

Tuberculosis treatment results in Western Iran over the past 13 years

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Abstract

Introduction Tuberculosis is one of Iran's most significant infectious diseases, which with the advent of new and chronic diseases, is still known as the most threatening disease of human community. The goal of this research was to assess the result of TB treatment in western Iran (province of Kermanshah) and its associated factors during 2005 to 2017. **Method** In this cross-sectional study, all patients who had tuberculosis from 2005 to the end of 2017 were evaluated. Treatment outcomes were categorized into four domains of "treatment completion," "death," "treatment failure," and "recoveries" based on national guidelines, and factors affecting outcome were identified using univariate and multivariate logistic regression. **Results** Tuberculosis incidence was 15.21 in males and 14.32 in females per 100,000 individuals. The therapy result was almost uniform during the years investigated. 32.2% had extra pulmonary TB; 58.7% completed treatment; 9.9% died, and 4.1% had treatment failure. After controlling for key factors, the odds of completion of therapy in females were 1.1 (1.0-1.3) times greater than in males, and therapy failure and mortality caused by tuberculosis were also smaller in females than in males 0.6(0.4-0.8) and 0.5(0.3-0.7) respectively). HIV was the greatest variable in the prevalence of tuberculosis with 9.5 (5.8–16.8) times greater chances of death in HIV-positive people than those without HIV. **Conclusion** Given the high prevalence of pulmonary tuberculosis and public health concerns, early screening and infection diagnosis, education and protective measures are suggested to prevent tuberculosis patients.

Background

TB is a bacterial chronic disease and expresses a wide range of clinical diseases that are caused by *Mycobacterium tuberculosis* (*Mycobacterium tuberculosis*, *Bovis* and *Africanum*) and in most cases is caused by *Mycobacterium tuberculosis*; The manifestations of tuberculosis in humans are of two forms: pulmonary tuberculosis and extrapulmonary tuberculosis(1).

TB is one of the fastest-growing single-factor infectious diseases (even more than HIV) and is ranked 10th among the world's prevalent diseases. According to World Health Organization (WHO) statistics in 2017, 10.0 million people have tuberculosis, of which 5.8 million are men; 3.2 million are women, and 1.0 million are children. Furthermore, in individuals with TB there were 1.3 million fatalities and more than 300,000 deaths in individuals with TB and HIV. Tuberculosis incidence in Iran is 20 cases per 100,000 individuals(2, 3). Although tuberculosis fatalities have decreased over the previous century, they still constitute a danger to humanity.

A person with pulmonary TB is the main infection source that coughs and generally has large positive sputum. Cough creates small infectious particles in such an individual who are released into the air by speaking, sneezing, etc., and stay alive for a long time in the air(4). Fever, cough, night sweats, weight loss, anorexia, and overall weakness are often the most prevalent clinical symptoms. Local signs at the

infection site reflect the development of the infection in this situation, and hemoptysis is one of the symptoms of pulmonary tuberculosis(3).

Tuberculosis diagnostic tests vary based on the type of tuberculosis, so that direct sputum smear and sputum culture are used as the primary therapeutic techniques, though there exist different and more complicated microbiological and immunological laboratory techniques as PCR requires special equipment and conditions owing to false-positive errors. Non-pulmonary tuberculosis is diagnosed by a practitioner depending on the organ involved with bacteriological, radiological, histological, MRI and other complementary tests(1, 2, 5).

Being infected with *Mycobacterium Bovis* can be induced in humans by drinking contaminated milk and consuming raw meat from infected livestock and other unprocessed products, or rarely by direct contact with the contaminated wound and cutting secretions. In latest years, bovine tuberculosis has been one of the significant disease Zoonoses on the OIE list. *Mycobacterium Bovis* pathogenicity for individuals is the same as for *Mycobacterium tuberculosis*, and the tuberculosis induced by these two types is indistinguishable in clinical, radiological and pathological signs(6).

Tuberculosis can be treated for at least six months with several potent antibiotics, but many people do not complete the therapy to the end of the treatment owing to a feeling of recovery and then discontinue their medication, leading to the transmission of disease in the community and increases the incidence of drug-resistant TB. According to the DOTS[1] strategy recommended by the World Health Organization, the drug is administered by the patient under the direct supervision of health personnel and trained persons. New patients are treated with a six-month short period diet (group I therapy) and treated patients are re-treated with an eight-month short period diet (group I therapy)(7).

Tuberculosis is still a life-threatening disease despite the development of new diagnostic and therapeutic techniques, and with the growing incidence of AIDS, the issue of tuberculosis has become increasingly accepted. In Iran, tuberculosis diagnosis and therapy have been carried out in accordance with national guidelines for many years. The aim of this research was to assess the result of TB treatment in the province of Kermanshah and its associated factors from 2005 to 2017.

[1] Directly Observed Treatment Short- course

Methods

Study participants

This cross-sectional study was conducted in Western Iran in 2005-2007 on all TB patients in Kermanshah province. With a population of nearly two million individuals, Kermanshah Province is the largest province in Western Iran, next to Iraq, the therapeutic center in Western Iran.

Treatment and diagnose of TB

All patients in Iran are subject to short period treatment guidelines for direct treatment with TB (DOTS). In the DOTS strategy, new patients are treated with a short period six-month (group I (Cat I)) therapy and treated patients are re-treated with a short-term eight-month (group II (Cat II)) therapy, each consisting of two steps. For more detail, see TB Therapeutic Guidelines for Iran(8, 9).

"Three sputum samples" were obtained within 2 to three days from the suspected patient to detect pulmonary tuberculosis and microscopically examined. Health staff examined the initial spot sample at the initial visit, and a sputum container was given to the patient. On the second day, the health unit received an early-morning specimen as a second sample. On the second day-after delivery of the second sample, the patient took another sputum specimen. For more information on how to interpret a sample, see Help Protocols(10).

Treatment results

The effects of therapy are split into four categories in this study. Improved _ A patient with positive sputum smear pulmonary tuberculosis whose sputum test was negative at the start of treatment and was also negative at least as a result of his previous sputum test (aimed at monitoring during treatment). If during the last month of therapy, the sputum smear test is not done, the treatment result cannot be improved and is considered a finished treatment course. "Completion of treatment"_ a patient who has received a finished course of anti-tuberculosis treatment but does not meet the criteria for progress in treatment groups or failure of therapy (for example, no information is available at the end of treatment on the results of his sputum test). "Patient Died "_any patient who dies during anti-TB treatment for any reason. Finally, "treatment failure "_Patients with the following conditions fall into the "treatment failure" group: A) a patient with a positive sputum smear with pulmonary tuberculosis whose direct sputum test is still positive five (or more) months after starting treatment or after being negative within the same period. B) A person with a negative sputum smear of pulmonary tuberculosis who at the end of the second month of therapy had a positive sputum test. C) A patient with a negative sputum smear with pulmonary tuberculosis who at the end of the second month of therapy had a positive sputum test. If MDR-TB is diagnosed at any time during treatment, the treatment result must be recorded as "treatment failure" and the person who has been withdrawn for two consecutive months or longer should also be reported as "absence of treatment." (Due to lack of data, this analysis considered treatment failure and absence groups as one group).

Time to Treatment Initiation (TTI) is defined as the interval between the date of diagnosis of the disease and the onset of TB treatment. Patients who begin treatment between 0-29 days after diagnosis are classified as "early treatment" and patients who have more than 30 days between diagnosis, and treatment are classified as "late treatment."

Data Analysis

Census data from 2006, 2011 and 2016 have been used in this analysis to evaluate the disease incidence. In addition to representing data using descriptive statistics such as mean and median for quantitative data, ratio and percentage for qualitative data, using logistic regression, variables that affect "treatment completion," "death," and "failure in treatment" are compared improved individuals and patients. It is important to note that extrapulmonary TB patients are not considered as "improved" and excluded from study. Variables significant at a level less than 0.3 were entered into multivariate analysis. The significance level was considered as less than 0.05. Data analysis was performed using STATA v 14 software.

Results

Of the 3542 patients with TB, 1864 (52.6%) were male and 2647 (74.8%) were residents of the city. The mean age of men and women was 47.4 (95% CI: 46.8-48.0) ($P < 0.001$). 91 (2.6%) of patients were incarcerated and 3317 (97.4%) received early treatment. 2382 people (67.2%) are pulmonary TB patients (54.6% male and 45.5% female) (Table 1).

Overall, 964 (27.2%) survived from 3542 TB patients, 2080 (58.7%) received therapy, 352 (9.9%) died and 146 (4.1%) failed treatment during the year. Surveys from 2005–2017 culminated in an almost uniform outcome of treatment, and the rate of tuberculosis recovery and death remained constant (Table 1).

The prevalence of TB increases in males, married people, city dwellers, persons with HIV as they get older, but with the increase in education and BMI, TB decreases. There was also a greater improvement in women, single people and rural residents (Table 1).

Table 1. The TB patients in relation to their demographic characteristics

P value	Failure treatment (%)	Deaths (%)	Completed (%)	Cured (%)	Total (%)	Variables	
	146(4.1)	352(9.9)	2080(58.7)	964(27.2)	3542(100.0)	Total (%)	
<0.001	105(5.6)	239(12.8)	1029(55.2)	491(26.3)	1864(52.6)	Male	Sex
	41(2.4)	113(6.7)	1051(62.6)	473(28.2)	1678(47.4)	Female	
<0.001	8(3.9)	7(3.4)	142(68.9)	49(23.8)	206(5.8)	0-18	Age
	12(2.1)	18(3.2)	368(65.7)	162(28.9)	560(15.8)	19-29	
	97(5.7)	161(9.5)	1033(60.9)	406(23.9)	1697(47.9)	30-59	
	29(2.7)	166(15.4)	537(49.8)	347(32.2)	1079(30.5)		
0.924	22(5.7)	39(10.1)	201(52.2)	123(31.9)	358(44.6)	illiterate	Education
	8(5.5)	18(12.3)	74(50.7)	46(31.5)	146(16.9)	1-5	
	5(3.6)	14(10.1)	78(56.5)	41(29.7)	138 (16.0)	6-9	
	5(4.1)	11(8.9)	72(58.5)	35(28.5)	123(14.2)	10-12	
	1(1.4)	9(12.5)	39(54.2)	23(31.9)	72(8.3)	13	
0.915	10(5.0)	22(10.9)	101 (50.2)	68(33.8)	201(22.4)	Single	Marital status
	24(4.5)	59(11.0)	282(52.8)	169(31.6)	534(59.4)	Married	
	8(4.9)	14(8.5)	93(56.7)	49(29.9)	164(18.2)	Widow / divorce	
0.940	3(3.6)	12(14.3)	42(50.0)	27(32.1)	84(30.3)	<18.5	BMI
	5(3.8)	14(10.8)	70(53.8)	41(31.5)	130(46.9)	18.5-24.9	
	3(7.7)	4(10.3)	19(48.7)	13(33.3)	39(14.1)	25-29.9	
	2(8.3)	2(8.3)	14(58.3)	6(25.0)	24(8.7)		
0.002	20(2.2)	77(8.6)	533(59.7)	263(29.4)	893(25.2)	Rural	Residence
	126(4.8)	275(10.4)	1547(58.4)	699(26.4)	2647(74.8)	Urban	
0.513	142(4.1)	347(10.1)	2022(58.6)	940(27.2)	3451(97.43)	No	Prisoner
	4(4.4)	5(4.5)	58(63.7)	24(26.4)	91(2.6)	Yes	
<0.001	124(5.2)	270(11.3)	1024(43.0)	964(40.5)	2382(67.2)	Pulmonary	Type of TB
	22(1.9)	82(7.1)	1056(91.0)	0(0.0)	1160(32.2)	Extra pulmonary	
0.516	141(4.2)	328(9.9)	1949(58.8)	899(27.1)	3317(97.5)	Early	TTI
	2(2.4)	9(10.7)	45(53.6)	28(33.3)	84(2.5)	Late	
<0.001	80(3.7)	152(7.0)	1286(59.5)	644(29.8)	2162(61.1)	NO	Length of hospitalization
	31(5.0)	85(13.7)	381(61.2)	125(20.1)	622(17.6)	1-10	
	29(5.7)	71(13.9)	269(52.8)	140(27.5)	509(14.4)	11-20	
	2(1.3)	21(13.8)	98(64.5)	31(20.4)	152(4.3)	21-30	
	4(4.3)	23(24.5)	45(47.9)	22(23.4)	94(2.7)	>30	
<0.001	25(3.3)	56(7.3)	421(55.1)	262(34.3)	764(21.6)	HIV negative	HIV status
	21(5.8)	89(24.6)	189(52.3)	62(17.2)	361(10.2)	HIV positive	
	100(4.1)	207(8.6)	1470(60.8)	640(26.5)	2417(68.2)	Unknown	
0.001	16(2.9)	58(10.4)	324(58.0)	161(28.8)	559(15.8)	2005-2006	Year
	21(3.3)	48(7.6)	381(60.0)	185(29.1)	635(17.9)	2007-2008	
	29(4.7)	67(10.8)	397(60.0)	127(20.5)	620(17.5)	2009-2010	
	33(5.4)	62(10.1)	379(61.6)	141(22.9)	615(17.4)	2011-2012	
	17(3.5)	53(10.9)	265(54.7)	149(30.8)	484(13.7)	2013-2014	
	30(4.8)	64(10.2)	334(53.1)	201(32.0)	629(17.8)	2015-2016-2017	

Tuberculosis incidence in the province of Kermanshah was 13.95 per 100,000 individuals. On average, the highest incidence of tuberculosis over the 13-year period was reported in the age group of "over 60 years" with a rate of 44.97 per 100,000 individuals. The incidence of the disease was higher in women aged 0-18, 19-29 and over 60 years and in men aged 30-59 years.

Overall, the incidence TB in males and females was 15.21 and 14.32 per 100,000 individuals, respectively. Despite the decreased disease incidence over the 13-year period, this decline was not statistically significant (Figure 1).

The incidence of pulmonary tuberculosis increased from 2005 to 2007. Pulmonary tuberculosis had the highest incidence in 2007 and the lowest in 2017. The incidence of the disease declined between 2009 and 2017. Extrapulmonary TB was also the highest incidence in 2012 and the lowest in 2017. The trend of extrapulmonary tuberculosis declined between 2012 to 2017 but was not statistically significant (Figure 2).

After accounting for other influential variables, the odds of completing treatment in women was 1.1 (1.0-1.3) times higher than in men, and the odds of treatment failure and Death from Tuberculosis in women was 0.6 (0.4-0.8) and 0.5 (0.3, 0.4) times lower than in men, respectively. Among urban residents, there was also a taller chance of tuberculosis treatment failure and death than in rural areas. HIV was the strongest predictor for tuberculosis prevalence, with 9.5 (5.8–16.8) times lower chances of dying among HIV-positive individuals than those without TB (Table 2).

Table 2. Results of the crude and adjusted multinomial logistic regression analysis for predictors of the tuberculosis treatment.

Failure treatment		Deaths		Completed		Variables	
Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)		
ref	ref	ref	ref	ref	ref	Male	Sex
0.5(0.3-0.7)	0.4(0.3-0.6)	0.6(0.4-0.8)	0.5(0.4-0.6)	1.1(1.0-1.3)	1.1(0.9-1.2)	Female	
ref	ref	ref	ref	ref	ref	0-18	Age
0.3(0.1-0.9)	0.4(0.2-1.2)	0.5(0.2-1.2)	0.8(0.3-2.0)	0.8(0.5-1.2)	0.8(0.5-1.1)	19-29	
0.9(0.4-2.0)	1.5(0.7-3.2)	1.3(0.6-3.2)	2.8(1.2-6.2)	0.9(0.6-1.2)	0.9(0.6-1.2)	30-59	
0.4(0.1-0.9)	0.5(0.2-1.2)	3.2(1.3-7.5)	3.3(1.5-7.5)	0.5(0.4-0.8)	0.5(0.4-0.7)		
-	ref	-	ref	-	ref	illiterate	Education
-	1.0(0.4-2.3)	-	1.2(0.6-2.4)	-	1.0(0.6-1.5)	1-5	
-	0.7(2.4-1.9)	-	1.1(0.5-2.2)	-	1.2(0.7-1.8)	6-9	
-	0.8(0.3-2.3)	-	1.0(0.5-2.1)	-	1.2(0.8-2.0)	10-12	
-	0.2(0.3-1.9)	-	1.2(0.5-2.9)	-	1.0(0.6-1.8)		
-	ref	-	ref	-	ref	Single	Marital status
-	0.9(0.4-2.1)	-	1.1(0.6-1.9)	-	1.1(0.8-2.0)	Married	
-	1.1(0.4-3.0)	-	0.9(0.4-1.9)	-	1.3(0.8-2.0)	Widow / divorce	
-	ref	-	ref	-	ref	<18.5	BMI
-	1.1(0.2-5.0)	-	0.8(0.3-1.9)	-	1.1(0.6-2.0)	18.5-24.9	
-	2.1(0.4-11.7)	-	0.7(0.2-2.6)	-	0.9(0.4-2.2)	25-29.9	
-	3(0.4-22.1)	-	0.7(0.1-4.3)	-	1.5(0.5-4.4)		
ref	ref	-	ref	-	ref	Rural	Residence
2.1(1.2-3.5)	2.4(1.4-3.9)	-	1.3(1.0-1.8)	-	1.1(0.9-1.3)	Urban	
-	ref	-	ref	-	ref	No	Prisoner
-	1.1(0.4-3.2)	-	0.6(0.2-1.5)	-	1.1(0.7-1.8)	Yes	
-	ref	-	ref	-	1.0(ref)	Early detection	case detection
-	0.4(0.1-1.9)	-	0.9(0.4-1.9)	-	0.7(0.4-1.2)	Late detection	
ref	ref	ref	ref	ref	ref	NO	Length of hospitalization
1.8(1.1-2.9)	2.0(1.3-3.1)	3.0(2.1-4.4)	2.9(2.1-4.0)	1.5(1.2-2.0)	1.5(1.2-1.9)	1-10	

1.3(0.8-2.2)	1.7(1.0-2.6)	2.7(1.8-4.0)	2.1(1.5-3.0)	1.0(0.8-1.3)	1.0(0.8-1.2)	11-20	
0.4(0.1-2.0)	0.5(0.1-2.2)	3.1(1.6-6.0)	2.9(1.6-5.1)	1.6(1.1-2.5)	1.6(1.0-2.4)	21-30	
1.0(0.3-3.3)	1.5(0.5-4.3)	6.9(3.4-13.9)	4.1(2.4-8.1)	1.0(0.6-1.7)	1.0(0.6-1.7)	>30	
ref	ref	ref	ref	ref	ref	HIV negative	HIV status
2.6(1.2-5.5)	3.5(1.9-6.7)	9.5(5.3-16.8)	6.7(4.3-10.4)	1.5(1.0-2.2)	1.9(1.4-2.6)	HIV positive	
2.7(1.4-5.4)	1.6(1.0-2.6)	1.7(1.1-2.9)	1.5(1.1-2.1)	1.2(0.9-1.6)	1.4(1.2-1.7)	Unknown	
ref	ref	ref	ref	ref	ref	2005-2006	Year
1.0(0.5-2.2)	1.1(0.6-2.3)	0.5(0.3-0.8)	0.7(0.5-1.1)	0.9(0.7-1.2)	1.0(0.8-1.3)	2007-2008	
2.1(1.0-4.2)	2.3(1.2-4.4)	0.8(0.5-1.4)	1.5(1.0-2.2)	1.4(1.1-1.9)	1.5(1.2-2.0)	2009-2010	
2.2(1.1-4.3)	2.3(1.2-4.4)	0.6(0.4-1.0)	1.2(0.8-1.9)	1.2(0.9-1.6)	1.3(1.0-1.7)	2011-2012	
1.3(0.6-2.8)	1.1(0.5-2.3)	0.6(0.4-1.0)	1.0(0.6-1.5)	0.8(0.6-1.1)	0.9(0.7-1.2)	2013-2014	
2.9(1.2-6.8)	1.5(0.8-2.8)	0.6(0.3-1.1)	0.9(0.6-1.3)	1.0(0.7-1.4)	0.8(0.6-1.1)	2015-2016-2017	

Discussion

The aim of this research was to determine the treatment results for TB patients in the province of Kermanshah over the years 2005-2017. Tuberculosis as an infectious disease known as calamity to the human community for a long time. According to the World Health Organization (WHO) reports, the average yearly incidence of tuberculosis in the world is 151 per 100,000 individuals and 16.31 in Iran(2, 11). There were also a 13.95 per 100,000 individuals yearly rate of tuberculosis in the province of Kermanshah.

In the 13-year study period, the highest incidence of disease was above 60 years, which may be attributed to a weakened immune system at an older age or to the consequences of tobacco consumption and air pollution, which are not discussed in this research. It requires more consideration in terms of improving health and enhancing the prevention of TB in the aging lifestyle. These research results are consistent with reports from other studies on the high incidence of tuberculosis among aging people(1, 12).

Treatment success rates for TB patients were 85.9% in 2005-2017 (improved+ completion of treatment), which is higher than the 2016 WHO report (82%)(2), suggesting the DOTS ' promising performance in tuberculosis prevention in Iran. The high success level for tuberculosis treatment was attributed to many factors; the most significant is the use of experienced human forces and the regular follow-up of individuals taking the drug. But there are also obstacles to 100% effective tuberculosis treatment, some of the most important causes of failure in tuberculosis treatment are the community's negative attitude towards TB patients, lack of knowledge about the disease and its transmission to others, lack of

awareness of free diagnostic and treatment services at all levels of health care, lack of anti-tuberculosis therapy, problems regarding admission to treatment centers and insufficient services by health care staffs, indicated that removing these barriers could increase treatment success rates.

Of those suffering from tuberculosis, 67.2% had pulmonary tuberculosis and 32.2% had extrapulmonary tuberculosis. There has been no significant change in the incidence rate in Iran over the past 13 years. Overall, nearly three-quarters of patients were afflicted by pulmonary TB based on the findings of this report and similar studies, and one-quarter had extrapulmonary TB(1). The high percentage of pulmonary TB disease compared with extrapulmonary tuberculosis was attributable to the probability of pulmonary TB transmission and the inability to transmit pulmonary TB to other individuals. 74.8% of patients lived in urban areas and 25.2% in rural areas. City patients were more likely to fail treatment than rural patients; Which is consistent with similar studies in this field (13, 14). Many individuals with TB generally live in urban areas. The high prevalence of urban patients in rural areas was due to the high proportion of patients in urban environments as well as the high density of population in urban areas than in rural areas. Iran's high rate of development in rural areas owing to the establishment of health houses in rural areas as well as the effective care provided by experienced health professionals and disease treatment process leading to better treatment in rural areas than urban areas.

More than 50% of patients in Western Iran are males, which is roughly equal to the proportion of the population which indicates that men and women have the same chance of developing TB, but still, according to the World Health Organization, the rate of men at 64% is higher than women at 36% (2) While infection rates are the same for both genders, the proportion of male deaths is higher than for females, which is consistent with studies in this field(15). One possible reason for men's elevated attenuation level is the lack of timely treatment or professional instructions.

When age rose, the likelihood of completing treatment decreased, with those over 60 experiencing lower chances of completing treatment and higher mortality than those below 18 years of age. Furthermore, as age increases due to lower rates of immunity, the probability of death in these patients grows. The odds of treatment failure in the 19-29 age group are lower than in the "under 18" age group. The treatment failure may have been due to the lack of consistent adolescent follow-up after complete recovery. The most regular patient(13). was the age group of 40-31 years in the northwestern Iranian sample. In another report on the 10-year trend of tuberculosis in West Azerbaijan province, the most commonly reported illness was reported to the group aged 65-31 years(16).

The chances of treatment failure for TB disease have decreased by growing the body mass index (BMI) at univariate level but there was no statistically significant relationship between BMI and treatment outcomes after controlling for other confounding factors. However, lower BMI owing to immunodeficiency, according to some reports, has dramatically increased the chance of death in patients with tuberculosis(17, 18).

The prevalence of HIV-positive patients in this research was 31.0% (excluding patients of unknown HIV status), 12.3% of whom were rural and 36.3% urban. The prevalence of HIV-positive TB cases was 13.7%,

6.3% rural and 7.3% urban(19) in a Chinese survey. For HIV-positive cases, the chances of death are lower than in patients with HIV-free TB, which was consistent with previous findings(20-22).

In the present study, 38.9 percent of patients have been admitted to the hospital, Patients hospitalized longer were also more likely to die as a result of severe illness, severe drug side effects, drug-resistant TB patients, and HIV-infected TB patients. The mortality rate for hospitalized patients was 14.5%, which is consistent with Saudi Arabia study findings (14%) (23). It is also slightly higher than the mortality rate recorded by Taiwan (12.3%) and less than that found by China (18.9%) (24, 25).

Study weaknesses and strengths

One of this study's main strengths is the large sample size and being long-term population-based research. Other strengths of this analysis are correctly evaluating and complete treatment outcomes and collecting information from field experts. The lack of evaluation of the effect of diabetes and smoking on the treatment results of TB patients was one of the drawbacks of this research.

Conclusion

To conclude, considering the mean age of 47.4 ± 20.0 and the high incidence of concurrent tuberculosis and HIV disease (10.2%), and knowing that tuberculosis makes a person susceptible to HIV, this is a concerning problem for public health. Timely testing and early detection of infection's training and protective measures to prevent and spread the disease to other individuals and further prevention of tuberculosis are recommended.

Declarations

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Availability of data and materials

Total data set supporting the conclusions of this study are available from the corresponding author and can be accessed against the sensible demand.

Authors' contributions

MS, AM, MM, SR, ES and PR participated in the study design and data collection and analysis and to the writing of the manuscript. Participated in the study design and helped in drafting article preparation for

publication. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

This study was approved by the Ethical Review Committee of Kermanshah University of Medical Sciences.

Consent for publication

This study has not been published elsewhere and is not under. All authors have accepted the final manuscript and agreed for its publication.

Competing interests

The authors declare that they have no competing interests.

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Figures

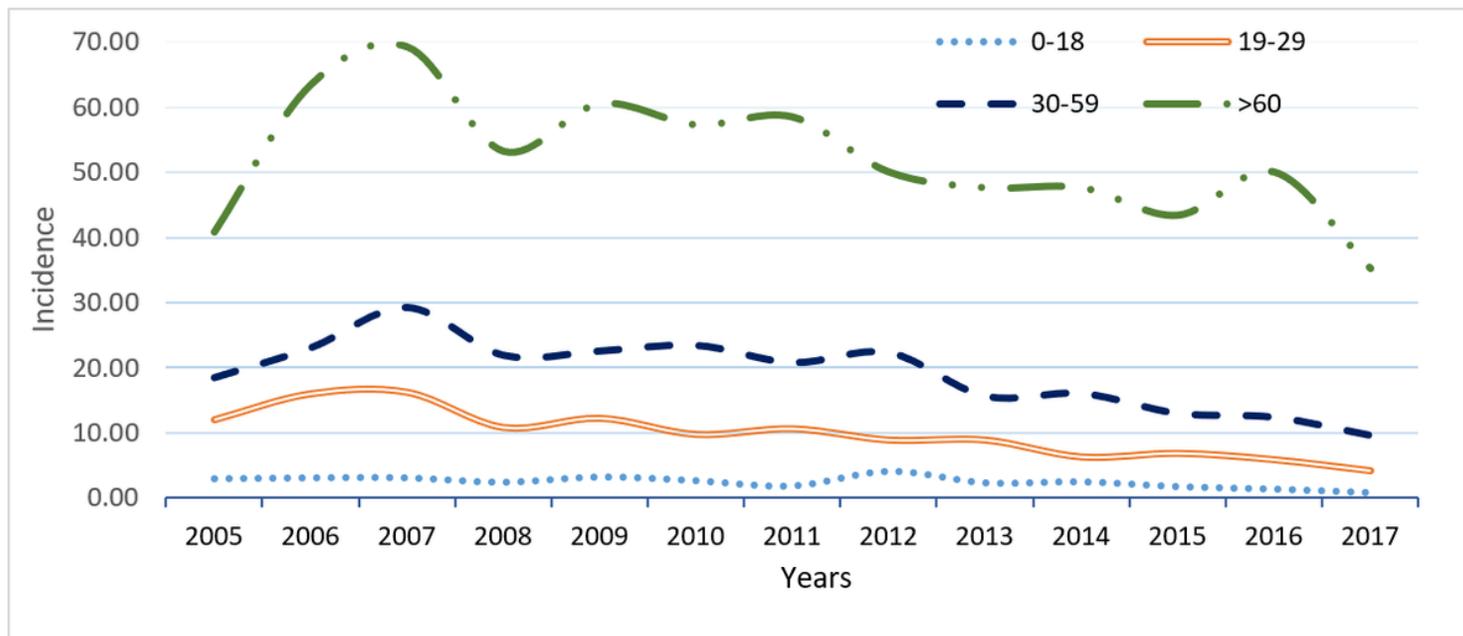


Figure 1

Trends in tuberculosis incidence among based on the age groups. (Rate per 100,000 population) in Iran, 2005-2017.

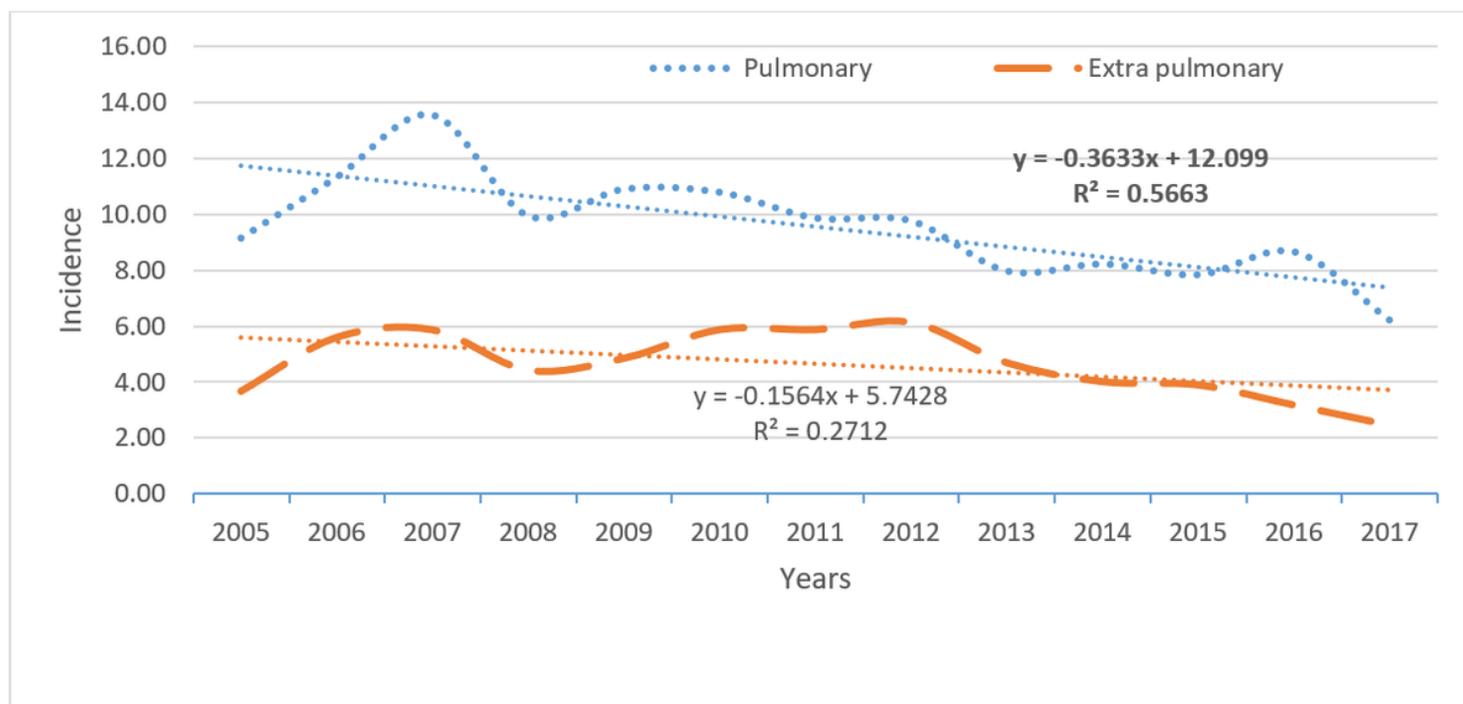


Figure 2

Trends in tuberculosis incidence among based on the type of tuberculosis. (Rate per 100,000 population) in Iran, 2005-2017.