

Association Between Adherence to Prevention of Disability (POD) and Disability Status Among Leprosy Patients at Kedaung Barat Public Health Center, 2023–2025

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Abstract

Introduction: Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* that can affect the skin, peripheral nerves, eyes, hands, and feet. Nerve damage that is not properly managed may lead to permanent disability and affect patients' quality of life. One Of the efforts to prevent disability is the disciplined implementation Of Prevention of Disability (POD).

Objective: This study aimed to determine the relationship between adherence to POD and disability grade among leprosy patients at Kedaung Barat Public Health Center in 2023–2025. **Method:** This study used an analytical quantitative design with a cross-sectional approach. The subjects were all leprosy patients in the working area of Kedaung Barat Public Health Center from January 2023 to December 2025 who met the inclusion and exclusion criteria, totaling 42 respondents. The sampling technique used was total sampling. **Result and Discussion:** Primary data were obtained through a POD adherence questionnaire, while secondary data were obtained from the patients' POD records. Data were analyzed using univariate and bivariate analyses with the Fisher-exact test. The results showed a significant relationship between POD adherence and the degree of disability among leprosy patients ($p\text{-value} = 0.003$). **Conclusion:** The Odds Ratio (OR) was 17.18. There is a statistically significant relationship between adherence to the implementation of Prevention of Disability (POD) and the degree of disability among leprosy patients.

Introduction

Leprosy, also known as Hansen's disease, is a chronic infectious disease caused by *Mycobacterium leprae* that primarily affects the skin, peripheral nerves, upper respiratory tract mucosa, and eyes. Leprosy patients are at risk of developing disabilities involving the eyes, hands, and feet due to damage to tissue structure and function. Disability is classified into three grades: grade 0 indicates no impairment, grade 1 represents sensory or motor nerve impairment without visible deformity, and grade 2 indicates visible disability, including visual impairment, wounds, ulcers, deformities of the fingers or toes, and tissue loss (Kementerian Kesehatan Republik Indonesia, 2020). Beyond physical impairments, the disease also causes substantial psychosocial consequences due to self-stigma among patients and negative perceptions within the community (Sholiha & Jatimi, 2024). In addition to its physical consequences, leprosy imposes considerable social and economic burdens because patients frequently experience social exclusion due to misconceptions that the disease is incurable or associated with supernatural causes. These conditions often result in unemployment and reduced household income among affected individuals and their families (Pratiwi et al., 2024).

One of the important factors associated with disability among leprosy patients is adherence to the Prevention of Disability (POD) program. Inadequate self-care may lead to progressive tissue damage because leprosy affects the peripheral nerves, skin, hands, feet, and eyes (Hannan et al., 2022). Routine self-care is therefore recommended to prevent disability and reduce its severity (Herawati, 2019). (Herawati, 2019) reported that leprosy patients with poor self-care practices had a twelve-fold higher risk of developing grade 2 disability compared with those who performed appropriate self-care. Disability assessment in leprosy patients is documented using the Prevention of Disability (POD) Book, which serves as a comprehensive guide for evaluating nerve function, muscle strength, eye function, and hand and foot function. The POD Book also records disability grades according to WHO indicators through examinations of both eyes, hands, and feet. Consistent and routine implementation of POD assessments is expected to reduce the risk of disability (Kementerian Kesehatan Republik Indonesia, 2019).

According to the World Health Organization (WHO), the number of new leprosy cases in Indonesia rose from 12,441 in 2022 to 14,376 in 2023, and increased further to 14,698 during the 2023–2024 period (World Health Organization, 2024, 2025a). Additionally, the number of new cases involving grade 2 disabilities also increased from 826 to 869 (World Health Organization, 2025b). Data from the Ministry of Health of the Republic of Indonesia indicates that the prevalence of leprosy in Banten Province rose from 0.62 to 0.63 between 2023 and 2024, while the rate of grade 2 disability reached 3.5 cases per 1,000,000 population in 2023 (Kementerian Kesehatan Republik Indonesia, 2024). According to the Banten Province Health Office, 791 leprosy cases were reported in 2024, with Tangerang Regency recording the highest number of cases (291 cases) (Dinas Kesehatan Provinsi Banten, 2025). A preliminary study based on data from the Tangerang Regency Health Office found that the Kedaung Barat Community Health Center (Puskesmas) recorded 28 leprosy cases in 2023, 21 cases in 2024, and 15 cases from the beginning of 2025 through November (Dinas Kesehatan Provinsi Banten, 2025).

Indonesia has implemented various strategies to reduce the burden of leprosy, including chemoprophylaxis and integrating leprosy screening into routine health programs. However, the COVID-19 pandemic disrupted detection activities, resulting in possible underreporting of cases. The incidence of grade 2 disability among new leprosy

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cases decreased from 6 per 1,000,000 population in 2000 to 2.47 per 1,000,000 population in 2021, although this figure may have been affected by the pandemic. Nevertheless, the World Health Organization continues to classify Indonesia as a country with a grade 2 disability rate exceeding 1 per 1,000,000 population. Recent evidence indicates that delayed case detection remains a major challenge because it is associated with progressive nerve damage, continued transmission of *Mycobacterium leprae*, and an increased risk of disability. Therefore, early detection remains the primary strategy for interrupting disease transmission and preventing disability among leprosy patients (Dharmawan et al., 2023).

The main components of the Prevention of Disability program include early detection and self-care. However, previous literature on POD adherence has predominantly emphasized self-care practices, while early detection has received comparatively less attention despite being considered the most effective intervention for preventing disability in leprosy. Consequently, case detection should remain a priority within leprosy control programs as part of disability prevention efforts (Dharmawan et al., 2023).

Therefore, this study aimed to examine the association between adherence to the Prevention of Disability (POD) program and disability status among leprosy patients at Kedaung Barat Public Health Center during 2023–2025. WHO disability grades were described as grades 0, 1, and 2; for the primary association analysis, grades 1 and 2 were combined as disability present because of the small number of grade 2 cases. The study was intended to estimate an association rather than a causal effect.

Method

This analytical study used a cross-sectional approach to examine the association between POD adherence and disability status among leprosy patients at Kedaung Barat Public Health Center, Tangerang Regency, Indonesia. Primary and secondary data were collected between February and April 2026. A total of 64 leprosy cases diagnosed between 2023 and 2025 were initially identified from the POD register and medical records. Patients were eligible for inclusion if they (1) were recorded as leprosy patients in the POD register at the public health center, (2) had their disability grade assessed by a physician at the public health center according to WHO criteria, and (3) were willing to participate in the study. Patients were excluded if they (1) were unwilling to participate or were uncooperative, (2) had incomplete information in the POD register or medical records, or (3) had moved to another residence or could not be contacted. After the inclusion and exclusion criteria were applied, 42 patients met the eligibility criteria and were included in the final analysis. Therefore, total sampling was applied, whereby all eligible patients were included in the study.

POD adherence was assessed using a 15-item questionnaire adapted and modified from the leprosy patient POD form and the original WHO self-care guidance used in the study. Six items were derived from the POD form and nine from WHO self-care guidance. Responses used a Guttman format (Yes=1; No=0), yielding a total score of 0–15. For pediatric participants, written consent was obtained from the mother, and the questionnaire was completed by the mother because she was directly involved in and familiar with the child's POD practices. Disability data were obtained from POD books and medical records using WHO disability grading. In routine care, disability grade was assessed at the beginning of treatment, during treatment, and at the end of treatment, followed by evaluation every three months during the first year and every six months

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during the second year after treatment completion. For the primary analysis reported in this manuscript, disability was categorized as grade 0 (no disability) and grades 1–2 (disability present). The available aggregate dataset did not permit analysis of individual disability trajectories.

Data were analyzed using Statistical Package for the Social Sciences (SPSS). Descriptive analysis summarized participant characteristics, POD adherence, and disability status. The POD adherence score was not normally distributed. Consistent with the original study analysis, the sample median of 13.5 was used as an operational cutoff to categorize POD adherence. Because no validated cutoff for POD adherence currently exists, the sample median was used solely as an operational classification for statistical analysis. Fisher's exact test was used because of sparse cells in the 2×2 table, with statistical significance set at $p < 0.05$. Crude effect estimates are reported. Multivariable analysis was not performed because only 10 participants had disability, which would make estimates from a model containing several covariates unstable. The study followed principles of voluntary participation, informed consent, confidentiality, beneficence, non-maleficence, and justice.

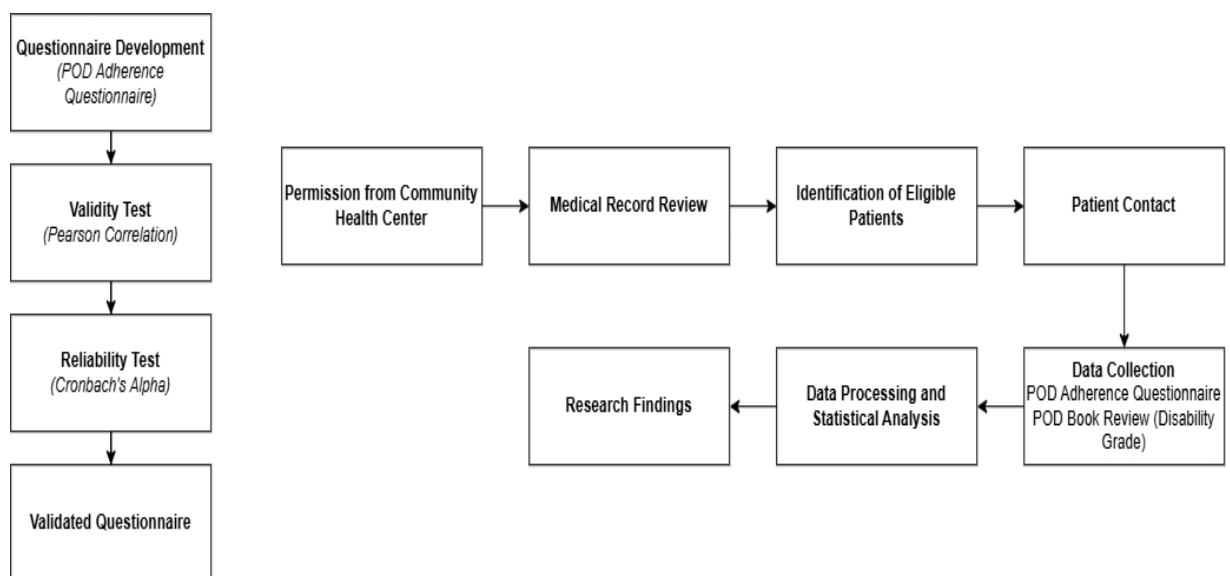


Figure 1. Research Workflow

Result and Discussion

1. Result

Questionnaire Validity and Reliability

Prior to the main study, the POD adherence questionnaire was evaluated for validity and reliability among 30 leprosy patients from Teluk Naga Public Health Center. These participants were independent of the 42 patients included in the main study. The instrument consisted of 15 dichotomous items, including six adapted from the leprosy patient POD form and nine from WHO self-care guidance. Item-total Pearson correlation coefficients ranged from 0.376 to 0.555 and exceeded the reference value of 0.361. Cronbach's alpha was 0.685, indicating moderate internal consistency. The psychometric findings support cautious use of the questionnaire in this study, while the adherence cut point itself has not been externally validated.

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Table 1
Validity Test Results of the POD Adherence Questionnaire

Question	Pearson's r	R-table	Interpretation
P1	0.376	0.3610	Valid
P2	0.398	0.3610	Valid
P3	0.448	0.3610	Valid
P4	0.451	0.3610	Valid
P5	0.406	0.3610	Valid
P6	0.555	0.3610	Valid
P7	0.386	0.3610	Valid
P8	0.428	0.3610	Valid
P9	0.405	0.3610	Valid
P10	0.441	0.3610	Valid
P11	0.424	0.3610	Valid
P12	0.442	0.3610	Valid
P13	0.444	0.3610	Valid
P14	0.457	0.3610	Valid
P15	0.406	0.3610	Valid

Respondent Characteristics

A total of 42 leprosy patients participated in this study. The respondents had a mean age of 34.95 ± 16.85 years, with ages ranging from 8 to 81 years. Based on the distribution of residence, most participants lived in Jatimulya and Sangiang villages, each accounting for 28.6% of the study population. Female respondents slightly outnumbered males, representing 52.4% and 47.6% of the participants, respectively.

Regarding educational attainment, the largest proportion of respondents had completed elementary school (33.3%), followed by senior high school (26.2%), junior high school (16.7%), no formal education (14.3%), and bachelor's degree (9.5%). Most respondents were unemployed (38.1%), while the remaining participants were students, employees, traders, laborers, and farmers. According to the age classification of the Indonesian Ministry of Health, the largest age group was older adults (≥ 60 years), accounting for 33.3% of all respondents. Assessment of disability grade showed that 32 respondents (76.2%) had no disability (Grade 0), 7 respondents (16.7%) had Grade 1 disability, and 3 respondents (7.1%) had Grade 2 disability.

Table 2
Characteristics of the Respondents

Characteristic		n	%
Age (years)	Mean $\pm$ SD	34.95 ± 16.85	
	Range	8–81	
Residence	Jatimulya	12	28.6
	Sangiang	12	28.6
	Gempol Sari	6	14.3
	Lebak Wangi	4	9.5
	Tanah Merah	4	9.5
	Kampung Kelor	2	4.8
	Kedaung Barat	1	2.4
	Pondok Kelor	1	2.4
Gender	Male	20	47.6
	Female	22	52.4
Education	No formal education	6	14.3
	Elementary school	14	33.3
	Junior high school	7	16.7

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Occupation	Senior high school	11	26.2
	Bachelor's degree	4	9.5
	Unemployed	16	38.1
	Student	10	23.8
	Employee	9	21.4
	Trader	4	9.5
	Laborer	2	4.8
Age group	Farmer	1	2.4
	5–9 years	1	23.8
	10–17 years	8	19.0
	18–59 years	30	23.8
	≥60 years	3	33.3
Disability grade	Grade 0	32	76.2
	Grade 1	7	16.7
	Grade 2	3	7.1

Distribution of POD Adherence and Disability Status

The normality of POD adherence scores was assessed using the Shapiro-Wilk test. The results indicated that the data were not normally distributed ($p < 0.001$). Therefore, the median score of 13.5 was used as the cutoff value to classify participants according to their level of adherence to the Prevention of Disability (POD) program.

Based on this classification, 22 respondents (52.4%) were categorized as adherent to the POD program, whereas 20 respondents (47.6%) were categorized as non-adherent. Disability status was subsequently grouped into two categories for statistical analysis. Overall, 32 respondents (76.2%) had no disability, while 10 respondents (23.8%) presented with disability.

Table 3
Distribution of POD Adherence

POD Adherence	n	%
Non-adherent	20	47.6
Adherent	22	52.4
Total	42	100.0

Table 4
Distribution of Disability Status

Disability Status	n	%
No disability	32	76.2
Disability	10	23.8
Total	42	100.0

Association Between POD Adherence and Disability

The association between adherence to the Prevention of Disability (POD) program and disability status was analyzed using Fisher's exact test. As presented in Table 5, a statistically significant association was identified between the two variables ($p = 0.003$).

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Table 5
Association Between POD Adherence and Disability Status

POD Adherence	No Disability n (%)	Disability n (%)	p-value	OR	95% CI	
					Lower	Upper
Adherent	21 (95.5)	1 (4.5)	0.003	17.18	1.921	153.675
Non-adherent	11 (55.0)	9 (45.0)				

Among respondents who adhered to the POD program, 21 (95.5%) had no disability, whereas only one respondent (4.5%) had disability. In contrast, among respondents who were not adherent to the POD program, 11 (55.0%) had no disability and 9 (45.0%) had disability.

The crude odds ratio was 17.18. Thus, non-adherent participants had higher odds of prevalent disability than adherent participants. Disability was present in 45.0% (9/20) of non-adherent participants and 4.5% (1/22) of adherent participants. Because this manuscript reports a cross-sectional association, the estimate should not be interpreted as incidence, risk of developing disability, or proof of a causal preventive effect.

2. Discussion

This study identified a statistically significant association between POD adherence and disability status among leprosy patients at Kedaung Barat Public Health Center (Fisher's exact $p=0.003$). The odds ratio (OR) of 17.18 95%, CI [1.921–153.675] indicated that leprosy patients who were non-adherent to POD practices had 17.18 times higher odds of experiencing disability compared with those who were adherent to POD practices. Disability was more frequent among participants classified as non-adherent. The direction of this association is consistent with previous studies of self-care and disability in leprosy; however, effect estimates from different studies should not be directly compared because definitions, populations, and analytical approaches differ. The present finding should also be interpreted in light of the cross-sectional analysis, the small number of disability events, and potential clinical confounding.

The findings are consistent with those reported by Wardani & Cendrawirda (2018), who found a significant relationship between self-care practices and disability among leprosy patients in Pulau Kijang Primary Health Center, Riau ($p = 0.01$; OR = 6.3). Their study demonstrated that patients who did not perform regular self-care were 6.3 times more likely to develop Grade II disability than those who practiced appropriate self-care. The direction of the association in the present study was consistent with these findings, although the effect estimates are not directly comparable across studies.

The present findings are also consistent with the Indonesian National Guidelines for Leprosy Management, which identify Prevention of Disability (POD) as an essential component of leprosy control. The Regulation of the Minister of Health of the Republic of Indonesia No. 11 of 2019 recommends routine POD assessment for every leprosy patient to facilitate early detection of nerve impairment and leprosy reactions (Kementerian Kesehatan Republik Indonesia, 2019). Similarly, the National Clinical Practice Guideline for Leprosy states that POD includes assessment of lagophthalmos, peripheral nerve tenderness, muscle weakness, sensory loss, ulcerated lesions, ruptured

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nodules, and active lesions along peripheral nerves, all of which represent early indicators of disability if left untreated (Kementerian Kesehatan Republik Indonesia, 2020).

These findings are further supported by previous studies emphasizing the importance of regular self-care in preventing disability progression. Van 'T Noordende et al. (2021) demonstrated that family-based self-care interventions significantly improved lower-limb impairments, reduced acute attacks, improved lymphoedema, and increased protective footwear use among persons affected by leprosy. Their study also highlighted that sustained adherence to self-care required continuous reinforcement from family members and healthcare professionals. Likewise, Rahman et al. (2022) reported that self-care contributes to ulcer prevention, improved physical well-being, and greater self-confidence among leprosy patients. However, socioeconomic barriers, stigma, and reduced work capacity may limit patients' ability to maintain appropriate self-care behaviors. Hannan et al. (2022) similarly concluded that inadequate self-care accelerates progressive tissue damage because leprosy affects peripheral nerves, skin, hands, feet, and eyes, whereas regular self-care and holistic support can reduce disability risk. More recently, Udo et al. (2026) emphasized that successful self-care should not be viewed solely as an individual responsibility but also depends on support from family, communities, and healthcare systems.

The association observed in this study can be explained biologically through the pathogenesis of leprosy neuropathy. Disability develops primarily because *Mycobacterium leprae* invades Schwann cells within peripheral nerves, causing demyelination, axonal degeneration, and impaired nerve conduction. Nerve damage may also be aggravated by immunological reactions, including Type 1 and Type 2 leprosy reactions, which produce acute neuritis and irreversible neurological impairment when not recognized and treated promptly (Kementerian Kesehatan Republik Indonesia, 2020; Sugawara-Mikami et al., 2022).

Loss of protective sensation resulting from sensory neuropathy prevents patients from recognizing pain, heat, or repetitive trauma, allowing minor injuries to progress into chronic ulcers, secondary infections, and permanent deformities. Motor neuropathy contributes to muscle weakness, contractures, claw hand, foot drop, and lagophthalmos, whereas autonomic neuropathy causes anhidrosis, dry skin, fissures, and ulcer formation (Kementerian Kesehatan Republik Indonesia, 2020; Sugawara-Mikami et al., 2022). Consequently, disability in leprosy results from both primary nerve injury and secondary complications that develop when early nerve impairment remains undetected.

The observed association is biologically plausible because Prevention of Disability (POD) is a comprehensive program that involves two complementary components: regular assessment and management by healthcare professionals and self-care practices performed independently by patients (Hannan et al., 2022; Thiodorus et al., 2023). These components work together in preventing disability, as regular professional assessment facilitates early identification and management of nerve function impairment, while patient-performed self-care helps prevent secondary injury and maintain the function of affected body parts in daily activities (Hannan et al., 2022). The observed association is biologically plausible because POD activities are designed to identify nerve-function impairment and reduce secondary injury. Routine POD enables early detection of nerve function impairment through regular examination of sensory function, muscle strength, and early signs of leprosy reactions. Early identification allows timely medical intervention before irreversible nerve damage occurs.

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Self-care is an important component of POD that enables patients to actively participate in preventing secondary injury and maintaining the function of affected body parts through regular daily care and protection. As part of the broader POD program, self-care complements regular professional assessment and clinical management by allowing patients to identify early signs of injury, protect anesthetic or weakened body parts from further trauma, and maintain functional capacity in their daily activities (Hannan et al., 2022). Furthermore, regular self-care practices including daily inspection of anesthetic limbs, wound cleansing and dressing, protection of the eyes from dust and sunlight, use of protective footwear or gloves, skin care, and range-of-motion exercises reduce repetitive trauma and preserve skin integrity and motor function (Darlong, 2021). In the present study, disability was more frequent in the group classified as non-adherent; item-level self-care practices were not analyzed separately.

Overall, the findings indicate that POD adherence was associated with lower prevalence of disability among patients with leprosy. Strengthening patient education, family involvement, continuous follow-up, and regular monitoring by healthcare professionals may improve long-term adherence to POD and contribute to reducing disability among individuals affected by leprosy.

Study Limitations

Several limitations should be considered. First, POD adherence was reported directly by adult participants and by mothers for pediatric participants. Although mothers were involved in the children's POD practices, differences between self-report and caregiver report may introduce reporting bias. Recall and socially desirable responses are also possible. Second, the adherence classification used a sample-derived median rather than an externally validated clinical or WHO cutoff. Third, the study was conducted at a single primary health center and included only 42 participants, of whom 10 had disability, limiting statistical precision and the feasibility of multivariable analysis. Fourth, potential confounders such as paucibacillary/multibacillary classification, disease duration, leprosy reactions or neuritis, diagnostic delay, treatment status, and baseline disability were not adjusted. Fifth, although disability grades were documented repeatedly during routine treatment and follow-up according to WHO grading, the available aggregate dataset did not allow patient-level analysis of disability progression or improvement over time. Existing disability may also influence subsequent POD behavior, so reverse causation cannot be excluded. Sixth, the observed association should be interpreted in light of the wide 95% confidence interval (1.921-153.675), indicating limited precision of the estimated OR. The wide confidence interval may be attributable to the small sample size and the low number of disability events, with only one disability event observed among participants classified as adherent. Therefore, although the association was statistically significant, the magnitude of the estimated association should be interpreted with caution. Thus, although the association was statistically significant, the magnitude of the association should be interpreted cautiously. Finally, the cross-sectional association reported here cannot establish causality or an independent preventive effect of POD adherence. Future studies should retain patient-level longitudinal disability data and use prospective or longitudinal analyses with appropriate adjustment for confounding.

Conclusion

This study found a significant association between POD adherence and disability status among 42 leprosy patients at Kedaung Barat Public Health Center (Fisher's exact $p=0.003$). Disability was present in 4.5% of adherent participants and 45.0% of non-adherent participants, with a crude odds ratio of 17.18 for prevalent disability among non-adherent participants. These findings indicate an association rather than a causal or independent protective effect. Patient education, caregiver and family involvement, regular POD assessment, and continued self-care support remain relevant components of leprosy services. Larger longitudinal studies retaining individual disability trajectories and relevant clinical confounders are recommended.

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