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Original Research Article

Exploring the Efficacy of Mycobacterium Indicus Pranii Vaccine in the Reduction of Anti-Phenolic Glycolipid-1 Titers in Contacts of Patients with Leprosy

Shivani[1], Alok Kumar[2]

[1]Senior Resident, Department of Skin and VD, Patna Medical College and Hospital, Patna, Bihar, India

[2]Senior Resident, Department of Skin and VD, Patna Medical College and Hospital, Patna, Bihar, India

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Corresponding author: Dr. Alok Kumar

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Abstract

Aim: In this study, we explored the efficacy of Mycobacterium indicus pranii vaccine in the reduction of anti-phenolic glycolipid-1 titers in contacts of patients with leprosy.

Methods: The present study was conducted at the Patna medical College and hospital and multi-speciality hospital, Patna, Bihar, India and for one year. We assessed 150 household contacts of 100 leprosy patients (mean age 39.5 ± 13 years). The disease duration in the 100 patients ranged from 1.5 years to eight years. Contacts were classified as domiciliary (household contacts) or nondomiciliary (relatives and neighbors). Household contacts were defined as individuals who currently resided or had resided with the patient in the past five years.

Results: The disease duration in the 100 patients ranged from 1.5 years to eight years and included 20 (20%) borderline tuberculoid, 25 (25%) borderlines lepromatous, 50 (50%) lepromatous and 5 (5%) histoid leprosy patients.

Conclusion: Immunotherapy with Mycobacterium indicus pranii vaccine resulted in complete clearance of anti-phenolic glycolipid-1 antibodies in contacts that might otherwise have developed leprosy. Immunoprophylaxis was safe and without any serious side effects.

Keywords: Mycobacterium indicus pranii, Immunoprophylaxis in leprosy, anti-phenolic glycolipid-1 antibodies

Introduction

Despite advances toward the elimination of leprosy over the last four decades, leprosy still remains an important health problem. [1,2] It is a treatable infection that ranks as the second most pathogenic mycobacterial infectious disease after tuberculosis. Leprosy is the clinical manifestation of a dermatoneurological disease caused by the yet-uncultured pathogen Mycobacterium leprae. Despite effective multidrug therapy (MDT), the torpid decline in new leprosy cases demonstrates that transmission in the society is persistent. In 2018, new diagnosed cases were 208,619, and India alone accounted for more than half of new cases reported globally. [3]

The implementation of multidrug therapy by the WHO and a focus on early diagnosis and treatment has resulted in a decrease in the global burden of leprosy, thus raising hopes of a leprosy free world. Prevention of leprosy in high-risk groups is an important strategy in reducing the prevalence of the disease. [4] Clinical findings in the early stages of infection are often absent and hence serological tests, such as the phenolic glycolipid-1 enzyme-linked immunosorbent assay, are used to detect the presence of infection in contacts. [5]

Immunoprophylaxis of high-risk groups such as household or close contacts is an important strategy in controlling leprosy transmission.7 However, there are neither data, nor consensus, on who should be offered immunoprophylaxis. Markers to assess the efficacy of such interventions as immuno- or chemoprophylaxis early (rather than the usual ten–15 years necessary to observe a drop in leprosy incidence) are needed. M. leprae possesses a longer generation time and lacks an artificial medium for in vitro growth; therefore, animals are used for in vivo propagation of bacilli. [6]

Although rarely lethal, leprosy is enormously feared for causing lifelong handicaps and deformities resulting from irreversible nerve damage. Leprosy is notable for its continued transmission, which results in a stable annual number of approximately 200,000 new cases.

In this study, we explored the efficacy of Mycobacterium indicus pranii vaccine in the reduction of anti-phenolic glycolipid-1 titers in contacts of patients with leprosy.

Methods

The present study was conducted at the Patna medical College and hospital and multi-speciality hospital, Patna, Bihar, India for one year. We assessed 150 household contacts of 100 leprosy patients (mean age 39.5 ± 13 years).

The disease duration in the 100 patients ranged from 1.5 years to eight years. Contacts were classified as domiciliary (household contacts) or nondomiciliary (relatives and neighbors). Household contacts were defined as individuals who currently resided or had resided with the patient in the past five years. Only household contacts who shared the same household and kitchen were selected for study.

After obtaining informed consent, a thorough clinical examination was performed in all contacts and those with active disease were excluded from the study. The presence of a BCG scar was noted. The nature of contact and the relationship with patient was ascertained. Slit-skin smears and anti-phenolic glycolipid-1 enzyme-linked immunosorbent assay was performed in all contacts. Serum samples from 40 healthy individuals who had no contact with leprosy patients were used as negative controls for enzyme-linked immunosorbent assay tests.

All anti-phenolic glycolipid-1 enzyme-linked immunosorbent assay positive contacts were given 0.1 ml of Mycobacterium indicus pranii vaccine (Cadila Pharma, Ahmedabad, India) intradermally in divided doses over both the deltoids. Antiphenolic glycolipid-1 enzyme-linked immunosorbent assay was repeated at six months and one year in vaccinated contacts.

Follow-up evaluations of all contacts (both phenolic glycolipid-1 positive and negative) were performed every six months for of leprosy. The mean and standard deviations were calculated.

Results

Table 1: Clinical data of leprosy patients whose contacts were positive for anti-phenolic-glycolipid-1 antibody

Patient age	Sex	Spectrum	Duration	BI	MI (%)	Reactions	Relapse	Contact age	Sex	Relation
40	F	BT	1 year	0	0	Type 1	None	16	F	Daughter
50	F	BL	1 year	5	15	None	None	17	M	Son
31	M	LL	1 year	3	0	Type 2	Yes	25	F	Wife
24	M	BT	5 months	0	0	None	None	27	M	Brother
42	M	BT	3 months	0	0	None	None	30	F	Wife
25	M	LL	3 years	5	4	Type 2	None	23	F	Wife
38	F	LL	4 years	6	3	Type 2	None	42	M	Husband
56	M	Histoid	2 years	3	2	None	None	30	F	Daughter
65	M	Histoid	2 years	4	2	None	None	35	F	Daughter
35	M	LL	5 years	5	4	None	None	30	F	Wife

We assessed 150 household contacts of 100 leprosy patients (mean age 39.5 ± 13 years). The disease duration in the 100 patients ranged from 1.5 years to eight years and included 20 (20%) borderline tuberculoid, 25 (25%) borderlines lepromatous, 50 (50%) lepromatous and 5 (5%) histoid leprosy patients.

Discussion

Contacts of patients with lepromatous leprosy have a 3.8-fold higher risk of developing leprosy, [8] but anti-phenolic glycolipid-1 antibody positive contacts have a six-fold higher risk of developing disease as compared to anti-phenolic glycolipid-1-negative contacts. [5,9-12]

India, Indonesia and Brazil together account for approximately 80% of the total leprosy cases of the world and there is an urgent need to halt the transmission of leprosy. Araujo et al., [13] in their study, observed that the majority of new cases among household contacts appeared by the first year of follow-up, emphasizing not only the importance of the initial examination but also close monitoring of household contacts for at least a year or more. Expectedly, most household contacts contracting leprosy were contacts of multibacillary leprosy patients, highlighting the need to especially monitor household contacts of multibacillary cases.

Vaccine trials from Venezuela and Malaysia measuring the outcome of BCG alone or in combination with killed Mycobacterium leprae demonstrated a decrease in leprosy incidence across all ages. [14] Carvelho et al. [15] observed that BCG vaccination of household contacts leads to a significant increase in memory CD4 and CD8 T cell to Mycobacterium leprae antigens at six months, suggesting a specific protective response. In a field trial of Mycobacterium indicus pranii vaccine in leprosy contacts in Uttar Pradesh, India, a protective efficacy of 69% and 59% for three and five years, respectively, was demonstrated. However, serological correlation was not attempted in this study. [16]

With disease rates still high in the community, it is imperative to target leprosy contacts, especially those of multibacillary patients, as a preventive strategy for leprosy control. India has the largest burden of leprosy patients with more than 126,000 new infections detected in 2017–2018, [17] but actual numbers may be higher.

The major limitation of our study was the small number of anti-phenolic glycolipid-1-positive contacts, the short follow-up period and the absence of control group. Another limitation was the lack of an untreated control group of anti-PGL +ve contacts, left untreated to find out how

many became negative on their own in the follow-up period. [18]

Conclusion

Immunotherapy with Mycobacterium indicus pranii vaccine resulted in complete clearance of anti-phenolic glycolipid-1 antibodies in contacts that might otherwise have developed leprosy. Immunoprophy laxis was safe and without any serious side effects.

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