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Comparison of Phenolic Glycolipid 1 Antibody Levels in Household Contacts of Pausibasilary and Multibacilary Patients

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ABSTRACT

Introduction. Leprosy is a chronic infectious disease caused by Mycobacterium leprae. Distribution of leprosy cases in the world in 2015 was highest in the Southeast Asia region, with 156,118 cases. The increase in new claims and the high prevalence of leprosy requires action to break the chain of transmission. Household contact groups are easy to identify by the research group because the group has good reasons for examining or getting chemoprophylaxis. This study aimed to compare Phenolic Glycolipid 1 (PGL-1) antibody levels in household contacts of paucibacillary (PB) and multibacillary (MB) patients.

Methods. This study was an analytic observational study with a cross-sectional design. ELISA examination conducted at the Leprosy Laboratory of the Institute of Tropical Diseases, Universitas Airlangga, Surabaya. The study was conducted from December 3rd 2019 to January 31st, 2020, with a total sample of 60 patients.

Results. PGL-1 antibodies in MB leprosy household contact were more excellent than PGL-1 antibodies in PB leprosy household contact, and the results showed statistically significant.

Conclusions. There are differences in the levels of PGL-1 antibodies between household contact PB leprosy patients and MB. The household contact PGL-1 antibody levels in MB leprosy are higher than PB leprosy.

1. Introduction

Leprosy is a chronic infectious disease caused by Mycobacterium leprae (M. Leprae). The incubation period of M. leprae varies from 2 to 5 years, and some literature shows that the period can reach up to 20 years.[1] Distribution of leprosy cases in the world in 2015 was highest in the Southeast Asia region, with 156,118 cases. Indonesia occupies the third position in the world after India and Brazil. A total of 14 countries reported more than 1000 new cases during 2015 (94.89%). Although globally there has been a decline in new situations, several countries such as Bangladesh, Congo, Ethiopia, India, and Indonesia have increased cases.[2]

The increase in new cases and the high

prevalence of leprosy requires action to break the chain of transmission. One effort is through the prevention of transmitting process, the discovery of infected people, and treatment of infected patients.[3] Household contact groups are easy to identify by the research group because the group has good reasons for examining or getting chemoprophylaxis.[3,4] Subclinical leprosy is a contact condition that has been infected with the bacterium *M. leprae,* but there are no clinical symptoms of leprosy so that the person looks healthy, but on examination found specific antibodies of *M. Leprae.*[4]

Phenolic glycolipid 1 is a firm surface antigen of *M. leprae* cells and is specific. PGL-1 antigens can stimulate antibody production, especially IgM.[5] In general, the specificity of the anti-PGL-1 ELISA examination in MB patients is 98% and the sensitivity range is 80-100%, with reactivity mainly to IgM. In PB patients, the specificity range is 60% sensitivity range 15-40%.[6] A study by Oliveira et al. in 2015, showed that the PGL-1 ELISA examination was a useful tool for leprosy detection especially for MB leprosy and subclinical infections.[6]

2. Methods

This research is an analytic observational study with a cross-sectional design. Sampling will be conducted at the Polyclinic of the Division of Infection Dermatology Department of Dermatology and Venereology (DV) Dr RSUP Mohammad Hoesin (RSMH) Palembang. ELISA examination will be conducted at the Leprosy Laboratory of the Institute of Tropical Diseases, Airlangga University, Surabaya. The study was conducted from 3 December 2019 to 6 January 2020, with a total sample of 60 samples, consisting of 42 MB leprosy household contact and 18 PB leprosy household contact. The covariables included age, sex, education, occupation, body mass index (BMI), duration of contact, and history of BCG immunisation. Household contact criteria are people that stayed in the same house for at least six months. The value of PGL-1 ≥ 605 µ/ml is considered as seropositive, and < 605 µ/ml finder as seronegative. Data then analysed using chi-square test, Mann Whitney U test and Pearson test. Ethical clearance had been approved for this study by the Local Ethical Committee.

3. Results

A total of 60 samples were examined, consisting of 42 MB leprosy household contact and 18 PB leprosy household contact. The result showed that all PB and MB household contacts have been living in the same house for more than two years. With statistical analysis, the results showed that there was no difference in the mean length of stay (p = 0.264) between PB and MB leprosy household contact. There was 16 PB household contact with a history of BCG immunisation (88.9%), and 31 in MB leprosy household contact (64.3%). In statistical analysis, there was no difference in the history of BCG immunisation between PB and MB leprosy household contact (p = 0.157) (**Table 1**).

The mean PGL-1 antibody level of PB household contact was 589.68 ± 395.58, while the average level of PGL-1 antibody in MB household contact was 1123.99 ± 920.61. The statistical analysis showed that there were significant differences in the mean levels of PGL-1 antibodies between PB and MB leprosy household contact (p = 0.011). The level of PGL-1 antibodies in MB household contact is significantly higher than in PB household contact (**Table 2**).

With Spearman's rho test the result was a negative correlation, not significant between PGL-1 antibody levels and patient's age (r = -0.015; p = 0.911), contact duration (r = -0.099; p = 0.453) and duration of treatment (r = -0.099; p = 0.453). In addition, the results showed that there was a very weak positive correlation, not significant between PGL-1 antibody levels and sex (r = 0.188; p = 0.150), BMI (r = 0.173; p = 0.186) and the history of BCG immunization (r = 0.067; p = 0.613) in PB and MB leprosy household contact (**Table 3**).

Tabel 1. Characteristic in contact duration and history of BCG Immunisation

Variable	PB leprosy household contact (n = 18)	MB leprosy household contact (n= 42)	P Value
Contact duration (year), mean ± SD	19,39 ± 9,51	16,12 ± 10,59	0,264[a]
History of BCG immunization, n (%)			
• Positive scar	16 (88,9)	31 (73,8)	0,308[d]
• Negative scar	2 (11,1)	11 (26,2)	

Tabel 2. Examination of PGL-1 Antibodies Level in PB and MB leprosy household contact

Parameter	PB household contact (n = 18)	MB household contact (n= 42)	P Value
PGL-1 antibody level, mean ± SD	589,68 ± 395,58	1123,99 ± 920,61	0,011

Tabel 3. Prediction constants of IgM anti-PGL-1 based on general characteristics and contact history

Model	Unstandardised Coefficient		p-value
	B	Standard Error	
Constanta	-771,432	977,427	0,434
Age	-5,848	9,375	0,535
Sex	46,497	223,956	0,836
IMT	58,210	44,214	0,194
Duration of contact	-7,417	13,401	0,582
Duration of treatment	-7,913	17,055	0,645
History of BCG immunisation	11,721	309,867	0,970
Leprosy type	454,589	250,536	0,075

4. Discussions

Household contacts, especially those who live in the same house with lepromatous or MB leprosy patients, have a 5-10 times greater chance of contracting the disease compared to the general population.[7] However, other studies found that the risk of transmission in PB and MB household contact leprosy patients does not show any significant differences.[8] Contact duration also an essential factor for the transmission of leprosy. A study by Castro et al. in 2005 shows that the average contact duration of leprosy contact was 13.7 years.[9] A survey by Montoya et al. in 2017 reported that 91.2% of contact persons had contact duration of more than two years.[7]

In this study, all PB and MB household contact had a length of stay ≥ two years. The average duration of contact of PB leprosy household contact was 19 years, with the ranges from 6 to 34 years. At the same time, the contact duration of MB household contact is around 16 years, with the range between 2 to 42 years. Cellular immune responses play an essential role in protecting from leprosy infection

because M. leprae is an intracellular obligate parasite. BCG vaccination is a vaccine that has been proven to have a protective effect against M. leprae. BCG can also provide initial sensitisation that can improve one's cellular immunity response to M. leprae in the future.10 In this study, the statistical analysis showed that there were no differences in contact duration, relationship, duration of therapy and history of BCG between household contact PB and MB leprosy patients (p> 0.05).

Phenolic glycolipid 1 is a stable surface antigen of M. leprae cells and is specific. PGL-1 antigens can stimulate antibody production, especially IgM.[5] In general, the specificity of the anti-PGL-1 ELISA examination in MB patients is 98% and the sensitivity range is 80-100%, with reactivity mainly to IgM. In PB patients, the specificity range is 60% sensitivity range 15-40%.[6] A study by Oliveira et al. in 2015, showed that the PGL-1 ELISA examination was a useful tool for leprosy detection, especially for MB leprosy and subclinical infections.[6] A study by Fabri et al. in 2015 found that more positive PGL-1 antibodies in the MB household contact group as many as 14 out of 15 household contact (93.3%) compared to PB type of leprosy household contact (6.7%). A study by Cabral et al. in 2013 reported that 54 out of 80 MB household contact (67.5%) had positive anti-PGL-1, whereas in PB household contact only 26 out of 80 touches (5%).[11] In this study, PGL-1 antibody in MB leprosy household contact was higher than the PGL-1 antibody in PB leprosy household contact, and the results showed statistically significant (p = 0.011).

5. Conclusion

There is a significant difference mean levels of PGL-1 antibodies between household contact PB and MB leprosy patients (p = 0.011). Further research is needed to monitor IgM PGL-1 antibody levels in both PB and MB household contact after chemoprophylaxis.

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