

Distribution of *Mycobacterium tuberculosis* Strains in Kırıkkale Povince of Turkey During 1999 – 2003

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Abstract

Background: The aim of this study was to investigate the prevalence of tuberculosis disease and the distribution according to age groups in Kırıkkale using retrospective data.

Methods: The data of 33596 patients (14709 females and 18887 males), who applied to Tuberculosis Control Dispensary among 1999-2003, were investigated retrospectively.

Two hundred sixty-three patients (82 females and 181 males) were diagnosed as tuberculosis throughout this period. *M. tuberculosis* disease were significantly higher in males than in females (male /female=2).

Results: The prevalence rates of *M. tuberculosis* disease (per 100000 population) were found to be 16.3 in 1999, 11.2 in 2000'de, 15.1 in 2001, 12.4 in 2002, 13.3 in 2003. The average prevalence rate for the period 1999-2003 was calculated as 13.61. The distribution according to age groups of 263 patients were observed to be 3% in 0-10 age group, 10% in 11-20 age group, 23% in 21-30 age group, 16% in 31-40 age group, 22% in 41-50 age group, 13% in 51-60 age group, 14% for over 61 years of age.

Conclusions: The prevalence rate of tuberculosis disease in this study was found as developed countries. But tuberculosis disease prevalence was the highest among young adult age groups.

Key Words: Mycobacterium tuberculosis; epidemiology; prevalence, Turkey

1999-2003 Yılları Arasında *Mycobacterium tuberculosis* Suslarının Kırıkkale (Türkiye)'deki Dağılımı

Amaç: Tüberkülozun prevalansını yaş gruplarına göre retrospektif olarak dağılımını ortaya koymaktır.

Hastalar ve Yöntem: Verem Savaş Dispanserine 1999-2003 yılları arasında hasta olarak başvuran 33596 kişi (14709 bayan and 18887 erkek), retrospektif olarak dağılımı araştırıldı. İkiyüzaltmışüç (82 bayan and 181 erkek), bu süre içinde tüberkülozlu olarak teşhis edildi. *M. tuberculosis*'in sebep olduğu hastalığın erkeklerde kadınlardan kayda değer oranda daha fazla olduğunu tespit ettik (erkek /bayan=2).

Bulgular: *M. tuberculosis*'in sebep olduğu hastalık oranları (her yüzbin kişide) 1999'da 16.3, 2000'de 11.2, 2001'de 15.1, 2002'de 12.4, 2003'de 13.3 olarak tespit edilmiştir. Yaş gruplarına dağılımlarında 0-10 yaş grubunda %3, 11-20 yaş grubunda %10, 21-30 yaş grubunda %23, 31-40 yaş grubunda %16, 41-50 yaş grubunda %22, 51-60 yaş grubunda %13, 61 ve üstü yaş grubunda ise %14 olarak tespit edilmiştir.

Sonuçlar: Bu çalışmada Tüberkülozun prevalans oranları gelişmekte olan ülkelerdeki oranlar gibi bulunmuştur. Fakat Tüberküloz hastalığı prevalansı genç erişkin yaş gruplarında en yüksektir.

Anahtar Kelimeler: Mycobacterium tuberculosis; epidemiyoloji, prevalans, Türkiye

Introduction

According to World Health Organization (WHO) 2007 tuberculosis report, in addition to 8.8 million new tuberculosis cases, an average of 14.1 million cases were present (217/100000) and 1.6 million people died (24/100000) globally, because of tuberculosis in 2005 (1). Africa had the highest prevalence rate. However, Asia contains high population countries such as India, China, Indonesia, Bangladesh, and Pakistan; therefore more than half of the cases in the world appear in Asia (2). WHO considers an annual tuberculosis prevalence rate that is lower than 25 in 100.000 as low, between 25 and 100 as moderate, and higher than 100 as high. According to this evaluation, Turkey was among the moderate risk countries with an average prevalence rate of 26/100.000 in 2005. Turkey ranked as 5th among all European countries after Russian Federation, Ukraine, Romania, and

Uzbekistan. Frequency of tuberculosis was the highest between the ages of 15-49 (1-3). However, when different age groups were considered, the age group that the frequency peaked varied among different countries. In Turkey and Asian countries, the frequency of tuberculosis was higher in earlier ages (1).

The purpose of this study was to investigate the prevalence and age distribution of tuberculosis in Kırıkkale using retrospective data.

Materials and Methods

Patients: This study includes 33596 patients, 14709 female and 18887 male; who were admitted to Ministry of Health, Kırıkkale Tuberculosis Control Dispensary (TCD) between the dates 1st of January, 1999 and 1st of January 2004. Diagnosis methods used in TCD were; microfilming lungs,

doing sputum sample cultures and microscopic investigations after the physical examination of patients with lower respiratory infection. Diagnosed or suspected cases were sent to the superior authority for definitive diagnosis and treatment. The follow-up and treatment of the patients, who returned from treatment in the superior hospital, were done by TCD.

In this study, file records were investigated retrospectively. The patients that were definitively diagnosed with tuberculosis infection and treated according to the mentioned procedure were included in the study.

Incidence: Tuberculosis prevalence: It shows the number of existing cases (old and new cases) of tuberculosis at a certain time. Usually, it is stated as the number of cases in a hundred thousand people. To determine the prevalence; all members of the population or a sample chosen by random sampling method should be scanned.

Infection Incidence: It is expressed by the ratio of infected people to the population size at a certain time. Since the infection prevalence reflects the ratio of people received tuberculosis bacillus, it also shows the transmission rate of the bacillus. In this study, population sizes of Kırıkkale from the year 1999 to 2003 were determined with projection calculations using Turkey Statistics Institute 1990-2000 Population Counts data (350.000-383.000 respectively) and annual population growth rate (9.04/ 1000). Incidence rate of tuberculosis infection is expressed as one part per 100000. Following formula was used to calculate the average prevalence: (total number of cases in five years/ cumulative (5-year) population size of Kırıkkale)*100.000.

Results

In the 5-year period, 33596 patients suspected of tuberculosis applied to TCD. The distribution of these patients according to gender was; 14709 female (%43.78), and 18887 male (%56.21). In this period, 263 (%0.8) patients diagnosed with tuberculosis were examined and it was observed that 82 (%31) of them were female, and 181 (%68.8) were male. *M. tuberculosis* disease was found twice as high in males than in females (male/female ratio 2). All the persons were diagnosed with pulmonary tuberculosis. None of the cases diagnosed as extrapulmonary tuberculosis. The annual prevalence of tuberculosis infection in our city were determined as; 16.3 (part per 100.000) in 1999, 11.2 in 2000, 15.1 in 2001, 12.4 in 2002, and 13.3 in 2003. It was also observed that 5-year average of the prevalence was 13.6.

The distribution of 263 patients, who were diagnosed with *M. tuberculosis*, according to age

groups were as follows: 9/263 (%3) between 0-10 years, 26/263 (%10) between 11-20 years, 60/263 (%23) between 21-30 years, 43/263 (%16) between 31-40 years, 58/263 (%22) between 41-50 years, 33/263 (%13) between 51-60 years, and 37/263 (%14) over 61 years old (Table 1)

Discussion

While the prevalence of all forms of tuberculosis increased in Africa and Europe from 1990 to 2005, it decreased in Southeast Asia, America, West Pacific, and East Mediterranean countries. The world prevalence was 293 (part per 100.000) in 1990, and decreased to 217 in 2005 (1,4).

According to the data of WHO, tuberculosis prevalence in Turkey was declared as 44 (part per 100.000) in 2005, while it was 83 in 1990 (1). Incidence studies were done in 1959 and 1982 in our country (3). In the study in 1982, it was stated that the disease was mostly common in Southeast Anatolia, Blacksea, and the Marmara regions. We could not find any other studies about the prevalence data of cities or regions of our country in the literature. However, in the prevalence data of Turkish Ministry of Health published in 2007, it was stated that Yozgat had the lowest (1,5), and Istanbul had the highest (55. 9) prevalence rate for the year of 2005. In the same publication; Kırıkkale, with an prevalence rate of 9.8, was among the cities that tuberculosis was not prevalent (6).

In this study, average prevalence in Kırıkkale in the 5-year period between the years 1999–2003 was investigated and it was determined as 13.61 (part per 100.000). The rates according to the years were as; 16.3 in 1999, 11.2 in 2000, 15.08 in 2001, 12.44 in 2002, and 13.33 in 2003. While some fluctuations occurred during the 5-year period, there was a slight overall decrease.

In years 1990 and 2005, tuberculosis prevalence rates of developed countries such as Germany, France, England, USA and developing countries such as India and Bangladesh were reported as 15–6, 19–10, 9–11, 7–3 and 299–570, 630–406 (part per 100.000) respectively. While for the same years the prevalence rates of 28–15, 44–41 were reported for Greece and Bulgaria respectively, which are among the neighboring European countries; and the rates for Persia and Iraq in Asia were 50–30, 88–76 respectively (1). In this study, the prevalence rates of Turkey were found to be closer to the developed European countries rather than the developing countries (6-19).

Tuberculosis is a disease that correlates with socioeconomic status. Good nutrition and high life standards decrease the tuberculosis prevalence rates (7).

Table 1. Patient demographics.

Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
1999	Female		3	6	2	3	3	3	20 (32)
	Male	2	1	7	9	15	7	1	42 (68)
	Total	2 (3)	4 (6)	13 (21)	11 (18)	18 (29)	10 (16)	4 (6)	62
Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
2000	Female		3	1	1	3		4	12 (28)
	Male	1	1	6	9	9	2	4	31 (72)
	Total	0 (0)	4 (9)	7 (16)	10 (23)	12 (28)	2 (5)	8 (19)	43
Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
2001	Female		2	7	3	6	1	1	20 (34)
	Male	1	3	10	4	7	6	7	38 (66)
	Total	1 (2)	5 (9)	17 (29)	7 (12)	13 (22)	7 (12)	8 (14)	58
Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
2002	Female		2	5	1	1	1	1	11 (23)
	Male	1	1	10	8	6	5	7	37 (77)
	Total	0	3 (6)	15 (31)	9 (19)	7 (15)	6 (13)	8 (17)	48
Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
2003	Female	2	2	4	2	1	3	5	19 (37)
	Male	1	8	4	4	7	5	4	33 (63)
	Total	3 (6)	10 (19)	8 (15)	6 (12)	8 (15)	8 (15)	9 (17)	52
Years	Sex	Distrubition of patiens according to age groups							Total patients
		0-10 n (%)	11-20 n (%)	21-30 n (%)	31-40 n (%)	41-50 n (%)	51-60 n (%)	61+ n (%)	0-61+ n (%)
Total	Female	2	12	23	9	14	8	14	82 (31)
	Male	4	14	37	34	44	25	23	181 (69)
	Total	6 (2)	26 (10)	60 (23)	43 (16)	58 (22)	33 (13)	37 (14)	263

In a publication of Turkish Medical Association; Central Anatolia Region, which includes Kırıkkale, was reported as the second highest region after Marmara Region concerning the number of health personnel in 2002. In the same publication, the

region was also reported to be the second highest region after Mediterranean Region in 2001-2004 concerning BCG vaccination rates. Moreover, according to the data between 1990 and 2000 Kırıkkale was among the second-tier developed

cities in Turkey, and the 10th highest city concerning the gross domestic product per capita in 2001 (7, 8).

The reason that tuberculosis prevalence rate in Kırıkkale is lower than the rate throughout the country could be related to the city's socioeconomic status which is better compared to the other cities country-wide.

According to the reports both from our country and world-wide countries, tuberculosis has been seen more in males than in females. While male/female ratio is 1,3 in African countries, it is between 2-2.2 in European, Southeast Asian, and Western Pacific countries (1, 6, 9). Similarly, in this study tuberculosis was determined twice as much in males than in females (male/female ratio 2).

When the distributions of tuberculosis infection against years and age groups were examined, it was observed that tuberculosis prevalence rate shifted through younger age groups in Kırıkkale. In a study of Balci and colleagues between the years 1995-1999, average age of positive cultures was reported as 47 (10). In this study, the highest positivity ratio (29%) among 62 patients was found in 40-50 age group in 1999. However, the highest positivity was observed in 20-30 ages beginning from 2001 (2001 29%, 2002 31%). Besides, peak value (19%) observed as early as in 10-20 age group in 2003. When the total number (263) of positive patients in 5 years is considered; two peak values in 21-30 and 41-50 age groups were observed (23% and 22% respectively). The distribution of the other age groups were determined as; 16% in 31-40 age group, 13% in 51-60 age group, 14% in the group over the age of 61, 10% in 11-20 age group, and 3% in 0-10 age group (Table 1). In another publication from Turkey, it was reported that the prevalence rate increased within young adults and people over 65 years. In the same publication, it was also shown that new cases peaked within 20-24 years of age in 2004 (3). Age distribution of tuberculosis is consistent with the results in our country (11). Moreover, according to WHO 2005 data tuberculosis peaked in young adults (25-35 years of age) in developed countries such as Germany and France. The explanation for the appearance of tuberculosis infection in young people, even in children in these countries is the immigrants from less developed countries.

Tuberculosis frequency among patients with Human Immunodeficiency Virus (HIV) is 500 times more than the ordinary population (5, 12). Among the reasons of increased frequency in young people are the increase in HIV infections and the spread of the infection being faster in young people than the older (13, 14, 15). It is not appropriate to link the increase among young people to HIV in our region since HIV incidence is not high in our country, unlike African countries. In the data

records of Ministry of Health, HIV incidence rate was reported as; 0.23 (part per 100.000) in 2000, 0.27 in 2001 and 2002, 0.28 in 2003 (1, 16). Immigrants from other cities or countries are not also considerable for Kırıkkale. Yet, 38% of the population is consisted of young people. The reason that the tuberculosis prevalence rate being high in young people might be related to the high population of young people in the city, active and social life style of these people (school, military service, and active social life), and the faster spread of the disease because of this lifestyle.

In summary, tuberculosis prevalence is considerably low in Kırıkkale. In fact, 2005 data is similar to the developed European countries' data. Yet, it might be considered dangerous since the prevalence and the spread rate is high among young age groups. Follow-up and the control of the spread of tuberculosis by surveillance studies are important.

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