Case-finding tuberculosis patients: diagnostic and treatment delays and their determinants

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كشف حالات السل: التأخُّر في التشخيص والمعالجة ومحدداته

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الخلاصة: قيَّمت هذه الدراسة التي أجريت في الجمهورية العربية السورية، تَوَاتُرَ ومحدِّدات التأخر في تشخيص حالات السل الجديدة الإيجابية اللطاخة، في مراكز المعالجة القصيرة الأمد تحت الإشراف المباشر DOTS. وبيَّنت هذه الدراسة التي شملت 800 مريض، أن متوسط التأخر المتعلِّق بالْتِمَاس الرعاية قد بلغ 52.7 يوماً (المجال: من 15 إلى 698)، ومتوسط التأخر المتعلِّق بإجراءات النظام الصحي السابقة للتشخيص قد بلغ 24.8 يوماً، ما جعل متوسط مدة التأخر الكلِّي قبل التشخيص 77.6 يوماً. في حين كان متوسط الفترة بين التشخيص وبين بدء المعالجة قصيراً جداً إذْ لم يتجاوز 2.9 يوماً. وتمثَّلت عوامل الاختطار الهامة المسؤولة عن التأخر الكلي في ما يلي: العيش في أماكن بعيدة عن المرفق الصحي، والشعور البالغ بالوصمة، والْتِمَاس الرعاية في البداية لدى شخص من غير مقدِّمي الرعاية الصحية، ومراجعة أكثر من مرفق صحي واحد قبل التشخيص.

ABSTRACT This study in the Syrian Arab Republic assessed the frequency and determinants of delays in diagnosis and treatment of new smear-positive tuberculosis cases at DOTS treatment centres. Among 800 patients, the mean delay due to patient care-seeking behaviour was 52.7 days (range 15–698) and the health system delay before diagnosis was 24.8 days; thus the mean total delay before diagnosis was 77.6 days. The mean delay from diagnosis to start of treatment was very short at 2.9 days. Significant risk factors for total delay were: living far from the health facility, feeling a high degree of stigma, seeking initial care at a non-health care provider and having more than 1 health care encounter before diagnosis.

Dépistage de la tuberculose : les retards au diagnostic et au traitement et leurs déterminants
RÉSUMÉ Cette étude, conduite en République arabe syrienne, avait pour objectif d'évaluer la fréquence et les facteurs déterminants des retards dans le diagnostic et le traitement de nouveaux cas de tuberculose à bacilloscopie positive (TPM+) dans les centres DOTS (traitement de brève durée sous surveillance directe). Sur un effectif de 800 patients, le retard moyen dû au comportement de recours aux soins du patient était de 52,7 jours (fourchette : 15-698) et le retard du diagnostic imputable au système de santé était de 24,8 jours, soit un délai total moyen avant diagnostic de 77,6 jours. Le délai moyen entre l'établissement du diagnostic et l'instauration du traitement est apparu très bref, à savoir 2,9 jours. Si l'on considère le retard global, les facteurs de risque significatifs sont l'éloignement du domicile par rapport au centre de soins, le poids de la stigmatisation, le recours dans un premier temps à une personne autre qu'un prestataire de soins et la multiplication des consultations médicales avant l'établissement du diagnostic.

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Introduction

In 1993, the World Health Organization (WHO) declared a state of global emergency for tuberculosis (TB), due to the steady increase of the disease worldwide [*1*]. In 1995, the directly observed treatment, short-course (DOTS) strategy was established as a key plan to achieve TB control worldwide. The global targets of TB control are to achieve 70% case detection and 85% cure rates by 2005. According to the latest WHO global report [*1*], DOTS programmes successfully treated 82% of all registered new smear-positive patients in 2002, but detected only 45% of the estimated TB cases in the world in 2003. The report indicated that the target of 70% case detection might not be reached until 2015, unless interventions were used to increase the case detection rate.

The situation in the Syrian Arab Republic is similar. In 2003, 1545 cases of new smear-positive pulmonary TB were detected, and 1353 of them were successfully treated [*2*]. As the estimated incidence of TB in the country is 20/100 000 population, the case detection rate is 44%, while the treatment success rate is 88%, and DOTS coverage of 100% was reached in April 2000. Therefore improving case-finding is a priority, and operational research is needed.

One important research area in this regard is the assessment of the delays between the start of symptoms and making the diagnosis of TB and between making the diagnosis and starting treatment, and what causes delays. The delay in diagnosis and treatment of TB patients can be caused by patients or by the health system, or both. The problems of delay in TB case-finding have been studied to some extent in other countries, both in developing and in developed countries, since delays in diagnosis have been noted in both high and low TB prevalence countries [*3–6*]. In high prevalence countries delays build up due to prolonged patient and doctor delays [*3*]. Several factors have been identified as influencing delay in diagnosis and start of treatment including the individual patients' perception of the disease, the severity of the disease, patients' access to health services and the expertise of health personnel.

Some previous studies have suggested that the determinants of a longer delay include specific patient groups (e.g. women in Viet Nam and Nepal, rural residents in Tanzania, nationality in Los Angeles, USA [*3–6*]). Other studies suggest that the most important factors for delays were availability and accessibility of health services. All these studies highlighted the importance of delay in increasing costs and mortality due to TB. The multiple factors causing delay in diagnosis must be clearly identified and addressed locally in order to improve the quality and effectiveness of the national TB control programmes (NTPs). Studies of case-finding, particularly analysing delays and their determinants, would allow good assessment of case-finding success under DOTS.

This study of TB case-finding in the Syrian Arab Republic made an in-depth analysis of various types of delay and their determinants. The goal was to identify gaps in case-finding under DOTS in order to assist in planning future interventions.

Methods

A cross-sectional study was conducted in all 13 NTP centres implementing DOTS in the country. The study covered new patients seen during the period 1 February 2003 to 30 September 2003. The number enrolled

from each centre was proportional to the number recorded in that centre in 2001.

A total of 800 new smear-positive pulmonary TB patients aged more than 15 years old were interviewed consecutively according to a structured and pre-tested questionnaire. The sample size was based on the estimated incidence of TB. The questionnaire included information about the time intervals between onset of symptoms and each of the following events: initial health-seeking, first visit to a health care provider, making the diagnosis of TB and starting DOTS treatment. Health workers, including doctors and paramedical staff, were given intensive training on interview and probing techniques. They interviewed the patients during the first 2 weeks of their treatment, after obtaining informed consent.

The patients were also interviewed about factors that might influence health-seeking behaviour and accessibility to timely and appropriate care:

- Sociodemographic status (measured using a summation score of education, occupation and incomes; best = 0 and worst = 7).
- Satisfaction with care (measured on a 4-point Likert scale; 0 = best and 3 = worst). The variables included availability of services in TB centres, prompt action from primary care personnel, adequacy of equipment and free medication in these centres, proper coverage of TB centres in the area, health facility workload, and waiting time. The cut-off for satisfied/unsatisfied was the median value.
- Knowledge (measured on a 3-point Likert scale; 0 = best and 2 = worst). The variables included knowledge about the type of disease, its causes, curability, existed of a vaccine, type of anti-TB drugs and duration of treatment. The cut-off for adequate/inadequate knowledge was the median value.
- Feelings of stigma about TB (measured on a 5-point Likert scale; 0 = highest, 4 = lowest degree of stigma). The variables included feeling ashamed of having TB, having to hide TB diagnosis from others and having problems with family relations, work performance, marriage prospects, family responsibilities, infertility, pregnancy or breastfeeding. The cut-off for high/low stigma was the median value.

Definitions

The following definitions of delay were used:

- Diagnostic delay: time interval between onset of symptoms and diagnosis of pulmonary TB. This consists of 2 components:
  - Patient related diagnostic delay: time interval between onset of symptoms and first seeking care at a health care provider.
  - Health system related diagnostic delay: time interval between seeking care at a health care provider and diagnosis of pulmonary TB.
- Treatment delay: time interval between diagnosis and start of DOTS treatment.
- Health system delay: time interval between seeking care at a health care provider and start of DOTS treatment.
- Total delay: time interval between onset of symptoms and start of DOTS treatment.

Statistical analysis

Data from questionnaires were checked before data entry. Data analysis was performed using *SPPS*, version 11, and *Epi-Info 2000*. Descriptive statistics were used such as frequency, mean and standard deviation (SD).

Comparisons between groups were made using the chi-squared test.

A multivariate logistic regression analysis was performed to analyse the determinants of delay. The median was used as a cut-off to compare patients in 2 groups with low delay (≤ the median) and high delay (> the median value).

Results

Demographic characteristics

More than two-thirds of the 800 newly diagnosed pulmonary TB patients were aged ≤ 35 years old and the mean age was 27.5 years (range 15–95 years). The male to female ratio was 510:290 (1.8). Demographic data showed that 34.6% were illiterate, 44.1% were unemployed or housewives, 67.3% had income that covered their expenses, 34.4% were residing in urban areas, 20.3% in suburbs and 42.9% in rural areas, 75.9% of the patients lived within 5 km of a health facility and 9.3% had to travel more than half an hour to reach a health facility. Half of the patients had a history of current or past smoking, whether cigarettes or *nargila* (waterpipe) (Table 1).

The majority (80.8%) of patients had "optimal" satisfaction with care and only a few had (19.2%) had "suboptimal" satisfaction. The great majority of patients (94.4%) felt a high degree of stigma attached to TB. Knowledge about TB was poor, with a high proportion of patients (91%) scoring "inadequate" knowledge. Almost all patients (99.6%) had previously heard about TB, mainly from Ministry of Health campaigns (51.7%) or from information from a sick relative or friend (27.0%). There was inadequate knowledge among many patients regarding the presence of a vaccine for the disease (45.3% incorrect), types of drugs (30.2% incorrect) and duration of treatment (14.8% incorrect).

Table 1 **Demographic and clinical characteristics of 800 smear-positive tuberculosis patients in the Syrian Arab Republic, 2003**

Variable	No. of patients	%
Age at diagnosis (years)		
≤ 35	516	64.5
> 35	284	35.5
Sex		
Male	510	63.8
Female	290	36.2
Marital status		
Married	432	54.0
Single	332	41.5
Widowed	17	2.1
Divorced/separated	19	2.4
Residence		
Urban	275	34.4
Suburban	162	20.2
Rural	343	42.9
Homeless/displaced	20	2.5
Educational level		
University or higher	20	2.5
Primary/middle/senior	503	62.9
Illiterate/read & write	277	34.6
Occupation		
Technical/professional	33	4.1
Clerical/manual worker	383	47.9
Student	31	3.9
Unemployed/housewife	353	44.1
Financial status		
Have savings	66	8.2
Income = expenses	538	67.2
In debt	196	24.5
Travelling time to a health facility (h)		
< 0.5	722	90.2
0.5–1	50	6.2
> 1	28	3.5
Travelling distance to health facility (km)		
≤ 5	607	75.9
> 5	193	24.1

Table 1 **Demographic and clinical of 800 smear-positive tuberculosis patients in the Syrian Arab Republic, 2003 *(concluded)***

Variable	No. of patients	%
History of smoking		
Never	396	49.5
Current smoker	213	26.6
Ex-smoker	191	23.9
Previous chronic disease		
No	701	87.6
Yes	99	12.4
Satisfaction with care		
Optimal (score < 1)	619	80.8
Suboptimal (score ≥ 1)	147	19.2
Stigma		
Low (score > 2)	43	5.6
High (score ≤ 2)	723	94.4
Knowledge		
Adequate (score < 1)	66	8.6
Inadequate (score ≥ 1)	697	91.4

Totals that do not sum to 800 are due to missing data.

Health-seeking behaviour before diagnosis

When asked about symptoms before diagnosis, cough was reported by almost all the patients (98.3%), followed by fever (76.6%) and weight loss (73.6%). Cough was the main symptom motivating the patients to seek health care (80.4%) (Table 2).

The main health-seeking behaviour after the onset of symptoms was to visit a health care provider (91.9% of patients) (Table 2). The majority of patients sought care at the private sector (79.1%) or public hospitals (17.9%) rather than the NTP centre (1.1%). The health care provider where patients first sought care was most commonly a chest specialist (50.4%), followed by general practitioner (19.3%) and internist (25.8%). The majority of patients visited 1 health care provider before diagnosis, but 41.4%

Table 2 **Health-seeking behaviour of 800 tuberculosis (TB) patients before diagnosis**

Variable	No. of patients	%
TB symptoms at diagnosis[a]		
Cough	786	98.3
Fever	613	76.6
Weight loss	589	73.6
Chest pain	527	65.9
Haemoptysis	250	31.3
Other	38	4.8
Symptoms causing patients to seek care		
Cough	643	80.4
Fever	27	3.4
Haemoptysis	66	8.3
Chest pain	50	6.3
Weight loss	6	0.8
Other	8	1.0
First place of seeking advice for care after onset of symptoms		
Health care provider	733	91.9
Pharmacy	35	4.4
None (self-medication)	21	2.6
Traditional medicine	7	0.9
Primary care worker at home	2	0.3
Other	0	0.0
First health care provider visited before diagnosis		
Private clinic or hospital	633	79.1
Public hospital	143	17.9
Primary health centre	14	1.8
NTP centre	9	1.1
Chest hospital	0	0.0
Other	0	0.0
Specialty of private health care provider visited before diagnosis (n = 633)		
Chest specialist	319	50.4
General practitioner	122	19.3
Internist	163	25.8
Other	29	4.5
No. of health care providers consulted before diagnosis		
0	1	0.1
1	467	58.4
2	189	23.6
3	89	11.1
4	41	5.1
5	13	1.6

Table 2 **Health-seeking behaviour of 800 tuberculosis (TB) patients before diagnosis *(concluded)***

Variable	No. of patients	%
Reason for choosing a health care provider		
Free service	244	30.5
Confidence in getting cured	221	27.6
Accessible (short travel distance)	176	22.0
Services available anytime	45	4.6
Referred by previous health service	14	1.6
Free service	66	8.3
Recommended by somebody	34	4.3
Other	0	0.0
Reason for not visiting a health care provider at onset of symptoms		
Too busy/long waiting time	233	30.0
Bad experience	231	28.4
Too far	133	17.1
Other	180	23.3
Reason for delay in seeking care		
No delay	414	51.8
Hoped to recover	242	30.3
Fear of diagnosis	51	6.4
Economic constraints	55	5.8
Poor quality of health services	7	0.9
Fear of social isolation	6	0.8
Poor staff attitude	1	0.1
Other	24	3.0

[a]***Multiple answers possible.***

NTP = national TB control programme.

Table 3 **Pattern of health services delivered to 800 tuberculosis patients**

Variable	No. of patients	%
Health provider who made first diagnosis		
Health care provider	386	48.2
None (self-medication)	3	0.4
Traditional medicine	0	0.0
Primary care worker at home	145	18.1
Pharmacy	266	33.3
Other	0	0.0
Specialty of private health care provider making initial diagnosis (n ***= 300)***		
Chest specialist	45	15.0
Internist	164	54.7
General practitioner	74	24.7
Other	17	5.7
Diagnostic actions		
X-ray and sputum	762	95.3
Referral	19	2.4
X-ray only	14	1.8
Sputum only	5	0.6
Other	0	0.0
X-ray result		
Positive	795	99.4
Negative	0	0
Not performed	5	0.6

visited more than 1 and up to 5 health care providers (Table 2).

The main reason for delayed care seeking was hoping that symptoms would resolve without treatment (30.3%), while half of patients did not admit to a delay in seeking care (Table 2).

Initial TB diagnosis in the health care system

Despite their initial health-seeking behaviour, almost half the patients were diagnosed with TB in an NTP centre (48.2%). Within the private sector, diagnosis was mainly done by internists (54.7%). The first action after suspecting TB was to request a sputum smear examination and X-ray (95.3%). Diagnosis was rarely based on sputum smear examination only (0.6%) and referral accounted for 2.4% of cases (Table 3).

Reasons for consulting the NTP centre were: free services (30.5%), confidence in getting cured (27.6%), and accessibility (short travel distance) (22.0%). Delay in

Table 4 **Average delay for tuberculosis patients at different stages from onset of symptoms to start of treatment (see text for definitions)**

Variable	Mean (SD) (days)	Median (days)	Range (days)	25th percentile (days)	75th percentile (days)
Patient related diagnostic delay	52.7 (62.1)	31	0–426	28	61
Health system related diagnostic delay	24.8 (39.4)	11.5	0–372	3	29
Diagnostic delay (total)	77.6 (78.6)	55	2–698	34	93
Treatment delay	2.9 (5.6)	1	0–89	0	3
Health system delay	27.6 (39.6)	15	1–372	6	31
Total delay	79.0 (80.4)	57	2–702	36	97

SD = standard deviation.

consulting the NTP centre was attributed to bad experiences (28.4%) and the distance from residence (17.1%).

Determinants of delay

Table 4 summarizes the mean and median delays at all stages between onset of symptoms and start of DOTS treatment.

Patient related diagnostic delay

The mean duration between onset of symptoms and first seeking care was 52.7 days (range 0–426) and the median was 31 days (Table 4).

To establish the determinants of delay due to patient related factors, patients were analysed in 2 groups: delay ≤ the median and > the median. The significant risk factors for delay in seeking care were: inadequate knowledge regarding the disease (1.07-fold increased risk), seeking care at a non-specialized provider (not a health care provider) (5.66-fold increased risk compared with health care provider) and more than 1 health care encounter before diagnosis (1.20-fold increased risk) (Table 5).

Diagnostic delay

The mean duration between onset of symptoms and diagnosis was 77.6 days and the median diagnostic delay was 55 days (Table 4). Again, patients were grouped into 2 groups for analysis: ≤ median and > median.

The significant risk factors for diagnostic delay were: older age (1.02-fold increased risk for each year), living far from the health facility (2.20-fold increased risk), high degree of stigma (1.22-fold increased risk), inadequate knowledge regarding the disease (1.07-fold increased risk), seeking care at a non-specialized provider (not a health care provider) (3.22-fold increased risk compared to health care provider); and more than 1 health care encounter before diagnosis (2.14-fold increased risk) (Table 6).

Treatment delay

The mean duration between diagnosis and start of treatment was 2.9 days and the median treatment delay was 1 day from diagnosis (Table 4).

Health care system delay

The mean duration between seeking health care in the health system and start of treatment was 27.6 days and the median health care system delay was 15 days (Table 4).

Table 5 **Determinants of patient related diagnostic delay in patients delaying above and below the median (31 days)**

Variable	Delay ≤ median (*n* = 450) No.	%	Delay > median (*n* = 316) No.	%	Crude OR (95% CI)	Adjusted OR (95% CI)
Age (years)						
≤ 35	323	62.4	195	37. 6	1	1
> 35	127	51.2	121	48.8	1.58 (1.16–2.14)*	1.01 (0.99–1.03)
Sex						
Male	283	58.2	203	41.8	1	1
Female	167	59.6	113	40.4	0.94 (0.70–1.27)	1.20 (0.78–1.86)
Marital status						
Married	239	57.6	176	42.4	1	1
Single	197	62.3	119	37.7	0.82 (0.60–1.12)	0.91 (0.61–1.37)
Widowed/divorced	14	40.0	21	60.0	2.04 (0.96–4.36)	1.58 (0.73–3.44)
Residence						
Urban	152	57.1	114	42.9	1	
Suburban	98	63.6	56	36.4	0.76 (0.50–1.17)	0.90 (0.57–1.41)
Rural	189	57.8	138	42.2	0.97 (0.69–1.37)	1.07 (0.74–1.55)
Homeless	11	57.9	8	42.1	0.97 (0.34–2.70)	1.21 (0.42–3.46)
Education						
University or higher	11	55.0	9	45.0	1	1
Primary/senior	288	59.5	196	40.5	0.83 (0.31–2.23)	1.78 (0.59–5.34)
Illiterate/read &write	151	57.6	111	42.4	0.90 (0.33–2.45)	1.29 (0.87–1.93)
Occupation						
Technical/professional	20	60.6	13	39.4	1	1
Clerical/worker	215	58.6	152	41.4	1.09 (0.50–2.40)	0.53 (0.22–1.27)
Students	20	69.0	9	31.0	0.69 (0.21–2.24)	0.91 (0.60–1.38)
Unemployed/housewife	195	57.9	142	42.1	1.12 (0.51–2.48)	0.80 (0.32–2.00)
Financial status						
Savings	26	41.3	37	58.7	1	1
Income = expenses	309	59.9	207	40.1	0.47 (0.27–0.83)	0.40 (0.23–0.71)*
In debt	115	61.5	72	38.5	0.44 (0.24–0.82)	0.38 (0.20–0.71)*
Crowding index						
≤ 2	232	59.2	160	40.8	1	1
> 2	218	58.3	156	41.7	1.04 (0.78–1.38)	1.02 (0.92–1.12)
Travelling time to health facility (h)						
< 0.5	411	59.3	282	40.7	1	1
0.5–1	26	54.2	22	45.8	1.23 (0.66–2.30)	1.28 (0.68–2.41)
> 1	13	52.0	12	48.0	1.35 (0.57–3.19)	1.30 (0.54–3.16)
Chronic disease						
No	404	60.2	267	39.8	1	1
Yes	46	48.4	49	51.6	1.61 (1.05–2.48)	1.30 (0.78–2.15)

Table 5 **Determinants of patient related diagnostic delay in patients delaying above and below the median (31 days)** ***(concluded)***

Variable	Delay ≤ median (*n* = 450) No.	%	Delay > median (*n* = 316) No.	%	Crude OR (95% CI)	Adjusted OR (95% CI)
Satisfaction with care						
Optimal	367	59.3	252	40.7	1	1
Suboptimal	83	56.5	64	43.5	1.12 (0.78–1.62)	1.02 (0.92–1.12)
Stigma						
Low	29	67.4	14	32.6	1	1
High	421	58.2	302	41.8	1.49 (0.77–2.86)	1.06 (0.92–1.23)
Knowledge						
Adequate	41	62.1	25	37.9	1	1
Inadequate	408	58.5	289	41.5	1.16 (0.69–1.95)	1.07 (1.01–1.14)*
First place of seeking care						
Health care provider	435	61.8	269	38.2	1	1
Other	15	24.2	47	75.8	5.07 (2.69–9.67)	5.66 (3.02 –10.6)*
Health care provider at first consultation						
NTP	15	65.2	8	34.8	1	1
Public	78	58.2	56	41.8	1.35 (0.49–3.75)	1.22 (0.45–3.32)
Private	357	58.6	252	41.4	1.32 (0.52–3.46)	1.30 (0.51–3.32)
No. of health care provider encounters before diagnosis						
1	276	61.7	171	38.3	1	1
>1	174	54.5	145	45.5	1.35 (1.01–1.80)	1.20 (1.02–1.40)*

P < 0.05
NTP = national tuberculosis control programme; OR = odds ratio; CI = confidence interval.
n ***= total number of respondents.***

Total delay

The mean duration between onset of symptoms and start of DOTS treatment was 79.0 days for all patients and the median total delay was 57 days.

Analysing patients above and below the median, the significant risk factors for total delay were living far from the health facility (2.51-fold increased risk), high degree of stigma (1.17-fold increased risk), seeking care at a non-specialized provider (not a health care provider) (3.56-fold increased risk compared to health care provider) and more than 1 health care encounter before diagnosis (2.04-fold increased risk) (Table 7).

Discussion

Delays in diagnosis and treatment of TB can occur at a number of points, from the time a patient develops symptoms until treatment is started on anti-TB drugs. Delays caused by the patient can occur during the process of noticing symptoms, deciding if one is ill, assessing the need for professional care, and overcoming social, personal, and physical barriers to obtaining care from the health care system. Delays in diagnosis can be because the differential diagnosis can broaden or become more focused depending on key

Table 6 **Determinants of diagnostic delay in patients delaying above and below the median (55 days)**

Characteristic	Delay ≤ median (*n* = 390) No.	%	Delay > median (*n* = 376) No.	%	Crude OR (95% CI)	Adjusted OR (95% CI)
Age (years)						
≤ 35	290	56.0	228	44.0	1	1
> 35	100	40.3	148	59.7	1.88 (1.38–2.56)	1.02 (1.00–1.03)*
Sex						
Male	252	51.9	234	48.1	1	1
Female	138	49.3	142	50.7	1.11 (0.83–1.49)	1.11 (0.71–1.74)
Marital status						
Married	202	48.7	213	51.3	1	1
Single	177	56.0	139	44.0	0.74 (0.55–1.01)	0.96 (0.63–1.45)
Widowed/divorced	11	31.4	24	68.6	2.07 (0.94–4.63)	1.47 (0.64–3.37)
Residence						
Urban	135	50.8	131	49.2	1	1
Suburban	84	54.5	70	45.5	0.86 (0.57–1.30)	0.79 (0.50–1.26)
Rural	163	49.8	164	50.2	1.04 (0.74–1.45)	0.96 (0.65–1.40)
Homeless	8	42.1	11	57.9	1.42 (0.51–4.00)	1.40 (0.46–4.19)
Education						
University or higher	11	55.0	9	45.0	1	1
Primary/senior	260	53.7	224	46.3	1.05 (0.40–2.82)	0.97 (0.32–2.94)
Illiterate/read & write	119	45.4	143	54.6	1.47 (0.54–4.01)	1.06 (0.71–1.60)
Occupation						
Technical/professional	18	54.5	15	45.5	1	
Clerical/worker	193	52.6	174	47.4	1.08 (0.50–2.34)	0.71 (0.29–1.71)
Student	17	58.6	12	41.4	0.85 (0.27–2.62)	0.93 (0.60–1.43)
Unemployed/housewife	162	48.1	175	51.9	1.30 (0.60–2.81)	1.04 (0.44–2.49)
Financial status						
Have savings	24	38.1	39	61.9	1	1
Income = expenses	259	50.2	257	49.8	0.61 (0.34–1.08)	0.46 (0.25–0.83)*
In debt	107	57.2	80	42.8	0.46 (0.25–0.86)	0.37 (0.20–0.72)*
Crowding index						
≤ 2	209	53.3	183	46.7	1	1
> 2	181	48.4	193	51.6	1.22 (0.92–1.62)	1.08 (0.97–1.19)
Chronic disease						
No	354	52.8	317	47.2	1	1
Yes	36	37.9	59	62.1	1.83 (1.18–2.85)	1.51 (0.88–2.58)
Time to reach the health facility (h)						
< 0.5	361	52.1	332	47.9	1	1
0.5–1	17	35.4	31	64.6	1.98 (1.04–3.82)	2.20 (1.12–4.34)*
> 1	12	48.0	13	52.0	1.18 (0.50–2.80)	1.28 (0.52–3.15)

Table 6 **Determinants of diagnostic delay in patients delaying above and below the median (55 days) *(concluded)***

Characteristic	Delay ≤ median No. (*n* = 390)	%	Delay > median No. (*n* = 376)	%	Crude OR (95% CI)	Adjusted OR (95% CI)
Satisfaction with care						
Optimal satisfaction	313	50.6	306	49.4	1	1
Suboptimal satisfaction	77	52.4	70	47.6	0.93 (0.65–1.33)	0.94 (0.85–1.05)
Stigma						
Low degree	27	62.8	16	37.2	1	1
High degree	363	50.2	360	49.8	1.67 (0.89–3.16)	1.22 (1.05–1.42)*
Knowledge						
Adequate	33	50.0	33	50.0	1	1
Inadequate	356	51.1	341	48.9	0.96 (0.58–1.59)	1.07 (1.01–1.14)*
HSB with onset of symptoms (first place of seeking health care)						
Health care provider	372	52.8	332	47.2	1	1
Other	18	30.0	44	70.0	2.74 (1.50–5.03)	3.22 (1.74–5.96)*
Health care facility at first consultation						
NTP centre	14	61.0	9	39.0	1	1
Public	73	54.5	61	45.5	1.30 (0.49–3.53)	0.98 (0.37–2.63)
Private	303	49.8	306	50.2	1.57 (0.63–4.00)	1.20 (0.48–3..02)
No. of health provider encounters before diagnosis						
1	273	61.1	174	38.9	1	1
> 1	117	36.7	202	63.3	2.71 (2.01–3.44)	2.14 (1.77–2.60)*

P < 0.05.
NTP = national tuberculosis control programme; OR = odds ratio; CI = confidence interval.
n ***= total number of respondents.***

pieces of information. For example, a physician who has a high clinical suspicion of TB and a smear-positive sputum result will probably initiate treatment more quickly than one with a low clinical suspicion and a smear-negative result. Furthermore, the clinic may be considering diagnoses other than TB.

The total delay to treatment could be related to the method of estimating the time from onset of symptoms to initiation of treatment, but could also be a true difference in delay to diagnosis. The estimation of the date of onset of symptoms is liable to error, due to recall bias and individual variations in the perception of disease. In addition, what has been defined as the onset of symptoms by the patient could in fact be related to another disease that either coincided with the beginning of TB or had favoured it. Indeed, patients frequently reported symptoms suggesting viral infection or other disease at the onset of disease. The estimate of the delay to treatment therefore lies within a wide range, the limits of which are defined by the

Table 7 **Determinants of total delay in patients delaying above and below the median (57 days)**

Characteristic	Adjusted OR (95% CI)
Age	1.02 (1.00–1.04)*
Sex	
Male	1
Female	1.01 (0.65–1.57)
Marital status	
Married	1
Single	1.04 (0.69–1.58)
Widowed/divorced	1.39 (0.60–3.19)
Residence	
Urban	1
Suburban	0.84 (0.53–1.35)
Rural	0.92 (0.63–1.35)
Homeless	1.36 (0.45–4.13)
Education	
University or higher	1
Primary/senior	1.06 (0.37–3.03)
Illiterate/read &write	0.96 (0.32–2.91)
Occupation	
Technical/professional	1
Clerical/worker	1.29 (0.56–2.99)
Students	1.47 (0.47–4.61)
Unemployed/housewife	1.42 (0.59–3.42)
Financial status	
Have savings	1
Income = expenses	0.45 (0.25–0.80)*
In debt	0.39 (0.20–0.74)*
Chronic disease	
No	
Yes	1.28 (0.75–2.20)
Time to reach the health facility (h)	
< 0.5	1
0.5–1	2.51 (1.27–4.98)*
> 1	1.34 (0.54–3.27)
Crowding index	1.10 (0.99–1.22)
Satisfaction with care	0.96 (0.86–1.06)
Stigma	1.17 (1.01–1.37)*
Knowledge	1.06 (1.00–1.13)
First place of seeking care	
Health care provider	1
Other	3.56 (1.91–6.64)*
Health care facility at first consultation	
NTP centre	1
Public	1.21 (0.44–3.38)
Private	1.25 (0.49–3.21)
Health care facility at first diagnosis	
NTP centre	1
Public	1.01 (0.62–1.65)
Private	1.01 (0.70–1.45)
Specialty of health provider at first diagnosis	
Chest	1
Internist	0.93 (0.62–1.42)
General practitioner	1.64 (0.95–2.84)
Other	1.48 (0.48–4.54)
No. of health provider encounters before diagnosis	
1	
> 1	2.04 (1.68–2.47)*

P < 0.05.
NTP = national tuberculosis control programme; OR = odds ratio; CI = confidence interval.
n ***= total number of respondents.***

occurrence of main events over the year and the individual's perception of disease.

This study highlights the prolonged delay from the onset of patients' symptoms until a diagnosis of smear-positive pulmonary TB is made.

In this study the mean patient related diagnostic delay was 52.7 days. The mean patient related diagnostic delay in our study was longer than those reported in similar studies in Egypt, Pakistan and Yemen [*8–10*], and less than those reported from Somalia [*11,12*]. Patient related diagnostic delay represented the main part (66%) of the total delay to treatment (79.0 days),

whereas the delays in diagnosis and treatment accounted on average for 34% of the total delay. This long patient delay was significantly associated with inadequate knowledge regarding the disease, seeking inital care at non-specialized individuals (not a health care provider) and having more than 1 health care encounter before diagnosis. Residence, sex and age showed no significant association and this may suggest that the most important determining factor for patients taking action about TB is knowledge about the disease; this is similar to what was observed in Yemen [*10*]. When asked why they had delayed seeking care, 28.4% of patients said that they delayed consulting the national TB control centre due to previous bad experiences and 17.1% because it was far from their residence, 30.3% were hoping that symptoms would resolve without treatment, while half of patients did not admit a delay in seeking care. There is a need to increase awareness of chest symptoms among patients.

The mean diagnostic delay was 77.6 days, which is higher than the mean diagnostic delay in Yemen (57.4 days) and in Egypt (55.9 days) [*8,10*] and lower than in Pakistan (96.3 days) [*9*] but similar to Somalia (76.6 days) [*11*].

A long distance between the patient's home and the health facility was a significant risk factor for diagnostic delay. Most patients (90.3%) were living within half an hour of the health facility prior to implementation of DOTS, but patients in some rural areas had to travel more than 1 hour to reach a health centre with microscopy facilities. The other significant risk factors for diagnostic delay were: older age, high degree of stigma, inadequate knowledge regarding the disease, seeking care at non-specialized individuals (not a health care provider), and more than 1 health care encounter before diagnosis.

The short treatment delay reflects the standard practice to start treatment as soon as a positive diagnosis is made. The mean treatment delay was 2.9 days: this is longer than in Egypt (1.2 days), Yemen (1.7 days), but less than in Somalia (4.5 days) and Pakistan (4.2 days) [*8–11*].

The mean health care system delay was 27.6 days. This is longer than in Yemen (20 days), Somalia (19.5 days), but less than in Egypt (33.9 days) and Pakistan (49 days) [*8–11*].

There are several limitations to this study. First, we were not able to determine the time of onset of symptoms in all patients in the study. Second, the medical records of some patients who sought care from private physicians were not available, which may have resulted in an underestimation of health care system delay in this group. Third, there may have been some recall bias from patients regarding the type, severity and onset of symptoms. Since health workers generally interview patients after they have begun TB treatment, patients may be more likely to report TB rather than non-TB symptoms. Fourth, it can be difficult to differentiate between patient and health care system delays; for example, a patient may have to wait to obtain an appointment with a health care provider. While this may be classified as a patient delay (the patient did not obtain the appointment) it may be more appropriate to classify this as a health care system delay (the patient sought care but it was not immediately available).

This study is valuable for improving the quality of services and strengthening the objectives of disease control; it highlights the importance of improving referral systems and access to diagnostic facilities for TB, at the same time as improving access to treatment if one wishes to reduce transmission of TB in the community. It shows also the importance of increasing awareness of the

signs and symptoms of TB in the general population and working closely with health care providers at all levels, including pharmacists, other drug sellers and traditional healers.

The research results were presented at a meeting of the NTP committee and doctors in TB centres, and a series of recommendations based on these results have been made. These recommendations include the provision of on-the-job training to health providers working within and outwith the government health services and the promotion of a concerted effort to increase awareness of signs and symptoms of TB in the general population to encourage self-referral to the health services and thereby increase passive case detection.

Conclusion and recommendations

The long time interval between onset of symptoms and treatment reported in this study was mainly attributed to patient related diagnostic delay rather than delay within the health care system. The main study recommendations are to increase awareness of the community about chest symptoms and the availability of free diagnostic and therapeutic services, educating public and private health care providers about NTP guidelines, and increasing collaboration between both sectors.

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