

Original Article

Clinical epidemiology and treatment findings of patients with tuberculosis in Babol city, Iran (2009-2013)

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ARTICLE INFO

Received 25.10.2015
Revised 03.05.2016
Accepted 12.06.2016
Published 30.06.2016

Key words:

Tuberculosis;
Epidemiology;
Risk factors;
Clinical Patterns;
Iran

ABSTRACT

Background & Aim: Nowadays tuberculosis (TB) is one of the public health concerns in Iran. The present study aimed to examine the clinical epidemiology and treatment findings of tuberculosis in Babol, Northern Iran.

Methods & Materials: This cross-sectional study was carried out on medical records of tuberculosis registry pertained to Health Center of Babol, Mazandaran province, Iran. The investigated variables included demographic characteristics and some clinical patterns. To present the findings the descriptive statistics such as mean (standard deviation, SD) and frequency (and relative frequency) were used. Analytical statistics was applied by using chi-square test and independent samples Student's t-test.

Results: The average age of 200 patients infected with tuberculosis was 47.5 years (SD = 21.4), and 58.5% of the cases were male. In both genders, age groups 18-38 years comprised the greatest percentage. During the 5 years study period, 95% of the patients received treatment protocol 1 (including new cases with positive smear, negative smear, and extra-pulmonary). At the end of treatment, 90.5% were improved or treatment period was completed. The most important clinical symptoms in referring the patients to the therapeutic centers were cough (75.1%) and fever (60.9%).

Conclusion: Education and giving information to general population about the most important clinical symptoms of tuberculosis such as fever and cough might be effective in early detection and prevention of Mycobacterium tuberculosis. Then effective treatment might decrease the burden of the disease.

Introduction

Infection with Mycobacterium tuberculosis, which includes 9 species of bacteria, causes tuberculosis in mammals such as humans (1). This infection leads to substantial economic losses (2). It is one of the main public health problems (3, 4) which afflicted about one third of the world population by some species (3). This pathogenic

agent is usually transmitted from those afflicted with the pulmonary forms to the others (5) and it is diagnosed by sputum samples test (6). Prevalence of tuberculosis (TB) is associated with some epidemiologic factors like HIV/AIDS epidemics, low social and economic level, over-population, and malnutrition (7, 8). According to several studies, the main identified risk factors of TB are age, gender, having positive or negative smear, direct observed treatment of cases by healthcare workers, the co-morbidity with HIV infection, and diabetes mellitus (3, 9-11).

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From the global burden perspective, TB is in the tenth place and it is anticipated that this disease will stay in that place or even come to the seventh place until 2020. The main priorities in TB control are decreasing its global prevalence to 50% of it in 1990 and decreasing TB associated deaths to one person in a million by the year 2050 (12). Technology development in developed countries, population rise, increased medical costs, and the critical role of education in treatment of patients together with a good relationship with patients will lead to better treatment results (13, 14).

In 2013, the prevalence of TB has been 21 people (95% CI 17-25) per one hundred thousand populations in Iran (15). The prevalence of TB in marginal parts of Iran like provinces of Sistan-va-Baluchistan, Khorasan, Mazandaran, Guilan, Western Azerbaijan, Eastern Azerbaijan, Ardabil, Kurdistan, Khuzestan and south costal parts is high and on the contrary in the central parts of the country it is low (16). Provinces of Golestan and Sistan-va-Baluchistan have the highest incidence and prevalence of TB in Iran. The age group of 60 to 80 years has the highest percentage of TB with the rate of 90.1% (17).

In order to control every disease, other than its surveillance, doing some cross sectional studies is needed to find out its epidemiologic pattern. Therefore, this study aimed to describe the clinical epidemiology of TB in Babol, Iran, during a 5 years period so that we will have an overview of TB pattern and provide some effective recommendations to improve the situation.

Methods

This was a cross sectional study which is performed in Babol Health Centre from April 2009 until March 2014 using census sampling method. The study site, Babol, is located in the northern part of Iran on the costal line of Caspian Sea with humid climate.

In this study data was collected from TB registry and according to patients' profile in the health centre. Patients' information was collected and documented by experienced personnel of Babol Health Centre and under supervision of a physician who was the

coordinator of TB Control Program. The study population were all patients with TB who were identified according to the flowchart approved by The Ministry of Health during the study period. The inclusion criteria were being a registered TB patient, being either Iranian or non-Iranian and having a complete medical profile and exclusion criteria were wrong TB diagnosis, uncompleted information in medical profile or migration from the city. Totally, 201 patients were registered during the 5-years study period and one patient was excluded due to incomplete profile. For the remaining 200 patients, questionnaires were filed according to the recorded information.

The investigated variables included age, gender, education level, job, marital status, the living place, and some clinical characteristics of patients like successful treatment (cured and completed treatment course), unsuccessful treatment (incomplete treatment, treatment failure, death and migration), history of contact with a TB patient, apparent clinical symptoms at the time of coming to the health centre, type of treatment regimen, history of having TB risk factors, history of hospitalization, and the name of TB diagnosing centre.

The collected data was analysed using SPSS statistical software version 19 (SPSS Inc., Chicago, IL, USA). Descriptive characteristics of patients were presented by mean (standard deviation) for normal quantitative variables and median (interquartile range) for non-normal ones. Qualitative variables were also presented by frequency (relative frequency). To investigate the statistical significance of associations between qualitative variables, we used chi-square test and in case of limitation in the frequency of observations, we used Fisher's exact test. We also used independent samples Student's t-test to compare the means of qualitative variables with the assumption of equal variances. P-value of less than 0.05 was considered as the significance level. The study protocol was reviewed and approved by the institutional review board (IRB) which is the ethics committee of Babol University of Medical Sciences. The patients' information was kept confidentially.

Results

200 patients with TB were recruited in this study from 2009 to 2014. The mean age of patients was 47.5 years old (SD = 21.4) with a range of 1 to 91 years old. The mean age of men and women was 50.0 (SD = 20.4) and 43.9 (SD = 22.3) years, respectively. There was a statistically significant association between patients' age and sex ($P = 0.04$). Among these patients, 103 (51.5%) lived in urban areas. The frequency of some of demographic characteristics of patients with TB referred to Babol Health Center is summarized in table 1.

Table 1. The frequency of demographic characteristics of patients with tuberculosis referred to Babol Health Centre, Iran (2009-2014)

Characteristic		Number (%)
Gender	Male	117 (58.5)
	Female	83 (41.5)
Living place	Urban	103 (51.5)
	Rural	97 (48.5)
Marital status	Married	160 (80.0)
	Single	35 (17.5)
	Others	5 (2.5)
Education	Illiterate or primary school	105 (52.5)
	Under high school	50 (25.0)
	High school and academic	45 (22.5)
Job	Farmer	30 (15.0)
	Jobless	21 (10.5)
	House wife	58 (29.0)
	Others	91 (45.5)

The highest rate of patients with TB in both sexes was in 18-38 years old group and the second place in men was for > 60 years old and in women 38-60 years old patients (Table 2).

During the 5 years of study, only 3 patients (1.5%) were diagnosed to have AIDS. From the perspective of risk factors of AIDS in patients with TB, 37 patients were tested for HIV including 9 prisoners (23.7%), 1 prisoner's spouse (2.6%), and 5 with the history of drug injection. In addition, 22 (57.9%) patients were tested in the national screening program. A statistically significant association was observed between job and having AIDS ($P = 0.001$). There was also a significant association between age and AIDS risk factors ($P = 0.001$). The place

of diagnosing these patients was as follows: 140 (70%) in government hospitals, 23 (11.5%) in clinics, 21 (10.5%) in health centres, 12 (6%) self-reporting, 3 (1.5%) in private hospitals and 1 person (0.5%) was diagnosed in prison.

Table 2. The age group and gender of patients with tuberculosis referred to Babol Health Centre, Iran (2009-2014)

Gender	Age groups (Years)	Number (%)
Male	< 7	1 (0.9)
	7-18	1 (0.9)
	18-38	50 (42.7)
	38-60	22 (18.8)
	> 60	43 (36.8)
Female	< 7	4 (4.8)
	7-18	6 (7.2)
	18-38	28 (33.7)
	38-60	25 (30.1)
	> 60	20 (24.1)

$P = 0.005$

In addition 47 patients (23.5%) reported the history of contact with a TB patient. In 15 patients (32.6%), the contact had happened less than 2 years ago, in 11 patients (23.9%) 2-5 years ago and in 20 patients (43.5%) more than 5 years ago.

In this study, according to the national guideline, only for 6 qualified patients the antibiogram test was done and of them, 5 patients (2.5%) showed sensitivity to the drug and 1 patient (0.5%) showed no sensitivity to it. Table 3 shows the distribution of therapeutic services among the patients with TB according to the treatment protocol.

Table 3. Distribution of treatment services among tuberculosis patients referred to Babol Health Centre, Iran (2009-2014)

Treatment groups	Patients under treatment	Intensive phase	Continuation phase
1 [n=190(95%)]	New patients with: positive smear test, negative smear test, extrapulmonary TB	HRZE 2 months or HRZS 2 months	HR 4 months
2 [n=10(5%)]	Relapse or treatment failure and others	HRZES 2 months and then, HRZE 1 month	HRE 5 months

H: Isoniazid (INH), R: Rifampin (RIF), Z: Pyrazinamide (PZA), E: Ethambutol (EMB); TB: tuberculosis

Adverse effect of drugs was reported in 15 (7.5%) patients. According to the treatment results, all patients who had died due to TB or other causes and also cases of treatment failure and treatment cut, were in treatment group 2 (Figure 1).

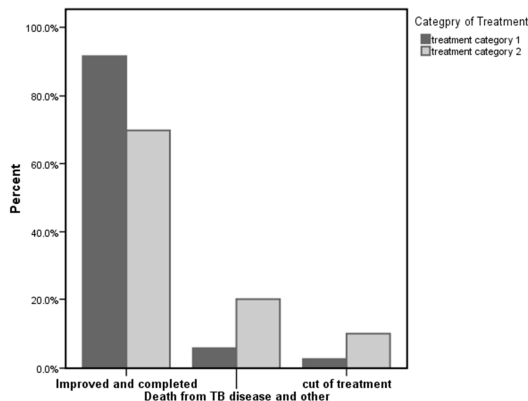


Figure 1. Comparison of treatment results in 2 groups of patients with tuberculosis referred to Babol Health Centre, Iran (2009-2014)

The early symptoms of TB in the studied population included coughing in 131 (66.2%) patients, fever in 19 (9.6%), asthma in 7 (3.5%) and neck oedema in 6 (3%) patients. In addition, coughing and fever were the main causes of referring to the health centre. The frequency of other symptoms is shown in table 4.

Table 4. Frequency of apparent clinical symptoms leading to referral to Babola Health Centre, Iran (2009-2014)

Variable	Yes [Number (%)]	No [Number (%)]
Cough	148 (75.1)	49 (24.9)
Fever	120 (60.9)	77 (39.1)
Sputum	110 (55.8)	87 (44.2)
Perspiration	111 (56.3)	86 (43.7)
Haemoptysis	22 (11.2)	175 (88.8)
Weight loss	118 (59.9)	79 (40.1)

In the studied population, 103 patients (51.5%) had the history of hospitalization before their TB diagnosis.

In patients with the history of TB related risk factors, 29 (14.5%) had diabetes, 8 (4%) had drug injection, 4 (2%) had cancer and 10 (5%) patients had others diseases.

Discussion

According to the study findings, 18-38 years old group had the highest number of patients with TB in both genders. The second age group with the highest number were > 60 years old in men and 38-60 years old in women. A statistically significant association was observed between variables of age and job. In Khazaei et al. study in Hamedan province, Iran, > 60 years old age group had the highest number of patients with TB (18). In a study conducted by Gholami et al. in Urmia, Iran, most of patients with TB were in 31-40 years old age group (19). In most of the studies conducted in Iran, the highest number of patients with TB has been in > 60 years old age group (20, 17). It seems that the high number of patients with TB in 18-40 years old age group is due to the higher population of this group in comparison with other age groups, or maybe it is due to some issues like addiction in Mazandaran province and referring the patients from all existing camps in the province to the health centres. In > 60 years old age group, weakness of immune system and having contact with children and other family members, increases the risk of opportunistic infections such as mycobacterium tuberculosis and that's why TB is more prevalent among them.

In this study, men constituted a high proportion of patients with TB. In Babamahmoodi et al. study conducted in northern Iran, the TB incidence rate was higher in men as well (21). Generally, according to the studies conducted in Iran, the number of patients with TB in men is more than women (22, 23). It seems to be due to the genetic factors, nutrition, presence of men out of home and job related factors.

Results of this study showed that most of the patients with TB have been diagnosed in governmental hospitals, clinics and health centres. In Hassan et al. study, governmental hospitals, clinics and private sector had the highest report of diagnosis (4). In another study conducted by Masjedi et al. in Tehran, the percentage of TB diagnosis by private sector was 87.3%. According to the findings of the mentioned study, there is a weak relationship and coordination between governmental systems

and private sector (24). Having the highest reports of TB diagnosis from governmental hospitals shows that patients with TB have passed from the first level of health care services without being diagnosed and for diagnosis or hospitalization they have been referred to the hospitals and in this process, the time between onset of symptoms and diagnosis will be longer. Therefore, it is recommended that health houses and health centres as the first levels of providing health services to people do the required actions for early diagnosis of patients.

In this study, a statistically significant association was observed between job and having AIDS and also between age and AIDS risk factors. In Khazaei et al. study, the highest number of TB and HIV cases which were mostly men was observed in 31-60 years old age group (90.7%) with the mean age of 36.2 years old (18).

According to the treatment results, 90.5% of patients with TB were in the cured and completed treatment course group (Figure 1). In a study, the rate of positive response to treatment in patients with TB was 64.5% (25). In Golestan province, Iran, the rate of treatment failure in direct observed treatment strategy (DOTS) group was 1.7% at the beginning of 5th month of treatment while the rate of treatment failure in control group was 7.3%. Therefore, a significant correlation between treatment strategy and treatment failure rate was observed (26). In a study conducted to compare the efficacy of family based DOTS (FB DOTS) with professional-family mix DOTS (PFM-DOTS) in Tabriz city, in 2 and 4 months periods, PFM-DOTS had better efficacy (27). Studies conducted all around the world have shown that implementation of DOTS may promote treatment success up to 90 to 95 percent (28, 29). In a study conducted in Iranian capital city (Tehran), it was estimated that the mean costs for a TB patient includes: 28,467,737 Rials (2588 US Dollars) for direct medical costs, 1,011,360 Rials (92 US Dollars) for indirect medical costs and 5,533,020 Rials (503 US Dollars) for other indirect costs. Since high costs of TB treatment are usually imposed on families during the first 2 to 3 months, this may lead to the reduction in the quality of their lives (30).

There are many factors causing treatment delay and treatment failure including lack of compliance to the treatment protocol, improper nutrition during treatment, wrong treatment regimen, delayed treatment, problems in drug distribution, lack of timely supervision and correct advice on the way of taking drugs (27, 31). Accordingly, the treatment status in both cured group and completed treatment group in Babol was better than what it had been reported in other studies.

The rate of adverse effects of medicines in this study was 7.5%. In Farazi et al. study, acute side effects and mild side effects were observed in 17.6% and 82.4% of the patients, respectively (31). Ayatollahi and Khavendegaran's study in Shiraz, Iran, reported that 29.5% of patients with TB had mild and 5.2% had acute drug adverse effects (32). In a study conducted in Guilan province, Iran, almost 27.3% of patients with TB reported more than one drug side effect. Their side effects included liver failure (48.2%), ocular complications (1.7%), intestinal complications (82%) and dermal complications (5.3%) (33).

According to the results of this study, the most prevalent symptom in patients with TB was cough, fever, sputum and weight loss which are the most important signs for TB diagnosis. This is consistent with the results of other studies in Iran in which cough has been the most prevalent symptom in patients with TB (34-36). In Alavi et al. study in Ahvaz, Iran, cough, fever, and sweating at night in diabetic patients with TB was the same as non-diabetic patients with TB but having sputum, haemoptysis, and dyspnoea were more prevalent among diabetic patients with TB in comparison with non-diabetic ones (37). In a study the more the age, the less the body mass (38). Also the response to the tuberculin test was significantly correlated with tuberculosis clinical symptoms (38). These symptoms may be emphasised in training for the society. Health care worker should consider TB as soon as they see these symptoms in a patient and do the needed actions. In addition, these patients should be checked in screening of TB high risk group for early diagnosis.

About one fourth of patients in this study reported the history of contact with a patient

with TB. In a study, more than 50% of patients had the history of contact with a patient with TB in the past time (21). In this study, 14.5% of patients with TB had diabetes mellitus. In another study, 9.5% of patients with TB were diabetic (21). The probability of TB treatment failure in patients having TB and diabetes concurrently is higher (39). The weakness of immune system in patients with TB and diabetes is associated with some factors such as reduction in the activity of alveolar macrophages and decreased ability in producing interleukin (40, 41). Therefore case finding among high risk groups like diabetic patients is recommended.

A limitation of this study was the access to the medical reports of patients. In addition, due to the probability of under reporting, the incidence rate was not calculated.

Based on the results of this study, it is needed to inform people about main clinical symptoms of TB such as cough and fever to diagnose and treat it as soon as possible and prevent the spread of mycobacterium tuberculosis in the society. Of course having effective treatment methods is very important. Active screening by health care workers in TB high risk groups and symptomatic patients and evaluation of barriers of implementing the preventive and therapeutic programs in the society is emphasized.

Acknowledgments

Authors would like to thank the Research and Technology vice-chancellor of Babol University of Medical Sciences and all personnel of Health vice-chancellery of Babol University of Medical Sciences for their cooperation. This article is result of a research project registered with the number of 9338811 in Babol University of Medical Sciences.

References

1. Brosch R, Gordon SV, Marmiesse M, Brodin P, Buchrieser C, Eiglmeier K, et al. A new evolutionary scenario for the Mycobacterium tuberculosis complex. Proc Natl Acad Sci U S A 2002; 99(6): 3684-9.
2. Riemann HP, Abbas B. Diagnosis and control of bovine paratuberculosis (Johne's disease). Adv Vet Sci Comp Med 1983; 27: 481-506.
3. Bawri S, Ali S, Phukan C, Tayal B, Baruwa P. A study of sputum conversion in new smear positive pulmonary tuberculosis cases at the monthly intervals of 1, 2 & 3 month under directly observed treatment, short course (dots) regimen. Lung India 2008; 25(3): 118-23.
4. Hassan ZJ, Nasehi M, Rezaianzadeh A, Tabatabaee H, Rajaeifard A, Ghaderi E. Pattern of reported tuberculosis cases in Iran 2009-2010. Iran J Public Health 2013; 42(1): 72-8.
5. Yazdani Charati J, Kazemnejad A, Mosazadeh M. An epidemiological study on the reported cases of tuberculosis in Mazandaran (1999-2008) using spatial design. J Mazandaran Univ Med Sci 2010; 19(74): 9-16. [In Persian].
6. Nasrollahi A, Khalilian A. Evaluation of treatment results in patients with drugresistant TB and compliance with treatment regimens in the province. Urmia Med J 2003; 14(4): 295-303. [In Persian].
7. Organizaci3n Mundial de la Salud. WHO Report 2011: Global Tuberculosis Control. Geneva, Switzerland: World Health Organization; 2011.
8. Harries AD, Dye C. Tuberculosis. Ann Trop Med Parasitol 2006; 100(5-6): 415-31.
9. Kumaresan JA, Ahsan Ali AK, Parkkali LM. Tuberculosis control in Bangladesh: success of the DOTS strategy. Int J Tuberc Lung Dis 1998; 2(12): 992-8.
10. Senkoro M, Mfinanga SG, Morkve O. Smear microscopy and culture conversion rates among smear positive pulmonary tuberculosis patients by HIV status in Dar es Salaam, Tanzania. BMC Infect Dis 2010; 10: 210.
11. Banu Rekha VV, Balasubramanian R, Swaminathan S, Ramachandran R, Rahman F, Sundaram V, et al. Sputum conversion at the end of intensive phase of Category-1 regimen in the treatment of pulmonary tuberculosis patients with diabetes mellitus or HIV infection: An analysis of risk factors. Indian J Med Res 2007; 126(5): 452-8.
12. World Health Organization. Tuberculosis: factsheet no. 104 [Online]. [cited 2008];

- Available from: URL:
<http://www.who.int/mediacentre/factsheets/fs104/en/index.html>
13. Anoosheh S, Farnia P, Kargar M. Association between TNF-Alpha (-857) Gene Polymorphism and Susceptibility to Tuberculosis. *Iran Red Crescent Med J* 2011; 13(4): 243-8.
 14. Sharifirad GR, Hazavehei MH, Mohebi S, Rahimi M, Hasan Zadeh A. The effect of educational programme based on health belief model (HBM) on the foot care by type ii diabetic patients. *Iran J Endocrinol Metab* 2006; 8(3): 231-9.
 15. World Health Organization. Global tuberculosis report. Geneva, Switzerland: WHO; 2014.
 16. Velaiati AA. Tuberculosis. In: Azizi F, Hatami H, Janghorbani M, Editors. *Epidemiology and control of common disorders in Iran*. 2nd ed. Tehran, Iran: Khosravi Press; 2004. p. 602-17. [In Persian].
 17. Mohammadpour A, Fani MJ, Motalebi M, Shams H. Epidemiology of tuberculosis disease during 1372-80 in Gonabad city. *Ofogh-e-Danesh* 2001; 8(1): 45-51. [In Persian].
 18. Khazaei S, Roshanaei G, Saatchi M, Rezaeian S, Zahiri A, Bathaei SJ. The epidemiological aspects of tuberculosis in Hamadan Province during 2005-11. *Int J Health Policy Manag* 2014; 2(2): 75-80. [In Persian].
 19. Gholami A, Gharah Aghaji R, Mousavi Jahromi L, Sadaghianifar A. Epidemiologic survey of pulmonary tuberculosis in Urmia city during 2004-2007. *Knowledge Health* 2009; 4(3): 19-23. [In Persian].
 20. Alaei K, Mansouri S, Alaei A. Study on the prevalence rate of clinical tuberculosis in HIV positive patients in Kermanshah province. 1998-2001. *J Mazandaran Univ Med Sci* 2002; 12(35): 20-30. [In Persian].
 21. Babamahmoodi F, Alikhani A, Yazdani CJ, Ghovvati A, Ahangarkani F, Delavarian L, et al. Clinical epidemiology and paraclinical findings in tuberculosis patients in north of Iran. *Biomed Res Int* 2015; 2015: 381572.
 22. World Health Organization. Global tuberculosis control: WHO Report 2010. Geneva, Switzerland: World Health Organization; 2010.
 23. Hoa NB, Wei C, Sokun C, Lauritsen JM, Rieder HL. Characteristics of tuberculosis patients at intake in Cambodia, two provinces in China, and Viet Nam. *BMC Public Health* 2011; 11: 367.
 24. Masjedi MR, Fadaizadeh L, Taghizadeh AR. Notification of patients with tuberculosis detected in the private sector, Tehran, Iran. *Int J Tuberc Lung Dis* 2007; 11(8): 882-6.
 25. Nasehi MM, Moosazadeh M, Amiresmaeili M, Parsaei MR, Nezammahalleh A. Epidemiology of factors associated with detection and treatment outcomes of patients with smear positive pulmonary tuberculosis: a population based study using univariate and multivariate analysis. *J Mazandaran Univ Med Sci* 2012; 21(1): 10-9. [In Persian].
 26. Abassi A, Aarabi M. The efficacy of DOTS strategy in treatment or failure of treatment in respiratory Tuberculosis. *J Gorgan Uni Med Sci* 2004; 6(1): 78-82. [In Persian].
 27. Yekrang SH, Jannati A, AsghariJafarabadi M, Ebrahimi-Kalan M, Taheri A, Koosha A. The Effectiveness of family-based DOTS versus professional-family mix DOTS in treating smears positive tuberculosis. *Health Promot Perspect* 2014; 4(1): 98-106.
 28. Nasehi M, Mirhagani L. National directory for combating TB. 1st ed. Tehran, Iran: Andishmand Publication; 2010. [In Persian].
 29. Shoraka H, Hoseini H, Alizade H, Alaviny M. Epidemiology of tuberculosis and other related factors in the province of North Khorasan, Iran, 2005-2010. *J North Khorasan Univ Med Sci* 2011; 3(3): 43-50. [In Persian].
 30. Hasoumi M, Nasehi M, Khakian M, Mohseni M, Ziaifar H, Keykale MS. Cost of illness of tuberculosis in tehran in the year 2011. *Mater Sociomed* 2014; 26(5): 339-42.
 31. Farazi A, Sofian M, Jabbariasl M, Keshavarz S. Adverse reactions to antituberculosis drugs in iranian tuberculosis patients. *Tuberc Res Treat* 2014; 2014.
 32. Ayatollahi S, Khavendegaran F. Prevalence of the side-effects of anti- tb drugs in tubercular patients in Shiraz, 2001-2002. *Armaghane-danesh* 2004; 9(1): 53-61. [In Persian].
 33. Taramian S, Joukar M, Asgharnezhad M,

- Biabani A, Mansour Ghanee F. Side effects of first-line anti tuberculosis drugs. *J Guilan Univ Med Sci* 2013; 22(85): 42-7. [In Persian].
34. Boloursaz MR, Khalilzadeh S, Baghaie N, Khodayari AA, Velayati AA. Radiologic manifestation of pulmonary tuberculosis in children admitted in pediatric ward-Massih Daneshvari Hospital: a 5-year retrospective study. *Acta Med Iran* 2010; 48(4): 244-9.
 35. Baghaei P, Tabarsi P, Abrishami Z, Mirsaedi M, Faghani YA, Mansouri SD, et al. Comparison of Pulmonary TB Patients with and without Diabetes Mellitus Type II. *Tanaffos* 2010; 9(2): 13-20. [In Persian].
 36. Mousavi SG, Saberi HR, Sharif AR, Ghorbani F, Shadkam M, Vojdani S, et al. A comparative study of patients with pulmonary tuberculosis and extra- pulmonary tuberculosis in Kashan. *Feyz* 2009; 13(3): 235-41.
 37. Alavi SM, Khoshkho MM, Salmanzadeh S, Eghtesad M. Comparison of epidemiological, clinical, laboratory and radiological features of hospitalized diabetic and non-diabetic patients with pulmonary tuberculosis at Razi hospital in Ahvaz. *Jundishapur J Microbiol* 2014; 7(9): e12447. [In Persian].
 38. Margolis B, Al-Darraji HA, Wickersham JA, Kamarulzaman A, Altice FL. Prevalence of tuberculosis symptoms and latent tuberculous infection among prisoners in northeastern Malaysia. *Int J Tuberc Lung Dis* 2013; 17(12): 1538-44.
 39. Jimenez-Corona ME, Cruz-Hervert LP, Garcia-Garcia L, Ferreyra-Reyes L, Delgado-Sanchez G, Bobadilla-Del-Valle M, et al. Association of diabetes and tuberculosis: impact on treatment and post-treatment outcomes. *Thorax* 2013; 68(3): 214-20.
 40. Wang CH, Yu CT, Lin HC, Liu CY, Kuo HP. Hypodense alveolar macrophages in patients with diabetes mellitus and active pulmonary tuberculosis. *Tuber Lung Dis* 1999; 79(4): 235-42.
 41. Yaghini N, Mahmoodi M, Asadikaram GR, Hassanshahi GH, Khoramdelazad H, Kazemi AM. Serum levels of interleukin 10 (IL-10) in patients with type 2 diabetes. *Iran Red Crescent Med J* 2011; 13(10): 752.