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Socioeconomic Factors and The Incidence of Maternal and Child Leprosy: A Study in Endemic Areas in East Java, Indonesia

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Abstract

Background: Leprosy is one of the neglected tropical disease caused by *Mycobacterium leprae.* Endemic areas are still found due to incapability of MDT regimen alone to eradicate leprosy. The good understanding of high-risk population characteristic to plan elimination strategy of leprosy is needed, especially in vulnerable populations such as mothers and children population. This study aims to find association between socioeconomic factors and the incidence of leprosy in maternal and children leprosy in endemic areas.

Methods: This is a case-control study in endemic areas in Tuban Regency, East Java Province, Indonesia. The obtained data was done using structured questionnaire and direct measurement. Chi-square, t-test/ Mann-Whitney test was used to assess the association between socioeconomic factors and the incidence of leprosy in maternal and children leprosy in endemic areas.

Results: 22 pairs of cases and 57 pairs of controls were analyzed. This study found that education is associated with the incidence of leprosy. Significant results were observed in father's education (*p* value= 0.023) with the incidence of maternal leprosy and mother's education (*p* value= 0.003) education) and father's education (*p* value= 0.013) with the incidence of children leprosy. Family income also associated with the incidence of maternal (*p* value= 0.040) and children leprosy (*p* value= 0.036). Occupation is not associated with the incidence of leprosy.

Conclusion : The result of this study shows that education and family income are related with the incidence of leprosy in both, mothers and children population.

Keywords: *Socioeconomic factors, Leprosy, Maternal, Children, Endemic*

Introduction

Leprosy, caused by *Mycobacterium leprae,* is considered as one of neglected tropical disease and remains to be a significant health burden in some tropical countries, such as Brazil, India, or Indonesia.[1] Eradication strategy that started with MDT regimen in early 1990 had showed successful drop in leprosy cases number leads to successful eradication of leprosy cases with less than one case per 10,000 population in some countries.[2] However, MDT regimen alone is in capable to eradicate leprosy and indicates other factors related to the transmission of leprosy.

Leprosy remains endemic in Brazil, India, and Indonesia. These three countries responsible for 80% global leprosy cases.[3] In Indonesia, registered leprosy cases were 19,938 cases in 2019, in which 17,439 were new cases consisted of 10,741 female leprosy cases (61.59%) and 2,009 (11.52%) of child leprosy.[4] Most of

eastern part provinces of Indonesia area areas with high leprosy burden. According to Indonesia health profile on 2019, East Java province holds the highest number of leprosy cases across Sumatera and Java Island with 2,940 cases.[4] Tuban Regency is one of leprosy endemic pocket in East Java Province with relatively stabil of new cases findings in the last five years with 159 new leprosy cases in 2019.[5]

Earlier studies and reports in other countries had showed higher male leprosy cases over female leprosy cases. Female leprosy cases dominance in Indonesia showed bigger effect on female due to stigma and discrimination towards the disease.[6] Moreover, female in developing countries tend to be underdiagnosed and hard to access health treatment in health facility.[7] The dominant role of women in taking care of their family increase the risk to transmit the disease, especially to their children.

The relatively stabil of new leprosy cases number, especially in children aged below 15 years old indicates the failure to stop the leprosy transmission, increased prevalence in general population, and poor monitoring programs.[8] Despite rarely being lethal, leprosy cause varies problems; ranging skin and peripheral nerves manifestations, deformity, stigma, and affects the social and economic aspect of the patient.[9] Eradication strategy of leprosy cases needs to be thorough and involve not only microbiology aspect but also factors related to the host aspect.

Previous studies showed the close relation between socioeconomic conditions and leprosy incidence. Population lived in endemic areas faced poverty, population density, poor house conditions that can be risk factors to the development of *M.leprae* and their transmission due to prolonged and intense close contact.[10–12] Family income and occupation are related to the welfare of the family, the ability to fulfill health and nutrition needs through foods, and household conditions such as number of people living together.[13] Household density can increase the risk of leprosy transmission through person to person contact.[13] The risk of developing leprosy is 5-10 times higher if one member of the family has developed the disease.[12]

Despite of several studies on socioeconomic factors related to leprosy, the research about socioeconomic factors focusing on the incidence of maternal and child leprosy is still lacking, especially in Indonesia. Thus, this paper aims to analyze the socioeconomic factors related to the maternal and child leprosy incidence in endemic areas.

Materials and Methods

Study area and population

The study was conducted from March until June 2020 in 10 sub-districts in Tuban Regency, East Java Province. Tuban Regency is one of nine leprosy pockets left in East Java. This regency is considered a leprosy pocket area, with 172 cases in 2018 of which 5.81% cases were cases among children.[5] These 10 areas across 10 sub-districts (Bulu, Jenu, Jetak, Kerek, Palang, Soko, Sumurgung, Tambakboyo, Temandang, Tuban) are considered endemic areas of leprosy, where in the last 5 years there are always new cases every year.

Cases from the local primary health center's registry data. The inclusion criteria for child subject with leprosy was those with confirmed diagnosis of leprosy and aged between 5-18 years old for children and women in childbearing age 20-49 years old for maternal leprosy; while the excluded were those with any leprosy reaction, poor general condition, and diagnosed with inflammatory or autoimmune disorder, allergy, or infection other than leprosy, and pregnancy. All of the subjects were given informed consent. The subjects underwent clinical examination done by a dermatologist and then acid-fast staining by trained health and laboratory professional from Dr Soetomo General Hospital and Tropical Disease Centre of Airlangga University to confirm the diagnosis. Controls were selected from mothers and children who visit the same primary health centers for other than skin problems and live in the same sub-districts.

Data collection: A structured questionnaire was used to collect socioeconomic data from cases and controls. The data obtained included father's education, mother's education, father's occupation, mother's occupation, and family income. Trained health professionals were responsible for interviewing cases and controls.

Data analysis: Data were analyzed using SPSS® software (IBM Corp., Armonk, New York, USA). Variables were analyzed using chi-square test and t-test/

mann-whitney test to assess the association between socioeconomic factors and leprosy in each maternal and child populations.

Ethical Considerations

The study protocol has been approved by the Health Research Committee of Dr Soetomo General Hospital, Surabaya (Ref. 1664/KEPK/XI/2019). Subjects were only included after written informed consent was obtained and they were reassured that non-participation would not affect their treatment.

Results and Discussion

The data was obtained from 22 pairs of cases and 57 pairs of controls in endemic areas. The data characteristic of this research subjects observed in table 1. Older mean age observed in both maternal and children leprosy groups. This can be caused from underdiagnosed of leprosy in women and chronic manifestation in children[14]

Table 1. Data Characteristics of Research Subjects

Subjects	Mothers	Children
	Mean Age ±SD	Mean Age±SD
Leprosy	42.41 ±7.397	16.32 ±3.242
Healthy	36.74 ±5.661	9.69± 3.706

The analysis of socioeconomic factors involved several indicators, such as education, occupation, and family income. The bivariate analysis results of education and occupation with the incidence of maternal leprosy are shown in table 2. From bivariate analysis, it can be concluded that father's education (*p* value= 0.023) associated with maternal leprosy incidence in endemic areas.

Table 2. Bivariate analysis of education and occupation with the incidence of maternal leprosy in endemic areas

Variables	Diagnosis		Total	p value
	Leprosy	Healthy		
Mother's Education				
Not Graduated from Junior High School	19 (70.4)	11 (40.7)	30	0.055
Graduated from Junior High School	8 (29.6)	16 (59.3)	24	
Father's Education				
Not Graduated from Junior High School	22 (81.5)	13 (48.1)	35	0.023
Graduated from Junior High School	5 (18.5)	14 (51.9)	19	
Father's Occupation				
Working	25 (92.6)	24 (88.9)	49	1
Not Working	2 (7.4)	3 (11.1)	5	
Mother's Occupation				
Working	17 (63.0)	13 (48.1)	30	0.411
Not Working	10 (37.0)	14 (51.9)	24	

The bivariate analysis results of education and occupation with the incidence of children leprosy are shown in table 3. From bivariate analysis, it can be concluded that mother's education (*p* value= 0.013) and father's education (*p* value= 0.003) associated with children leprosy incidence in endemic areas.

Table 3. Bivariate analysis of education and occupation with the incidence of children leprosy in endemic area

Variables	Diagnosis		Total	p value
	Leprosy	Healthy		
Father's Education				
Not Graduated from Junior High School	19 (86.4)	13 (48.1)	32	0.013
Graduated from Junior High School	3 (13.6)	14 (51.9)	17	
Mother's Education				
Not Graduated from Junior High School	19 (86.4)	11 (40.7)	30	0.003
Graduated from Junior High School	3 (13.6)	16 (59.3)	19	
Father's Occupation				
Working	19 (86.4)	24 (88.9)	43	0.147
Not Working	3 (13.6)	3 (11.1)	6	
Mother's Occupation				
Working	16 (72.7)	13 (48.1)	29	1
Not Working	6 (27.3)	14 (51.9)	20	

The bivariate analysis results of family income and the incidence of maternal leprosy are shown in table 4. From bivariate analysis, it can be concluded that family income associated with the incidence of maternal (p value= 0.040) and children leprosy (p value= 0.036) in endemic areas.

Table 4. Bivariate analysis of family income and the incidence of maternal and children leprosy in endemic areas

Variable	Mean Family Income (Millions Rp)		p value
	Leprosy	Healthy	
Mothers group Family Income	1.9±1771940.20	2.5±1846093.90	0.04
Children group Family Income	1.7±1108128.66	2.5±1846093.90	0.036

In this study we analyzed the association of socioeconomic factors (education, occupation, and family income) with the incidence of maternal and children leprosy in endemic areas in East Java, Indonesia. From our understanding, this is the first study that analyzed the association of socioeconomic factors and the incidence of maternal and children leprosy, spesifically in endemic areas. The results showed several factors are related to the incidence of maternal and children leprosy in endemic areas.

According to our data, education showed association with the incidence of leprosy. Significant results were

observed in father's education (p value= 0.023) with the incidence of maternal leprosy and mother's education (p value= 0.003) and father's education (p value= 0.013) with the incidence of children leprosy. This results is in accordance with previous study that showed higher education level could increase knowledge about healthy behavior, indicates the symptoms of the disease early, and supports to better environmental and health access that potentially could reduce the incidence and transmission of leprosy.[15,16] Other study conducted by Oktaria et al. also reported higher education level and its protective effects against leprosy.[17] Positive correlation between leprosy incidence and the number of population that couldn't read (alliteration) was reported in cross-sectional study in Brazil.[18] In children population, previous studies had reported that parents education, especially mother's education could influence parents decision to take their children infected with leprosy to receive treatment in health care facility and stop transmissions in the household contacts.[19,20] Moreover, higher education level also related to better family income.[17] In this study, control group showed more parents with higher education compared to the leprosy group (both in mothers and children population).

Furthermore, family income also associated with the incidence of maternal (p value= 0.040) and children leprosy (p value= 0.036). Higher family income was observed in the control group compared to the leprosy group (both in mothers and children population). This results is in line with study conducted by Kerr-Pontes et al that reported hunger and poverty are the characteristics of low income family that directly related to the incidence of leprosy.[12] Poverty that defined with low family income also correlated with the relatively stabil of new cases findings in the endemic areas.[21] Study conducted by Dwivedi et al. also reported low family income associated with low education level and family's poor ability to get enough food and fulfill nutrition needs.[22] Economic aspect also influence family to solve health problem, like leprosy.[23]

In this study, occupation was not showed significant association with the incidence of leprosy. This can be caused by the similarity of characteristics in occupation indicator in this subjects. Table 2 and 3 showed majority of the father's are working and the similarity of the not working mothers between the case and control group. The majority of occupation were high risk occupation such as farmer and labor, thus the not diverse data showed non-significant results.[24]

The present study has limitation in terms of the type of study, the number of subjects within group, and the area covered in this study. Nevertheless, to prevent and minimize the biases and ensure comparable groups, participants were included from the same area.

Conclusion

In conclusion, the results of our study showed that education and family income included in socioeconomic factors related to the incidence of maternal and children leprosy in endemic areas. Holistic and good understanding of socioeconomic characteristic of infected and high-risk populations in endemic areas could help on planning the elimination strategy. Further studies need to be conducted to analyze other socioeconomic factors that are not analyzed in this study.

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Ethical Clearance: The study protocol has been approved by the Health Research Committee of Dr Soetomo General Hospital, Surabaya (Ref. 1664/KEPK/XI/2019).

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References

1. Foss NT, Motta ACF. Leprosy, a neglected disease that causes a wide variety of clinical conditions in tropical countries. *Mem Inst Oswaldo Cruz*. Published online 2012. doi:10.1590/S0074-02762012000900006
2. Saunderson PR. Leprosy elimination: Not as straightforward as it seemed. *Public Health Rep*. 2008;123(2):213-216. doi:10.1177/003335490812300214
3. WHO. *Integrating Neglected Tropical Diseases into Global Health and Development: Fourth WHO Report on Neglected Tropical Diseases*.; 2017.

4. Kementerian Kesehatan Republik Indonesia. 2017. Pencegahan dan Pengendalian Penyakit Antraks di Indonesia. Jakarta: Kementerian Kesehatan Republik Indonesia.
5. Dinkes Provinsi Jawa Timur. *Profil Kesehatan Jawa Timur 2018*.; 2019. https://www.google.com/search?client=firefox-b-d&ei=zxpWXtieKq6c4-EPzvSfyAs&q=profil+kesehatan+jawa+timur+2018&oq=profil+kesehatan+jawa+timur+2018&gs_l=psy-ab.3..0i7i30l10.98332.105008..105951...0.4..0.1459.7810.2-1j0j2j2j2j3.....0....1..gws-wiz.....0i
6. van Brakel WH, Sihombing B, Djarir H, et al. Disability in people affected by leprosy: the role of impairment, activity, social participation, stigma and discrimination. *Glob Health Action*. 2012;5. doi:10.3402/gha.v5i0.18394
7. Sarkar R, Pradhan S. Leprosy and women. *Int J Women's Dermatology*. 2016;2(4):117-121. doi:10.1016/j.ijwd.2016.09.001
8. Santos SD, Penna GO, Costa M da CN, Natividade MS, Teixeira MG. Leprosy in children and adolescents under 15 years old in an urban centre in Brazil. *Mem Inst Oswaldo Cruz*. 2016;111(6):359-364. doi:10.1590/0074-02760160002
9. Tosepu R, Gunawan J, Effendy DS, Fadmi FR. Stigma and increase of leprosy cases in SouthEast Sulawesi Province, Indonesia. *Afr Health Sci*. 2018;18(1):29-31. doi:10.4314/ahs.v18i1.5
10. Vieira MCA, Nery JS, Paixão ES, Freitas de Andrade KV, Oliveira Penna G, Teixeira MG. Leprosy in children under 15 years of age in Brazil: A systematic review of the literature. *PLoS Negl Trop Dis*. Published online 2018. doi:10.1371/journal.pntd.0006788
11. Moet FJ, Pahan D, Schuring RP, Oskam L, Richardus JH. Physical distance, genetic relationship, age, and leprosy classification are independent risk factors for leprosy in contacts of patients with leprosy. *J Infect Dis*. 2006;193(3):346-353. doi:10.1086/499278
12. Kerr-Pontes LRS, Barreto ML, Evangelista CMN, Rodrigues LC, Heukelbach J, Feldmeier H. Socioeconomic, environmental, and behavioural risk factors for leprosy in North-east Brazil: Results of a case-control study. *Int J Epidemiol*. 2006;35(4):994-1000. doi:10.1093/ije/dyl072
13. Rahmah AH, Dharmawan R, Rahardjo SS. Socioeconomic, Environmental, and Behavioral Determinants of Leprosy in Kediri, East Java. *J Epidemiol Public Heal*. 2018;03(02):253-262. doi:10.26911/jepublichealth.2018.03.02.05
14. de Oliveira MBB, Diniz LM. Leprosy among children under 15 years of age: Literature review. *An Bras Dermatol*. 2016;91(2):196-203. doi:10.1590/abd1806-4841.20163661
15. Pescarini JM, Strina A, Nery JS, et al. Socioeconomic risk markers of leprosy in high-burden countries: A systematic review and meta-analysis. *PLoS Negl Trop Dis*. 2018;12(7). doi:10.1371/journal.pntd.0006622
16. Cordeiro TL, Frade MAC. Leprosy: Education as first priority. *J Neurosci Rural Pract*. 2014;5(5):S3-S4. doi:10.4103/0976-3147.145191
17. Oktaria S, Hurif NS, Naim W, Thio HB, Nijsten TEC, Richardus JH. Dietary diversity and poverty as risk factors for leprosy in Indonesia: A case-control study. *PLoS Negl Trop Dis*. 2018;12(3). doi:10.1371/journal.pntd.0006317
18. Freitas LRS, Duarte EC, Garcia LP. Leprosy in Brazil and its association with characteristics of municipalities: ecological study, 2009-2011. *Trop Med Int Health*. 2014;19(10):1216-1225. doi:10.1111/tmi.12362
19. Sales AM, Ponce de Leon A, Düppre NC, et al. Leprosy among patient contacts: A multilevel study of risk factors. *PLoS Negl Trop Dis*. 2011;5(3):1-6. doi:10.1371/journal.pntd.0001013
20. Vikram K, Vanneman R. Maternal Education and the Multidimensionality of Child Health Outcomes in India. *J Biosoc Sci*. 2018;176(1):139-148. doi:10.1117/12.2549369.Hyperspectral
21. Nyamogoba H, Mbuthia G, Mulambalah C. Endemicity and Increasing Incidence Of Leprosy In Kenya And Other World Epidemiologic Regions: A Review. *Afr J Health Sci*. 2019;32(3):38-62.
22. Dwivedi VP, Banerjee A, Das I, et al. Diet and nutrition: An important risk factor in leprosy. *Microb Pathog*. 2019;137(August):103714. doi:10.1016/j.micpath.2019.103714
23. Duarte MTC, Ayres JA, Simonetti JP. Socioeconomic and demographic profile of leprosy carriers attended in nursing consultations.

Rev Lat Am Enfermagem. Published online 2007. doi:10.1590/s0104-11692007000700010

24. Nardi SMT, Ikehara E, Pedro HSP, Paschoal VDA. Characterization of the profession/occupation of individuals affected by leprosy and the relationship with limitations in professional activities. *Indian J Lepr*. Published online 2012.