ORIGINAL ARTICLE

Diagnosis of the leprosy laboratory care network in Regional Health Department XV, São José do Rio Preto, São Paulo, Brazil*

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Abstract

Objetivo: To present the situational diagnosis of the leprosy laboratory reference network in the region of São José do Rio Preto, SP, Brazil. **Methods:** This was an evaluation study with a descriptive design. The data were collected by means of an online form filled in by those in charge of the leprosy program in 2018. **Results:** All 102 municipalities that make up the region provided the requested data, 82.4% (84/102) requested slit-skin smear microscopy and of these 68 received training. Of the total, 11.7% sent slit-skin smears to other laboratories outside the reference network. Only 57.8% (59/102) requested a biopsy, of these 47 had a doctor responsible for taking the biopsy sample and 31 did not send biopsy samples for analysis in the reference network. Lack of an adequate room, few trained professionals, absence of material for transportation and absence of printed test requisitions were described as aspects that hinder leprosy case diagnosis in the region. **Conclusion:** The laboratory network is fragile and needs to be restructured.

Keywords: Leprosy; Public Health Laboratory Services; Health Services Research; Public Health; Health Management.

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Introduction

Leprosy is caused by *Mycobacterium leprae* and belongs to the group of neglected tropical diseases.[1] It is a communicable disease which develops slowly, manifests itself through dermatological and neurological signs and symptoms, caused by pathological and immunological processes occurring directly in peripheral nerves.[2,3]

The Ministry of Health defines a leprosy case as being when there are lesion(s) and/or area(s) of skin with changes in heat sensitivity and/or pain sensitivity and/or touch sensitivity; or thickening of the peripheral nerve, associated with sensitivity and/or motor and/or autonomic changes; or presence of *M. leprae* bacillus in slit-skin smears or skin biopsies.[4]

> *Health workers lack information about the network of laboratories in their catchment area equipped to provide suspected and confirmed leprosy cases with quality tests and/or refer the respective samples to a reference laboratory.*

Slit-skin smear microscopy continues to be the only laboratory test required by the Ministry of Health and provided by the Public Health network. It is a quick and low-cost test, has good accuracy for classifying the clinical form of the disease and, therefore, assists with defining the treatment regimen.[5] Biopsy is of great relevance when it is not possible to perform leprosy differential diagnosis using slit-skin smear microscopy, or when clinical procedures do not provide elucidation;[6] biopsy can also be useful for diagnosing the difference between reversal reaction and relapse.[7]

Other laboratory tests, besides biopsy and slit-skin smear microscopy, contribute to differentiating leprosy from other diseases with similar signs and symptoms. Serological tests (PGL-1) assist with precise diagnosis of the disease and, when associated with clinical analysis, assist with the decision as to the most adequate form of treatment, avoiding possible cases of treatment failure, drug resistance and/or reinfection. New leprosy diagnosis methods, in the areas of Molecular Biology and Genetics, are being studied and tested; however, possibly because they cost more and require specialized technical staff, these tests are not available in public health services - except for some of them in a few reference centers.[8]

Health workers on the front line of health care, whether in primary health care centers or in reference centers, apart from high staff turnover, lack information about the network of laboratories in their catchment area equipped to provide suspected and confirmed leprosy cases with quality tests and/or refer the respective samples to a reference laboratory.

The objectives of this study were to present the situational diagnosis of the leprosy laboratory network in the area covered by the São José do Rio Preto Regional Health Department in São Paulo State, Brazil, and to propose the updating of a laboratory test sample collection and sending flow from municipal leprosy care services to the reference laboratory.

Methods

This is a health service evaluation study with a descriptive design, based on situational investigation of the São José do Rio Preto Regional Health Department (RHD XV) care network for people suspected or confirmed as having leprosy.

RHD XV is one of 17 regional health departments of São Paulo State and is comprised of Epidemiological Surveillance Group 29 – São José do Rio Preto (ESG-29) – and Epidemiological Surveillance Group 30 – Jales (ESG-30) –, which cover 67 and 35 municipalities, respectively, with a total population of 1,557,237 inhabitants in 2018.

The leprosy program is one of the programs developed by the municipalities belonging to ESG-29 and ESG-30. Between 2010 and 2018, they treated 885 and 675 people with leprosy, respectively.

The leprosy care network, defined in collegiate meetings and put into operation by the 'Alexandre Vranjac' Epidemiological Surveillance Center State Leprosy Control Program, is shown in Figure 1.

The data were collected between January and March 2018, using an online form via the Google Forms application, containing questions about the patient care dynamics and flow at health services, sample collection, storage and transportation, follow-up of diagnosed leprosy cases and training of health workers involved.

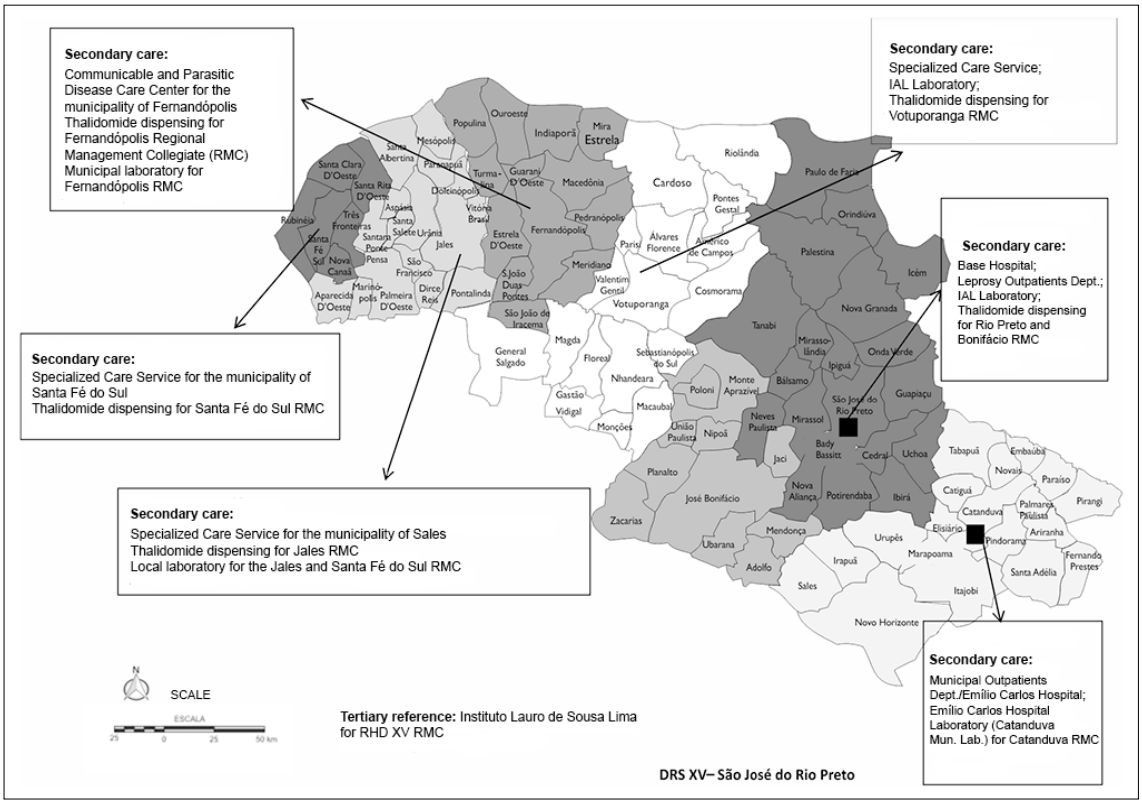

Figure 1 – Map of the leprosy care network in Regional Health Department XV, São José do Rio Preto, São Paulo State, 2018

A message was sent by email containing the link to the form to those in charge of the leprosy program or epidemiological surveillance in each of the 102 municipalities belonging to RHD XV, requesting them to fill it in. The completed form was the study's main source of data. Telephone calls were made to the municipalities that did not fill in the form, emphasizing the importance of their doing so.

The data obtained via the online form were imported to an Excel spreadsheet and, once they had been organized and consolidated, the absolute and relative frequencies and the mean and standard deviation of the variables were analyzed with the aid of the statistical computer program Epi Info, version 7.2.2.

The study project was approved by the Instituto Adolfo Lutz/São Paulo State Health Department Research Ethics Committee: Opinion No. 2.101.044, issued on June 5th 2017. All participants signed a Free and Informed Consent form.

Results

Answers were received from health professionals from all 102 municipalities belonging to RHD XV. The results showed that 17.6% (18/102) of the municipalities did not request slit-skin smear microscopy to confirm results. Among the health professionals from the 84 (82.4%) municipalities that did request slit-skin smear microscopy, 16 replied that they had not had technical training for collecting samples. Of the 59 (57.8%) municipalities with health workers who requested biopsies, 47 had a doctor responsible for collecting the samples which were then sent for analysis in laboratories in the region; 12 requested biopsies but did not have a doctor responsible for this and did not inform where they referred the patient to in order for the sample to be collected (Table 1). The difficulties listed by the municipalities in requesting tests and/or collecting samples are shown in Table 1.

Of the 43 (42,2%) municipalities that did not request biopsies and did not collect samples for biopsies, 25 answered that they referred patients to other health services without respecting the RHD XV leprosy care network; 18 municipalities did not request and/or did not collect material for biopsy (Table 2).

Table 2 shows the distribution of the number of municipalities that followed the protocol for slit-skin smear sample collection sites, form of sending/transport, time between collection and sending and sample packaging.

The data shown in Table 3 reveal that 70.6% (n=72) and 45.1% (n=46) of the municipalities followed the laboratory network defined by RHD XV for slit-skin smear microscopy and for biopsy, respectively. When asked about their knowledge of serological tests (PGL-1), 27 (26.5%) municipalities answered that they knew about the test, while only 2 of them requested it, possibly requesting it to be performed at the Instituto Lauro de Souza Lima tertiary reference service in Bauru, SP. With regard to molecular biology tests (Polymerase Chain Reaction – PCR), only 13 (12.8%) had knowledge of the existence/usefulness/indication of these tests for leprosy; none of the municipality health professionals requested PCR tests.

Regarding the characteristics of care for leprosy cases and their intrahousehold contacts after laboratory tests were performed, 37 made contact by telephone and household visits, 27 only made household visits and 17 only made telephone contact. Three municipalities reported other forms of making contact with case households: personally, at the health center (n=1); by telephone, household visit and medical consultation (n=1); and visit and a reminder letter (n=1).

In 69.6% (71/102) of the municipalities, there was a doctor to provide care and/or follow-up for cases at the health center; in 84.3% (86/102), those in charge carried out dermatology/neurology examinations on intrahousehold contacts; and in 95% (97/102), BCG (Bacillus Calmette-Guérin) vaccine was administered to intrahousehold contacts.

The study produced a poster (Figure 2), which was sent to all the leprosy patient care services for educational purposes and to standardize services provided by the care network, showing the location of municipal and regional reference services, defining the flow for test referrals to be provided at health centers and standardizing the main procedures for sending samples for laboratory testing.

Table 1 – Laboratory tests requested for leprosy, support material and health worker training in the municipalities belonging to Regional Health Department XV (N=102), São José do Rio Preto, São Paulo State, 2018

Variables	Slit-skin smear microscopy		Biopsy	
	N	%	N	%
Municipalities that requested the test	84	82,4	59	57,8
Municipalities that had material for collecting slit-skin smears and biopsies	83	81,4	–	–
Municipalities that had a staff member trained in collecting slit-skin smears	68	66,7	–	–
Municipalities that had a doctor responsible for collecting biopsy samples	–	–	47	46,1
Difficulties in sending samples or performing test in relation to:				
Transport/driver	20	19,6	4	3,9
Transportation material	3	2,9	–	–
Printed requisition form	3	2,9	–	–
Trained professional	3	2,9	37	36,3
Room suitable for sample collection	–	–	6	5,9
Two or more of the above difficulties	4	3,9	16	15,6
Reported not having difficulties	51	50	21	20,6
Did not answer	18	17,6	18	17,6

Table 2 – Number of municipalities (N=84) that followed the leprosy slit-skin smear sample protocol for collection site, form of sending/transport, time between collection and sending and sample packaging, Regional Health Department XV, São José do Rio Preto, São Paulo State, 2018

Variables	N
Site of skin smear collected	
Earlobe, elbow and lesion	65
Earlobe and elbow	11
Earlobe and lesion	2
Other	6
After material is collected, the slide is fixed (Bunsen burner, lighter or similar)	
Yes	71
No	13
Time elapsed between collecting sample and sending it to the laboratory	
1 - 2 days	81
More than two days	3
Storage	
Slide holder	74
Bench	6
Aluminum foil	2
Carton box	2
Transportation and storage are done using a hard box and slide holder identified with complete patient data and requesting unit	
Yes	82
No	2

Discussion

When delving into the dynamics of collecting, sending and receiving samples and reading and reporting on laboratory tests for leprosy, especially slit-skin smear microscopy and biopsy, the study found a structured laboratory network in the region, although it showed logistic weakness with regard to its effective use and technical up-to-dateness of health professionals.

Laboratory services should be organized in a manner coherent with Brazilian National Health System (SUS) decentralization, hierarchization and regionalization guidelines, so as to provide resolutive capacity to its different levels of care complexity, i.e. primary, secondary and/or tertiary.[9]

Ministry of Health Ordinance GM/MS No. 149, dated February 3rd 2016, provides the regulatory framework for the leprosy Health Care Network and establishes that the control of this endemic disease should be based on early diagnosis, timely treatment of all diagnosed cases, prevention and treatment of disabilities and surveillance of household contacts.[4]

Diseases caused by mycobacteria affect millions of people all over the world. Considering the global prevalence and incidence of leprosy, infectious agent transmission control and prevention objectives and targets are hard to achieve in current times.[10] Besides clinical care, laboratory support is an important aspect of surveillance and diagnosis, serving to confirm and classify cases, monitor treatment and antimicrobial resistance, as well as control of intrahousehold contacts.

In the region we studied, leprosy had reached elimination levels in 2008, with fewer than 10 cases per 100,000 inhabitants being notified.[11] Not with standing, the result achieved requires even more attention, since when a disease begins to have a low number of cases and the care network and health worker expertise tend

Table 3 – Conformity of municipalities when sending slit-skin smear and biopsy samples to test for leprosy, according to reference laboratory, Regional Health Department (RHD) XV, São José do Rio Preto, São Paulo State, 2018

RHD XXV reference laboratories	In conformity with RHD XV network	Not in conformity with RHD XV reference network	Sent to other laboratory not part of RHD XV reference network	Did not request and/or did not reply[a]	Total
	N	N	N	N	N
Slit-skin smear microscopy					
Instituto Adolfo Lutz – IAL	41	–	2	5	48
Emilio Carlos Hospital Laboratory, Catanduva, SP	16	1	–	2	19
CYTOS Laboratory, Fernandópolis, SP	5	2	–	6	13
Jales-SP Laboratory	10	7	–	5	22
Biopsy					
Instituto Adolfo Lutz – IAL	20	3	17	8	48
Emilio Carlos Hospital Laboratory, Catanduva, SP	15	1	–	3	19
CYTOS Laboratory, Fernandópolis, SP	8	–	–	5	13
Jales-SP LaboratorySP	3	2	8	9	22

a) Slit-skin smear and Biopsia:18 (17.6%) municipalities do not perform and/or do not collect; 07 (6.9%) did not inform where they send the biopsy sample to.

to dissipate, diagnosis becomes increasingly late and manifestations of the disease become more serious.

The three key signs for leprosy diagnosis, as per the national guidelines for leprosy control, are (i) area or patch of skin with hypesthesia and/or (ii) changes to nerve function and/or (iii) positive slit-skin smear microscopy.[12] When these three signs are present, diagnostic sensitivity reaches 97%.[8] Clinical dermatological and neurological examination, positive slit-skin smear microscopy and, when possible, confirmatory biopsy, continue to be paramount for defining diagnosis of leprosy.

Slit-skin smear microscopy and biopsy are considered to be straightforward and low-cost tests. This simplicity is evident when compared to the complexity of other sophisticated and high-cost laboratory techniques performed by well-trained staff.[13,14]

In the São José do Rio Preto region, 19% of the municipalities did not have health professionals trained to collect slit-skin smear samples and over 50% did not have a doctor responsible for collecting samples for biopsies. Within this context, the role of municipal, regional, state and federal health service managers takes on special relevance and should be carried out jointly with universities specialized in this theme, in the sense of providing continuing education. Training leaves health professionals more secure to make decisions and conclude leprosy diagnosis.[15,16]

Despite the obligatory presence of a specialist doctor when following-up on diagnosed cases, the study indicated that 59.8% of health centers did not comply with this criterion. It is important to highlight that health teams should be complete and structured so as to provide comprehensive health care to people with leprosy and their household contacts, and, if there is no doctor to provide case follow-up, cases should be referred to the nearest service where the patient can be cared for correctly.

The interviewed health professionals reported making technical mistakes related to slit-skin smear microscopy, such as collecting fewer smears than recommended, not fixing the sample on the slide, inadequate storage and transportation. A study conducted in India proved the efficiency and importance of slit-skin smear microscopy and biopsy test results in conjunction with clinical characteristics, for obtaining conclusive diagnosis of cases.[17] Laboratory tests should follow defined protocols, right from collection of the sample through to the final technical result report.

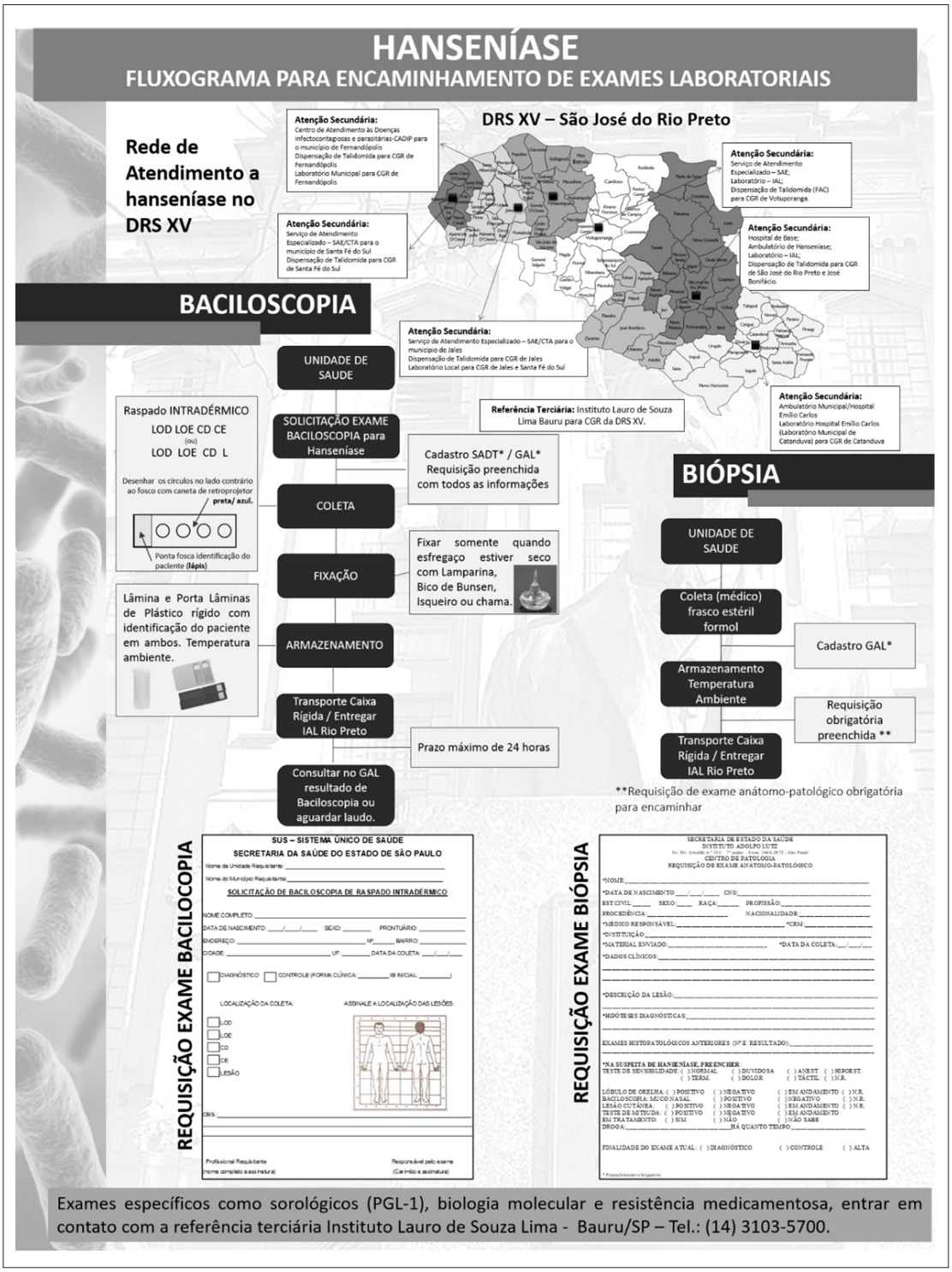

Figure 2 – Poster prepared and sent to all leprosy patient care services, for educational purposes and to standardize services provided by the Regional Health Department XV care network, São José do Rio Preto, São Paulo State, 2018

Performing slit-skin smear microscopy cannot be done in a self-taught manner, and it is essential to facilitate access to a standard operating procedure (SOP), to be used by health professionals to guide their daily practice.[18]

The health professionals interviewed, in each of the municipalities, reported diverse restrictions to collecting slit-skin smears and biopsy samples, such as there being no driver and/or vehicle, no printed requisition form, lack of an adequate room and packaging for transportation, as well as difficulties in sending samples. Leprosy services provided to SUS users, right from Primary Care through to reference services, need to be evaluated frequently with regard to quality standards being maintained.[19] Slit-skin smear microscopy and biopsy, when performed adequately, continue to be important laboratory tests for assisting with diagnosis,[17] as indicated by the World Health Organization (WHO), at least until new tests are incorporated into the SUS care network.[20]

This evaluation of the laboratory network concluded that almost a third of the municipalities did not follow the due criteria for slit-skin smear samples, and over half of them did not follow the criteria for biopsy samples. As such, continuing education, through information provided by epidemiological surveillance groups and even by reference laboratories, so as to keep municipal health service staff up to date, is an essential action to ensure that the care network works well.[21] This study demonstrated that the health professionals interviewed had little knowledge about serological and PCR tests, which is understandable, since they are tests that are not available in the laboratory network, despite being considerably referred to and discussed in the scientific community, according to published studies.

Moreover, diverse studies have highlighted immune response to the leprosy bacillus and use of serological tests to assist with classifying patients in order to define their treatment, treatment monitoring, risk of relapse, as well as for selecting contacts at greater risk of becoming ill.[5, 22, 23] Studies indicate that the association of different techniques can result in more precise diagnosis, especially in more serious cases. Serological tests, such as anti PGL-I, and molecular tests that use specific *M. leprae* genes as their target, have high sensitivity and specificity, and are indicated as important complementary tools for differential diagnosis, classification of leprosy, identification of special cases of medication failure and, for cases with bacterial resistance to recommended medication, clinical and laboratory investigation at reference services.[4,24-26] Although restricted to research, adoption of these tests in the laboratory routine is indicated, principally in low-endemicity regions, given their contribution to epidemiological surveys[24] and to strengthening the patient care network.

As the results presented pointed to difficulties in gathering and sending material for testing, in the attempt to improve care for cases, we prepared educational material in the form of a poster, which was made available to heath centers with the aim of instructing health professionals as to each stage of the laboratory test process. Of a self-explanatory nature and intended for practical consultation, the poster is aimed above all at services that request few tests and also those where there is high staff turnover whereby procedures are not adequately shared with new staff.

The biggest challenges to conducting this study, the aim of which was to understand the real situation of the laboratory care network in the area under the responsibility of Regional Health Department XV, were related to the delays in the questionnaires being filled in and returned by the professionals in the municipalities and, in some cases, absent or inconsistent answers. We suggest that these difficulties may have resulted from lack of knowledge about the subject on the part of some professionals recently taking on responsibility for the leprosy program in their municipality. Consideration must also be given to the urgency of actions in relation to acute diseases and/or diseases that cause epidemics, and the obligation to meet deadlines related to the diverse health care programs and lines of action existing in Brazil.

The establishment of an active and well-designed care network, with well-defined municipal and regional reference services, diversification of laboratory tests to achieve precise diagnosis and effective follow-up of cases, will contribute to the consolidation of the actions to eliminate leprosy in the state of São Paulo.

Authors' contributions

Tolentino-Binhardi FM and Nardi SMT contributed to the study concept and design, analysis and interpretation

of the results, drafting and critically reviewing the contents of the manuscript. Patine FS, Pedro HSP, Montanha JOM, Santi MP, Belotti NCU and Paschoal VDA contributed to the study concept and design, drafting and critically reviewing the contents of the manuscript. All the authors have approved the final version of the manuscript and are responsible for all aspects thereof, including the guarantee of its accuracy and integrity.

References

1. Ferreira IN. A hanseníase no contexto das doenças negligenciadas. In: Alves ED, Ferreira IN, Ferreira TL, organizadores. Hanseníase avanços e desafios [Internet]. Brasília: NESPROM; 2014 [citado 2020 jul 17]. p. 41-3. Disponível em: http://www.morhan.org.br/views/upload/hanseniaseavancoes.pdf
2. Mendonça VA, Costa RD, Brito-Melo GE, Antunes CM, Teixeira AL. Imunologia da hanseníase. An Bras Dermatol [Internet]. 2008 ago [citado 2019 dez 10];83(4):343-50. Disponível em: https://doi.org/10.1590/S0365-05962008000400010
3. Trabulsi LR, Althertum F. Microbiologia. 5. ed. Rio de Janeiro: Atheneu; 2008.
4. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. Diretrizes para vigilância, atenção e eliminação da Hanseníase como problema de saúde pública: manual técnico-operacional [Internet]. Brasília: Ministério da Saúde; 2016 [citado 2019 dez 18]. 58 p. Disponível em: https://portalarquivos2.saude.gov.br/images/pdf/2016/fevereiro/04/diretrizes-eliminacao-hanseniase-4fev16-web.pdf
5. Buhrer-Sékula S. Sorologia PGL-I na hanseníase. Rev Soc Bras Med Trop [Internet]. 2008 [citado 2020 jul 17];41 Supl 2:3-5. Disponível em: https://doi.org/10.1590/S0037-86822008000700002
6. Ura S, Barreto JA. Educação continuada em hanseníase: papel da biópsia cutânea no diagnóstico de hanseníase. Hansen Int [Internet]. 2004 [citado 2019 nov 20];29(2):141-4. Disponível em: http://www.ilsl.br/revista/detalhe_artigo.php?id=10689#
7. Sales AM, Ponce de Leon A, Düppre NC, Hacker MA, Nery JAC, Sarno EN, et al. Leprosy among patient contacts: a multilevel study of risk factors. PLoS Negl Trop Dis [Internet]. 2011 Mar [cited 2020 Jul 17];5(8):e1013. Available from: https://doi.org/10.1371/journal.pntd.0001013
8. Lyon SG, Faria MA. Diagnóstico e tratamento da hanseníase. In: Alves ED, Ferreira TL, Nery I, organizadores. Hanseníase: avanços e desafios [Internet]. Brasília: NESPROM; 2014 [citado 2020 jul 17]. p. 141-69. Disponível em: http://www.morhan.org.br/views/upload/hanseniaseavancoes.pdf
9. Leal DR, Cazarin G, Bezerra LCA, Albuquerque AC, Felisberto E. Programa de Controle da Hanseníase: uma avaliação da implantação no nível distrital. Saúde Debate. 2017 mar [citado 2020 jul 17];41(Esp):209-28. Disponível em: http://dx.doi.org/10.1590/0103-11042017s16
10. Ministerio de Salud Pública y Bienestar Social (Paraguai). Organización Panamericana de la Salud – OPAS. Organización Mundial de sa Salud – OMS. Manual de diagnóstico laboratorial de lepra [Internet]. Paraguai: Ministerio de Salud Pública y Bienestar Social; Programa Nacional de Control de Lepra; 2017 [citado 2020 jul 17]. 30 p. Disponível em: http://docs.bvsalud.org/biblioref/2018/11/963833/7-manual-diagnostico-laboratorial-version-final.pdf
11. Conte ECM, Magalhais LCB, Cury MRCO, Soubhia RMC, Nardi SMT, Paschoal VDA, et al. Situação epidemiológica da hanseníase no município de São José do Rio Preto, SP, Brasil. Arq Ciênc Saúde [Internet]. 2009 out-dez [citado 2020 jul 17];16(4):149-54. Disponível em: http://repositorio-racs.famerp.br/racs_ol/vol-16-4/IDK1_out-dez_2010.pdf
12. Gautam M, Jaiswal A. Forgetting the cardinal signis a cardinal sin: Slit skinsmear. Indian J Paediatr Dermatol [Internet]. 2019; Sep [cited 2020 Jul 17]20(4):341-4. Available from: https://doi.org/10.4103/ijpd.IJPD_74_19
13. Baptista IMFD, Sartori BCS, Trino LM. Guia de conduta para realização do exame baciloscópico. Hansen Int [Internet]. 2006 [citado 2020 jul 17];31(2):39-41. Disponível em: http://www.ilsl.br/revista/detalhe_artigo.php?id=10727
14. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância e Doenças Transmissíveis. Guia prático sobre a hanseníase

[Internet]. Brasília: Ministério da Saúde; 2017 [citado 2020 jul 17]. 68 p. Disponível em: https://portalarquivos2.saude.gov.br/images/pdf/2017/novembro/22/Guia-Pratico-de-Hanseniase-WEB.pdf

15. Moreno CMC, Enders BC, Simpson CA. Avaliação das capacitações de Hanseníase: avaliação das capacitações de Hanseníase: opinião de médicos e enfermeiro opinião de médicos e enfermeiros das equipes de saúde da família os das equipes de saúde da família. Rev Bras Enferm [Internet]. 2008 nov [citado 2020 jul 17];61(n esp):671-5. Disponível em: https://doi.org/10.1590/S0034-71672008000700003

16. Oliveira MPR, Menezes IHCF, Sousa LM, Peixoto MRG. Formação e qualificação de profissionais de saúde: fatores associados à qualidade da atenção primária. Rev Bras Educ Médica [Internet]. 2016 dez [citado 2020 jul 17];40(4):547-59. Disponível em: https://doi.org/10.1590/1981-52712015v40n4e02492014

17. Semwal S, Joshi D, Goel G, Asati D, Kapoor N. Clinico-histological correlation in hansen's disease: three-year experience at a newly established tertiary care center in central India. Indian J Dermatol [Internet]. 2018 Nov-Dec [cited 2020 Jul 17];63(6):465-8. Available from: https://doi.org/10.4103/ijd.ijd_525_17

18. Marcondes FL, Tavares CMM, Santos GS, Silva TN, Silveira PG. Capacitação profissional de enfermagem na atenção primária à saúde: revisão integrativa. Rev Pró-Univer SUS [Internet]. 2015 jul-dez [citado 2020 jul 17];6(3):9-15. Disponível em: http://editora.universidadedevassouras.edu.br/index.php/RPU/article/view/353

19. Mahajan VK. Slit-skin smear in leprosy: lest we forget it! Indian J Lepr [Internet]. 2013 Oct- Dec [cited 2020 Jul 17];85(4):177-83. Available from: https://europepmc.org/article/med/24834639

20. Azevedo MC, Ramuno NM, Fachin LRV, Tassa M, Rosa PS, Belone AFF, et al. qPCR detection of Mycobacterium leprae in biopsies and slit skin smear of different leprosy clinical forms. Braz J Infect Dis [Internet]. 2017 Jan-Feb [cited 2020 Jul 17];21(1):71-8. Available from: https://doi.org/10.1016/j.bjid.2016.09.017

21. Beluci ML, Borgato MHB, Galan NGA. Avaliação de cursos multiprofissionais em hanseníase. Hansen Int [Internet]. 2012 [citado 2020 jul 17];37(2):47-53. Disponível em: http://www.ilsl.br/revista/download.php?id=imageBank/v37n2a06.pdf

22. Amador MPSC, Cunha MHCM, Cruz CAV. Análise imunodiagnóstica do teste anti-PGL-I na diferenciação entre hanseníase clínica e reação hansênica pós-cura. Cad Saúde Colet [Internet]. 2007 jul-set [citado 2020 jul 17];15(3):357-68. Disponível em: http://www.cadernos.iesc.ufrj.br/cadernos/images/csc/2007_3/artigos/CSC_IESC_2007_3_5.pdf

23. Bazan-Furini R, Motta AC, Simão JCL, Tarquínio DC, Marques Jr W, Barbosa MHN, et al. Early detection of leprosy by examination of household contacts, determination of serum anti-PGL-1 antibodies and consanguinity. Mem Inst Oswaldo Cruz [Internet]. 2011 Aug [cited 2020 Jul 17];106(5):536-40. Available from: https://doi.org/10.1590/S0074-02762011000500003

24. Araújo S. Epidemiologia molecular da Hanseníase: sorologia anti PGL-I e PCR em swab nasal de pacientes com hanseníase e contatos domiciliares [dissertação]. Uberlândia (MG): Universidade Federal de Uberlândia; 2012. Disponível em: https://repositorio.ufu.br/handle/123456789/18262

25. Araújo MG. Hanseníase no Brasil. Rev Soc Bras Med Trop [Internet]. 2003 maio-jun [citado 2012 set 19];36(3):373-82. Disponível em: https://doi.org/10.1590/S0037-86822003000300010

26. Barreto JA, Nogueira MES, Diorio SM, Buhrer-Sékula S. Sorologia rápida para hanseníase (teste ML Flow) em pacientes dimorfos classificados como paucibacilares pelo número de lesões cutâneas: uma ferramenta útil. Rev Soc Bras Med Trop [Internet]. 2008 [citado 2020 jul 17];41 Supl 2:45-7. Disponível em: https://doi.org/10.1590/S0037-86822008000700010

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