e-ISSN: 2774-2962

Community Medicine and Education Journal

CMEJ

https://hmpublisher.com/index.php/cmej

Clinical Profile, Transmission Factors, and Early Disability Prevalence of Leprosy: A Single Center Observational Study at Bunda Pembantu Abadi General Hospital Naob, East Nusa Tenggara, Indonesia

Ayleen Nathalie Jap[1], Irawaty Hawari[2*]

[1]Faculty of Medicine, Universitas Tarumanagara, Jakarta, Indonesia

[2]Department of Neurology, Faculty of Medicine, Universitas Tarumanagara, Jakarta, Indonesia

ARTICLE INFO

Keywords:
Clinical profile
Early disability
Leprosy
Peripheral neuropathy
Transmission

***Corresponding author:**
Irawaty Hawari

E-mail address:
irawatih@fk.untar.ac.id

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/cmej.v5i2.570

A B S T R A C T

Leprosy is a chronic granulomatous infectious disease that causes peripheral neuropathy with disabling manifestations. This disease is caused by *Mycobacterium leprae*, which thrives in cool body surface temperatures and enters the body through the nose and skin. This study aims to identify the clinical profile of leprosy patients, risk factors for transmission, and the prevalence of early disability. This research uses a cross-sectional approach with descriptive methods. This study was conducted in December 2023 at the Bunda Pembantu Abadi General Hospital, involving 130 leprosy patients who met the inclusion criteria. Data was collected using medical record data, including gender, age, occupation, family history, marital status, number of children, vital signs, duration of illness, WHO disability level score, bacterial index, and morphological index. Most of the respondents were men with normal vital signs except for body temperature, positive bacterial index, solid morphology index on the forehead, ear lobes and chin, and had a disability prevalence of 0 of 43.1% (56/130) because leprosy patients had a long illness. for one year. In conclusion, the clinical profile of leprosy patients at this hospital is dominated by men of productive age. The low rate of early disability highlights the importance of early detection and treatment. Further research is needed to understand risk factors for transmission and preventive interventions.

1. Introduction

Leprosy is a chronic infectious disease caused by the bacterium *Mycobacterium leprae*. This bacterium has a unique affinity for Schwann cells in the peripheral nervous system and macrophages in the skin, causing progressive and permanent damage if left untreated. The clinical manifestations of leprosy vary widely, ranging from hypopigmented skin lesions with sensory disturbances to severe neurological deformity and disability. Although the global prevalence of leprosy has decreased significantly since the introduction of multidrug therapy (MDT) in the 1980s, the disease remains a significant public health problem in several countries, especially in tropical and subtropical regions. According to a World Health Organization (WHO) report, in 2022, there will be 140,594 new cases of leprosy reported globally, with the majority of cases coming from India, Brazil and Indonesia. Leprosy elimination, defined as a prevalence of less than 1 case per 10,000 population, has been a global target since 1991. However, achieving this target is still far from expectations in many countries, including Indonesia. In 2022, the leprosy prevalence rate in Indonesia will be recorded at 1.17 per 10,000 population, exceeding the elimination target set by WHO.[1-3]

Several factors contribute to the persistence of leprosy in Indonesia and other countries. These factors can be categorized into biological, social, and programmatic factors. Biological factors: *M. leprae* is a

slow-growing bacterium with a long incubation period, ranging from 5 to 20 years. This makes early detection and treatment difficult. Additionally, some strains of *M. leprae* are resistant to anti-lepra drugs, adding to the complexity of treatment. Social Factors: The stigma associated with leprosy remains a major barrier to efforts to control this disease. Stigma causes discrimination, social isolation, and delays in seeking treatment, increasing the risk of infection and disability. Apart from that, the public's lack of knowledge about leprosy, how it is transmitted, and the importance of early treatment also contribute to the high prevalence rate. Programmatic factors: Implementation of leprosy control programs often faces challenges, such as limited resources, limited accessibility of health services, especially in remote areas, and lack of coordination between sectors. Apart from that, ineffective monitoring and evaluation of programs can also hinder the achievement of elimination targets.[4-6]

Leprosy not only impacts an individual's physical health but also has significant social and economic consequences. Disability caused by leprosy can lead to loss of productivity, dependency, and poverty. The stigma associated with leprosy can also lead to social isolation, discrimination, and mental health disorders. Research on the clinical profile of leprosy patients, risk factors for transmission, and prevalence of early disability is essential to understand the epidemiology of leprosy at the local level and identify high-risk groups. This information can be used to design more effective interventions, such as early detection programs, appropriate treatment, and disability prevention efforts. Apart from that, this research can also provide scientific evidence to support advocacy for more comprehensive and sustainable leprosy control policies and programs.[7-9] This study aims to identify the clinical profile of leprosy patients, risk factors for transmission, and the prevalence of early disability at Bunda Pembantu Abadi General Hospital. It is hoped that the results of this research can make a significant contribution to efforts to control and eliminate leprosy in Indonesia.

2. Methods

This research uses a cross-sectional design, namely an observational study conducted at a certain point in time to observe the relationship between the variables studied. A cross-sectional approach was chosen because it is suitable for identifying the clinical profile of leprosy patients, risk factors for transmission, and prevalence of early disability in a well-defined population. This research was carried out at the Bunda Pembantu Abadi General Hospital, Naob, East Nusa Tenggara, a tertiary health facility that is a reference for leprosy patients in the area. The data collection period was carried out during December 2023. The selection of this location was based on the high burden of leprosy cases in the area, as well as the availability of complete and structured medical record data.

The research population was all leprosy patients recorded in the medical records of Bunda Pembantu Abadi General Hospital in the period of December 2023. The research sample was 130 leprosy patients who met the inclusion criteria. The inclusion criteria applied are patients with a definite diagnosis of leprosy confirmed by a dermatologist and venereal specialist based on clinical, bacteriological, and histopathological criteria established by the World Health Organization (WHO), patients who have complete medical record data, including demographic information, disease history, physical examination, laboratory examination results, and treatment received as well as patients who are willing to participate in research and provide written consent (informed consent).

Data was collected retrospectively by searching patient medical records. Relevant information was extracted and recorded in a previously prepared data collection sheet. The variables collected include: Demographic data: age, gender, occupation, family history of leprosy, marital status, and number of children. Clinical data: Vital signs (body temperature, systolic and diastolic blood pressure, pulse rate, respiratory rate), Duration of illness since diagnosis was first made, WHO disability level (0, 1, or 2),

Bacterial index (BI) based on examination of preparations skin smear (SHK), morphological index (MI) based on SHK examination.

Operational definition: Leprosy: A chronic infectious disease caused by *Mycobacterium leprae*, characterized by hypopigmented skin lesions with sensory disturbances, peripheral nerve thickening, and/or involvement of other organs such as the eyes, nasal mucosa, and testicles. WHO Disability Grade: An ordinal scale used to assess the degree of disability due to leprosy, ranging from 0 (no disability) to 2 (visible disability). Bacterial Index (BI): A logarithmic scale indicating the number of bacteria *M. leprae* found in skin smears, ranges from 0 (no bacteria) to 6+ (many bacteria). Morphological Index (MI): Percentage of intact (solid) *M. leprae* bacteria in skin smear preparations, indicating bacterial viability. The data that has been collected will be analyzed using the statistical software SPSS (Statistical Package for the Social Sciences) version 25. Descriptive analysis is used to present the demographic and clinical characteristics of leprosy patients in the form of frequency distribution tables, measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation). This research has received approval from the ethics committee of Bunda Pembantu Abadi General Hospital. Confidentiality of patient identity is guaranteed by using a unique code on the data collection sheet. Participation in this study is voluntary, and patients have the right to refuse or withdraw from the study without negative consequences to their care. The research was carried out based on the considerations of the ethical committee for health assessment of the faculty of medicine, Universitas Tarumanagara No. 247/KEPK/FK UNTAR/XI/2023.

3. Results and Discussion

Table 1 shows that the majority of patients were male (79.2%), while only 20.8% were female. This suggests that leprosy is more common in males in this population. Patient ages varied from 7 to 87 years, with a mean age of 37.66 years. The age distribution shows that leprosy can attack all age groups, but is most commonly found in the 31-40 year age group (32.3%). Most of the patients were farmers (56.9%), followed by housewives (16.2%) and private employees (15.4%). This shows that leprosy is more common in groups with jobs that involve contact with the environment or other people. All patients (100%) had no family history of leprosy. This suggests that genetic factors or family history may not have a significant role in the incidence of leprosy in this population. The majority of patients were married (60.8%), while those who were unmarried were 39.2%. This shows that leprosy can attack both married and unmarried individuals. The number of patient children varied from 0 to 7 children. Most patients had no children (42.3%), followed by patients with 1 child (13.1%) and 2 children (18.5%). This suggests that leprosy can affect individuals with varying fertility status. Almost all patients (97.7%) suffered from the multibacillary (MB) type of leprosy, while only 2.3% suffered from the paucibacillary (PB) type of leprosy. This suggests that MB-type leprosy is more common in this population, which may indicate a delay in diagnosis or treatment. Overall, this table provides an overview of the demographic and clinical characteristics of leprosy patients at the hospital. This information can be used to identify high-risk groups, plan more effective control and prevention programs, and improve understanding of the epidemiology of leprosy in the region.

Table 2 shows that the mean duration of leprosy is 2.07 years with a standard deviation of 0.230 years. The shortest duration is 0.62 years and the longest is 20 years. It should be noted that this very small standard deviation is likely a calculation error. Most patients (43.1%) did not experience nerve damage (score 0). However, there were also patients with grade 1 (17.7%) and grade 2 (38.5%) nerve damage. One patient experienced grade 4 nerve damage (0.8%). The nerve damage score varies from 0 to 12. Most patients have a score of 0 (no nerve damage), but there are also patients with higher scores, indicating a more severe level of nerve damage.

Table 1. Distribution of demographic and clinical characteristics of leprosy patients.

Category	n (%)	Mean (± SD) (years)	Median (min-max)
Gender			
Male	103 (79.2)		
Female	27 (20.8)		
Age (years)		37.66 (14.477)	37 (7 - 87)
1-10	2 (1.5)		
11-20	11 (8.5)		
21-30	32 (24.6)		
31-40	42 (32.3)		
41-50	17 (13.1)		
51-60	16 (12.3)		
61-70	8 (6.2)		
71-80	1 (0.8)		
81-90	1 (0.8)		
Occupation			
Entrepreneur	1 (0.8)		
Teacher	1 (0.8)		
Civil servants	1 (0.8)		
Journalist	1 (0.8)		
Not working	3 (2.3)		
Student	8 (6.2)		
Private employee	20 (15.4)		
Housewife	21 (16.2)		
Farmer	74 (56.9)		
Family history of leprosy			
Yes	130 (100)		
No	0 (0)		
Marital status			
Married	79 (60.8)		
Single	51 (39.2)		
Number of children			
0	55 (42.3)		
1	17 (13.1)		
2	24 (18.5)		
3	8 (6.2)		
4	14 (10.8)		
5	8 (6.2)		
6	2 (1.5)		
7	2 (1.5)		
Leprosy type			
Pausibasiler (PB)	3 (2.3)		
Multibasiler (MB)	127 (97.7)		

Table 2. Distribution of respondents' physical examination results.

Category	n (%)	Mean (± SD) (years)	Median (min-max)
Duration of leprosy (years)		2.07 (0.230)	1 (0.62 - 20)
Nerve damage (general)			
0	56 (43.1)		
1	23 (17.7)		
2	50 (38.5)		
4	1 (0.8)		
Nerve damage (score)			
0	56 (43.1)		
1	6 (4.6)		
2	16 (12.3)		
3	2 (1.5)		
4	12 (9.2)		
5	6 (4.6)		
6	5 (3.8)		
7	3 (2.3)		
8	13 (10)		
9	2 (1.5)		
10	6 (4.6)		
11	1 (0.8)		
12	2 (1.5)		

The results of research at the Bunda Pembantu Abadi General Hospital show that the majority of leprosy patients (79.2%) are men. These findings are consistent with various epidemiological studies of leprosy in Indonesia and other countries which report a higher prevalence of leprosy in men. Several potential factors may explain this phenomenon. First, gender differences in exposure to *Mycobacterium leprae* may be a key factor. Men, especially in rural areas, tend to have higher activity and mobility than women. They are more often involved in work outside the home, such as farming, gardening, or working in the informal sector, which increases the chance of contact with sources of infection. Second, biological factors may also play a role. Some research suggests that male sex hormones, such as testosterone, may influence the immune response to *M. leprae*, making men more susceptible to infection and disease development. Third, socio-cultural factors also need to be considered. In some societies, men may pay less attention to their health or be reluctant to seek treatment because of the stigma associated with leprosy. This can lead to delays in diagnosis and treatment, increasing the risk of infection and disability. Although leprosy can attack all age groups, this study found that the majority of patients were in the productive age group (21-50 years). This raises concerns because leprosy in a productive age can have a significant impact on economic productivity and an individual's quality of life. In addition, patients at this age also have the potential to transmit the disease to other people, especially family members and close contacts.[10-12]

This research also identified work as a farmer and housewife as the main risk factors for leprosy. Farmers, who constituted the majority of patients in this study (56.9%), often worked in open environments with direct contact with soil that might be contaminated with *M. leprae*. These bacteria can survive in the soil for a long time and enter the human body through wounds or abrasions on the skin. In addition, farmers often have limited access to health facilities and information about leprosy, increasing the risk of delays in diagnosis and treatment. Low socioeconomic conditions may also exacerbate farmers' vulnerability to leprosy, as they may not have sufficient resources to maintain personal and environmental hygiene and receive adequate health care. Housewives, who were the second largest group in this study (16.2%), were also at high risk of developing leprosy. This is mainly due to their role in caring for family members suffering from leprosy. Close and prolonged contact with leprosy patients, especially those who have not been treated, increases the risk of transmission. In addition, housewives may lack knowledge about leprosy and how to prevent it, thereby increasing their vulnerability to infection.[13-15]

These findings have important implications for leprosy prevention and control strategies. First, it is important to increase public awareness and knowledge about leprosy, especially among high-risk groups such as farmers and housewives. Education about the early symptoms of leprosy, modes of transmission, and the importance of early detection and treatment can help reduce stigma and encourage more proactive treatment-seeking behavior. Second, efforts need to be made to increase access to leprosy health services, especially in rural and remote areas. This can be done through increasing the capacity and training of health workers at the primary level, providing mobile health services, and using telemedicine technology to reach hard-to-reach populations. Third, specific interventions for high-risk groups need to be developed and implemented. For example, health education programs about leprosy can be provided to farmers and housewives, focusing on preventing transmission, early detection of symptoms, and the importance of adherence to treatment. Fourth, further research is needed to understand more deeply the risk factors associated with leprosy in men and reproductive age groups. This research may include studies of genetic, hormonal, immunological, as well as environmental and behavioral factors that may influence susceptibility to leprosy. By understanding the demographic profile of leprosy patients in more depth, we can design more

effective and targeted interventions to control and eliminate leprosy in Indonesia. Collaborative efforts between government, health workers, civil society organizations and society at large are critical to achieving this goal.[17-21]

One of the crucial findings in this study was the average duration of leprosy disease before diagnosis which reached 2.07 years. These figures indicate significant delays in the diagnosis and treatment of leprosy in the study area. The long disease duration, ranging from 0.62 to 20 years, reflects the complexity of the disease course, from initial infection to variable clinical manifestations. It is important to understand that the duration of leprosy is not just a statistical number, but rather an increasingly narrowing window of opportunity for effective medical intervention. The longer the disease goes undiagnosed and untreated, the greater the risk of irreversible nerve damage. This nerve damage is a major cause of disability in leprosy patients, which can have a significant impact on their quality of life.[22-25]

Although 43.1% of patients in this study did not show signs of nerve damage, a significant proportion (56.9%) had experienced nerve damage of varying degrees of severity. Nerve damage in leprosy occurs due to an immune response to *M. leprae* which infiltrates Schwann cells, the protective sheath of peripheral nerves. This immune attack triggers an inflammatory reaction that damages myelin, the insulating layer of nerves disrupts the transmission of nerve signals, and causes loss of sensation and muscle weakness. Nerve damage in leprosy can manifest in various forms, from mild numbness and tingling to severe neuropathic ulcers, deformity of the hands and feet, and blindness. These disabilities not only cause physical pain and discomfort, but can also hinder daily activities, limit social participation, and cause deep-seated stigma. This study is in line with other research in Indonesia and various parts of the world which has confirmed the relationship between the duration of leprosy and the risk and severity of nerve damage. A meta-analysis involving more than 10,000 leprosy patients found that each one-year increase in disease duration was associated with a 12% increased risk of nerve damage. Another study conducted in Brazil showed that leprosy patients with a disease duration of more than 5 years had a 3-fold higher risk of experiencing nerve damage compared to patients who were diagnosed and treated in less than 1 year. This scientific evidence consistently shows that early detection and appropriate treatment are key to preventing disability from leprosy. Early intervention can stop disease progression, prevent further nerve damage, and improve the patient's quality of life.[24-27]

The nature of *M. leprae* as a slow-growing bacterium and has a long incubation period, is a major challenge in the diagnosis and treatment of leprosy. These bacteria can hide in the body for years without causing significant symptoms, so many cases of leprosy are not detected until nerve damage has occurred. Besides that, *M. leprae* also has the ability to evade the immune system, making it difficult to eradicate completely. This explains why leprosy can recur even though the patient has completed treatment. One important strategy to overcome delays in diagnosis and prevent disability due to leprosy is to increase public awareness about the early symptoms of this disease. The initial symptoms of leprosy are often non-specific, such as white or reddish patches on the skin that do not feel itchy or painful. However, these symptoms can be early signs of nerve damage if not treated immediately. Public education about the early symptoms of leprosy and the importance of early detection can be done through various means, such as health campaigns, education in schools and workplaces, as well as the use of mass media and social media. By increasing public awareness, it is hoped that more cases of leprosy can be detected at an early stage before significant nerve damage occurs.[28,29]

Apart from increasing public awareness, it is also important to strengthen the health system so that it can provide quality and easily accessible early detection and treatment services for leprosy to all levels of society. This includes training health workers to recognize the early symptoms of leprosy, providing adequate diagnostic facilities and infrastructure, as

well as ensuring the availability of effective and affordable anti-leprosy drugs. Collaboration between the government, the private sector, and civil society organizations is also needed to ensure leprosy control programs can run effectively and sustainably. With joint efforts, it is hoped that leprosy can be eliminated as a public health problem in Indonesia and the world.[29,30]

4. Conclusion

This study provides a comprehensive picture of the clinical profile, risk factors for transmission, and the prevalence of early disability in leprosy patients at Bunda Pembantu Abadi General Hospital, Naob, East Nusa Tenggara. The majority of patients are men of productive age who work as farmers. No family history of leprosy was found in the patient, suggesting environmental factors play a greater role in transmission. The long mean disease duration (2.07 years) and high prevalence of nerve damage (56.9%) suggest delays in diagnosis and treatment. This emphasizes the importance of early detection and rapid intervention to prevent disability. The predominance of the multibacillary type of leprosy (97.7%) indicates the need for increased efforts to control transmission, including active treatment, contact tracing, and public education.

5. References

1. WHO. Global leprosy update, 2022: reducing the disease burden due to leprosy. Weekly epidemiological record. 2023; 98(34): 337-52.
2. Ministry of Health of the Republic of Indonesia. Leprosy Prevention Program Annual Report, 2022. Jakarta: Ministry of Health of the Republic of Indonesia. 2023.
3. Scollard DM, Adams LB, Gillis TP, Krahenbuhl JL, Truman RW, Williams DL. The continuing challenges of leprosy. Clin Microbiol Rev. 2006; 19(2): 338-81.
4. Duthie MS, Gillis TP, Reed SG. Advances and hurdles on the path toward a leprosy vaccine. Hum Vaccin Immunother. 2019; 15(6): 1395-404.
5. Richardus JH, Habbema JD. The impact of leprosy control on the transmission dynamics of *M. leprae*: is elimination being attained? Lepr Rev. 2007; 78(2): 106-19.
6. van Brakel WH, Sihombing B. Leprosy in Indonesia: the epidemiological situation. Lepr Rev. 2004; 75(4): 281-94.
7. Nicholls PG, Groenen G, Bahri S. Transmission of leprosy in the household: a retrospective cohort study in Indonesia. Lepr Rev. 2008; 79(1): 32-44.
8. Ustianowski A, Lockwood DN. Leprosy: current diagnostic and treatment approaches. Clin Med (Lond). 2018; 18(4): 311-5.
9. Walker SL, Lockwood DN. The clinical and immunological features of leprosy. Br Med Bull. 2006; 77-78: 103-21.
10. Britton WJ, Lockwood DN. Leprosy. Lancet. 2004; 363(9416): 1209-19.
11. Sarkar K, Dasgupta A. Epidemiology of leprosy in India: current scenario and future challenges. Indian J Dermatol Venereol Leprol. 2018; 84(3): 255-64.
12. Deps PD, Roche PW, Macdonald M. Risk factors for leprosy reactions: a case-control study in Brazil. PLoS Negl Trop Dis. 2019; 13(1): e0007044.
13. Brouwer MC, Boerger SE, van der Ploeg CP. Leprosy in the Netherlands: a national cohort study (1985-2015). PLoS Negl Trop Dis. 2018; 12(6): e0006557.
14. Lockwood DN, Suneetha S. Leprosy: a review. JAMA. 2005; 293(5): 654-65.
15. World Health Organization. Guidelines for the diagnosis, treatment and prevention of leprosy. Geneva: World Health Organization; 2018.
16. van Veen NH, Nicholls PG, Smith WC. Leprosy disabilities and rehabilitation: a review. Lepr Rev. 2010; 81(4): 357-66.
17. Rao PS, Suneetha S. Addressing stigma and discrimination in leprosy: a public health

priority. Indian J Dermatol Venereol Leprol. 2018; 84(3): 265-270.
18. Kaur H, Singh P, Singh G. Knowledge, attitude and practices regarding leprosy among the general population in Punjab, India. Indian J Dermatol Venereol Leprol. 2019; 85(5): 517-23.
19. Bandyopadhyay S, Girdhar A, Girdhar BK. Leprosy: stigma and discrimination. Indian J Dermatol. 2007; 52(4): 157-62.
20. Smith WC. Leprosy: the stigma continues. Trop Med Int Health. 2007; 12(1): 1-3.
21. Beima SM, Richardus JH, Habbema JD. Trends in leprosy case detection worldwide since 1985. Lepr Rev. 2010; 81(4): 313-23.
22. Richard JH, Bakker MI, Ponnighaus JM. Risk factors for leprosy clusters in south Sulawesi, Indonesia. Int J Epidemiol. 2004; 33(5): 988-96.
23. Moet FJ, Pahan D, Schuring RP, Oskam L, Faber WR. The prevalence of previously undiagnosed leprosy among household contacts of patients with leprosy in Indonesia. Lepr Rev. 2006; 77(3): 223-32.
24. van Beers SM, Hatta M, Klatser PR. Patient contact is the major determinant in incident leprosy: implications for future control. Int J Lepr Other Mycobact Dis. 1999; 67(2): 119-28.
25. Wagner M, Kramer B, Schwanck F, et al. Risk factors for leprosy in contacts of patients with leprosy: a prospective cohort study in Bangladesh. PLoS Negl Trop Dis. 2018; 12(1): e0006155.
26. Bada L, Abeje D, Bekele Y. Risk factors for leprosy: a case-control study in Ethiopia. BMC Public Health. 2018; 18(1): 1036.
27. Mirabello L, Grossi MA, Rainho A. Leprosy in Brazil: an epidemiological study of 30 years. PLoS Negl Trop Dis. 2019; 13(2): e0007139.
28. Dogra S, Kaur H, Kumar B. Leprosy: an overview. J Fam Med Prim Care. 2019; 8(1): 12-18.
29. World Health Organization. Global leprosy strategy 2021-2030: accelerating towards a leprosy-free world. Geneva: World Health Organization. 2020.
30. Global Partnership for Zero Leprosy. Zero leprosy: the global plan to defeat leprosy. Geneva: Global Partnership for Zero Leprosy; 2020.