Direct patient costs associated with tuberculosis diagnosis in Yemen and Nepal

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_____ S U M M A R Y

BACKGROUND: The diagnosis of TB requires multiple visits. Reducing the number of visits for diagnosis could make the process more accessible, with significant savings to the patients.

OBJECTIVE: To describe direct costs incurred by patients consulting TB diagnostic centres.

METHOD: Adults with cough >3 weeks' duration were interviewed using structured questionnaires in Yemen and Nepal to quantify their expenses.

RESULTS: A total of 456 adults were interviewed. Most patients were accompanied, and 20% were smear-positive. Patients in Nepal were more likely to be male, to live in urban areas and were older (123/206 [60%], 152 [74%] and mean age 41 years) than in Yemen (120/250 [48%], 114 [36%] and mean age 35 years). Although most patients from rural areas stayed with relatives, their overall expenses were higher than for patients from urban areas. Clinic fees represented the highest expenditure in both countries, and rural patients paid more than urban patients in both settings. The expenses for diagnosis were equivalent to 1 week of the national income per capita.

CONCLUSION: Patients incur considerable costs for diagnosis, and clinic fees represent a substantial component of these costs. Patients requiring investigations for TB should be able to access diagnostic services free of charge.

KEY WORDS: tuberculosis; diagnosis; smear microscopy; low-income countries; urban population; rural population

TUBERCULOSIS (TB) is a disease associated with poverty. Low- and middle-income countries (LMICs) bear the heaviest burden of this disease and often lack the health system infrastructure required for effective control. Most diagnostic services for TB are based on the examination of multiple sputum specimens using smear microscopy. Sputum specimens are often collected according to a 'spot-morning-spot' algorithm, where patients provide the first specimen at the time of consultation, a second specimen collected at home the morning of the following day and a third specimen collected on the spot when the patient brings the morning specimen to the clinic. The scheme therefore requires at least two visits.

The Stop TB Partnership aims to reduce by 2015 the global burden of TB by 50%, relative to 1990 levels.[1] This requires the detection of at least 70% of new smear-positive cases and the successful treatment of 85% of cases identified. Although many countries currently achieve cure rates of more than 85%, the case detection targets are proving harder to attain. Most National TB Control Programmes in LMICs provide anti-tuberculosis treatment through outlets close to where patients live to facilitate treatment uptake and adherence. Yet, despite diagnosis being the gateway to treatment, smear microscopy centres are rarely close to where patients live, resulting in significant costs for patients residing in distant locations.

The World Health Organization (WHO) recently modified the guidelines for the diagnosis of TB in high-burden countries, reducing the minimum number of sputum specimens to be screened from three to two.[2] Although the reduced number of smears would lighten laboratory workloads, the resulting 'spot-morning' scheme would still require repeated visits, with negligible savings in time and money for the patients.[3]

It has also been suggested that two specimens collected on the spot (spot-spot) on the first day of consultation could identify a similar number of smear-positive patients to two specimens collected as 'spot-morning'.[4,5] Although this scheme could result in more rapid referral for treatment, it is poorly documented whether it would result in significant savings

for the patients. As costs are likely to vary according to service organisation, residence and travel, this study aimed to describe travel, food, accommodation and clinic costs for adults attending health centres in Yemen and Nepal for TB diagnosis. The analysis of expenses incurred for each day of attendance could inform whether diagnostic schemes that reduce the number of visits would result in significant savings for patients.

MATERIAL AND METHODS

The studies were based at the National TB Institute in Sana'a, Yemen, and at Tribhuvan University Hospital in Kathmandu, Nepal, in 2007. In Nepal, patients were enrolled from the DOTS centre, Tribhuvan University Hospital, and the Dirgh Jeevan TB and Chest Clinic in Kathmandu. The National TB Institute in Sana'a provides diagnosis and treatment services to the surrounding area and to referred patients. In both places, patients were screened independently of whether they required hospitalisation, to represent patients ranging from mild to severe symptoms. Patients who were hospitalised were included, but hospitalisation costs were not documented.

All consecutive patients aged >18 years with cough of >3 weeks' duration were invited to participate during a 2-month period. Patients were selected once they had been screened by the attending clinician and independently of whether the diagnosis of TB was confirmed by laboratory examinations. The study therefore excluded people who travelled to the clinic for diagnosis for whom the clinician did not request sputum examinations and who did not meet the inclusion criteria.

Patients were asked to submit sputum samples over 2 consecutive days (spot-morning). Patient information was collected using structured questionnaires administered by research interviewers in the local language. Information obtained included demographic and economic background, medical history and transport, food and accommodation expenses incurred each day by the patients and accompanying party. Distance from the residence to the health facility was not documented, as this was considered unreliable and dependent on the availability of roads and transport. In addition to the official clinic fees, costs included any unofficial payments described by patients. In addition, as a large proportion of patients do not have wages or do not wish to disclose them due to the widespread perception that health staff may ask for additional payments, lost wages due to missed work for the patient or the accompanying person were not included.

The costs incurred for attendance on the first day and the anticipated costs for the second day of consultation were assessed in the local currencies. Total costs were converted to United States dollars (US$)

to facilitate comparisons and as a proportion of the average yearly income for the country (i.e., US$290 per capita for Nepal and US$760 for Yemen in 2007). Residency was classified according to whether the patient resided in the same town, another town or a rural area.

Continuous variables with normal distributions were compared using parametric statistics. Medians and interquartile ranges were used to describe patient expenses and were compared using non-parametric tests. Categorical variables were compared using χ^2 or Fisher exact tests, and P values of <0.05 were considered statistically significant.

Informed consent was obtained from all patients. The Research Ethics Committees of the Liverpool School of Tropical Medicine, UK, the Tuberculosis Institute in Yemen and Tribhuvan University in Nepal approved the study protocol.

RESULTS

Two hundred and six adults were enrolled in Nepal and 250 in Yemen. Their general characteristics are shown in Table 1. In Nepal, patients were older and were more likely to be male than patients in Yemen. The majority of patients in Nepal resided in Kathmandu and other urban areas (74%), while most participants in Yemen (53%) resided in rural areas. Most patients in both countries (70%) were accompanied by another adult, and this person was a relative in the majority of cases. Similar proportions of patients in both countries were found to be smear-positive (51/206, 24.8% and 59/250, 23.6%, respectively).

The overall expenses for accessing diagnosis represented approximately one week of their respective national income per capita in both countries. The majority of the patients in Nepal used buses (62%), with only 16% taking taxis and 13% walking to the clinic (Table 2). In contrast, most patients in Yemen used taxis (53%). Nearly all patients had to pay for transport, which was independent of the place of residence. Most of the patients from rural areas stayed overnight in a relative's home (65% in Nepal, 60% in Yemen), with only a minority staying in hotels. Very few patients in Nepal, but the majority in Yemen, purchased food.

The expenses incurred for attending each day of consultation are shown in Table 3. The median (25th–75th quartiles) costs for food in Nepal and for accommodation in both countries were 0, as few patients had paid for these items. In Nepal, only 18% of patients paid for food and 5% for accommodation. In Yemen, only 12% of patients paid for accommodation. In Nepal, patients from rural areas reported spending less for accommodation than patients residing in urban areas, while in Yemen, accommodation costs were higher for patients travelling from outside Sana'a.

Table 1 Characteristics of participants in Nepal and Yemen

	Nepal (n = 206) n (%)	Yemen (n = 250) n (%)	P value
Age, years, mean (SD) [range]	41 (17) [15–81]	35 (17) [14–95]	0.001
Male	123 (60)	120 (48)	<0.01
Residency			
Same city	115 (56)	97 (39)	<0.01
Other town	37 (18)	17 (7)	<0.01
Rural area	44 (26)	133 (53)	<0.01
Accompanied participants	149 (72)	215 (73)	NS
Person accompanying the patient			
Husband/wife	21 (14)	44 (10)	NS
Relative	106 (71)	156 (73)	NS
Friend	20 (13)	10 (5)	<0.01
Neighbour	2 (1)	3 (1)	NS
Other	1 (1)	2 (1)	NS
Number with smear-positive TB	55 (22)	61 (24)	NS

SD = standard deviation; NS = not significant; TB = tuberculosis.

Clinic fees represented the highest expenditure in Nepal, followed by food and transport. Clinic fees varied by residence, with patients from outside Kathmandu paying more than those residing in Kathmandu. As clinic fees included the cost of tests, the higher fees for patients from outside Kathmandu may suggest that patients from these locations had more advanced disease stages and were more likely to require a higher number of tests, such as X-rays. Clinic fees also represented the highest expenditure in Yemen, followed by transport and food. The latter two were several-fold higher in patients residing in rural areas (P < 0.01).

After exclusion of clinic fees, the costs for the second day of attendance were similar to those of the first day. The costs for attendance increased if the patients resided in the same city, in other towns or in rural areas (P = 0.03 for both countries). Clinic fees therefore represented the highest expenditure in both countries, and rural patients paid more than urban patients in both settings.

DISCUSSION

TB control programmes in high TB burden countries require that patients with chronic cough attend diagnostic centres to undergo smear microscopy before they can be prescribed anti-tuberculosis treatment. Once diagnosed, the treatment for TB is decentralised to more peripheral centres for the convenience of patients. The need to attend diagnostic services that are distant and for multiple visits to complete the submission of samples is associated with direct and indirect patient costs and patients dropping out of the process, and may be barriers to accessing TB treatment.[6–11] These factors have led to initiatives to develop approaches that minimise the number of visits required (possibly to a single visit) which, presumably, would reduce patient costs.[12] Although it is plausible that a single visit for smear examinations could

Table 2 Transport and accommodation characteristics and proportion of patients who paid for clinic-related expenses in Nepal and Yemen

	Nepal					Yemen				
	Same city n (%)	Other town n (%)	Rural areas n (%)	All n (%)	P value	Same city n (%)	Other town n (%)	Rural areas n (%)	All n (%)	P value
Total	115 (56)	37 (18)	54 (26)	206	<0.01	97 (39)	17 (7)	133 (54)	247*	0.00
Main transport										
Bus	69 (60)	22 (59)	37 (69)	128 (62)	NS	24 (25)	1 (6)	31 (23)	56 (22)	NS
Walking	19 (16)	4 (11)	4 (7)	27 (13)	NS	2 (2)	0	0	2 (1)	NS
Taxi	17 (15)	10 (27)	5 (9)	32 (16)	0.07	44 (45)	10 (59)	78 (56)	132 (53)	NS
Motorbike	7 (6)	1 (3)	1 (2)	9 (4)	NS	0	0	0	0	NS
Bicycle	1 (1)	0	2 (4)	3 (1.5)	NS	0	0	0	0	NS
Car	0	0	4 (7)	4 (2)	NS	24 (25)	6 (35)	25 (19)	55 (22)	NS
Other	2 (2)	0	1 (2)	3 (1.5)	NS	3 (3)	0	2 (2)	5 (2)	NS
Overnight accommodation										
Home	100 (87)	20 (54)	9 (17)	129 (63)	<0.001	91 (92)	2 (12)	30 (23)	123 (50)	<0.001
Relative's house	5 (4)	12 (32)	35 (65)	52 (25)	<0.001	4 (4)	13 (77)	80 (60)	97 (39)	<0.001
Hotel	1 (1)	2 (5)	8 (15)	11 (5)	<0.01	1 (1)	2 (12)	21 (16)	24 (10)	<0.001
Makeshift house	7 (6)	3 (8)	2 (4)	12 (6)	NS	0	0	2 (2)	2 (1)	NS
Other	2 (2)	0	0	2 (1)	NS	0	0	0	0	
Number who paid for										
Clinic fees	96 (83)	33 (89)	50 (93)	179 (87)	NS	93 (96)	17 (100)	130 (98)	243 (98)	NS
Transport	83 (72)	32 (87)	45 (83)	160 (78)	NS	72 (74)	12 (71)	118 (89)	205 (83)	<0.01
Food	15 (13)	9 (24)	13 (24)	37 (18)	NS	70 (72)	12 (71)	113 (85)	195 (79)	0.04
Accommodation	3 (3)	1 (3)	7 (13)	11 (5)	0.01	1 (1)	2 (12)	26 (20)	29 (12)	<0.01

*Residency not recorded for three patients.
NS = not significant.

Table 3 Expenses incurred for attending the first and second day of the clinics in Nepal and Yemen. Data are presented in Nepalese rupees and Yemeni rials*

	Nepal					Yemen				
	Same city	Other town	Rural area	All	P value	Same city	Other town	Rural area	All	P value
Total patients, n (%)	115 (56)	37 (18)	54 (26)	206		97 (39)	17 (7)	133 (54)	247*	
Costs day 1										
Clinic fees	270 [120–700]	400 [150–500]	425 [150–1000]	300 [150–700]	0.3	450 [250–450]	450 [450–450]	450 [250–450]	450 [250–450]	NS
Transport	20 [0–40]	36 [20–100]	32 [18–40]	30 [9–40]	0.008	200 [0–500]	600 [0–800]	500 [300–1000]	400 [130–800]	0.001
Food	0	0	0	0	NS	150 [0–250]	300 [0–600]	350 [150–1200]	200 [60–600]	0.001
Total cost day 1	310 [150–790]	450 [270–2108]	530 [236–1032]	396 [222–800]	0.13	750 [570–1050]	1250 [950–1800]	1580 [850–2850]	1100 [700–1800]	0.001
Costs day 2										
Transport	20 [0–40]	36 [24–92]	36 [18–30]	30 [14–40]	0.01	290 [100–500]	200 [50–600]	400 [150–600]	300 [120–600]	0.03
Accommodation	0	0	0	0	NS	0	0	0	0	NS
Food	0	0	0	0	NS	200 [60–300]	200 [60–1000]	500 [200–1200]	250 [100–900]	0.001
Total cost day 2	32 [0–70]	60 [32–120]	38 [20–80]	36 [18–80]	0.005	500 [260–700]	800 [400–1500]	1070 [550–2250]	695 [300–1300]	0.001
Total costs	366 [240–900]	520 [374–766]	645 [260–1120]	470 [250–972]	0.04	1250 [850–1720]	2300 [1250–2850]	2810 [1490–5650]	1830 [1050–3250]	0.001
% of yearly income†	1.9	2.8	3.4	2.5	0.03	0.9	1.6	2	1.3	0.04

* US$1 = NPR 79 and YER 220. Median [25th–75th percentile] cost; median instead of mean cost was used. The costs for food in Nepal and accommodation in both countries were 0, as few patients paid for the items.
† Calculated as a proportion of the average annual per capita income for the country in 2007: US$290 for Nepal and US$760 for Yemen.
NPR = Nepalese rupee; YER = Yemeni rial.

reduce the burden for some patients, it is not known whether this reduction would motivate more people to access services or whether this difference would increase treatment uptake. Although the logic of this assumption is appealing,[13–15] there are very few studies documenting the costs of attending each day of the diagnostic process and scanty evidence that reducing the number of visits would result in significant cost savings.

There is a widespread misconception among health professionals that smear-based diagnostic services for TB are universally provided free of charge in the public sector of LMICs. However, a number of recent studies from high TB burden LMICs have reported that these services are often not free. Patients with chronic cough, and those subsequently confirmed to have TB, are required to pay clinic fees like any other patients before accessing diagnostic facilities,[16] and costs for diagnostic tests are frequently built into these fees. Although the costs presented in the manuscript are representative of patients coming from a small number of centres, and are thus not representative of all rural and urban patients, a major finding of this study is that clinic fees made up a considerable proportion of the total direct costs for the process (40% in Nepal and 15% in Yemen). It is, therefore, most likely that clinic fees themselves represent a considerable barrier to accessing diagnosis and treatment. When clinic fees were excluded, the direct costs of attending the second day were similar to those attending the first day. However, it is necessary to be cautious when interpreting these findings, as we do not have evidence of the accuracy of the anticipated costs for the second day of diagnosis and patients did not know exactly what the diagnostic procedure entailed. Attendance on a second day thus doubles the direct costs incurred in seeking a diagnosis, but savings to the patient are smaller than expected given the considerable proportion represented by the clinic fees.

Despite the differences in age, sex and residency, more than two thirds of patients were accompanied during their visit, increasing the patient costs. Further studies are needed to document the indirect and opportunity costs not described here. These include, among others, expenses related to preparing and bringing food from home, staying in relatives' houses and loss of income due to visits.[17,18] Although the direct costs of 2-day visits reported here were significant, the full cost of accessing TB diagnosis is therefore likely to be higher and represent a significant burden to the patients, especially the poor. There is also the possibility that travel time/distance is a more substantial barrier to access than the monetary costs described. It is not known whether patients who did not access the diagnostic services (not studied) would have behaved differently if the costs were lower, and the notion of travelling while ill or being away from home could have been a more substantial barrier than the

monetary costs. Furthermore, travelling to diagnostic centres also represents a risk to other individuals, with possible TB transmission when staying with friends and family while making visits to the TB centre. Individuals with chronic cough and active untreated TB travelling on buses and staying with host families are infectious and represent a public health hazard that is often ignored. Mobile smear microscopy or other strategies for decentralised diagnostic services may be justified not only because they reduce a barrier for patients, but also because they may reduce the incidence of TB.

In conclusion, patients with chronic cough in Nepal and Yemen incur considerable direct costs in undergoing smear examinations for the investigation of TB. The clinic fees that patients pay represent a substantial component of the direct costs incurred and are likely to present a considerable barrier to diagnosis and treatment. Although the findings of this study are not directly generalisable to other settings, patients experience a similar problem in two very different places: a high cost and significant effort to access TB diagnosis. Eliminating user fees from health services in poorer countries may remove a major obstacle to TB case detection and control. The results of this study would also support the recent call of the Stop TB Partnership's Subgroup on TB and Poverty (DOTS Expansion Working Group) and the International Union Against Tuberculosis and Lung Disease (The Union) for broad advocacy campaigns to ensure that patients who require investigations for TB can access a smear-based diagnostic service free of charge at the time and place of need (S B Squire, President, The Union, personal communication).[19,20] Reducing clinic fees may also need to be accompanied by providing smear microscopy (or at least sputum collection) near patients' homes.

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_____ RÉSUMÉ

CONTEXTE : Le diagnostic de la tuberculose (TB) exige de nombreuses visites. Une réduction du nombre de visites pourrait améliorer l'accessibilité du processus et engendrer une diminution significative des frais incombant aux patients.

OBJECTIF : Décrire les frais directs encourus par les patients consultant les centres de diagnostic de la TB.

MÉTHODE : Des entretiens des adultes toussant depuis >3 semaines ont été menées au moyen de questionnaires structurés pour quantifier leurs dépenses au Yémen et au Népal.

RÉSULTATS : On a interviewé 456 adultes. La plupart des patients étaient accompagnés et 20% avaient des frottis positifs. Au Népal, les patients sont plus souvent de sexe masculin, résident dans des zones urbaines et ont un âge plus avancé (123/206 [60%], 152 [74%] et un

âge moyen de 41 ans) par comparaison au Yémen (120/250 [48%], 114 [36%] et 35 ans). Bien que la plupart des patients des zones rurales séjournent avec des membres de la famille, les patients des zones rurales dépensent plus que ceux des zones urbaines. Les honoraires cliniques représentent la dépense la plus importante, et plus grande également en zone rurale qu'urbaine dans les deux pays. Les dépenses de diagnostic correspondent à une semaine de revenu national « per capita ».

CONCLUSION : Les patients encourent des coûts considérables pour le diagnostic et les honoraires cliniques constituent une composante substantielle de ces coûts. Les patients chez qui une investigation s'impose pour la TB devraient avoir accès gratuitement aux services de diagnostic.

_____ RESUMEN

MARCO DE REFERENCIA: Establecer el diagnóstico de tuberculosis (TB) necesita múltiples consultas. Una disminución de la cantidad de consultas podría significar mayor accesibilidad al diagnóstico y economías considerables para el paciente.

OBJETIVO: Describir los costos directos que pagan los pacientes con tos crónica que acuden a los centros de diagnóstico de la TB.

MÉTODOS: Se llevaron a cabo encuestas transversales con cuestionarios estructurados a adultos con tos de >3 semanas de duración en Yemen y Nepal, con el fin de cuantificar los gastos hasta obtener el diagnóstico de tuberculosis.

RESULTADOS: Se entrevistaron 456 adultos. En su mayor parte, los pacientes acudieron acompañados a las consultas y 20% presentó baciloscopia positiva del esputo. En Nepal, se observaron más pacientes de sexo masculino (123/206; 60%) y que residían en zonas urbanas

(152; 74%) en comparación con Yemen y la edad promedio fue más alta en Nepal (41 años contra 35 años). Aunque la mayoría de los pacientes provenientes de zonas rurales se alojó en casas de familiars, los pacientes de zonas rurales tuvieron mayores gastos que los pacientes de zonas urbanas. Los gastos más altos correspondieron a los del consultorio en ambos países, y fueron mayores en zonas rurales que en zonas urbanas en ambos entornos. El costo global del diagnóstico para los pacientes fue el equivalente de 1 semana de ingreso nacional por persona.

CONCLUSIÓN: El diagnóstico de TB conlleva gastos considerables para los pacientes, de los cuales una proporción importante corresponde los costos de atención en los consultorios. Los pacientes que precisan valoración por TB deberían tener acceso a servicios diagnósticos sin costo alguno.