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Characteristics of known leprosy contact in a high endemic area in Brazil

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Summary

Background and purpose: The annual number of new cases of leprosy has not declined in Brazil over the last 15 years, indicating that transmission continues at the same level. To study transmission, we interviewed leprosy patients about their known leprosy contact (KLC).

Methods: Clinical and demographic data were collected from 506 leprosy patients in four health units in the Metropolitan Region of Vitória, State of Espírito Santo, Brazil. SPSS 9·0 was used as a database and analysis.

Results: Two hundred and twenty-six (44·7%) of 506 leprosy patients reported KLC, 136 (60·2%) of 226 were parents. Among 226, the mean of KLC was 1·89 (SD ± 1·65), and 61·3% had one KLC. KLC as a household contact was reported by 92 (40·7%) out of 226, and 121 (53·5%) had no household contact. KLC were most frequently sisters and brothers in the PB cases, and sons/daughters in MB cases. Mothers occurred more frequently as a KLC than fathers. From the leprosy patients that had reported household contacts, 73% said that at the onset of their skin lesions, the KLCs were either undergoing were not yet released from treatment (RFT), and 23·45% had not begun the treatment yet. Altogether, 62·3% of 226 cases had daily contact with the KLC.

Conclusion: In Brazil, household contacts, including the family members (mothers, sisters and brothers), as well as the social contact need to be investigated by the control programs.

Introduction

Aspects of the natural history of leprosy infection remains unclear. Transmission is believed to be airborne with inhalation of mycobacteria and spread through nasal and respiratory

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mucosa.[1] Clinical disease in adult life may be due to infection acquired in childhood.[2] Poor understanding of transmission may have contributed to the low effectiveness of control programmes in decreasing the incidence of infection in many endemic countries.[3]

Leprosy patients are not all equally effective in transmitting *Mycobacterium leprae*.[4] Untreated lepromatous leprosy patients are the most infectious; a household contact of a lepromatous patient being the most important risk factor for leprosy.[4,5] The risk of leprosy in household contacts when compared to the general population is 8–10 times for the household of lepromatous cases and 2–4 times for tuberculoid forms.[1] Therefore, other patient characteristics such as sex, age, contact outside the household (e.g. at work) may also be important factors.

Many authors have published on the frequency of known contact in leprosy patients and all information was obtained by the patient recall. In the USA, between 70%[6] and 75%[7]of newly diagnosed cases reported contact with a known case of leprosy. Among 133 leprosy patients interviewed from Vitória in State of Espírito Santo, Brazil, 70% report having a family member with leprosy, only 124 knew their contact, and 58·9% had also reported known contact with an other leprosy patient, whether related or not, as a KLC.[8] In another Brazilian study carried out in Sao Paulo, 27·5% of leprosy cases reported ($n = 40$) contact with another leprosy patient before the development of their own lesions.[9] In Malawi, 30% of leprosy patients recognized household (or dwelling) contact.[10] In Sri Lanka, a 20-year follow-up showed that a second leprosy case is diagnosed in about 20% of households with a leprosy case.[3] The proportion of cases that have a household contact with leprosy is even higher in low prevalence countries: A study conducted in China in order to assess the value of contact examination to case finding in a low endemic situation of leprosy found that 85% (out of 547) of leprosy cases reported contact with another leprosy case of which 90 were a household contact.[11] Social contacts and neighbours of cases, not just household contacts, can have an increased risk of developing leprosy.[4,12]

Brazil has the second biggest number of leprosy cases around the world with almost 50,000 new cases diagnosed in 2003.[13] Information about the primary case is not routinely collected. Determining who was the 'known contact' in leprosy transmission and their role might help defining control policies. We aimed to describe some characteristics of the primary leprosy case (known leprosy case) – a possible source of *M. leprae* infection – for the leprosy patient (index case) and determine the importance of the primary case the transmission.

Materials and methods

Most studies of leprosy transmission start with an index case, treat them as a primary case and search for secondary cases. We chose a different approach: we treated index cases as secondary cases and searched for the known leprosy contact (KLC), a potential source of the infection of the index case. So, we interviewed the index case about their known leprosy contact or KLC. The study was conducted in the Metropolitan Region of Vitória, State of Espírito Santo, Southern Region of Brazil, between June 2003 and August 2004. The State of Espírito Santo has a high prevalence of leprosy.

Cases of leprosy (index cases) were recruited randomly from amongst patients being treated for leprosy in four health units participating in the national Leprosy Control Programme. All leprosy cases (index cases) who had agreed to be studied undertaken the objective of study and were able to answer the questionnaire were included. We accepted the

leprosy diagnosis of the index case made by the physicians of the Leprosy Control Programme (according to WHO recommendations[14]) and the diagnosis of KLC, we accepted the index case information. Information on the operational classification of leprosy of the index cases, multibacillary (MB) or paucibacillary (PB) was collected from the Leprosy Control Programme records.

Index cases were interviewed at the health unit by a team of six (four medical students, one physician and one nurse) and demographic data (age, sex, place of birth and of current residence) was collected using a standard questionnaire. The questionnaire collected information about any leprosy cases with whom the index case had contact before the onset of their own leprosy clinical symptoms. These were called potential known leprosy cases. If an index case had more than one potential KLC, information was collected only for the case with more frequent contact with the index case. Information was collected on age, sex, whether a family member of household contact of the index case, frequency of contact and treatment status. Household contact meaning was a person who lived or had lived with an index case, and the duration had no matter. The data about the age of the KLC was collect from correspondent at the time of diagnosis of leprosy case (index case). The frequency of contact was stratified in eight categories: daily, 3 times a week, twice a week, twice a month, monthly, less than once a month, once a year and less than once a year.

For statistical analysis, chi-squared test was used to determine the significance of differences between categorized data and of trends and for numerical data we used *t*-test. A *P*-value of $<0{\cdot}05$ was considered to be statistically significant. Each analysis was carried out using commercial statistical software, SPSS version 9·0 for Windows.

Ethical approval was granted by Ethical Committee in Research of the Biomedical Centre from the Federal University of Espírito Santo, Vitória, Brazil. Informed verbal consent was sought after patients had been given a general explanation about leprosy and the research topic.

Results

Of the 506 index patients were interviewed, 217 (42·9%) were women and 289 (57·1%) were men. Nineteen patients (3·8%) were younger than 15 years old, 192 (37·9%) were aged between 15 and 40, 204 (40·3%) were aged between 41 and 60 and 91 (18%) were more than 60 years old. Three hundred and forty (67·2%) were MB and 166 (32·8%) were PB leprosy. Of 506 index cases, 226 (44·7%) had at least one KLC and 280 (55·3%) had none. Among the 226 index leprosy patients with a KLC, 88 (39%) were PB and 138 (61%) were MB. The mean of number of KLCs per patient was 1·89 (SD $\pm$ 1·65), ranging from 1 to 10. Out of 226 patients with at least one KLC, 138 (61·3%) patients had one KLC, 81 (36%) had from two to five KLCs and six (2·7%) had 6–10 KLCs.

Table 1 shows some features of KLCs and their contacts separately for MB and PB classification. The mean age of KLCs was 42·5 years at the time of the index cases diagnosis. KLCs were relatives of the index case in 136 (60·2%) out of 226 leprosy patients. One hundred and ten (48·6%) of the KLCs were women and 116 (51·4%) were men. Among the 136 patients with relatives as a KLC, 42 (30·9%) were sisters/brothers, 29 (21·3%) were sons/daughters, 27 (19·8%) were mothers, 13 (9·6%) were fathers and 25 (18·4%) were other family members.

Table 1. Frequency of known leprosy contacts, their characteristics according to the index case classification

	Leprosy classification of index cases			
	MB (%)	PB (%)	Total (%)	*P*-value
KLC				
Yes	138 (40·6)	88 (53)	226 (44·7)	0·008
No	202 (59·4)	78 (47)	280 (55·3)	
Total	340 (100)	166 (100)	506 (100)	
KLC as a relative				
Yes	81 (58·7)	55 (62·5)	136 (60·2)	0·64
No	57 (41·3)	33 (37·5)	90 (39·8)	
Total	138 (100)	88 (100)	226 (100)	
Sex of the KLC				
Female	63 (45·6)	47 (53·4)	110 (48·6)	0·3
Male	75 (54·4)	41 (46·6)	116 (51·4)	
Total	138 (100)	88 (100)	226 (100)	
KLC is a family member contact				
Mother	16 (19·7)	11 (20)	27 (19·8)	0·157
Father	9 (11·1)	4 (7·3)	13 (9·6)	
Brother/sister	20 (24·7)	22 (40)	42 (30·9)	
Son/daughter	22 (27·2)	7 (12·7)	29 (21·3)	
Grandmother/grandfather	3 (3·7)	5 (9·1)	8 (5·9)	
Cousin/aunt/Uncle	11 (13·6)	6 (10·9)	17 (12·5)	
Total	81 (100)	55 (100)	136 (100)	

Key: KLC = known leprosy contact; MB = multibacillary; PB = paucibacillary.

Table 2 shows that 92 (40·7%) out of 226 patients had a household contact. This was statistically significantly higher in PB cases than in MB cases. Furthermore, 218 out of 226 leprosy patients knew whether their KLCs were receiving treatment or had been released from treatment at the time of contact: in 111 cases (49·11%) their KLCs were not released from treatment, in 54 (23·9%) they had been released from treatment and in 53 (23·45%) the KLCs had not yet started multidrug therapy for leprosy (MDT). There was a significant difference between PB and MB index cases.

Table 2. Household and no household among the KLC, between MB and PB classification

	Leprosy classification		
KLC	MB	PB	Total
Household	54 (39·1)	38 (43·2)	92 (40·7)
No household	75 (54·3)	46 (52·3)	121 (53·55)
Missing	09 (6·5)	04 (4·5)	13 (5·75)
Total	138 (100)	88 (100)	226 (100)
KLC no RFT*	63 (45·65)	48 (54·54)	111 (49·11)
KLC RFT	32 (23·2)	22 (25)	54 (23·9)
Had not received MDT[#]	41 (29·71)	12 (13·64)	53 (23·45)
Missing	02 (1·44)	06 (6·82)	08 (3·54)
Total	138 (100)	88 (100)	226 (100)

Key: KLC = known leprosy contact; RFT = release from treatment; MB = multibacillary; PB = paucibacillary.

*$P = 0{\cdot}02$; [#]$P = 0{\cdot}01$.

Table 3 shows the frequency of contact between the index case and KLC at the time of the leprosy diagnosis; daily contact having occurred in 141 (62·3%) out of 226 index cases ($P > 0{\cdot}05$).

Discussion

Data were collected in our study by patient interviews after diagnosis and therefore is vulnerable to some recall bias, although all those interviewed were leprosy cases. We can only report on contacts known to have had leprosy: some people had primary cases whose disease was diagnosed or the diagnosed not made public, therefore the number of contacts is likely to be an underestimate. In addition, information about the primary case was obtained from the index case. The operational classification of the KLC was not collected, because in the most of the cases these data are not available in those health units. Finally, we do not know when *Mycobacterium leprae* transmission occurred, since leprosy has a long incubation period. We did not investigate genetic factors, not even the genetic relative risk ratio for leprosy as done in Karonga, Malawi, a study that suggested that host genes play a small but significant role.[15]

The only other study looking at KLCs was conducted in China[11] and found 46% of 547 newly diagnosed leprosy patients referred contact with known leprosy cases; of these, 36% were a household contact (16% of all cases). Others studies also found a role for known contacts outside the household. In a population study from five Indonesian islands with high levels of leprosy, household contacts and neighbours of patients who were seropositive for PGL-1 antibodies were more likely to harbour antibodies against *M. leprae*.[12] In addition, Smith *et al*.,[16] commenting on findings in India where most new patients do not report a history of contact, points out the importance of understanding the nature of the exposure, the pattern of responses, and the possibility of other reservoirs of infection. In our study, only 24% of the leprosy patients (index cases) with a KLC reported that the KLC had symptoms but had not been diagnosed at the onset of the index case symptoms. These numbers demonstrate how delay in diagnosis and treatment is an important factor in transmission and how this keeps leprosy a difficult disease to eliminate. In these cases, it seems that the index

Table 3. Frequency of contact between leprosy patients and known leprosy contact

	Leprosy classification		
Contact frequency	MB (%)	PB (%)	Total (%)
Daily	86 (62·3)	55 (62·5)	141 (62·3)
3/week	14 (10·2)	7 (8)	21 (9·3)
2/week	8 (5·8)	6 (6·8)	14 (6·2)
2/month	6 (4·3)	5 (5·7)	11 (4·9)
Monthly	9 (6·5)	5 (5·7)	14 (6·2)
Less than 1/month	10 (7·3)	4 (4·5)	14 (6·2)
1/year	3 (2·2)	2 (2·3)	5 (2·2)
Less than 1/year	2 (1·4)	4 (4·5)	6 (2·7)
Total	138 (100)	88 (100)	226 (100)

Key: KLC = known leprosy contact; MB = multibacillary; PB = paucibacillary.

cases had developed leprosy after their KLC cited by them, but in such a situation it is difficult to distinguish between who was the index case and who was the KLC. The eradication programme has not been successful in decreasing leprosy incidence, despite treatment and high cure rates: understanding transmission therefore became key. To interrupt transmission we need to eliminate or remove the reservoir, eliminate the agent in the reservoir, and protect those who are susceptible.[17] Close proximity with the KLC is clearly a important factor in leprosy transmission.

Segregation of MB cases (used in the past in Norway, Japan and Brazil), would not be acceptable today, and so understanding the natural history of leprosy becomes essential. In this study setting, transmission is mainly from case to case, from known contacts in the household (between parent/child or siblings) or outside the household. Examination of contacts by the control programme should not be restricted to household contacts, as other contacts generate a proportion of all new cases. Some have argued for prophylactic therapy in family or other close contacts of leprosy patients,[18] although this may not be effective.[19] Even if prophylaxis is not shown to be effective, systematic examination, follow-up and control of all contacts, not only household contacts, should be implemented.

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