Pulmonary tuberculosis incidence in Turkish prisons: importance of screening and case finding strategies

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ÖZET

Türkiye'deki cezaevlerinde akciğer tüberkülozu insidansı: Olgu bulma ve tarama stratejilerinin önemi

Giriş: *Bu çalışmanın amacı, Türkiye'de Marmara Bölgesi'ndeki cezaevlerinde, akciğer tüberkülozu insidansını araştırmak ve Türkiye'deki genel akciğer tüberkülozu insidansıyla karşılaştırmaktır.*

Hastalar ve Metod: *Marmara Bölgesi'nde dört şehirde bulunan toplam 10 cezaevindeki tüm hükümlüler çalışmaya alındı. Taramalar Ocak 2006-Ocak 2007 tarihleri arasında yapıldı. Radyolojik taramalar mobil-X ray cihazıyla yapıldı. Tüberküloz şüphesi olan olgulardan bakteriyolojik inceleme amaçlı balgam örneği alındı. Akciğer grafileri birbirinden bağımsız dört hekim tarafından ayrı ayrı değerlendirildi.*

Bulgular: *Radyolojik olarak toplam 4615 hükümlü tarandı. Üç yüz bir (%7)'i kadın, 4314 (%93)'ü erkekti. Kadınların yaş dağılımı 16-59 yıl, erkeklerin yaş dağılımı 14-72 yıl idi. Tüm hükümlülerin 398/4615 (%8.6)'ini, yaş dağılımı 14-18 yıl olan gençler oluşturmaktaydı. Radyolojik olarak tüberküloz düşünülen 130 olgudan bakteriyolojik inceleme amaçlı üç kez balgam örneği alındı. Yüz otuz olgunun tamamı erkek ve yaş ortalaması 33 ± 10 yıl idi, beşine yayma ya da kültür pozitif akciğer tüberkülozu tanısı koyuldu. Çalışmamızda cezaevlerindeki tüberküloz prevalansı 108/100.000 olarak bulundu. Bu değer, çalışmamızın yapıldığı tarihteki Türkiye'deki genel tüberküloz prevalansının dört katı yüksekliktedir.*

Sonuç: *Türkiye'de cezaevlerindeki hükümlüler, tüberküloz açısından önemli risk gruplarındandır. Çalışmamız, cezaevlerinde uygun olgu bulma ve tarama stratejilerine duyulan ihtiyacı vurgulamaktadır.*

Anahtar Kelimeler: *Tüberküloz, cezaevi, aktif tüberküloz tarama.*

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SUMMARY

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Introduction: The purpose of this study was to evaluate the burden of pulmonary tuberculosis in 10 prisons mostly located in the Marmara Region of Turkey, and to compare them with the country incidence.

Patients and Methods: All the inmates in ten prisons mostly located in the four cities in the Marmara Region of Turkey were enrolled in this study. Tuberculosis screening was done between January 2006-January 2007. Radiological screening for tuberculosis was performed by the mobile X-ray system and it was followed by bacteriological analysis of sputum for tuberculosis suspects. Four physicians evaluated the X-rays independently.

Results: Four thousand six hundred and fifteen prisoners were detected by radiological screening. Three hundred and one (7%) of them were female and 4314 (93%) were male, age range was between 14-72 years. Age ranges of female and male prisoners were 16-59 and 14-72 respectively. 398/4615 (8.6%) were young adults inmates with an age range of 14-18. Radiological abnormalities consistent with tuberculosis were found in 130 chest X-rays and followed by sputum bacteriology. Smear and culture positive pulmonary tuberculosis diagnosed in five out of 130, were all male with mean age 33 ± 10 years. Tuberculosis prevalence in the prisons was found to be 108/100.000 which was four times higher than the overall incidence of tuberculosis in Turkey in the year which the present study was conducted.

Conclusion: Prisoners are one of the most important risk groups with high burden of tuberculosis in Turkey. This result highlights the need for adequate case- finding strategies in prisons.

Key Words: Tuberculosis, prisoners, active tuberculosis screening.

INTRODUCTION

Approximately 10 million people around the world are incarcerated, mostly in prisons. Occurrence of active tuberculosis in prisons is usually reported to be much higher than average levels reported for the corresponding general population (1-3). Late tuberculosis case finding and delays in treatment are common problems in many prisons (2). Conditions within prisons (poor health services, poor nutrition, poor physical condition, drug addiction and presence of other diseases) are conductive to the spread of TB (4,5). Moreover, prisons represent a reservoir for disease transmission; the tuberculosis infection may spread into the general population through prison staff, visitors, and close contacts of released prisoners (6,7).

In addition to the universal World Health Organization (WHO) Directly Observed Treatment Short-course strategy, several measures have been proposed by WHO and the Red Cross to control tuberculosis in prisons including mass screening of prisoners based on symptoms and the systematic detection of tuberculosis at entry point (2,8-11). In Turkey the administration of prisons is under the responsibility of three different authorities having different bureaucratic rules: Ministry of Health (MoH), Ministry of Justice (MoJ) and Ministry of Internal Affairs (MoIA). Although there is a protocol accepted by MoH and MoJ for control in prisons which highlights the necessity of annual tuberculosis screening, it is not well implanted or if done the outcomes are not well assessed due to the lack of coordination between these three authorities. That must be one of the reasons, to our knowledge why there are two published papers about the prevalence of tuberculosis in Turkish prisons (12,13). To start this study, we got permission from all the authorities mentioned above to assess and use outcomes. The aim of this study is to evaluate the burden of tuberculosis in ten prisons mostly located in the Marmara Region of Turkey, and to compare them with the country incidence.

PATIENTS and METHODS

Between January 2006-January 2007 all the inmates in 10 prisons mostly located in the four cities in the Marmara Region of Turkey were enrolled in this study. Each inmate was interviewed using a standardised questionnaire containing questions on demographic, clinical variables [including cough (> 3 weeks), sputum, fever, weakness, weight loss, loss of appetite, night sweats], history of tuberculosis treatment and smoking habits. Each inmate underwent for microfilm examination that is used in community based screening for tuberculosis by the mobile X-ray system in Turkey. All microfilms were evaluated by three physicians (two chest physicians, one dispensary physician) who were blinded to the subjects' sign and symptoms. Radiologically suspected tuberculosis lesions on microfilms were selected for standart posterior-anterior chest X-rays. Agreement were settled by concensus between the two specialists. Inmates with any pulmonary, mediastinal or pleural abnormality in standart posterior-anterior chest X-rays were selected for sputum examination. Three early morning sputum samples were collected from tuberculosis suspects on different days. Microscopic sputum smear examination for acid-fast bacilli (AFB) was performed after Ziehl-Neelsen staining. All sputum samples were cultured on Löwenstein-Jensen medium.

Diagnostic criteria for pulmonary tuberculosis cases were defined as (8);

Bacteriologically positive cases: Subjects with two smear positive results by direct microscopic examination, or one smear positive sample with chest X-ray abnormalities consistent with active pulmonary tuberculosis, or positive culture for *Mycobacterium tuberculosis*.

Bacteriologically negative cases: Patient with;

1. At least three sputum specimens negative for AFB, and

2. Radiographic abnormalities consistent with active pulmonary tuberculosis, and

3. No response to a course of broad spectrum antibiotics, and

4. Decision by a clinician to treat with a full course of anti-tuberculosis chemotherapy, is accepted as smear negative case.

Collected data were recorded using SPSS 13.0 version for Windows. The protocol was approved by Istanbul Health Directorate and by Republic of Turkey, Ministry of Justice.

RESULTS

During the study period, a total of 4615 prisoners in 10 prisons, 301 (7%) female and 4314 (93%) male, were screened by microfilm. The mean age of all prisoners was 42 ± 11 years. The mean age of female and male prisoners were 36 ± 9 and 40 ± 10 years. 398/4615 (8.6%) were young adults inmates with an age range of 14-18 years. The demographic and clinical characteristics of the inmates are shown in Table 1.

Radiological abnormalities consistent with tuberculosis were found in 130 microfilms and followed by sputum bacteriology. Radiological abnormalities were as follows: apical infiltration in 46 (0.1%), calcification of apical and hilar region in 16 (0.3%), parenchymal infiltration in 24 (0.5%), pleural effusion in 2, blunting of the costophrenic angle in 33 (0.7%) and noduler lesions in 12 (0.3%) prisoners, as shown in Table 2.

Table 1. Demographic and clinical characteristics of the cases.	
	n= 4615
Gender [n]	
Female	301 (7%)
Male	4314 (93%)
Mean age of all prisoners (years, mean ± SD)	42 ± 11
Mean age of female (years, mean ± SD)	36 ± 9
Male (years, mean ± SD)	40 ± 10
History of tuberculosis treatment [n]	1
Smoking [n]	
Smokers	84 (1.8%)
Ex-smokers	24 (0.5%)
No data	4507 (97.7%)
SD: Standard deviation, n: Number.	

Table 2. Radiological abnormalities consistent with tuberculosis.						
	Apical infiltration	Calcification of apical and hilar region	Parenchymal infiltration	Pleural effusion	Blunting of costhophrenic angle	Noduler lesion
Prison-1	1	1	1	-	2	-
Prison-2	1	-	3	1	-	-
Prison-3	-	-	-	-	-	-
Prison-4	1	-	2	-	-	-
Prison-5	1	1	-	-	-	-
Prison-6	10	-	3	1	1	-
Prison-7	17	5	6	-	3	1
Prison-8	6	3	4	-	14	3
Prison-9	9	5	5	-	11	7
Prison-10	-	1	-	-	2	1
Total [n (%)]	46 (0.1)	16 (0.3)	24 (0.5)	2	33 (0.7)	12 (0.3)

Smear and culture positive pulmonary tuberculosis diagnosed in 5 out of 130 , were all male with mean age 33 ± 10 years (Table 3).

All of the tuberculosis cases were at the same prison (Prison 7) which was the biggest and most crowded of all. Findings of each prison were shown in Table 4.

The prevelance of tuberculosis was found to be 108/100.000 in the prisons which is four times higher than the country prevelance (29/100.000) in 2006 that present study was conducted (14).

DISCUSSION

Prisons represent dynamic communities where at-risk groups congregate in a setting that exacerbates disease and its transmission, including tuberculosis (3).

Although prisons are closed institutions, the prisoners are often mobile within various prisons, inside the prison and even between different institutions such as co-

urts. At the end they are released into the community with insufficient, incomplete and interrupted treatment.

Other common issue is the administrative problems of the prisons in Turkey. Three different ministries (MoH, MoJ, MoIA) are responsible to report prison health data. This complex administrative structure often interferes routine screening protocol, data reporting system and the implementation of effective tuberculosis control, so delayed diagnosis, and inadequate treatment results in prolonged transmission. To obtain most reliable data we initially built a bridge between these three ministries and urged them to collaborate with each other. Our study has shown that active tuberculosis prevalence (108/100.000) among prisoners in Turkey was four times higher than the country prevalence (29/100.000) in 2006 (14). This result is smilar to worldwide. The prevalence rates of tuberculosis in prisons usually exceed prevalence rates in the specific country substantially. As shown in Table 5, tuberculosis

Table 3. Characteristics of the five tuberculosis cases.					
Tuberculosis cases	Age	Gender	Radiological finding	Sputum smear*	Sputum culture**
Case 1	23	Male	Apical infiltration	Positive	Positive
Case 2	21	Male	Apical infiltration	Positive	Positive
Case 3	57	Male	Apical infiltration	Positive	Positive
Case 4	29	Male	Apical infiltration	Positive	Positive
Case 5	29	Male	Parenchymal infiltration	Positive	Positive

  * Microscopic sputum smear examination for acid-fast bacilli (AFB) was performed after Ziehl-Neelsen staining.
** Sputum samples were cultured on Löwenstein-Jensen medium for *Mycobacterium tuberculosis*.

Table 4. Findings of the prisons.

	Screened prisoners n (%)	Radiological abnormalities n	Tuberculosis found n (%)
Prison-1	342 (7.4)	5	0
Prison-2	240 (5.2)	5	0
Prison-3	47 (1.0)	0	0
Prison-4	398 (8.6)	3	0
Prison-5	242 (5.2)	2	0
Prison-6	642 (13.9)	14	0
Prison-7	1043 (23.1)	33	**5 (0.018)**
Prison-8	598 (13.0)	28	0
Prison-9	944 (20.5)	36	0
Prison-10	119 (2.6)	4	0
Total (n)	**4615**	**130**	**5**

Table 5. Prison case notification rates compared to country tuberculosis prevalence, in selected countries (3).

Country	Country prevalence rate (number per 100.000 per year)	Prison case notification rate (number per 100.000 per year)
Prison notification rates found through passive case finding		
France[7]	10.3	41.3
Spain[15]	18.2	2283.0
Azerbaijan[3]	94.2	4667.0
Moldova[3]	149.0	2640.0
Russia[16]	109.0	7000 (Tomsk)
Thailand[17]	208.0	1226.0
Brazil[18]	77.0	1439.0 (Rio de Jeneiro)
USA[19]	10.4	156.0 (New York)
Prison prevalence rates found through active case finding		
Georgia[9]	34.3	5995
Malawia[20]	209.0	5100
Russian Federation[21]	240.0	9930
Brazil[22]	10.4	3532

rates of over 3000 per 100.000, as compared to the general population, are not unusual (3).

There are only two studies about prevalence of tuberculosis in prisons in Turkey (12,13). Kiter and colleagues obtained data from a systematic annual tuberculosis screening programme undertaken in Nazilli District Prison between 1997 and 2001, and found that the mean point prevalence of tuberculosis in prisons was 341 per 100.000 prisoners (12). Elbek and colleagues screened the 757 microfilms of 763 prisoners in Gaziantep E-type petientiary to investigate the prevalence of tuberculosis in prisons in Turkey, they found twenty cases who were suggested to have sequelae or active pulmonary tuberculosis on microfilm findings and were referred to Gaziantep dispensary for detailed examination for tuberculosis, but Elbek and colleagues didn't complete their study as most of the prisoners, including the 20 suspected cases, were discharged following new legislation (13).

Risk factors for tuberculosis transmission in prisons include overcrowding, inadequate ventilation, poor hygiene, poor health services, poor nutrition, poor

physical condition, drug addiction and presence of other diseases (4,5,12). One of the results of our study was that all active tuberculosis cases were belonging to the same prison (Prison 7) which was the biggest and the most crowded of all. Prison-7 that was built on system of wards with 50 or more prisoners in each ward. After this result, the conditions of Prison-7 were renovated, and type of Prison-7 was changed from ward type to the another type that was built on a system of cells constructed for one or three people.

Case finding and treatment of tuberculosis disease are currently the principal means of controlling transmission and reducing incidence (23). Case-finding strategies for tuberculosis can be divided into two: first, passive case finding (PCF) strategy is defined as detecting active tuberculosis disease among symptomatic patients who present to medical services for diagnosis of symptoms; second, active case finding (ACF) strategy is defined as detecting the people with tuberculosis who have not applied to a diagnostic service by themselves (23). PCF is widely used in developing countries based on the recommendation of World Health Organization (WHO) (24). Despite, ACF strategies are more costly due to need of manpower and budget, they have ability to find a large number of tuberculosis cases. As is seen in publications, targeted ACF has been effective for prisons, homeless and nursing homes (23). A combination of questionnaires and radiography is also suggested (2). In our study, we found that the most common radiological abnormalities among prisoners is apical infiltration (in 46 of 4615; 0.1%), also apical infiltration is present in 4 (80%) of five prisoners with diagnosed active tuberculosis. Similar with our result, Elbek and colleagues reported that the apical infiltration is the most common radiological abnormality among prisoners (in 16 of 757; 2.1%) in Gaziantep E type penitentiary (13).

Tuberculosis screening activities are not systematically performed in all Turkish prisons. With our study, there have been only three published papers that reported the prevalence of tuberculosis among prisoners in Turkey. We strongly recommend that targeted ACF screening protocols should be routinely performed for all prisons in Turkey.

Our study had several limitations: lack of incidence of extrapulmonary tuberculosis cases, and lack of the ratio of demographic and clinical characteristics, due to loss of the most of the files; it would be better to give the results of tuberculosis treatment of inmates with diagnosed active tuberculosis.

In conclusion, prisons are one of the most important risk groups with high burden of tuberculosis in Turkey.

Results of our study highlights the need for adequate case-finding strategies in prisons. We strongly recommend that targeted ACF screening protocols should be routinely performed for all prisons in Turkey. The collaboration between different ministries and tuberculosis dispenseries is essential for application and success of such protocols for tuberculosis control in prisons.

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CONFLICT of INTEREST

None declared.

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