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Pulmonary tuberculosis case detection through fortuitous cough screening during home visits

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Summary

OBJECTIVE To compare the yield of active tuberculosis (TB) case detection among risk groups during home visits with passive detection among patients at health services.

METHODS In April 2004, in a first phase, we introduced, active screening for coughing among all family members of patients that were visited at home by their family doctor or nurse for other reasons. Subsequently, from October 2004 onwards, active screening was restricted to family members belonging to groups at risk of TB.

RESULTS The overall detection rate of TB increased from 6.7/100 000 during passive detection at health services before the intervention to 26.2/100 000 inhabitants when passive detection was complemented by active case finding. Active screening among risk groups yielded 35 TB cases per 1000 persons screened compared to 20 TB cases per 1000 persons passively screened at health services. Active case finding was particularly efficient in those coughing for 3 weeks or more (107/1000 screened).

CONCLUSION This study demonstrates that active case finding in groups at risk during home visits increases the case detection rate in the population and permits the identification of cases that may not be detected through passive case finding at health facility level.

keywords tuberculosis, active case finding, risk groups, Cuba

Introduction

The 2006–2015 Global Plan of the WHO and STOP TB partnership to stop tuberculosis (TB) emphasises the need to increase the detection of TB cases worldwide (STOP TB Partnership and World Health Organisation 2006). DOTS, the WHO recommended strategy for tuberculosis control, advocates passive case finding i.e. the detection of active TB among persons who present to health services with symptoms indicative of TB (World Health Organization 2002). Early diagnosis and prompt treatment of TB cases is important not only to reduce severity and mortality of TB disease, but also to limit transmission of TB within the community. As the case detection worldwide lags behind, some authors recommend the implementation of active case finding as an extension to DOTS (Murray & Salomon 1998; Golub *et al.* 2005; Den Boon *et al.* 2008). Most countries with low incidence of TB, especially those which aim to eliminate TB, complement passive case finding with other case finding strategies. Those strategies include active case finding among contacts of recent TB cases, screening of groups at risk for TB such as immigrants coming from countries with high TB incidence, ethnic minorities, homeless people, prisoners and occupational screening for health care workers (Broekmans *et al.* 2002; Centers for Disease Control and Prevention 2002).

In Cuba, TB incidence has decreased steadily from 14.7 per 100 000 in 1995 to 6.5 per 100 000 inhabitants in 2004 and the National Programme for Control of Tuberculosis (NPCT) aims now at its elimination (Marrero *et al.* 2000; González *et al.* 2007). This demands further improvement of case finding by detecting infectious cases as rapidly as possible, rendering them non-infectious through curative treatment and thus limiting transmission. Up to now, case finding in Cuba has been based on the screening of patients who present with a cough of 2 weeks or more at health services, investigation of contacts of recent TB cases and screening of immigrants, mostly young adults who come to study in Cuba (Ministerio de Salud Publica 1999). (At curative consultations 1% of the

patients who consult for a new illness episode should be screened for tuberculosis, but this target is not strictly adhered to). Persons suspected of TB are investigated through smear analysis of two sputum samples and one culture. TB cases with positive smear or culture are notified and investigation of contacts is readily initiated. Recently, the NPCT conducted operational research on active case finding at the occasion of home visits which were scheduled for other reasons (Brooks *et al.* 2006).

Methods

An active case finding strategy was implemented in the whole Municipality of Las Tunas, a territory of 895 km^2 with a population of 164 000 inhabitants that is divided in five health areas. Each area is served by one polyclinic and 35–45 practices of family doctors and nurses for primary health care. They pay regular home visits to their patients who are registered for integral health care: pregnant and lactating women, infants, the elderly, people suffering from chronic diseases such as diabetes or hypertension and socio-economically vulnerable people.

After initial training, family doctors and nurses started active case finding in April 2004 during scheduled routine home visits by questioning the family about members coughing for more than 2 weeks. Persons with a cough of 2 weeks or more were referred for sputum smear analysis and culture and a special form was completed with name, address, gender, age and possibly risk group. In a first period (April 2004–September 2004) the presence of cough was investigated for all family members; at the same time the screening target of 1% was abandoned in the health facilities. Subsequently (October 2004–September 2005) the investigation for cough was restricted to family members belonging to groups at risk for TB: the elderly, heavy alcohol users, ex-prisoners, persons living with HIV and socio-economically vulnerable persons.

We recorded the total number of people with respiratory symptoms that were investigated, the duration of cough before being investigated and the number of bacteriologically positive (smear and/or culture positive) pulmonary tuberculosis (PTB) detected 1 year before and during the intervention. We calculated the yield of PTB cases, computed the 95% exact (binominal) confidence interval for proportions and compared the yield of the different screening strategies and for different duration of cough (2 weeks *vs.* 3 weeks). Proportions of yield were compared using the Chi square and a *P*-value below 0.05 was considered significant. The case detection rate in the

Table 1 Pulmonary TB case yield in function of screening strategy. Las Tunas, April 2003–September 2005

Strategy	Number of people with cough >2 weeks investigated	% active screening	Number of PTB cases detected*	PTB case yield per 1000 investigated (95% CI)†	Case detection rate per 100 000 population per year (95% CI)‡
Passive detection in health centre§ 12 months: April 2003–March2004	1821	Not done	11	6.0 (5–7.2)	6.7 (2.7–10.7)
Passive detection in health centre¶ and indiscriminate active screening at home 6 months: April 2004–September 2004	1090	45%	13	11.9 (6.4–20.3)	15.8 (7.2–24.4)
Passive detection in health centre¶ and active screening at home in groups at risk 12 months: October 2004–September 2005	1621	42%	43	26.5 (19.3–35.6)	26.2 (18.4–34)

TB, tuberculosis; PTB, pulmonary tuberculosis.
*Pulmonary TB cases sputum smear and/or culture positive.
†Exact 95% confidence intervals.
‡Poisson 95% confidence intervals.
§Screening target in health centres: 1% of the curative consultations.
¶Screening target in health centres abandoned.

population was calculated and Poisson 95% CI for rates computed. The study was approved by the ethics committee of the Institute of Tropical Medicine Pedro Kourí in Havana and the Provincial Authorities of Las Tunas.

Results

The number of people with a cough of 2 weeks or more that were investigated in the Municipality decreased slightly from 1821 in the year before the intervention (exclusively passive case finding in the health facilities and contact tracing) to 1621 in the last 12 months of the study, when 42% of suspects were identified through active case finding among persons belonging to groups at risk during home visits (Table 1). However, the overall rate of PTB case detection in the Municipality increased from 6.7 per 100 000 inhabitants to 26.2 per 100 000 respectively.

The yield of PTB cases increased from 6 per 1000 patients screened under passive case finding in health facilities and contact tracing to 12 per 1000 persons when complemented by indiscriminate case finding during home visits. This yield increased further and reached 26.5 per 1000 persons investigated when the passive case finding and contact tracing was complemented by targeted case finding in risk groups during home visits.

When the target of 1% was relaxed at health service level, the number of patients screened at the facilities diminished but the yield of passive case finding in the health facilities increased from 6 per 1000 patients before the intervention to 20 per 1000 during the last year of intervention. However, active case finding in persons belonging to groups at risk who cough for 2 weeks or more yielded 35 per 1000 persons investigated (Table 2).

Screening patients with a cough of 3 weeks or more had a yield which was significantly higher than screening of patients coughing for more than 2 weeks, both during active case finding in risk groups at home (107 per 1000 screened *vs*. 35 per 1000 screened, *P*-value = 0.0001) and during passive case finding in patients presenting at health services (65 per 1000 screened *vs*. 20 per 1000 screened, *P*-value = 0.0004).

Discussion

The yield of passive case finding in health services among people who cough for 2 weeks or more is very low in settings with a low TB incidence such as Cuba. Indeed to diagnose one smear or culture positive TB patient, 166 suspects undergo two sputum smear analyses and one culture. Better targeted, more effective and efficient screening strategies could be adopted. This study demonstrates that a strategy combining passive case finding with active case finding in groups at risk of developing TB on the occasion of home visits which are scheduled for other reasons has a yield almost five times higher than passive case finding in health services alone. It is possible that persons who are at risk of developing TB, such as the elderly, ex prisoners and people with socio-economic difficulties do not readily attend health services even when they are free of charge as in Cuba. Thus, this strategy permits the detection of TB patients that would otherwise

Table 2 Yield of passive and active screening according to duration of cough. Las Tunas, October 2004–September 2005

	Active screening at home in risk groups			Passive screening among patients presenting at health services			
	Cough between 14 and 20 days	Cough ≥21 days	All	Cough between 14 and 20 days	Cough ≥21 days	All	Grand total
No of people screened	532	149	681	725	215	940	1621
Total number of PTB† cases detected	8	16	24	5	14	19	43
PTB case yield per 1000 suspects investigated (95% CI)‡	15 (6.5–29.4)	107.4* (62.6–168.5)	35.2* (22.7–51.9)	6.9 (2.2–16)	65.1 (36–106.8)	20.2** (12.2–31.4)	26.5** (19.3–35.6)

TB, tuberculosis; PTB, pulmonary tuberculosis.
**P*-value = 0.0001.
***P*-value = 0.0004.
†Pulmonary TB cases sputum smear and/or culture positive.
‡Exact 95% confidence intervals.

not be diagnosed or at least accelerates the diagnosis and limits further transmission of TB. As the study area is relatively small and the TB incidence low, the numbers of TB cases detected are relatively few and the CI of some of the changes observed in the case detection rates in the population overlap. This indicates that the corresponding increases in case finding are not statistically significant, but the width of the CI indicates that there was probably insufficient power. Nevertheless the trend is quite clear and convincing. The number of cases detected in health centres did not decrease during the intervention period as would be expected if cases were detected at home instead of in health services. On the contrary, detection in the health services increased from 11 TB cases in the year before the intervention to 19 cases during the year of intervention. It is possible that the intervention has raised the awareness of clinicians about TB, also during consultations at the health services, and better targeted screening was applied. Similar observations were done in cluster randomised controlled trials in the UK and South Africa where educational outreach to promote screening for tuberculosis in primary health care improved case-finding (Fairall *et al.* 2005; Griffiths *et al.* 2007). Overall, the PTB case detection rate in the population increased fourfold. If active case finding at population level detects hidden cases that would otherwise not be diagnosed, detection rates could fall back after depleting the prevalence pool. TB incidence should be monitored over the coming years in order to evaluate the impact of active case finding on TB incidence in the Municipality. As case finding takes place during home visits scheduled for other reasons, it does not demand much extra effort from family doctors. Few supplementary costs are incurred, except for a marginal increase in personnel time; however this seems to be outweighed by the gains in overall effectiveness, efficiency and the reduction in absolute numbers of laboratory tests to be performed.

Screening among patients who cough for 3 weeks or more is more efficient- but somewhat less effective. In order to diagnose one TB patient in passive case finding at health service level only 15 suspects coughing 3 weeks or more need to be investigated compared to 166 suspects with a cough of 2 weeks or more. During active case finding in high risk groups this diminishes to 10 suspects coughing 3 weeks or more. Changing the screening criterion to cough for 3 weeks or more would greatly reduce the workload in laboratories and rationalises the use of scarce resources but could result in missing or delaying diagnosis of TB for 30% of the TB patients diagnosed with a cut off point of cough for 2 weeks or more. It should be further explored whether clinical follow up of people coughing for 2 weeks and screening if cough continues will eventually detect the patients suffering from TB. If so, the impact on transmission will be low in a setting with low incidence of tuberculosis as the number of patients who remain contagious 1 week longer is small. The benefits in terms of workload and costs must be carefully outweighed against this.

Community strategies to detect TB cases on a continuous and integrated basis in the regular health activities have been rarely described. Studies on community based strategies to detect TB cases have been reported before, but most were one off cross sectional efforts or surveys (Pronyk *et al.* 2001; Wood *et al.* 2007; Den Boon *et al.* 2008). Our study confirms that integrated active case finding during home visits scheduled for other purposes may help to identify cases that may not be detected through passive case finding at health facility level.

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