received it. The proportion of eligible contacts who received IPT in the study was considerably higher than in a study conducted in India *(11)*. Taking into account the fact that the study methods did not include interviews, the reasons for not receiving IPT have not been completely investigated during this study; however, anecdotal evidence suggests that parental refusal and lack of childhood TB specialists could be responsible. In 2013, an extensive review of the National TB Programme noted that there was no systematic approach by TB staff at facility level to investigate contacts of TB cases *(12)*. Anecdotal evidence also suggests that the reasons for the lack of full coverage of contact-tracing might be due to a lack of human resources and incomplete record-keeping. Currently, the TB registry includes records of paediatric patients, household contacts, and whether eligible contacts received IPT. These are paper based and kept separately, and are thus difficult to audit for complete linkage and follow-up.

The strengths of this study are that it covered a five-year period and included all ambulatory health-care facilities of the capital. We adhered to the STrengthening the Reporting of OBservational studies

in Epidemiology (STROBE) guidelines for reporting our research.

An important study limitation is that a large proportion of cases (43%) notified during the study period could not be included in the study due to missing information. The large number of missing treatment cards for 2009–2012 could have been due to decentralization of the TB service and shortage of TB specialists in some polyclinics of Dushanbe. The lack of complete case ascertainment in this study may have caused a bias, particularly in the reporting of treatment outcomes, as well as contact tracing and IPT data. However, as there have been no previous studies on childhood TB in Tajikistan, this study could serve as an important baseline from which to conduct further research at the national level.

The Ministry of Health of Tajikistan has recently called for intensified efforts to scale up contact-tracing and active case finding through a systematic approach at the primary health-care level, in polyclinics, and with the involvement of general practitioners, paediatricians, and community health-care workers and feldshers in the more rural areas of Tajikistan *(12,13)*. The results of this study can be used to improve the methods of early TB detection and monitoring of household TB contacts in Dushanbe city, thus leading to improved management of TB in children in Tajikistan. Strategies could be developed and implemented to scale up active case finding and national protocols, including data linkages to routinely monitor and evaluate the quality of contact-tracing. In addition, efforts should be made to train and build the capacity of human resources for tracing contacts and reporting data within the TB and primary health-care systems. It should be noted that during the collection of data for the study, the issue of proper data recording and reporting was discussed with the administration of the health-care facilities involved, which led to immediate improvement in several facilities. It would be important to assess improvements in case reporting in future studies.

In conclusion, this study identified good rates of successful treatment outcomes, contact-tracing and IPT coverage in Dushanbe, Tajikistan. It contributes to the current efforts implemented by the Ministry of Health of Tajikistan for the urgent and systematic scaling up of contact-tracing and active case finding in the country.

Acknowledgements: This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership led by the Special Programme for Research and Training in Tropical Diseases (TDR), which is hosted at the World Health Organization. The model is based on a course developed jointly by the International Union Against Tuberculosis and Lung Disease and Medécins sans Frontières. The specific SORT IT programme that resulted in this publication was jointly developed and implemented by the WHO Regional Office for Europe; TDR; the Operational Research Unit, Médecins Sans Frontières, Brussels Operational Centre, Luxembourg; and the Centre for Operational Research, The Union, Paris, France.

We are grateful for the support of the WHO Country Office in Astana, Kazakhstan, for its support in hosting the training workshops. We also appreciate the active involvement of the WHO country offices and the ministries of health in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan in the selection of candidates for training in operational research and identification of research projects in line with their priorities.

Sources of funding: The programme was funded by TDR and the United States Agency for International Development (USAID) through a grant managed by WHO/TDR. Additional support was provided by the WHO Regional Office for Europe; the Department for International Development (DFID), UK; and MSF. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflict of interests: None declared.

Disclaimer: The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions or policies of the World Health Organization.

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