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Survival rate among tuberculosis patients identified in south of Iran, 2005−2016

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ABSTRACT

Objective: To determine the survival rate of tuberculosis (TB) patients and to identify the important factors associated with the survival of these patients in southern Iran. **Methods**: The present retrospective cohort study extracted and reviewed available medical records of 134 TB patients undergoing TB treatment centre, during 2005 to 2016. The Survival rate of patients for the outcome of the interval from diagnosis until death was plotted using life table and Kaplan-Meier survival curve. Cox proportional hazard regression model was used to examine the simultaneous effect of variables on survival rate. The significance level was considered to be 0.05. **Results**: In this study, 64.2% of the participants were male, 73.1% had pulmonary TB and 5.22% had HIV. The survival rate of one, five and thirteen years after diagnosis were 93%, 78% and 69%, respectively. The risk of death in patients with extrapulmonary TB (95% *CI*=1.96-15.83, *P*=0.001) was 5.58 times higher than in patients with pulmonary TB. The risk of death in smokers with TB (95% *CI*=1.74-2.46, *P*<0.001) was 2.07 times higher than in non-smoker patients, and also the risk of death increased to 1.10 times more for a one-year increase in patient age (95% *CI*=1.06-1.14, *P*<0.001). **Conclusions**: The risk of death in patients with extrapulmonary TB and TB smokers was higher than other patients. Therefore, timely diagnosis and proper treatment of patients with extrapulmonary TB as well as the development and integration of smoking cessation programs are underlined and emphasized in the formulation and implementation of the National Tuberculosis Control Program.

1. Introduction

Tuberculosis (TB) is a life-threatening infectious disease that accounts for a wide range of clinical diseases, which is mainly developed by *Mycobacterium tuberculosis*; 85% of cases are manifested in pulmonary form and 15% as extrapulmonary[1]. The areas involved in the extrapulmonary type are lymph nodes, pleura, genitourinary system, bone, joints, meninges and peritoneum, and the likelihood of a patient's death varies according to the illness intensity based on the count of bacteria, the extent of the disease, and anatomical location[2,3]. On the other hand, the clinical symptoms in the type of pulmonary disease are often more specific and include fever, night sweats, weight loss, anorexia and general weakness, and it leads to a cough in 90% of cases that begins with morning coughing and then purulent cough and bloody sputum[4].

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Despite global efforts to control TB, the disease remains the most important cause of death among infectious diseases worldwide, and it is estimated that between 8 and 9 million new cases of TB with 2 million deaths annually occur in the world[5].

The TB mortality rate varies from 5% in a few countries to 20% in most African countries, which indicates significant inequalities among countries in access to TB diagnostic services and treatment[6].

The TB control is very difficult due to concurrent HIV infection and increased multidrug-resistant TB (MDR-TB). Extensively drug-resistant TB (XDR-TB) has been reported from 49 countries since 2008, with a success rate of 30%[1,6].

In a study in South Korea, the mean survival rate of patients with XDR-TB was significantly lower than in other MDR-TB patients[7]. In a study in Iran, the survival rate of patients with concurrent HIV and TB infection at three, five and ten years after the diagnosis of TB, was reported to be 72.0%, 62.5% and 44.3%, respectively[8].

Directly observed treatment, short-course (DOTS, also known as TB-DOTS) is a strategy adopted in TB control, whose treatment success will be 90%-95% if correct and less than 70% if not implemented[9].

More than 80% of TB cases live in 22 Asian and African countries, such as Afghanistan and Pakistan, where are eastern neighbors of Iran. On the other hand, the incidence of TB in Iraq, where is the western neighbor of Iran, is increasing due to political currents and changes in recent years[10].

The incidence rate of smear-positive pulmonary TB is currently the main indicator of measuring the state of TB in Iran[11]. This rate is not the same in all regions of Iran, which is higher in boundary areas such as Sistan Baluchestan, Khorasan, Gorgan and East Azarbaijan and Khuzestan and the southern coasts mainly border with Pakistan, Afghanistan and Iraq, but less prevalent in central provinces[10].

The drug-resistant TB in Iran is also becoming a health problem; besides, recent reports indicate totally drug-resistant TB in Iran[12].

According to the World Health Organization, the total number of new cases of TB in Iran in 2015 was 10416 cases, of which 170 were MDR-TB and 1 425 were rifampicin-resistance TB; the mortality rate of TB in this year in Iran was 2.03 deaths per 100 000 people[13,14].

By reviewing available literature, there is clearly a research gap in the study of the survival of TB patients in Iran. The present study was conducted to determine the survival rate of TB patients and to identify the important factors associated with the survival of these patients in southern Iran.

2. Materials and methods

2.1. Study design and sampling methods

The present retrospective cohort study extracted and reviewed available medical records of 134 TB patients undergoing TB treatment centre affiliated to Jahrom University of Medical Sciences, Iran, during 2005 to 2016.

2.2. Data sources/ measurement

A researcher-made questionnaire based on the study objectives was used to collect information. Information contained in the records was noted in the information form, including age, gender, nationality, residence, involved organ, type of disease, incidence time, underlying diseases such as diabetes, HIV/AIDS, history of contact with smear-positive pulmonary TB and positive degree of sample. Next, an expert at the TB Center contacted by telephone with all registered patients over a period of six months from March 1 to August 30, 2018, and asked about the current condition of the patient. In case of death, the cause of death and the exact date of death were questioned. Of the 134 registered patients who had the phone number, 22 were excluded due to lack of adequate information from follow-up and survival analysis for reasons such as immigration, change of address and phone number, especially in the foreign citizens group, such as Afghani and Iraqi groups. Eventually, 112 patients were followed up for survival analysis. The period of survival was from diagnosis to death, which was calculated by subtracting the date of death from the date of diagnosis of TB. The secondary objective of this study was to determine the risk factors associated with death and to compare the frequency of death among patients with pulmonary and extrapulmonary TB.

In the present study, pulmonary TB was considered in patients with two positive sputum smears or one positive sputum smear plus a positive sputum culture or a chest X-ray. Furthermore, sputum-negative pulmonary TB was considered in patients with two negative sputum smears but with a positive sputum culture or with signs and symptoms of pulmonary TB who did not respond to a two-week broad-spectrum antibiotic treatment. Extra-pulmonary TB was diagnosed in patients with positive TB culture and pathological confirmation (caseous necrosis)[10].

2.3. Statistical methods

Mean (±SD) and frequencies (%) were used to describe patients' characteristics in each group. χ^2 test and Mann-Whitney *U* test were used to compare categorical and continuous variables between the two groups, respectively.

The Kaplan-Meier test was used to estimate the probability of death and the median time to death after TB diagnosis. The log-rank test was used to compare the median time to death between the two groups of pulmonary and extra pulmonary TB. The Cox proportional hazard regression model was used to determine the chance of death after TB diagnosis by adjusting for confounding factors. The hazard ratio (HR) and its 95% confidence interval (*CI*) were estimated. All analyses were performed using Stata version 12. A *P* value less than 0.05 was considered statistically significant.

2.4. Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Jahrom University of Medical Sciences (Project identification code IR.JUMS.REC.1394.147).

3. Results

Of the 134 patients with TB in Jahrom city in 2005-2016, 64.2% were male and 66.4% were Iranians and the rest were foreign nationals. Concerning the form of TB, 73.1% had pulmonary TB, 91.83% of which had positive-smear sputum, and 32.1% of samples in terms of positive grade were above three plus.

According to Table 1, most of the organs involved in extrapulmonary TB were lymph nodes (52.79%), pleura (22.22%), bone (13.89%), skin (5.55%) and meninges (5.55%). The mean age was (50.92±21.39) years in the pulmonary TB patients under study at the time of diagnosis and was (44.03±22.26) years in extrapulmonary TB patients, and this difference was not statistically significant (P=0.104).

During the study period, 27 TB patients died. Out of 27 deceased patients, the cause of death was determined in 21 patients. Of these, the most commonly reported deaths were myocardial infarction, lung infection, TB and lung cancer in 13, 4, 3, and 1 people, respectively.

According to life table (Table 2), the one-year survival rate after diagnosis was 93% (95%CI: 87%-96%), five-year survival rate was 78% (95%CI: 69%-85%) and 13-year survival rate was 69% (95%CI: 58%-78%).

Moreover, the survival rates of 1, 5 and 13 years were 96% (95%CI: 8%9-98%), 83% (95%CI: 72%-90%) and 72% (95%CI: 59%-82%) in the patients with pulmonary TB and 86% (95%CI: 68%-94%), 69% (95%CI: 49%-82%) and 65% (95%CI: 44%-79%) in the patients with extrapulmonary TB; this difference was not statistically significant (P=0.223) (Figure 1).

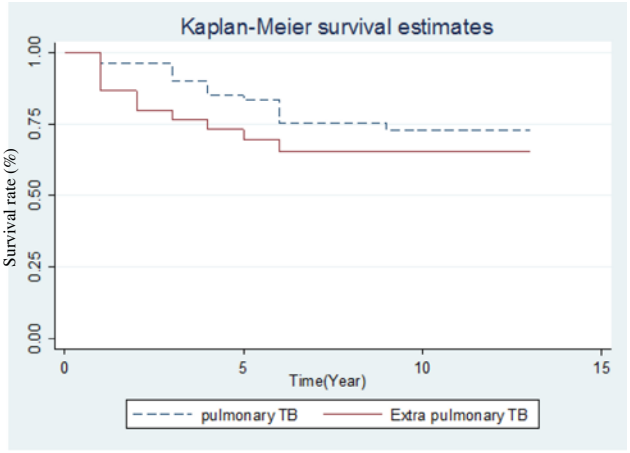

Figure 1. Survival rate between pulmonary and extra pulmonary TB.

In the next step of data analysis the Cox proportional hazard model was used to determine the chance of death after TB diagnosis by adjusting for confounding factors. The factors in this model included gender, weight, type of TB, Smoking, co-infected with HIV/AIDS, Diabetes mellitus, and Residence place (Table 3). We found that

Table 1
Baseline characteristics of patients in groups of pulmonary and extra pulmonary tuberculosis.

Variables	Bivariate	Pulmonary tuberculosis		Extra pulmonary tuberculosis		Total		P-value
		Frequency	Percent	Frequency	Percent	Frequency	Percent	
Gender	Male	62	63.3	24	66.7	86	64.2	0.710
	Female	36	36.7	12	33.3	48	35.8	
Occupation	Government employee	2	2.0	2	5.6	4	3.0	0.350
	Worker	36	36.7	8	22.2	44	32.8	
	Housewife	26	26.5	11	30.6	37	27.6	
	Other	34	34.7	15	41.7	49	36.6	
Residence place	Urban	64	65.3	25	69.4	89	66.4	0.650
	Rural	34	34.7	11	30.6	45	33.6	
Nationality	Iranian	60	61.2	29	80.6	89	66.4	0.085
	Iraqi	4	4.1	0	0	4	3.0	
	Afghan	34	34.7	7	19.4	41	30.6	
History of contact	Yes	27	27.6	4	11.1	31	23.1	0.045
	No	71	72.4	32	88.9	103	76.9	
Weight	50 kg	44	44.9	5	13.9	49	36.6	0.001
	>50 kg	54	55.1	31	86.1	85	63.4	
Smoking	Yes	15	15.3	2	5.6	17	12.7	0.133
	No	83	84.7	34	94.4	117	87.3	
HIV/AIDS	Yes	6	6.1	1	2.8	7	5.2	0.440
	No	92	93.9	35	97.2	127	94.8	
Diabetes mellitus	Yes	12	12.2	1	2.8	13	9.7	0.100
	No	86	87.8	35	97.2	121	90.3	

Table 2
Survival rate from diagnosis to death in tuberculosis patients in Jahrom during 2005-2016.

Survival rate (year)	Total number of patients	Death	Lost	Survival (%)	Std.Error	95% confidence interval	
						Lower	Upper
1	112	7	0	93	0.022	87	96
2	105	2	4	91	0.025	85	95
3	99	6	15	85	0.033	77	91
4	78	4	8	81	0.039	72	87
5	66	2	6	75	0.042	69	85
6	58	5	4	71	0.048	60	79
7	49	0	3	71	0.048	60	79
8	46	0	5	71	0.048	60	79
9	41	1	8	69	0.051	58	78
10	32	0	8	69	0.051	58	78
11	24	0	10	69	0.051	58	78
12	14	0	6	69	0.051	58	78
13	8	0	8	69	0.051	58	78

extra pulmonary TB was associated with a higher probability of death (HR=5.58, 95% *CI*=1.96-15.83, *P*=0.001); that is, patients who did extra pulmonary were 5.58 times as likely to die compared with patients pulmonary TB. The other risk factors associated with a higher probability of death were smoking (HR=2.07, 95% *CI*=1.74-2.46, *P*<0.001) and age (HR=1.10, 95% *CI*=1.06-1.14, *P*<0.001).

Table 3
Cox regression of possible risk factors for mortality in TB patients.

Variables	Bivariate	HR	95% *CI*		*P*-value
			Upper	Lower	
Age	-	1.10	1.06	1.14	<0.001
Weight	-	0.99	0.96	1.02	0.702
Gender	Male	1.51	0.65	3.52	0.336
	Female	Ref	-	-	
Residence place	Rural	0.98	0.38	2.53	0.972
	Urban	Ref	-	-	
Smoking	Yes	2.07	1.74	2.46	<0.001
	No	Ref	-	-	
HIV/AIDS	Yes	0.15	0.01	2.32	0.177
	No	Ref	-	-	
Diabetes mellitus	Yes	3.24	0.97	10.80	0.055
	No	Ref	-	-	
Type of TB	Extra pulmonary	5.58	1.96	15.83	0.001
	Pulmonary	Ref	-	-	

Ref: reference.

4. Discussion

Based on the life table, the results of this study showed that the survival rates of one, five and 13 years in the patients with TB under study were 93%, 78% and 69%, respectively. On the other hand, the survival rates were 83%, 96% and 72% in the patients with pulmonary TB, and 86% 69% and 65% in the patients with extrapulmonary TB, but the log-rank test was not significant (*P*=0.223).

Kim from South Korean compared the survival rate of patients with XDR-TB and other MDR-TB, and showed that 80-month survival was 45% in the patients with XDR-TB and 80% in other MDR-TB, and XDR-TB was the strongest predictor of both all-cause and TB-related mortality[7].

Roshanaei *et al.* evaluated survival rates among patients with co-infected HIV/TB in Tehran, Iran, and showed that the survival probability of patients with a period of infection onset to TB after 3, 5 and 10 years of post-diagnosis of HIV was 72.0%, 62.5% , and 44.3% respectively[8]. Another study in Thailand investigated the survival rate among HIV/TB-coinfected patients with and without antiretroviral therapy. The survival rates at 1, 2 and 3 years were 96.1%, 94.0% and 87.7% in ART+ group and 44.4%, 19.2% and 9.3% in ART- group (log-rank test, *P*> 0.001)[15]. Further, Catala *et al*. in Spain reported that the 10-year survival rate of patients with concurrent HIV and TB infection was 47.4%[16].

Based on the results of this study, 73.1% of the cases were pulmonary TB and the remaining cases were extrapulmonary, and the most cases of TB in Jahrom are pulmonary TB, which is in line with the results of the studies by Biranvand *et al*. in the southwest of Iran[17], MohamadiAzni *et al*. in the city of Damghan in Iran[18], Ebrahimzadeh *et al.* in Birjand in Iran[19], Culqui *et al.* in Spain[20] and Abdallah *et al.* in Sudan[21].

In the present study, there was no significant difference in the forms of pulmonary and extrapulmonary TB in terms of gender, nationality, residence and occupation (*P*>0.05). These results were consistent with the results of Ebrahimzadeh *et al.* in Birjand[19], Saghafipour *et al.* in Qom[22], but inconsistent with the results of the Yazdani *et al.* in Lorestan[23]. Additionally, there was a significant difference between the forms of TB and the history of contact with the cases and the weight of the patient (*P*<0.05).

Other results of the present study showed that the risk of death in the patients with extrapulmonary TB is 5.58 times higher than the risk of death in patients with extrapulmonary TB. Most of the organs involved in extrapulmonary TB were lymph nodes (52.79%), pleura (22.22%), bone (13.89%) skin (5.55%) and meninges (5.55%), while a study by the Ministry of Health of Iran in 2006 reported that the most common involvements in the extrapulmonary TB were the lymph nodes (26.8%), pleura (20.8%)

and spinal cord (17.7%). The prevalence of extrapulmonary TB in Iran is higher than what the World Health Organization offers[24], perhaps due to an increase in HIV infection or a mistake in detecting extrapulmonary TB and exaggeration in diagnosis.

Other results of this study showed that smoking increases the risk of death to 2.07 times in people with TB. Several studies have shown the role of smoking as a risk factor in pulmonary diseases, including lung cancer[25,26], chronic obstructive pulmonary disease (COPD)[27,28], asthma[29], emphysema[30], and TB[31].

A study in Masih Daneshvari Hospital as a referral center for treating TB cases in Iran showed that the odds ratio of smokers with TB was 4 times higher than non-smokers[32]. This result indicates the severity of pulmonary and non-pulmonary damage in patients with TB. According to various studies, smoking has been shown to have a major impact on pulmonary immunity. Tomito *et al*. found that alveolar macrophages in smokers have a significant increase in relation to COPD and apoptosis[33]. Zappacost *et al*. demonstrated that smoking with horseradish peroxidase inhibited luminal oxidation, which inhibited the strong chemiluminescence of the polymorphonuclears. They showed that the secretion of macrophage inflammatory protein (MIP-1) and TNF- (IL-6MM, IL-1B, IL-10 and IL-2) in smokers[34].

Other findings of this study revealed that diabetes increased the risk of death in patients with TB by 3.24 times, but this was not significant (P=0.055). Several studies have reported the concurrent TB and diabetes, and found diabetes as a serious risk factor in activating the latent TB and the incidence of active TB[35]. Although most of the studies indicate concurrent TB and diabetes, they have been unable to pinpoint these two diseases; in other words, they could not determine whether diabetes is a cause of TB or vice versa. Overall, a 40-year study by researchers confirms the impact of diabetes in increasing the risk of TB[36]. The results of review study by Jeon and Murray on 17 research articles from 2007 to 1983 on 700 000 people, of whom approximately 18 000 were infected with TB, indicated that the diabetes increased the risk of developing TB by three times, and researchers in various studies estimated this risk up to 7.83-0.99 times more[37].

There are limitations in this study. A valid prospective cohort study was needed to estimate the survival rate, while the results of this study were derived from a retrospective cohort study and from data recorded in the TB treatment center. In addition, information about the patient's condition during the follow-up period, cause and date of death were obtained by telephone from the patient or the family, as the error of attained information may affect the quality and the accuracy of the study results. On the other hand, so far, no study has evaluated the survival rates of TB patients in Iran. This casts the inability to compare the results with other study results.

According to the results of this study, the survival rates of one, five and 13 years in the patients with TB were 93%, 78% and 69%, respectively. The risk of death in patients with extrapulmonary TB and TB smokers was higher than other patients. Therefore, timely diagnosis and proper treatment of patients with extrapulmonary TB as well as the development and integration of smoking cessation programs are underlined and emphasized in the formulation and implementation of the National Tuberculosis Control Program.

Conflict of interest statement

The authors declare that they have no conflict of interest.

References

[1] Glaziou P, Floyd K, Raviglione MC. Global Epidemiology of Tuberculosis. *Seminars Respir & Crit Care Med* 2018; **39**(3): 271-285.

[2] Fauci AS. *Harrison's principles of internal medicine*. New York: Mcgraw-hill; 1998.

[3] Ozbay B, Uzun K. Extrapulmonary tuberculosis in high prevalence of tuberculosis and low prevalence of HIV. *Clin Chest Med* 2002; **23**(2): 351-354.

[4] Mama M, Manilal A, Tesfa H, Mohammed H, Erbo E. Prevalence of pulmonary tuberculosis and associated factors among HIV positive patients attending antiretroviral therapy clinic at Arba Minch General Hospital, Southern Ethiopia. *Microbiol J* 2018; **12**: 163-171.

[5] Frieden TR, Sterling TR, Munsiff SS, Watt CJ, Dye C. Tuberculosis. *Lancet* 2003; **362**(9387): 887-899.

[6] WHO. Global Tuberculosis Report 2017. [Online] Availabe from: http://www.who.int/tb/publications/C2_2017GLOBAL_FACTSHEET.pdf?ua=1. [Accessed on 018 Aug 13].

[7] Kim DH, Kim HJ, Park SK, Kong SJ, Kim YS, Kim TH, et al. Treatment outcomes and long-term survival in patients with extensively drug-resistant tuberculosis. *Am J Respir Crit Care Med* 2008; **178**(10): 1075-1082.

[8] Roshanaei G, Ghannad MS, Poorolajal J, Mohraz M, Molaeipoor L. Survival rates among co-infected patients with human immunodeficiency virus/tuberculosis in Tehran, Iran. *Iran J Public Health* 2017; **46**(8): 1123.

[9] Qader G, Hamim A, Sayedi M, Rashidi M, Manzoor L, Seddiq MK, et al. Addressing tuberculosis control in fragile states: Urban DOTS experience in Kabul, Afghanistan, 2009-2015. *PloS One* 2017; **12**(5): 1-14.

[10]Nasehi M, Mirhaghani L. *Gidlin tuberclosis*. 2 ed. Tehran: Ministry of Health; 2009.

[11]Hazrati S, Khaligh N, Moeini A, Amani F, Barak M, Rahimi G, et al. Epidemiology of tuberculosis in Ardabil city from 2005 to 2010. *J Health& Hyg* 2013 ;**4**(2): 103-109.

[12]Farazi A, Jabbariasl M, Sofian M. Assessment of drug resistance in tuberculosis patients and the factors affecting it (2005-2010). *J Arak Univ Med Sci* 2012; **15**(1): 77-85.

[13]Institute for Health Metrics and Evaluation. Tuberculosis 2017.

[Online] Available from: https://vizhub.healthdata.org/gbd-compare/. [Accseed on 2017 Aug 2].

[14]WHO. [Internet]. Tuberculosis 2016. [Online]Available from: http://www.who.int/gho/countries/irn/country_profiles/en/. [Accseed on 2017 Aug 8].

[15]Manosuthi W, Chottanapand S, Thongyen S, Chaovavanich A, Sungkanuparph S. Survival rate and risk factors of mortality among HIV/tuberculosis-coinfected patients with and without antiretroviral therapy. *J Acquir Immune Defic Syndr* 2006; **43**(1): 42-46.

[16]Catala L, Orcau A, Garcia de Olalla P, Millet J, Rodriguez-Mondragón A, Cayla J, et al. Survival of a large cohort of HIV-infected tuberculosis patients in the era of highly active antiretroviral treatment. *Int J Tuberc Lung Dis* 2011; **15**(2): 263-269.

[17]Biranvand Reza GS, Delpisheh A, Cyrus S, Shokrollah S. Epidemiology of Tuberculosis in south-west of Iran: a brief report. *Tehran Univ Med J* 2014; **72**(4): 263-267.

[18]Mohamadi Azni S, Mansourian AA, Nokandeh Z. Epidemiological study of tuberculosis in Damghan city (Iran) during 2003-2007. *Koomesh* 2008; **9**(4): 315-320.

[19]Ebrahimzadeh A, Sharifzadeh G, Eshaghi S. The epidemiology of tuberculosis in Birjand (1996-2006). *J Birjand Univ Med Sci* 2009; **16**(1): 31-38.

[20]Culqui-Levano DR, Rodriguez-Valin E, Donado-Campos JM. Analysis of extrapulmonary tuberculosis in Spain: 2007-2012 national study. *Enferm Infecc Microbiol Clin* 2017; **35**(2): 82-87.

[21]Abdallah TEM, Mohmmed Toum FE, Bashir OH, Mansoor TI, Yuosif MM, Awad-Elseed Elkhawad M, et al. Epidemiology of extra pulmonary tuberculosis in Eastern Sudan. *Asian Pac J Trop Biomed* 2015; **5**(6): 505-508.

[22]Saghafipour A, Noroozei M, Mostafavi R, Heidarpour, Azam, Ghorbani, Mostafa. The epidemiologic status of Pulmonary Tuberculosis and its associated risk factors in Qom province during 2002-2010. *J Mazandaran Univ Med Sci* 2012; **22**(90): 63-70.

[23]Yazdani Cherati J, Ahmadi Baseri E, saki M, Etemadinejad S. Epidemiology of tuberculosis in Lorestan between 2002 and 2008. Iran *J Epidemiol* 2014; **9**(4): 40-47.

[24]Hendessi F RM, Ressai A. Extrapulmonary TB in Gylan (1999-2006). Sanandaj-Iran: 18th National Congress onTuberculosis; 2007, p. 79.

[25]van Zyl Smit R, Pai M, Yew WW, Leung C, Zumla A, Bateman E, et al. Global lung health: the colliding epidemics of tuberculosis, tobacco smoking, HIV and COPD. *European Respir J* 2010; **35**(1): 27-33.

[26]Zhang H, Cai B. The impact of tobacco on lung health in China. *Respirology* 2003; **8**(1): 17-21.

[27]van Eerd E, van der Meer RM, Reda AA, van Schayck CP, Kotz D. Smoking cessation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2003.[Online]Avaiable from: https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010744/full. [Accessed on 17 September 2013].

[28]Tee A. Chronic Obstructive Pulmonary Disease (COPD): Not a cigarette only pulmonary disease. *Ann Acad Med* 2017; **46**(11): 415-416.

[29]Silverman RA, Hasegawa K, Egan DJ, Stiffler KA, Sullivan AF, Camargo Jr CA. Multicenter study of cigarette smoking among adults with asthma exacerbations in the emergency department, 2011–2012. *Respir Med* 2017; **125**: 89-91.

[30]Kerdidani D, Magkouta S, Chouvardas P, Karavana V, Glynos K, Roumelioti F, et al. Cigarette smoke–induced emphysema exhausts early cytotoxic CD8+ T cell responses against nascent lung cancer cells. *J Immunol* 2018: ji1700700.

[31]Wagnew F, Eshetie S, Alebel A, Dessie G, Tesema C, Abajobir AA. Meta-analysis of the prevalence of tuberculosis in diabetic patients and its association with cigarette smoking in African and Asian countries. *BMC Res Notes* 2018; **11**(1): 298.

[32]Mirsaeidi S, Hirmanpur A, Zareiy S, Ardalan M, Mansouri M, Kazempur M, et al. Smoking as a risk factors in pulmonary tuberculosis mortality. *J Army Univ Med Sci* 2003; **1**(2): 99-104.

[33]Tomita K, Caramori G, Lim S, Ito K, Hanazawa T, Oates T, et al. Increased p21CIP1/WAF1 and B cell lymphoma leukemia-xL expression and reduced apoptosis in alveolar macrophages from smokers. *Am J Respir Crit Care Med* 2002; **166**(5): 724-731.

[34]Zappacosta B, Persichilli S, Giardina B, De Sole P. Effect of aqueous extract of cigarette smoke on peripheral blood polymorphonuclear leukocytes chemiluminescence. *Luminescence* 2000; **15**(3): 165-168.

[35]Rahmanian V, Rahmanian K, Mansoorian E, Rahmanian N, Shakeri H, Rastgoofard MA. Prevalence of active tuberculosis & MTB-infection among diabetic population in southern of Iran, 2016. *Pharmacophore* 2018; **9**(3): 30-36.

[36]Asefzadeh MAB, B%A Kalantari, Z. Determine the prevalence of tuberculose infection in diabetic patients in Qazvin. *J Guilan Univ Med Sci* 2008; **17**(67): 38-47.

[37]Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: A systematic review of 13 observational studies. *PLoS Med* 2008; **5**(7): e152.