The Profile of Type 1 Leprosy Reaction at Leprosy Division of Dermatology and Venerology Outpatient Clinic of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

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ABSTRACT

Background: Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. Type 1 leprosy reaction is a delayed hypersensitivity reaction caused by the increased response of cellular-mediated immunity to the *Mycobacterium leprae* antigen on the skin and nerves with a reversal result. The clinical manifestation includes inflammation which can cause skin and nerve lesions, swell, to permanent disabilities. **Purpose:** To describe the demographic and clinical profile of type 1 leprosy reaction at the Leprosy Division of the Dermatology and Venerology Outpatient Clinic of Dr. Soetomo General Academic Hospital in 2017–2019. **Methods:** This was a descriptive study. We used secondary data from the medical records of leprosy patients at the Leprosy Division of Dermatology and Venereology outpatient clinic, Dr. Soetomo General Academic Hospital Surabaya, from January 2017 to December 2019. **Result:** Out of 364 patients, 65 (17.9%) had type 1 reactions. They were mostly in productive age at 35–55 years old (56.9%). The patients were predominantly male (75.4%), with normal nutritional status (98.5%) and negative bacterial index (72.3%). The most common types of leprosy were BB (Borderline) with 61.6% and BL (Borderline Lepromatous) with 20.8%. All patients took WHO (World Health Organization) MDT (Multi Drug Therapy) MB (Multi-Bacillary). **Conclusion:** The profile of type 1 leprosy reaction at the Leprosy Division of Dermatology and Venerology Outpatient Clinic of Dr. Soetomo General Academic Hospital in 2017–2019 shows an average data as follows: age 35–55 years, male, normal nutritional status, negative bacterial index, leprosy type BB.

Keywords*: leprosy, type 1 reaction, Mycobacterium leprae, infectious disease.*

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BACKGROUND

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*, and it mainly affect the skin and nerves. It is highly contagious, but its morbidity is low because a large portion of the population is naturally resistant to this disease. The diagnosis is established based on skin and neurologic examination.[1]

Indonesia has the third-highest cases number of leprosy infection globally, after India and Brazil.[2] In 2017, the Indonesian Ministry of Health reported that the incidence of leprosy in Indonesia is 6.08 new cases per 100,000 population. Twelve provinces have new cases detection rate above 10 cases per 100,000 population, and East Java has the highest number of leprosy patients.[3]

Type 1 leprosy reaction is an immunological phenomenon that occurs before, during, or after the completion of multi-drug therapy (MDT). It's a delayed hypersensitivity reaction caused by an increase in cellular immunity response to *Mycobacterium leprae* antigen on the skin and nerves of leprosy patients.[4] Clinical manifestations of type 1 reactions are inflammation of the skin and nerves that can cause skin and nerve lesions, edema, and permanent disability.[5,6]

Leprosy reaction is one of the causes of morbidity in leprosy patients. These immune-mediated complications can cause rapid nerve damage, resulting in anesthesia and weakness. They then contributed to an increased risk of injury and deformity.[7] The incidence of type 1 reactions varies around 19.7%–30 % in various countries.[6,8,9]

METHODS

This descriptive study aimed to describe the demographic and clinical profile of type 1 leprosy reactions in leprosy patients, particularly patients

treated at the Leprosy Division of Dermatology and Venerology Outpatient Clinic of Dr. Soetomo General Academic Hospital in 2017–2019. We used secondary data obtained from medical records.

The inclusions criterion was patients diagnosed with type 1 leprosy reaction, as described in their medical records, at the Leprosy Division of the Dermatology and Venerology Outpatient Clinic of Dr. Soetomo General Academic Hospital from January 2017 to December 2019.

RESULT

There were 364 leprosy cases managed at Dr. Soetomo General Academic Hospital between January 2017 and December 2019. Table 1 shows the demographic distribution of the patients. Of the 364 cases, 17.9% of them had type 1 leprosy reaction diagnosed. We further profiled their age, sex, nutritional status, bacterial index, types of leprosy, and therapeutic regimen. Most patients were mostly in productive age at 35–55 years old (56,9%). They were predominantly males (75.4%), had normal nutritional status (98.5%), and had negative bacterial index (72.3%). The most common types of leprosy were BB (Borderline) with 61.6%, and BL (Borderline Lepromatous) with 20.8%. All patients took WHO (World Health Organization) MDT-MB (Multi-bacillary).

Table 1. Type 1 leprosy reaction patient distribution in Dr. Soetomo General Academic Hospital in January 2017–December 2019

Characteristics	Year			Total (%)
	2017 (%)	2018 (%)	2019 (%)	
Patient				
Leprosy division	135 (37.1)	125 (34.3)	104 (28.6)	364 (100)
Leprosy without a reaction	70 (19.2)	70 (19.2)	50 (13.7)	190 (52.2)
Leprosy with type 1 reaction	26 (7.14)	18 (4.9)	21 (5.8)	65 (17.9)
Age (year)				
< 15	0 (0)	1 (1.5)	0 (0)	1 (1.5)
15–34	8 (12.3)	4 (6.2)	7 (10.8)	19 (29.2)
35–55	15 (23.1)	10 (15.4)	12 (18.5)	37 (56.9)
> 55	3 (4.6)	3 (4.6)	2 (3.1)	8 (12.3)
Sex				
Male	21 (32.2)	12 (18.5)	16 (24.6)	49 (75.4)
Female	5 (7.7)	6 (9.2)	5 (7.7)	16 (24.6)
Nutritional Status				
Under	1 (1.5)	0 (0)	0 (0)	1 (1.5)
Normal	25 (38.5)	18 (27.7)	21 (32.3)	64 (98.5)
Over	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bacterial Index				
Negative	19 (29.2)	12 (18.5)	16 (24.6)	47 (72.3)
1+	3 (4.6)	1 (1.5)	4 (6.2)	8 (12.3)
2+	4 (6.2)	4 (6.2)	1 (1.5)	9 (13.8)
3+	0 (0)	1 (1.5)	0 (0)	1 (1.5)
4+	0 (0)	0 (0)	0 (0)	0 (0)
> 4+	0 (0)	0 (0)	0 (0)	0 (0)
Types of Leprosy				
TT	0 (0)	0 (0)	0 (0)	0 (0)
BT	0 (0)	0 (0)	0 (0)	0 (0)
BB	12 (18.5)	13 (20.0)	15 (23.1)	40 (61.6)
BL	12 (18.5)	4 (6.2)	4 (6.2)	20 (20.8)
LL	2 (3.1)	1 (1.5)	2 (3.1)	5 (7.7)
Neural	0 (0)	0 (0)	0 (0)	0 (0)
Therapeutic Regimen				
PB (Pauci-bacillary)	0 (0)	0 (0)	0 (0)	0 (0)
MB (Multi-bacillary)	26 (40.0)	18 (27.7)	21 (32.3)	65 (100)

TT = polar tuberculoid; BT = borderline tuberculoid; BB = borderline borderline; BL = borderline lepromatous; LL = polar lepromatous

DISCUSSION

This retrospective study shows 364 cases of leprosy managed at the Dr. Soetomo General Academic Hospital from January 2017 to December 2019. Of those cases, 17.9% (65 cases) recorded type 1 leprosy reactions. The age distribution was 35–55 years old (56.9%), a productive age. This is similar to previous studies, which report that most type 1 leprosy reaction patients were 30–60 years old.[10-12] Age is an independent risk factor for the incidence of type 1 leprosy reactions. Patients over 20 years of age are more likely to experience type 1 leprosy reactions. There are reasons why type 1 leprosy reactions are common in adult patients. Type 1 leprosy reaction is mainly caused by a high Th1 level, a more common immune response in adults. Also, adults have more memory T cells, causing a secondary antigen cross-reaction from *Mycobacterium* infection other than *M. leprae*, for example, *Mycobacterium tuberculosis*. This cross-reaction then resulted in type 1 leprosy reactions.[8,12] Age is an important risk factor in determining the incidence and severity of type 1 leprosy reactions.[12]

The patients were predominantly males (75.4%), which is in accordance with other studies.[8,13,14] There are two reasons why most leprosy patients were males. First, leprosy itself is a very stigmatized disease so people tend to postpone seeking healthcare, but it is found that women in particular tend to do it later than male.[15] Secondly, it is said that leprosy reaction is mostly related to stress. Therefore, it is more common in male patients. Stress is associated with immune responses and non-specific responses to lymphocyte proliferation, the emergence of T cells, specific antigens, activation of macrophages, changes in the balance of Th1 and Th2, and the release of cytokines such as IL-6s.[9,16] Those immune responses can trigger type 1 leprosy reaction.[1]

Most patients (98.5%) had normal nutritional status. This is not in line with a previous study that reports that patients with type 1 leprosy reaction are more likely to be undernutrition.[17] It is reported that leprosy patients suffer from severe oxidative stress due to malnutrition and poor immunity. Lack of nutrients can lead to destruction of the body's defenses and immune suppression. Some micronutrients are important to maintaining the body's defenses and immune function, such as immune response and antibody production.[17,18] This discrepancy is influenced by a lack of research related to data collection on nutritional status in the outpatient clinic of Dr. Soetomo General Academic Hospital, Surabaya. The nutritional status data were obtained from measurements of patient's height and weight. However, some medical records did not specify patient's height and weight.

Most patients had a negative bacterial index (72.3%). This is not in line with previous studies, which reported a higher incidence of the negative bacterial index in patients with type 1 leprosy reactions.[19-22] This discrepancy can be caused by the low number of data used in this study. For example, a study by Antunes in 2013 involved 440 patients, where 211 of them had type 1 leprosy reaction. Also, another study by Hungria in 2016 involved 753 leprosy patients, and 418 of them had type 1 leprosy reaction diagnosed.

The most common types of leprosy were BB (61.6%) and BL (20.8%). These are similar to previous studies. Antunes and colleagues in 2013 reported that 68.5% of patients with type 1 leprosy reactions had the borderline type of leprosy.[20] A study conducted by Hungria and colleagues in 2016 also reported a similar result. They found that 98.5% of patients had the borderline type of leprosy.[19] Borderline is the most common type of leprosy that causes type 1 leprosy reaction. This is because borderline type has a very unstable immunity that it can easily stimulate a cell-mediated hypersensitivity caused by increased bacteria level.[14,20,23]

All of the patients (100%) took WHO MDT-MB. This is similar to previous conducted studies. Hungria and colleagues in 2016 reported that MB patients had a higher tendency to develop leprosy reactions. Other studies also showed that leprosy reactions mainly occur in patients receiving MDT-MB.[20,24] The type 1 leprosy reaction is related to the success of therapy in the MDT-MB because the antigen from bacterial degradation will stimulate the body to produce antibodies and generate a cell-mediated immune response (CMI).[25,26] The CMI then causes an inflammatory reaction to the skin and nerves, resulting in a type 1 leprosy reaction.[25]

The limitation of this study is that we used secondary data obtained from the medical records, which in some cases, are not complete. It should be noted that a complete medical record is important for early detection and evaluation of the disability. Every clinician should be aware of the importance of a complete medical record. For future studies, we recommend a study with a bigger sample size.

In conclusion, there was a total of 65 patients (17.9%) diagnosed with type 1 leprosy reactions. The age distribution was 35–55 years old (56.9%), a productive age. The patients were predominantly males (75.4%), and they had normal nutritional status (98.5%) negative bacterial index (72.3%). The most

common types of leprosy were BB (61.6%) and BL (20.8%). All patients took MDT-MB.

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