

Epidemiological characteristics of the pulmonary tuberculosis's movement in the area of Central Bosnia Canton in light of DOTS strategy application

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ABSTRACT

Aim To determine the incidence of pulmonary tuberculosis in the Central Bosnia Canton (CBC) in relation to the place of residence, gender, occupation, age, as well as the effects of prevention programs implemented in terms of these infectious diseases. The purpose of this study is to highlight the growing public health problem of developing this chronic infectious disease and the importance of consistent implementation of the strategy of directly observed therapy (DOTS).

Methods This retrospective analytical research was conducted on 550 patients hospitalized during the period 2008-2012 in the Hospital for Pulmonary Diseases and Tuberculosis in Travnik. Sources of data included all reported infections, statistical ballot of patients and protocol patients treated at the Hospital for Pulmonary Diseases and Tuberculosis of Travnik, as well as the Protocol of tuberculosis patients at the CBC Department of Public Health. Data were analyzed based on gender, age, place of residence and occupation.

Results Average incidence rate of pulmonary tuberculosis was 46/100.000, with variations that ranged from 29/100.000 in the towns Novi Travnik to 86/100.000 in Fojnica. Most of the patients were males, 380 (69%). People who were most affected were younger labor force of the age group 25 to 49, 218 (40%). A significant decline in the trend rate of illness per year was recorded, from 61.81/ 100,000 in 2008, to 29.80 year/100,000 in 2012. No cases of resistance in *M. tuberculosis* were recorded.

Conclusion A consistent implementation of the DOTS strategy provides the opportunity to establish full control over this chronic infection, which is one of the most important public health problems.

Keywords: incidence, early detection, effective treatment.

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INTRODUCTION

Pulmonary tuberculosis is an illness that affects the lung parenchyma. Therefore intrathoracic tuberculosis lymphadenopathy (mediastina and / or hilar lymph nodes) or tuberculosis pleuritis without radiographic changes in the lungs are the cases of extra pulmonary tuberculosis. A patient who has both pulmonary and extra pulmonary tuberculosis (TB), will be classified as a case of pulmonary TB (1). Germs that cause tuberculosis belong to the *Mycobacterium tuberculosis* complex. These organisms include *Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*, *Mycobacterium microti*, and *Mycobacterium canettii* (2,3).

Tuberculosis is primarily a disease that is transmitted directly through inhalation of droplets which contain 1-3 bacilli. Through coughing, people expectorate over 3000 droplets, and sneezing creates about a million droplets. In a cavern, which has 2 cm in diameter, more than 100 million germs can exist. Patients who excrete pathogens in sputum (over 50 000 bacilli in 1 ml) are far more contagious, because they excrete more agents than those who are positive only in culture (less than 1000 germs per 1 ml) (4-6).

Tuberculosis is the most common infectious disease in the world, the disease that takes 3 million lives a year, a disease that is as old as mankind, and finally, a disease whose incidence has recently increased by 20% despite modern medicine and science (7-9). Every year tuberculosis infects 1% of the world population, and 8 million develop active disease. At the time when the cause of tuberculosis was discovered in 1882, every seventh citizen was infected, and today it is every third inhabitant (about two billion people). Only 1-5% of the infected will develop the disease within one to two years (10).

Alarming data on tuberculosis, at the global

level have led to the creation of a strategy to combat tuberculosis, which is called DOTS (Directly Observed Therapy Short Course), by the World Health Organization (11). National Program (NTP) for tuberculosis in Bosnia and Herzegovina, which was introduced in 1994, revised in 1996, in 1998 included the application of the DOTS strategy in our country (1,7). The ultimate objectives of NTP are to decrease mortality, morbidity and transmission of the disease, and to prevent the development of drug resistance. Objectives to increase the capacity to detect cases of tuberculosis, ensure access to this program, especially for the vulnerable groups, maintaining control of drug resistance through early detection, and treatment of new cases, were effective and appropriate treatments of cases of drug resistance, adopting a new strategy to stop TB and strengthen DOTS throughout the country.

The aim of this work was to determine the incidence of pulmonary tuberculosis in the area of Central Bosnia Canton (SBK), in relation to the place of residence, gender, occupation, age, as well as, to analyze the effects of prevention programs implemented in terms of this infectious disease. The purpose of this study is to highlight the growing public health problem of the development of this chronic infectious disease and the importance of consistent implementation of the DOTS strategy.

PATIENTS AND METHODS

A retrospective analytical method was used. The analysis refers to the 250,000 residents of central cantons, divided into 11 districts, which incline towards the Hospital for Treatment for Lung Diseases and Tuberculosis in Travnik. The study sample included 550 new cases of pulmonary tuberculosis patients in the period 2008- 2012. Patients were analyzed based on their gender, age, place of residence and occupation.

Table 1. Number of pulmonary tuberculosis cases by municipalities in Central Bosnia Canton period in the period 2008-2012

Year	No (%) of cases										
	Travnik	Donji Vakuf	Jajce	Vitez	Busovača	Novi Travnik	Kreševo	Bugojno	Gornji Vakuf	Kiseljak	Fojnica
2008	37 (31.3)	11 (28.9)	19 (34.5)	11 (28.2)	7 (23.3)	7 (21.8)	8 (50.0)	25 (30.1)	16 (39.0)	11 (21.5)	5 (10.6)
2009	17 (14.4)	9 (23.6)	20 (36.6)	9 (23.0)	6 (20.0)	8 (25.0)	5 (31.2)	16 (19.2)	5 (12.1)	10 (19.6)	8 (17.0)
2010	32 (27.1)	8 (21.0)	9 (16.3)	7 (17.9)	5 (16.6)	9 (28.1)	2 (12.5)	13 (15.6)	6 (14.6)	14 (27.4)	13 (27.6)
2011	13 (11.0)	4 (10.5)	3 (5.4)	9 (23.0)	7 (23.3)	4 (12.5)	0	14 (16.8)	8 (19.5)	9 (17.6)	15 (31.9)
2012	19 (16.1)	6 (15.7)	4 (7.2)	3 (7.6)	5 (16.6)	4 (12.5)	1 (6.2)	15 (18.0)	6 (14.6)	7 (13.7)	6 (12.7)
Total	118 (100)	38 (100)	55 (100)	39 (100)	30 (100)	32 (100)	16 (100)	83 (100)	41 (100)	51 (100)	47 (100)

Sources of data included all registrations of the infectious disease, statistical ballot of patients and protocol for patients treated at the Hospital for Pulmonary Diseases and Tuberculosis of Travnik, as well as the record of tuberculosis patients at the Department of Public Health SBK. Inclusion criteria were tuberculosis in a patient with at least two initial sputum microbiological examination (direct microscopy) positive for acid fast bacilli or tuberculosis in a patient with one sputum examination positive in direct microscopy and radiographic changes indicating active pulmonary tuberculosis, according to the ordering physician or tuberculosis in a patient with one sputum specimen positive in direct microscopy positive for acid fast bacilli culture.

DOTS includes five components as specific priorities identified by the National Program for Tuberculosis: sustained political support, provided access to quality sputum microscopy, standardized depleting chemotherapy for all patients suffering from TB in terms of proper care of patients, including taking the therapy under direct supervision, regular supply of quality-medication, and monitoring and reporting system that allows assessment of treatment outcomes for all patients and to evaluate the success of application programs (7).

RESULTS

The analysis of reported cases of pulmonary tuberculosis at the Department of Public Health SBK/KSB for the period since 2008 - 2012 showed that during this period 550 cases of newly infected patients with tuberculosis were registered, e.g. yearly average of 110 new cases. Number of new cases dropped down from 157 in 2008 (with incidence of 61.81/100,000) to 76 (and incidence of 29/100.000) in 2012 (Figure 1).

The largest number of patients registered was in the municipality of Travnik (118), then Bu-

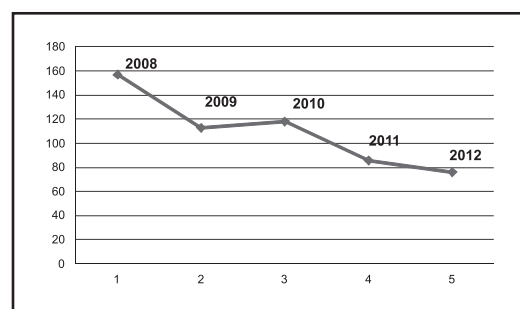


Figure 1. The number of cases of pulmonary tuberculosis in the period 2008-2011

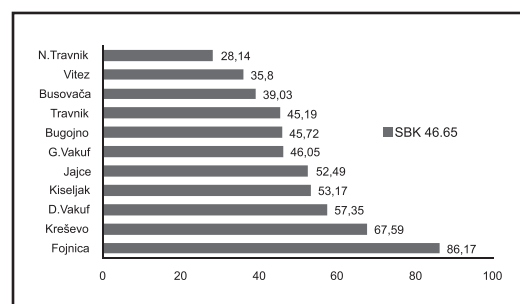


Figure 2. The average annual incidence rate in the municipalities of Central Bosnia Canton in the period 2008-2012

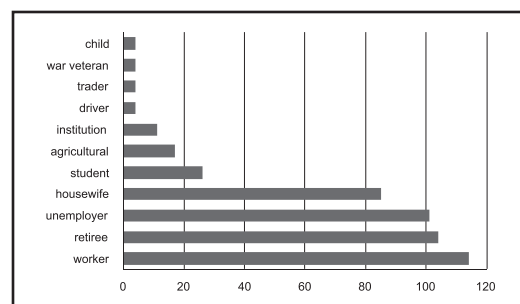


Figure 3. Patients with pulmonary tuberculosis in relation to occupation

gojno (83) and Jajce (55), while in Kreševo only 16 patients in the five-year period were registered (Table 1).

During this period the average incidence rate of pulmonary tuberculosis in the area of Central Bosnia Canton was 46/100,000, with variations that ranged from 29/100,000 in Novi Travnik to 86/100,000 in Fojnica (Figure 2). Males were more likely infected than females, in 380 (69%) and 170 (31%) cases, respectively. The largest number of infected males was registered during 2008, 110 cases (Table 2).

Most affected age group was the group 25-49, 218 (40%). Although rare, there were some cases of affected children younger than 15 years, in seven cases, of which two children were under seven years of age (Table 3).

Following the occurrence of pulmonary tuber-

Table 2. Patients with pulmonary tuberculosis according to gender

Year	No (%) of cases	
	Males	Females
2008	110 (70)	47 (30)
2009	82 (72)	31 (28)
2010	76 (64)	42 (36)
2011	58 (67)	28 (33)
2012	54 (71)	22 (29)
Total	380 (69)	170 (31)

Table 3. Patients from pulmonary tuberculosis in relation to age

Age	No (%) of cases					Total
	2008	2009	2010	2011	2012	
0-7	1 (0.1)	0(0)	0(0)	0(0)	1 (0.1)	2 (0.3)
8-14	0(0)	0(0)	3 (0.5)	1 (0.1)	1 (0.1)	5 (0.9)
15-24	9 (1.6)	15 (2.7)	19 (3.4)	9 (1.6)	8 (1.4)	60 (10.9)
25-49	64 (11.6)	49(8.9)	35 (6.3)	40 (7.2)	30 (5.4)	218 (39.6)
50-64	39 (7.0)	24 (4.3)	36 (6.5)	28 (5.0)	20 (3.6)	147 (26.7)
65 and older	44 (8.0)	25 (4.5)	25 (4.5)	8 (1,4)	16 (2.9)	118 (21.4)
Total	157 (28.5)	113 (20.5)	118 (21.4)	86 (15.6)	76 (13.8)	550 (100)

culosis in relation to the people's profession it was observed that majority of the patients were employed, 132 (24%), unemployed 121 (22%) and pensioners 121 (22%) (Figure 3). During the period there were no reported cases of pathogen resistance to antituberculous therapy. However, in this period there were 18 registered deaths from this disease. (mortality rate 32/1000 patients). Also, in the period there were not registered cases of the diseases such as pulmonary tuberculosis in HIV infected patients.

DISCUSSION

In developed countries the downward trend of TB disease was stopped in the 80-ies of the last century, since the increased number of cases was noticed (11). The reason for this is probably large immigration from areas with a high incidence of tuberculosis, a high incidence of HIV infection in some urban areas, and a large number of drug addicts and the homeless (11,12). In the WHO European Region there are more people in young and mature period of life dying from tuberculosis than from any other infectious disease. In Western countries, the incidence of TB is less than 10/100,000 and it does not represent a health problem. Given incidence is also the goal that was set by the WHO European Office (11,12). In the period 2005-2010, in Europe, there was a trend of a decreasing number of cases of tuberculosis, with 40 to 34 cases per 100 000 inhabitants. However, reported rate of infection among 18 countries of Central and Eastern Europe is nearly eight times higher (69/100,000 population) than in the rest of the region (10/100,000 population). Almost 75% of new cases in Europe are from Romania, Russia, Kazakhstan and Ukraine (12).

Pulmonary tuberculosis in BiH still has a high incidence compared to more developed countries such as the Scandinavian countries

(4-10/100,000) and most Western European countries (10-20/100,000) (15). In 2000 the incidence in BiH was 65.6/100,000. Starting from 2001 BiH was accepted and included in the program for tuberculosis surveillance in Europe, Euro-TB. (7). A national strategy was developed and a significant decrease in the incidence of tuberculosis has been registered, so in 2010 the incidence was 50/100,000 and in 2011 the 49/100,000. In the same period, the prevalence of 60 patients in the total population of Bosnia and Herzegovina were registered (15). In the period from 1996-2011, in the Federation of Bosnia and Herzegovina, the rate of infection with tuberculosis was ranged 91-44 per 100,000 patient population (13).

In the Federation of Bosnia and Herzegovina in 2008 there were 1150 registered cases of localized tuberculosis, of which pulmonary localization was represented with 87%, while extrapulmonary localization was 7% . The largest number of reported cases was in Tuzla Canton (382), and then in the Zenica-Doboj Canton (310), while in the Central Bosnia Canton there were 157 cases (14).

In 2011, tuberculosis still was ranked on the fifth place among the top ten infectious diseases in the Federation, with morbidity of 36.86/100,000 population, but with a lower rate of illness compared to 2010 (41.32/100,000 patients). The most vulnerable age group of TB patients were people older than 64, and males (15).

According to a report on the health status of the population Federation in 2011 the highest mortality was recorded in the Tuzla Canton (58.49/100,000), and the lowest in the Livno Canton (6.25 / 100,000) (16). Our research showed that in the area of Central Bosnia Canton in 2012, the morbidity rate was reduced to 29/100.000 from 61.4 as it was noted in 2008. High rates of the disease in the municipality Fojnica (86/100.000) are in connection with residents of institutions for care of mentally

disabled persons “Drin” and “Bakovići”.

Active surveillance of tuberculosis (in mid 2011) was established through Tuberculosis Control Unit (NTP) within the project of Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). Further strengthening of DOTS strategy in Bosnia and promotion plan, including the fight against TB, MDR-TB and infection control is expected to result in sustained decline in morbidity. By reducing the number of patients to ten patients per hundred thousand inhabitants, TB ceases to be a

public health problem. Despite the significant effects of the measures implemented to date as shown in this research, a very considerable period of activity in the direction of achieving the set target is imminent.

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TRANSPARENCY DECLARATIONS

Competing interests: none to declare

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Epidemiološke karakteristike kretanja plućne tuberkuloze na prostoru Srednjobosanskog kantona u svjetlu primjene strategije DOTS

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SAŽETAK

Cilj Utvrditi učestalost pojavljivanja plućne tuberkuloze na prostoru Srednjobosanskog kantona u odnosu na mjesto stanovanja, spol, zanimanje i dob, te analizirati efekte preventivnih programa koji se provode u slučaju ove zarazne bolesti. Svrha ovog ispitivanja je ukazati na rastući javnozdravstveni problem obolijevanja od ove hronične zarazne bolesti i značaj dosljedne primjene strategije direktno opservirane terapije (DOTS).

Metode Ovo retrospektivno analitičko istraživanje provedeno je na 550 ispitanika, hospitaliziranih tokom perioda od 2008. do 2012. godine u Bolnici za plućne bolesti i tuberkulozu Travnik. Izvor podataka predstavljale su prijave zaraznih bolesti, bolesničko-statistički listić, te protokol bolesnika liječenih u Bolnici za plućne bolesti i tuberkulozu Travnik, kao i knjiga oboljelih od tuberkuloze pri Zavodu za javno zdravstvo SBK-a. Podaci su analizirani u odnosu na spol, dob, mjesto stanovanja i zanimanje.

Rezultati Prosječna stopa incidencije plućne tuberkuloze iznosila je 46/100.000, s varijacijama koje su se kretale od 29/100.000 u Novom Travniku do 86/100.000 u Fojnici. Većinu su oboljelih činili muškarci, 380 (69%). Najviše je pogođeno mlađe radnoaktivno stanovništvo, dobne skupine od 25 do 49 godina, s učešćem 218 (40%). Evidentiran je trend značajnog opadanja stopa obolijevanja po godinama, i to sa 61,81/100.000 tokom 2008. godine na 29,80/100.000 u 2012. godini. Nisu zabilježeni slučajevi rezistencije *M. tuberculosis*.

Zaključak Dosljedna primjena strategije DOTS omogućava uspostavljanje pune kontrole nad ovom teškom hroničnom infekcijom koja predstavlja jedan od najznačajnijih javnozdravstvenih problema.

Ključne riječi: incidencija, rano otkrivanje, efikasni tretman.