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Leprosy-Diagnosis and Management

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Abstract: Leprosy, caused by Mycobacterium leprae, is a neglected infectious disease that primarily affects the skin and can progress to a secondary stage causing peripheral neuropathy and potential long-term disability. Leprosy patients make up a significant portion of the global disease burden, with efforts historically focusing more on adult cases rather than childhood leprosy. This review aims to provide updated recommendations for diagnosing and treating both adult and childhood leprosy, summarizing various approaches including clinical, bacteriological, and immunological methods. As advancements in diagnostic and therapeutic techniques for leprosy are made, it is essential to focus on better control and prevention strategies for this disease.

Keywords: Leprosy, Mycobacterium leprae, skin, peripheral neuropathy, long-term disability, adult cases.

INTRODUCTION

Leprosy, also called Hansen's disease, is a bacterial infection caused by M. leprae. This bacterium targets the skin and nerves. It's found in armadillos and lab mice. Despite efforts to eliminate leprosy, it's still a problem in tropical countries. Multidrug therapy has helped, but new cases are still being found, especially in Africa and Southeast Asia. India, Brazil, and Indonesia have high numbers of new cases. The World Health Organization has a strategy to reduce child leprosy cases and discrimination. Its unfortunate that despite efforts to control leprosy, the disease is still widespread in many developing nations. In 2019, there were over 202,000 patients receiving treatment, with a high prevalence rate. Leprosy cases are found in Southeast Asia, America, Africa, the Eastern Pacific, and the Western Mediterranean. The fact that many children are affected suggests that transmission rates are high and control programs need improvement. Since there's no vaccine, early detection and treatment are key to preventing the spread of the disease and reducing disability. Childhood leprosy is often overlooked, so it's important to improve our understanding and management of the condition. This review focuses on recent developments in the epidemiology, diagnosis, and treatment of leprosy.

CLASSIFICATION

Rabello was the first to classify leprosy and establish its characteristics. Then, in 1966, Ridley-Jopling introduced a classification system based on clinical features and immune status. This system divides leprosy into different poles and an intermediate state. The poles include polar tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), mid-borderline leprosy (BB), borderline lepromatous leprosy (BL), and lepromatous leprosy (LL). It's important to have these classifications to better understand and treat the different forms of leprosy. It's fascinating how

the immune response plays such a crucial role in determining the different forms of leprosy. Patients with a strong cell-mediated immune reaction tend to have fewer lesions and lower levels of mycobacteria, which is classified as the tuberculoid form. On the other hand, patients who don't have an immune response to M. leprae have multiple lesions and higher mycobacterial loads, classifying them as having lepromatous forms. The balance of the Th1/Th2 response alone doesn't fully explain the leprosy response, as other T-cell subsets also play a significant role. Tuberculoid leprosy is relatively stable and not highly contagious, and it may resolve on its own. Bacteriological analysis may not detect the bacillus, but the Mitsuda reaction and the presence of granulomas are typical. Borderline cases fall into different categories depending on which pole they lean towards. And patients who haven't developed a cell-mediated immune response yet are classified as having indeterminate leprosy. If left untreated, indeterminate leprosy can progress to either tuberculoid or lepromatous disease.

LEPROSY REACTION

Leprosy reactions occur when the person's immune system interacts with the M. leprae bacteria. These reactions can cause inflammation in the skin and nerves, leading to disability and morbidity. It's interesting to note that leprosy reactions can happen at any stage of the disease, even without treatment. And here's an interesting fact: effective chemotherapy can sometimes trigger or worsen these reactions because it destroys the bacteria and releases more antigenic material into the immune system. There are two types of leprosy reactions: type 1 and type 2.

GLOBAL LEPROSY SITUATION

The WHO's "Global Strategy for Leprosy 2016-2020" is a crucial initiative to work towards a leprosy-free world. It's great that they're focusing on bolstering governmental commitment, fostering collaboration, and combating discrimination while promoting inclusivity. Addressing gender and age disparities, improving referral mechanisms, and monitoring drug resistance are also important areas of emphasis. It's good to see progress in reducing disease prevalence globally, but it's concerning that new cases are still being reported. Ongoing efforts are definitely needed to tackle the challenges of delayed detection, discrimination, and transmission.

CURRENT SITUATION OF LEPROSY IN INDIA

In the vast expanse of India, the National Leprosy Eradication Programme (NLEP) serves as a cornerstone in the nation's healthcare landscape. Under the auspices of the Ministry of Health and Family Welfare, Government of India, this centrally sponsored initiative orchestrates meticulous strategies and blueprints. However, its on-ground execution unfurls through the hands of individual states and union territories (UTs). This collaborative endeavor garners support not only from domestic stakeholders but also from global health entities like the World Health Organization (WHO), International Federation of Anti-Leprosy Associations (ILEP), and various non-governmental organizations (NGOs).

The trajectory of leprosy in India narrates a compelling tale of triumph over adversity. From the stark prevalence rate of 57.8 per 10,000 souls in 1983, India's relentless pursuit of progress bore fruit, culminating in a historic milestone as the national prevalence dwindled to less than one per 10,000 by December 2005. By 2016, this figure further dwindled to a commendable 0.66 per 10,000, a testament to the efficacy of the strategies employed. By March 2011–2012, the nation rejoiced as 34 out of its 36 states/UTs achieved the coveted status of leprosy elimination at the state level, leaving only Chhattisgarh and Dadra & Nagar Haveli on the path to completion.

PRESENT AND FUTURE NATIONAL STRATEGY FOR LEPROSY

In its recent assessment, the National Leprosy Eradication Programme (NLEP) acknowledged the persistence of cases within communities, revealing a disparity between detection capacity and the intensity of disease occurrence. An August 2016 directive from the office of the Deputy Director General for Leprosy in India highlighted four concerning trends [54]. Firstly, pockets of high endemicity persist, indicative of ongoing transmission. Secondly, a sample survey

conducted by the Indian Council for Medical Research (ICMR) unveiled numerous hidden cases within communities. [55] Thirdly, the new case detection rate has stagnated since 2005, while fourthly, disability rates in new cases have surged due to delayed diagnosis.

In response to these challenges, the NLEP advocated a comprehensive three-pronged approach. Firstly, the implementation of "leprosy case detection campaigns (LCDC)" in highly endemic districts was prioritized. Secondly, a targeted leprosy awareness campaign utilizing Accredited Social Health Activists (ASHA) and multipurpose health workers in identified "Hot Spots" aimed to address areas where new cases with Grade 2 Disability (G2D) were prevalent. Thirdly, area-specific plans were devised to enhance case detection in hard-to-reach regions.

AREAS OF CONCERN

Despite the concerted efforts undertaken by the National Leprosy Eradication Programme (NLEP), the persistently high occurrence of new leprosy cases in India over the past decade remains a significant concern. When aiming to eliminate a disease from a community, sustained and vigorous efforts are essential until the desired objectives are met. A notable success story is the national smallpox eradication programme. Regrettably, the objective of eliminating leprosy from the community seems to have been equated solely with reaching the WHO-defined target of elimination as a public health problem, which India achieved by the end of 2005. Furthermore, the terminology of "elimination" can lead to confusion among both the general public and healthcare professionals.

Another factor diverting attention from leprosy in India occurred in the 1990s. As the nation focused on eliminating leprosy as a public health problem, initiatives for HIV/AIDS were being progressively implemented. Leprosy health workers were assigned additional responsibilities for HIV and tuberculosis control, leading to a reallocation of resources and a decline in funding for leprosy-related programme over the subsequent decade. Eventually, the perceived reduction in leprosy prevalence led to its integration into general healthcare services, with a phased-out approach to the vertical leprosy programme. A study conducted in Odisha highlighted the necessity for effective monitoring and evaluation of this integration process, emphasizing the risk of setbacks such as delayed diagnosis and increased disability rates due to inadequate monitoring.

The notion of the WHO elimination target lacks scientific basis to support the gradual decline or disappearance of remaining leprosy cases once the target is reached. This misinterpretation has led to the cessation of skin smear services, rapid integration of leprosy services into general medical healthcare, efforts to shorten therapy duration, and reduced emphasis on research and funding for leprosy programs. It is essential to reassess these actions for the sustainability of the programme. Additionally, there is concern over why the initial enthusiasm and efforts of the first two decades following the introduction of multidrug therapy (MDT) were curtailed before fully consolidating the gains achieved.

In contrast to India, Brazil, facing a similar economic context and leprosy endemicity, nearly doubled its investments in leprosy programmes, resulting in a significant reduction in incidence and cases. Basic investigations such as skin smear services need to be reintroduced in India's leprosy programme, as they have proven to be as effective as advanced PCR techniques. Moreover, the persistence of disability among new leprosy cases in India underscores the need for early diagnosis, proper management, and wider awareness of the disease and its complications among healthcare staff and the community.

In conclusion, sustained efforts and increased support are imperative to combat leprosy effectively in India [69]. This entails revisiting strategies, reinstating essential services, and enhancing awareness to ensure early diagnosis, effective management, and prevention of disabilities.

TREATMENT

The WHO recommends a multidrug therapy (MDT) regimen for treating leprosy in children. The treatment is tailored based on age and whether it's paucibacillary or multibacillary leprosy. The first-line treatment includes rifampicin, clofazimine, and dapsone. For paucibacillary cases, the treatment lasts for six months, while multibacillary cases require a 12-month regimen. It's important for patients to take the medications under direct supervision to ensure compliance and effectiveness. Dapsone is indeed a first-line drug for leprosy, taken daily to inhibit bacterial growth. Rifampicin is another powerful antibiotic taken once a month. It's great to know that these medications are effective against the bacteria. Clofazimine is typically used for leprosy reactions and can be taken daily or weekly. The duration of treatment varies depending on the type and severity of the disease. For milder paucibacillary leprosy, treatment usually lasts around six months, while for more severe multibacillary leprosy, it can be 12 months or longer.

The World Health Organization (WHO) recommends a multidrug therapy (MDT) regimen for treating leprosy in children, which is tailored according to age and subdivided into paucibacillary and multibacillary forms (see Table 3) [22]. The first-line treatment consists of rifampicin, clofazimine, and dapsone (also known as diamino diphenyl sulfone).

For paucibacillary cases, the recommended treatment duration is six months, during which rifampicin, dapsone, and clofazimine are administered. On the other hand, multibacillary cases require a 12-month treatment regimen with the same combination of rifampicin, dapsone, and clofazimine. All patients, regardless of the form of leprosy, receive this drug combination monthly, under direct supervision to ensure compliance and effectiveness of treatment.

The treatment of leprosy usually involves a combination of antibiotics, such as dapsone, rifampicin, and clofazimine. The specific treatment regimen and duration depend on the type and severity of the disease. It's important for patients to complete the full course of treatment to effectively eliminate the bacteria and prevent complications. Regular follow-up with healthcare professionals is also crucial to monitor progress and manage any potential side effects.

Dapsone is usually the first-line drug and is taken daily. It works by inhibiting the growth of the bacteria that cause leprosy. Rifampicin is another key antibiotic that is taken once a month and is highly effective against the bacteria. Clofazimine is typically used for the treatment of leprosy reactions and is taken daily or weekly.

The duration of treatment can vary depending on the type and severity of the disease. For paucibacillary leprosy (a milder form), treatment usually lasts for six months, while for multibacillary leprosy (a more severe form), treatment can last for 12 months or longer.

PREVENTION

a. PROPHYLACTIC IMMUNIZATION

The primary objective of prophylactic immunization is to prevent infection or hinder the progression of diseases, either before or after exposure. Various vaccines, including Bacille Calmette–Guérin (BCG), LepVax, and Mycobacterium indicus Pranii (MIP), have demonstrated efficacy in this regard. Presently, BCG stands as the sole vaccine administered for leprosy prevention. A study conducted in eastern India, focusing on leprosy patients up to 12 years old attending a tertiary care hospital, revealed a significantly lower proportion of multibacillary (MB) leprosy cases in the BCG-vaccinated group compared to the nonvaccinated group ($p=0.0352$). This underscores BCG vaccination's role in augmenting cell-mediated immunity (CMI) and its potential protective effect against leprosy, estimated to range from 20% to 90% [96,82].

However, despite widespread BCG vaccination programs, leprosy persists in many countries, mirroring the situation with tuberculosis (TB). Evidence suggests that the protective efficacy of BCG against leprosy diminishes over time [85]. Furthermore, a study spanning from June 1987 to

December 2006 revealed that BCG vaccination seems to offer better protection against the MB form of leprosy than against the paucibacillary (PB) form [97]. Nevertheless, the effectiveness of BCG vaccination remains a subject of debate, underscoring the necessity for the development of more potent vaccines. Such vaccines could either complement or substitute the BCG vaccine, offering enhanced protection against leprosy.

b. CHEMOPROPHYLAXIS

In the 1960s, the concept of chemoprophylaxis using dapsone for leprosy exposure emerged [91]. Trials investigating chemoprophylaxis included dapsone/acedapsone, rifampicin, and a combination of rifampicin, ofloxacin, and minocycline (ROM). Notably, studies have demonstrated that a single dose of rifampicin (SDR) (25 mg/kg) administered to close contacts of newly diagnosed leprosy patients can reduce the risk of developing clinical leprosy by 57% (95% CI 33–72) [92,93]. Between 2015 and 2018, single-dose rifampicin postexposure prophylaxis (SDR-PEP) was implemented in the Union Territory of Dadra and Nagar Haveli (DNH), underscoring the importance of health system-focused leprosy research programs [94].

Moreover, findings from Bangladesh participants in a similar study indicated that the combined protective effect of BCG and rifampicin was 80% (95% CI 50–92) [95]. This underscores the potential of combined treatment strategies in reducing leprosy incidence. SDR postexposure prophylaxis was endorsed by the WHO in 2018 and has been favored for several years, potentially complementing BCG vaccination [22]. However, gauging the extent to which SDR mitigates excess leprosy cases post-BCG vaccination is challenging due to many cases presenting before SDR intervention [97,98]. Thus, further research on chemoprophylaxis for leprosy prevention is warranted [99].

Firstly, early diagnosis and treatment are crucial. If you notice any unusual skin lesions, numbness, or muscle weakness, it's important to visit a healthcare professional as soon as possible. Early diagnosis allows for prompt treatment, which can prevent complications and reduce the risk of transmission.

Maintaining good hygiene practices is another essential preventive measure. Regularly washing your hands with soap and water, especially after coming into contact with someone who has leprosy or their personal belongings, can help minimize the risk of transmission.

Additionally, it's advisable to avoid prolonged close contact with individuals who have untreated leprosy until they have completed their treatment. Although leprosy is not highly contagious, limiting close contact can further reduce the chances of transmission.

While there is no specific vaccine for leprosy, the Bacillus Calmette-Guérin (BCG) vaccine, commonly used for tuberculosis, has shown some protective effects against leprosy in certain populations. However, its effectiveness may vary, and it's important to consult with healthcare professionals regarding the availability and suitability of the BCG vaccine in your specific situation.

CONCLUSION

Leprosy is a chronic infectious disease that primarily affects the skin and nerves. While it is not highly contagious, early diagnosis and treatment are crucial to prevent complications and reduce the risk of transmission. Maintaining good hygiene practices, avoiding prolonged close contact with untreated individuals, and promoting health education and awareness are important preventive measures. While there is no specific vaccine for leprosy, the BCG vaccine has shown some protective effects in certain populations. It's always best to consult with healthcare professionals for personalized advice and guidance. Remember, by taking proactive steps and spreading awareness, we can work towards reducing the impact of leprosy and supporting those affected by it.