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Lema et al

Case report

Increased anti-M. Leprae PGL-I igm levels in a child who developed leprosy

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Abstract

As part of a study that aimed at reaching those at risk of developing leprosy through screening of household contacts, a child aged 7 was included as contact of a multibacillary leprosy patient. This study was conducted in Kokosa, hot spot area in Oromia Region, Ethiopia. Compared to other contacts, this child showed increased levels of anti-M. leprae Phenolic glycolipid-I (PGL-I) IgM antibodies as assessed by up-converting lateral flow assay (UCP -LFA) at initial and second-time screening and developed leprosy three years later. Therefore, the anti-PGL-I IgM UCP-LFA can serve as an additional diagnostic field tool in leprosy control programs.

Keywords: *Leprosy, anti-M. Leprae, IgM antibodies*

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Introduction

At the end of 2020, the World Health Organization (WHO) reported 202,185 new cases of leprosy globally, among which 10,813 had new grade-two disability (G2D) cases, and 14,981 were new child leprosy cases. Ethiopia reported 3,201 new cases, standing 6th among the 23 global priority leprosy burden countries and 1st in Africa reporting 507 new child cases and 411 G2D cases (1).

Prolonged contact with untreated newly diagnosed leprosy patients is considered one of the risk factors, which implies the need for regular screening of contacts for possible early case detection (2, 3). Studies showed there is 6 fold relative risks for contacts of all types of leprosy compared to the general population. Contacts of multibacillary (MB) patients even showed 8-fold increased risk compared to paucibacillary (PB) contacts (4). Some studies also rapid detection of leprosy through monitoring antibody titers of household contacts (5, 6). The Anti-PGL-I-IgM UCP-LFA discussed in this paper is a serological test that quantitatively detects anti-M. leprae PGL-I IgM levels. PGL-I is M. leprae-specific glycolipid component of M. leprae found on the cell wall of the bacteria, comprising up to 3% of the total weight of the bacteria.

Antibodies directed against PGL-I can also be used in monitoring treatment outcome, as the levels decrease after MDT due to bacilli destruction which means reduced PGL-I synthesis (5).
This study was designed to reach those at risk of developing leprosy, where the close household contacts (HHCs) should be traced and followed.

Case presentation

A 7-year-old boy from Hebeno Kebele of Kokosa Woreda (HEB-03-018) was screened as one of the household contacts of a multibacillary (MB) leprosy index patient, a 13-year-old child, detected through the house-to-house screening. During contact screening, the 7-year-old boy did not show any clinical signs and symptoms of leprosy. Venous blood was collected from this child for serological analysis. He was screened again after one year when his index case completed leprosy treatment but still did not show any clinical signs and symptoms of leprosy. A second-time point blood was also collected after one year, and all samples were analyzed for the presence of anti-PGL-I IgM antibodies. His anti-PGL-I IgM levels showed a progressive increase from the first to the second-time point (Figure 1).

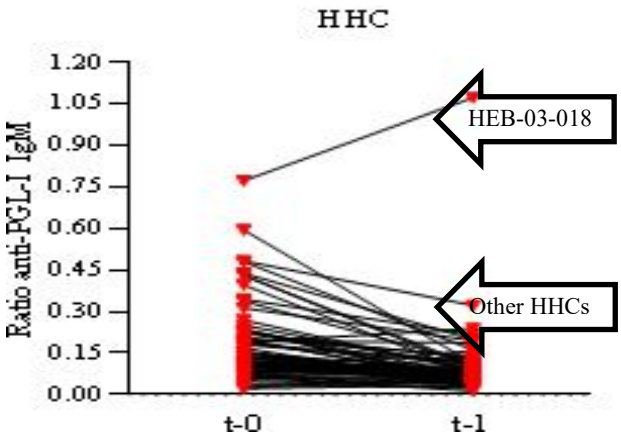

Figure 1: Anti PGL-I IgM antibody levels at two–time points measured by UCP-LFA:

Moreover, the ratio value of the UCP-LFA, which corresponds to the IgM antibody level, was higher in comparison to the other screened contacts. So far, none of the contacts has developed leprosy. Ratio of anti-PGL-I IgM in household contacts at time of first screening (t-0) and at time of second screening performed after one year (t-1).IgM in household contacts at time of first screening (t-0) and at time of second screening performed after one year (t-1).HEB-03-018 is a household contact with an increased anti-PGL-I IgM ratio which later developed leprosy. The child was continuously followed up for three years, and in the fourth year, i.e., after three years of the first sampling; he developed nodular lesions typical of leprosy on his face and hands **(Figure 2).** He was put on MDT-MB and has shown significant improvement.

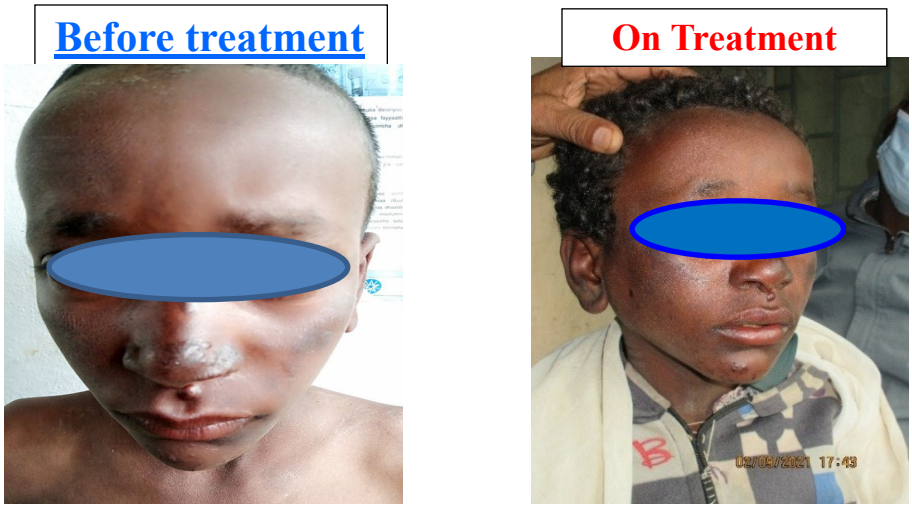

Figure 2 Anti-PGL-1 IgM positive apparently healthy household contact of an index case who developed leprosy 3 years later. The picture was taken after 9 months of MDT.

Discussion

Our study has shown the importance of contact tracing and serological testing to serve as supporting evidence for early detection of leprosy. In line with our findings, Spencer *et al.* previously showed household contacts with progressively elevated antibody titers. Among them, one contact developed borderline lepromatous leprosy (BL) at an early stage after two years routine follow-up.

This demonstrates that repeated measurements of the serum anti-PGL-I antibody levels in HHCs of leprosy patients may be used to evaluate antigen exposure and identify contacts that may progress to disease (6). Moreover, anti-*M. leprae* PGL-I antibody level in young children can indicate the time of infection and be used as a proxy indicator for transmission in an area (7).

However, anti-PGL-I antibody levels alone might not be enough to indicate whether a person develops disease or not as shown in a study in Bangladesh (8).

In fact, a systematic review showed that contact screening for prophylaxis based only on anti-PGL-I antibodies would miss more than half of future leprosy cases. This could be due to inter-individual, or population variations. In recent studies, Anti PGL-I IgM was included in the Multi-Biomarker Test (MBT) as a serological marker to assist in the early diagnosis of leprosy in contacts of leprosy (9, 10). The present study showed that progressively elevated anti-PGL-I IgM antibody level in exposed individuals particularly in children can be used for early detection of those at "high risk" of developing leprosy. Therefore, establishing the method and integrating it as one screening method while implementing Active case detection in high burden areas may facilitate early detection of leprosy that contributes towards reduced transmission, disability and stigma.

Competing interest

The authors declare that this manuscript was approved by all authors in the current form and that no competing interest exists.

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