

A CASE STUDY ON LEPROSY

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Abstract: Leprosy is a disease like other infectious diseases (Hansen's disease), mildly infectious malady capable of producing, when untreated, various deformities and disfigurements. It is caused by the rod-shaped bacterium *Mycobacterium leprae*, first described by G. Armauer Hansen, a Norwegian physician, in 1874. The mode of transmission is not fully understood. It is thought to be transmitted by nasal discharges and skin sores, and possibly also by contaminated objects and arthropods and by infected armadillos (which are also susceptible to the disease). Only 5% of those exposed acquire the disease. The onset is intermittent and gradual, symptoms may not appear until years after exposure. It is seldom fatal, but its involvement of the peripheral nerves destroys sensation and makes the patient prone to inadvertent injury.

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Leprosy today

Leprosy control has improved significantly due to national and sub national campaigns in most endemic countries. Integration of primary leprosy services into existing general health services has made diagnosis and treatment of the disease easy. The implementation of the global leprosy strategy 2011–2015 national leprosy programmes now focus more on underserved populations and inaccessible areas to improve access and coverage. Since control strategies are limited, national programmes actively improve case holding, contact tracing, monitoring, referrals and record management.

According to official reports received from 105 countries and territories, the global registered prevalence of leprosy at the beginning of 2012 stood at 181 941 cases. The number of cases detected during 2011 was 219 075 compared with 228 474 in 2010.

Pockets of high endemicity still remain in some areas of Brazil, Indonesia, Philippines, Democratic Republic of Congo, India, Madagascar, Mozambique, Nepal, and the United Republic of Tanzania. All endemic countries remain highly committed to eliminating the disease, and continue to intensify their leprosy control activities.

Brief history - disease and treatment

Leprosy was recognized in the ancient civilizations of China, Egypt and India. The first known written mention of leprosy is dated 600 BC. Throughout history, the afflicted have often been ostracized by their communities and families.

Although leprosy was treated differently in the past, the first breakthrough occurred in the 1940s with the development of the drug dapsone, which arrested the disease. But the duration of the treatment was many years, even a lifetime, making it difficult for patients to follow. In the 1960s, *M. leprae* started to develop resistance to dapsone, the world's only known anti-leprosy drug at that time. In the early 1960s, rifampicin and clofazimine, the other two components of recommended multidrug therapy (MDT), were discovered.

In 1981, a WHO Study Group recommended MDT. MDT consists of 3 drugs: dapsone, rifampicin and clofazimine and this drug combination kills the pathogen and cures the patient.

Since 1995, WHO provides free MDT for all patients in the world, initially through the drug fund provided by the Nippon Foundation and since 2000, through the MDT donation provided by

Novartis and the Novartis Foundation for Sustainable Development.

Types of Leprosy

There are two forms of leprosy. In the **tuberculoid** form of the disease the skin lesions appear as light red or purplish spots. Tuberculoid leprosy is the more benign type, even though it is accompanied by nerve involvement, which leads to numbness (usually of the extremities), contractures, and ulceration. In **lepromatous** leprosy the skin lesions appear as yellow or brown infiltrated nodules (protuberances) that affect the mucous membranes of the eyes, nose, and throat. There is a general thickening of the skin, especially the face and ears. Lepromatous leprosy is the more easily spread of the two.

Elimination of leprosy as a public health problem

In 1991 WHO's governing body, the World Health Assembly (WHA) passed a resolution to eliminate leprosy by the year 2000. Elimination of leprosy is defined as a prevalence rate of less than 1 case per 10 000 persons. The target was achieved on time and the widespread use of MDT reduced the disease burden dramatically.

- Over the past 20 years, more than 14 million leprosy patients have been cured, about 4 million since 2000.
- The prevalence rate of the disease has dropped by 90% – from 21.1 per 10 000 inhabitants to less than 1 per 10 000 inhabitants in 2000.
- Dramatic decrease in the global disease burden: from 5.2 million in 1985 to 805 000 in 1995 to 753 000 at the end of 1999 to 181 941 cases at the end of 2011.
- Leprosy has been eliminated from 119 countries out of 122 countries where the disease was considered as a public health problem in 1985.
- So far, there has been no resistance to antileprosy treatment when used as MDT.

- Efforts currently focus on eliminating leprosy at a national level in the remaining endemic countries and at a sub-national level from the others.

Actions and resources required

In order to reach all patients, leprosy treatment needs to be fully integrated into general health services. Moreover, political commitment needs to be sustained in countries where leprosy remains a public health problem. Partners in leprosy elimination also need to continue to ensure that human and financial resources are available.

The age-old stigma associated with the disease remains an obstacle to self-reporting and early treatment. The image of leprosy has to be changed at the global, national and local levels. A new environment, in which patients will not hesitate to come forward for diagnosis and treatment at any health facility, must be created.

Presentation

- The symptoms of leprosy may develop in a very insidious fashion due to an average incubation period of approximately 7 years. Three features are required in order to make a diagnosis of leprosy:
 - Reddish patches or hypopigmented areas of skin with reduced sensation.
 - Thickened peripheral nerves.
 - The presence of acid-fast bacilli in skin smears or biopsies.
- The initial skin lesion, often referred to as indeterminate leprosy, may resolve spontaneously. If this fails to happen, the subsequent progression of the disease will depend on the patient's immune response to the organism.
- A spectrum of disease activity is described from tuberculoid leprosy, in which there is a low bacterial load and few skin lesions, to lepromatous leprosy, in which there is a high bacterial load and diffuse infiltration. This can affect not only the skin, but also

areas such as the respiratory tract, the eye and lymph glands.

- The mycobacterium has a preference for cooler temperatures and therefore it is the superficial structures rather than deep visceral organs which are usually involved.
- Features which may be seen in leprosy include:
 - *Skin lesions* - hypopigmented macules and plaques (common), papules and nodules (rare)
 - *Neurological involvement* - damage to small nerves to the skin producing reduced sensation and anhidrosis, or peripheral nerve damage with the posterior tibial nerve being most commonly affected followed by ulnar, median, lateral popliteal and facial. Peripheral nerve damage may result in a 'glove and stocking' pattern of sensory loss and/or a distal weakness beginning with the intrinsic muscles of the hands and feet.
 - *Ocular involvement* - damage to the eye resulting in blindness may occur as a combination both of nerve damage and direct infiltration of the eye with the organism. Damage to the trigeminal nerve may also result in reduced blink rate and impaired corneal sensation resulting in injury and ulceration to the cornea.
 - *Systemic involvement* - severe forms of lepromatous leprosy may be associated with systemic disease affecting, for example, the respiratory tract - both upper and lower, the testes, lymph nodes, kidneys and bones, and rarely may cause amyloidosis

Patient Case Study *To protect patient confidentiality, no specific patient identifiers are listed in this account.*

A 34 year old woman from Madhanapalli, was diagnosed with lepromatous leprosy (multibacillary leprosy) after complaining of a persistent pruritic rash throughout her body. The diagnosis was made after a skin biopsy of skin lesions on the abdomen revealed acid-fast bacilli. The patient was not aware of her diagnosis until she presented to the Infectious Disease physician. The patient had two children, including an infant, she had stopped smoking several years ago and appeared to be well nourished.

Her medical history indicated that her symptoms started five years ago, with cramping and spasms of her arms. She noted that her wrists felt like they were falling asleep at times, along with needle-like pain that would occasionally erupt. Additionally, she reported a significant amount of fatigue and stress. The patient's medical record indicated a diagnosis with depression; her initial visits for the skin condition included initial diagnoses of atopic dermatitis and urticaria before the biopsy was taken. The patient was prescribed ibuprofen, fluoxetine and hydroxyzine.

During the course of the interview, the patient revealed that she had worked with flowers extensively several years ago while in the United States, which presents a possible exposure to the *M. leprae* bacterium; furthermore, she reported that armadillos were endemic in her home in South America and that her family kept a variety of household pets such as dogs and birds. The interview was unable to determine if any other family members, locally or out-of-state, had similar dermatological complaints; however, her infant reportedly had a fungal infection suggesting potential infection of the child.

The physical exam revealed numerous lesions throughout her body, including those on her nasal bridge area, cheeks, abdomen and back. These lesions were macular in nature and did not exhibit significant plaque, dryness or significant discoloration other than an erythematous appearance. The soles of her feet appeared to be usually dry and callous, and her legs appeared hypopigmented when compared to the rest of the body. The eyebrows appeared to have started

thinning. Her reflexes were hyperreflexive and her forearm demonstrated some anesthesia, corresponding to the ulnar nerve.

The patient was counseled about leprosy, and a course of multi-drug therapy combining dapsone (100mg/ day), clofazimine (50mg/ day) and rifampin (600mg/monthly) was prescribed for a period of 2 years. The monthly dose of rifampin would be taken under supervision to ensure compliance and to track any adverse effects. Liver function tests were ordered to ensure hepatotoxicity did not result from her concurrent use of other medications.

As required by county law, the patient's case was reported to the Public Health Department using established protocols.

WHO response

The WHO Strategy for leprosy elimination contains the following:

- ensuring accessible and uninterrupted MDT services available to all patients through flexible and patient-friendly drug delivery systems;
- ensuring the sustainability of MDT services by integrating leprosy services into the general health services and building the ability of general health workers to treat leprosy;
- encouraging self-reporting and early treatment by promoting community awareness and changing the image of leprosy;
- monitoring the performance of MDT services, the quality of patients' care and the progress being made towards elimination through national disease surveillance systems.

Sustained and committed efforts by the national programmes along with the continued support from national and international partners have led to a decline in the global burden of leprosy. Increased empowerment of people affected by the disease, together with their greater involvement in services

and community, will bring us closer to a world without leprosy.

Future treatments

- Pentoxifylline and clofazimine have shown encouraging results for the treatment of severe type II immune reactions and are currently undergoing large clinical trials.
- Mycobacterium w (Mw) vaccine has shown reasonable efficacy in eliciting immunoprophylactic responses in household contacts of leprosy patients, particularly in children.
- Therapeutic roles for leprosy vaccines and other immunomodulatory agents are also under investigation. It is believed that enhancement of defective host cell-mediated immunity improves clearance of mycobacteria.
- However, the use of immunotherapy in the treatment of established leprosy is currently hampered by an increased frequency of type I reactions.

Complications

- Pheriperafal nerves are involved to damage and deformities occur.
- If left untreated, leprosy may result in blindness and physical deformity.
- Despite treatment with MDT, reactive states may still lead to neurological damage producing Charcot's joints and other deformities.
- Secondary amyloidosis is now rare in patients treated with MDT.

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