

Tuberculosis in the Prisons in the Republic of Macedonia, 2008-2017

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Abstract

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BACKGROUND: Tuberculosis (TB) is a major health problem in penitentiary institutions (prisons), and its prevalence was reported to be multiple times higher compared to that of the general population. Conditions such as overcrowding, malnutrition and limited access to medical care which often exist in prisons increase the risk of reactivation, transmission and poor prognosis of tuberculosis disease among inmates.

AIM: The main objective of this study was to present the epidemiological situation of TB in the prisons from 2008 till 2017 in the Republic of Macedonia (RM).

PATIENTS AND METHODS: There are 13 different penitentiary institutions in the RM with a total capacity to house 2600 prisons inmates. Management of TB in the prisons is part of the National TB program in RM, and the Institute for Lung Diseases and Tuberculosis in Skopje is in charge of it. All prisoners with TB in the RM are registered in the Central Register for TB within this Institute. We use the data from the Central Register, and with the method of description, we present the epidemiological data and clinical characteristics of the prisoners about TB in prisons in RM for 10 years' period.

RESULTS: From 2008 till 2017 there were 58 TB cases registered in prisons in total. The absolute number of TB cases in the prisons is not big, but the incidence rate is higher than 100/100,000 population, or several times bigger than in the general population (except in 2012 and 2016). In 2017 there were 10 TB cases registered in the prisons with an incidence rate of 323.9/100,000 population which is many times higher than in the general population in RM. The majority of inmates with TB were young men with risk factors for TB infection or TB disease before incarceration such as drug abuse, alcohol, smoking, but there was no association with HIV infection. The most of the patients diagnosed in prison were new cases (54), secondary TB due to reactivation from the latent TB infection or secondary TB due to the environment. From 2008-2017 there were 82.75% successfully treated TB cases in the prisons, and there were no cases of multi-drug resistant tuberculosis (MDR-TB).

CONCLUSION: The results from our study showed that the TB control in the prisons in RM is good with satisfactory treatment outcome. On the other hand, the high incidence rate showed that the prisons in RM provide conditions for TB transmission and with other additional risk factors present place for high TB prevalence. The study findings can be used for planning more effective TB control interventions for the prison population in RM.

Introduction

According to the World Health Organization (WHO), the prevalence of tuberculosis (TB) in prisons is very high, accounting for up to 25% of the TB burden in high-incidence countries, and is reported to be 10- to 100-fold higher than in the general population, in both low- and high-incidence countries [1]. In prisons located within developing countries, TB has been reported as the most common cause of death [2]. Conditions such as overcrowding, malnutrition and limited access to medical care which often exist in prisons increase the risk of reactivation, transmission and poor prognosis of tuberculosis disease among inmates [3] [4]. These factors could contribute to prisons to act as reservoirs of infection

transmission [5]. Prisoners are overwhelmingly male, are typically aged 15–45 years, and come predominantly from poorly educated and socioeconomically deprived sectors of the population where TB infection and transmission are higher. Offenders often belong to minority or migrant groups and live on the margins of society. Prisoners are also more likely to suffer from other debilitating diseases and have additional health problems such as drug addiction, alcoholism and liver disease [6]. Prison health services are often minimal or nonexistent due to insufficient funding, and in many cases lack human rights. Prisoners are often admitted to cells without being given a health check and are mixed in confined settings ideal for the spread of disease [6]. Moreover, prisons represent a reservoir for disease transmission to the community at large; the TB infection may

spread into the general population through prison staff, visitors, and close contacts of released prisoners [7]. Overlooking TB prevention and control in prisons settings can carry serious consequences for both prisoners and the general community, in particular in those countries where poor TB control, lack of TB infection control measures, and incarceration rates are high [2].

In 2017, there were 220 new TB cases in the Republic of Macedonia (RM) with an incidence rate of 10.6/100,000 population [8]. We have reported continual decreasing of the TB incidence rate from 2002 till now [8]. But, prisoners are still high-risk groups with incidence rate several times higher than those in the general population [8]. An absolute level of TB prevalence or incidence may be used as a cut-off to define a risk group in a given epidemiological situation. For example, in Europe, where TB notification often is a good estimate of TB incidence, risk groups have been defined as those in which TB notification is more than 100/100,000 population, which is considerably higher than the incidence in the general population in the region [9].

The main objective of this study was to present the epidemiological situation of TB in the prisons from 2008 to 2017 in the RM.

Patients and Methods

All prisoners with TB in the RM are registered in the Central Register for TB within the Institute for lung diseases, and TB and all data regarding their diseases are kept there. For the aims of this study we use the data from the Central Register, and with the method of description, we present the epidemiological data and clinical characteristics of the prisoners regarding TB within the prisons in RM for 10 years' period. The analyses of the clinical characteristics are regard to the gender and age of the prisoners, present risk factors for TB, HIV status, and data of the previous TB treatment, localisation of the TB, bacteriological findings and treatment outcome.

Results

In Figure 1 we present the epidemiological data regarding the absolute number of TB cases in the prisons, the incidence rate of TB in the prisons and the incidence rate among the general population. During this 10 years' period, there were 58 TB cases within prisons in total. The absolute number of TB cases in the prisons is not big, but the incidence rate in the most of years is higher than 100/100,000

population, or several times bigger than in the general population (except in the 2012 and 2016). In 2017, there were 10 TB cases registered in prisons with an incidence rate of 323.9/100,000 population. In comparison, the incidence rate in the general population in RM was 10.6/100,000. There are a lot of variations during this period, but the prisoners belong to the risk group of TB in RM.

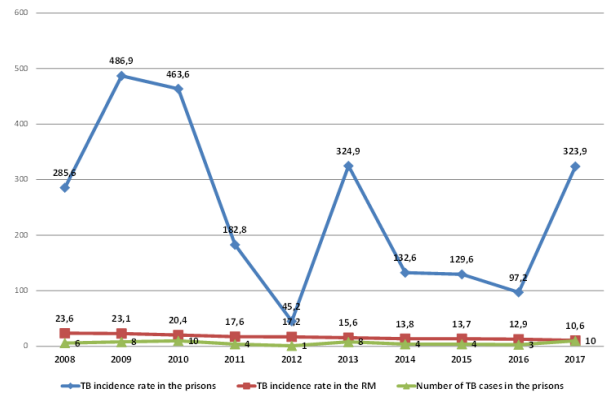


Figure 1: The absolute number of TB cases, TB incidence rate within prisons and the incidence rate among the general population

There was great variability among the prisons: the highest TB prevalence was observed in prison "Idrizovo" in Skopje which is the biggest prison in the country: 40 TB cases were from the prison "Idrizovo" in Skopje (68.95%), followed by prison "Skopje" in Skopje with 7 TB cases (12.06%) and 11 TB cases were from the other prisons (18.96%).

Among the total number of 58 prisoners with TB, 57 were male (98.2%), and only 1 case (1.72%) was a female.

Considering the most of TB cases were new-54, and only 4 were previously treated cases: 2 failures, 1 relapse and 1 after interruption of the treatment.

HIV testing had only 24 TB cases in the prisons, and all results were negative.

The youngest prisoner with TB was 20, and the oldest was 59 years old. In table 1, the distribution of the TB cases according to the age groups was presented. The most frequent were young cases between 25-34 years old (47.3%). 88.6% of prisoners are in their productive age group, from 25 to 54.

Table 1: Distribution of TB cases in prisons according to the age groups

Age groups	15-24	25-34	35-44	45-54	55-64	Total
Number	5	27	17	7	2	58
%	8.6	47.3	29.3	12.0	3.4	100.00%

The analysis showed that many of the prisoners were from population groups already at high risk of TB infection and TB disease before incarceration (Table 2).

Table 2: Risk factors present in TB cases before incarceration

Risk factors	Drug users	Drug users&smoking	Drug users&smoking&alcohol	Smoking&alcohol	Smoking	Risk factors -total
Number	5	12	3	3	14	37
%	8.62	20.68	5.17	5.17	24.13	63.79

Forty cases (70.6%) in the prisons were with pulmonary TB (PTB), 7 cases were with both localisation: PTB and extra PTB (EPTB) which means that the total number of cases with PTB was 47 (80.9%) - Table 3. Among the 11 cases with EPTB, 6 were with TB pleurisy, 2 with skin Tthe B, 1 with lymph node TB, 1 with urogenital TB and 1 with TB meningitis. EPTB among all 6 cases with PTB/EPTB were TB pleurisy.

Table 3: Localisation of TB among TB cases in the prisons

Localisation of TB	Number	%
PTB	41	70.6
PTB/EPTB	6	10.3
EPTB	11	18.9

The results from bacteriological examinations in the sputum at the time of diagnosis were as it follows: microscopy the positive (M+) were 30 TB cases, and microscopy negative (M-) was 28; culture positive (C+) were 44 and culture negative (C-) were 14. Bacteriological findings in the sputum are presented in Table 4.

Table 4: Bacteriological findings in the sputum of 58 TB cases in the prisons

Bacteriological findings	M+/C+	M+/C-	M-/C+	M-/C-
Number	29	1	15	13
%	50	1.72	25.86	22.41

The bacteriological analyses in the sputum in all 11 cases with EPTB were M- and C-. In 3 cases out of total 6 cases with TB pleurisy, there were M-, C- and GeneXpert- results in the pleural fluid. Among the other 3 cases, the results were: in the pleural fluid from one case M-, C-, GeneXpert +, in the other one M-, C+, GeneXpert-, and in the third M, C and Gene Xpert were + simultaneously. The patient with TB meningitis had negative bacteriological findings (M-/C-) in the cerebrospinal fluid.

Regarding the resistance of *Mycobacterium tuberculosis*, there were no cases with MDR-TB. In one case there was resistance to 1 drug, in another one resistance to 2 drugs and the third, there was resistance to 3 drugs (Table 5).

Table 5: Resistance to *Mycobacterium tuberculosis*

Resistance to <i>Mycobacterium tuberculosis</i>	Number of TB cases
Ethambutol	1
Streptomycin and Isoniazid	1
Streptomycin, Ethambutol and Rifampicin	1

The treatment outcome in the prisons is presented in Table 6: 17 TB cases (29.31%) were cured, and 31 (53.44%) completed the treatment, which means there were high rates of successfully

treated TB cases: 48 (82.75%).

Table 6: Treatment outcome of TB cases within prisons, 2008-2017

Treatment outcomes	Number of TB cases	%
Cured	17	29.31
Treatment completed	31	53.44
Treatment interrupted	5	8.62
Loss of evidence	2	3.44
Died	1	1.72
Still on treatment	2	3.44

Discussion

All prisons in the Republic of Macedonia are under control by the Ministry of Justice - Administration for sanctioning and all procedures are regulated by the Law on the execution of sanctions. There are 13 different facilities in the different cities within the whole country: 9 prisons, 3 penitentiary homes and 1 correctional home with a total capacity to house 2,600 prisons inmates. According to the rights of the prisoners, the prisons in the RM are divided into three different types: closed type, semi-open and open type. There are possibilities for transferring the prisoners from one to another facility which is an important moment, especially in the case when the prisoner is a TB patient. Compulsory medical services are in function within all prisons. The prisoners have access to medical services all the time while their stay in the prisons. Management of TB in prisons is part of the National TB program in RM, and the Institute for Lung Diseases and Tuberculosis in Skopje is in charge of it. The "Protocol for Tuberculosis Control within Prisons in the Republic of Macedonia" is applied where the written rules for diagnosis, treatment and follow-up of the TB in the prisons exist.

Regarding the diagnosis of TB, there is a possibility for active screening and passive case findings. For active screening there are the following: at time of entry in prisons screening for TB is done with a questionnaire for TB symptoms and chest X-ray; once a year there is a screening with fluorography which is performed in all prisons, and also the questionnaire for symptoms is filled out by the prisoners, also on annual basis. With the passive case findings, every prisoner who is suspected for TB is sent for a check-up to a hospital or dispensary for lung diseases and tuberculosis. When the diagnosis of TB is confirmed, TB cases are hospitalised in a separate hospital department for prisoners located close to the Institute for lung diseases and TB where the TB cases stay and will be treated during the initial phase of treatment. After the initial phase of treatment, or after the bacteriological conversion in the sputum, the prisoners will be brought back in the prisons and will continue with the continuous phase of treatment.

During this phase, all controls are performed in the hospitals or dispensaries. The "Protocol for the Control of TB within Prisons in the Republic of Macedonia" is accepted by the Ministry of Justice and the Institute for Lung Diseases and Tuberculosis.

Even there is continuous decreasing of TB cases among the general population in the RM from 2002 till 2017, there are still few risk groups, like prisoners where the incidence rate is several times higher than in the general population or is above 100/100,000 population [8]. The analyses showed that the majority of prisoners with TB were young men with risk factors for TB infection or TB disease before incarceration. The highest prevalence of TB cases was detected in the prison of "Idrizovo", which is the biggest prison in RM where the buildings are very old and run down to stay in. According to the "Protocol for TB Control within Prisons in the Republic of Macedonia" the prisoners should pass at time of entry in prisons screening for TB with a questionnaire for TB symptoms and chest X-ray, but usually they filled out the questionnaire only. The most TB cases are detected with annual fluorography performed, or by passive finding through the medical service in the prisons. The results have shown that the majority of detected TB cases are newly registered cases which mean reactivation from the latent TB infection or new infection from the surrounding; only 4 cases had the history of the previous TB. We have found that drug use, alcohol, and smoking were strongly associated with TB in prisoners. But, there was no association of TB and HIV infection in the prisons.

On the other hand, all detected TB cases in the prisons within the RM were regularly treated with standard TB regime, and they were followed in a regular way and treated successfully which is in concordance with good treatment results in all TB cases within prisons from 2008-2017. There were 82.75% successfully treated TB cases, and there were no registered MDR-TB cases. There is satisfactory cooperation between the medical service in the prisons and the hospitals and the dispensary for lung diseases and TB. The National TB program in RM is aware of all the weaknesses and challenges in the management of TB within prisons and of the consequences that might be a result of the TB control within the community.

According to the data from the literature, TB in prisons is a big problem worldwide: In European prisons, the prevalence of TB is estimated to be up to 17 times higher than in the general population [10]. A similar epidemiological situation has been described in low- and middle-income countries including Bangladesh, Thailand, Ethiopia, and Brazil, where TB prevalence has been reported to be almost four-, eight-, seven-, and 64-times higher, respectively, among prisoners, compared to the general population [11] [12] [13] [14] [15]. In this study we did not report any case with TB/HIV co-infection in contrast with other study where HIV prevalence increased from 20%

at entry to 34% at the exit, suggesting possible disease transmission within the prison [16]. The death rate in the prisons in RM is very low, in comparison with the data from the literature where deaths due to TB are between 9 to 18 % of total deaths [17]. High levels of MDR-TB have been reported from some prisons with up to 24% of TB cases suffering from MDR forms of the disease. In the systematic review by Dara et. al, the main challenges in regard to TB control in the prisons are lack of well organized health services, quality of bacteriological services, the high turnover of the prison population between prisons and to the wider community, collaborative TB/HIV activities, political commitment [18]. In a systemic review done by Vinkeles Melchers et al. and Abrahão et al. was found that approximately 21% of all studies reporting on TB screening in prisons described the lack of a well-organized health system [19], potentially leading to the ongoing spread of TB to other prisoners, prison staff, visitors, and to the general population upon release from the prison [20]. Data from a systematic review identified that 31.2% of studies struggled with effective TB control due to loss to follow-up and a high turnover of prisoners [19].

Consequently, difficulties may be encountered in diagnosing and treating TB, leading to the further spread of infection to other inmates, prison staff, and visitors [20]. In light of the challenge of overcrowding associated with increased rates of TB in both the prison and community setting, TB infection control is a fundamental element for improved TB control [21] [22]. Globally, WHO and The International Union Against Tuberculosis and Lung Disease have recommended education on early identification of TB and early case management, screening of all inmates to prevent infection transmission, isolation of infected person (known TB patients), the right of inmates to access medical services, and to integrate TB services within prisons with the national tuberculosis programmes [9] [23]. The implementation of these measures is, however often hampered by resource constraints specific to the prison setting. Prison health services often have small budgets [24] which, in addition to the lack of skilled and motivated workforce, may jeopardise successful TB control programmes in prisons [11] [15].

In conclusion, globally there is a great concern to address TB in prisons and strategies propose directly establishing a system for early identification through a process of entry and on regular intervals. Every successful TB control program also requires effective TB control in prisons and failure to control TB in prisons has the potential to disrupt community TB control programs [25]. The requirements for enhanced TB control in prisons are good governance, clear strategies to diagnose and treat TB patients, adherence to internationally established IC policies, and the performance of cost-effectiveness analyses to evaluate screening procedures and other control strategies. The results

from our study showed that the TB control in the prisons in RM is good with satisfactory treatment outcome. On the other hand, the high incidence rate showed that the prisons in RM provide conditions for TB transmission and with other additional risk factors present place for high TB prevalence. The study findings can be used for planning more effective TB control interventions for the prison population in RM.

References

- World Health Organization. Tuberculosis in prisons. Geneva, Switzerland: WHO. http://www.who.int/tb/challenges/prisons/story_1/en/index.html Accessed February 2011.
- Reyes H, Coninx R. Pitfalls of tuberculosis programmes in prisons. *BMJ*. 1997; 315:1447–1450. <https://doi.org/10.1136/bmj.315.7120.1447> PMID:9418098 PMID:PMC2127886
- Habeenzu C, Mitarai S, Lubasi D, Mudenda V, Kantenga T, Mwansa J, et al. Tuberculosis and multidrug resistance in Zambian prisons, 2000–2001. *Int J Tuberc Lung Dis*. 2007; 11:1216–1220. PMID:17958984
- Baussano I, Williams BG, Nunn P, Beggiato M, Fedeli U, Scano F. Tuberculosis Incidence in Prisons: A Systematic Review. *PLoS Med*. 2010; 7(12):e1000381. <https://doi.org/10.1371/journal.pmed.1000381> PMID:21203587 PMID:PMC3006353
- Sacchi FPC, Praca RM, Tatará MB, Simosen V, Ferrazoli L, Croda MG. Prisons as reservoir for community transmission of tuberculosis, Brazil. *Emerg Infect Dis*. 2015; 21:452–5. <https://doi.org/10.3201/eid2103.140896> PMID:25642998 PMID:PMC4344267
- Tuberculosis in prisons: a growing public health challenge. USAID, 2013.
- Niveau G. Prevention of infectious disease transmission in correctional settings: a review. *Public Health*. 2006; 120:33–41. <https://doi.org/10.1016/j.puhe.2005.03.017> PMID:16129465
- Central Register for tuberculosis. Institute for lung diseases and tuberculosis, Macedonia.
- Systematic Screening for Active Tuberculosis: Principles and Recommendations. Geneva: World Health Organization. 2, Definition of screening for active TB in risk groups, 2013.
- Aerts A, Hauer B, Wanlin M, Veen J. Tuberculosis and tuberculosis control in European prisons. *Int J Tuberc Lung Dis*. 2006; 10:1215–1223. PMID:17131779
- Jittimane S, Ngamtrairai N, White MC, Jittimane S. A prevalence survey for smear-positive tuberculosis in Thai prisons. *Int J Tuberc Lung Dis*. 2007; 11:556–561. PMID:17439681
- Chiang CY, Hsu CJ, Hsu PK, Suo J, Lin TP. Pulmonary tuberculosis in the Taiwanese prison population. *J Formos Med Assoc*. 2002; 101:537–541. PMID:12440082
- Banu S, Hossain A, Uddin MK, Uddin MR, Ahmed T, Khatun R, et al. Pulmonary tuberculosis and drug resistance in Dhaka central jail, the largest prison in Bangladesh. *PLoS One*. 2010; 5:e10759. <https://doi.org/10.1371/journal.pone.0010759> PMID:20505826 PMID:PMC2874010
- United Nations. Millennium Development Goals Indicators. The official United Nations site for the MDG Indicators. Available at: <http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=617> (accessed June 11, 2014).
- Abebe D.S, Bjune G, Ameni G, Biffa D, Abebe F. Prevalence of pulmonary tuberculosis and associated risk factors in Eastern Ethiopian prisons. *Int J Tuberc Lung Dis*. 2011; 15:668–673. <https://doi.org/10.5588/ijtld.10.0363> PMID:21756520
- Henostroza G, Topp SM, Hatwinda S, Maggard KR, Phiri W, Harris J B, Krüüner A, Kapata N, Ayles H, Chileshe C, Reid SE. The High Burden of Tuberculosis (TB) and Human Immunodeficiency Virus (HIV) in a Large Zambian Prison: A Public Health Alert. *Plos*. 2013; 2013. PMID:PMC3743881
- Bellad AA, Naik VA, Mallapur VD. Morbidity Pattern Among Prisoners of Central Jail, Hindalga, Belgaum Karnataka. *Indian J Community Med*. 2007; 32:307. <https://doi.org/10.4103/0970-0218.37707>
- Dara M, Chadha SS, Vinkeles Melchers NV, et al. Time to act to prevent and control tuberculosis among inmates. *Int J Tuberc Lung Dis*. 2013; 17:4–5. <https://doi.org/10.5588/ijtld.12.0909> PMID:23231999
- Vinkeles Melchers NV, van Elsland SL, Lange JM, Borgdorff MW, van den Hombergh J. State of affairs of tuberculosis in prison facilities: a systematic review of screening practices and recommendations for best TB control. *PLoS One*. 2013; 8:e53644. <https://doi.org/10.1371/journal.pone.0053644> PMID:23372662 PMID:PMC3556085
- Abrahão RM, Nogueira PA, Malucelli MI. Tuberculosis in county jail prisoners in the western sector of the city of São Paulo, Brazil. *Int J Tuberc Lung Dis*. 2006; 10:203–208. PMID:16499262
- Bick JA. Infection control in jails and prisons. *Clin Infect Dis*. 2007; 45:1047–1055. <https://doi.org/10.1086/521910> PMID:17879924
- Baussano I, Williams BG, Nunn P, Beggiato M, Fedeli U, and Scano F. Tuberculosis Incidence in Prisons: A Systematic Review. *PLoS Med*. 2010; 7(12): e1000381. <https://doi.org/10.1371/journal.pmed.1000381> PMID:21203587 PMID:PMC3006353
- United Nations Office on Drugs and Crime, WHO Europe. Good governance for prison health in the 21 st century. A policy brief on the organization of prison health. Copenhagen: WHO Regional Office for Europe, 2013.
- Sanchez A, Larouzé B, Espinola A.B, Pires J, Capone D, Gerhardt G, et al. Screening for tuberculosis on admission to highly endemic prisons? The case of Rio de Janeiro State prisons. *Int J Tuberc Lung Dis*. 2009; 13:1247–1252. PMID:19793429
- O'Grady J, Hoelscher M, Atun R, Betes M, Mwaba P, Kapata N, et al. Tuberculosis in prisons in sub-Saharan Africa - the need for improved health. *Tuberculosis*. 2011; 91(2):173–178. <https://doi.org/10.1016/j.tube.2010.12.002> PMID:21251881