Delay in the diagnosis and management of tuberculosis among patients in the Suez Canal Area

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Background Delayed diagnosis of tuberculosis (TB) can enhance the transmission of infection and worsen prognosis.

Aim To identify the risk factors of delay in the management of TB cases for early management.

Patients and methods A cross-sectional analytic study was performed to assess the proportion, duration of delay, and its determinants in the diagnosis and management of TB. To assess the risk factors of delay, the sample was dichotomized into 'delay' and 'nondelay' groups taking the median total delay in the diagnosis and management of TB as a cutoff point. The study included 183 TB patients, who were registered in TB records during the study period (first of January to end of June, 2017). Data were collected by an interview questionnaire.

Results Nearly half of patients (49.20%) had unacceptable total delay in the diagnosis and management of TB. The median of total delay, patient delay, and health-care system delay were 65, 14, and 20 days, respectively. Significant risk factors of total delay in the diagnosis and management of TB were not consulting the health-care provider after onset of symptoms ($P=0.002$), visiting initially the health facility other than the chest hospital/TB clinics ($P=0.019$), not consulting a chest physician initially ($P=0.043$), negative sputum smear ($P=0.001$), more than two health visits before initial diagnosis ($P<0.001$), while low-degree TB stigma was protective ($P=0.006$).

Conclusion Nearly half of patients had unacceptable total delay in the diagnosis and management of TB. The main determinants were seeking pharmacies instead of visiting health-care providers, not visiting initially chest hospital/TB clinics, not consulting a chest physician initially, negative sputum smear, and more than two health visits before initial diagnosis.

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Introduction

Globally, tuberculosis (TB) is the ninth leading cause of death and the leading cause from a single infectious agent, ranking above HIV/AIDS [1]. Most deaths from TB could be prevented with early diagnosis and appropriate treatment. However, death rates are still high [2]. Delayed TB diagnosis and management can be attributed to patients as well as to the health-care system [3] and reported in both high-prevalence and low-prevalence countries [4]. Owing to the limited data in Egypt, our aim was to identify the risk factor of delay in the management of TB cases for early management.

Patients and methods

Design

A cross-sectional analytic study was done from the first of January to end of June, 2017 to measure the proportion and duration of delay in the diagnosis and management of TB cases. To assess the predictors of delay, the sample was dichotomized into 'delay' and 'nondelay' groups taking the median total delay (65 days) as a cutoff point [5,6]. An interview questionnaire was applied to collect data.

Study patients

All new TB patients registered in Directly Observed Treatment Program of TB who were smear positive or smear negative (clinical diagnosis) and diagnosed of extrapulmonary TB (pleural, lymph node, bone TB, or TB of other organs than the lungs) were included in the study. Cases who were too ill to be interviewed, refused participation and retreatment cases were excluded from the study.

Setting

This study was conducted in the Suez Canal Area in three chest hospitals of Ismailia, Suez, and Port Said Governorates from January to June 2017.

Sampling method

The sample was taken using a comprehensive method. The total numbers of registered cases were 215 during the period of data collection. They were distributed as follows: 112 cases in Ismailia, 48 cases in Port Said, and 55 cases in Suez Governorate. In Ismailia governorate, 11 cases were excluded (five cases were retreated and six cases had refused participation in the study). In Port Said Governorate, 10 cases of the total number of registered cases had refused participation in the study. In Suez governorate, 11 cases were excluded (two were in prison/difficult to reach, two were severely ill, two were retreated, and five refused to participate).

Data collection tools

Data were collected by using an interview questionnaire. It was standardized, adopted from WHO [5], and it was ready in Arabic language, with scoring of variables and interpretation of their values. Some items had been verified using the DOTS patients' records and laboratory data in the chest hospitals/TB clinics. The questionnaire included information about: sociodemographic characteristics of the patient, risk factors, present history of current illness, health-care seeking behavior, TB stigma, satisfaction with health care, knowledge about TB, and date of diagnosis and treatment. This study has the approval of the ethics committee of Faculty of Medicine, Suez Canal University, ethics committee number: 2894.

Definition of study variables: patient delay is the time interval between onset of symptoms and first visit to a health-care provider. Diagnostic delay is the time interval between presentation to a health-care provider and diagnosis of TB. Treatment delay is the time interval between diagnosis of TB and initiation of anti-TB treatment. Health-care system delay is the time interval between presentation to a health-care provider and initiation of anti-TB treatment (health-care system delay includes diagnostic and treatment delay). Total delay is the time interval between onset of symptoms and initiation of anti-TB treatment (total delay includes patient delay and health-care system delay).

Statistical analysis

Data entry and statistical analysis was performed using the statistical package for the social sciences (SPSS) software program, version 20 (IBM, Armonk, New York, USA). Descriptive statistics such as mean, median, and SD were calculated to show proportion, length of delay, and the distribution of the population by sociodemographic characteristics. For assessing the risk factors for delay, comparisons between groups were done using the χ^2 test or Fisher's exact test as appropriate for qualitative variables, and using Mann–Whitney test for quantitative variables. Ninety-five percent confidence interval and odds ratio (OR) was used to assess the associated risk factors of the different delays. Logistic regression analysis was performed to investigate the predictors of total delay.

Results

A total of 183 TB patients from three chest hospitals of Suez Canal Area receiving TB treatment were enrolled in the study from January to June 2017. Thirty one percent of patients were older than 45 years old, TB was common in men with a male/female ratio of 2.1. The proportion of patients who could read and write was the least 8%. More than half of patients (59%) were employed. The majority of patients (87%) were living in urban areas and were mostly married (62%) (Tables 1 and 2). Most of the patients (72%) had pulmonary TB, while only 28% had extrapulmonary TB (Fig. 1).

The types of delay were classified as the following:

(a) Patient delay, (b) diagnostic delay, (c) treatment delay (both b–c constitute health-care system delay), and (d) total delay. All patients had no treatment delay as they received treatment immediately after diagnosis (Table 3). Nearly half of patients (49.20%) had unacceptable total TB delay of more than 65 days (median value) in the diagnosis and management of TB (Fig. 2).

Table 1 Sociodemographic characteristics of studied patients (age, sex, city, and residence) (N=183)

Characteristics	n (%)
Age (years)	
15–30	67 (36.6)
>30–45	60 (32.8)
>45–60	38 (20.8)
>60	18 (9.8)
Mean±SD	39.1±14.7
Sex	
Male	124 (67.8)
Female	59 (32.2)
City	
Ismailia	101 (55.2)
Suez	44 (24)
Port Said	38 (20.8)
Residence	
Rural	24 (13.1)
Urban	159 (86.9)

Regarding determinants of total delay in the diagnosis and management of TB, patients who sought pharmacies immediately after onset of symptoms instead of visiting health-care providers had increased risk of total delay (OR=2.5) (Table 4). Patients who sought first consultation from health-care facility other than chest hospital/TB clinics, patients who initially had visited different specialties other than chest and patients with more than two visits to health-care facility before initial diagnosis also had increased risk of total delay (Table 4). Patients with negative sputum smear results (Table 5) had increased risk of total delay (OR=5.21). Old patients more than 60 years old (OR=0.74) (Table 6) and patients with low-degree perceived TB stigma (OR=0.43) (Table 5) were protective against total delay.

Not consulting a health-care provider as the first behavior and negative sputum or extrapulmonary TB were significant risk factors of total delay on binary logistic regression analysis. Low number of encounters was significantly protective against total delay. Not seeking medical care from a health-care provider at the onset of symptoms had the highest OR (5.04) for total delay compared with those who sought care from a healthcare provider (Tables 7–9).

Table 2 Sociodemographic characteristics of studied patients (education, occupation, income, and marital status) (N=183)

Characteristics	n (%)
Education	
Illiterate/read and write	59 (32.3)
Primary middle/high school	104 (56.8)
University or higher	20 (10.9)
Occupation	
Employed	107 (58.5)
Student	10 (5.5)
Unemployed	66 (36)
Income	
Have savings	33 (18)
Income=expenses	105 (57.4)
In debt	45 (24.6)
Marital status	
Married	113 (61.7)
Single	51 (27.9)
Divorced or separated	8 (4.4)
Widowed	11 (6)

Table 3 Frequency of tuberculosis risk factors among studied patients (N=183)

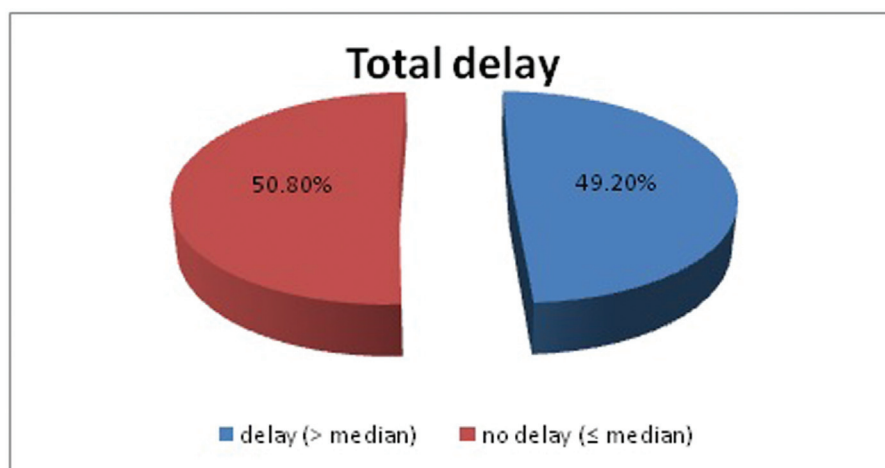| Risk factors	n (%)
Smoking status	
Never	86 (47)
Current	76 (41.5)
Ex-smoker	21 (11.5)
Shisha smoker	20 (10.9)
Daily consumption of cigarettes among smoker	
Median	10
Minimum–maximum	4–60
Duration of smoking among smokers	
Median	6
Minimum–maximum	2–50
Previous exposure to TB patients	
No	145 (79.2)
Yes	75 (20.8)
Chronic disease	
No	138 (75.4)
Yes	45 (24.5)
HIV	2 (4.4)
DM	28 (62.2)
Others[d]	15 (33.3)

DM, diabetes mellitus; TB, tuberculosis. [d]Others chronic liver disease, hypertension, renal disease, cardiac diseases, and thyroid disease.

Figure 1
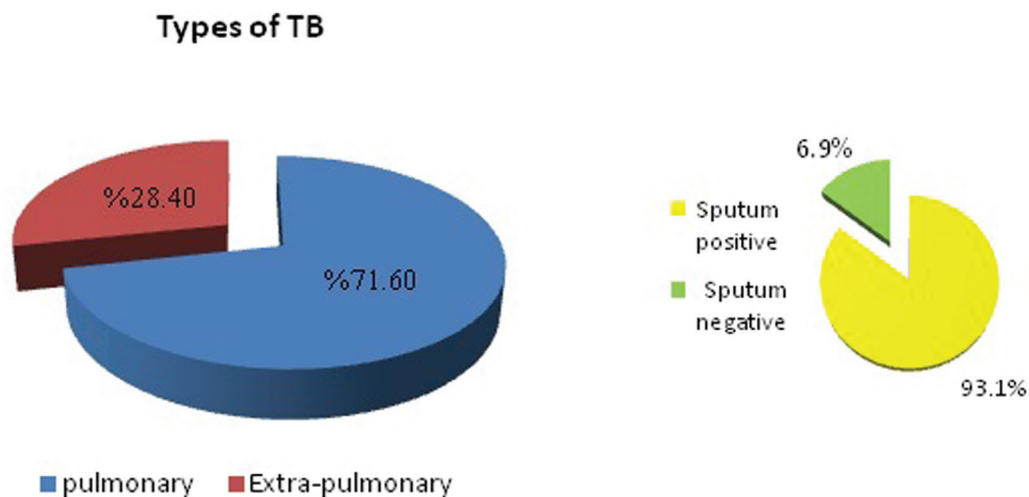
Distribution of patients according to the type of TB (N=183). TB, tuberculosis.

Figure 2

Proportion of total delay among the studied patients (N=183).

Table 4 Risk factors for total delay among the studied patients (previous exposure to tuberculosis, cough first symptom, and tuberculosis type) (N=183)

Risk factors	Delayed (>median) (N=90) [n (%)]	Not delayed (≤ median) (N=93) [n (%)]	OR and 95% CI	P value
Previous exposure to TB				
Yes[@]	17 (44.7)	21 (55.3)	0.79 (0.39–1.64)	0.538[1]
No	73 (50.3)	72 (49.7)		
Cough first symptom				
Yes[@]	65 (47.1)	73 (52.9)	0.71 (0.36–1.4)	0.325[1]
No	25 (55.6)	20 (44.4)		
TB type				
Pulmonary[@]	59 (45)	72 (55)	0.56 (0.29–1.07)	0.075[1]
Extrapulmonary	31 (59.6%)	21 (40.4%)		

CI, confidence interval; OR, odds ratio; TB, tuberculosis. [1]χ^2 test. [@]Reference group. *Statistically significant at P value less than 0.05.

Discussion

This study was performed in Ismailia, Port Said, and Suez chest hospitals. One hundred and twenty TB cases were treated annually and 10 TB cases were admitted in Ismailia Chest Hospital. It contains 67 inpatient beds, three ICU beds, chest radiography, and a laboratory. Sixty four cases were treated and 25 cases were admitted in Port Said Chest Hospital. It contains 42 beds, chest radiography, and a laboratory. Sixty one cases were treated in Suez Chest Hospital, no TB cases were admitted. It contains 140 beds, chest radiography and a laboratory.

In this study most of the TB patients were in their middle age (15–35years) which could be explained by the decreasing effectiveness of TB vaccine and increased risk of getting infection. These findings were consistent with previous studies in Ismailia [7] and Aswan [8]. Male TB infection to female ratio was 2 : 1, probably because men are spending much more time outdoors and contacting more people than women. Moreover, Egyptian men have higher risk of TB infection due to the higher prevalence of

smoking among them (40%) as compared with the women (1.5%) [9], and smoking is an important risk factor for TB infection [10].

In this study, only 10.9% of patients had finished university, all of them had statistically significant higher level of good TB knowledge compared with others and about 65% of them had not patient delay. Osei et al. [11], found that patients who attained formal education to at least the primary level were more likely to have previous knowledge of TB compared with patients with no formal education. ElHadidy et al. [12] found that TB knowledge were poor among tuberculous patients than among nontuberculous individuals. About 36% of current patients were unemployed which is greater than the unemployment rate in the general population of Egypt (11.3%) [13]. Nearly quarter of patients (24.6%) had been in debt. These findings on illiteracy, unemployment rates, and monthly income indicate that TB patients were a disadvantaged group in the community and the findings were consistent with the WHO's labeling of TB as a disease of poverty [5].

Table 5 Risk factors for total delay among studied patients (N=183)

Risk factors	Delayed (>median) (N=90) [n (%)]	Not delayed (≤ median) (N=93) [n (%)]	OR and 95% CI	P value
Time to reach health facility				
< ½ an hour[@]	45 (45.9)	53 (54.1)	1	0.636[1]
½ an hour–1 hour	33 (53.2)	29 (46.8)	0.75 (0.39–1.41)	
>1 h	12 (52.2)	11 (47.8)	0.78 (0.31–1.93)	
Health-seeking behavior at onset of symptom				
Health-care provider[@]	50 (40.8)	71 (59.2)	1	0.004[2]*
Self-medication /traditional medicine	2 (100)	0 (0)	0	
Pharmacies	38 (33.3)	22 (66.7)	2.45 (1.3–4.7464) 2.5	
First health facility patient sough for consultation				
Chest hospital[@]	13(32.5)	27 (67.5)	1	0.019[2,*]
Primary health-care unit	7 (77.8)	2 (22.2)	7.27 (1.32–39.99)	
Public hospital outpatient clinic	18 (64.3)	10 (35.7)	3.74 (1.35–10.34)	
Private practice (hospital or clinics	52 (49.1)	54 (50.9)	2 (0.93–4.29)	
Specialty of health-care provider				
Chest[@]	37 (39.8)	56 (60.2)	1	<0.043[1,**]
Internist	28 (57.1)	21 (42.9)	2.02 (1–4.07)	
General practitioner	9 (75)	3 (25)	4.54 (1.15–17.89)	
Others	16 (55.2)	13 (44.8)	1.86(0.8–4.32)	
Number of encounters				
1–2 times[@]	32 (29.6)	76 (70.4)	1	<0.001[1,**]
3–5 times	41 (73.2)	15 (26.8)	6.49 (3.16–13.36)	
>5 times	17 (89.5)	2 (10.5)	20.19 (4.41–92.51)	
Radiography				
Positive[@]	55 (43.7)	71 (56.3)	1	0.084[1]
Negative	19 (61.3)	12 (38.7)	2.04 (0.91–4.57)	
Not performed	16 (61.5)	10 (38.5)	2.07 (0.87–4.91)	
Sputum result				
Positive[@]	49 (40.2)	73 (59.8)	5.21 (1.04–26.15)	0.001[2,**]
Negative	7 (77.8)	2 (22.2)		
Perceived stigma				
Low degree[@]	35 (38.9)	55 (61.1)	0.43 (0.24–0.79)	0.006[1,*]
High degree	55 (59.1)	38 (40.9)		
TB knowledge level				
Good knowledge[@]	62 (50.4)	61 (49.6)	0.86 (0.46–1.6)	0.635[1]
Poor knowledge	28 (46.7)	32 (53.3)		

CI, confidence interval; OR, odds ratio; TB, tuberculosis. [1]χ^2 test. [2]Fisher's exact test. [@]Reference group. *Statistically significant at P value less than 0.05. **statistically significant at P value <0.01

In the present study, the proportion of patient delay was 48.10% with median patient delay of 14 days. Longer median patient delay was observed in Zimbabwe (28 days) [14], Northwest Ethiopia (21 days) [6], Angola (30 days) [15], and in Ghana (59 days) [11]. Better patient delay in this study could be due to: better accessibility to health-care services, different proportion of patients ever heard about TB before diagnosis, good TB knowledge level, the low level of perceived TB stigma, and differences in sociodemographic characteristics between current and other studies.

Results showed that being married was a significant risk factor for patient delay. Also, all separated and divorced patients were delayed, while single and widowed had the least patient delay. This could be due to the heavy family and financial responsibilities that led to a delay in health-seeking advice on time. Separated and divorced patients could have social, psychological, and financial issues. Moreover, taking self-medication or traditional medicine and seeking first advice from pharmacies were found to lead significantly to patient delay. Previous studies found similar findings [14,15].

Results showed that the median of health system delay (HSD) in Suez Canal Area was 20 days. The WHO, 2006, has reported 18 days HSD duration in Egypt [5], which indicates that it did not improve over the past 12 years and even it is slightly longer. Shorter HSD duration was reported in Zimbabwe (2 days) [14], Angola (7 days) [15], Uganda (9 days) [16], India (9 days) [17], and Nigeria (14 days) [18]. Although Zimbabwe, Uganda, and Ethiopia are categorized by the World Bank as lower-income countries, while India, Nigeria, and Angola as low middle income countries (LMICs) as Egypt. The average HSD in this study was 39.9 days which is longer than reported by systematic review conducted by Sreeramareddy et al. [21] who found that the average HSD was 28.4 days in the LMICs. This may be due to the fact that the health-care sector initially consulted was mainly private sector in more than half of patients (55.2%) and 50% of patients who had HSD were diagnosed in private practice. These finding is similar to other studies [19,20]. Patients need to repeat same diagnostic steps in TB clinics to confirm diagnosis which lead to longer HSD duration. Most patients in this study preferred private practitioners and were advised by friends or relatives as the main reasons for seeking initial care from them compared with their lack of confidence in the quality of services in the public sector, where 62.80% of patients were not satisfied with public health-care services and 71.1% of patients with HSD had inadequate level of satisfaction with health care. Negative chest radiography results or not performing chest radiograph were significant risk factors for HSD.

Table 6 Duration of different types of delay among studied patients (N=183)

Types of delay	Duration (days)
Patient delay	
Mean±SD	35.5±41.5
Median	14
Range	1–180
Health-care system delay	
Mean±SD	39.9±46.4
Median	20
Range	0–190
Total delay	
Mean±SD	75.5±56.8
Median	65
Range	6–244

Table 7 Binary logistic regression analysis for predictors of total delay (>median) with covariates (health-seeking behavior at onset of symptoms, first health facility visited, sputum type, number of encounters, satisfaction score, and stigma score

Predictors	$\hat{I}$	P value	OR (95% CI)
First health-seeking behavior	1.616	< 0.001**	5.035 (2.175–11.654)
First health facility visited	0.584	0.231	1.793 (0.690–4.658)
Sputum type	0.683	< 0.001**	1.980 (1.506–2.604)
Number of encounters	−0.540	0.024	0.583 (3.65–0.930)
Satisfaction score	0.005	0.582	1.005 (0.988–1.021)
Stigma score	0.021	0.076	1.021 (0.998–1.045)
Constant	−5.628	< 0.001**	0.004
Model χ^2=70.505		< 0.001**	

CI, confidence interval; OR, odds ratio. **Statistically significant at P value < 0.01.

Table 8 Risk factors for total delay among studied patients (age, sex, city, and residence) (N=183)

Risk factors	Delayed (>median) (N=90) [n (%)]	Not delayed (≤ median) (N=93) [n (%)]	OR and 95% CI	P value
Age (years)				
15–35[@]	27 (40.2)	40 (59.7)	1	0.033[1,*]
>35–45	38 (63.3)	22 (36.6)	2.56 (1.25–5.24)	
>45–60	19 (50)	19 (50)	1.48 (0.66–3.33)	
>60	6 (33.3)	12 (66.6)	0.74 (0.25–2.21)	
Sex				
Male[@]	60 (48.4)	64 (51.6)	0.91 (0.49–1.68)	0.756[1]
Female	30 (50.8)	29 (49.2)		
City				
Ismailia[@]	52 (51.5)	49 (48.5)	1	0.651[1]
Suez	19 (43.2)	25 (56.8)	1.39 (0.68–2.85)	
Port Said	19 (50)	19 (50)	1.06 (0.5–2.2)	
Residence				
Urban[@]	74 (46.6)	85 (53.4)	0.49 (0.19–1.27)	0.0660[2]
Rural	16 (69.6)	8 (30.4)		

CI, confidence interval; OR, odds ratio. [1]χ^2 test. [2]Fisher's exact test. [@]Reference group. *Statistically significant at P value less than 0.05.

Table 9 Risk factors for total delay among studied patients (education, occupation, income, and marital status) (N=183)

Risk factors	Delayed (>median) (N=90) [n (%)]	Not delayed (≤ median) (N=93) [n (%)]	OR and 95% CI	P value
Education				
University[@]	12 (60)	8 (40)	1	0.772[1]
Illiterate	22 (48.9)	23 (51.1)	1.57 (0.5–4.57)	
Read and write	7 (50)	7 (50)	1.5 (0.38–5.95)	
Primary/middle/high school	49 (47.1)	55 (52.9)	1.68 (0.64–4.46)	
Employment				
Employed[@]	55 (51.40)	52(48.5)	1	0.798[2]
Student	5 (50)	5 (50)	1.06 (0.29–3.87)	
Unemployed	30 (45.5)	36 (54.5)	1.27 (0.69–2.35)	
Income				
Savings[@]	20 (60.6)	13 (39.4)	1	0.271[1]
Income=expenses	47 (44.8)	58 (55.2)	1.9 (0.86–4.21)	
In debt	23 (51.1)	22 (48.9)	1.47 (0.59–3.66)	
Marital status				
Married[@]	61 (54)	52 (46)	1	0.078[2]
Single	19 (37.3)	32 (62.7)	1.98 (1–3.89)	
Divorced or separated	6 (75)	2 (25)	0.39 (0.08–2.02)	
Widowed	4 (36.4)	7 (63.6)	2.05 (0.57–7.41)	

[1]χ^2 test. [2]Fisher's exact test. [@]Reference group.

This arouses attention to the importance of training physicians on following the national algorithm for TB diagnosis and developing high suspicion index when negative chest radiograph are found while symptoms persist. The study found that multiple health-care provider visits prior to diagnosis was significantly associated with HSD. This relationship may be explained by poor clinical suspicions by healthcare providers, failure for requesting for appropriate investigations, or refer patients to TB clinics/chest hospitals for further investigations. The study found that the median of total delay duration was 65 days (range, 6–244 days). The total delay duration is unacceptably too long. Total delay duration is longer than previously reported in Egypt by WHO [5], that found a median total delay duration of 44 days (range, 0–364 days). The average total delay duration in this study was 75.5 days which is longer than reported by Sreeramareddy *et al.* [21]; they found that the average total delay was 67.8 days in LMIC which mean that the situation in the Suez Canal Area is deteriorating and more efforts are needed to focus on this problem.

Limitations of the study
The study depended on the recall but we tried to avoid this by reascertainment of delay time and onset of treatment by checking the DOTS record which included all dates and ecruiting new TB cases in the period of data collection. There were several defintions for cut off point for delay in previous studies but we used the most common one and which was used by WHO. The study included only patients who were registered and patients aged 18 years and over, it did not include children because no enough data about them were available. The study excluded retreatment cases which may affect the period of delay.

Point of strength: the study included pulmonary and extrapulmonary TB cases.

Conclusion
Nearly half of patients (49.20%) had unacceptable total TB delay. The main determinants of total delay in the diagnosis and management of TB were seeking pharmacies instead of visiting health-care providers after onset of symptoms, not visiting initially chest hospital/TB clinics, seeking consultation from different specialties other than chest, negative sputum smear results, and more than two health visits before initial diagnosis.

Conflicts of interest
There are no conflicts of interest.

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