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Original Article

The Relationship between Self-Efficacy and Self-Esteem with Recovery in Leprosy Patients: A Retrospective Case-Control Study

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Stigma from the community often causes leprosy sufferers to experience negative emotions, such as fear, anxiety, and loss of confidence, which can lead to avoidance and delays in treatment. These emotional challenges impact their interpersonal relationships, social status, and overall recovery process. This study examines the relationship between self-efficacy and self-esteem in the recovery of leprosy patients. This retrospective case-control study was conducted in Papua, Indonesia, from May to November 2022. There were 96 samples in this study, 48 samples each in the case and control group selected by simple random sampling technique. Data were analyzed using the chi-square test for unadjusted odd ratio (OR) and multivariate logistic regression analysis for adjusted OR with a significance level of α=0.05 (95% CI). Most respondents in the released from treatment (RFT) group had high self-efficacy and self-esteem, at 60.4% and 64.6%, respectively. Conversely, most respondents in the patient group exhibited low self-efficacy and self-esteem, at 62.5% and 54.2%, respectively. In the adjusted analysis, occupation (aOR= 0.25, 95% CI: 0.07–0.82; *p*= 0.023) and leprosy duration (aOR= 1.32, 95% CI: 1.12–5.83; *p*= 0.019) were significantly associated with self-efficacy. Meanwhile, age (aOR= 0.32, 95% CI: 0.12–0.84; *p*= 0.022) and leprosy duration (aOR= 1.37, 95% CI: 1.14–1.95; *p*= 0.041) were associated with self-esteem. Socio-demographic factors related to recovery status were economic status and age, where patients with higher economic status had a greater likelihood of recovery (aOR= 3.23, 95% CI: 1.07–9.71; *p*= 0.017). Among psychological factors, only self-esteem was significantly associated with recovery (aOR= 4.02, 95% CI: 1.37–11.74; *p*= 0.003), while self-efficacy did not significantly influence the adjusted analysis. Self-esteem is the primary psychological factor affecting the recovery of leprosy patients, whereas occupation and disease duration are associated with self-efficacy. Socioeconomic status and age also play a role in determining recovery status. These findings highlight the importance of psychosocial interventions focusing on enhancing self-esteem and providing economic support to improve treatment adherence and recovery outcomes among leprosy patients.

Keywords: Hansen's Disease, Leprosy, Recovery, RTF, Self-efficacy, Self-esteem, Indonesia

Introduction

Leprosy is a neglected tropical disease caused by *Mycobacterium leprae*, which can cause progressive and permanent damage to the skin,

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muscles, limbs, and eyes (Sarode et al 2020). The impact caused by leprosy is not only for sufferers but also for former leprosy sufferers, both physically, socially, and psychologically (Yudanagra 2020). Globally, in 2018, there were 208,619 new cases of leprosy worldwide (WHO 2019). In 2023, Brazil, India, and Indonesia continued to report more than 10,000 new cases, with an increase in case detection compared to the previous year—Brazil by 16%, Indonesia by 15.6%, and India by 3.9%. Meanwhile, 12 countries (Bangladesh, the Democratic Republic of the Congo, Ethiopia, Madagascar, Mozambique, Myanmar, Nepal, Nigeria, the Philippines, Somalia, Sri Lanka, and the United Republic of Tanzania) reported 1,000–10,000 new cases, 112 countries recorded fewer than 1,000 cases, and 56 countries reported no new cases (WHO 2024). In 2019, the prevalence of leprosy in Indonesia was 0.74/10,000, and the new case detection rate (NCDR) was 6.51/100,000. There are still eight provinces in Indonesia that have not achieved leprosy elimination, one of which is the province of Papua (Ministry of Health Inonesia 2019). In 2020, most leprosy cases in Papua were recorded in Jayapura City, with 316 cases (Provincial Health Office of Papua 2020).

Leprosy can be cured without disability, provided it is detected early and undergoes regular treatment at a health facility under supervision by health personnel (Warson et al 2013). In addition to paying attention to the regularity of medical treatment and leprosy treatment, the social and personal dimensions are essential to note as determinants of the success of leprosy treatment (Sermrittirong & van Brakel 2014). Leprosy patients, as well as cured or "RFT" often receive stigma from the community where they live, which affects interpersonal relationships, marriage, employment, and social status (Garbin et al 2015). This condition causes negative emotions such as sadness, anxiety in interactions, fear of being shunned, and loss of self-confidence (Yudanagara 2020). In many cases, this causes leprosy affected persons to become avoidant and experience delays in treatment; even these feelings tend to become permanent (van't Noordende et al 2021).

Handling and treating leprosy requires attention from social, biological, and medical perspectives as well as individual aspects. Understanding how patients accept their condition, perceive its impact on their daily activities and treatment adherence, and respond to the treatment process is essential in addressing the challenges associated with leprosy management (Somar et al 2020). This needs to be studied, especially for diseases such as leprosy, which are always associated with stigma and discrimination. Individual psychosocial strengths for the success of leprosy treatment, some of which are the subject of study, are self-efficacy and self-esteem (Somar et al 2020). Self-efficacy and self-esteem are psychosocial factors that influence the health recovery process. Self-efficacy refers to an individual's belief in managing health-related behaviors and overcoming challenges (Waddington 2023). Higher self-efficacy is associated with better adherence to treatment, stronger coping mechanisms, and increased confidence in social reintegration (Hong et al 2023, Wu et al 2023). Additionally, self-esteem, which reflects an individual's perception of self-worth and social acceptance (Orth & Robins 2022), also plays a role in treatment adherence, emotional resilience, and quality of life after treatment (Hamidi et al 2023). Recovery refers to the release from treatment (RFT) status, which indicates that a patient has completed multidrug therapy (MDT) according to leprosy treatment protocols (9 months for paucibacillary and 18 months for multibacillary) and is declared free of active infection (Meadows & Davey 2022).

Several studies have been conducted to describe self-efficacy and self-esteem in patients with leprosy and other diseases (Ida et al 2020, Sari et al 2020). The study's results showed that the self-efficacy and self-esteem of leprosy sufferers and other diseases were moderate to low and affected their willingness and sustainability to receive treatment (Prabowo et al 2019, Yamaguchi et al 2013). Socio-demographic factors also influence treatment adherence and the psychological aspects of patients in the recovery pathway of leprosy patients (de Oliveira et al 2023, Chavarria et al 2023). Several studies have shown that age, sex, education level, and employment status affect a patient's ability to adhere to treatment and cope with stigma, which ultimately impacts their recovery process (Marisaa et al 2022).

Until now, leprosy patients have been relatively high in Jayapura City. Medical aspects in health services have been carried out to treat and prevent leprosy. An individual psychosocial approach needs to be built to support treatment success. Several previous studies have seen low self-esteem as a result of leprosy. Meanwhile, studies on the effect of self-esteem on adherence to leprosy treatment based on literature searches have never been carried out, especially in Jayapura City. Likewise, the influence of self-efficacy is only associated with treating other diseases, not leprosy. Exploratory research on self-efficacy needs to be carried out on leprosy cases in Indonesia as an effort to improve the quality of life of patients, considering that leprosy is a disease associated with psychosocial problems.

Therefore, this study aims to explore the relationship between socio-demographic factors and disease-related factors with self-efficacy and self-esteem in leprosy patients and those who have been declared cured (RFT). Additionally, this study assesses the association between socio-demographic and disease-related factors with the recovery status of leprosy patients, which refers to RFT status. The primary objective of this study is to evaluate the influence of self-efficacy and self-esteem on the recovery status of leprosy patients. The findings of this research are expected to contribute to increasing the RFT rate through an individual psychosocial approach.

Materials and Methods

Ethics Statement

Data was collected after obtaining an ethical approval certificate (number 055/KEPK-J/V/2022) from the Health Research Ethics Committee of the Health Polytechnic of Jayapura. All research procedures followed applicable research ethics guidelines, primarily focusing on participant safety and protecting personal information. Before data collection, each participant was provided with a full explanation of the study objectives and procedures, potential risks, and expected benefits. Participants were then asked to sign a written informed consent form as evidence that they voluntarily agreed to participate after fully understanding the provided information. Participation in this study was voluntary, and participants had the right to withdraw from the study at any time without any consequences. To ensure participant privacy, all data collected during the study were kept confidential and used solely for research purposes. Participant identities were anonymized during the data analysis process, ensuring the protection of their personal information.

Study Design and Setting

This is a retrospective case-control design to identify the relationship between self-efficacy, self-esteem, and recovery in leprosy patients. This design was selected because it allows the researchers to compare two distinct groups,

patients who have recovered from leprosy (case group) and patients still undergoing treatment (control group), to evaluate the psychological factors that may influence treatment outcomes.

The study was conducted in Jayapura City, Papua, Indonesia, one of the regions with the highest incidence of leprosy. In 2019, the prevalence of leprosy in Papua was 4.8/per 10,000 people, with a new case detection rate of 45.5/100,000 people, higher than the national prevalence and NCDR. The study was conducted between May and November 2022, encompassing participant recruitment, data collection, and analysis. Jayapura has 14 public health centers (PHCs), called *Puskesmas* in Indonesia, that provide healthcare services, including leprosy treatment. This study selected four PHCs as research sites based on their active involvement in the leprosy treatment program. These PHCs include Hamadi, Hedam, Waena, and Jayapura Selatan. The selection of these locations aimed to ensure that the collected data came from facilities that directly manage leprosy patients. The respondents in this study were patients receiving treatment at the selected PHCs.

The case group consisted of patients who had reached release from treatment (RFT) status, meaning they had completed multidrug therapy (MDT) and were declared cured by medical professionals. In contrast, the control group consisted of patients still undergoing MDT and who had not yet achieved RFT status. Self-efficacy and self-esteem levels were measured using retrospective questionnaires during the treatment period. Self-efficacy assessed patients' confidence in managing their treatment, while self-esteem measured their self-worth and confidence throughout their leprosy therapy.

Participants

This study involved participants selected based on inclusion and exclusion criteria. The inclusion criteria for the case group consisted of patients diagnosed with leprosy who had completed multidrug therapy (MDT) and were declared released from treatment (RFT) at least six months before data collection. Meanwhile, the control group included patients who were still undergoing leprosy treatment and had been receiving MDT for at least three months before data collection. Both case and control group participants were at least 15 years old and able to communicate verbally and in writing. Patients with severe comorbidities that could affect the study results and those with significant mental health disorders that might impact their levels of self-efficacy and self-esteem were excluded from this study.

Patient data were obtained from medical records at four PHCs involved in the study. The recruitment process was conducted systematically using the simple random sampling method. From the list of patients meeting the inclusion criteria, random selection was performed to ensure that every patient had an equal chance of being chosen as a respondent. Selected candidates were then provided detailed explanations of the study's objectives, procedures, benefits, and potential risks. This process was carried out through face-to-face interviews at the Puskesmas or remote communication for patients unable to attend in person. Patients who agreed to participate in the study had to provide written informed consent before data collection was conducted.

Study Size

The study population consisted of leprosy patients in the working area of public health centers (Puskesmas) in Jayapura City, totaling 348 cases based on data as of March 2022 ((Health Office of Jayapura City 2022). The sample size for this study was determined using the formula developed by Lemeshow, Jr (Lameshaw et al 1990) for case-control studies. The calculation

was based on a 95% confidence level ($\alpha = 0.05$) and an 80% statistical power ($\beta = 0.20$), assuming a significant difference in proportions between the case group (patients who had recovered) and the control group (patients still undergoing treatment) in terms of self-efficacy and self-esteem. Based on these estimates, the minimum required sample size for each group was 48 participants, resulting in a total sample size of 96 participants (48 in the case group and 48 in the control group).

Variables

The dependent variable in this study is leprosy recovery status, defined as release from treatment (RFT) for patients who have completed multidrug therapy (MDT) and have been declared cured by medical professionals. The primary independent variables are self-efficacy and self-esteem, measured using validated instruments. Self-efficacy was measured using the General Self-Efficacy Scale (GSES), which assesses the patient's confidence in managing their treatment (Novrianto et al 2019). Self-esteem was measured using the Coopersmith Self-Esteem Inventory (CSEI), which evaluates patients' self-worth and confidence during treatment (Sarandria 2012). Both instruments have been adapted and validated for the Indonesian context.

Identified confounding variables include demographic and clinical factors such as age, sex, economic status, education, disease duration, and type of leprosy (paucibacillary or multibacillary). These variables were considered in the analysis to control for their influence on the relationship between self-efficacy, self-esteem, and leprosy recovery.

Data Collection

This study collected data about socio-demographic characteristics, leprosy conditions, self-efficacy, and self-esteem through interviews and secondary data from medical records. The socio-demographic measurements included information on sex (male and female), age (15–24, 25–34, 35–44, 45–54, and ≥55 years), education level (no formal education, elementary school, junior high school, high school, and higher education), occupation (civil servant, contract worker, entrepreneur, trader, farmer, unemployed, and others), ethnicity (Papuan and non-Papuan), place of residence (mountainous areas and coastal/lake areas), and economic status (lower-middle and upper-middle class).

Leprosy conditions were measured using secondary data from medical records, which included information about the type of leprosy (paucibacillary or multibacillary) and the duration of the disease (<3 years or ≥3 years). Self-efficacy was measured using the General Self-Efficacy Scale (GSES), a 10-item instrument developed by Schwarzer and Jerusalem and adapted into Indonesian. GSES measures patients' confidence in managing challenges, including the leprosy treatment process. The instrument assesses three aspects of self-efficacy: magnitude, strength, and generality of self-belief. This tool has been validated for the Indonesian context by Novrianto et al (2019), showing that the GSES is a unidimensional instrument where all items measure the same construct. The final GSES score was calculated by summing the total score of the ten items and then categorized as high or low based on the median of the data distribution.

Self-esteem was measured using the Coopersmith Self-Esteem Inventory (CSEI), which consists of 58 items, including eight items serving as a lie scale to detect dishonest or inconsistent responses. CSEI measures various aspects of self-esteem, such as self-acceptance, confidence in interpersonal relationships, and overall self-perception. This instrument was adapted into

Indonesian by Sarandria (2012) and validated by two psychology experts from Universitas Indonesia. Like GSES, CSEI scores were categorized into high and low based on the median of the data distribution. Socio-demographic data and medical information, such as leprosy type and disease duration, were obtained from patients' medical records at healthcare facilities.

Data collection was conducted through home visits based on patient names and addresses obtained from healthcare facilities. Trained healthcare workers from PHCs who had undergone a standardized training session on the research objectives, methodology, and questionnaire structure were responsible for administering the data collection process. Participants completed the questionnaires after receiving clear instructions, ensuring consistency in data collection across all sampling locations.

Bias

In this study, several potential sources of bias were identified, and efforts were made to minimize them. Recall bias was one of the potential biases that could arise due to the retrospective study design. Participants were asked to recall their self-efficacy and self-esteem conditions during treatment. To minimize recall bias, the instruments used, such as the General Self-Efficacy Scale (GSES) and the Coopersmith Self-Esteem Inventory (CSEI), were accompanied by clear instructions to help participants accurately reflect on their experiences. Additionally, trained researchers guided participants in completing the questionnaires to ensure they understood and accurately recalled their experiences.

Measurement bias was also minimized using validated instruments, namely the GSES and CSEI, adapted to the Indonesian context. Measurements were conducted using the same methods for both the case and control groups to ensure consistency of results between groups.

Quantitative Variables

The main quantitative variables analyzed were self-efficacy and self-esteem, measured using the General Self-Efficacy Scale (GSES) and the Coopersmith Self-Esteem Inventory (CSEI). Both variables were measured using a Likert scale, and a total score was calculated by summing each item in the questionnaire. Self-efficacy was measured using the GSES, which consists of 10 items, with total scores ranging from 10 to 40. Meanwhile, self-esteem was measured using the CSEI, which consists of 58 items, including eight items as a lie scale, with a maximum total score of 50. Self-efficacy and self-esteem scores were categorized into two groups (high and low) based on the median score distribution in the study population. The median score for self-efficacy (GSES) was 25, and for self-esteem (CSEI), it was 27. Participants with scores equal to or above the median were categorized as having high self-efficacy or self-esteem, while those with scores below the median were classified as having low self-efficacy or self-esteem.

Socio-demographic variables such as age and disease duration were also analyzed as quantitative variables. Participants' age was divided into several categories (15–24, 25–34, 35–44, 45–54, and ≥55 years), while disease duration was categorized into two groups (<3 years and ≥ three years). This categorization was done to simplify interpreting the relationships between these variables and leprosy recovery status. In the statistical analysis, the categorized quantitative variables were analyzed using logistic regression, which was employed to evaluate the relationship between self-efficacy, self-esteem, and leprosy recovery while controlling for confounding variables such as age, sex, and economic status.

Statistical Methods

Data were analyzed using SPSS (SPSS Inc.,

Chicago, USA) version 20. Descriptive analysis was conducted to describe the distribution of demographic and clinical characteristics of participants. Categorical data were presented in the form of frequencies and percentages. Bivariate analysis was performed to evaluate the relationship between independent variables and dependent variables, as presented in Table 1. The bivariate analysis results were reported as unadjusted odds ratios (ORs) with a significance level of α= 0.05 and a 95% confidence interval (CI).

Multivariate analysis using logistic regression was performed to calculate the adjusted odds ratio (aOR) with a 95% CI to control for confounding variables such as age, sex, economic status, education, disease duration, and type of leprosy.

Results

Table 2 presents the data of 96 participants (100%) included in the analysis, with 48 respondents in both the case and the control groups. In the RFT group, most of the respondents were male (70.8%), aged 35-44 years (29.2%), graduated from elementary school (43.8%), worked as farmers (25%), are Papuan (70.8%), living in the mountains (52.1%), middle to down economic group (66.7%), suffering from paucibacillary leprosy (79.2%), and suffer from leprosy <3 Years (64.6%). Most respondents in the RFT group had high self-efficacy and self-esteem, namely 60.4% (self-efficacy score ≥score median 25) and 64.6% (self-esteem score ≥score median 27), respectively.

Whereas in the patient group, most of the respondents were male (58.3%), aged 25-34 years (27.1%), graduated from junior high school (38.5%), worked as traders (27, 1%), were indigenous Papuans (52.1%), living in the mountains area (66.7%), upper-middle-class economy (56.2%), 62.5% were suffering from

Table 1: Analysis of relationships between variables in the study.

Objective	Variable Relationship	Independent Variables	Dependent Variables	Statistical Test
1.	Relationship between socio-demographic factors and leprosy conditions with self-efficacy and self-esteem	Sex, age, education, occupation, ethnicity, residential area, economic status, type of leprosy, and disease duration	Self-efficacy and self-esteem	Chi-square test
2.	Relationship between socio-demographic factors and leprosy conditions with leprosy recovery status	Sex, age, education, occupation, ethnicity, residential area, economic status, type of leprosy, and disease duration	Leprosy recovery status	Chi-square test
3.	Relationship between self-efficacy and self-esteem with leprosy recovery status	Self-efficacy and self-esteem	Leprosy recovery status	Chi-square test

Table 2: **Socio-demographic characteristics and leprosy conditions**.

Characteristics of respondents	Case (RFT)		Control (Patient)		Total	
	n	%	n	%	n	%
Sex						
a) Male	34	70.8	28	58.3	62	64.6
b) Female	14	29.2	20	41.7	34	35.4
Age						
a) 15-24	5	10.4	9	18.8	14	14.6
b) 25-34	12	25.0	13	27.1	25	26.0
c) 35-44	14	29.2	12	25	26	27.1
d) 45-54	7	14.6	11	22.9	18	18.8
e) ≥ 55	10	20.8	3	6.2	13	13.5
Education						
a) None	1	2.1	1	2.1	2	2.1
b) Elementary school	21	43.8	10	20.8	31	32.3
c) Junior high school	16	33.3	21	43.8	37	38.5
d) Senior high School	8	16.7	13	27.1	21	21.9
e) Higher education	2	4.2	3	6.2	5	5.2
Occupation						
a) Civil servants (Administrative staff)	2	4.2	1	2.1	3	3.1
b) Contract worker (construction worker)	6	12.5	3	6.2	9	9.4
c) Self-employed (small business owner, freelancer)	6	12.5	4	8.3	10	10.4
d) Trader (traditional trader)	8	16.7	13	27.1	21	21.9
e) Farmer (Own land)	12	25.0	9	18.8	21	21.9
f) None	9	18.8	12	25.0	21	21.9
g) Others (Fishermen, Porter at fish auction)	5	10.4	6	12.5	11	11.5
Ethnicity						
a) Papua	34	70.8	25	52.1	59	61.5
b) Non Papua	14	29.2	23	47.9	37	38.5
Residential area						
a) Mountain Region	25	52.1	32	66.7	57	59.4
b) Coastal/lake area	23	47.9	16	33.3	39	40.6
Economic status						
a) Middle to down	32	66.7	21	43.8	53	55.2
b) Upper-middle-class economy	16	33.3	27	56.2	43	44.8

Leprosy type						
a) Paucibacillary	38	79.2	30	62.5	68	70.8
b) Multibacillary	10	20.8	18	37.5	28	29.2
Leprosy duration (years)						
a) <3	32	66.7	21	43.8	53	55.2
b) ≥3	16	33.3	27	56.2	43	44.8
Self-efficacy						
a) High (≥ score median 25)	29	60.4	18	37.5	47	49.0
b) Low (<score median 25)	19	39.6	30	62.5	49	51.0
Self-Esteem						
a) High (≥ score median 27)	31	64.6	22	45.8	53	55.2
b) Low (< score median 27)	17	35.4	26	54.2	43	44.8
Total	**48**	**100**	**48**	**100**	**96**	**100**

paucibacillary leprosy, and 56.2% were suffering from leprosy ≥ 3 years. Most of the respondents in the patient group had low self-efficacy and self-esteem, namely 62.5% (self-efficacy score <score median 25) and 54.2% (self-esteem score <score median 27), respectively (Table 2).

Table 3 shows that in the unadjusted analysis, the socio-demographic factors associated with self-efficacy in leprosy patients as well as those who have been cured or declared RFT were occupation (OR 4.07; 95% CI: 1.35 – 12.27; *p*= 0.018) and leprosy duration (OR 2.84; 95% CI: 1.23 – 5.83; *p*= 0.023). Similarly, in the adjusted analysis, only occupation (aOR 0.25; 95% CI: 0.07 – 0.82; *p*= 0.023) and leprosy duration (aOR 1.32; 95% CI: 1.12 – 5.83; *p*= 0.019) remained as socio-demographic factors associated with self-efficacy in leprosy patients as well as cured or RFT.

Table 4 shows that in the unadjusted analysis, the socio-demographic factors associated with self-esteem in leprosy patients as well as those who have been cured or declared RFT were age (OR 2.68; 95% CI: 1.13 – 6.31; *p*= 0.038) and leprosy duration (OR 2.26; 95% CI: 1.99 – 5.14; *p*= 0.020). Similarly, in the adjusted analysis, only age (aOR 0.32; 95% CI: 0.12 – 0.84; *p*= 0.022) and leprosy duration (aOR 1.37; 95% CI: 1.14 – 1.95; *p*= 0.041) remained as socio-demographic factors associated with self-esteem in leprosy patients as well as those who have been cured or declared RFT.

Table 5 shows that in the unadjusted analysis, the socio-demographic factors and leprosy conditions associated with the recovery of leprosy patients were education level (OR 2.53; 95% CI: 1.06 – 6.03; *p*= 0.033), economic status (OR 2.57; 95% CI: 1.12 – 5.88; *p*= 0.040), and leprosy duration (OR 2.34; 95% CI: 1.03 – 5.33; *p*= 0.040). In the adjusted analysis, economic status (aOR 3.23; 95% CI: 1.07 – 9.71; *p*= 0.017) was the only socio-demographic factor and leprosy condition related to the recovery of leprosy patients. Age (aOR 0.29; 95% CI: 0.09 – 0.91; *p*= 0.035) was identified as a protective factor. Respondents with an upper-middle-class economic status had a 3.23 times higher chance of recovery than patients with middle to lower economic status.

Table 6 shows that in the unadjusted analysis,

Table 3: Association between socio-demographic and leprosy factors with self-efficacy.

Variables	Self-efficacy				Total		*p*-value	Un-adjusted OR CI 95%	*p*-value	Adjusted OR CI 95%
	High		Low							
	n	%	N	%	n	%				
Sex										
Male	33	53.2	29	46.8	62	100	0.360	1.62 (0.69 – 3.78)	0.727	0.84 (0.31 – 2.66)
Female	14	41.2	20	58.8	34	100				
Age										
≤34	20	51.3	19	48.7	39	100	0.866	1.17 (0.51 – 2.64)	0.725	0.84 (0.33 – 2.15)
>34	27	47.4	30	52.6	57	100				
Education										
Not school and primary education	18	52.9	16	47.1	34	100	0.715	1.28 (0.55 – 2.96)	0.785	1.15 (0.41 – 3.16)
Upper middle education	29	46.8	33	53.2	62	100				
Occupation										
Working	42	56.0	33	44.0	75	100	0.018*	4.07 (1.35 – 12.27)	0.023*	0.25 (0.07 – 0.82)
None	5	20.8	16	79.2	21	100				
Ethnicity										
Papua	29	49.2	30	50.8	59	100	1.000	1.02 (0.44 – 2.32)	0.938	1,12 (0.36 – 2.39)
Non-Papua	18	48.6	19	51.4	37	100				
Residential area										
Mountain	27	47.4	30	52.6	57	100	0.866	0.85 (0.37 – 1.93)	0.399	1.50 (0.58 – 3.86)
Coastal/lake	20	51.3	19	48.7	39	100				
Economic status										
Middle to down	30	56.6	23	43.4	53	100	0.145	1.99 (0.88 – 4.51)	0.268	0.58 (0.22 – 1.51)
Upper-middle-class economy	17	39.5	26	60.5	43	100				
Leprosy type										
Paucibacillary	33	48.5	35	51.5	68	100	1.000	0.94 (0.39 – 2.27)	0.954	0.97 (0.35 – 2.66)
Multibacillary	14	50.0	14	50.0	28	100				
Leprosy duration (years)										
<3	32	60.4	21	39.6	53	100	0.023*	2.84 (1.23 – 6.55)	0.019*	1.32 (1.12 – 5.83)
>=3	15	34.9	28	65.1	43	100				

*Statistically significant at *p*=0.05

Table 4: Association between socio-demographic and leprosy factors with self-esteem.

Variables	Self-efficacy				Total		*p*-value	Un-adjusted OR CI 95%	*p*-value	Adjusted OR CI 95%
	High		Low							
	n	%	N	%	n	%				
Sex										
Male	38	61.3	24	38.7	62	100	0.160	2.00 (0.85 – 4.68)	0.527	0.73 (2.76 – 1.93)
Female	15	44.1	19	55.9	34	100				
Age										
≤34	27	69.2	12	30.8	39	100	0.038*	2.68 (1.13 – 6.31)	0.022*	0.32 (0.12 – 0.84)
>34	26	45.6	31	54.4	57					
Education										
Not school and primary education	20	58.8	14	41.2	34	100	0.754	1.25 (0.53 – 2.92)	0.584	1.33 (0.47 – 3.71)
Upper middle education	33	53.2	29	46.8	62	100				
Occupation										
Working	44	58.7	31	41.3	75	100	0.299	1.89 (0.71 – 5.03)	0.120	0.40 (0.13 – 1.26)
None	9	42.9	12	57.1	21	100				
Ethnicity										
Papua	34	57.6	25	42.4	59	100	0.696	1.28 (0.56 – 2.94)	0.809	0.89 (0.34 – 2.27)
Non-Papua	19	51.4	18	48.6	37	100				
Residential area										
Mountain	29	50.9	28	49.1	57	100	0.411	0.64 (0.28 – 1.48)	0.173	1.93 (0.75 – 4.97)
Coastal/lake	24	61.5	15	38.5	39					
Economic status										
Middle to down	29	54.7	24	45.3	53	100	1.000	0.95 (0.42 – 2.14)	0.573	1.32 (0.49 – 3.50)
Upper-middle-class economy	24	55.8	19	44.2	43	100				
Leprosy type										
Paucibacillary	38	55.9	30	44.1	68	100	1.000	1.09 (0.45 – 2.65)	0.520	0.71 (0.25 – 1.99)
Multibacillary	15	53.6	13	46.4	28	100				
Leprosy duration (years)										
<3	34	64.2	19	35.8	53	100	0.020	2.26 (1.99 – 5.14)	0.041*	1.37 (1.14 – 1.95)
≥ 3	19	44.2	24	55.8	43	100				

*Statistically significant at p=0.05

Table 5: Relationship between socio-demographic and leprosy factors with recovery status.

Variables	Case (RFT)		Control (Patient)		Total		*p*-value	Un-adjusted OR CI 95%	*p*-value	Adjusted OR CI 95%
	n	%	N	%	n	%				
Sex										
Male	34	54.8	28	45.2	62	100	0.286	1.73 (0.74 – 4.04)	0.538	1.38 (0.48 – 3.93)
Female	14	41.2	20	58.8	34	100				
Age										
≤34	17	43.6	22	56.4	39	100	0.406	0.64 (0.28 – 1.47)	0.035*	0.29 (0.09 – 0.91)
>34	31	54.4	26	45.6	57	100				
Education										
Not school and primary education	22	64.7	12	35.3	34	100	0.033*	2.53 (1.06 – 6.03)	0.143	2.27 (0.75 – 6.84)
Upper middle education	26	41.9	36	58.1	62	100				
Occupation										
Working	39	52.0	36	48.0	75	100	0.621	1.44 (0.544 – 3.832)	0.935	0.94 (0.26 – 3.39)
None	9	42.9	12	57.1	21	100				
Ethnicity										
Indigenous Papuans	34	57.6	25	42.4	59	100	0.093	2.23 (0.96 – 5.18)	0.119	2.19 (0.81 – 5.91)
Non-Indigenous Papuans	14	37.8	24	62.2	37	100				
Residential area										
Mountain	25	43.9	32	56.1	57	100	0.212	0.54 (0.23 – 1.24)	0.218	0.52 (0.18 – 1.47)
Coastal/lake	23	59.0	16	41.0	39	100				
Economic status										
Middle to down	32	60.4	21	39.6	53	100	0.040*	2.57 (1.12 – 5.88)	0.017	3.23 (1.07 – 9.71)
Upper-middle-class economy	16	37.2	27	62.8	43	100				
Leprosy type										
Paucibacillary	38	55.9	30	44.1	68	100	0.116	2.28 (0.91 – 5.66)	0.090	2.54 (0.86 – 7.50)
Multibacillary	10	35.7	18	64.3	28	100				
Leprosy duration (years)										
<3	32	60.4	21	39.6	53	100	0.040*	2.34 (1.03 – 5.33)*	0.108	2.36 (0.82 – 6.74)
≥ 3	16	37.2	27	62.8	43	100				

*Statistically significant at *p*=0.05

Table 6: Relationship between the effect of self-efficacy and self-esteem on the recovery of leprosy patients.

Variables	Case (RFT)		Control (Patient)		Total		*p*-value	Un-adjusted OR CI 95%	*p*-value	Adjusted OR CI 95%
	n	%	N	%	n	%				
Self-efficacy										
High (≥ score median 25)	29	61.7	18	38.3	47	100	0.041*	2.54 (1.11 – 5.78)*	0.144	2.14 (0.77 – 5.93)
Low (<score median 25)	19	38.8	30	61.2	49	100				
Self-Esteem										
High (≥score median 27)	31	58.5	22	41.5	53	100	0.010*	2.78 (1.21 – 6.36)*	0.011*	4.02 (1.37 – 11.74)
Low (<score median 27)	17	39.5	26	60.5	43	100				

*Statistically significant at *p*=0.05

self-efficacy (OR 2.544; 95% CI 1.11 – 5.78; *p*= 0.041) and self-esteem (OR 2.78; 95% CI 1.21 – 6.36) were associated with the recovery of leprosy patients. However, in the adjusted multivariate logistic regression analysis, self-esteem (aOR 4.02; 95% CI 1.37 – 11.74; *p*= 0.011) was identified as the psychological factor related to the recovery of leprosy patients. Respondents with high self-esteem had a 4.02 times higher chance of recovery than those with low self-esteem.

Discussion

The results of this study indicate that several socio-demographic factors are associated with self-efficacy and self-esteem in leprosy patients in Papua. In the adjusted analysis, occupation and disease duration were related to self-efficacy, while age and disease duration were associated with self-esteem. Patients with a job were 4.07 times more likely to have high self-efficacy than those unemployed. This finding is consistent with previous research, which states that socioeconomic factors play a role in building self-confidence and providing social meaning to individuals, thereby increasing their ability to manage illness (Dadun et al 2017). Individuals with jobs tend to have broader social interactions, better access to healthcare resources, and a more supportive environment, which can strengthen their self-efficacy in coping with self-stigma (Dadun et al 2017, Bhat et al 2023).

Disease duration was also associated with self-efficacy and self-esteem, where patients with a longer disease duration exhibited 1.32 times higher self-efficacy and 1.37 times higher self-esteem compared to newly diagnosed patients. The length of the infection period and the type of leprosy experienced are associated with medication adherence and motivation for treatment (Susanti et al 2018). Rahman et al (2022) have reported that longer disease duration is related to increased self-acceptance among leprosy patients, especially those who have undergone long-term treatment. This can be explained by the psychological adaptation process that develops over time, where patients

who have lived with leprosy for a long time may have built better-coping mechanisms and accepted their condition more positively (Costa et al 2024). Older patients (>34 years) had higher self-esteem than younger patients, supporting findings that older individuals tend to have higher psychological resilience, broader life experiences, and greater ability to manage social pressures. In contrast, younger patients may be more vulnerable to self-stigma, struggle with accepting their diagnosis, and have more difficulty building self-acceptance (Bhat et al 2023).

In addition to influencing the psychological aspects of patients, socio-demographic factors are also associated with the recovery of leprosy patients, as measured by release from treatment (RFT) status. Socioeconomic status was identified as a key factor related to patient recovery, where patients with middle to high socioeconomic status were 3.23 times more likely to recover compared to those with low socioeconomic status. According to Adhikari et al (2013) , stigma becomes an obstacle for individuals to receive treatment, especially for patients who do not have self-power due to separation in social life and low knowledge and economy. Leprosy patients who experience low self-esteem tend to hide their illness. This causes delays in seeking treatment and results in failure of treatment outcomes (Stangl et al 2019). Concealment from the closest people, especially the family, has powerful implications for the family. Family aspects, which include instrumental, emotional, appreciation, and informative support, significantly influence leprosy patients' adherence to treatment (Andriani et al 2019, Sahiddin 2021).

The results of this study indicate that in the unadjusted analysis, the psychological factors of self-efficacy and self-esteem were associated with the recovery of leprosy patients in Papua. However, in the adjusted analysis, self-esteem was the only psychological factor related to the recovery of leprosy patients. This is consistent with the findings of the study conducted by Zaki et al (2019) , which found that self-esteem is related to the coping mechanisms of leprosy patients. Leprosy patients have various psychological conditions in response to the fact that they are diagnosed with leprosy, such as feelings of rejection, guilt, worthlessness, confusion, fear, sadness, and anger (Singh et al 2013). This condition can cause stress for the patient. Stress is one of the main contributors to physical dysfunction (Manna & Jain 2015).

Lack of behavioral control, the absence of stress control, and distrust of oneself to control perceived circumstances will increase susceptibility to bacterial and viral infections, contribute to the development of physical disorders and immune system disorders, and accelerate disease progression (More et al 2015). However, if patients show strong self-confidence and self-esteem that they can handle stress and believe they will recover, this problem can be overcome and increase their motivation to take treatment (Farmer et al 2022). The study conducted by Sehgal et al (2024) in India on outpatient leprosy patients found that those who experienced high levels of stigma were 6.8 times more likely to suffer from depression.

In some sections of society leprosy is still perceived as a shameful disease, hated, and associated with unhygienic conditions (Ebenso et al 2019). Over 60% of leprosy afflicted persons have a primary school education (Herawati 2019). It is a common fact that people affected by leprosy often have low socioeconomic status, low education levels, and little awareness of human rights, which increases the vulnerability of patients to discrimination in their social environment (Sermrittirong & van Brakel 2014). Most sufferers have multibacillary-type leprosy

(Herawati 2019). The incidence of leprosy is related to sex, race, and housing conditions, as well as unfavorable social conditions (Castro et al 2016). Research conducted by Karki et al (2021) found that male parents with a junior secondary education level were a group with low self-esteem. The incidence of level II disability is related to education and self-care, where patients who lack self-care for leprosy have 12 times the risk of developing a level II disability compared to those who do good self-care (Herawati 2019).

An interpersonal approach is essential to cure leprosy (Hannan et al 2022). Improving self-care is an activity that must be carried out to increase motivation and willingness to treat leprosy (Susanti et al 2018). The results of research conducted by Kato et al (2020)) concluded emphatically that practical services need to emphasize interventions on self-esteem and self-efficacy to increase patient activity in self-care. The research results conducted by Hannan et al (2022) found that self-efficacy is directly related to leprosy patients' self-care efforts. Likewise, the results of research conducted by Jatimi et al (2020) reported that active coping carried out by leprosy afflicted persons is in the form of involvement in social support, being active in religious activities, and carrying out agricultural activities as a form of diverting the focus of the mind. Awick et al (2017) stated that self-efficacy and self-esteem can be increased through physical and social activities to form sufferers' welfare, encouraging motivation to take treatment. Self-efficacy is a crucial determinant of causal structure because it directly influences health behavior and other determinants. The stronger the perceived efficacy, the higher the challenge of the goals people set for themselves, the more they expect their efforts to produce the desired results, and the more they perceive obstacles to personal change as something that can be overcome (Farmer et al 2022). Individual resilience influences health at a more fundamental level, namely beliefs that activate biological systems that mediate health and disease and are related to the exercise of direct control over habits that affect health and biological aging rates (Farmer et al 2022). The personal resilience of leprosy patients is formed from positive adaptation to the conditions experienced, productive social life, respecting and accepting self-conditions, and helping others overcome the same pressure (Jatimi et al 2020). Interestingly, research conducted by Wilski &Tasiemski (2016) on multiple sclerosis patients showed that self-management in terms of general self-efficacy, perception of control, and acceptance of the patient's condition correlated more with patient recovery than severity, type of disease, and duration.

Limitations of the study

The retrospective design used in this study relied on respondents' recollections of their past self-efficacy and self-esteem conditions, which may increase the risk of recall bias, especially for the case group that had already achieved RFT status. Additionally, in retrospective studies, using a control group may not be strictly necessary, as the data collected focus more on the respondents' history than their current psychological condition, which may affect the interpretation of the findings and the study methodology. Using questionnaires for data collection may increase the likelihood of social desirability bias, where respondents tend to provide more socially acceptable answers rather than accurately reflecting their actual psychological state. Another limitation is that the study was conducted only in Jayapura City, which may limit the generalizability of the findings to a broader population, given that contextual factors such as access to healthcare, stigma levels, and community support may vary in different regions. Nevertheless, these limitations

do not diminish the study's findings' value but provide a foundation for more comprehensive future research. It is recommended that future studies use a prospective design with repeated measurements of self-efficacy and self-esteem to obtain a more accurate understanding of their impact on leprosy patient recovery. Expanding the geographical scope of research would also enhance the external validity of the findings. Additionally, more objective measurement methods, such as in-depth interviews or data triangulation, could be implemented to improve the accuracy and depth of analysis regarding the relationship between psychological factors and the recovery of leprosy patients.

Conclusion

This study found that occupation and disease duration were associated with self-efficacy in leprosy patients and those declared RFT. In contrast, age and disease duration were associated with self-esteem in leprosy patients and those who had been declared RFT. Additionally, socioeconomic status and age were related to patients' recovery status, with those with a higher socioeconomic status being more likely to recover. Among psychological factors, self-esteem was identified as the primary factor influencing the recovery of leprosy patients, whereas self-efficacy did not show a significant association in the adjusted analysis.

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