

Epidemiology of Tuberculosis in Northeast of Iran: A Population-Based Study

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Abstract

Background: Tuberculosis (TB) is currently one of the greatest problems in public health. *Mycobacterium tuberculosis* infects about one third of the world's population, of whom more than 80% are living in developing countries. The incidence and prevalence of TB are very different in various parts of Iran and also throughout the world. Golestan province is one of the areas in the country where the risk of TB is the highest because of its ethnically varied population and special location. We aimed to describe the prevalence of TB and related demographic data in Golestan province (northeast of Iran).

Methods: We collected all data of patients with TB who registered in 2005 and 2006 in each of the 11 districts of Golestan province. Data were entered into the computer database and age-specific incidence rates per 100 000 population were calculated.

Results: There were 321 new smear-positive cases. The incidence and prevalence of TB were 20.88 and 38.15 per 100 000 population, respectively. The male to female ratio was 0.96. Relapse of TB was reported in 20 patients. We found 141 cases of extrapulmonary TB, with a significant predominance in women. The organ most frequently involved in extrapulmonary TB was the lymph nodes. Generally, smear-negative TB was more common in men and extrapulmonary TB was more common in women.

Conclusion: The incidence and prevalence of TB were higher in Golestan province in comparison with other provinces in Iran. We suggest using improved screening strategies and better education about TB for high-risk groups and physicians.

Iran J Med Sci 2009; 34(3): 193-197.

Keywords • Tuberculosis • Iran • prevalence • incidence

Introduction

Currently, tuberculosis (TB) is one of the greatest problems in the public health, and is the most prevalent cause of death from infectious diseases after HIV. The World Health Organization reported that one third of the world's population is infected by *Mycobacterium tuberculosis*, and three million persons die from it annually. A point of great concern is that about 50 million persons are infected with multidrug-resistant TB. Over 80% of all cases are from developing countries.¹

Tuberculosis usually occurs after prolonged close contact with

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Received: 26 April 2008
Revised: 6 October 2008
Accepted: 20 November 2008

infected persons (working or living together), but anyone can be infected. Most infected individuals are malnourished, have underlying diseases or are from the lower socioeconomic classes. The best way to control TB is by increasing socioeconomic status and improving nutrition.^{2,3}

In countries where the TB epidemic is still at the early stages, as prevalence reaches its peak the incidence rate becomes highest in young adults, especially young women. But in developed industrial countries, incidence rates are highest in older people. In most countries TB is considered a disease of aging and originates from reactivation of childhood infection because of immunosuppression.³

In Iran, the incidence rate of TB started to decrease about 40 years ago. In 1963, 142 persons per 100 000 suffered from TB, but recently a decline of about 10-fold occurred, resulting in an incidence rate of 13.9 per 100 000. The decreasing trend was very slow in some areas, suggested different patterns of the disease. In 1998 Iran had an incidence rate of 17.9 cases per 100 000. In 2005 the TB prevalence was reported as 6.8 per 100 000, but according to a WHO report, 12 Iranians per 100 000 suffered from TB.¹

Only 57% of all patients with TB are diagnosed in Iran. Inaccurate diagnosis and the lack of obligatory reporting are among the problems that have led to incorrect statistics.¹ Bordering on Afghanistan, Pakistan, Iraq and newly established countries to the north of Iran, the area presents particular challenges which should be considered.¹

Golestan province, with an area about 20437.7 km², is located in northeastern Iran, south of the Caspian Sea. This province is characterized by its special situation with regard to infectious diseases, resulted from its ethnic diversity and geographic location. This article reports demographic data related to TB and reviews recent estimates of TB incidence, prevalence, and some related factors in Golestan province in northeastern Iran.

Patients and Methods

We collected all data on TB cases reported in 2005 and 2006 from district databases (disease prevention and control units) in the Vice-Chancellery for Health, Golestan University of Medical Sciences, then divided Golestan province to 11 separate districts for data analysis. The predominant ethnic group in the northern part of the province was Turkmen, while native and immigrant groups were residents of the southern part of the province.

We included all patients who were newly diagnosed during 2005-2006 by positive sputum culture, and old cases with recurrent symptoms, smear-positive and -negative cases, and extrapulmonary TB based on histopathology reports or clinical diagnosis. A questionnaire was completed for each patient with information from medical records and face-to-face interviews. We recorded demographic data and information about treatment and response to treatment. The incidence and prevalence of TB were estimated per 100 000 persons, according to the age pyramid of the province available for that year.

Results

During the study period, 616 cases of TB were recorded. Among them, 321 (52%) new cases were diagnosed. The incidence and prevalence of TB were approximately 20.88 and 38.15 per 100 000 respectively, with a prevalence of about 39.2 and 37.1 per 100 000 in males and females, respectively. Table 1 shows the prevalence of TB in different age groups and in the two sexes, per 100 000 persons, after excluding relapses (N=21) and extrapulmonary TB (N=141). Among these patients who were diagnosed by positive sputum cultures, 134 smear-negative cases were reported, with a male-to-female ratio of about 1.2 (80 males, 54 females). Table 2 shows the incidence of pulmonary TB with positive smear results per 100 000 persons in both sexes. Relapses were reported in 21 patients (3.24%)

Table 1: Prevalence of tuberculosis in different age groups and sexes after excluding relapses and extrapulmonary tuberculosis in Golestan Province, Iran, 2005

Age group (years)	Male		Female	
	Number	Per 100 000	number	Per 100 000
< 5	1	1	1	1.55
5-14	2	0.97	8	3.73
15-24	29	16.49	31	17.71
25-34	45	39.62	13	11.45
35-44	30	37.56	21	25.87
45-54	38	76.06	25	55.64
55-64	32	38.2	47	55.47
> 65	61	187.95	69	190.33
Total	238	39.2	215	37.1

Table 2: Incidence of pulmonary tuberculosis with positive smear in each sex per 100 000 persons in Golestan Province, 2005

Age group (years)	Male		Female	
	Number	Per 100 000	Number	Per 100 000
< 5	0	0	1	1.6
5-14	1	0.46	4	1.9
15-24	22	12.5	25	14.2
25-34	30	26.44	9	7.92
35-44	20	24.64	11	13.77
45-54	31	69	21	43.14
55-64	24	28.3	33	39.4
> 65	39	47.6	50	54
Total	167	20.52	154	19.23

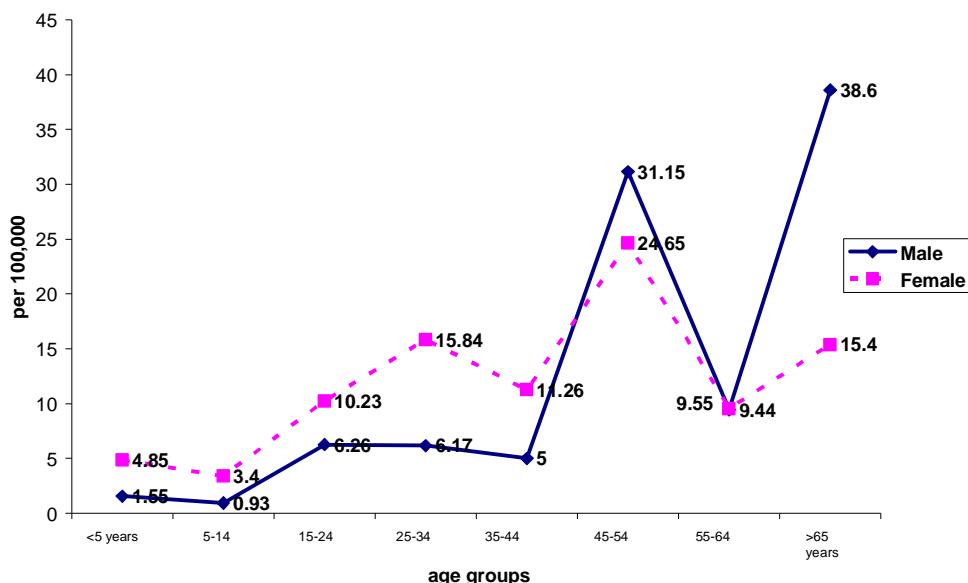
with a male-to-female ratio of 1.85 (13 males, 7 females). A trend toward increasing incidence was seen with increasing age.

We found 141 cases of extrapulmonary TB, with a significant predominance in females. The incidence of extrapulmonary TB per 100 000 persons is shown for both sexes in figure 1. The organ most frequently involved in extrapulmonary TB was the lymph nodes. Males were predominant among persons with smear-negative and smear-positive pulmonary TB in the southern part of the province. Generally, smear-negative TB was more common in males whereas extrapulmonary TB was predominant in females. Although no significant relationships were seen between ethnicity and the disease, 43% of the patients in the southern part of the province belonged to the Sistani ethnic group. Tuberculosis was most prevalent among Sistani farmers. No apparent scar from BCG vaccination was seen in 63% of the patients.

Discussion

Iran is located in a critical region in the TB world. On one hand, two countries with a high prevalence of TB lie to the east of Iran, and health services in Iraq (to the west of Iran) have been severely disrupted because of war. Moreover, multidrug resistant TB is a problem in neighboring countries to the north of Iran.⁴ The incidence and prevalence of TB are not identical throughout Iran. In 2005 the prevalence of TB was reported as 44 per 100 000 in Sistan and Baluchestan province (southeastern Iran), 38 per 100 000 in Golestan, and 25 per 100 000 in Khorasan, whereas the prevalence in the central part of Iran is lower. After Sistan and Baluchestan province, Golestan province is ranked second in terms of TB prevalence.⁵

In the present study we found an incidence and prevalence of TB of approximately 20.88

**Figure 1:** Incidence of extra-pulmonary tuberculosis in both sexes per 100 000 persons in Golestan Province, Iran, 2005

and 38.15 per 100 000, respectively. This gap between incidence and prevalence may be explained by cases of TB relapse, long-term treatment for extrapulmonary TB, treatment failure or withdrawal, and multidrug resistant TB. Nevertheless, a 2007 study in Golestan province showed that the DOTS strategy significantly increased the success rate of TB treatment.⁶

The mean annual incidence of TB is reported as 7.36 per 100 000 (3.5 for pulmonary TB with a positive culture) in Iran and 28.6 per 100 000 (14 for pulmonary TB with positive culture) in Afghanistan.⁷ The high incidences of TB in Khorasan and Sistan and Baluchestan provinces,⁷ are predictable because of the location of these provinces near Afghanistan, to the east of Iran.

Golestan province hosts a large number of incoming immigrants from Sistan and Baluchestan province, where the prevalence of TB is high.⁸ A 2003 study in Bam city (southern Iran) showed that 19.2% of all TB cases were extrapulmonary. Among pulmonary TB cases, 77.5% were smear-positive. More than half of the patients were females (53.6%) and 53.4% were from rural areas.⁷ The results of the present study were similar to the study done in Bam city, except for the gender ratio.

Tuberculosis is more common in males throughout the world, but in Iran this was reversed during 1992-2001.⁹ In the present study, however, the TB incidence per 100 000 persons was slightly higher in males. It thus seems that the pattern of TB is changing in Iran. In countries where a TB epidemic is developing, the incidence is higher in young adults, especially young women, but in developed industrialized countries, the incidence is higher in older people.¹⁰ In this study, a mixed pattern was seen. Young women had a higher risk for extrapulmonary TB, which was rare in boys under 15 years old. However, smear-positive and -negative pulmonary TB was more common in older people (>45 years old). The increasing trend seen with the age may be the result of a cohort effect, and thus requires further complementary studies to be adequately explained.

Various factors are involved in the body's defense against TB bacilli, including age, malnutrition, smoking, alcoholism, corticosteroids use, infectious diseases such as HIV infection, poverty, and ethnicity. In the USA, low-income groups with poor access to health care, including high-risk racial and ethnic groups (e.g., Asians, Pacific Islanders, African-Americans, Hispanics and Native Americans) are at

greater risk for TB.⁸ In Iran we could not find any relationship between ethnicity and incidence or prevalence of TB, although most of the patients in the southern part of Golestan province were originally from Sistan and Baluchestan province. Most of our patients (77%) were from low socioeconomic classes and lived in rural areas. Other studies in Iran that focused on Fars province (southern Iran) and Gonabad city showed that males with pulmonary TB were almost always farmers, and that more than 90% of the females with TB worked at home.^{7,10}

It seems that some groups are locally identified as high-prevalence groups, such as immigrant farm workers from Sistan and Baluchestan. A study of the epidemiology of TB among Afghan immigrants in Fars province showed a high incidence of about 63.5 per 100 000 in this population.¹¹ In another study in Hong Kong, illegal immigrants and drug addicts were two major high-risk groups.¹² Immigration is one of the main factors contributing to the resurgence of TB.

The human immunodeficiency virus epidemic is the main cause of the increase in TB cases, particularly in Africa, although increases are also expected in Asia.¹² In our patients there were no underlying diseases such as cancer, HIV infection, or immune deficiency conditions that might have been potential risk factors or predisposing factors. Many countries, like Iran, use BCG vaccination as part of their TB control programs, especially for infants, but we could not find an obvious BCG vaccination scar in about 63% of the patients. Persons without an apparent BCG scar may be at risk for TB in the future.¹⁴ A similar study of gastrointestinal TB in Golestan province confirmed these results.¹³

Conclusion

We suggest using improved strategies to screen for TB and educate people about the disease, especially immigrants, high-risk groups, and young female students. Recognition of patients at risk is the key to prompt detection. Eliminating TB within a given area will not be possible without effective TB control programs in other areas. Although tight control has been re-established, TB continues to afflict those in high-risk groups who are most difficult to provide treatment for.¹⁵ The wide distribution of cases in different parts of the province and lack of accurate follow-up in some cases were among the probable limitations of this study which may have affected the results to some extent.

Acknowledgement

The authors thank Dr. Ramezankhani for kind cooperation and assistance with data collection.

Conflict of Interest: None declared

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