

# Adherence of the private sector to national tuberculosis guidelines in the Islamic Republic of Iran, 2001–02

M.R. Shirzadi<sup>1</sup>, R. Majdzadeh<sup>2</sup>, F. Pourmalek<sup>2</sup> and K. Naraghi<sup>3</sup>

امتثال القطاع الخاص للدلائل الإرشادية الوطنية لمكافحة السل: دراسة في المدن الإيرانية الكبرى، 2001–2002

محمد رضا شيرزادي، سيد رضا مجد زادة، فرشاد بورمك، كامران نراقي

**الخلاصة:** تعرفت الدراسة على معارف وممارسات أطباء القطاع الخاص في ما يتعلق بالتدبير العلاجي للسل الرئوي وفقاً لما تنص عليه الدلائل الإرشادية للبرنامج الوطني لمكافحة السل ومحدداتها. فأجري مسح باستخدام استبيان على عينة عشوائية شملت 732 من الأطباء العاملين في القطاع الخاص، وتم التعرف على المعارف والممارسات الملائمة عن طريق تحليل العناصر الرئيسية. كما استخدم كل من التحليل ذي الطبقات والتحوُّف اللوجستي للتعرف على المحددات المصححة للنتيجتين. لقد كان لدى نسبة عالية من الأطباء معارف صحيحة حول المعايير التشخيصية الرئيسية، إلا أن مستوى معارفهم وممارستهم للتدبير العلاجي للسل كان منخفضاً. أما عوامل الاختطار المهمة لقلّة المعارف فهي العمر الذي يساوي أو يقل عن 36 عاماً، والعمل كطبيب ممارس وليس كأخصائي، وعدم المشاركة في دورات تدريبية على مكافحة السل أو في دورات تنظيمها معاهد أو مؤسسات من خارج النظام الصحي العمومي. أما العمر الذي يساوي أو يقل عن 36 عاماً فقد كان عامل الاختطار الوحيد الذي يُعتدُّ به إحصائياً في ما يتعلق بالممارسة السيئة.

**ABSTRACT** We determined the knowledge and practice of private sector physicians in three cities regarding management of pulmonary tuberculosis (TB) and their determinants. A random sample questionnaire survey was conducted of 732 private physicians. Stratified analysis and logistic regression were used to identify the adjusted determinants of the two outcomes. A high proportion of the doctors had correct knowledge about the major diagnostic criteria but there was a low level of knowledge and practice of TB management. Significant risk factors for poor knowledge were age  $\geq 36$  years, being a GP rather than a specialist and no attendance in TB training courses or attendance in courses held by institutions other than the public health system. Age  $\geq 36$  years was the only significant risk factor for poor practice.

## Respect des directives du programme national de lutte contre la tuberculose par le secteur privé en République islamique d'Iran, 2001-2002

**RÉSUMÉ** Nous avons déterminé les connaissances et les pratiques des médecins du secteur privé concernant la prise en charge de la tuberculose pulmonaire ainsi que leurs déterminants. Une enquête sur échantillon aléatoire par questionnaire a été réalisée auprès de 732 médecins privés. L'analyse stratifiée et la régression logistique ont été utilisées pour identifier les déterminants ajustés des deux résultats. Une forte proportion de médecins privés connaissait correctement les principaux critères de diagnostic mais le niveau de connaissance et de pratique de la prise en charge de la tuberculose était faible. Un âge supérieur ou égal à 36 ans, le fait d'être généraliste plutôt que spécialiste, et de ne pas avoir suivi de cours de formation sur la tuberculose ou d'avoir suivi des cours organisés par des organismes ne relevant pas du système de santé publique constituaient des facteurs de risque significatifs pour de faibles connaissances. Un âge supérieur ou égal à 36 ans était le seul facteur de risque significatif pour une pratique déficiente.

<sup>1</sup>Division of Communicable Disease, Center for Disease Management, Ministry of Health and Medical Education, Tehran, Islamic Republic of Iran.

<sup>2</sup>Department of Epidemiology and Biostatistics, School of Public Health and Institute of Public Health Research; <sup>3</sup>Department of Research Affairs, Tehran University of Medical Sciences and Health Services, Tehran, Islamic Republic of Iran.

## Introduction

Reduction of the tuberculosis (TB) burden is an important part of the equity promotion and poverty alleviation targets central to the United Nations Millennium Development Goals [1]. To achieve this in the Islamic Republic of Iran, the directly observed treatment, short-course (DOTS) strategy is being used and 100% DOTS coverage has been achieved. We are now striving to improve further the case detection rate, in line with the regional and country targets of the 2002–2005 Strategic Plan for TB Control in the Eastern Mediterranean Region [2]. Population coverage of DOTS was 28% in 1997, 69% in 1998, 94% in 1999 and 96% in 2000. The incidence rate of smear-positive pulmonary TB was 24 per 100 000 population in 2001, and was estimated by the Styblo method to be between 9.4 and 13.2 per 100 000 population in 2003 [3]. In 2001 the detection rate of new smear-positive was 33% compared with 7% in 1997, 21% in 1998, 30% in 1999 and 32% in 2000. The cure rate under DOTS in 2001 was 85% compared with 84% in 1997, 83% in 1998, 82% in 1999 and 85% in 2000 [4]. The Islamic Republic of Iran conducted a comprehensive review of the DOTS programme in 2002 and started strengthening surveillance and laboratory quality assurance, and involving health care providers other than the Ministry of Health and Medical Education. In order to achieve the global targets, there is a need to improve considerably case detection rates, particularly through involving all health care providers in DOTS activities [5].

Operational research on DOTS quality in the private sector is a priority, as the majority of TB patients first seek care within this sector [6], and the quality of TB management services is generally low in this sector [7]. Although there are no ad

hoc studies on the role of private practitioners in TB control in the Islamic Republic of Iran, routine statistics from the Ministry of Health and Medical Education show that in Tehran, the average coverage of health services by government service delivery points is around 30%. Only clients who present to the delivery points are dealt with and there is no active follow up. The result is that over 70% of the population seeks medical care directly from the private sector. In addition, the lack of any real public–private mix (PPM) is a major obstacle to successful TB control [8], and information about the knowledge and practice of private sector physicians is a prerequisite to establishing a functioning PPM-DOTS system [2]. Exploration of the national TB programme (NTP)-private sector interaction and its determinants will help create an evidence base for achieving an effective PPM for TB control and help devise more effective national strategies and regional guidelines.

The major rationale for the present study was to assess whether the standard TB treatment practices, as laid down in the National Guidelines, which are published and distributed by the Center for Disease Control, Ministry of Health and Medical Education, are known and practised correctly by physicians in the private sector. Thus the process indicators of DOTS quality were assessed by investigating the knowledge and practices of private sector doctors and their determinants.

## Methods

A cross-sectional study was conducted in 2001–2002 on private sector physicians who were randomly selected from the list of private sector general physicians (GPs) and specialists registered by the Medical

Council. These physicians were working in 3 large cities in the Islamic Republic of Iran with more 1.5 million inhabitants each, namely Tehran, Mashhad and Isfahan.

The main sample was randomly selected from two strata of GPs and specialists using the Medical Council numbers which allowed proportional distribution of the subjects according to their year of graduation. Since among the different medical specialties there are 4 that deal with the bulk of the pulmonary TB (PTB) cases [9], our results focused on GPs and paediatricians, infectious disease specialists, internists, and pulmonologists.

A postal questionnaire was sent out to 1400 private sector physicians in the 3 cities which resulted in 380, 356 and 343 responses from Tehran, Mashhad and Isfahan respectively. The validity and reliability of the questionnaire had been assessed previously on a representative subsample of 26 physicians using Cohen's kappa and Cronbach's alpha.

The questionnaire included data on the physicians' knowledge and attitude regarding the management of PTB, which were compared with the NTP guidelines. Questions about attitude were used as a proxy for practice and substituted for its direct measurement.

Since the majority of the Iranian physicians have attended different types of the postgraduate TB training courses, the impact of these courses on their knowledge and practice was also evaluated.

Knowledge and practice summed scores were constructed by the Principal Components Analysis (PCA), with the median value as the cut-off point. Ten questions on knowledge of respondents about the proper management of PTB were entered in PCA with extraction method of principal components and no rotation of the solution. Correctness or properness of the

questions about knowledge was identified with reference to the NTP guidelines. The 10 extracted factors were weighted by the percentage of total variance explained by each, and summed. The resultant quantitative variable was dichotomized on its median value. Respondents with values less than the median were scored as having incorrect or suboptimal knowledge of PTB management. Five questions on practice were similarly treated and yielded a binary variable indicating compatible or incompatible practice of PTB management.

Odds ratio point and interval estimates, and chi-squared and *t* tests were used thereafter. Control of effect modification and confounding was achieved by Mantel-Haenszel stratified analysis and logistic regression to identify the adjusted determinants of knowledge and practice.

## Results

A total of 732 respondents were included in the study, 599 (81.8%) GPs and 133 (18.2%) specialist in paediatrics, infectious diseases, internal medicine or pulmonary medicine; 197 (26.9%) practised in Tehran, 236 (32.2%) in Mashhad and 237 (32.4%) in Isfahan (for 8.5% data were missing). Of the total respondents, 98.4% (95% CI: 97.33–99.25%) had attended postgraduate TB training courses, organized by the communicable disease control units of the public health system at the national or provincial level, or held by universities, or as obligatory continuing medical education required by the National Medical Council and the Ministry of Health and Medical Education. Attendance at the courses organized by the health system, compared with other types of the courses, was associated with significantly higher proportion of physicians with appropriate total knowledge

summed score ( $\chi^2 = 4.890$ ,  $P = 0.027$ ), but this was not true for the total practice summed score ( $\chi^2 = 3.623$ ,  $P = 0.057$ ). Higher proportions of incorrect practice were found in Tehran (as compared with Mashhad or Isfahan) ( $\chi^2 = 7.620$ ,  $P = 0.006$ ). The majority of physicians (93.4%) (95% CI: 91.40%–95.13%) stated that cough for at least 3 weeks was the main clinical manifestation of PTB and 87.3% (95% CI: 84.66%–89.62%) indicated that sputum smear microscopy was the principal diagnostic method. Most of the physicians (82.8%) (95% CI: 79.85%–85.45%) used the laboratories outside the private sector for diagnosis of suspected PTB cases. The proportion of physicians with correct knowledge of treatment as contained in the NTP guidelines was 55.9% (95% CI: 50.44%–61.53%) for correct drug dosage, 54.2% (95% CI: 48.97%–59.75%) for correct duration of treatment and 49.6% (95% CI: 44.38%–54.86%) for the correct use of combination therapy. Only 34.5% (95% CI: 31.12%–38.13%) knew the correct practice of all three dimensions of drug therapy and only 34.2% (95% CI: 30.72%–37.72%) knew the correct drug therapy for smear-positive and smear-negative PTB cases. For smear-positive cases, 20.2%, 29.4% and 37.1% of the physicians dispensed/prescribed anti-TB medication daily, weekly and monthly respectively. Direct observation of treatment was used by 55.6% (95% CI: 51.92%–59.24%) of the physicians to check complete drug consumption, whereas 33.7% (95% CI: 30.32%–37.30%) did so by clinical/paraclinical means. Records were kept by 78.2% (95% CI: 74.97–81.09) of the physicians, and sputum smear microscopy for assessment of treatment outcome was the first-choice method used by 72.97% (95% CI: 67.53%–77.95%). Correct follow-up of defaulters

were done by 88.6% (95% CI: 85.55%–90.37%) of the physicians, either by referring the task to the local public health services or by personal contact with the patient/family. The existence of free sputum microscopy, culture and anti-TB drugs in the public health services for patients was known by 67.8% (95% CI: 64.24%–71.14%) of the physicians.

The results of the stratified analysis of point and interval estimates of adjusted and unadjusted odds ratios for the determinants of incorrect knowledge and practice are shown in Tables 1 and 2.

Of the incorrect knowledge and practice determinants identified, the following risk factors remained significant for incorrect knowledge (at the significance level of  $\alpha = 0.05$ ) after allowing for all confounders by stratification: age ( $\geq 36$  years), specialty (GP versus specialist) and attendance in postgraduate TB training courses (versus no attendance). For incorrect practice, only age ( $\geq 36$  years) remained significant. The time since graduation modified the effects of the other variables on knowledge and practice when analysed with stratification. The effect of older age on incorrect knowledge was greater for those whose time since graduation was  $\geq 7$  years (relative to those with that of  $\leq 6$  years) (Table 3). The only independent variable that had a significant coefficient in the regression model was age ( $P = 0.023$ ).

## Discussion

The main findings of our study are the relatively high proportion of physicians among the private sector with correct knowledge of PTB diagnosis and relatively low proportion with correct knowledge and practice of PTB treatment as indicated in the NTP guidelines. The majority of the private sec-

**Table 1 Point and interval estimates of crude and Mantel–Haenszel adjusted odds ratios for determinants of knowledge of the private sector physicians**

Variable	Physicians with suboptimal knowledge No. (%)	Physicians with optimal knowledge No. (%)	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
<i>Age (years)</i>				
≥ 36	196 (61.6)	122 (38.4)	1.78 (1.30–2.44)	1.74 (1.21–2.49)
≤ 35	148 (47.4)	164 (52.6)		
<i>Specialty level</i>				
GP	337 (56.2)	263 (43.8)	2.01 (1.14–3.56)	2.44 (1.32–4.52)
Specialist <sup>a</sup>	21 (38.9)	33 (61.1)		
<i>Attendance in public health system's TB control workshops</i>				
No <sup>b</sup>	289 (57.1)	217 (42.9)	1.52 (1.06–2.20)	1.53 (1.04–2.26)
Yes	69 (46.6)	79 (53.4)		

<sup>a</sup>Includes internal medicine, pulmonary and infectious disease specialists.

<sup>b</sup>Includes those have not attended any type of the TB training courses and also those who have attended TB training courses held by the universities or the continuing medical education system.  
The total number of physicians was less than 732 because of incompletely filled questionnaires.

**Table 2 Point and interval estimates of crude and Mantel–Haenszel adjusted odds ratios for determinants of the practice of the private sector physicians**

Variable	Physicians with compatible practice No. (%)	Physicians with incompatible practice No. (%)	Crude odds ratio (95% CI)	Adjusted odds ratio (95% CI)
<i>Age (years)</i>				
≥ 36	212 (66.7)	106 (33.3)	1.78 (1.29–2.46)	1.55 (1.08–2.22)
≤ 35	165 (52.9)	147 (47.1)		
<i>Specialty level</i>				
GP	363 (60.5)	237 (39.5)	0.90 (0.51–1.60)	0.88(0.48–1.63)
Specialist <sup>a</sup>	34 (63.0)	20 (37.0)		
<i>Attendance in public health system's TB control workshops</i>				
No <sup>b</sup>	319 (63.0)	187 (37.0)	1.53 (1.06–2.22)	1.38 (0.94–2.30)
Yes	78 (52.7)	70 (47.3)		
<i>Knowledge summed score</i>				
Suboptimal	265 (64.5)	146 (35.5)	1.32 (0.96–1.81)	1.15 (0.82–1.61)
Optimal	184 (57.3)	137 (42.7)		

<sup>a</sup>Includes internal medicine, pulmonary and infectious disease specialists.

<sup>b</sup>Includes those have not attended any type of the TB training courses and also those who have attended TB training courses held by the universities or the continuing medical education system.  
The total number of physicians was less than 732 because of incompletely filled questionnaires.

**Table 3 Effect of age on incorrect knowledge and practice of the private sector physicians by time since graduation**

Variable	Effect of age $\geq$ 36 years on incorrect knowledge OR (95% CI)	Effect of age $\leq$ 36 years on incorrect practice OR (95% CI)
<i>Time since graduation (years)</i>		
$\leq 6$	1.65 (1.05–2.59)	0.92 (0.40–2.11)
$\geq 7$	1.8 (1.01–3.20)	0.78 (0.34–1.84)

tor physicians (93.4%) (95% CI: 91.40%–95.13%) had the correct knowledge about chronic cough for diagnosis of TB. This diagnosis knowledge is relatively high compared with similar proportions reported from other countries in the Region and other developing countries [10–13]. However, the majority of private sector physicians had incorrect knowledge and practice about PTB treatment measures as outlined in the NTP guidelines (i.e. prescription of correct drug regimen, monitoring of treatment outcome, assurance of directly observed treatment and recording of patient data). There was a significantly greater proportion of GPs aged  $\geq 36$  years who had not attended postgraduate TB training courses who had incorrect knowledge of PTB management in comparison with specialists aged  $\leq 36$  years who had attended postgraduate TB training courses. The only variable that had a significant adjusted relation with incorrect practice was age ( $\geq 36$  years). Knowledge and practice of PTB management did not show a significant adjusted relation in our study.

Several knowledge, attitudes and practice (KAP) studies indicate poor knowledge and practice among private sector physi-

cians regarding the management of TB both in developing [10–13] and industrialized [14–17] countries. While we found a high proportion of the private sector physicians with correct knowledge about the diagnostic use of chronic cough, this is reported to be less than 1% in a study in Pakistan [18], 71.7% in a study in Somalia [19] and less than 50% in a study in Korea [10]. This wide variation can be attributed to the degree of success in attracting the collaboration of private sector physicians and the effectiveness of medical education on TB. For instance, the first workshop on TB control for private practitioners in Somalia was held in 2002 [19], whereas incorporation of the NTP guidelines into the continuing medical education and conducting of TB control workshops by the government health sector have been done since 1992 in the Islamic Republic of Iran.

The proportion of the private sector physicians with correct knowledge of the diagnostic use of sputum microscopy was 87.3% (95% CI: 84.66%–89.62%) in our study. In other countries the figures are reported to be less than 1% in Pakistan [18], 60% in the Somalia [19], less than 50% in Korea [10] and 12% in India [20].

The proportion of the private sector physicians who followed the NTP guidelines regarding the anti-TB drug regimen was 34.5% in our study, less than 1% in the Pakistan study [18], 7% in the Somalia study [19], 11% in the Korean study [10] and 29.4% in the Indian study [20].

Direct questioning about practice, as a substitute for other practice measurement methods, may lead to overestimation of practice correctness because of information bias for social credibility. Moreover, it is highly likely that the non-respondents in our study had less correct knowledge and practice. Thus, the high proportion of proper diagnostic knowledge among the

private sector physicians may to some extent be explained by the non-response rate. On the other hand, the effective performance of the medical education system with regard to TB may also account for the high level of diagnostic knowledge.

The association of incorrect knowledge of PTB management with being a GP aged  $\geq 36$  years with no attendance in postgraduate TB training courses is understandable and has implications about the effectiveness of training courses, especially those delivered by the Disease Control Units of the Ministry of Health and Medical Education. The lack of a significant association between knowledge and practice of PTB management shows that correct knowledge and attendance in postgraduate training courses do not necessarily result in correct practice of PTB management. This can be partially explained by the negative attitude of private sector physicians towards compliance with NTP guidelines. A private sector physician may believe they will lose a patient if the patient has a direct relation with the government health sector for diagnostic, drug therapy or follow-up issues.

There is room for improvement in coordination and support from the Ministry of Health and Medical Education in terms of provision of sufficient and good quality laboratory diagnostic services/facilities and anti-TB medications, and practical and acceptable mechanisms for direct observation of treatment and follow-up of defaulters of private sector patients by the government system in order to overcome the observed knowledge–practice mismatch.

Reinforcement of knowledge is the traditional solution and is indeed one of the basic requirements that should be addressed. The postgraduate training courses on TB held by the NTP at the national, pro-

vincial and district levels have been more effective in increasing physician knowledge than those held by universities and the continuing medical education system. Therefore more cooperation is advisable between the government health sector and NTP on one side and the other deliverers of postgraduate TB training courses (i.e. universities and the continuing medical education system) on the other, focusing on identified areas of incorrect knowledge and practice. A more critical issue is the actual attitude of private sector physicians toward the government health sector in general and the NTP in particular. Since a negative attitude acts as an obstacle to knowledge and correct practice, good policies, practices and management from the public sector are needed to promote further coherence of the NTP–private sector relations and more success in the control of TB in the community.

## Conclusion and recommendations

There is a need for more adequate treatment of PTB patients by private sector physicians to avoid patients acting as a source of infection in the community. The knowledge, attitude and practice of private sector physicians regarding the proper management of TB patients should be reinforced to become more compatible with NTP guidelines. Besides increasing the effectiveness of postgraduate training courses and continuing medical education, more advocacy for the NTP is needed by the Ministry of Health and Medical Education among the private sector. In addition a more effective information, education and communication system is needed to reassure private sector physicians about the security of the physician–patient relation and

encourage greater collaboration with the government health sector to meet the requirements of the NTP guidelines. Improvement of the response by the Ministry to the needs and expectations of private sector physicians and patients when utilizing laboratory diagnostic services, anti-TB medications and direct observation/follow-

up facilities will help strengthen private-public sector relations, increase the impact of patient health education on compliance and ultimately improve TB diagnosis and treatment. Intervention research on improving the effectiveness of PPM is recommended following this observational study.

### References

1. United Nations Development Programme. *Human development report 2003. Millennium development goals: A compact among nations to end human poverty*. New York, Oxford University Press, 2003.
2. *Strategic plan for tuberculosis control in the Eastern Mediterranean Region 2002–2005*. Cairo, World Health Organization Regional Office for the Eastern Mediterranean, 2002 (document WHO-EM/TUB/236/E/G).
3. *Estimation of TB incidence rate*. Tehran, Islamic Republic of Iran, Ministry of Health and Medical Education, Diseases Management Center. <http://www.emro.who.int/stb/Presentations/Morocco03/Day1/CntryExperience-Iran.ppt> (accessed: 30 September 2004).
4. World Health Organization, Regional Office for the Eastern Mediterranean. Stop Tuberculosis Programme. *TB situation in the Region. Country profile. Islamic Republic of Iran*. (<http://www.emro.who.int/STB/TBSituation-CountryProfile-ira.htm> (accessed: 30 September 2004)).
5. WHO Global Tuberculosis Programme. *Global Tuberculosis Control. WHO report*. Geneva, World Health Organization, 1996–2002.
6. Uplekar M, Pathania V, Raviglione M, eds. *Involving private practitioners in tuberculosis control: issues, interventions and emerging policy framework*. Geneva, World Health Organization, 2001 (document WHO/CDS/TB/2001.285).
7. Lönnroth K et al., eds. *First meeting of the public-private mix, subgroup for DOTS expansion*. Geneva, World Health Organization, 2003 (document WHO/CDS/TB/2003.317).
8. Dye C et al. Prospects for worldwide tuberculosis control under the WHO DOTS strategy. *Lancet*, 1998, 352(9144): 1886–91.
9. The Francis J Curry National Tuberculosis Center. *Strategic plan for tuberculosis training and education position papers: workgroup 1, tuberculosis training and education for private sector, managed care, and provider education*. [http://www.nationaltbccenter.edu/resources/position\\_papers/private.pdf](http://www.nationaltbccenter.edu/resources/position_papers/private.pdf); (accessed: 30 September 2004).
10. Uplekar M, Pathania V, Raviglione M. Private practitioners and public health: weak links in tuberculosis control. *Lancet*, 2001, 358:912–6.
11. Uplekar M et al. Tuberculosis patients and practitioners in private clinics in India. *International journal of tuberculosis and lung disease*, 1998, 2(4):324–9.
12. Hong Y et al. Survey of knowledge, attitudes and practices for tuberculosis among general practitioners. *Tubercle and lung diseases*, 1995, 76(5):431–5.



13. Hurtig A et al. Tuberculosis treatment and private practitioners, Kathmandu valley. *Journal of the Nepal Medical Association*, 2000, 39:163–8.
14. Liu Z, Shilkret KL, Finelli L. Initial drug regimens for the treatment of tuberculosis: evaluation of physician prescribing practices in New Jersey, 1994 to 1995. *Chest*, 1998, 113(6):1446-51.
15. Sumartojo E et al. Can physicians treat tuberculosis? Report on a national survey of physician practice. *American journal of public health*, 1997, 87:2008–11.
16. Ormerod L, Bentley C. The management of pulmonary tuberculosis in England and Wales in 1993. *Journal of the Royal College of Physicians*, 1997, 31:662–5.
17. Rothe T, Karrer W. Short-course therapy of pulmonary tuberculosis: doctor's compliance. *Tubercle and lung diseases*, 1996, 77:93–7.
18. Shah SK. Is the private sector following the national tuberculosis guidelines in diagnosis and management of pulmonary tuberculosis? In: *Operational research in tropical diseases. Final report summaries 1992–2000. Results portfolio. Small Grants Scheme*. Cairo, World Health Organization Regional Office for the Eastern Mediterranean, 2003. <http://www.emro.who.int/TDR/frs/proj00-10-pak.pdf> (accessed: 30 September 2004).
19. Suleiman BA. Are medical practitioners in Somaliland following the national guidelines for tuberculosis control in Somaliland in diagnosis and case management of pulmonary tuberculosis? In: *Operational research in tropical diseases. Final report summaries 1992–2000. Results portfolio. Small Grants Scheme*. Cairo, World Health Organization Regional Office for the Eastern Mediterranean, 2003. <http://www.emro.who.int/TDR/frs/proj00-10.pdf> (accessed: 30 September 2004).
20. Singla N et al. Survey of knowledge, attitudes and practices for tuberculosis among general practitioners in Delhi, India. *International journal of tuberculosis and lung disease*, 1998, 2(5):384–9.