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Retrospective active case finding in Cambodia: An innovative approach to leprosy control in a low-endemic country

Thomas Fürst[a,b,c], Arielle Cavaliero[d], Sambath Lay[e], Chrystel Dayer[f], Saren Chan[f], Ajda Smrekar[f], Visal So[e,f], Tanja Barth-Jaeggi[a,b], Peter Steinmann[a,b,*]

[a] Swiss Tropical and Public Health Institute, Basel, Switzerland
[b] University of Basel, Basel, Switzerland
[c] Imperial College London, London, United Kingdom
[d] Novartis Foundation, Basel, Switzerland
[e] National Leprosy Elimination Programme, Phnom Penh, Cambodia
[f] Campagne Internationale de L'Ordre de Malte Contre la Lèpre (CIOMAL), Geneva, Switzerland and Phnom Penh, Cambodia

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ABSTRACT

Currently, leprosy control relies on the clinical diagnosis of leprosy and the subsequent administration of multidrug therapy (MDT). However, many health workers are not familiar with the cardinal signs of leprosy, particularly in low-endemic settings including Cambodia. In response, a new approach to early diagnosis was developed in the country, namely retrospective active case finding (RACF) through small mobile teams. In the frame of RACF, previously diagnosed leprosy patients are traced and their contacts screened through "drives".

According to the available records, 984 of the 1,463 (67.3%) index patients diagnosed between 2001 and 2010 and registered in the national leprosy database were successfully traced in the period 2012–2015. Migration (8.4%), death (6.7%), operational issues (1.6%) and unidentified other issues (16.0%) were the main reasons for non-traceability. A total of 17,134 contacts of traced index patients (average: 2.2 household members and 15.2 neighbors) and another 7,469 contacts of the untraced index patients could be screened. Among them, 264 new leprosy patients were diagnosed. In the same period, 1,097 patients were diagnosed through the routine passive case detection system. No change was observed in the relation between the rate at which new patients were identified and the number of years since the diagnosis of the index patient. Similar to leprosy patients diagnosed through passive case detection, the leprosy patients detected through RACF were predominantly adult males. However, the fraction of PB leprosy patients was higher among the patients diagnosed through RACF, suggesting relatively earlier diagnosis.

It appears that RACF is a feasible option and effective in detecting new leprosy patients among contacts of previously registered patients. However, a well-maintained national leprosy database is essential for successful contact tracing. Hence, passive case detection in the frame of routine leprosy surveillance is a precondition for efficient RACF as the two systems are mutually enhancing. Together, the two approaches may offer an interesting option for countries with low numbers of leprosy patients but evidence of ongoing transmission. The impact on leprosy transmission could be further increased by the administration of single dose rifampicin as post-exposure prophylaxis to eligible contacts.

1. Introduction

To date, no biomedical tests are available to easily and reliably diagnose subclinical *Mycobacterium leprae* infections and leprosy disease (Roset Bahmanyar et al., 2016). Likewise, efficacious vaccines specifically targeting *M. leprae* remain elusive (Steinmann et al., 2017). As a consequence, leprosy control largely depends on the recognition of the cardinal signs of leprosy disease by a health worker, followed by administration of multidrug therapy (MDT) (Smith et al., 2017). Early diagnosis is important for two main reasons: to reduce the risk that the patient develops irreversible disability, and to shorten the time the patient can contribute to the transmission of the infection (Smith et al., 2014; Smith and Aerts, 2014, 2015). As a relatively rare disease with initially inconspicuous and painless symptoms that can easily be mistaken for other dermatological conditions, health workers often lack experience to recognize the cardinal signs of leprosy. Further, patients

* Corresponding author at: Swiss Tropical and Public Health Institute, Socinstrasse 57, P.O. Box, CH-4002 Basel, Switzerland.
E-mail address: peter.steinmann@unibas.ch (P. Steinmann).

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tend to overlook symptoms and do not seek medical attention at an early stage. Consequently, leprosy is often ignored or diagnosed late, and a considerable proportion of newly detected leprosy patients suffer from severe morbidity (Anonymous, 2015).

To shorten the delay between the onset of leprosy disease and diagnosis, contribute to the training of the health workforce, and raise awareness among the public; mass campaigns and targeted group screenings are conducted in many leprosy-endemic countries (Schreuder et al., 2002). Typically, such activities focus on high-incidence communities, but they can also have more general reach. Further, they usually focus on the contacts of newly diagnosed leprosy patients since prolonged contact with an untreated leprosy patient is one of the key risk factors for developing leprosy disease (Moet et al., 2004; Moet et al., 2006). Contacts are usually categorized as household members, neighbors and social contacts such as class mates and co-workers. Close contact for more than 20 h per week and over several weeks has been recognized as the main threshold for increased risk of leprosy disease among contacts (Smith and Aerts, 2014). The contact definition applied in a specific programme depends on the local level of stigma, resources and operational feasibility.

In 1998, Cambodia reached the WHO-defined threshold of leprosy elimination, namely < 1 case per 10,000 population (CENAT – National Center for Tuberculosis and Leprosy, 2005). Unfortunately, this achievement has resulted in a diversion of attention to other public health issues. Human and material resources dedicated to leprosy control have consequently diminished, along with public interest in the disease and internal and external financial support to leprosy control. However, over one hundred new leprosy patients continue to be diagnosed in the country every year through passive case detection (2016: n = 154 (Anonymous, 2017)), and there is evidence for both, ongoing transmission (i.e. pediatric patients) and considerable delay until diagnosis (i.e. grade II disability) (Anonymous, 2015). Contrary to other countries, in Cambodia the contacts of newly diagnosed leprosy patients are not routinely traced and screened for signs of leprosy. In response, a unique approach to leprosy control has been developed in Cambodia, building on the concept of retrospective active case finding (RACF) that had been developed in the frame of tuberculosis control (Morishita et al., 2016).

In this article, we summarize the Cambodian experience with RACF to amplify the efforts for leprosy control in the country. We report on the feasibility and effectiveness of RACF as compared to the routine activities and summarize first findings. Last, we discuss future perspectives and integration with other innovative approaches for leprosy control. A special focus is on the coverage achieved with this approach, the optimal time span from diagnosis of the index patient until contact tracing and screening, and on the characteristics of the leprosy patients diagnosed through RACF as compared to those diagnosed through routine program activities.

2. Materials and methods

2.1. RACF and its implementation in Cambodia

The RACF project was jointly developed by the Cambodian National Leprosy Elimination Programme (NLEP), the Campagne Internationale de L'Ordre de Malte contre la Lèpre (CIOMAL) and Novartis Foundation. An inclusive contact definition was used that covered all household members and neighbors living within a radius of about 200 m around an index patient diagnosed in the country between 2001 and the onset of the program in 2011. The national database of leprosy patients in the country provided the starting point to trace index patients. The list was completed based on local records since the national list apparently was incomplete and address details for the index patients were sometimes missing. The tracing of the index patient and the screening of their contacts for signs of leprosy disease was then implemented by a mobile team in the frame of "drives" that systematically covered all 78 operational districts (OD) of the country until all ODs had been visited at least once; a goal achieved in 2015. The scheduling of the drives took the rainy season (ca. July-October) into account as periodic flooding compromises access to some areas. The mobile team included experienced leprologists from NLEP and CIOMAL, province- and district-level leprosy control staff, and local health care personnel. In parallel, routine leprosy control activities, namely passive case detection, continued throughout the country.

The final drive protocol was developed based on the experience gained through three initial drives during which the contacts of 1,818 index patients in 25 ODs had been screened and 277 new leprosy patients had been diagnosed. Similarly, the documentation of the drive activities evolved over time. Standardized documentation is available from drive 4 onwards.

In brief, field activities included a theatre play to raise awareness for leprosy in general and for the RACF mission in particular. The following day, index patients were visited and re-examined to confirm their leprosy status. Then, the household members of the index patient were screened for signs of leprosy disease, followed by the neighbors. Possible new leprosy patients identified through the screening process were examined by an experienced leprologist and diagnosis confirmed on the day of the drive. For newly detected patients, MDT was initiated immediately. Drive documentation focused on the newly diagnosed leprosy patients and on the household contacts for which individual demographic data were collected. From neighbor contacts without any signs of leprosy disease, only summary data were obtained (e.g. number of contacts screened).

2.2. Data analysis

Following the completion of the first phase of the RACF project, namely once all ODs had been visited at least once, all drive data were entered into a single database. Available data from the RACF drives included the general reports from the project build-up phase (drives 1–3) and detailed data from the fully operational phase (drives 4–11). However, as the procedures and reporting were designed, tested and continuously revised during the build-up phase of the RACF project, and no individual data were collected during the build-up phase, only data from drives 4–11 were considered in the current analysis. Also excluded from the more detailed analysis was both data on patients not initially included in the national leprosy database and data on their respective contacts. To compare the performance of RACF with routine activities, annual data from the national leprosy control programme were obtained from NLEP for the years 2001–2015. All data were stored in Microsoft Excel 2010 (Microsoft Corporation, Redmond, Washington, United States of America); data management and analysis was done in Stata version 14 (Stata Corporation, College Station, Texas, United States of America).

Descriptive statistics was used to summarize key RACF and NLEP data with the aim to investigate the feasibility of RACF, describe the main characteristics of the index patients and newly detected leprosy patients among their contacts, and evaluate the effectiveness of RACF as compared to the routine activities in Cambodia. The feasibility of RACF was assessed through (i) the percentage of index patients that had been traced successfully; (ii) the number of household members and neighbors that were successfully screened, stratified by the presence or absence of the index patient on the screening day; (iii) the number of new leprosy patients detected among the contacts, stratified by household and neighbor contacts; and (iv) the fraction of new leprosy patients among contacts in relation to the number of years since the diagnosis of the index patient.

Standard demographic and leprosy-specific variables were used to characterize the index patients and newly detected leprosy patients among their contacts: sex (male/female), age group (≤15 years and > 15 years of age), disability grade (DG) 0, I or II, and leprosy type (paucibacillary (PB)/multibacillary (MB)).