

Close Contact with Patients and Immunity Status as Major Risk Factors for Leprosy Among Adults

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ABSTRACT

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* that affects peripheral nerves, skin, the upper respiratory tract, eyes, and nasal mucosa. Despite global progress, it remains a public health problem in Indonesia. This study aimed to analyze the risk factors associated with leprosy among adults at UPT RSUD RAA Soewondo Pati in 2025. An analytical observational study with a case–control design was conducted involving 70 cases and 70 controls (1:1 ratio). Data were analyzed using Chi-square tests and multivariate logistic regression. In results, age ($p=0.007$), sex ($p=0.033$), close contact with leprosy patients ($p=0.005$), personal hygiene ($p=0.011$), and immunity status ($p=0.000$) were significantly associated with leprosy. Multivariate analysis identified close contact with leprosy patients (OR=8.3; 95% CI: 1.897–36.310) and immunity status (OR=6.2; 95% CI: 2.798–13.570) as the strongest predictors. In conclusion, close contact with leprosy patients and compromised immunity status are the major risk factors for leprosy among adults. Strengthening early detection, monitoring close contacts, improving personal hygiene, and enhancing community immunity are essential strategies to reduce transmission and prevent new cases.

Keywords: leprosy; risk factors; close contact

INTRODUCTION

Leprosy, or Hansen's disease, is a chronic infectious condition caused by *Mycobacterium leprae*, which primarily affects peripheral nerves, the skin, and other tissues, and may lead to permanent disability if not detected and treated early. Despite global progress in disease control, leprosy remains a public health problem in several developing countries [1]. The persistence of new cases indicates ongoing transmission within communities and highlights the need for continuous epidemiological monitoring.

Several factors have been identified as being associated with the occurrence of leprosy, including age, sex, history of close contact with leprosy patients, personal hygiene practices, and immunity status. These factors play an important role in increasing the likelihood of *M. leprae* transmission, particularly in environments where prolonged exposure and inadequate preventive measures are common [2]. Close contact with untreated or late-diagnosed cases is especially critical, as it facilitates bacterial transmission through respiratory droplets or prolonged skin-to-skin interaction.

Medical record data from UPT RSUD RAA Soewondo Pati indicate that leprosy cases among adults continue to be reported consistently. This pattern suggests that adult populations remain vulnerable and that existing prevention and control strategies may require strengthening. Therefore, research aimed at identifying risk factors associated with leprosy among adults is essential to support targeted interventions, improve early detection, and enhance community-based prevention programs.

The objective of this study is to analyze the association between age, sex, close contact with leprosy patients, personal hygiene, and immunity status with the occurrence of leprosy among adults at UPT RSUD RAA Soewondo Pati in 2025.

METHODS

This study employed an analytical observational design with a case–control approach and was conducted in July 2025 at UPT RSUD RAA Soewondo Pati. The case population consisted of adult patients aged 15–60 years who were diagnosed with leprosy based on bacteriological confirmation through skin smear (BTA) examination, whereas the control population comprised adult patients diagnosed with dermatological conditions other than leprosy. This design was selected to enable comparison between individuals with and without leprosy in order to identify factors associated with disease occurrence [1].

A total of 140 respondents were included in the study, consisting of 70 cases and 70 controls with a 1:1 ratio. Sampling for the case group was conducted using total sampling, ensuring that all eligible leprosy patients within the study period were included. Meanwhile, the control group was selected using consecutive sampling, in which eligible non-leprosy dermatology patients were recruited sequentially until the required sample size was achieved [2]. Inclusion criteria for the case group were adults aged 15–60 years with a confirmed leprosy diagnosis based on BTA examination and willingness to participate. For the control group, inclusion criteria included adults aged 15–60 years diagnosed with non-leprosy skin diseases and willingness to participate. Exclusion criteria for both groups included incomplete medical records and refusal to participate in the study.

Data collection utilized structured questionnaires and medical record data. The questionnaire captured demographic characteristics, behavioral factors, and exposure history, while medical records provided diagnostic confirmation and clinical information. Data analysis consisted of univariate analysis to describe

Table 1. Distribution of research variables based on risk factors for leprosy among adults at UPT RSUD RAA Soewondo Pati, 2025

Variable	Cases	Controls	Total
Age			
Full adulthood (26–60 years)	69 (53.9%)	59 (46.1%)	128 (100%)
Early adulthood (15–25 years)	1 (8.3%)	11 (91.7%)	12 (100%)
Sex			
Female	31 (63.3%)	18 (36.7%)	49 (100%)
Male	39 (42.9%)	52 (57.1%)	91 (100%)
Close contact with leprosy patients			
Close	15 (83.3%)	3 (16.7%)	18 (100%)
Not close	55 (45.1%)	67 (54.9%)	122 (100%)
Personal hygiene			
Poor	47 (60.3%)	31 (39.7%)	78 (100%)
Good	23 (37.1%)	39 (62.9%)	62 (100%)
Immunity status			
Poor	50 (71.4%)	20 (28.6%)	70 (100%)
Good	20 (28.6%)	50 (71.4%)	70 (100%)

respondent characteristics, bivariate analysis using the Chi-square test to assess associations between independent variables and leprosy occurrence, and multivariate analysis using multiple logistic regression to identify the most influential risk factors while controlling for potential confounders [3].

RESULTS

The distribution of research variables related to risk factors for leprosy among adults at UPT RSUD RAA Soewondo Pati is presented in Table 1. The distribution of respondent characteristics shows that most leprosy cases occurred among individuals in full adulthood (26–60 years), accounting for 53.9%. By sex, leprosy cases were more common among females (63.3%). A history of close contact with leprosy patients (83.3%), poor personal hygiene (60.3%), and poor immunity status (71.4%) were more frequently found in the case group than in the control group [1].

The results of the bivariate analysis of independent variables associated with leprosy are presented in Table 2. Bivariate analysis showed significant associations between age ($p=0.007$), sex ($p=0.033$), close contact with leprosy patients ($p=0.005$), personal hygiene ($p=0.011$), and immunity status ($p=0.000$) with leprosy occurrence [2].

Variables with $p < 0.25$ in the bivariate analysis were included in the multivariate logistic regression model (Table 3). All five variables were included in the initial multivariate model. In Table 4, personal hygiene ($p=0.749$) was removed from the next model. In Table 5, sex ($p=0.198$) was removed from the final model. In Table 6, multivariate analysis showed that the most dominant factors associated with leprosy were close contact with leprosy patients (OR = 8.3; 95% CI: 1.897–36.310) and immunity status (OR = 6.2; 95% CI: 2.798–13.570) [3].

DISCUSSION

The findings of this study at UPT RSUD RAA Soewondo Pati in 2025 demonstrate clear variations in the occurrence of leprosy across different age groups. Respondents were categorized into early adulthood (15–25 years) and full adulthood (26–60 years) to assess the influence of productive-age stages on exposure risk. Most leprosy cases were identified among individuals in full adulthood, indicating that as age increases, the likelihood of exposure to *Mycobacterium leprae* also tends to rise due to greater social interaction, occupational engagement, and cumulative environmental exposure [3,4]. This pattern aligns with previous research showing that the majority of leprosy patients fall within the productive age range, where mobility, work responsibilities, and community participation are typically higher.

Differences in the proportion of cases between early and full adulthood may be attributed to variations in activity levels, mobility patterns, and duration of exposure to infected individuals. Adults in the productive age group are more frequently involved in economic activities, caregiving roles, and community interactions, all of which increase opportunities for contact with undiagnosed or untreated leprosy cases [5]. These findings reinforce the notion that leprosy transmission is strongly influenced by behavioral and social determinants rather than biological susceptibility alone.

The prevalence of leprosy among adults in this study reached 91.4%, with a higher proportion of cases occurring among females compared to males. This finding contrasts with earlier studies reporting that males are generally more susceptible to leprosy [9]. Such discrepancies suggest that vulnerability to leprosy is context-specific and shaped by sociocultural norms, gender roles, and differential access to healthcare services. In the context of Pati Regency, women often carry dual responsibilities in domestic work and informal economic activities, which may increase their exposure to unhygienic environments and elevate their risk of contact with infectious sources [6]. These gender-related dynamics highlight the importance of considering local social structures when interpreting epidemiological patterns.

Multivariate analysis revealed that close contact with leprosy patients and immunity status were significantly associated with leprosy occurrence ($p < 0.05$). Individuals with a history of close contact had an 8.3-fold higher risk of developing leprosy compared to those without such contact. This finding underscores the central role of direct exposure in the transmission of *M. leprae*, particularly in households or communities

Table 2. Bivariate analysis of risk factors associated with leprosy among adults at UPT RSUD RAA Soewondo Pati, 2025

Variable	Cases	Controls	p-value	OR (95% CI)
Age				
Full adulthood (26–60 years)	69 (53.9%)	59 (46.1%)	0.007	12.9 (1.613–102.603)
Early adulthood (15–25 years)	1 (8.3%)	11 (91.7%)		
Sex				
Female	31 (63.3%)	18 (36.7%)	0.033	2.3 (1.125–4.689)
Male	39 (42.9%)	52 (57.1%)		
Close contact with leprosy patients				
Close	15 (83.3%)	3 (16.7%)	0.005	6.091 (1.677–22.124)
Not close	55 (45.1%)	67 (54.9%)		
Personal hygiene				
Poor	47 (60.3%)	31 (39.7%)	0.011	2.571 (1.294–5.107)
Good	23 (37.1%)	39 (62.9%)		
Immunity status				
Poor	50 (71.4%)	20 (28.6%)	0.000	6.250 (3.002–13.013)
Good	20 (28.6%)	50 (71.4%)		

Table 3. Variable selection based on bivariate analysis

No.	Variable	p-value	Candidate
1	Age	0.007 ($p < 0.25$)	√
2	Sex	0.033 ($p < 0.25$)	√
3	Close contact	0.005 ($p < 0.25$)	√
4	Personal hygiene	0.011 ($p < 0.25$)	√
5	Immunity status	0.000 ($p < 0.25$)	√

Table 4. Multivariate logistic regression analysis (Model 1)

No.	Variable	p-value	OR	95% CI
1	Age	0.050	8.616	0.996–74.538
2	Sex	0.205	1.730	0.742–4.035
3	Close contact	0.005	8.480	1.895–37.945
4	Personal hygiene	0.749	1.160	0.468–2.879
5	Immunity status	0.000	5.165	2.080–12.827

Table 5. Multivariate logistic regression analysis (Model 2)

No.	Variable	p-value	OR	95% CI
1	Age	0.051	8.568	0.990–74.152
2	Sex	0.198	1.742	0.748–4.058
3	Close contact	0.005	8.306	1.879–36.712
4	Immunity status	0.000	5.544	2.479–12.397

Table 6. Multivariate logistic regression analysis (Model 3)

No.	Variable	p-value	OR	95% CI
1	Age	0.049	8.999	1.015–79.817
2	Close contact	0.005	8.299	1.897–36.310
3	Immunity status	0.000	6.162	2.798–13.570

where prolonged interaction occurs. Similarly, individuals with compromised immunity were found to be substantially more vulnerable to infection, indicating that host defense mechanisms play a critical role in determining susceptibility.

Previous studies have reported that individuals with poor personal hygiene have a 12.1-fold higher risk of developing leprosy compared to those who maintain good hygiene practices [7]. Poor hygiene—such as infrequent bathing, wearing unclean clothing, or living in unsanitary environments—facilitates bacterial entry and persistence. Moreover, inadequate hygiene is often associated with lower educational attainment and limited health awareness, which may delay early detection and treatment. Although personal hygiene did not remain significant in the final multivariate model of this study, its role as a contributing factor should not be overlooked, particularly in settings with limited sanitation infrastructure.

Individuals with low immunity were found to have a 6.2-fold higher risk of leprosy. In contrast, variables such as age, sex, and personal hygiene did not show significant effects in the final model ($p > 0.25$), indicating that leprosy transmission is more strongly influenced by the intensity of exposure and the host's immune capacity than by demographic characteristics. These findings emphasize that leprosy is not merely a function of age or sex but is driven by biological vulnerability and patterns of interpersonal contact.

Overall, the results of this study highlight that close contact with leprosy patients and immunity status are the primary determinants of leprosy among adults in the productive age group. Consequently, prevention efforts should prioritize continuous monitoring of close contacts, strengthening community immunity through improved nutrition and health education, and enhancing active surveillance and early case detection to interrupt transmission chains within the community.

This study has several limitations. The case-control design does not allow for establishing direct causal relationships, as exposure and outcome are measured retrospectively. Additionally, data on personal hygiene and contact history were collected through questionnaires, which may introduce information bias due to recall inaccuracies or social desirability. The study was also conducted at a single healthcare facility, which may limit the generalizability of the findings to broader populations with different demographic or environmental characteristics. Future research involving multiple centers and longitudinal designs is recommended to strengthen the evidence base and provide more comprehensive insights into leprosy transmission dynamics.

CONCLUSION

The findings of this study indicate that age, sex, close contact with leprosy patients, personal hygiene, and immunity status are associated with the occurrence of leprosy among adults. Among these variables, the most dominant factors were close contact with confirmed leprosy patients and immunity status, both of which showed the strongest association with leprosy incidence.

Ethical consideration, competing interest and source of funding

-Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Public Health, Universitas Mohammad Husni Thamrin, under approval number 058/S.Ket/KEPK/UMHT/VII/2025. All respondents provided informed consent prior to participation, and confidentiality of personal data was strictly maintained throughout the research process.

-There is no conflict of interest related to this publication.

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