Risk factors for physical disability at diagnosis of 19,283 new cases of leprosy

Fatores de risco para incapacidade física no momento do diagnóstico de 19.283 casos novos de hanseníase

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ABSTRACT

Introduction: The purpose of this study was to evaluate risk factors for physical disability at the moment of leprosy diagnosis. Methods: This is a retrospective, descriptive and exploratory investigation of 19,283 patients with leprosy, registered in the State of Minas Gerais, Brazil, between 2000 and 2005. Results: The risk of Grade 2 disability was 16.5-fold higher in patients with lepromatous leprosy, and 12.8-fold higher in patients presenting the borderline form, compared to patients presenting indeterminate leprosy. The occurrence of more than one thickened nerve increased the odds of a patient developing Grade 2 disability, 8.4-fold. Age <15 years, multibacillary leprosy and no formal education presented 7.0, 5.7 and 5.6 odds of developing physical disability, respectively. Conclusions: These factors should be considered as strong prognostic indicators in the development of physical disability at diagnosis.


RESUMO

Introdução: O objetivo deste estudo foi o de avaliar os fatores de risco para incapacidade física no momento do diagnóstico. Métodos: Trata-se de estudo retrospectivo, descriptivo e exploratório de 19.283 pacientes com hanseníase, notificados entre 2000 e 2005, no estado de Minas Gerais, Brasil. Resultados: O risco para desenvolver grau 2 de incapacidade física foi 16,5 vezes maior no paciente com hanseníase virchowiana e 12,8 vezes maior no paciente com a forma dimorfa, quando comparados aos pacientes com a forma indeterminada. A presença de mais de um nervo acometido aumentou o risco de desenvolver grau 2 de incapacidade em 8,4 vezes. A idade inferior a 15 anos, os pacientes multibacilares e a falta de escolaridade aumentaram a chance de deformidades em 7,0, 5,7 e 5,6, respectivamente. Conclusões: Estes fatores devem ser considerados indicadores importantes do prognóstico para incapacidade física no momento do diagnóstico.

classification of physical disability in leprosy is defined in 3 categories<sup>4</sup>: 1) no disability (no anesthesia) and no visible deformity or damage to the eyes, hands or feet (Grade 0); 2) only disability (anesthesia, but no visible deformity or damage to the eyes, hands or feet) (Grade 1); and 3) visible deformity or damage to the eyes (lagophthalmos, iridocyclitis, corneal opacities, severe visual impairment), hands (claw hands, ulcers, absorption of the digits, thumb-web contracture) (Grade 1), and 4) visible deformity or damage to the feet (plantar ulcers, foot-drop, inversion of the foot, clawing of the toes, absorption of the toes, collapsed foot and callosities) (Grade 2).

As there was no clear definition of skin color in the notification card this variable was excluded from analysis. Treatment was not included, because the information was obtained at diagnosis.

The multivariate analysis was adjusted in 3 distinct logistic models, as some explanatory variables were multicollinear. Among the models, the one which included thickened nerves and the clinical form was chosen because it presented a smaller confidence interval for the odds ratio.

### RESULTS

All the variables presented statistically significant association with disability levels. The model used to evaluate risk factors for disability at the moment of diagnosis is presented in Table 2.

Geographic area was dropped from the model as it did not maintain statistical significance.

Lepromatous leprosy at diagnosis had the highest impact on physical disability and deformity. It increased the odds of developing grade 2 disability 16.5-fold, whereas borderline form increased the odds 12.8-fold, when both were compared to the indeterminate clinical form.

The occurrence of more than one thickened nerve at diagnosis increased the odds of grade 2 disability 8.4-fold compared to one thickened nerve.

The other models are not presented here, but age <15 years, multibacillary patients and no formal education presented 7.0, 5.7 and 5.6 odds of developing physical disability, respectively. Other variables were identified as risk factors, but with low effect on physical disability: 1 to 3 years of formal education (3.51 times), positive bacilloscopy (1.77 times), more than 5 skin lesions (1.60 times), male gender (1.40 times) and detection through community survey (1.24 times).

### DISCUSSION

The presence of lepromatous leprosy at diagnosis showed the highest impact as a risk factor for disability and physical deformity, followed by borderline leprosy. Physical disability and deformity are seen in both clinical forms and are explained by the host immune response and the long time span of the disease before diagnosis is confirmed. When the cellular immune response is strong (tuberculoid leprosy), bacillary destruction with minimal nerve injury occurs<sup>7-10</sup>. When it is weak (lepromatous leprosy), the bacilli multiply and spread to nerve trunks<sup>11</sup>. Multibacillary leprosy and bacillary index ≥2 have been reported as risk factors for neuropathy<sup>11</sup>.

Nerve damage is associated with physical disability and deformity and is considered the most severe complication of leprosy<sup>12,15-19</sup>. In our analysis, this variable presented the most precise odds for developing physical disability and deformity (95% CI 7.41-9.68). Although it is considered a subjective variable (palpation of peripheral nerves), the number of thickened nerves should be evaluated and its prognostic importance recognized. The frequency of neuropathy increases significantly in elderly patients, in cases with late diagnosis and in patients with higher number of thickened nerves<sup>12,20</sup>.

Diagnosis of leprosy using community surveys (e.g., schools, nurseries, small villages) increased the detection of Grade 2 disability. This may reflect the examiners’ better training, with a defined focus on verifying leprosy complications.

Aged 15 years-old and over at diagnosis was a strong risk factor for disability. Age is known to be related to disease duration and diagnosis delay<sup>22,23</sup>, but this is the first study to quantify the association<sup>12,20</sup>. Tissue damage caused by magnified and prolonged immunological
response is reduced by early diagnosis and treatment which prevent the development of neural damage.

At diagnosis, illiteracy was associated with physical disability, as previously reported. Formally educated people are more aware of their needs, seek medical attention at an earlier stage of the disease and have timely access to health system facilities.

Male patients presented deformity more frequently than females and the following arguments have been proposed to explain such difference: 1) the difficulty of male subjects to come to a health facility during their working day; 2) the fear of losing their jobs because of the stigma of leprosy and 3) since they are more likely to be engaged in heavy physical activities the risk of deformity is increased.

In summary, the most important risk factors for physical incapacities at diagnosis, in decreasing order of importance, were: lepromatous clinical form, borderline leprosy, the presence of more than one thickened nerve and tuberculoid clinical form. A more aggressive approach is necessary to diagnose leprosy at an earlier stage, targeting the reduction of disability and deformity.

### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

### REFERENCES