

# The use of ML Flow test in school children diagnosed with leprosy in the district of Paracatu, Minas Gerais

## Uso do teste ML Flow em escolares diagnosticados com hanseníase no Município de Paracatu, Minas Gerais

Isaias Nery Ferreira<sup>1</sup>, Iris Leda Camargos Silva Nery Ferreira<sup>2</sup>,  
Maria do Socorro Nantua Evangelista<sup>3</sup> and Rosicler Rocha Aiza Alvarez<sup>3</sup>

### ABSTRACT

The detection rate of leprosy in the district of Paracatu is high in the age group under 15 years-old, including about 6.8/10,000 inhabitants in 2003, and classified as hyperendemic. The study aimed to analyze the application of the PGL-1 (ML Flow) serological test in 56 of 68 school-age patients of the public school system, diagnosed with leprosy through active case finding in Paracatu, Minas Gerais State (2004 to 2006), with 71% classified as paucibacillary. Of these, 85.2% lived in urban areas, 55.8% were female and the disease was predominant in the 10 to 14 year-old age group (95%CI: 0.49-0.89;  $\chi^2=7.373$ ), with 15 (26.7%) presenting a positive ML Flow result. Five patients showed grade 1 disabilities in the borderline clinical form (40% ML Flow positive). The percentage of leprosy cases among household contacts was 46.4%, 44.9% presenting positive ML Flow test results. The study suggests incorporating the ML Flow test into the health services, since it assists in the operational classification of the disease and in the control of household contacts with positive test results, aimed at early detection of suspected leprosy cases.

**Key-words:** Leprosy. School children. PGL-1/ML Flow. Paracatu. Minas Gerais.

### RESUMO

A detecção da hanseníase no município de Paracatu é elevada em menores de quinze anos, abrangendo cerca de 6,8/10.000 hab. em 2003 e é classificada como hiperendêmica. O estudo objetiva analisar a aplicação do teste sorológico do PGL-1 (ML Flow) em 56 de 68 pacientes escolares da rede pública, diagnosticados com hanseníase através da busca ativa de casos no município de Paracatu – MG (2004 a 2006), sendo 71%, paucibacilares. Cerca de 85,2% dos pacientes residiam na área urbana, 55,8% eram do sexo feminino e a doença predominava no grupo de 10 a 14 anos (IC95%:0,49-0,89%) e  $\chi^2=7,376$ , sendo que 15 (26,7%) com resultado do ML Flow positivo. Cinco pacientes tinham incapacidades do Grau 1, da forma clínica Dimorfa (40% ML Flow positivo). O percentual de casos de hanseníase entre os contatos intradomiciliares foi de 46,4%, sendo que 44,9% deles com resultado do teste do ML Flow positivo. O estudo sugere incorporar o teste ML Flow nos serviços de saúde, uma vez que o mesmo auxilia na classificação operacional da doença, controle de contatos intradomiciliares com resultado do teste positivo, visando à detecção precoce dos casos suspeitos de hanseníase.

**Palavras-chaves:** Hanseníase. Escolares. PGL-1/ML Flow. Paracatu. Minas Gerais.

In its national program for leprosy elimination, the Ministry of Health recommends the detection and the early treatment of cases with multidrug therapy (MDT), as well as the screening of household contacts<sup>2</sup>. Leprosy diagnosis is essentially clinical<sup>2</sup>; however, other exams can be used as auxiliary or complementary, aimed at greater accuracy<sup>3,4</sup>, since the object of the investigation is detection and early treatment, which has a direct implication on the prevention of disabilities, permitting limitation of foci and, thus, the dissemination of leprosy in the community<sup>2</sup>.

The use of serological tests as auxiliary tools for diagnosis and to control household contacts has been highlighted in the

specialized literature, showing results that encourage their continued use, given the practicality and facility of the test reading<sup>3</sup> and its good acceptance and ease of test handling by health professionals<sup>1,4,7</sup>.

Leprosy in the district of Paracatu is considered a priority due to the high prevalence in the general population, about 13.7/10,000 inhabitants in 2003, and is classified as very high by the Ministry of Health<sup>2</sup>. Another important leprosy indicator was its detection in children in the age group under 15 years-old, at rates of 1.8, 1.3, 1.5, and 6.8/10,000 inhabitants in 2000, 2001, 2002 and 2003 respectively. Hyperendemy in children belonging to this age group in the district of Paracatu was responsible for 56% of the multibacillary forms, 24.0% of leprosy reactions during diagnosis and 22% of high grade disabilities detected, considering all the cases in the program from 1994 to 2001<sup>6</sup>.

The study aimed to analyze the use of the ML Flow/PGL-1 serological test in leprosy cases in adolescents and children in

1. Health National Foundation, Paracatu, Brazil. 2. Franca University, Franca, SP, Brazil. 3. Health Sciences College, Post- graduation department, Brasília University, Brasília, Brazil.

**Address to:** Dr. Isaias Nery Ferreira. Rua Afrânio Salustiano Pereira 303, Bairro Bela Vista, 38.600-000 Paracatu, MG.

Phone: 55 38 3671-4351

e-mail: isaias@unb.com

the district of Paracatu, Minas Gerais, diagnosed by active case finding from 2004 to 2006 in the public school system population and to contribute to improving disease control.

**MATERIAL AND METHODS**

The district of Paracatu is located in the northwest of Minas Gerais State, 220km from the Federal District and 500km from Belo Horizonte, with an economy tied to the agricultural and mining sectors (gold, zinc and calcareous). In 2005, the estimated population was 83,011 inhabitants and the town presented a Human Development Index of 0.760 and a populational increase rate of 1.7% annually. The district has 51 institutions of primary and junior education, including public and private schools. The number of students enrolled in the public education system in Paracatu in 2005 was 21,587 students and 95% of them were sensitized in relation to leprosy. Of this total, 16,623 students in the age group from 1 to 19 years-old spontaneously submitted to the dermato-neurological examination, according to the national protocol, after attending a lecture concerning the signs and symptoms of leprosy during the period from January 2004 to August 2006. Students who were absent on the day the team visited the schools were excluded, as well as those who refused to participate in the study.

The team responsible for the students' examinations belonged to the Sanitary Dermatology Health Center of Paracatu (SDHP) and to the PSF and consisted of a doctor, a biochemist, a physiotherapist, auxiliary nurses and a male nurse. The Paracatu service acts as a regional reference regarding leprosy control. Diagnosis confirmation and treatment followed the national protocol rules, with the addition of the PGL-1/ ML Flow serological test<sup>4</sup>.

An epidemiological study of a descriptive and exploratory nature involving epidemiological, clinical and laboratorial data was conducted.

The analysis variables included ML Flow, sex, residential location, age group, clinical form, disability grade, number of BCG scars and household contacts. Excel software was used to construct the database and perform the nonparametric analysis of the  $\chi^2$  test and confidence interval (95%CI). The study was approved by the Research Ethics Committee of Brasilia University, under protocol number 050/2005.

**RESULTS**

Of the total number of students enrolled in the public school system, 16,623 students were examined (77%), of which 51.5% were female, and of this total, 14,212 students resided in urban areas and 2,411 in the rural zone. The population studied represented approximately 20% of the general population in Paracatu. Sixty eight leprosy cases were identified, of which 57 (83.8%) resided in urban areas (95%CI, 0.3-0.5). In relation to the global results of the serological tests applied in 56 patients,

30 (53.6%) of the students presented grade zero disability, 19 (33.9%), 4 (7.1%), 2 (3.6%) and 1 (1.8%) presented results of +1, +2, +3, and +4, respectively (**Table 1**).

**TABLE 1**

Leprosy case distribution among school children in the district of Paracatu according to the results of ML Flow test.

ML Flow	Number	Percentage	95% CI
0	30	44.1	40.7 – 65.9
1	19	27.9	22.9 – 47.0
2	4	5.9	2.8 – 16.9
3	2	2.9	0.9 – 12.1
4	1	1.6	0.3 – 9.4
Not performed	12	17.6	10.4 – 28.4
Total	68	100.0	-

CI: confidence intervals.

**Table 2** shows that the PGL-1 ML Flow serological test was applied in 56 patients, 23 (41%) male and 33 (59%) female, which, in comparison to the male cases, showed a 95%CI of 37.12-60.6. In relation to the patients' age group, 13 (23.2%) cases belonged to the 5 to 9 year-old age group, 35 (62.5%) cases to the 10 to 14 year-old and 8 (14.3%) patients to the 15 to 19 year-old age group. Comparison of the cases in the age groups from 5 to 9 and from 10 to 14 years-old showed a greater number of leprosy cases occurred in the 10 to 14 year-old age group, a statistically significant difference (95%CI: 0.13-0.35 ) and (95%CI: 0.49-0.89). Between the other age groups, the distribution of cases was similar, with no significant differences. In relation to the clinical form observed among the diagnosed cases, 34 (60.7%) patients presented the indeterminate form of the disease (95%CI: 38.4-61.6), 11 of these were ML Flow positive; 6 (10.7%) cases presented the tuberculoid clinical form, one was ML Flow positive and 16 (28.6%) patients were borderline, with 14 positive for ML Flow. This means that approximately 71% of the cases in the study presented paucibacillary forms of leprosy. One patient (1.8%) was identified with positive bacilloscopy and presented positive for ML Flow (95%CI: 0.26-7.87). In relation to the disability grade at the time of diagnosis, 51 patients presented grade zero disability, 27 (48.2%) with positive ML Flow results and 24 (42.9%) with negative results. Five students presented grade 1 disability, three (5.4%) with negative ML Flow and two (3.6%) positive.

In relation to the number of BCG scars among the patients, 35 (62.5%) presented one scar (95%CI: 39.8-62.9), 16 (28.6%) presented two scars (95%CI: 15.1-34.8) and in two (3.5%) patients, no BCG vaccination was observed (95%CI: 0.8-10.1). At the time of diagnosis, two patients presented leprosy reaction type 1 and in 18 (32.1%) cases, neuritis was observed: the ulnar (41.4%), tibial (30.8%), fibular (10.1%) and radial nerve (6.7%) in descending order of damage.

The patients indicated 26 (46.4%) contacts with household leprosy history: uncles (29%), grandparents (25.5%), siblings (20%), cousins (13.0%) and parents (12.5%). Two (3.5%) patients reported contact with a leprotic neighbor. One hundred

TABLE 2

Leprosy case distribution among public school system students of Paracatu, MG. according to the ML Flow test, sex, clinical form, bacilloscopy, disability grade and bacille Calmette-Guérin scar.

Variables	n <sup>a</sup>	%	ML FLOW	
			positive	negative
Sex	56	100.0		
male			10 (CI:95%= 10.0-29.8)	13 (CI:95%=14.1-35.8)
female			16 (CI:95%=18.4-41.5)	17 (CI:95%=19.9-43.3)
Age group (years-old)	56	100.0		
5-9			5 (CI:95%=3.8-19.2)	8 (CI:95%=7.4-25.7)
10-14			15 (CI:95%=15.5-37.7)	20 (CI:95%=24.5-48.8)
15-19			6 (CI:95%=6.2-23.6)	2 (CI:95%=1.0-12.1)
Clinical form	56	100.0		
indeterminate			11 (CI:95%=11.3-31.8)	23 (CI:95%=29.2-54.1)
tuberculoid			1 (CI:95%=0.3-9.4)	5 (CI:95%=3.9-19.3)
borderline			14 (CI:95%=15.5-37.7)	2 (CI:95%=1.0-12.12)
Disability grade	56	100.0		
grade 0			24 (CI:95%=30.8-55.9)	27 (CI:95%=35.6-60.9)
grade 1			2 (CI:95%=1.0-12.12)	3 (CI:95%=1.8-14.6)

CI: confidence intervals.

and sixty household contacts were examined, an average of 2.8 contact/patient, among which, 69 consented to the ML Flow test with positive results in 31 (44.9%) and negative in 38 (55.1%).

## DISCUSSION

Among the limitations of the study, the lack of existing literature should be highlighted, which makes comparison and analysis difficult. Twelve diagnosed cases in Paracatu and 91 household contacts were not submitted to the ML Flow test due to the lack of kits for the tests in the same reference unit. All the patients diagnosed and their contacts, readily consented to the test, showing its good acceptance. Despite the fact that the ML Flow test is not yet routine in leprosy services, the district participated in a state research in 2003 and 2004<sup>4</sup>. Active case finding was conducted by the Paracatu team among students under 20 years-old with the help of the ML Flow tests, showing an increase of 38.2% in relation to the spontaneous demand of all the patients. This meant a high hidden prevalence that the service possibly would not have reached, making a direct impact in the short, medium and long-term in the endemy indicators of the district. Finally, many of the cases diagnosed would probably have been detected later, possibly with greater signs of disability<sup>12</sup>. The seropositivity observed of 46.4% among the students diagnosed with leprosy in the study was lower than that observed by other authors<sup>4</sup>. However, in this study, the majority of patients were younger than 19 years-old and most presented the paucibacillary clinical forms, similar to the reports by other authors<sup>7</sup>.

In relation to sex, a greater proportion of leprosy cases occurred among female students and 16 (48.5%) of these presented ML Flow positive. However, it should be noted that more girls were examined in the study (51.5%) and seropositivity can vary according to the endemy<sup>9</sup>. It is important to remember that

adult women are known seek out health services more often, a fact that may favor greater access to health services and thus to early leprosy diagnosis<sup>9</sup>.

There was a predominance of leprosy in the 10 to 14 year-old age group, with almost 62% of the cases, and of greatest prevalence of seropositivity, 27.5% of the cases. This data is similar to the studies of Van Beers<sup>14</sup>. The literature is unanimous in affirming that the detection of the disease in the age group of under 15 years-old is an indicator of high leprosy endemicity<sup>2, 13</sup>, showing the high transmission of *Mycobacterium leprae* bacilli in the community; thus, the analysis indicated a serious leprosy problem in Paracatu.

An average of 1.8 lesions/patient was observed among the students, even so, this skin problem gained little attention, probably because the lesions caused no pain, discomfort, pruritus or other important symptoms/signs, undermining a leprosy diagnosis. Among the cases studied in Paracatu, 45.6% of the students presented one lesion, with two, three, four and more lesions observed in 32.3%, 1.4%, 5.8% and 5.8% of cases, respectively. While studying the behavior of the ML Flow test in the age group under 18 years-old, Ferreira<sup>7</sup> concluded that a correlation existed between seropositivity in the test with patients presenting positive bacilloscopy and with more than five skin lesions. However, any comparison with this study was impaired, since only one patient presented a positive bacilloscopy and another three had more than five skin lesions.

Active case finding made it possible to discover cases earlier, since more than 2/3 of the students were classified with the paucibacillary form of the disease, while only 8.9% presented disabilities, which is very different from the findings observed in the spontaneous demand recorded by the leprosy service of Paracatu<sup>6</sup>. The borderline form presented the most disabilities (four cases), followed by the tuberculoid form (one case); such findings corroborate the results of other studies<sup>11</sup>. While analyzing 86 children in the age group under 15 years-old, in

New Delhi, India, Sardana<sup>11</sup> observed almost twice as many cases involving disabilities (13.0%) than that that obtained in children diagnosed with leprosy in Paracatu, MG. Only one case analyzed in Paracatu showed a positive bacilloscopic exam and seropositivity for the ML Flow test, among the 17 (25.1%) leprotic patients in the borderline form. This situation could also be related to the clinical classification of some patients and to the ML Flow test protocol in Minas Gerais<sup>4</sup>.

Among the students treated, 91.1% presented at least one BCG vaccination scar with seropositivity of 44% in the ML Flow test. It is likely that even with their continuous exposure to individuals with a high bacillary load and living in an hyperendemic region, the vaccine was able to maintain its efficacy against leprosy, since the majority of the cases diagnosed were classified as paucibacillary.<sup>10</sup> Another important indicator among the patients was the percentage of leprosy cases with household contacts (46.4%), 44.9% of them presenting a seropositive ML Flow test result. Other authors reinforce the necessity of detailed dermatoneurological examination of household contacts<sup>5</sup>, since, in Brazil, only a part of these contacts are examined<sup>2,6</sup>. Use of the ML Flow test helped the improve the diagnosis of suspected leprosy cases, since it is not yet part of the service routine, rather it provides support in the operational process of diagnosis aimed at reducing endemy in the district. Briefly, the study suggests incorporating the ML Flow test into the health services, since it assists in the operational classification of the disease and in the control of household contacts with seropositive test results, aimed at early detection of suspected leprosy cases.

#### ACKNOWLEDGMENTS

The authors are grateful to Prof Glauro Guimarães, Mrs Marcia de Souza Gonçalves and Dr. Erika Neumann Rocha Salgueiro.

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