



# ORIGINAL: Epidemiological, Clinical and Paraclinical Study of the Reported Cases of Tuberculosis in Qaemshahr (2010-2017)

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## ABSTRACT

**Introduction:** Tuberculosis (TB) is a chronic, life-threatening, and contagious infectious. This study aimed to evaluate the epidemiological, clinical, and paraclinical findings of TB in Qaemshahr.

**Material and Methods:** In this descriptive cross-sectional study, we investigated all patients with TB who had registered and existing data from 2010 to 2017. Demographical data, clinical and paraclinical characteristics including family history of disease, disease type (pulmonary and extrapulmonary), smear and culture results, underlying disease, chest X-ray results were extracted from records. Data were collected and analyzed using SPSS version 22.

**Results:** Out of 290 patients, 61.4% were male (178 cases), and 38.6% (112 cases) were female. The mean age was  $21.75 \pm 21.25$  years. 70.7% were pulmonary, and 29.3% were extrapulmonary. 60.3% were in urban areas and 39.7% in rural areas. The largest organ involved was lung (70.7%). 95.5% were diagnosed as new. The smear was negative in 53.8% of patients. 44.8% of patients were smear-positive. The culture result was positive in 54.5% of patients with TB. In the case of bronchoalveolar lavage (BAL), smear, 11.7% of patients had a positive result. The negative result of BAL smear was observed in 88.3% of cases.

**Conclusion:** Awareness of various forms and clinical symptoms, radiographic findings in people with TB help to early detection of the disease.

## Introduction

Tuberculosis (TB) is a life-threatening infectious disease that describes a wide range of clinical diseases caused by Mycobacterium

tuberculosis in most cases. The most common sites of infection are lungs, but it can also affect other organs in one-third of cases (1,2).

It has been estimated that 10 million people fell ill with TB in 2018, while the incidence of TB was 14 per 100,000 in Iran (3). Most cases of TB are vulnerable populations who are predisposed to risk factors, including population aggregation, unhealthy diet, weakened immune system, and sources of infection in the family (4). Smoking, alcohol use, and diabetes can also be risk factors for TB infection (5). Transmission of TB occurs when a source case of TB spread infective particles that will survive in air and are being inhaled by an individual and may develop TB (6). Because of deficiencies in immune system or using immunosuppressive drugs and other associated factors, 5 to 10 % of people who were infected with TB would get TB disease. If one individual with TB does not get treated, he or she can infect 10 to 15 people (7,8). According to disease center of health deputy of ministry of health and medical education, TB outbreak is 13% in 1000 in Iran, which reaches its peak in Sistan, Baluchestan, and Golestan provinces (9). TB presents with usual clinical and radiological presentations includes fever, night sweats, hemoptysis, and alveolar lesions in upper lobes in adults and middle-ages. However, these presentations are not observed in older adults (10). TB diagnosis is usually based on observing Acid-fast Bacillus microscopically in sputum or tissue samples. Other diagnostic methods include sample culture, biopsy from engaged spot, pathological inspection, and observing calcified necrosis and radiology with clinical presentations (11,12). Rapid diagnosis and treatment of TB is the best way to prevent it. If TB caused by sensitive species being treated correctly, it would be followed by total recovery, but in the case of remaining untreated, it would lead to patient mortality in 5 years (1). The purpose of this study is to investigate epidemiological, clinical, and paraclinical factors of registered TB disease cases in Qaemshahr between 2010 to 2017.

## Methods

In this descriptive cross-sectional study, we investigated all patients with TB who had

registered and existing data during an 8-year period (2010-2017). Demographical data, clinical and paraclinical characteristics including family history of disease, disease type (pulmonary and extrapulmonary), smear and culture results, underlying disease, chest X-ray results were extracted from records. Inclusion criteria were all recognized patients with TB in Qaemshahr from 2010 to 2017, and exclusion criteria were patients who had incomplete case records.

Data were collected and analyzed using SPSS v.22. In order to investigate association between quantitative variables, Pearson's or Spearman's coefficients were calculated, and Chi-Square test was used for qualitative variables. P-value < 0.05 was considered as significant.

All relevant authorities and samples were informed of study purposes after obtaining permission for research conduction. Participants were also informed that enrolling in research is mandatory, and they can exit the study if they did not want to proceed anymore at any time. They were ensured that their identity would be remained classified in the entire study. Finally, informed consent was obtained from the volunteers.

## Results

Of the 290 patients studied, 61.4% were male (178 patient) and 38.6% (112 patient) female. Out of the total population, 60.3% were in urban areas and 39.7% in rural areas. 70.7% of patients had pulmonary TB (PTB), and extrapulmonary TB (EPTB) was present in 29.3%. The most common organ involved in patients with TB was lung (70.7%) followed by pleural and spine (9.7%) and neck lymph nodes (8.6%) (*Table 1*). Of all patients, 95.5% were diagnosed as new. Recurrence had occurred in 2.4% of patients. Four cases were from Sari, Jouybar, Neka, and Kerman. A total of 290 smears were performed, of which 130 were positive. The smear results were negative in 53.8% of patients. The result of cultures was positive in 54.5%. Smear of bronchoalveolar lavage (BAL), 11.8% were positive. Negative BAL smear result was

observed in 88.2% of cases. In 45.9% of chest radiographs in patients with TB, the result was more suggestive of having the disease (*Table 2*).

In total, of the 45 people who tested HIV, HIV infection was positive in one patient and negative in 44 patients. A history of imprisonment was the most common risk factor for HIV in patients with TB (16.6% of 19%). There was also a history of high-risk sexual behavior and a history of injecting drug addiction in 1.4% and 1% of patients with a history of HIV risk factors, respectively.

Jaundice and hepatitis were the most common complication of TB (17 cases). Then vomiting (5 cases), silicosis and itching, skin rashes were other major complications. 91.7% of people had no specific complications (*Table 1*).

**Table 1. Frequency of TB patients in terms of organs involved and major complications**

	Variable	% (N)
<b>Organs Involved</b>	Lung	70.7 (205)
	Pleural and Spine	9.7 (28)
	Neck lymph nodes	8.6 (25)
	Spine	3.1 (9)
	Digestive system	1 (3)
	Meninges	1 (3)
	Peritoneum	0.7 (2)
	Bronchus	0.3 (1)
	Genital	0.3 (1)
	Middle ear	0.3 (1)
	Eye	0.3 (1)
	Pelvis	0.3 (1)
	Pericardium	0.3 (1)
	Knee joint	0.3 (1)
	Chest soft tissue	0.3 (1)
	Bone	0.3 (1)
	Skin	0.3 (1)
	Small intestine	0.3 (1)
	Testis	0.3 (1)
	Uterus	0.3 (1)
Breast	0.3 (1)	
<b>Major Complications</b>	Jaundice and hepatitis	5.9 (17)
	Vomit	1.7 (5)
	Silicosis	0.3 (1)
	Itching, rash with fever	0.3 (1)

Diabetes was the most common risk factor observed among patients with TB (17.2% of patients with a history of risk factors for TB). Immunosuppressive medications, low body weight, prolonged treatment with corticosteroids, history of TB infection, Intravenous drug user (IVDU), HIV, End stage renal disease (ESRD), and malignant hematopoietic and reticuloendothelial diseases were risk factors among the patients with TB in our study. Among the patients, a history of contact with the patient with TB was seen in 15.5% of patients. Most of the patients who had a history of contact with TB patients had a history of contact in 7.9% over the past two years, with 18 (6.2%) having contact for more than five years (*Table 3*). The mean length of hospital stay was 11.50  $\pm$ 10.98 days.

## Discussion

About 3 million people die of TB worldwide each year, of which 98% are in developing countries. Today, TB control remains a top health priority for developing countries, including Iran. TB is a chronic bacterial disease that can cause a wide range of diseases (13,14). Arsang et al. conducted a study on the epidemiology of TB in Iran (2001-2008). In this cross-sectional descriptive study, the incidence rate of smear-positive PTB in Iran was decreasing during 2001-2008, with an average decrease of 4.1% and 3.6% of cases of recurrent TB,

**Table 2. Frequency of TB patients in terms of smear results, BAL, Culture, CXR**

	Variable	% (N)
<b>Smear Results</b>	Positive	44.8 (130)
	Negative	53.8 (156)
<b>Culture Results</b>	Positive	54.5 (158)
	Negative	45.5 (132)
<b>BAL smear results</b>	Positive	11.8 (34)
	Negative	88.2 (256)
<b>CXR results</b>	More suggestive	45.9 (133)
	Less suggestive	31.7 (92)
	Non-suggestive	22.4 (65)

**Table 3. Frequency risk factors and history of contact**

	Variable	% (N)	
<b>Risk factors</b>	<b>Diabetes</b>	17.2 (50)	
	<b>Taking other immunosuppressive drugs</b>	2.8 (8)	
	<b>Low body weight</b>	2.8 (8)	
	<b>Long term treatment with corticosteroids</b>	1.7 (5)	
	<b>History of TB infection</b>	0.7 (2)	
	<b>IVDU</b>	0.7 (2)	
	<b>HIV-positive</b>	0.3 (1)	
	<b>ESRD</b>	0.3 (1)	
	<b>Malignant blood and reticuloendothelial diseases</b>	0.3 (1)	
	<b>History of contact with TB patient</b>	<b>&gt; 5 years ago</b>	6.2 (18)
		<b>2 - 5 years ago</b>	1.4 (4)
		<b>&lt; 2 years ago</b>	7.9 (23)
		<b>No contact</b>	84.5 (245)

respectively. The median annual rate of TB deaths decreased by 6.8% and TB patients finding increased by 2.5% annually; in 2002, the pattern of disease trends in men and women changed, with the number of cases decreasing in women and continued in men with a steady trend. Also, most cases of both sexes were those over 65 years of age. The results of this study showed that in Iran, the incidence of smear-positive PTB and the rate of success in the treatment of TB has a decreasing trend, and the percentage of TB patients finding has an ascending trend (15). In a study by Saghafipour et al., study on the epidemiological status of PTB and its related factors in 3 patients with PTB in Qom province from 2002 to 2002, the lowest incidence was in 2002 (5). The highest incidence was observed in the year 87 (13.6 per hundred thousand). Saghafipour et al. study on the epidemiological status of PTB and its related factors in 1035 patients with PTB in Qom province from 2002 to 2010, the lowest incidence was in 2002 (5.9 per hundred thousand), and the highest incidence was observed in 2008 (13.6 per hundred

thousand). In their study findings, as in our study, no significant increase or decrease was observed during the years studied (16).

Jamshidi et al. conducted a study of the prevalence of PTB in patients with chronic cough suspected of having TB within one year. In this cross-sectional study, 546 patients with chronic TB suspected of TB during one year were evaluated for three cases of sputum smear and, in some cases, of sputum culture for acid-fast bacilli and chest x-ray. 53.7% were male and 46.3% female, of which 80 (15.6%) had positive sputum PTB, 39 (7.7%) had negative sputum PTB, and 427 (77.7%) had antibiotic-treated cases with other diagnoses. In this study, out of every 100 cases of sputum, about 15 were positive for acid-fast bacilli, which is unexpected. Therefore, it is recommended that patients with chronic unexplained cough who have not responded to appropriate antibiotic therapy be evaluated by examining sputum samples for acid-fast bacilli and, if necessary, chest x-ray to rule out or confirm TB (17).

In a study by Heshmati et al., Which conducted an epidemiological study of TB disease in Galikesh between 2006 and 2011, 74.7% of patients had PTB, and the highest frequency of PTB patients was smear-positive with 56.2%. The most common type of EPTB was lymph node TB with 33.3% (18). The prevalence of PTB in our study was similar and consistent with Heshmati study. On the other hand, in our study, the prevalence of smear-positive cases in TB patients was 44.8%. In a study in Gorgan in which Khodabakhshi et al., conducted a study of 1550 TB patients, 77.3% had PTB and 22.7% had EPTB (19), which is similar to our study. In a study by Farazi et al., A study of EPTB and its comparison with 1787 patients between 2001-2011, 24.2% had EPTB. 1.9% of patients with EPTB were associated with HIV infection (20).

In a study in Kashan that examined the epidemiology of TB in 183 TB patients, 33% of patients were in the age group of 10-30 years, and 33% were in the age group of 50-70 years. 107 patients (58.5%) were female and 76 (41.5%) were male. The highest

prevalence of TB in homemakers and carpet women (about 90%) and TB men (about one-third). 67% of patients were Iranian, and 33% were Afghan. 55% of patients were urban, and the rest were rural. 53.5% of cases were PTB, and 46.5% were EPTB. PTB was diagnosed by direct examination or sputum culture in 60% of patients with pathology and in 70% of patients with EPTB. 10% of TB patients and 30% of EPTB patients had negative tuberculin skin test (21). In a study conducted by Afzali et al. on 190 TB patients, 51% were male and 49% were female. The lowest TB in the age group was less than 5 years and the highest TB in the age group of 66 years. Of the 190 patients with TB, 56.3% had PTB and 43.7% had EPTB (22). Given the increase in liver enzymes and the possibility of liver toxicity following TB treatment, especially in elderly patients, appropriate drug therapy and attention to the liver side effects of the drug should be considered. In the study of Teymoorzadeh Baboli et al., The incidence of PTB and EPTB was 91.7% and 8.3%, respectively (23), which was different from the findings of our study.

Charati et al. performed a descriptive epidemiological study on 2444 reported cases of TB in Mazandaran province during the years 1999-2008. 52.5% were male and 47.5% female, 61% urban and 39% rural and 96.4% Iranian. The highest incidence rate was in Behshahr city (19.39 per hundred thousand) and the lowest was in Jouybar (6.45 per hundred thousand) (9). In our study, 45.9% of chest radiographs in patients with TB were more suggestive of TB. The smear result was negative in 53.8% of patients. The result of culture was positive in 54.5% of patients with TB. Prior to BAL smear before treatment in TB patients, 11.7% had a positive outcome, 6.2% with 1, 2.8% with 2, and 2.8% with 3. Negative BAL smear result was observed in 88.3% of cases. Patients with TB had negative results for culturing BAL before treatment in 94.5% of cases.

In one study, Keramat et al. (24) compared radiological findings in patients with positive smear and negative smear PTB. In this cross-

sectional study, 63 patients with PTB referred to Hamadan hospital were enrolled. At the end of treatment, 32 patients remained in the study and clinical symptoms and radiological findings were re-evaluated. Of 63 patients, 68.3% were male and 31.7% female with mean age of  $56.84 \pm 23.77$  years. Forty-four patients (69.8%) were smear-positive, and 19 patients (30.2%) were smear-negative. The most common radiological manifestations of smear-positive patients were fibrotic changes at the beginning of nodular infiltration treatment and atelectasis at the end. But in the smear-negative patients, alveolar density, nodular infiltration, pleural effusion and lymphadenopathy were observed at the end of treatment and fibrotic changes and greater volume reduction at the end of treatment. End-of-treatment imaging was abnormal in 54.5% of smear-negative patients and 85.7% of smear-positive patients. Abnormal imaging at the end of treatment was seen especially in a significant percentage of patients. Abnormal findings at the end of treatment were more in smear-positive patients than in smear-negative patients. Familiarity with the different radiographic findings of PTB can help in early diagnosis and timely treatment of the disease, thus preventing or at least reducing the complications of the disease. In total, 78 patients (26.9%) had biopsy specimens for the diagnostic process, with the most frequent biopsy being the pleural or spinal cord (9% of the 26.9%); subsequently, lymph node, bone, and gastrointestinal biopsy were performed. Of the cases sampled from the organs involved, in 13.4%, the results were identified as positive and definitive, and in 73.1% of cases, there was no need to do so, and in 13.4%, the pathology was suspicious.

In 2001, Badri et al. studied the association between TB and the progression of HIV disease in the region with a high incidence of TB. They conducted a prospective cohort study of 690 people with high prevalence of TB in the area. The prevalence of TB in the five years was 25.94%. TB was associated with an increased risk of AIDS (1.6 times) and mortality (2.16 times). The increased risk

of mortality in patients with TB was only in patients with CD4 <200. Mortality and risk of AIDS increased in HIV-infected patients who develop TB (25). In another study, Moosazadeh et al. (26) conducted a descriptive cross-sectional study of the prevalence of TB in 2405 prisoners. In terms of length of time in prison, 1008 (41.9%) were in prison for more than six months. Seven of the prisoners (0.3%) were HIV positive. 136 (5.7%) of the prisoners had a cough lasting more than two weeks. Sputum smear was positive in 2 (0.1%) of subjects and 2 (0.1%) of patients had EPTB.

Hadadi et al. (27) studied a study of PTB manifestations in patients with and without HIV / AIDS. In this case-control study, 120 patients with PTB including 40 HIV-positive patients (patient group) and 80 HIV-negative patients (control group) who were admitted to the infectious ward of Imam Khomeini Hospital during the years (1998-2004), Clinical signs, laboratory changes, and radiologic manifestations were compared. In both groups, male TB was more common. Clinical manifestations of weight loss and chronic cough were significantly higher in the control group (93.8% and 76.3%, respectively) than in the patients (80% and 45%), and the feeling of weakness and fatigue in the patient group was significant. Radiologically, cavitation and infiltration were less in the TB / HIV group, and the primary involvement was higher than the secondary involvement compared to the control group. Concerning the laboratory findings, our TB / HIV subjects had higher PPD negative (75% vs. 50%), higher ESR and lower Hb (10.6 vs. 12.4), and lower mean leukocyte and lymphocyte levels. The difference was significant in all these cases. Also, Since HIV causes changes in the clinical, laboratory, and radiological symptoms of TB, it is necessary to diagnose TB in all patients infected with the virus, especially if they have pulmonary symptoms. In our study, jaundice and medicinal hepatitis were the most common complication among TB patients (17 cases). Then vomiting (5 cases), silicosis and itching, skin rashes were

other major complications. In a study, Teymoorzadeh Baboli et al. conducted a study investigating the prevalence of medicinal hepatitis and its associated factors in four patients with TB referred to Razi Hospital from 2006 to 2011. 23.5% of patients had a history of underlying disease. The prevalence of medicinal hepatitis was 9.5%. There was no significant relationship between gender, type of TB, and type of treatment with medicinal hepatitis. In our study, the prevalence of medicinal hepatitis (5.9%) was lower than that of their study. The results of this study showed that high age might be one of the risk factors for drug hepatitis following anti-TB treatment. For this reason, these patients need to undergo regular clinical and laboratory examinations (23).

In a Gorgan study of 1550 hospitalized patients taking anti-TB drugs, hepatitis was seen in 37 patients (84.1%), skin complications in 5 patients (11.4%), and other complications in 2 patients (4.5%). Liver complications in 37 patients (84.1%), skin complications in 5 patients (11.4%), and other complications in 2 patients (4.5%) resulted in hospitalization. In their study, there was no significant relationship between the occurrence of drug side effects, age, sex, and underlying disease (19). Diabetes was the most common risk factor observed among patients with TB (17.2% of patients with a history of TB risk factors). Among the patients, a history of contact with the patient with TB was seen in 15.5% of patients. Most of the patients who had a history of contact with TB patients had a history of contact in 7.9% over the past two years, and 18 patients (6.2%) had a history of contact for more than five years. In 84.1% of the cases, there was a history of hospitalization associated with TB among the subjects.

### *Conclusion*

Awareness of various forms and clinical symptoms, radiographic findings in people with TB help to early detection of the disease. The findings of this study can provide useful

information on epidemiology, clinical findings, and paraclinical findings of TB so that physicians and health professionals can take effective interventions and clinical decisions to control the disease.

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### **Conflicts of interest**

The authors declare that there is no conflict of interest regarding the publication of this article.

### **Authors' contributions**

Study design: F.B., L.D.

Writing: A.R., M.H., F.H., A.H.

Final revision: All authors

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### **Ethics approval**

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## **References**

1. Fair E, Hopewell PC, Pai M. International Standards for Tuberculosis Care: revisiting the cornerstones of tuberculosis care and control. Expert review of anti-infective therapy. 2007;5(1):61-5.
2. Ghasemian R, Jafarpour H, Davoodi L, Movasagh S, Razavi A. Epidemiological and Clinical Survey of Patients with Spondylitis. Journal of Mazandaran University of Medical Sciences. 2019;29(180):57-67.
3. World Health Organization. Global tuberculosis report. 2019. Available from: [https://www.who.int/tb/publications/global\\_report/en/](https://www.who.int/tb/publications/global_report/en/)
4. Masjedi MR, Farnia P, Sorooch S, Pooramiri MV, Mansoori SD, Zarifi AZ, et al. Extensively drug-resistant tuberculosis: 2 years of surveillance in Iran. Clinical infectious diseases. 2006;43(7):841-7.
5. Silva DR, Muñoz-Torrico M, Duarte R, Galvão T, Bonini EH, Arbex FF, et al. Risk factors for Tuberculosis: diabetes, smoking, alcohol use, and the use of other drugs. J Bras Pneumol. 2018;44(2):145-52.
6. Churchyard G, Kim P, Shah NS, Rustomjee R, Gandhi N, Mathema B, et al. What We Know About Tuberculosis Transmission: An Overview. J Infect Dis. 2017;216(suppl\_6):S629-S35.
7. Organization WH. Global tuberculosis control: surveillance, planning, financing: WHO report 2008: World Health Organization; 2008.
8. Organization WH. Global tuberculosis control: epidemiology, strategy, financing: WHO report 2009: World Health Organization; 2009.
9. Yazdani Charati J, Kazemnejad A, Mosazadeh M. An epidemiological study on the reported cases of Tuberculosis in Mazandaran (1999-2008) using spatial design. Journal of Mazandaran University of Medical Sciences. 2010;19(74):9-16.
10. Rodger A, Jaffar S, Paynter S, Hayward A, Carless J, Maguire H. Delay in the diagnosis of pulmonary Tuberculosis, London, 1998-2000: analysis of surveillance data. Bmj. 2003;326(7395):909-10.
11. Babamahmoodi F, Alikhani A, Yazdani Charati J, Ghovvati A, Ahangarkani F, Delavarian L, et al. Clinical epidemiology and paraclinical findings in tuberculosis patients in north of Iran. BioMed research international. 2015.
12. Davoodi L, Babamahmoodi F, Mirabi A, Mohammad Hosseini E. Evaluation of Tuberculin Skin Test Seroconversion Among the Staff in Qaemshahr Razi Hospital, 2015-2017. Journal of Mazandaran University of Medical Sciences. 2018;28(164):158-63.
13. Glaziou P, Floyd K, Raviglione MC, editors. Global epidemiology of Tuberculosis. Seminars in respiratory and critical care medicine; 2018: Thieme Medical Publishers.

14. Merker M, Blin C, Mona S, Duforet-Frebourg N, Lecher S, Willery E, et al. Evolutionary history and global spread of the *Mycobacterium tuberculosis* Beijing lineage. *Nature genetics*. 2015;47(3):242.
15. Arsang S, Kazemnejad A, Amani F. Epidemiology of Tuberculosis in Iran (2001-08). *Journal of Gorgan University of Medical Sciences*. 2011;13(3):78-86.
16. Saghafipour A, Noroozei M, Mostafavi R, Heidarpour A, Ghorbani M. The epidemiologic status of Pulmonary Tuberculosis and its associated risk factors in Qom province during 2002-2010. *Journal of Mazandaran University of Medical Sciences*. 2012;22(90):63-70.
17. Jamshidi M, Zanganeh M, Askarani F, Khamesan M. Prevalence of Tuberculosis in patients with chronic cough. *Medical Science Journal of Islamic Azad University-Tehran Medical Branch*. 2005;15(4):197-200.
18. Heshmati H, Ravanbakhsh K, Khajavi S, Behnampour N. Epidemiologic Study of Tuberculosis in Galikesh city during 2006-2011. *Iranian Journal of Medical Microbiology*. 2015;9(1):61-5.
19. Khodabakhshi B, Abbasi A, Hashemi Fard A, Ghasemi Kebria F, Khosravian M. Complications leading to hospitalization due to consumption of anti-TB drugs in patients with Tuberculosis in Gorgan, Iran (2007-12). *Journal of Gorgan University of Medical Sciences*. 2015;16(4):120.
20. Farazi A, Sofian M, Jabbari asl M. Extrapulmonary tuberculosis and its comparison with pulmonary Tuberculosis in Markazi province (2002-2012). *Arak Med Univ J*. 2013;16(74):58-66.
21. Khalife Soltani SA, Afzali H, Arbabi M. Epidemiology of Tuberculosis among patients referred to the center against Tuberculosis in Kashan, 1993-95. *Feyz*. 1998;1(4):81-8.
22. Afzali H, Taghavi N. Evaluation of clinical and paraclinical signs and drugs side-effects in patients with Tuberculosis. *Feyz*. 2002;5(4):86-96.
23. Teymoorzadeh Baboli M, Yousefi Abdolmaleki E, Shirzad M, Abedi Samakoosh M, Ghasemian R. Prevalence of Drug-Induced Hepatitis and its Risk Factors in the Treatment of Tuberculosis in TB Infected Patients Attending Razi Hospital, 2006-2011. *Journal of Mazandaran University of Medical Sciences*. 2014 Feb 15;23(109):235-9.
24. Keramat F, Rastegari S, Poorolajal J, Abdoli E. Comparison of Radiologic Findings among Smear-Positive and Smear-Negative Tuberculosis Patients. *Avicenna J Clin Med*. 2016;23(2):141-8.
25. Badri M, Ehrlich R, Wood R, Pulerwitz T, Maartens G. Association between Tuberculosis and HIV disease progression in a high tuberculosis prevalence area. *The International Journal of Tuberculosis and Lung Disease*. 2001;5(3):225-32.
26. Moosazadeh M, Amiresmaili M, Parsaei M, Ahmadi M, Jalahi H. Prevalence of Tuberculosis among the prisoners of Mazandaran. *Journal of Rafsanjan University of Medical Sciences*. 2011;10(4):309-16.
27. Hadadi A, Rasoolinejad M, Davoudi S, Nikdel M, Rasteh M. Clinical characteristics of pulmonary Tuberculosis in patients with HIV/AIDS: a case-control study. *Tehran University Medical Journal TUMS Publications*. 2006;64(5):87-95.