Community strategies to tackle tuberculosis according to the WHO region of origin of immigrant communities

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Setting: Tuberculosis (TB) control requires the proper identification and treatment of affected patients and investigation of their contacts. In certain vulnerable immigrant groups, however, these tasks may be hindered due to their ethnic and sociocultural characteristics.

Objective: To analyse the results of a community programme designed to locate hard-to-reach immigrants with TB.

Design: Descriptive study of all cases diagnosed with confirmed TB referred to the Public and Community Health team of the Drassanes International Health Unit in Barcelona during 2012–2014 due to difficulties in tracing these patients. Both cases and contacts were categorised based on their World Health Organization region of origin. The sociodemographic characteristics of each group and the community interventions carried out during the tracing period are described.

Results: A total of 122 cases and 316 contacts were detected. As a result of community-based strategies, 73% of the initial cases completed treatment; 3.8% of the contacts were diagnosed with TB, 91.7% of whom were treated appropriately; 17.1% contacts had latent infection, 79.3% of whom completed chemoprophylaxis.

Conclusions: Intervention strategies with a community approach for follow-up and control of TB in certain immigrant communities seem to be effective.

Tuberculosis (TB) remains one of the deadliest infectious diseases worldwide. In 2015, it was estimated that there were 10.4 million new cases of TB and 1.8 million deaths due to TB.¹ Although the number of fatalities decreased from 2000 to 2015, TB remains one of the 10 leading causes of death worldwide. One of the Sustainable Development Goals adopted by the United Nations in 2014 was the eradication of TB by 2050.² In 2014, 27% of cases in the World Health Organization Europe Region were detected in immigrants from countries with high TB incidence.³

Spain is one of the countries in Western Europe with the highest rates of TB, particularly in Catalonia where, despite significant advances in the prevention and control of the disease, TB remains more prevalent than in other neighbouring industrialised countries.^{3,4} Individuals with TB are not spread homogeneously throughout the region: 68% of cases were registered in the Barcelona Health Region—26% in the city of Barcelona, 18.5% in Zona Sur, 14.1% in Zona Vallés Occidental y Oriental and 9.5% in Zona Barcelonés Nord-Maresme.⁴

TB can be transmitted in overcrowded conditions, particularly in small spaces. Any close contact with a person with smear-positive pulmonary TB (PTB) may result in infection. In a recent systematic review, the estimated prevalence of active TB in contacts was 3.1%, while the prevalence of microbiologically confirmed TB was 1.2%.⁵

TB is related to a number of demographic and socio-economic factors, such as poverty, malnutrition, unemployment and economic migration.⁶ Economic migrants are also often from areas with higher TB prevalence, and in their country of adoption they frequently live in precarious residential and socio-economic conditions. In 2015, 46% of the TB cases in Catalonia occurred in immigrants, and the proportion of such cases in nearly all of Catalonia's health regions exceeds 40%.⁴

The current epidemiological TB situation in Catalonia requires new, effective strategies to increase the diagnosis of TB disease as well as the treatment of latent tuberculous infection (LTBI) in people most at risk of developing the disease, including those in contact with active TB cases.⁷

Conventional contact investigations carried out systematically among people in close contact with active TB patients are one of the most effective public health activities for controlling TB, as they allow the detection and treatment of TB and LTBI, thus severing the chain of transmission.⁸ However, the number of such studies among the most vulnerable groups, and particularly among immigrant populations, are limited due to a variety of factors, such as language barriers, irregular legal status, lack of access to the health care system, increased geographic mobility and socio-cultural differences in conceptions about the disease. These factors, taken together, hinder proper follow-up by conventional health care services in these vulnerable populations.

Since 2008, as part of the TB prevention and control activities carried out by the Catalan Public Health Agency (Barcelona, Spain), the Public and Community Health team (*equipo de Salud Pública y Comunitaria*, eS-PiC) of the Drassanes International Health Unit, Vall d'Hebron (*Unidad de Salud Internacional Drassanes - Vall d'Hebron*), of the Catalan Healthcare Institute, which includes health care professionals and community health workers from different cultures, has been involved in epidemiological surveillance to develop a community-oriented programme. The three teams of the epidemiological surveillance service involved in the Barcelona Healthcare Region programme assess

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the need for the eSPiC to intervene based on the characteristics of and any difficulties faced by the patient; and make the appropriate referrals to a nurse coordinator, who assigns a community health care worker (CHW) to each case based on his/her place of origin, culture and other needs. The intervention includes tracing and following up TB cases who were considered lost to follow-up or who had difficulties following treatment, and actively searching for contacts.

The goal of the present study was to describe the results of this community-oriented programme and to identify the most successful methods of tracing and investigating contacts of referred PTB cases by analysing the final outcomes of the interventions.

STUDY POPULATION AND METHODS

Study setting

The reports delivered to the eSPiC by the three epidemiological surveillance services during the period from 2012 to 2014, as well as those issued by the CHWs, were reviewed retrospectively.

Study design

A descriptive analysis of TB cases and their contacts was carried out by categorising them based on their country of origin into four different regions—Eastern Europe, North Africa, sub-Saharan Africa and South-East Asia—in accordance with the geographical zones defined by the Catalanian Epidemiological Surveillance Service. Definitions issued by these services were used to define TB cases and their contacts.

All referred PTB patients who had been declared lost to follow-up, and/or those who were having difficulties in following treatment and requiring contact investigations, were included in the study. These reports provided demographic information and all the TB patients' relevant clinical, microbiological, diagnostic and treatment information, as well as the reasons for their referral to the eSPiC.

Once a case had been referred, the CHWs applied a pre-defined community intervention algorithm coordinated by a nurse from the eSPiC team jointly with another epidemiological surveillance service to trace and/or carry out follow-up investigations and identify contacts (Figure), and provided a description of the contacts identified (sex, age, country of origin, possible place of infection and bacille Calmette-Guérin [BCG] vaccination status). Methods used to locate the cases and any identified contacts (mediation, telephone calls made and received, informal meetings, health care clinic visits, on-the-spot visits, group activities for health care education) were also recorded. Both cases and their contacts were referred to the appropriate health care centre for testing and follow-up.

The final results of the community actions were assessed based on treatment completion in index cases and secondary TB cases among contacts, and completion of isoniazid preventive therapy (IPT) in contacts with LTBI.

Ethics approval

Ethical approval was not required for this retrospective study.

Statistical analysis

Quantitative variables are described as median and interquartile ranges, and qualitative variables in percentages. Statistical analyses were carried out using SPSS v 18 (Statistical Package for the Social Sciences; IBM Corp, Armonk, NY, USA).

RESULTS

A total of 438 individuals were contacted during the study period: 122 were referred TB cases and 316 were identified contacts. The characteristics of the TB cases are given in Table 1. Of the 122 participants, the majority were males (67.2%), with a median age of 33 years (range 1–72 years). A high proportion of cases (9.8%) were aged <17 years, particularly in the population from North Africa (17.8%). Most cases were from Morocco (36.1%) and Pakistan (18.9%), and were referred to the eSPiC mainly due to the language barrier (38.5%) and difficulties in tracing contacts (27.1%). Language difficulties were more significant in the South-East Asian group (60.5%). Identified cases were referred to or helped to access the appropriate health care centre; 89 (73%) of these were successfully treated, with a treatment completion outcome.

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FIGURE Algorithm of community interventions implemented. SVE = Servei de Vigilància Epidemiològica (Epidemiological Surveillance Department); eSPiC = equipo de Salud Pública y Comunitaria. (Public and Community Health team of the Drassanes International Health – Vall D'Hebron)

TABLE 1 Characteristics of pulmonary tuberculosis cases based on WHO region of origin

	Eastern Europe <i>n</i> (%)	North Africa <i>n</i> (%)	Sub-Saharan Africa <i>n</i> (%)	South-East Asia <i>n</i> (%)	Total <i>n</i> (%)
Sex					
Female	10 (52.6)	18 (40.0)	2 (10.0)	10 (26.3)	40 (32.8)
Male	9 (47.4)	27 (60.0)	18 (90.0)	28 (73.7)	82 (67.2)
Age, years					
<17	1 (5.3)	8 (17.8)	1 (5.0)	2 (5.3)	12 (9.8)
17–30	6 (31.6)	17 (37.8)	4 (20.0)	10 (26.3)	37 (30.3)
31–45	8 (42.0)	12 (26.7)	13 (65.0)	18 (47.4)	51 (41.8)
>45	3 (15.8)	8 (17.8)	2 (10.0)	5 (13.2)	18 (14.8)
No information	1 (5.3)	0	0	3 (7.9)	4 (3.3)
Country of origin					
Morocco	—	44 (97.8)	—	—	44 (36.1)
Pakistan	—	—	—	23 (60.5)	23 (18.9)
Romania	16 (84.2)	—	—	—	16 (13.1)
India	—	—	—	13 (34.2)	13 (10.7)
The Gambia	—	—	10 (50.0)	—	10 (8.2)
Senegal	—	—	5 (25.0)	—	5 (4.1)
Other	3 (15.8)	1 (2.2)	5 (25.0)	2 (5.3)	11 (8.9)
Reason for referral					
Language difficulties	5 (26.3)	14 (31.1)	5 (25.0)	23 (60.5)	47 (38.5)
Contact study	7 (36.9)	15 (33.3)	9 (45.0)	2 (5.3)	33 (27.1)
Index case lost to follow-up	1 (5.26)	9 (20.0)	0	5 (13.2)	16 (13.1)
Missed medication	2 (10.5)	3 (6.7)	3 (15.0)	1 (2.7)	9 (7.4)
Case lost after diagnosis	2 (10.5)	0	1 (5.0)	4 (10.5)	6 (4.9)
No reason given	0	1 (2.2)	0	0	1 (0.8)
Other reasons	2 (10.5)	3 (6.7)	2 (10.0)	3 (7.9)	10 (8.2)

WHO = World Health Organization.

TABLE 2 Characteristics of contacts of pulmonary tuberculosis cases based on WHO region of origin

	Eastern Europe <i>n</i> (%)	North Africa <i>n</i> (%)	Sub-Saharan Africa <i>n</i> (%)	South-East Asia <i>n</i> (%)	Total <i>n</i> (%)
Sex					
Female	18 (45)	57 (45.6)	10 (7.8)	6 (27.2)	91 (28.8)
Male	22 (55)	68 (54.4)	119 (92.2)	16 (72.8)	225 (71.2)
Age, years					
<17	12 (30)	37 (29.6)	5 (3.9)	8 (36.4)	62 (19.6)
17–30	14 (35)	34 (27.2)	59 (45.7)	2 (9.1)	109 (34.5)
31–45	8 (20)	30 (24)	52 (40.3)	7 (31.8)	97 (30.7)
>45	5 (12.5)	12 (9.6)	3 (2.3)	12 (54.5)	22 (7)
No information	1 (2.5)	12 (9.6)	10 (7.8)	3 (13.6)	26 (8.2)
Place of exposure					
Home (>6 h)	10 (25)	73 (58.4)	21 (16.3)	16 (72.7)	120 (38)
Home (<6 h)	22 (55)	46 (36.8)	22 (17.1)	4 (18.2)	94 (29.7)
Recreational areas	3 (7.5)	0	30 (23.3)	1 (4.5)	34 (10.8)
Work	0	1 (0.8)	0	1 (4.5)	2 (0.6)
Unknown/NA	5 (12.5)	5 (4)	56 (43.4)	0	66 (20.9)
Non-immigrant contacts					
Yes	3 (7.5)	2 (1.6)	0	0	5 (1.6)
No	37 (92.5)	122 (98.4)	129 (100)	22 (100)	311 (98.4)
Previous BCG vaccination					
Yes	1 (2.5)	25 (20)	77 (59.7)	1 (4.5)	106 (33.5)
No	12 (30)	17 (13.6)	0	2 (9.1)	31 (9.8)
Unknown	27 (67.5)	83 (66.4)	52 (40.3)	19 (86.4)	179 (56.6)
Total	40 (100)	125 (100)	129 (100)	22 (100)	316 (100)

WHO = World Health Organization; NA = not available; BCG = bacille Calmette-Guérin.

TABLE 3 Community strategies for the detection/tracing of tuberculosis contacts based on region of origin

	Eastern Europe		North Africa		Sub-Saharan Africa		South-East Asia		Total	
	<i>n</i>	Average (range)	<i>n</i>	Average (range)	<i>n</i>	Average (range)	<i>n</i>	Average (range)	<i>n</i>	Average (range)
Contacts per case	40	2.1 (1–10)	125	2.8 (1–76)	129	6.4 (8–40)	22	1.7 (1–10)	316	2.6 (1–76)
Calls made	132	6.9 (1–22)	211	4.7 (0–12)	259	12.9 (0–50)	1094	29.6 (0–135)	1696	14.0 (0–135)
Calls received	0	0 (0–0)	1	0 (0–1)	66	3.3 (0–20)	139	1.2 (0–32)	206	1.7 (0–32)
Mediation	22	1.2 (0–5)	2	0 (0–1)	11	0.6 (0–7)	14	0.4 (0–9)	49	0.4 (0–9)
On-the-spot visits	17	0.9 (0–3)	3	0 (0–1)	19	1.0 (0–15)	12	0.3 (0–3)	51	0.4 (0–15)
Informal meetings	4	0.2 (0–2)	5	0.1 (0–3)	8	0.4 (0–7)	0	0 (0–0)	17	0.1 (0–7)
Visits to health care centre	8	0.4 (0–2)	2	0 (0–1)	25	1.3 (0–10)	5	0.1 (0–3)	40	0.3 (0–10)
Group workshops	6	0.3 (0–1)	1	0 (0–1)	3	0.2 (0–3)	5	0.1 (0–1)	15	0.1 (0–3)
Attendants	34	5.7 (0–8)	0	0 (0–0)	82	27.3 (0–82)	9	1.8 (0–5)	125	8.3 (0–82)
Total	183	4.6 (0–22)	224	1.8 (0–12)	388	1.5 (0–50)	1264	57.5 (0–135)	2059	6.5 (0–135)

The demographic characteristics of the 316 contacts identified are given in Table 2. Contacts were mostly male (71.2%), with a median age of 27 years (range 1–83 years). The proportion of contacts aged <17 years was high (19.6%), particularly among immigrants from South-East Asia (36.4%). Sex differences were greatest in the sub-Saharan population, where 92.2% were male. Only a very small proportion of contacts (1.6%) were from non-immigrant populations. Contact had occurred mainly at the place of residence (67.7%), and was very infrequent in other locations (11.4%). A history of previous BCG vaccination was present in 33.5% of the contacts, and was highest among those from sub-Saharan Africa (59.7%).

Community approach strategies carried out to detect and trace contacts are described in Table 3. The average number of contacts per patient was 2.6. Cases from North Africa had an average of 2.8 contacts (range 1–76), who were mainly traced via telephone, with an average of 4.7 calls per case (range 0–12). Cases from South-East Asia (India and Pakistan) had an average of 1.7 (range 1–10) contacts and required a very high number of telephone calls (average 29.6, range 0–135) to be traced compared to other groups. Cases from Eastern Europe had on average 2.1 contacts (range 1–10) and required more on-the-spot visits (average 1.0, range 1–15) and informal meetings (average 0.4, range 0–7). The average number of contacts was highest among cases from sub-Saharan Africa (mean 6.4, range 8–40), and they were more willing

to attend group workshops, with an average of 27.3 attendants per workshop (range 0–82).

The final results of the contact investigations performed as part of the community strategy are given in Table 4. Of the 316 contacts traced, contact with an index case was confirmed for 265 (83.9%). Of these, 188 (70.9%) had contact with the TB patient on a daily basis, and it was therefore deemed that they had a high probability of LTBI. In 77 cases (29.1%), as contact with the index case was not daily and occurred outside of the home, no follow-up was carried out. Of the 188 contacts included in the follow-up, 12 (6.4%) were diagnosed with TB, 11 (91.7%) of whom successfully completed treatment. The proportion of secondary TB cases among contacts was highest in the Eastern European population (18.2%).

Fifty-four contacts (28.7%) had LTBI, 43 (79.6%) of whom completed treatment; 109 (58.0%) had neither TB nor LTBI, and only 20 (18.3%) of these completed the chemoprophylaxis prescribed (contacts are treated if the 12-week window-period has not ended since the last exposure). Adherence was particularly low among sub-Saharan African immigrants (5.2%).

DISCUSSION

The sociodemographic profile of the TB cases identified in our study was in line with the general immigrant profile in Catalonia and with the profile of TB cases among immigrants notified to

TABLE 4 Final results of the tracing and investigation of contacts through community strategies

	Eastern Europe <i>n</i> (%)	North Africa <i>n</i> (%)	Sub-Saharan Africa <i>n</i> (%)	South-East Asia <i>n</i> (%)	Total <i>n</i> (%)
Contacts					
Prolonged exposure	11 (31.4)	98 (78.4)	57 (44.2)	18 (81.8)	188 (59.5)
No infection/disease	4 (36.4)	52 (53.1)	36 (63.1)	13 (72.2)	109 (58)
LTBI	2 (18.2)	31 (31.6)	17 (29.8)	4 (22.2)	54 (28.7)
Secondary TB case	2 (18.2)	8 (8.2)	2 (3.5)	0	12 (6.4)
Lost to follow-up	3 (27.3)	7 (7.1)	2 (3.51)	1 (5.6)	13 (6.8)
Sporadic exposure	10 (28.6)	22 (17.6)	42 (32.6)	1 (4.6)	77 (24)
NI exposure	14 (40)	5 (4)	30 (23.3)	3 (13.6)	52 (16.5)
Total	40 (100)	125 (100)	129 (100)	22 (100)	316 (100)
Individuals who completed treatment					
Chemoprophylaxis in non-infected individuals	3 (75)	14 (26.9)	2 (5.6)	1 (7.7)	20 (18.5)
LTBI treatment	1 (50)	25 (80.6)	16 (94.1)	1 (25)	43 (79.6)
Treatment for secondary TB cases	2 (100)	7 (87.5)	2 (100)	—	11 (91.7)
Total	6 (75)	46 (50.5)	20 (36.4)	2 (11.8)	74 (42.3)

NI = not infected; LTBI = latent tuberculous infection; TB = tuberculosis.

the Catalan Public Health Agency (*Agència de Salut Pública de Catalunya*);^{4,9} it can therefore be used to design further surveillance actions.

The community-based strategies were used to identify 438 people who either had active TB or were in contact with individuals with active TB; most cases were referred to the appropriate health care centres. We believe this success was due to the fact that the eSPiC has a team of CHWs from the same countries as the index cases and who were familiar with the characteristics each subgroup; they may therefore have been able to overcome some of the barriers to accessing health care that immigrant populations usually face, including legal issues, lack of information, cultural aspects and perceptions of the disease and its treatment, as well as language and other cultural features.^{10–13}

Our results are in line with reports from previous studies that have highlighted the effectiveness of using CHWs who act not only as translators, but also as cultural mediators and facilitators for TB contact follow-up in areas with high rates of immigration.^{14,15} This method has also been used successfully for other diseases, such as HIV in adolescents, or in other types of health care, such as in primary care or mother and child health care, which suggests that the presence of CHWs within a community focus improves the effectiveness of interventions.^{16–19}

In our study, the language barrier was the main reason for loss to follow-up among cases. Various studies have identified language barriers as the main difficulty in communication, although it is unclear whether or not these barriers are accentuated depending on the language of the country of arrival.^{8,20}

Exposure to TB appears to have occurred mostly in the home. This is important, as it implies a high level of exposure in childhood members of the household and, in overcrowded conditions, increases the risk of transmission. There were wide variations in the numbers of contacts in the various communities; the number of contacts was much higher among immigrants from sub-Saharan Africa than among those from South-East Asia. This figure could be related to different integration and socialisation patterns that would require more detailed follow-up in certain communities.

On the other hand, although a direct relationship between the language barrier and difficulty in tracing contacts is often stressed, the results of the present study suggest that clearly defined strategies adapted to each group are required. As some studies show, even where the researcher is familiar with the language and possible meeting places, such as bars, satisfactory results depend on having a suitable strategy and appropriate personnel for contact investigation and testing.²¹

Within the algorithm of community interventions, we observed that the method used in the sub-Saharan African community required not only a high number of telephone calls to trace contacts, but also home visits and group workshops with contacts to raise awareness and promote TB screening. In this community, homes are often inhabited by groups of friends and acquaintances rather than families, and interventions should be designed to target contacts in the home.²²

In the South-East Asian community, contact searches needed a much higher average number of telephone calls and could only be carried out with an exhaustive knowledge of the various social community networks. This can be explained by the high mobility of individuals in this group, due to changes in both their place of residence and their jobs.²³

Contacts of cases in the North African community were more easily traced than in other groups, probably due to their

greater economic stability and the family life patterns in this community.²⁴

One salient characteristic of contact tracing in the Eastern European community was the use of mediation, particularly for the Roma community, without which the Roma would have been denied access to the health care system.^{25,26}

Finally, it is of note that community interventions resulted in a prevalence of secondary TB cases of 6.4% in our population. Adherence to chemoprophylaxis treatment was generally low, particularly among the sub-Saharan African population, and new actions should be designed to increase adherence rates.

CONCLUSIONS

Intervention strategies among immigrant groups should be adapted to each group's characteristics. A community-based intervention involving both CHWs and the Epidemiological Surveillance Services may be more effective than classic contact tracing systems due to the fact that CHWs and the Surveillance Services are more familiar with the characteristics of the groups under study. Moreover, they allow bonds of mutual trust to be created among the different groups which could prove useful in the future in the development of strategies for good health and the prevention of other diseases.

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Contexte : La lutte contre la tuberculose (TB) requiert l'identification et le traitement appropriés des patients affectés et l'examen de leurs contacts. Ces tâches peuvent néanmoins être entravées dans certains groupes vulnérables d'immigrants en raison de leurs spécificités ethniques et socioculturelles.

Objectif : Analyser les résultats d'un programme communautaire conçu pour localiser les immigrants atteints de TB dont le suivi s'avère difficile.

Schéma : Etude descriptive de tous les cas ayant un diagnostic de TB confirmé référés à l'équipe de santé publique et communautaire dans l'unité de santé internationale Drassanes de Barcelone en 2012–2014 en raison des difficultés à les localiser. A la fois les cas et les contacts

ont été classés en se basant sur leur région Organisation Mondiale de la Santé d'origine. Les caractéristiques sociodémographiques de chaque groupe et les interventions communautaires réalisées pendant leur recherche sont décrites.

Résultats : Ont été détectés 122 cas et 316 contacts. Grâce aux stratégies communautaires, 73% des cas initiaux ont achevé leur traitement, 3,8% des contacts ont eu un diagnostic de TB, dont 91,7% ont été traités correctement ; 17,1% des contacts avaient une infection latente, dont 79,3% ont achevé la chimioprophylaxie.

Conclusions : Les stratégies d'intervention par approche communautaire du suivi et de la lutte contre la TB dans certaines communautés d'immigrants semblent efficaces.

Marco de Referencia: El control de la tuberculosis (TB) requiere identificar y tratar adecuadamente a los pacientes afectados y realizar el seguimiento de sus contactos. Sin embargo, la realización de estas tareas puede ser complicada de llevar a cabo en ciertos colectivos de inmigrantes vulnerables debido a sus peculiaridades étnicas y socioculturales.

Objetivo: Analizar los resultados de un programa comunitario diseñado para realizar el seguimiento de inmigrantes afectados de TB.

Diseño: Estudio descriptivo de todos los casos con diagnóstico confirmado de TB remitidos al equipo de Salud Pública y Salud Comunitaria de la Unidad de Salud Internacional de Drassanes de Barcelona debido a las dificultades para realizar su seguimiento, durante el período 2012–2014. Se describen las características

sociodemográficas tanto de los casos como de los contactos categorizados según su región de origen como intervenciones comunitarias llevadas a cabo durante su seguimiento.

Resultados: Se detectaron 122 casos y 316 contactos. Como resultado de las estrategias comunitarias el 73% de los casos iniciales completaron el tratamiento. Un 3,8% de los contactos fueron diagnosticados de TB, de los cuales el 91,7% fueron tratados correctamente. El 17,1% de los contactos tenían una infección tuberculosa latente, de los cuales el 79,3% completaron la quimioprofilaxis.

Conclusiones: Las estrategias de intervención comunitarias para el seguimiento y control de la TB en ciertos colectivos inmigrantes parecen ser efectivas.