ORIGINAL ARTICLE

Social Determinants of Leprosy in Banten, Indonesia

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ABSTRACT

Introduction: Leprosy and social determinants of health have been proven to have a consistent association. However, studies are also limited in Banten, Indonesia, where these diseases are more urgent or difficult to control due to the ineffective dynamic or migration of residents from one place to another. A study was conducted to examine the impact of social determinants of health on leprosy-infected individuals in Banten, Indonesia. **Methods:** A descriptive comparative study using cross-sectional design was used to identify the social and environmental determinant of leprosy in Banten, Indonesia. The inclusion criteria are age over 18 years old, patients with leprosy registered for treatment between January to December 2021. A convenience sampling was used to select a participant. Logistic regression was used to determined social determinant of leprosy. **Results:** A total of 200 patients were included in the study, with 100 patients with leprosy and 100 general population. Their mean age was 41.62±3.75 for patients with leprosy and 40.79±2.11 for general population. Occupation (OR=2.57, 95% CI=2.11-5.89), monthly income (OR=3.46, 95% CI =2.23-6.71), education level (OR=2.39, 95% CI=1.12-6.82), house ownership (OR=2.32, 95% CI=1.11-4.79), house size (OR=1.34, 95%CI=1.13-4.77), HFIAS score, and IDDS score remained significantly determinant of leprosy (p<0.05). **Conclusion:** Our findings demonstrate that inequalities in socioeconomic determinants of health are associated with an increased incidence of leprosy, implying that substandard living conditions are a prevalent occurrence among persons living with leprosy-related disability. More research is needed to investigate the effect of social inequality on the severity of leprosy-related disability.

Keywords: Leprosy, Social determinants of health, Indonesia

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INTRODUCTION

Leprosy is a chronic infectious disease caused by Mycobacterium leprae (1). Even though leprosy has been under control for a long time, the disease is still a public health problem in many countries around the world, including Indonesia. Inequities in social determinants of health have been repeatedly linked to leprosy (2–6). Socio-political context and structural factors that determine social hierarchies, as well as an individual's socioeconomic status (7) compose these social determinants of health. However, it is unknown which factors, including the socioeconomic background, structural mechanisms, and an individual's total socioeconomic status, contribute most to infection risk (3–7).

The literature on the relationship between leprosy and population density is mixed. For example, high population density can be connected with the endemic process of the disease, as contact is more common in such a group (8,9). It is possible to explore these associations using new geoprocessing tools, while also evaluating the prevalence of disease with data relating to socio-economic and environmental variables as well as the accessibility of health care (10). A modest increase in food intake, reduced food insecurity, improved nutritional circumstances, increased school enrolment and frequency can dramatically increase food consumption, decrease food insecurity and improve nutritional conditions (11–13).

In recent years, social determinants and the potential for social interventions to improve disease treatment and control have gained recognition (14). Leprosy has been related to a poorer standard of living, and shame and anxiety associated with chronic sickness may delay treatment and impair individual economic efficiency,

perpetuating poverty (15). Poverty reduction measures have been included into leprosy control health policies in some countries to break the two-way relationship between poverty and leprosy. There are several non-monetary variables that can contribute to the negative effects of poverty, such as a lack of sufficient nutrition intakes, which can be compounded by poverty (16). Food shortage, food insecurity, and dietary diversity are all factors of poverty that leprosy patients face (17). Insufficient dietary intake may produce an inefficient host immune response to the pathogenic bacterium, according to previous research (14). However, research are limited in Banten, Indonesia, where diseases are more severe or harder to control due to poor population mobility from one place to another (18). The purpose of this study was to determine the differences in the effects of social determinants of health in Banten, Indonesia, among leprosy patients.

MATERIALS AND METHODS

Study design
A descriptive comparative study using cross-sectional design was used to identify the social and environmental determinant of leprosy in Banten, Indonesia. This study was conducted into two group, one group is leprosy patients and one group is non-leprosy patients (general population).

Participants
The sample of this study was patients diagnose with leprosy and general population. The inclusion criteria are age over 18 years old, patients with leprosy registered for treatment between January to December 2021. The sample size was calculated using G-Power Software Version 3.1.6 using the F test with the assumption α = 0.05, effect size=0.15 (medium effect size by Cohen et al 1995), power level=0.95. The estimation for minimum sample was 150 and assuming attrition rate of 15 %, the total minimal sample was recruited was 200 (100 in each group). A convenience sampling was used to select a participants.

Instruments
Demographic data include age measure by calculating date of birth with current data of data analysis, sex (female and male), education (higher education means above senior high school and low education level is under senior high school), ethnicity (Sundaneses, Javanese, Batak, and others), religion (Muslim, Christian, Catholic, Buddha, Hindu, and others). Living condition includes house ownership (Private vs rent), house size (rooms in the household less than two vs. more than two), building material (ground/cement vs. carpet/ floor/ wood/ ceramic). Food availability was measured using Household Food Insecurity Access Scale (HFIAS). The result was categorized into food secure and food insecure.

The Cronbach' Alpha in the current study was 0.81. Dietary diversity was used to assess the diversity of individual foods including starchy foods, green vegetables, vitamin A, vegetables and fruits, other vegetables and fruits, organ meats, meat and fish, eggs, nuts and seeds, as well as milk and its preparations. Food diversity can be categorized high if consuming> 6 food groups, medium category if consuming 4-6 food groups, and low category if consuming ≤3 food groups. The Cronbach' Alpha in the current study was 0.90.

Data collection
Permission to do a research was obtained from the Faculty of Health Science at Lincoln University before data collection. The researcher was issued a letter of referral to the University of Lincoln to pursue ethical clearance in Indonesia. Once permission and legal clean-up had been secured, the consent process required the following steps: All subjects signed or verbally agreed to participate in the study. Participants have been encouraged to maintain a copy of the permission form for their own records. Participants were given the option to withdraw from the study at any time. Participants were informed that the study's findings and direct quotes could be shared or published. It was also restricted to include information that could be used to identify participants in presentations and publishing of the study results.

Data analysis
A descriptive analysis and inferential statistics were performed where appropriate. The standard deviation of the mean (SD) was added for continuous data, while frequency and percentage were used for categorical variables. Logistic regression was used to determined social determinant of leprosy. All data were analysed using SPSS version 22.00 (SPSS Inc. Chicago, IL).

RESULTS

Table I summarizes the information regarding demographic and economic situations. A total of 200 patients were included in the study, with 100 patients with leprosy and 100 general population. Their mean age was 41.62±3.75 for patients with leprosy and 40.79±2.11 for general population. There was a significant difference between patients' leprosy and general population in term of education level, occupation, and monthly income (p<0.05). The majority of patients with leprosy had low education, unemployed, and unstable economic status.

Most patients with leprosy were living in rent house, while general population were living in their own house. Among patients with leprosy, about 75% having room in the household less than two, building

Table I : Demographic characteristics of studied participants (n=200)

	Leprosy patient n=100 (%)	General population n=100 (%)	p-value
Age, Mean ± SD	41.62±3.75	40.79±2.11	0.067
Gender			
Male	45%	50%	0.213
Female	55 %	50 %	
Education level			0.031
Elementary school	35%	27%	
Junior high school	28%	35%	
Senior high school	37%	23%	
University	0	15%	
Ethnicity			0.216
Sundanese	55%	56%	
Javanese	30%	34%	
Other	15%	10%	
Religion			0.451
Muslim	97%	90%	
Non-Muslim	3%	10%	
Migration in the past 5 year			0.111
Yes	35%	30%	
No	65%	70%	
Occupation			0.001
Employee/	10%	65%	
Unemployed	90%	35%	
Monthly income			0.000
Above minimum regional salary	3%	40%	
Under minimum regional salary	97%	60%	

material was carpet/floor/wood/ceramic, had toilet and water supply including clean water and regular bath, distance to clinic ranged from 1 to 5 kilometer, stayed with 2 to 3 resident in household. While in general population, about 55% having room in the household less than two, building material was carpet/floor/wood/ceramic, had toilet and water supply including clean water and regular bath, distance to clinic ranged from 1 to 5 kilometer, stayed with 2 to 3 resident in household. There we significance differences between patients' leprosy and general population in term of house ownership and house size (p<0.05) (Table II).

About 70% of patients with leprosy sharing a household with a current leprosy, 60% within the neighbourhood with a current leprosy, and 80% outside the neighbourhood with a current leprosy. Then, in general population, 10% sharing a household with a current leprosy, 25%within the neighbourhood with a current leprosy, and 50% outside the neighbourhood with a current leprosy. There we significance differences between patients' leprosy and general population in social contact (p<0.05) (Table II).

Table II : Social conditions of studied participants (n=200)

	Leprosy patient	General population	p-value
	n=100 (%)	n=100 (%)	
Living condition			
House ownership			0.001
Owner	25%	50%	
Rent	75%	50%	
House size			0.021
Rooms in the household less than two	70%	45%	
Rooms in the household more than two	30%	55%	
Building material			0.043
Ground/cement	25%	40%	
Carpet/floor/wood/ceramic	75%	605	
Availability of facility in the household (toilet)			0.056
Yes	80%	90%	
No	20%	10%	
Availability of water supply including clean water and regular bath			0.077
Yes	90%	98%	
No	10%	2%	
Distance to health clinics			0.219
< 1 km	15%	25%	
1-5 km	45%	45%	
> 5 km	40%	30%	
Number of residents in household:			0.355
< 2 persons	30%	25%	
2-3 persons	40%	40%	
3-5 persons	20%	20%	
> 5 persons	10%	15%	

Detailed information about HFIAS and IDDS are provided in Table III. The HFIAS score was higher in people with leprosy compared to the controls (p = 0.001). While IDDS had a lower score people with leprosy affected than general population (p=0.001). All of the significant and relevant variables were included in logistic analysis. Occupation (OR=2.57, 95% CI=2.11-5.89), monthly income (OR=3.46, 95% CI =2.23-6.71), education level (OR=2.39, 95% CI=1.12-6.82), house ownership (OR=2.32, 95% CI=1.11-4.79), house size (OR=1.34, 95% CI=1.13-4.77),

HFIAS score, and IDDS score remained significantly determinant of leprosy (p<0.05).

DISCUSSION

This study found that education, occupation, and monthly income were significant factors associated with leprosy. Many studies have found a correlation between literacy and decreased leprosy rates, despite the fact that educational data cannot be aggregated due of different classifications (19). Previous meta-

Table III : Food insecurity and dietary diversity of studied participants (n=200)

	Leprosy patients	General population	p-value
	n=80 (%)	n=100 (%)	
HFIAS score, Mean ± SD	4.56±2.13	2.04±0.38	0.001
HFIAS category			0.000
Food secure	40%	70%	
Mildly food insecure	20%	15%	
Moderately food insecure	30%	10%	
Severely food insecure	10%	5%	
IDDS	2.98±0.43	4.01±1.08	0.001
High	25%	70%	
Medium	30%	15%	
Low	45%	15%	

Note: HFIAS, household food insecurity access scale; IDDS, individual dietary diversity score.

analyses showed a robust and consistent connection between inequality and leprosy risk (20). Several research (3,21,22) investigated the relationship between income and leprosy, employing per capita household income (21) or socioeconomic position as evaluated by self-assessment, assets score, or social score (23). Another study found statistically significant relationships between poverty and leprosy in univariate analysis, but the associations faded after controlling for potential mediators such as age, gender, and occupation. Although the poverty measurements utilized in the research varied, the direction of the link remained constant across studies, indicating a negative relationship between socioeconomic level and leprosy risk (24). Improved health literacy and healthy behaviors, better access to appropriate job conditions and services, and full independence can all assist to reduce the spread of leprosy illness and its symptoms (19).

House ownership and size were found to be important predictors of leprosy. According to a previous meta-analysis, neither property ownership, private housing, nor house size are significantly linked with leprosy (20). Overcrowding (defined as more than five individuals sharing a household or more than four persons sharing a bedroom) can be a significant risk factor for leprosy (20). Our study participants had less living space than the suggested bare minimum. In 2015, just 58% of the world's population had access to safe drinking water and 68% to appropriate sanitation, with considerable gaps between rural and urban areas, as well as rich and poor places, including several leprosy-endemic countries (25). Recognizing this bidirectional relationship, many countries have attempted to link poverty and leprosy by including poverty reduction as a major component in health strategies supporting leprosy control. However, not all developing countries have high prevalence rates of leprosy, and several countries such as Brazil and India, as well as Indonesia, continue to have endemic leprosy in spite of efforts to control the disease (23).

Food scarcity has been associated with higher leprosy risk (20). However, another study stated that inadequate food diversity and limited food supplies were not associated with an increase in the incidence of leprosy cases, whereas food consumption and HFIAS were adversely connected with leprosy (23). In contrast to food expenditure and HFIAS, limited food diversity and inadequate food supplies were found to be associated with an increase in leprosy cases (23,26). Understanding the association between leprosy and dietary factors may aid in determining why there is a higher incidence of infection in Banten than in other parts of the world. This research is significant because it adds to our understanding of the social determinants of leprosy risk by taking into account cultural diversity and a unique human condition. This data could help develop effective leprosy preventive and treatment programs in Indonesia, taking into consideration the wide range of leprosy patients.

Table IV : Logistic regression analysis consisting of significant and relevant variables

	OR	95% CI	p-value
Occupation			
Employee	1	2.11-5.89	0.001
Unemployed	2.57		
Monthly income			
Above minimum regional salary	1	2.23-6.71	0.006
Under minimum regional salary	3.46		
Education level			
High education	1	1.12-6.82	0.001
Low education	2.39		
House ownership			
Owner	1	1.11-4.79	0.001
Rent	2.32		
House size			
Less than 2 room	1.34	1.13-4.77	0.005
More than 2 room	1		
HFIAS			
Food secure	1		
Food insecure	1.89	1.01-2.32	0.001
IDDS			
High food diversity	1		
Low food diversity	1.24	1.06-1.99	0.001

Note: * OR adjusted for age, sex, and all variables in the column; **$p<0.05$; R^2: 0.515; HFIAS, household food insecurity access scale; IDDS, individual dietary diversity score.

Limitations

This study was limited in its ability to be used in large-scale settings because of the small sample size and the fact that it only took place in Banten. All participants were recruited from inside Banten, while Indonesia has 34 provinces. Some data, such as food availability and diversity was collected based on self-reported information, which may lead to bias.

CONCLUSION

This study emphasizes that social factors may lead to the perpetuation of leprosy risk. Reducing leprosy requires more than simply changing the complex factors of the disease. Modern medicine for diagnosis and treatment will have a meaningful effect only if substantial progress in social areas is made. Leprosy reduction approach must go beyond health-care sector's innovative performance and incorporate importance of human development and prosperity. Further research is needed to explore the impact of social in inequalities on severity of leprosy-related disabilities.

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