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Review Article

Understanding Leprosy : A Comprehensive Review

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ABSTRACT

Leprosy is a unique infectious disease with a prolonged incubation period and a predilection for skin and nerves. The involvement of nerves by the primary infection as well as the immunologically mediated reversal reactions result in impairment of nerve function and severe disabilities. The introduction of the World Health Organization Multi Drug Therapy over the last two decades has produced dramatic changes in the management and control programmes of leprosy. Despite significant improvements in leprosy (Hansen's disease) treatment and outlook for patients since the introduction of multidrug therapy (MDT) 3 decades ago, the global incidence remains high, and patients often have long-term complications associated with the disease. Traditionally, India holds the unenviable position of the origin of leprosy. Therapeutic modalities that were initially restricted to chaulmoogra expanded to include newer anti-leprotic medications and even surgical reconstruction of deformities. India's future challenges in leprosy control include stigmata, educational knowledge gaps, and multiple systems of medicine.

INTRODUCTION

Leprosy is a chronic infectious disease that may lead to severe, disfiguring skin sores and nerve damage in the arms, legs and skin areas around your body. All you want to know about the signs and symptoms. Mycobacterium leprae, the bacterium that causes leprosy, also goes by the name Hansen's disease. It is a chronic infection that affects the skin, nerves, and other body components. A leprosy patient may experience long-term skin damage, nerve damage or blindness, paralysis, nasal deformity, and

persistent foot sores if treatment is not received. Leprosy manifests as discoloured skin patches, numbness in the hands and feet, and loss of sensation in the limbs. Antibiotics are used to treat leprosy, which is curable with early diagnosis.

Synonyms :

Hansen's disease
kushtharog

History :

Leprosy has been identified for the first time in 2000 BC osteo-archaeological remains discovered in India . According to molecular research, the

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disease originated in eastern and central Europe, the Mediterranean Basin, and the Americas approximately 40,000 years ago. It migrated towards Asia along the migratory routes of the earliest human groups from East Africa. This finding implies that *M. leprae* was encountered by numerous ancient documents imply that leprosy has been present in Africa, Asia, and India since prehistoric times. These countries' ancient literature has references to leprosy. But none of these narratives—nor many others—tell us precisely where Hansen's sickness was initially reported, and it's likely that we'll never find out. Leprosy and other general skin illnesses were referred to as "Kushtha" in traditional Indian medicine. These days, India uses it especially treating leprosy. The Manu Smriti (Laws of Manu), which are thought to have been composed between 500 and 1300 BC, and the "Vedas," which are thought to be extremely ancient and were composed circa 1400 BC, both make mention to this term (Kushtha). Entered by both the first Homo sapiens and the final Neanderthal, it is difficult to find any credible allusions to leprosy in ancient Chinese literature. The Yellow Emperor, Huang Ti, is revered as the founder of Chinese medicine and is credited with writing the "Nei Ching," which is said to be the oldest medical manuscript in existence. He included numerous symptoms that could be connected to Hansen's illness in this extensive medical manuscript, which was most likely composed around 500 BC. These symptoms included nodules, ulcerations, numbness, and eyebrow loss. Hua Tuo (ca. 140–208), a Chinese physician and surgeon who lived during the late Eastern Han dynasty, described a similar case of suspected leprosy in his book "Secret Prescriptions." He mentioned white and red spots on a patient's skin, anaesthesia, blindness, foot ulcerations, loss of eyebrows, and hoarseness.(10)

Signs and Symptoms:

Symptoms mainly affect the skin, nerves, and mucous membranes (the soft, moist areas just inside the body's openings).(6)

- The disease can cause skin symptoms such as:
- Discolored patches of skin, usually flat, that may be numb and look faded (lighter than the skin around)
- Growths (nodules) on the skin
- Thick, stiff or dry skin
- Painless ulcers on the soles of feet
- Painless swelling or lumps on the face or earlobes

Loss of eyebrows or eyelashes



Fig. 1: A large, discolored lesion on the chest of a person with Hansen's disease:



Fig. 2: Enlarged nerves below the skin and dark reddish skin patch overlying the nerves affected by the bacteria on the chest of a patient with Hansen's disease. This skin patch was numb when touched.

Symptoms caused by damage to the nerves are:

- Numbness of affected areas of the skin
- Muscle weakness or paralysis (especially in the hands and feet)

- Enlarged nerves (especially those around the elbow and knee and in the sides of the neck)
- Eye problems that may lead to blindness (when facial nerves are affected)

Enlarged nerves below the skin and dark reddish skin patch overlying the nerves affected by the bacteria on the chest of a patient with Hansen's disease. This skin patch was numb when touched .

Symptoms caused by the disease in the mucous membranes are:

- A stuffy nose
- Nosebleeds

Since Hansen's disease affects the nerves, loss of feeling or sensation can occur. When loss of sensation occurs, injuries such as burns may go unnoticed. Because you may not feel the pain that can warn you of harm to your body, take extra caution to ensure the affected parts of your body are not injured.

Complications:

If left untreated, the signs of advanced leprosy can include:

- Paralysis and crippling of hands and feet
- Shortening of toes and fingers due to reabsorption
- Chronic non-healing ulcers on the bottoms of the feet
- Blindness
- Loss of eyebrows
- Nose disfigurement

Other complications that may sometimes occur are:

- Painful or tender nerves
- Redness and pain around the affected area
- Burning sensation in the skin

Diagnosis:

Hansen's disease is diagnosed based on clinical presentation and the diagnosis is confirmed by skin or nerve biopsy and acid-fast staining. In the United States, the National Hansen's Disease Program External provides diagnostic services.(5)

Some serological tests have been developed and promoted by some investigators, but they lack sufficient sensitivity and specificity to be used as diagnostic tests. For this reason, they are not used to diagnose Hansen's disease.(5)

Specimens and Tests:

Depending on the form of leprosy suspected by the treating physician, the following specimens may be collected:(5)

- Skin smears from the earlobes, elbows, and knees
- Skin biopsy from edges of active patches
- Nerve biopsy from thickened nerves

Skin and nerve biopsy:

Biopsies are needed to definitively confirm a diagnosis of Hansen's disease and to classify the disease, and slit skin smear may also be helpful in diagnosing those with multibacillary disease.(5)

In the multibacillary form of Hansen's disease, tissue biopsy of various affected sites may reveal typical histopathologic changes that show large numbers of foam cells. Foam cells are macrophages that have ingested, or phagocytized, *M. leprae* bacteria, but are unable to digest the organisms, who in turn multiply and use the macrophage as a method of transport throughout the body. This is how the bacteria cause the multiple lesions that may appear in all parts of the body in MB leprosy patients.(5)

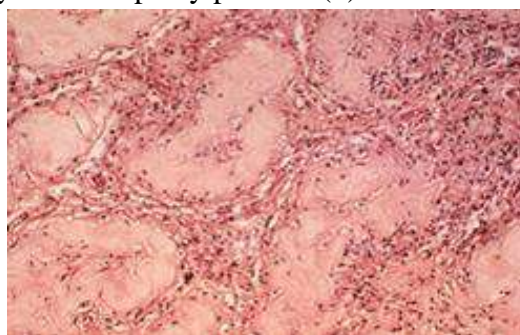


Fig.3: This photomicrograph reveals some of the histopathologic changes in a specimen of human testicular tissue, which included a large number of "foam cells". These changes were attributed to a case of multibacillary (MB) leprosy.

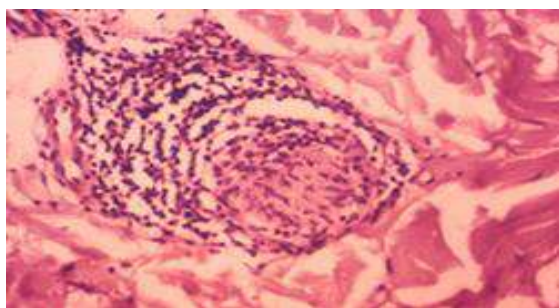


Fig.4: This photomicrograph reveals some of the classic histopathologic changes found in a skin section from an individual with a case of the leprosy, which may have been the paucibacillary form of the disease, though this has not been confirmed. Shown here is a nerve surrounded by a dense infiltrate consisting of undifferentiated histiocytes and large numbers of lymphocytes. This neural involvement was found to be independent of any pathology of the upper corium.

Acid fast staining:

The Ziehl-Neelson method using 5% sulphuric acid as decolorizing agent is used. The presence of acid-fast bacilli confirms the diagnosis of Hansen’s disease.

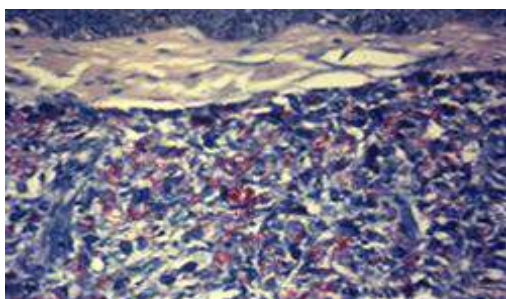


Fig.5: This acid-fast-stained photomicrograph of a tissue sample extracted from a patient with leprosy shows a chronic inflammatory lesion known as a granuloma, within which numerous red-colored *M. leprae* bacteria are visible.

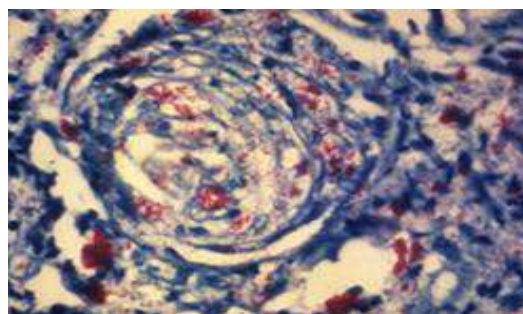


Fig.6: This photomicrograph of a skin tissue sample from a patient with leprosy shows a cutaneous nerve, which had been invaded by numerous *M. leprae* bacteria (shown in red).(5)

PREVALANCE OF LEPROSY IN INDIA:

The prevalence rate of leprosy is 0.4 per 10,000 population in the country. Of the new cases detected during 2020-2021, 58.1% were multibacillary, 39% were women, 5.8% were children less than 14 years of age, and 2.41% had visible deformities.(7) The rate of visible deformities was 1.1 per million population. The study registered 1 662 infected persons (called index cases) and on average, traced 26 contacts of each index case. Screening was conducted for 42 333 contacts (97.8% of those listed) and 42 cases of leprosy were confirmed among them. The new case detection rate per 10 000 contacts was 10. Of the contacts, 30 295 (71.6%) were eligible and provided SDR treatment. Prior to the start of the COVID-19 pandemic in 2020, more than half a million contacts were screened annually and about 65% of them were administered SDR treatment.(7) In March 2021, 79 898 patients were under free MDT treatment for leprosy across the country. Despite COVID-19 disruption of health services during 2020-2021, 65 147 new cases of leprosy were identified, diagnosed and provided free treatment. Continuity of these essential healthcare services during pandemic response ensures that leprosy is cured and disability is prevented.(7) (8)

TREATMENT:

Table 1: List of medicinal plants used in the treatment of leprosy:(9)

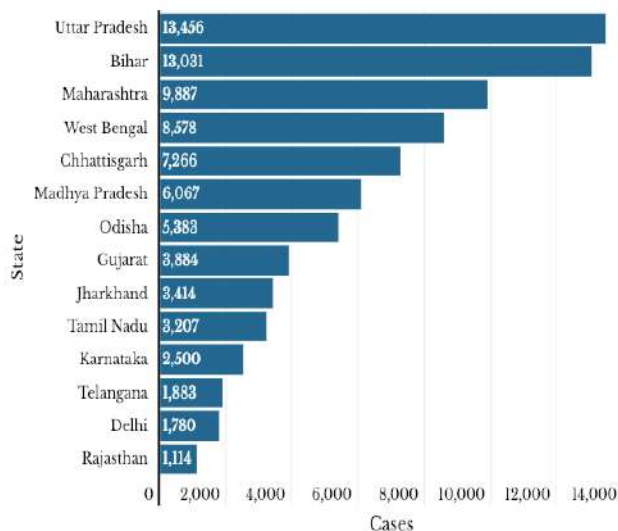
Sr. no	Botanical name	Family	Common name	Parts used
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1.	Tinospora cordifolia	Menispermaceae	Heart-leaved moonseed	Stem
2.	Euphorbia tirucallane	Euphorbiaceae	Firestick plants	Wood decoctions
3.	Calotropis procera Linn.	Asclepiadaceae	Apple of Sodom	Different parts of the plant Root
4.	Cassia Tora Linn.	Caesalpiniaceae	Sickle senna	Seeds
5.	Sonchus arvensis Linn	steraceae	Field milk thistle	Roots Leaves
6.	Terminalia chebula Retz	Combretaceae	Chebulic myrobalan	Fruit
7.	Triumfetta pilosa Roth.	Malvaceae	Burbark	Leaf Flower
8.	Dalbergia sissoo Roxb.	Fabaceae	Sisu North Indian Rosewood,	Decoction of the bark and leaf Wood
9.	Musa paradisiaca	Musaceae	Banana	Astringent plant sap
10.	Mimosa pudica	Mimisaceae	Sensitive plant	Root
11.	Cordia dichotoma (Forsk)	Boraginaceae	Sebesten plum	Leaves Stem bark
12.	Pandanus tectorius Solad	Pandanaceae	Screw pine, Ketki	Leaves
13.	Pterospermum acerifolium Willd	Sterculiaceae	Karnikara, Hathipaila	Stem bark
14.	Parkia biglobosa	Fabaceae	African locust bean	Dried leaf
15.	Ocimum basilicum L.	Lamiaceae	Great basil	Dried stem bark
16.	Mitracarpus hirtus L. (Dc)	Rubiaceae	Girdlepod	Root Plant
17.	Leucosmartiniensis (Jacq.) Ait. F	Lamiaceae	Whitewort	Root Plant
18.	Bombax ceiba L.	Malvaceae	Semar	Roots of young plants Leaf Bark Flower
19.	Ficus hispida Linn.f	Moraceae	Papasih	Fruits
20.	Careya arborea Roxb.	Lecythidaceae	Slow match tree	Leaves Bark

Table 2: Synthetic drug use to treat leprosy:(9)

Sr.no	Synthetic drugs used	Activity
1.	Clofazimine	Binds to mycobacterial DNA, inhibits mycobacterial growth 16B
2.	Dapsone	Inherent level of bactericidal activity 15B
3.	Rifampicin	High bactericidal activity on <i>M. leprae</i> 14B
4.	Ofloxacin	Inhibits bacterial DNA gyrase 18B
5.	Prednisolone	Inhibition of macrophage accumulation

Leprosy Cases Recorded As On March 2017



MARKETED PRODUCTS:(2)

Avlosulfon Tablet
 Biaxin 187.5 Mg/5 MI
 Biaxin 500 Mg Tab
 Clarithromycin
 Clarithromycin Er
 Clarithromycin Suspension
 Cleeravue-M Convenience
 Minocycline Hcl Er
 Minocycline Solution, Reconstituted (ReconSoln)
 Minocycline-Eyelid Cleanser #1 Kit
 Minocycline-Wipes Combination Package
 Minocycline-Wipes,Emolnt,Mask Kit
 Myrac Tablet
 Ofloxacin
 Ofloxacin In D5w Piggyback
 Ofloxacin Solution
 Rifadin 150 Mg Capsule
 Rifadin 600 Mg Intravenous Solution Rifamycins
 Rifampin

CONCLUSION :

Leprosy is an age-old disease and is described in the literature of ancient civilizations. It is a chronic infectious disease which is caused by a type of bacteria called Mycobacterium leprae. The disease affects the skin, the peripheral nerves, mucosa of

the upper respiratory tract, and the eyes. Leprosy is curable and treatment in the early stages can prevent disability. Apart from the physical deformity, persons affected by leprosy also face stigmatization and discrimination.

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