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Case Report: Morbus Hansen Type BB With Type I Leprosy Reaction With Positive Leprosy Cardinal Sign

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ABSTRACT
Morbus Hansen (leprosy) is an infectious disease caused by Mycobacterium leprae and can cause disability if not treated properly. Leprosy reactions are divided into type 1 and type 2 (erythema nodosum leprosum) reactions, which differ depending on the type of immunity involved. We report the case of a 21-year-old man from Papua, a leprosy endemic area, who developed red patches accompanied by pain on the hands, feet and ears. Physical examination revealed a “punch out” lesion with erythematous nodes, hypoesthesia, firm borders, and scaling. Thickening of the auricularis magnus sinistra nerve was also found. The diagnosis of Morbus Hansen type BB with type 1 reaction was made based on positive BTA (B1/MI 2+/2%) and positive anti PGL-1 IgM and IgG. Risk factors such as stress and physical fatigue are thought to worsen the patient's condition. Management of type 1 reactions requires appropriate therapy along with control of risk factors to prevent recurrence. Leprosy and its reactions can cause complications that reduce the patient's quality of life. Therefore, effective screening examinations are needed, especially in individuals entering educational institutions, to prevent the spread of the disease. This report highlights the importance of early diagnosis through proper history taking, physical examination and supportive measures to optimize therapy and prevent further complications.

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INTRODUCTION

Morbus Hansen (MH), also known as leprosy, is caused by the obligate intracellular bacterium Mycobacterium leprae (M. leprae). The bacteria begin to invade the peripheral nerves, then enter the skin and mucosa of the upper respiratory tract, before spreading to the rest of the body, except for the central nervous system (Prasetyo and Saftarina, 2019). Poor housing, polluted water, insufficient bedding and immune-compromising diseases are risk factors for MH (Pramudya Wardhani *et al.*, 2022). Studies suggest the incubation period in leprosy varies, estimated at around three to five years for tuberculoid leprosy and more than 9-10 years for lepromatous leprosy (Gilmore, Roller and Dyer, 2023).

According to the World Health Organization's (WHO) weekly epidemiological data in 2019, there were 202,185 new cases of leprosy. The number of new cases in 2019 decreased

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slightly compared to the previous year, which reached 208,618 new cases. In Indonesia, there were 15,910 new leprosy cases. From 2015 to 2017, 3,373 new leprosy cases occurred in East Java, 1,813 in West Java, 1,644 in Central Java and 1,091 in South Sulawesi (Baeha, Budiarti and Maharani, 2023).

The Ministry of Health's target is to eliminate leprosy with an incidence rate of <1/10,000 population. Unfortunately, there are six provinces that have not yet achieved this target, including Minahasa, Gorontalo, Maluku, North Maluku, Papua and West Papua. In 2022, a recent epidemiological study showed that the prevalence rate of leprosy in Papua reached 5.8 per 10,000 population. New cases were found mainly in Jayapura, Biak Numfor, and other areas on the coast of Papua (Dinas Kesehatan Provinsi Papua, 2023).

According to the WHO, the classification of Morbus Hansen is based on the number of skin lesions, and the two types are known as PB and MB (Baeha, Budiarti and Maharani, 2023). In terms of clinical spectrum, Ridley and Jopling classified MH into five categories: polar tuberculoid (TT), borderline tuberculoid (BT), central borderline (BB), borderline lepromatous (BL), and polar lepromatous (LL) leprosy (Amal, Anggara and Dwiyanti, 2024).

Patients who exhibit one or more of these 'cardinal signs' are considered MH patients. The cardinal signs are 1) Hypopigmentation or redness of local skin lesions with loss of sensation (particularly touch and temperature); 2) Peripheral nerve involvement indicated by thickening of certain peripheral nerves with loss of sensation (especially touch and temperature); 3) laboratory examination of skin tissue scrapings showing positive BTA (acid-resistant bacilli). (Baeha, Budiarti and Maharani, 2023). Leprosy reactions can occur before, during or after leprosy treatment and can occur in thirty to fifty percent of people with leprosy. Leprosy reactions are usually divided into two types: reversal reactions (RR), also known as type 1 reactions, and Erythema Nodosum Leprosum (ENL) reactions, also known as type 2 reactions (Idris and Mellaratna, 2023a).

Type 1 and type 2 leprosy reactions *(erythema nodosum leprosum)* are distinguished by the type of immune response and acid-resistant bacilli. Focal infection, pregnancy, anemia, physical fatigue, and mental stress are some of the conditions that can cause recurrent reactions (Kusumaningrum *et al.*, 2019). Type 1 reactions can show symptoms of inflammation of the skin and nerves. The skin shows symptoms such as redness, swelling, pain and heat. Nerve symptoms include pain or impaired nerve function. It may also cause general symptoms such as fever. If not treated properly, type 1 reactions can cause disability such as paralysis and deformity (Kusumaningrum *et al.*, 2019).

Type 1 leprosy reaction is a type IV hypersensitivity reaction by slowing down the expression of MHC class II on the cell surface. CD4 lymphocytes will kill infected cells with the mediation of cytokines such as TNF. Basically, type 1 reactions occur due to changes in the balance between the body's immunity and the bacilli, which can lead to *upgrading/reversal* or *downgrading*. Since it often occurs in treated patients, type 1 reaction is considered as *reversal* reaction. On the other hand, *downgrading reactions* are less common because they are slower and usually occur in untreated patients (Vionni, Arifputra and Arifputra, 2016).

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Complications are associated with loss of sensation in the limbs and fingers, leading patients to ignore small wounds or burns until infection occurs. Wounds especially on the soles of the feet are problematic. Nerve damage and its complications may lead to disability, especially if all limbs and both eyes are affected (Vionni, Arifputra and Arifputra, 2016; Kusumaningrum *et al.*, 2019).

Leprosy is transmitted through close and prolonged contact, hence good and thorough screening is necessary to prevent transmission, especially in educational institutions where students stay in one dormitory for a long time. Supportive examinations that can be performed in leprosy include bacteriological examination, skin biopsy and serological examination. Bacteriological examination assesses the presence or absence of leprosy-causing bacteria. Sampling is done by scraping tissue or skin slices on skin lesions that have the possibility of accumulation of leprosy-causing bacteria, one of which is the ear area. Further polymerase chain reaction (PCR) tests may also be performed to confirm the diagnosis. Various serologic tests may be required to measure antibodies to phenolic glycolipid-I (PGL-1) or its derivatives either quantitatively (ELISA or UCP-LFA) or qualitatively (ML-flow or NDO-LID rapid test) (Pierneef *et al.*, 2021; Gilmore, Roller and Dyer, 2023).

CASE

A 21-year-old male patient from Papua who was a student of an educational institution living in a dormitory for several months, was being treated at Bhayangkara H.S. Samsoeri Mertojoso Hospital Surabaya with complaints of full body pain accompanied by red bumps and felt for three weeks. Complaints have worsened since the last week. Symptoms began with a fever that could be reduced with antipyretic drugs. In addition, the patient complained of pain and cramps in the fingers and toes that made it difficult to move. In the psychosocial history, the patient is currently doing education at one of the educational institutions so that the patient is in a condition of physical fatigue and mental stress for the past few months.

From the results of the physical examination, the patient's blood pressure was 115/88 mmHg, pulse 80x/min, temperature 36.5, breathing 22x/min. On examination of dermatological status on the superior extremities there are hyperemic plaques in the form of “punch out” and there are erythema nodules on the brachii dextra and sinistra, antebrachii dextra and sinistra to the dorsum of the manus. Then on the inferior extremities, an erythema plaque was found on the dorsal pedis dextra in the form of a circle with a diameter of approximately 5 cm. On the left earlobe there is an erythema nodule measuring 3x2 cm, all nodules and plaques are painful and palpable heat.

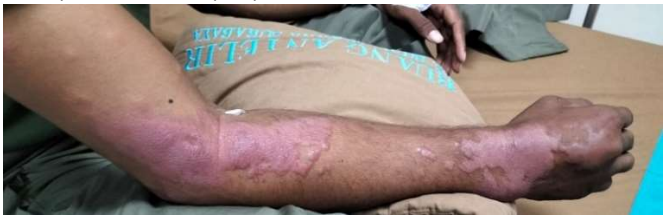

Figure 1: A punch out erythematous plaque with erythema nodules with uneven surface and firm boundaries and dense lesion consistency in the antebrachia region dextra and sinistra.

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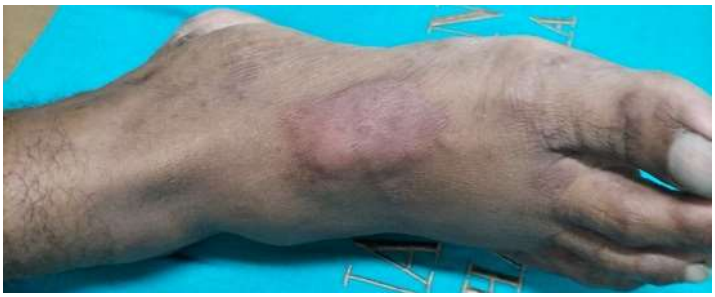

Figure 2. There is a lesion in the form of a regular-shaped erythematous plaque with a flat surface and firm boundaries. With a solid consistency in the dorsal region of the dextral pedis.

Figure 3. There is a lesion in the form of an erythematous nodule measuring 3x2 cm, unified in shape with a flat surface and firm boundaries. With a solid consistency in the auricula sinistra and dextra region accompanied by thickening of the nervus auricularis magnus.

Blood and xray laboratory tests were within normal limits. The patient was examined with a slit skin smear from the skin of the right arm with *Ziehl Neelsen* staining results: BI/MI 2+/2% acid-resistant rod germs were found. Serologic test with ELISA method showed the results of IgM and IgG anti PGL-1 titers above the upper threshold of >6300 u/ml and 5388 u/ml. Based on history, physical examination and supporting examination, the patient was diagnosed with Morbus Hansen Borderline (BB). The management given to the patient included the administration of 1500 cc crystalloid fluid/24 hours, ranitidine injection 2x50mg, prednisone 20 mg - 20 mg - 0, esomeprazole 1x40mg, sucralfate syrup 3xC1 after meals, vitamin B complex 1x1 tablet, diclofenac sodium 2x 50 mg, and topical medication in ointment preparations containing fusidic acid and vaseline. Prednisone was given by *tapering off.* The initiation of prednisone administration started from a dose of 40 mg then the dose was gradually decreased from 35 mg, 25 mg, 20 mg to 5 mg. After hospitalization and close observation for two weeks, the patient experienced clinical improvement. The macular erythema thinned, edema and pain in the extremities decreased. At the time of outpatient control, she received *multidrug therapy for leprosy.*

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RESULTS AND DISCUSSION

Leprosy also known as *Morbus Hansen*, is a chronic granulomatous disease caused by infection with *Mycobacterium Leprae*. *Mycobacterium Leprae* is an acid-resistant, intracellular obligate bacillus with tropism to peripheral nerves and reticuloendothelial cells. As leprosy can mimic many other skin diseases, diagnosis is difficult for patients with different clinical manifestations and serological tests, especially for patients living in non-endemic areas (Idris and Mellaratna, 2023a).

Clinical cardinal signs and specific history extracted from the history can help the clinician direct the diagnosis. Specific history includes a history of contact with leprosy patients, family background with a history of living in Papua and socioeconomic circumstances, and a history of leprosy treatment. Referring to data from the Ministry of Health, there are six provinces that have not yet reached the leprosy elimination target, namely Minahasa, Gorontalo, Maluku, North Maluku, Papua and West Papua (Amal, Anggara and Dwiyanti, 2024). Therefore, this patient was found to have a risk factor of coming from a leprosy endemic area.

The patient was found based on the patient's identity, first, the patient was a student of an educational institution where his training had been carried out for several months. Before being admitted, a medical examination was carried out which was divided into 2: 1) Stage 1 includes: hearing test, vision test, dental test, heart test, urine test and blood test; 2) Stage 2 includes: X-ray test, ECG test, visual acuity test, audiometry test, and spirometry test (Armadi *et al.*, 2020; Idris and Mellaratna, 2023b). No special examination related to leprosy had been carried out previously, so the patient passed the initial health examination.

Anamnesis found pain and heat since 3 weeks and worsened during this week. Initially in the form of red spots, the pain increased over time. During this week the patient also complained of fever and joint pain. Type 1 leprosy reactions have typical symptoms such as redness, heat, and pain and can result in impaired nerve function (Menaldi, 2019). Then from the anamnesis it was found that the patient had physical fatigue and a history of stress in the last few months which could cause a type 1 leprosy reaction.

On dermatologic and neurologic examination, irregularly shaped erythematous plaques with uneven surfaces and firm boundaries and dense lesion consistency were found in the antebrachia region dextra, erythematous plaques were regular in shape with flat surfaces and firm boundaries. Erythematous plaques with dense consistency in the dorsal pedis region dextra, and erythematous nodules measuring 3x2 cm, regular in shape with a flat surface and firm boundaries, dense consistency in the auricula region sinistra accompanied by thickening of the nervus auricularis magnus sinistra. Plaques and nodules are palpable hot and painful. The BTA examination showed a positive BTA result with a BI/MI of 2+/2% supported by serological results in the form of an increase in serum IgM and IgG anti PGL-1 titers. So based on the dermatological examination, neurological examination and BTA examination, the working diagnosis of this case is MH type BB with type 1 leprosy reaction (Menaldi, 2019).

Leprosy management aims to stop the chain of transmission, prevent drug resistance, shorten the treatment period, improve the regularity of treatment and prevent defects that already exist or reappear before treatment (Pierneef *et al.*, 2021). The leprosy regimen

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according to WHO can be divided into pausibacillary type MDT (PB) with rifampicin and dapsone for 6-9 months or multibacillary type MDT (MB) with rifampicin, dapsone, and lampren for 12-18 months (Widiatma and Prakoeswa, 2019). The patient was given multibacillary type *multidrug therapy*.

For early detection of leprosy reactions, every examination of leprosy patients must be done carefully and using the national leprosy program format, the Prevention of Dissability (PoD) format. That is why the MDT must be taken by the Leprosy Patient himself, not by someone else. There are the following symptoms of leprosy reaction: a) new lagoftalmus within the last six months; b) peripheral nerve pain; c) decreased muscle strength within the last six months; d) decreased sense of touch within the last six months; e) ruptured patches or ruptured nodules; f) active (inflamed) patches at peripheral nerve sites. If any of the above symptoms appear and there is a severe reaction, immediate leprosy reaction therapy is given. *Leprosy* reaction therapy includes: a) Prednisone (for type 1 and 2 reactions) to manage or treat the reaction; b) Clofazimine/lamprene (for type 2 reactions) to manage or treat recurrent ENL reactions (steroid dependent) (IPO Channel, 2023). This patient was given prednisone therapy with tappering off and *multidrug therapy leprosy* experienced clinical improvement after treatment.

Table 1. Leprosy Reaction Management

Reaction Type and Neuritis	Prednisone	Clofazimine
Severe types 1 and 2	According to the scheme. Every 2 weeks the patient should be rechecked to see the clinical state to check nerve function. If condition: - If improved, the dose of prednisone is decreased according to the scheme - If persistent, the dose of prednisone is decreased for 1 week - When worsening, the dose of prednisone is increased by 1 level above it	
Type 1 and 2 child weight	Initial maximum dose of 1mg/kg BW. Evaluation every 2 weeks, for dose reduction. Maximum total treatment duration is 12 weeks.	
Neuritis	In neuritis that occurs < 6 months, prednisone is given at a standard dose of 12 weeks. Doses start at 40-60 mg/day with a maximum dose of 1 mg/kg body weight. Usually healing occurs within a few days.	
Recurrent severe ENL (steroid dependent)		Adult clofazimine dosage:

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Reaction Type and Neuritis	Prednisone	Clofazimine
		300 mg/day for 2 months 200 mg/day for 2 months 100 mg/day for 2 months

CONCLUSION

This study reports the case of a 21-year-old male student of an educational institution who developed a leprosy reaction while in the educational hostel. On initial medical examination, a history of leprosy was not identified and no medical examination had been performed for leprosy detection. Type 1 leprosy reactions must be correctly diagnosed to determine appropriate management through history taking, physical examination and to prevent recurrent or ongoing type 1 leprosy reactions, it is very important to explore and avoid factors that trigger complications that can occur in patients, which can reduce patient productivity. In this case, the patient's history of leprosy was not detected during the medical examination because at that time the patient was not under stress or physical fatigue, and had not been screened for leprosy. A more effective screening system to detect the presence of leprosy in health checks needs to be implemented by educational institutions that require students to stay together for long periods of time due to the risk of transmission that can occur in these conditions. If efforts are not made early on, leprosy rates may increase again even in non-endemic areas. A detailed history and skin examination should be conducted as a screening effort, especially for prospective students who come from endemic areas, have a history of contact with leprosy patients, or have a history of previous leprosy treatment. If necessary, additional tests can be done, such as bacteriological or serological tests as supporting tests. A proper screening, examination and management system is needed to support the realization of the National Action Plan for Leprosy Elimination in 2023-2027 with a target prevalence rate of <1/10,000 population to zero cases (Dinas Kesehatan Aceh, 2023). The National Action Plan for Leprosy Elimination mainly targets 101 districts/cities spread across 6 provinces namely West Papua, Papua, Maluku, North Maluku, North Sulawesi and Gorontalo.

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