

Epidemiological Investigation of Pediatric Tuberculosis in Tehran Province, 2006-2015

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Abstract

Background: On tuberculosis control standpoint, the treatment of children with TB is not considered a priority as they rarely transmit the disease and contribute little to the maintenance of the tuberculosis epidemic. Therefore this study conducted to describe pediatric TB cases, and to identify pattern of risk factors in non-endemic communities

Materials and Methods: The present cross-sectional study conducted on 139 children under-five years of old with TB in Tehran province from March 2006 to March 2015. Data were extracted from TB registry system. Data were analyzed using Stata software version, 12.

Results: Overall, records on 139 children with TB had been evaluated. Most of under-five TB cases were boys (58%) and urban dwellers (88%), roughly half of the sample (54%) was diagnosed as extra-pulmonary TB, while most of them (66%) had been reported through public health networks. Treatment success rate were nearly 85%, and 11% of them had been deceased. There was a significant relationship between household contacts and type of TB ($P < 0.05$).

Conclusion: We found that most of pediatric TB cases in central part of Iran were males, urban dwellers, and extra pulmonary type. Despite the fact that Afghans refugees make up a small percentage of the population of Tehran province but more than 25 % of TB cases attributable to them. Given that Pediatric TB is a direct consequence of adult TB and is a good marker of current transmission in the community, therefore necessary health strategies should be taken to control TB in this high-risk group.

Key Words: Epidemiology, Iran, Pediatrics, Tuberculosis.

*Please cite this article as: Molaiepoor L, Khazaei S, Ayubi E, Rezaeian Sh, Nematollahi Sh, Mansori K, et al. Epidemiological investigation of Pediatric Tuberculosis in Tehran Province, 2006-2015. Int J Pediatr 2016; 4(6): 1895-1902.

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Received date Jan17, 2016 ; Accepted date: Feb 22, 2016

1- INTRODUCTION

Tuberculosis (TB) is a public health problem and leading causes of death with an annual incidence rate of about 8.6 million cases and an estimated 1.3 million people die every year with 130,000 deaths of them attributed to children (1). The burden of TB is the highest rate in Asia and Africa (2). Iran has the most Afghan refugees due to the neighboring with this country, according to the 2012 census, number of 463,190 Afghan citizen are residing in Tehran, and according to the World Health Organization in 2014, the incidence of TB in Afghanistan was 340 (178-555) cases per hundred thousand inhabitants; while this estimation in Iran is mean are 33 (17-55) cases per hundred thousand population(3). Therefore Afghan Immigrants and refugees are considered among the groups at high risk of TB in our country. The World Health Organization (WHO) considered directly observed treatment short-course (DOTS), with first-line drugs (isoniazid, rifampicin, pyrazinamide, and streptomycin or ethambutol or both) under direct observation for treatment of TB, and has now been adopted by 119 countries worldwide including Iran (4).

Death from TB in children has a strong correlation with socio-economic, underlying nutritional and immunosuppression status. In addition, TB has been reported to be the one of the most common cause of death in HIV-infected children as well (5). Although ending the TB epidemic by 2030 is among the health targets of the newly adopted Sustainable Development Goals (SDG), but evidence show that TB remains one of the world's biggest threats (6). Pediatric TB is a direct consequence of adult TB and is a good marker of current transmission in the community. Although advances have been made in diagnostics and new drugs for treatment of TB in adults, development in children has lagged behind (7).

Children under 15 years of old consisted of only 6% of all TB cases, but this ratio ranges from less than 5% in industrialized countries and up to 40% in some developing countries (8). Most pediatric TB cases in industrialized countries are detected through contact tracing and usually have good outcomes. This is in contrast to the case in low- and middle-income countries, where these cases are closely associated with poverty, overcrowding, and malnutrition, with consequently lower treatment success rates (9). Early ages and some infections, particularly HIV, are considered as the most important risk factors for severe or disseminated disease. Pulmonary parenchymal disease is the most common clinical manifestations of pediatric TB, accounting for 60%–80% of all cases (10).

On tuberculosis control standpoint, the treatment of children with TB is not considered a priority as they rarely transmit the disease and contribute little to the maintenance of the tuberculosis epidemic (11). Nevertheless pediatric TB contributes greatly in global burden of TB, therefore, more research is required to describe pediatric TB cases, and to identify pattern of risk factors in non-endemic communities. Thus, the aim of the present study was to epidemiologic description of pediatric TB cases in Tehran province, Iran, during 2006-2015.

2- MATERIALS AND METHODS

This study was a cross sectional conducted on children under-five years of old in Tehran province, Iran, during 2006-2015 (10 year).

The study sample included 139 children with TB whose information was registered in the TB registry system of health departments of three Medical Universities of Tehran province, namely Tehran University of Medical Sciences (TUMS), Iran University of Medical Sciences (IUMS), and Shahid-Beheshti University

of Medical Sciences (SBU). After case finding, for these patients created care and treatment file and for six months (final of treatment) are under follow of physician and health care workers. According to the patient record system, each patient was recorded in a single center and gives a specific code, and if transferred to other centers considered as an imported case.

According to national TB control program guidelines, the following criteria considered for definition of a case with sputum smear-positive are: two positive sputum smears by microscopy, one positive sputum smear and one positive sputum culture, or one positive sputum smear with typical pathology of active TB on chest X-ray (12).

Smear-negative TB is a case who has a smear-negative sputum and a *Mycobacterium tuberculosis* positive culture, along with prescription of anti-TB treatments by a clinician; and radiographic abnormalities consistent with active pulmonary TB. Extra pulmonary tuberculosis (EPTB) is a case of TB involving organs other than lungs (13).

Retrieved information from TB registry software included: age, gender, residency, reporting source of cases (social security, health networks, private sector etc.), and type of tuberculosis (pulmonary smear-negative, pulmonary smear-positive or extra-pulmonary).

To describe data, descriptive statistics includes maps, tables and charts were used. The geographic distribution of pediatric TB cases was carried out using Geographic Information System (GIS) software. Two-sided Chi-squared statistical test was used to determine relationship between household contacts and type of TB.

The level of statistical significance was considered less than 0.05 (what's mean).

Data were analyzed by Stata computer software version 12 (Stata Corp, College Station, TX, USA).

3- RESULTS

Overall, records on 139 children with TB from mentioned universities during March 2006 to March 2015 had been evaluated. Spatial distribution of cases showed that West parts of the province such as *Savejbelagh* and *Hashtgerd* cities had the lowest number of cases, while Central parts of the province such as *Tehran* city had the highest (**Figure 1**).

On a quantitative scale, the relative frequency of cases reported from all around the province ranged between 0.7-17 percent with the highest was for South of *Tehran* city (17%), and the lowest was for *Pishva* and *Ghods* cities (0.7%) (**Table.1**).

Results showed that most of under-five TB cases were boys (58%), urban dwellers (88.5%), and Iranian nationality (75%). Roughly half of the sample (54%) was diagnosed as Extra- pulmonary TB, while most of them (66%) had been reported through public health networks (**Table.2**).

Additionally, in terms of household contact situation, about half of the smear-positive pulmonary cases (56%) had a history of household contact, while this proportion was 28% for smear-negative pulmonary, and 5.6% for extra-pulmonary cases. All of above proportions had shown significant statistical level ($P=0.001$) (**Table.3**).

Finally, we presented the treatment outcomes of all 139 TB cases in (**Figure.2**). Accordingly, most of cases (67%) had completed TB treatment regimen, while 18% of cases had been cured spontaneously, and 11% of them had been deceased.

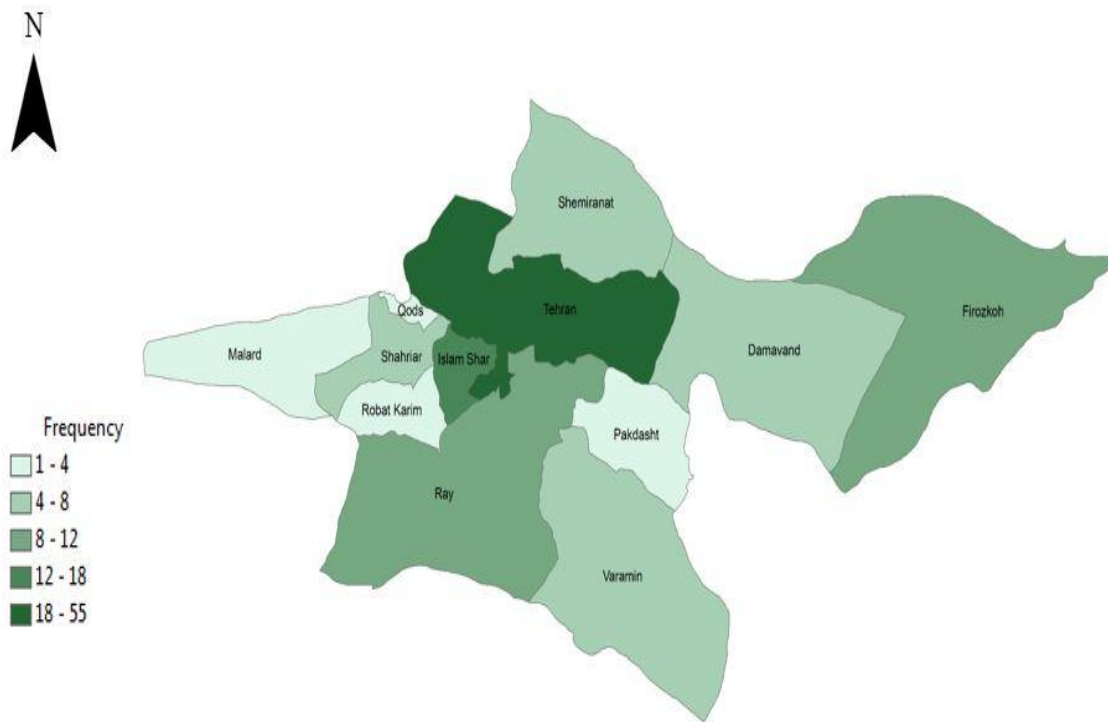


Fig1: The Spatial distribution of children (≤ 5 years) TB patients according to counties in Tehran province

Table 1: Distribution of pediatric tuberculosis cases in Tehran Province, 2015

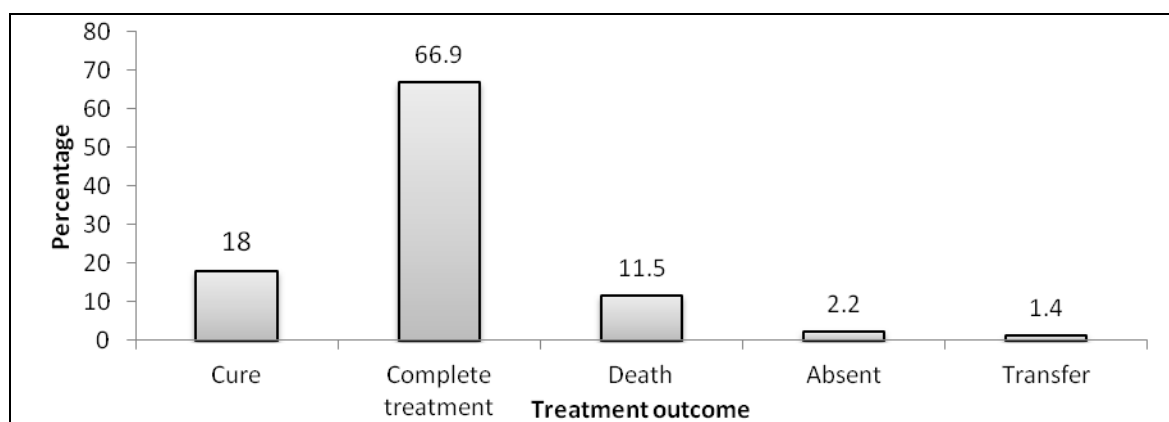
| County | | Number | Percentage |
|--------------|-----------|------------|------------|
| Tehran city | South | 24 | 17.2 |
| | West | 15 | 10.7 |
| | Northwest | 6 | 4.3 |
| | North | 10 | 7.1 |
| | East | 13 | 9.3 |
| Rey | | 12 | 8.6 |
| Slamshahr | | 18 | 12.9 |
| Baharestan | | 5 | 3.6 |
| Shahryar | | 8 | 5.7 |
| Malard | | 2 | 1.4 |
| Ghods | | 1 | 0.7 |
| Damavand | | 6 | 4.3 |
| Shemiranat | | 6 | 4.3 |
| Pakdasht | | 4 | 2.8 |
| Pishva | | 1 | 0.72 |
| Varamin | | 8 | 5.7 |
| Total | | 139 | 100 |

Table 2: Demographic and clinical characteristics of children under-five with TB in Tehran province

| Variables | | Frequency | Percentage |
|--------------------|------------------|-----------|------------|
| Gender | Male | 81 | 58.3 |
| | Female | 58 | 41.7 |
| Place of Residence | Urban | 123 | 88.5 |
| | Rural | 16 | 11.5 |
| Nationality | Iranian | 104 | 74.8 |
| | Afghan | 35 | 25.2 |
| Type of disease | Smear-Positive | 36 | 25.9 |
| | Smear-Negative | 32 | 23 |
| | Extra -Pulmonary | 71 | 51.1 |
| Source of report | Social Security | 5 | 3.6 |
| | Health Network | 92 | 66.2 |
| | Private Sector | 13 | 9.4 |
| | Others | 29 | 20.9 |

Table 3: History household contacts among pediatric TB patients in Tehran province

| TB Type | History household contacts | | | P-value |
|-----------------|----------------------------|-----------|-----------|---------|
| | Yes | No | Un known | |
| Pulmonary SP | 18 (56.3) | 10 (31.2) | 4 (12.5) | 0.001 |
| Pulmonary SN | 10 (27.8) | 8 (22.2) | 18 (50) | |
| Extra Pulmonary | 4 (5.6) | 46 (64.8) | 21 (29.6) | |
| Total | 32 (23) | 64 (46) | 43 (30.9) | |

**Fig.2:** Treatment outcomes in pediatric TB patients in Tehran province

4- DISCUSSION

Among 139 pediatric TB cases in Tehran province during 2006-2015, we found that most of the cases had been reported from South and Central parts of the province. This finding is consistent with previous reports revealing that TB mostly happens in overcrowded and poor societies (14, 15). Moreover, we found that more than half of the cases were extra-

pulmonary cases. This result is partially consistent with the results of studies performed in southwest of Iran (16); and also is similar to previous studies from less developed countries; with results ranged from 40% to 47% (17, 18). It seems that the high amount of EPTB in our children may be caused by over diagnosis, or low detection of PTB.

Treatment and recommended standard anti-TB regimens for children are similar to those for adults (19). Treatment for most forms of pulmonary and extra-pulmonary TB consists of a 6-month short-course chemotherapy regimen with 4 drugs (Isoniazid [INH], Rifampin (RMP), Ethambutol [EMB], and Pyrazinamide [PZA]) in the initial intensive phase, followed by 2 drugs (INH and RMP) in the continuation phase (19). We found that most of the children (85%) have completed their treatment regimen or cured, which means that routine treatment for TB still works satisfactory in our study population (20). The rate of TB treatment responders among children in our study was lower than the rate of similar study in southeast of Iran (16). This subject may be due to high number of Afghan patients with low compliance in our study compared to the southern provinces with the small numbers of Afghan refugee.

In this study about 25% of cases attributed to Afghan refugees, in this regard, a study has been conducted to examine the situation of TB in the non-US citizens, showed that the highest incidence of TB happened in this population over a period of time less than a year after the immigration to America (21). This research shows the importance of timely identifying of latent infections in immigrant cases that migrate in the areas with high prevalence of TB to the country. Current WHO guidelines advise that children under-five who are in close contact with a sputum smear-positive patient should be actively traced and screened for TB, and provided preventive chemotherapy. Although this is good policy, implementation is tangled with challenges, some of them including difficulty with diagnosis of latent TB in a highly BCG-vaccinated population, ruling out incipient active disease, and the lack of procedures for documentation and follow-up of contact screening and

chemoprophylaxis in national programs. Because the majority of transmission in young children occurs in the household and they are also the group at highest risk of progression to disease after primary infection, this activity should be given higher priority in national infection-control programs. Moreover, active tracing and screening of household contacts at high risk would allow children with disease to receive a diagnosis earlier, thus reducing complications (22).

4-1. Limitations of the study

Our study had some limitations. We used a registry based data for analysis. Accordingly, we could not directly investigate the information of some variables such as HIV status, HIV risk factors and socio – economic status of TB patients.

5. CONCLUSION

In conclusion we found that most of pediatric TB cases in Tehran province were males, urban dwellers, and extra-pulmonary type. Most of the cases had been under routine treatment regimen successfully and completely. We recommend more accurate contact tracing activities for case detection in high-risk households of TB index cases. Despite the fact that Afghans refugees make up a small percentage of the population of Tehran province but more than 25 % of TB cases attributable to them. So the, immigration control for the presence of latent infections and active form of TB and also regular and consistent follow-up program to treating these individuals is very important issues that should be paid special attention to prevent the spread of TB in the country.

Given that Pediatric TB is a direct consequence of adult TB and is a good marker of current transmission in the community, therefore necessary health strategies should be taken to control TB in this high-risk group.

Also our findings suggest an early case detection and treatment program to optimize the likelihood of reducing burden of the disease at the level of individual, family and community especially for smear positive TB patients with the 56.3% history of household contact.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

The authors wish to thank the head and personnel of three Medical Universities of Tehran province, namely Tehran University of Medical Sciences (TUMS), Iran University of Medical Sciences (IUMS), and Shahid-Beheshti University of Medical Sciences (SBU).

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