

Diagnosis delay in smear positive tuberculosis patients

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Background: Early diagnosis of tuberculosis (TB) is a major key for effective TB program. Evaluation of delay in diagnosis of smear positive TB is needed to evaluation of TB program situation in each country. The aim of this study was to evaluate of diagnosis delay in smear positive tuberculosis patients in Islamic Republic of Iran. **Materials And Methods:** In this cross sectional study, all smear positive TB registered patients from 20 March 2009 to 20 March 2010 in Iran were assessed. Diagnosis delay is defined as the time interval between the first presentations of TB symptoms to the TB confirmation. Mann-Whitney test, chi-square and logistic regression was used to analysis. **Results:** Diagnosis delay was 58 days in female and 53 days in male ($P=0.004$), 61 days in non-Iranian and 54 days in Iranian ($P<0.001$), 59 days in urban and 50 days in rural ($P<0.001$), 57 days in non-prisoner and 37 days in prisoner ($P<0.001$), 61 days in patients who chose private outpatients system and 52 days in patients who chose Public health outpatients system ($P<0.001$). 193 (9.4%) had 1-9 bacilli and 2132 (37.4%) were 3+ in sputum smear examination. **Conclusion:** Non-Iranian, urban, non-prisoner, old patients and the patients who chose private system are in risk of delay diagnosis of TB. Cooperation of private system through public-private mix model is an important key in successful national TB program (NTP).

Key words: Diagnosis delay, public private mix, tuberculosis

INTRODUCTION

Tuberculosis (TB) kills about two million people annually.^[1-3] 84% case detection, 87% treatment success rate and reversing TB incidence rate by 2015 are the main goals of World health organization (WHO) and stop TB partnership to control TB.^[4,5] TB is one of important infectious diseases in Iran. Immigration from Afghanistan and pilgrims from Pakistan and Iraq are intensifying the problem.

Delay in diagnosis of TB is a major defect in TB program and it can lead to several complications, mortality, and TB contamination in the community.^[6-8] It may be related to patient (patient delay) or the health system (system delay).^[7] Hence, the TB patients are evaluated and reported by some health care sources, identifying the diagnosis delay in these sources is important to planning effective national TB program (NTP). Also,

some variable such as age, sex, residency, nationality and HIV may be related to the diagnosis delay.

Evaluation of determinants of delay must be studied and addressed to improve the effectiveness of the NTPs.^[7] Also, conducting this study is important for planning Public-Private Mix (PPM) program. This program advised by WHO to improve the collaboration of public and private sectors in the NTP.^[9,10]

The aim of this study was evaluation of diagnosis delay in smear positive tuberculosis patients in Islamic Republic of Iran 2009-2010

MATERIALS AND METHODS

In this cross sectional study, all smear positive TB registered patients from 20 march 2009 to 20 march 2010 (one Hijri year) in Iran were assessed. Smear positive TB cases were defined according to WHO and Iran's national TB guideline.^[11]

Diagnosis delay (both delays caused by patient and physician) is defined as the time interval between the first presentations of TB symptoms such as cough>2-3 weeks, fever, loss weight, sputum, night sweating to the diagnosis of TB.^[11]

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The patients were reported from public health outpatient system (PHO), public hospitals (PHs), private outpatient system (PO), private hospitals (PH), social security fund (hospitals or clinics that are belong to social security fund organizations) and other sources (charity and army forced clinic or hospitals).

Sputum smear positivity grade by direct microscopic examination were graded as 1-9 bacilli, 1+, 2+ and 3+.^[11]

TB patients data were entered in TB register software via double-entry. After a review, the final data were prepared for analysis using SPSS16 software. Quantitative data were evaluated using Kolmogorow-Smirnov statistical test and also via graphical test to assure their normal distribution. Mann-Whitney test were utilized to compare median diagnosis delay between dichotomous variables. Relationship between diagnostic delay group (>median and <=median) and dichotomous variables was evaluated by Chi-square test and odds ratio (95% confidence intervals) was calculated. The significant level of 0.05 was used as a statistical significant value. Logistic regression analysis was used to examine the adjusted odds ratio by SPSS software 16 (Chicago, USA).

RESULTS

The mean age of 5702 TB patients was 47.8 (SD: ±21.6) years. 2855 (50.1%) were female, 852 (14.9%) were Non-Iranian, 183 (3.2%) were prisoner, and 107 (1.9%) were HIV positive.

The median of diagnosis delay in all patients was 59 days. Diagnosis delay was longer in female than male ($P=0.004$), non-Iranian than Iranian ($P<0.001$), urban than rural ($P<0.001$), non-prisoner than prisoner ($P<0.001$) [Table 1]. Significant correlation was seen between age and diagnosis delay ($r_s=0.05$; $P<0.001$).

In multivariate analysis, Non-Iranian, urban, Non-prisoner and patients older than 50 years had chance 1.367, 1.335, 2.126 and 1.22 times more likely that their delay in TB diagnosis be longer than >59 days, respectively [Table 2].

Median diagnosis delay in patients who chose the PO system (private clinics) to be visited were higher than PHO ($P<0.001$). Prisoners had less diagnosis delay than PHO ($P<0.001$) [Table 3].

One hundred ninety three (3.4%) were 1-9 bacilli, 2053 (36%) were 1+, 1324 (23.2%) were 2+ and 2132 (37.4%) were 3+ in sputum smear examination.

DISCUSSION

Total delay in diagnosis of TB was about 2 months. Prisons had minimum delay in diagnosis of smear positive

Table 1: Comparison of median diagnosis delay according to some variables

Variables	No	Analyzed	Median	25 th -75 th percentile	P-value
Sex					
Male	2855 (50.1%)	2760	53	29-92	0.004 [†]
Female	2847 (49.9%)	2774	58	30-99	
Nationality					
Iranian	4850 (85.1%)	4699	54	29-92	<0.001 [†]
Non-Iranian	852 (14.9%)	835	61	31-121	
Residency					
Urban	3678 (64.5%)	3572	59	30-101	<0.001 [†]
Rural	2024 (35.5%)	1962	50	29-91	
Prison history					
No	5519 (96.8%)	5367	57	30-96	<0.001 [†]
Yes	183 (3.2%)	167	34	23-61	
HIV Positive					
No	5595 (98.1%)	5433	56	30-94	0.613
Yes	107 (1.9%)	101	60	22-92	
Age					
<50 years	2767 (48.5%)	2680	53	30-91	0.001 [†]
>50 years	2935 (51.5%)	2854	59	30-107.2	
Total	5702	5534	56	30-94	-

Comparisons of median were done using Mann-Whitney U test, [†]Shows the statistically significant differences

patients. Diagnosis delay was longer in Non-Iranian, urban, non-prisoner and older than 50 years patients. PO system had higher diagnosis delay than PHO. 37.4% were diagnosed as 3+ in sputum smear examination.

In Nasehi *et al.* study in Iran,^[8] 2003 the median of diagnosis delay was reported as 89 days which is fortunately reduced now. A reduction of one month in diagnosis delay is considered as a great success in Iran NTP. However, diagnosis delay in our country is higher than other countries. Smear positivity grade shows 37.4% of the patients diagnosed in advanced stage of TB. In other studies, the median of diagnosis delay was about 50 days in Vietnam,^[12] 56 days in Ghana,^[13] and 6 days in New York.^[14] Generally, the median of delay in diagnosis of smear positive patients varies from 2 days to 4 months in different countries.^[6,7,15,16]

The PO services had more delay in diagnosing smear positive cases compared with PHS. Total delay in diagnosis in public sector and private sector are respectively 47.6 and 60.3 days in Egypt, 99.02 and 110.8 days in Pakistan, 79.7 and 84.1 days in Somali, 67 and 86 days in Syria, and 5.05 and 63.1 days in Yemen; in all countries except Somalia and Syria, delay in private sector is significantly higher than public sector^[7] which is the same as our study. Participation of private sector in TB program could lead to improved diagnosis and treatment. Furthermore, contribution of private sector is needed to achieve specified targets.^[17] It is suggested to implement TB control and reporting system in private sectors in Iran and design and perform a Public-Private Mix program.

Table 2: Relation of different variables with diagnosis delay (cut-off point, median = 59 days)

Variables	Multivariate analysis			Univariate analysis		
	Odds Ratio	CI 95%	P-value	Odds Ratio	CI 95%	P-value
Sex (Female/Male)	1.157	1.041-1.286	0.007 [†]	1.111	0.997-1.239	0.057
Nationality (Non-Iranian/Iranian)	1.37	1.182-1.588	<0.001 [†]	1.367	1.176-1.589	<0.001 [†]
Residency (Urban/Rural)	1.316	1.178-1.47	<0.001 [†]	1.335	1.193-1.493	<0.001 [†]
Prison history (No/Yes)	2.259	1.609-3.172	<0.001 [†]	2.126	1.5-3.014	<0.001 [†]
HIV Positive (No/Yes)	0.803	0.542-1.192	0.276	0.677	0.452-1.016	0.6
Age (>50/<50)	1.21	1.088-1.345	<0.001 [†]	1.22	1.094-1.36	<0.001 [†]

Univariate analysis was done by Chi-square test, Multivariate analysis by logistic regression was done for calculation adjusted odds ratio (OR) and 95% CI

Table 3: Comparison of median diagnosis delay (day) in registered tuberculosis patients from different source of reporting

Source of reporting	No (%)	Analyzed	Median (25 th -75 th percentile)	P-value
Public health outpatients system	2215 (33.8)	2152	52 (29-92)	-
Private outpatients system	1198 (21)	1157	61 (31-116)	<0.001 [†]
Public hospital system	1990 (34.9)	1943	57 (29-96)	0.176
Private hospital	18 (0.3)	18	56 (12.5-152)	0.946
Social security fund	120 (2.1)	118	60 (31.7-116)	0.099
Jail	141 (2.5)	127	31 (23-58)	<0.001 [†]
Other	20 (0.4)	19	51 (31-113)	0.699

Comparisons were done against health system outpatient using Mann-Whitney U-test, [†]shows the statistically significant differences

The minimum delay was seen in prisons; it is a sign of early TB case finding in Iran prisons. However, it is still higher than some countries.^[18]

Median diagnosis of TB in HIV positive did not have different with HIV negative in our study. However, we expected the HIV positives were diagnosed in early stage of TB because of active follow-up of these patients. In Diez *et al.* study^[18] HIV positive diagnosed faster than HIV negative patients. However, diagnosis of TB in HIV patients is difficult but it is likely that TB diagnosis in HIV patients not appropriate in Iran.

Risk factors for diagnosis delay were similar in different area of the world. Characteristics such as lack of specific symptoms (hemoptesia), unemployed, smokers, females, older age, attending private sector as first provider attended, not prescription of CXR, living in Suburban or rural area and low literacy were related with more diagnosis delay.^[7,8,19,20-22] Some of these factors related to presence of co-morbidity, health seeking behaviors, society culture and health care providers practice and attitude. Family physician system has been implemented in rural area in Iran and it may lead to decrease TB diagnosis delay in rural area. Also, according to the results, it is likely that private care system not familiar with NTP or complicated patients are referred to private

system. Therefore, education and cooperation of private system through public-private mix model is an important key in successful NTP.

However, our study had some limitation. First, we just considered the characteristics that recorded in TB register software so we could not evaluate some related characteristics. Second, there may have been some recall bias from patients regarding the onset of symptoms.

CONCLUSION

Non-Iranian, urban, non-prisoner and old patients are in risk of diagnosis delay of TB. Cooperation of private system through public-private mix model is an important key in successful NTP.

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