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A review on leprosy: A comprehensive guide to diagnosis and treatment

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ABSTRACT

Leprosy, medically known as Hansen's disease, is an ancient infectious disease caused by the bacteria Mycobacterium leprae and Mycobacterium lepromatosis. In a few low- and middle-income countries, the disease still persists as a public health issue due to the continuous advances in diagnosis and therapies. This review presents an overview of the global burden of leprosy, disease mechanisms, clinical manifestations, diagnostic tools, and therapeutic strategies. It also highlights recent advances, challenges, and future perspectives in the context of the efforts to eliminate leprosy and leprosy-related disabilities.

Keywords: Leprosy, Hansen's disease, Mycobacterium leprae, Mycobacterium lepromatosis, Infectious disease, Diagnostics, Treatment, Public health concern, Countries with low and middle incomes, Global burden, Disease mechanisms, Clinical symptoms, Diagnostic tools, Treatment strategies, Recent developments

Introduction

For centuries, leprosy has been a scourge on humanity, and while global majority efforts have greatly lowered its prevalence, thousands are still infected each year. The disease affects mainly skin, peripheral nerves, respiratory tract, and eyes. Untreated, it may lead to lasting impairments. World Health Organization (WHO)-led campaigns contributed to substantial progress in recent decades, but ongoing transmission in endemic countries highlights the need for sustained vigilance.

Epidemiology

Leprosy remains endemic in parts of Asia, Africa and South America. In 2023, almost 200,000 new cases were recorded globally, most of them in India, Brazil and Indonesia. The principal route of transmission is via respiratory secretions from infectious people. Also, animal reservoirs, especially of armadillos in the Americas, also play a role in new case and areas of reservoir diseases.

Key Risk Factors Include:

- ● Prolonged close contact with an infected, untreated person
- ● Genetic predisposition
- ● Lacks human nutritional requirements
- ● Poor standards of living

Pathogenesis

Leprosy, it turns out, is caused by the same bacteria that live inside human cells, in this case, preferentially Schwann cells in the peripheral nervous system. The immune response of the body determines what the disease looks like:

- TT: Strong immunity, leading to a few, localized lesions.
- Lepromatous Leprosy (LL): Characterized by a poor immune response, leading to disseminated lesions and high bacterial load.

Leprosy is classified into five categories according to Ridley-Jopling classification (TT, BT, BB, BL, and LL) using clinical, histological, and immunological criteria.

Clinical Features

Leprosy has a wide clinical spectrum, impacting the skin and nervous system and occasionally the eyes and other organs.

Skin Symptoms:

● White or red areas with loss of feeling
● Papules, raised nodules, or thickened plaques

Neurological Symptoms:

- Loss of temperature or pain sensitivity
- Nerve thickening neuropathy (familial)
- Weakness or paralysis of muscles
- Pins and needles or numbness in the limbs

Eye Involvement:

● Lack of eyelid closure (lagophthalmos)
● Corneal damage
● Progressive vision loss

Other Systemic Symptoms:

- Degeneration of testicular tissue
- Nasal obstruction, bleeding, or septal perforation

Diagnosis

The diagnosis of leprosy often starts with clinical observation, and continued with laboratory confirmation:

Clinical Clues:

● Numb skin patches
● Nerves that thicken and can be felt
- Indirect contact with confirmed cases Laboratory test:
● Skin Smears: Microscopy with acid-fast staining to identify bacilli
● Biopsy: Microscopic examination of tissue to identify granulomas or bacteria
● PCR: M. leprae genetic material detection especially applicable in early or smear-negative cases
● Serological Tests: Serological markers such as PGL-1 (in early disease, less helpful)

Challenges in Diagnosis:

● Milder symptoms that resemble other illnesses
● Advanced diagnostics in endemic area are poorly accessible
When stigma leads to a delay in consulting a doctor

Classification Systems

WHO Classification:

- **Paucibacillary (PB):** Five or fewer skin lesions with no detectable bacilli
- **Multibacillary (MB):** > Five lesions or positive skin smear

Ridley-Jopling System:

This classification, based on immune response and histopathology, is used mostly in research and clinical settings.

Treatment

The WHO recommends multidrug therapy (MDT) for leprosy cure and resistance prevention:
For Paucibacillary (PB) Cases:

- Rifampicin: 600 mg monthly (with supervision)

● Dapsone — 100 mg PO daily (self-administered)
● Duration: 6 months
For Multibacillary (MB) Cases:
● Rifampicin: 600 mg per month
● Dapsone: 100 mg daily
● Clofazimine: 300 mg once monthly and 50 mg once daily
● Duration: 12 months
Resistant forms of the M. leprae bacterium have developed resistance to rifampicin and dapsone, necessitating the use of alternative regimens in the case of resistant infections, which demand regular monitoring.
Emerging and Investigational Treatment Approaches:
● Uniform MDT (U-MDT): An easily available, standardised regimen under clinical research
● ROM Therapy: rifampicin, ofloxacin and minocycline for single-lesion cases
Managing Leprosy Reactions
Leprosy reactions are acute flares that can lead to nerve damage and systemic symptoms:

Type 1 Reaction (Reversal Reaction)
● typical in borderline cases
● Provoke swelling in skin and nerves
● Treated with corticosteroids

Type 2 Reaction (Erythema Nodosum Leprosum – ENL)
● Found in lepromatous, borderline lepromatous types
● Manifests as painful red lumps, fever and joint pain
● Managed with steroids, clofazimine or (extensively regulated) thalidomide

Therapeutic and Disabling Care Rehabilitative

The response to disabilities due to leprosy is multidisciplinary and includes:
● **Physical Therapy:** To help keep muscles strong and joints flexible
● **Occupational Therapy:** To help with activities of daily living
● **Manual Therapies:** Realignment of bony structures
● **Patient Education:** Teaching self-care practices to prevent further injury Timely treatment can prevent chronic injury, but continued follow-up care is essential to managing complications.
WHO Strategy: Public Health and Control
● Stop transmission via early diagnosis and full treatment
● Integrate leprosy care into general systems of health care
● Track and trace people who have been in contact with cases

Ongoing Challenges:

● Stigma keeps people from seeking care
● Education about missed diagnoses in the remote and underserved population
● Access to lab diagnostics and diagnostics medicines needs to be improved

Future Prospects:

● Vaccines like LepVax were developed
● Improved, more rapid diagnostic tests
● Global surveillance for drug resistance

Conclusion:

While dramatic advances have been made over the past few decades, leprosy remains a in some areas, the health issue. To tackle disease against it need to be combined early symptoms, suitable drug management, utilization of immune responses and prolonged rehabilitation. Global health initiatives is the official written statement of government No one must not only face medical treatment but also stigma and increase public awareness. And it ends ultimately, with bringing transmission to zero while providing those affected with the attention, care and support they need.

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