Research Article

The Influence of Internal Factors on the Success of Leprosy Treatment at Cibuaya Health Center, Indonesia

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ABSTRACT

Background: Indonesia still has a significant number of leprosy cases; there was an increase in cases to 12,441 compared to the previous year, which was 10,976 (WHO, 2023). At the national level, the target percentage of leprosy treatment has not been reached; 87% achievement was obtained, while the national indicator target is 90%. Age, gender, marital status, education level, occupation, and leprosy type are among the internal characteristics that contribute to the effectiveness of leprosy therapy. The most leprosy cases in Karawang Regency are found in Cibuaya Health Center, Indonesia.

Aims: This study aims to determine the influence of internal factors (age, gender, marital status, education, occupation, and leprosy type) on the success of leprosy treatment at the Cibuaya Health Center.

Methods: Observational analysis with cross-sectional design was used in this study with a sample size of 110 respondents at the Cibuaya Health Center. Medical records from patients receiving leprosy treatment at the Cibuaya Health Center served as the sample. Total sampling, a non-probability sampling technique, has been used. The study was conducted in June 2024.

Results: Leprosy treatment success was found to be influenced by age (p=0.09), gender (p=0.001), marital status (p=0.012), education level (p=0.001), and leprosy type (p=0.001) in the bivariate analysis using the Chi-square test. However, the occupation factor did not show a significant effect on treatment success (p=0.275). Based on multivariate logistic regression analysis, Leprosy type was the most dominant factor influencing treatment success (Exp(B) = 38.863). The limitation of this study is that it did not investigate internal factors in the success of leprosy treatment by using laboratory results (such as BTA testing) after treatment.

Conclusion: The success of leprosy treatment at the Cibuaya Health Center is influenced by age, gender, marital status, education level, and leprosy type. The most influential factor on the success of leprosy treatment is the type of leprosy. However, the occupation factor did not show a significant effect on treatment success. These findings can inform targeted strategies to improve treatment outcomes, especially among high-risk groups such as Multibacillary (MB) patients and the elderly.

Keywords: *Internal factors; Treatment success; Leprosy.*

1. Introduction

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. According to the World Health Organization (WHO), leprosy is one of the 17 neglected tropical diseases with a high incidence rate. Leprosy cases in Indonesia are still quite high. Based on WHO data, in 2022 there was an increase in cases to 12,441 patients compared to the previous year, which was 10,976 patients (WHO, 2023).

From 2021 to early 2022, Karawang Regency reported a total of 197 leprosy cases, including 196 cases of the multibacillary (MB) type and 1 case of the paucibacillary (PB) type. Cibuaya Health Center is the health center with the highest incidence of leprosy compared to other health centers in Karawang Regency; namely, in 2022, a total of 16 cases were found at the Cibuaya Health Center, with grade 0 disabilities in as many as 14 patients and grade 2 disabilities in 2 patients. This high number of cases indicates the need for special attention in the handling and treatment of leprosy in the region (Dinkes Kabupaten Karawang, 2022).

According to the WHO, leprosy is classified into two types: paucibacillary and multibacillary. This classification aims to determine the severity, therapy, and complications. Leprosy treatment aims to cure the disease, break the chain of transmission, and prevent disability or complications. WHO recommends treating leprosy with multidrug therapy (MDT). Leprosy treatment can last for 6-12 months, depending on the type of leprosy. The indicator of the percentage of leprosy patients who complete leprosy treatment on time is called RFT (Release From Treatment). The calculation of this indicator is obtained after the patient is declared to have completed treatment for type PB for 6-9 months and type MB for 12-18 months. (Siswanto, 2020)

Nationally, the percentage of leprosy treatment that meets the target has not been achieved; 87% achievement was obtained, while the national indicator target is 90%. This is influenced by several factors, one of which is internal. Several studies have been conducted on the influence of internal factors on leprosy treatment success, including age, gender, education level, occupation, knowledge, and socioeconomic factors. However, internal factors, including leprosy types, have not yet been studied in relation to leprosy treatment success. Leprosy treatment success is influenced by several factors, including age, gender, education, occupation, socioeconomic status, and knowledge (Zahnia, 2017). In addition, research conducted by (Oeleu et al. 2022) found that Leprosy treatment regularity is influenced by several factors, such as the existence of community stigma regarding leprosy. Therefore, this study aims to analyze the influence of internal factors (age, gender, marital status, education, occupation, and type of leprosy) on the success of leprosy treatment at the Cibuaya Health Center.

2. Methods

Study design

This research includes observational analysis using cross-sectional data collected at the same time. The aim is to ascertain how internal factors impact the effectiveness of leprosy treatment at the Cibuaya Health Center. The success of leprosy treatment is measured by the percentage of leprosy patients who complete their treatment on time, known as RFT (Release from Treatment). This indicator is calculated following the completion of 6–9 months of treatment for type PB and 12–18 months of treatment for type MB.

Study design/research procedures

The population in this study was all patients undergoing treatment at the Cibuaya Health Center in the 2018–2023 time span, and the sample of this study was taken from all medical record data of patients who were confirmed to have leprosy and were undergoing leprosy treatment, with a total sample size of 110

Measurements

The independent variables in this study are internal factors: age, gender, marital status, education level, occupation, and type of leprosy. The dependent variable in this study is the success of leprosy treatment. The research data was taken from the medical records of patients at Cibuaya Community Health Center.

Statistical techniques

A univariate, bivariate, and multivariate analysis were used in this study. Univariate analysis described the characteristics of each research variable. A bivariate analysis determined the relationship between the characteristics of age, gender, marital status, education level, occupation, and type of leprosy and the successful treatment of leprosy patients using the chi-square test. And multivariate analysis was used to analyze 6 internal factors to determine the most dominant relationship or influence on the success of leprosy treatment by using the logistic regression test. Logistic regression analysis is used because there is one dependent variable, and the dependent variable data scale is categorical. The accuracy of the data was assessed by doing a completeness check, which began with examining the quantity and completeness of the necessary information, including age, gender, marital status, occupation, education level, and leprosy type.

Ethical Clearance

This research has been approved by the Ethics Commission, Faculty of Medicine, Universitas Swadaya Gunung Jati Cirebon, Number 43/EC/FKUGJ/V/2024. Researchers did not collect patient name data or patient information; therefore, patient anonymity was preserved in the utilization of medical records in this study. To provide serial numbers from the medical record data, researchers only collected information on age, gender, marital status, occupation, education level, and type of leprosy.

3. Results

Respondent characteristics

Table 1 summarizes the respondent characteristics in this recent study, including age, gender, marital status, education level, occupation, type of leprosy, and success of leprosy treatment. The most common age group was elderly, 46 (41.8%), compared to adults, 42 (38.2%), and children, 22 (20%). There were 65 (59.1%) male patients compared to 45 (40.9%) women. Based on marital status, the most patients were unmarried, 64 (58.2%), compared to married, 46 (41.8%). Based on the data, patients with low education levels were more dominant, 72 (65.5%), compared to patients with high education levels, 38 (34.5%). According to occupation, there were 57 (48.2%) employed patients and 53 (51.8%) Unemployed. There were 47 (42.7%) and 63 (57.3%) MB leprosy patients. Data shows that 66 people (60%) were successful in leprosy treatment and 44 people (40%) failed.

Table 1. Respondents' characteristics

	characteristics	frequency	Percentage
Age	Children	22	20.0
	Adult	42	38.2
	elderly	46	41.8
Gender	Male	65	59.1
	Female	45	40.9
Marital status	Married	46	41.8
	Unmarried	64	58.2
Education level	High education	38	34.5
	Low education	72	65.5
Occupation	Employed	53	48.4
	Unemployed	57	51.8
Type leprosy	Paucibacillary	47	42.7
	Multibacillary	57	51.8
Success of leprosy	Success	66	60
	failed	44	40

Bivariate analysis

Table 2 shows the effect of internal factors on the success of leprosy treatment analyzed using the chi-square test. Based on the research data, the internal factors of age (p=0.009), gender (p=0.001), marital status (p=0.012), education level (p=0.001), and leprosy type (p=0.001) were found to be significant to the success of leprosy treatment because the p-value < 0.05, which fulfills the criteria of the chi-square test. While the employment factor is not significant because it has a p-value > 0.05 (p = 0.275), it does not meet chi-square criteria.

Table 2. Chi-square Analysis

Variable	Success of Therapy				Total	*p value*
	Success (N = 66)		failed (N = 44)			
	n	%	n	%		
Age						
Children	17	77.3	5	22.7	22	
Adult	29	69	13	31	42	0.009
Elderly	20	43.5	26	56.5	46	
					110	
Gender						
Male	53	48	12	11	65	0.001
Female	13	12	32	29	45	
					110	
Marital Status						
Married	34	31	12	11	46	0.012
Unmarried	32	29	32	29	64	
					110	
Education level						
High education	43	39	6	6	38	0.001
Low education	23	21	38	35	72	
					110	
Occupation						
Employed	29	54.7	24	45.3	53	
Unemployed	37	64.9	20	35.1	57	0.275
					110	
Type of leprosy						
Paucibacillary	44	40	3	3	47	0.001
Multibacillary	22	20	41	37	63	
					110	

Multivariate analysis

Table 3 shows that the logistic regression analysis found the type of leprosy to be the most important factor, with an Exp(B) value of 38.863. This means that Paucibacillary (PB) patients are 38.8 times more likely to successfully complete their treatment compared to Multibacillary (MB) patients. The next most important factors were gender with an Exp(B) value of 13.326, marital status with an Exp(B) value of 11.254, education level with an Exp(B) value of 9.378, and age with an Exp(B) value of 1.138. Gender came next with an Exp(B) value of 13.326, followed by marital status with an Exp(B) value of 11.254, education level with an Exp(B) value of 9.378 and age with an Exp(B) value of 1.138.

Table 3. Logistic regression analysis

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Age	0.129	0.806	0.026	1	0.873	1.138
Gender	2.590	0.732	12.505	1	0.000	13.326
Marital status	2.421	0.842	8.272	1	0.004	11.254
Education level	2.238	0.816	7.530	1	0.006	9.378
Type of leprosy	**3.660**	**0.944**	**15.047**	**1**	**0.000**	**38.863**
Constant	-17.516	3.735	21.994	1	0.000	0.000

4. Discussion

This study aims to determine the influence of internal factors (age, gender, marital status, education, occupation, and leprosy type) on the success of leprosy treatment at the Cibuaya Health Center.

Age

Age categories (Kemenkes 2009) Children: <15 years; adults: ≥ 15–45 years; elderly: >45 years. The most dominant age was in the "elderly" category, age > 45 years, with as many as 46 respondents (41.8%). In the chi-square analysis, it was found that the significance is 0.009. There is an effect of age on the success of leprosy treatment. In table 2, it was found that the elderly experienced the most treatment failures (56.5%) and the highest treatment success at the age of children, namely (77.3%). This conclusion is in line with (Hutabarat, 2007) study, where it was found that children have a higher recovery rate than adults or the elderly because they are supervised by parents in taking medicine regularly. In elderly patients, medication compliance can be affected by memory loss, especially if they live alone. The relationship between age and immunity affects the potential exposure to disease risks and the body's physiological activities. In the context of leprosy, age plays an important role due to the long incubation period. Thus, leprosy is rarely found in infants, as it takes longer to develop into a visible disease.

Gender

Based on the research data, there were 65 patients with male gender (59.1%) and 45 patients with female gender (40.9%), meaning that there were more leprosy patients with male gender than female. In the chi-square analysis, it was found that the significance was 0.001; there is an influence of gender on the success of leprosy treatment. Based on Table 2, the cure rate was higher in patients with a male gender (48%) than a female gender (12%). This finding aligns with the research of (Tami, M., 2015), which indicates that the success rate of leprosy treatment in East Java from 2015 to 2017 was higher for men than for women. In addition, this is in accordance with the research of (Wang Y et al., 2022), based on the distribution ratio of leprosy patients in this study, which shows a sex ratio of 3.82:1, with more men than women. This could be because men engage in a greater range of social activities, which increases their exposure to infection sources. Additionally, some academics contend that women report illnesses later than men because they have less access to healthcare services.

Marital Status

Based on the research data, patients with married marital status were 46 (41.8%), and those not married were 64 (58.2%). In the chi-square analysis, it was found that the significance was 0.012, which indicated the influence of marital status on the success of leprosy treatment. It was found that treatment success was higher in patients who had married marital status (31%) compared to patients with unmarried marital status (29%). This information is in line with research conducted by (Andriani E et al., 2019). This family includes the patient's spouse, which is relevant to their marital status. Emotional support is crucial for leprosy patients, as they need affection and encouragement to feel calmer while undergoing treatment. In addition, respondents who did not receive emotional support during treatment could be caused by a lack of affection and empathy from the family towards the patient.

Education Level

Education level was assessed based on the last formal education taken by the patient at the time of leprosy treatment, low education level was categorized as elementary to junior high school, and high education level was categorized as high school to college. Based on the research data, it was found that the majority of leprosy patients at the Cibuaya Health Center had a low level of education, namely 72 people (65.5%), while patients with a high level of education were 38 people (34.5%). In the chi-square analysis, it was found that a significance of 0.001 indicates that there is an influence between education level and treatment success. In Table 2, higher treatment success was obtained in patients who have a high level of education (39%) compared to patients with a low level of education (21%). According to research (Muntasir et al. 2017), it was found that the dominant respondents had a low level of education (66.7%) compared to higher education levels. Higher education (33.3%) can assist leprosy sufferers in making better health-related decisions. With greater knowledge about leprosy, patients tend to be more disciplined in taking medication and have a strong motivation to recover. Low levels of education, on the other hand, may make it more difficult to seek treatment and receive a timely diagnosis, which could result in disability and a worsening of the patient's illness.

Occupation

Based on the research data, 53 leprosy patients (48.2%) were employed, and 57 people (51.8%) were unemployed. It can be seen in this study that respondents who do not have jobs have the largest number. Based on the chi-square statistical test, the p-value was 0.275 or (p > 0.05), indicating that there was no influence between occupation and the success of leprosy treatment. In table 2, it was found that the success of leprosy treatment was greatest among respondents who did not work, namely 64.9%. This conclusion is in line with the research of Siti Zahnia et al. (2019), who found that there is no effect of work on the success of leprosy treatment. According to (Tukiman et al. 2014), individuals who have jobs are usually more encouraged to undergo treatment for recovery. This motivation is caused by the desire to return to work, because work is the main source of income that is important to support their lives and their families. Based on research conducted by (Suki, 2018), which shows that people with leprosy who have a job tend to be more motivated to comply with their treatment compared to people who do not work. This is because work is considered a source of livelihood and a way for them to provide for their families. In contrast, unemployed patients have more time to focus on their health, including medication adherence. Therefore, there was no significant difference in medication adherence between working and non-working leprosy patients.

Type of Leprosy

Based on the research data, there were 47 patients with Paucibacillary (PB) leprosy type (42.7%) and 63 respondents with Multibacillary (MB) leprosy type (57.3%). Based on the chi-square statistical test, the p-value is 0.001 (<0.05), indicating that there is an influence between the type of leprosy and the success of leprosy treatment. Among the different types of leprosy, treatment success was highest for patients with PB leprosy type at 40%, compared to 20% for those with MB leprosy type. The highest treatment failure occurred in patients with MB leprosy, specifically involving 41 individuals (37%). This conclusion is in line with the research of (Wang Y et al., 2022), where it was found that the chance of recovery for PB patients was 2.06 (95% CI: 1.39-3.04) times higher than MB patients. Significantly, MB leprosy patients have a lower chance of recovery than PB leprosy patients. MB leprosy patients tend to have more severe symptoms and a longer disease course. This conclusion is in line with the WHO report in 2018; global leprosy cases show that multibacillary (MB) cases are more dominant than paucibacillary (PB) cases. The number of patients with multibacillary leprosy was reported as 14,543.

The most important factor in the success of leprosy treatment

Based on the results of research was conducted at the Cibuaya health center. The type of leprosy has the strongest relationship, with an Exp(B) value of 38.863, so the Paucibacillary type has a better chance of successful treatment. This conclusion was followed by gender with an Exp(B) value of 13.326, marital status with an Exp(B) value of 11.254, education level with an Exp(B) value of 9.378, and age with an Exp(B) value of 1.138.

The prevalence of patients with multibacillary type (MB) is higher than that of paucibacillary type (PB). This is due to the bacteria's virulence, heredity, low patient immunity, and community awareness. Additionally, factors such as how quickly patients seek treatment, their distance from health facilities, socio-economic conditions, and the regularity of their medication intake also have an influence. The availability of access to medical care and the consistency with which patients undergo treatment play an important role in disease control. Multibacillary (MB) leprosy is more common than paucibacillary (PB) leprosy because MB leprosy is more contagious. This effect is due to a weak cellular immune response to *M. leprae*, resulting in a greater number of bacteria in the lesions and becoming the main source of infection. Type MB usually occurs in individuals with weakened immune systems, especially in older people (Martomijoyo, 2014).

This study is limited to respondent characteristics; however, prior research indicates that various external factors may affect treatment success, such as patient awareness of side effects, family support, and health education. The study by (Nurhidayah et al., 2017) identified awareness of potential side effects as a critical factor in enhancing compliance. This indicates that educating and counselling patients about medication effects can improve adherence and, consequently, enhance the success of treatment interventions. Family support and motivation significantly impact treatment success, as evidenced by a study conducted by (Fauzi et al., 2017). Emotional support from family members can significantly impact a patient's motivation to pursue and adhere to treatment. Health education enhanced knowledge and significantly increased motivation to engage in preventive health measures (Estiyani, A., et al., 2017).

The limitations of the study should be highlighted, including its retrospective design, being conducted at a single center, and the absence of laboratory confirmation, such as post-treatment BTA tests. Future researchers are expected to add other variables that aim to determine factors associated with the success of leprosy treatment, such as external factors. In addition, further research is needed to determine the effect of external and internal factors on the success of leprosy treatment by using laboratory results (such as a BTA examination) after treatment is carried out, as well as the criteria for drug completion (Release From Treatment).

5. Conclusion

This study found that several internal factors significantly influenced the success of leprosy treatment; the most important factor contributing to the success of leprosy treatment is the type of leprosy, with Paucibacillary (PB) patients 38.8 times more likely to complete treatment successfully than Multibacillary (MB) patients. This advantage is related to various factors such as high bacterial virulence, low immunity, and speed of drug seeking. This study also showed the relationship between the internal factors of age, gender, marital status, education level, and type of leprosy to the success of leprosy treatment. However, the occupation factor did not show a significant effect on treatment success. These findings can inform targeted strategies to improve treatment outcomes, especially among high-risk groups such as multibacillary (MB) patients and the elderly.

Conflict of Interest

The authors declare no conflict of interest for the results.

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