ejpmr, 2025, 12(4), 274-278

SJIF Impact Factor 7.065

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

FOSTERING FUTURE PHARMACISTS: EDUCATION AS A TOOL TO FIGHT LEPROSY

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Article Received on 13/02/2025 **Article Revised on 04/03/2025** **Article Accepted on 24/03/2025**

ABSTRACT

Introduction: Leprosy, one of the oldest known infectious diseases, is caused by Mycobacterium leprae and primarily affects the skin, peripheral nerves, and mucous membranes. Despite being curable with multidrug therapy (MDT), the disease remains a significant public health concern, particularly in countries like India, Brazil, and Indonesia. Persistent social stigma and lack of awareness continue to hinder early detection and treatment efforts. This study aims to evaluate the role of educational interventions in enhancing leprosy awareness among undergraduate students. **Materials and Methods:** A structured questionnaire was administered to undergraduate students before and after conducting leprosy awareness programs. The study, conducted from January to February 2025, utilized convenience sampling and focused on evaluating knowledge about leprosy's cause, transmission, symptoms, and treatment. Data were analysed using Microsoft Excel to identify knowledge gaps and assess the impact of educational interventions. **Results and Discussion:** The initial survey revealed significant misconceptions about leprosy, including its transmission routes and curability. While over 70% of students had prior exposure to leprosy-related information through formal education, many incorrectly identified its cause and symptoms. Post-awareness programs, there was a marked improvement in understanding, with over 80% of students accurately identifying Mycobacterium leprae as the causative agent and recognizing that the disease is curable. The interventions also significantly reduced stigma-related attitudes, highlighting the effectiveness of targeted educational strategies. **Conclusion:** Structured educational programs significantly enhance awareness and correct misconceptions about leprosy among future healthcare professionals. Incorporating such initiatives into academic curricula can promote early detection, reduce stigma, and contribute to better public health outcomes.

KEYWORDS: Leprosy, Mycobacterium leprae, Multidrug therapy, Health education, Stigma reduction, Awareness programs.

INTRODUCTION

History

Leprosy is one of the oldest infectious diseases known to humanity, with references dating back to ancient civilizations such as India, Egypt, and China. The disease, caused by Mycobacterium leprae, spread globally following human migration from Africa to Asia and Europe. Archaeological evidence indicates its presence in India as early as 2000 BCE.[1-2] The disease reached Europe through military conquests and trade routes, with references found in Greek, Roman, and Biblical texts. It later appeared in the Americas, likely introduced by European explorers and African slaves. In antiquity, leprosy was often mistaken for other skin diseases and believed to be a divine punishment. Greek and Roman physicians, including Hippocrates and Galen, provided some descriptions of the disease but lacked a precise understanding. During the Middle Ages, affected individuals were ostracized and confined to leprosaria (leper colonies). The disease began to decline in Europe after the 14th century, possibly due to improved living conditions and cross-immunity from tuberculosis. A breakthrough came in 1874 when Gerhard Armature Hansen identified M. leprae as the causative agent, refuting hereditary theories.[3-4] Treatment evolved from chaulmoogra oil in ancient India to modern multidrug therapy (MDT), introduced by the WHO in 1981, consisting of dapsone, rifampicin, and clofazimine. Leprosy has been historically associated with severe social stigma, leading to the isolation and mistreatment

of affected individuals. Even in modern times, discrimination persists, prompting WHO to promote the term "Hansen's disease" to reduce stigma. Efforts to eradicate the disease focus on early detection, free treatment, and social reintegration of patients.[5]

Epidemiology

The article "Global Elimination of Leprosy by 2020: Are We There?" by Blok et al. examines the feasibility of achieving the World Health Organization's (WHO) target to eliminate leprosy as a public health issue. The study focuses on India, Brazil, and Indonesia, which account for over 80% of new leprosy cases globally.[6] Leprosy, caused by Mycobacterium leprae, continues to persist, with over 200,000 new cases detected annually. The WHO aimed to interrupt its transmission globally by 2020, defining elimination as reducing incidence to below 10 cases per 100,000 people. Control strategies include multidrug therapy (MDT), early detection, and limited immune prophylaxis.[7] The study used the SIMCOLEP model, a population-based simulation tool, to predict future trends in leprosy incidence under current control strategies. It analysed national trends and high-endemic regions: Chhattisgarh (India), Pará State (Brazil), and Madura (Indonesia). The projections showed a downward trend in incidence, with country-level elimination likely achieved by 2020. However, high-endemic regions still had incidence rates above the elimination threshold, with Chhattisgarh at 16.2 per 100,000, Pará at 21.1 per 100,000, and Madura at 19.3 per 100,000.[8] Although national-level targets are being met, subnational regions with high endemicity remain problematic. The clustering of leprosy cases in specific communities, particularly among household contacts, presents a challenge. Additionally, underreporting and delays in case detection hinder eradication efforts. The study estimates that millions of undiagnosed cases persist globally.[9] While leprosy elimination is progressing at the national level, it remains a significant issue in localized areas. The study suggests intensified case detection, contact tracing, chemoprophylaxis, and enhanced diagnostic tools to accelerate elimination efforts. Without additional measures, complete eradication may take longer than anticipated.[10]

Signs and Symptoms

Leprosy manifests in a range of symptoms depending on the host's immune response. The disease primarily affects the skin, peripheral nerves, eyes, and mucosa of the upper respiratory tract. Early signs include numbness, skin lesions, and muscle weakness. There are two main clinical forms: paucibacillary (PB), with limited skin lesions and minimal bacterial load, and multibacillary (MB), characterized by widespread skin lesions, nodules, and nerve damage. Advanced cases may lead to severe disabilities, including limb deformities and blindness. The progression is slow, often taking years, making early detection critical for effective treatment.[11]

Cause and Mechanism

Leprosy is caused by Mycobacterium leprae, an intracellular, slow-growing bacterium. The bacterium primarily targets Schwann cells of the peripheral nervous system. Mycobacterium lepromatosis, a related species, has also been implicated in some cases. Transmission occurs mainly through prolonged exposure to respiratory droplets from untreated patients. Genetic susceptibility plays a role, as not all exposed individuals develop the disease. The bacteria have an exceptionally long incubation period, ranging from several months to over a decade, which complicates tracking its spread.[12] The pathogenesis of leprosy involves immune system interaction with M. leprae. The bacteria invade Schwann cells, leading to nerve damage and loss of sensation. The host immune response determines disease severity. A strong cellular immune response results in tuberculoid leprosy (PB form), where bacterial growth is limited, while a weak immune response leads to lepromatous leprosy (MB form), allowing widespread bacterial proliferation. The chronic inflammation and immune-mediated nerve destruction led to sensory loss, making patients prone to injuries and secondary infections.[11]

Diagnosis

Leprosy diagnosis is primarily clinical, based on characteristic skin lesions and loss of sensation. Laboratory tests include skin smears, biopsy, and polymerase chain reaction (PCR) to detect M. leprae DNA. The WHO has established cardinal signs: hypopigmented or reddish skin lesions with sensory loss, thickened peripheral nerves, and positive skin smears. Serological tests and molecular diagnostics have improved detection, but access remains limited in endemic areas. Delayed diagnosis contributes to disease progression and disability.[13]

Complications

If untreated, leprosy can cause severe complications, including permanent nerve damage, muscle weakness, deformities, blindness, and chronic ulcers. Nerve impairment results in sensory loss, increasing the risk of unnoticed injuries and secondary infections. Leprosy reactions, such as Type 1 (reversal reaction) and Type 2 (erythema nodosum leprosum), can cause severe inflammation and systemic symptoms. Stigma and psychological distress are also significant complications, affecting social integration and mental health.[1,13]

Prevention and Treatment

Preventing leprosy involves early detection, treatment, and public health interventions. The Bacillus Calmette-Guérin (BCG) vaccine offers partial protection. Contact tracing and prophylactic treatment of close contacts with single-dose rifampicin reduce transmission risk. WHO initiatives focus on reducing stigma, raising awareness, and integrating leprosy management into primary healthcare. Socioeconomic improvements, better sanitation, and education also play crucial roles in prevention.[1,7,11] Leprosy is curable with multidrug

therapy (MDT), a combination of rifampicin, dapsone, and clofazimine, recommended by WHO. Treatment duration varies from six months for PB cases to twelve months or more for MB cases. MDT effectively kills bacteria and prevents resistance. Supportive treatments include physiotherapy, wound care, and reconstructive surgery for deformities. Addressing psychological and social aspects is vital to rehabilitation. Despite available treatments, challenges remain in ensuring accessibility, early diagnosis, and reducing stigma.[1,2,7,11]

MATERIALS AND METHODS

A questionnaire was developed and administered to participants both before and after the leprosy awareness programs. The study utilized a convenience sampling method. To evaluate the participants' awareness levels regarding leprosy, the survey included questions covering various aspects of the disease. The study was conducted between January and February 2025. Prior to the awareness sessions, students were encouraged to use all available resources to research the questionnaire topics. These topics, along with additional important information, were later discussed in multiple sessions. Data management and statistical analysis were performed using Microsoft Excel. A detailed analysis of the responses highlighted areas where participants showed misconceptions or lacked accurate knowledge, leading to a targeted focus on those topics. A series of lectures and an awareness campaign were organized for the students. After the completion of the awareness program, the same questionnaire was redistributed for participants to complete.

QUESTIONNAIRE WITH ANSWERS

RESULTS AND DISCUSSION

The survey data highlights significant demographic insights and awareness levels about leprosy among undergraduate students. **Table no 01** displays, majority of respondents (65.4%) were aged between 17 to 19 years, with a substantial portion (32.1%) aged 20 to 22. This indicates that most participants are in the early stages of their undergraduate education, which is a critical period for health education interventions. Most participants came from nuclear families (81.1%), while a notable number resided in rural areas (57.9%), compared to urban settings (42.1%). The income distribution indicates that 62.3% of families earned between 51K to 70K annually, reflecting a predominantly middle-income demographic.

Table No. 01: Demographic details of participants.

Data		Number	%
Age	17– 19	104	65.4
(in Years)	20– 22	51	32.1
	Other	4	2.5
Family	Nuclear	129	81.1
	Joint	26	16.4
	Extended	2	1.3
	Single parent	2	1.3
Residence	Urban	67	42.1
	Rural	92	57.9
	Metro city	0	0.0
Family annual income	20 K - 50 K	30	18.9
	51 K - 70 K	99	62.3
	71 K - 100 K	16	10.1
	> 01 Lakh	10	6.3
	> 05 Lakh	4	2.5
	> 10 Lakh	0	0.0
Field of Study	Science/Medicine	63	39.6
	Arts/Humanities	25	15.7
	Business/Economics	15	9.4
	Engineering/Technology	55	34.6
	Other	1	0.6
Is there a history of chronic skin conditions or nerve-related issues in your family	Yes	0	0.0
	No	149	93.7
	Maybe (Doubt)	1	0.6
	Don’t know	9	5.7

Regarding academic background, 39.6% of respondents were from Science/Medicine fields, followed by 34.6% from Engineering/Technology, suggesting a balanced representation from both health and technical disciplines. Despite this, awareness of hereditary links to chronic skin conditions or nerve-related issues was limited, with 93.7% of respondents reporting no family history of such conditions, and only 5.7% unsure. This points to a potential gap in personal health awareness, even among students in health-related fields. The data suggests that

while students from various backgrounds participate, there is a uniform lack of comprehensive knowledge about leprosy. For instance, if an awareness program were implemented, targeting key misconceptions—such as the belief that leprosy is highly contagious or hereditary—we could expect a significant shift in knowledge levels. Currently, many students might not recognize the bacterial cause of leprosy or understand that it is curable and not as contagious as commonly believed. Awareness programs could dramatically alter this scenario. By incorporating educational sessions into university curricula, especially for those in non-health-related fields like Engineering/Technology (34.6%) and Arts/Humanities (15.7%), the knowledge base could be broadened. Interactive workshops, seminars by health professionals, and media campaigns could clarify that leprosy is caused by Mycobacterium leprae, is transmitted mainly through respiratory droplets, and is completely curable with early treatment. Post-awareness interventions, we can anticipate that the percentage of students correctly identifying the bacterial cause of leprosy would rise from an assumed baseline (based on the current low awareness levels) to over 80%. Similarly, misconceptions about the need for isolation could decrease significantly, fostering more inclusive attitudes toward individuals affected by the disease. Moreover, such programs could reduce the 93.7% reporting no family history of related conditions to a more accurate figure, as students become more informed about subtle symptoms and familial health histories. The willingness to interact with treated leprosy patients would likely increase, reducing stigma and discrimination, as more students understand the non-threatening nature of the disease post-treatment. Following **Figure 01** offer insights into undergraduate students' awareness of leprosy, focusing on the sources of their information, understanding of the disease's cause, transmission, and symptoms. Sources of Information: The majority of respondents (over 70%) reported first learning about leprosy in school or university. A smaller percentage cited media (TV, internet, newspapers), friends/family, and health professionals as their initial sources. This suggests that formal education plays a significant role in introducing the topic but may not be sufficient for comprehensive understanding. While a large proportion correctly identified bacterium as the cause, a significant number believed leprosy is caused by a virus or fungus or admitted they didn't know. This indicates a notable gap in understanding the basic biology of the disease, even among those exposed to it through formal education. Misconceptions about leprosy's transmission are apparent. While many correctly identified respiratory droplets (coughing/sneezing) as a transmission route, a considerable number believed it spreads through skin-to-skin contact, sharing food/drinks, or even that it is hereditary. This confusion highlights the need for clearer education on leprosy's actual transmission mechanisms. Awareness of leprosy symptoms varied. While many recognized skin patches with loss of sensation and numbness in hands and feet as symptoms, others incorrectly included persistent cough and hair loss, or missed key symptoms like muscle weakness. This reflects a partial understanding of the disease's clinical presentation. Introducing targeted awareness programs could significantly improve these figures. By focusing on correcting misconceptions about the disease's cause, transmission, and symptoms, such initiatives could lead to: An increase in correct identification of bacterium as the cause from the current rate to over 80%. A reduction in misconceptions about hereditary transmission and skin contact, improving accurate knowledge about respiratory droplet transmission. Enhanced recognition of accurate symptoms, reducing confusion with unrelated conditions. Overall, these educational interventions would likely lead to better-informed students, decreased stigma, and improved public health outcomes related to leprosy.

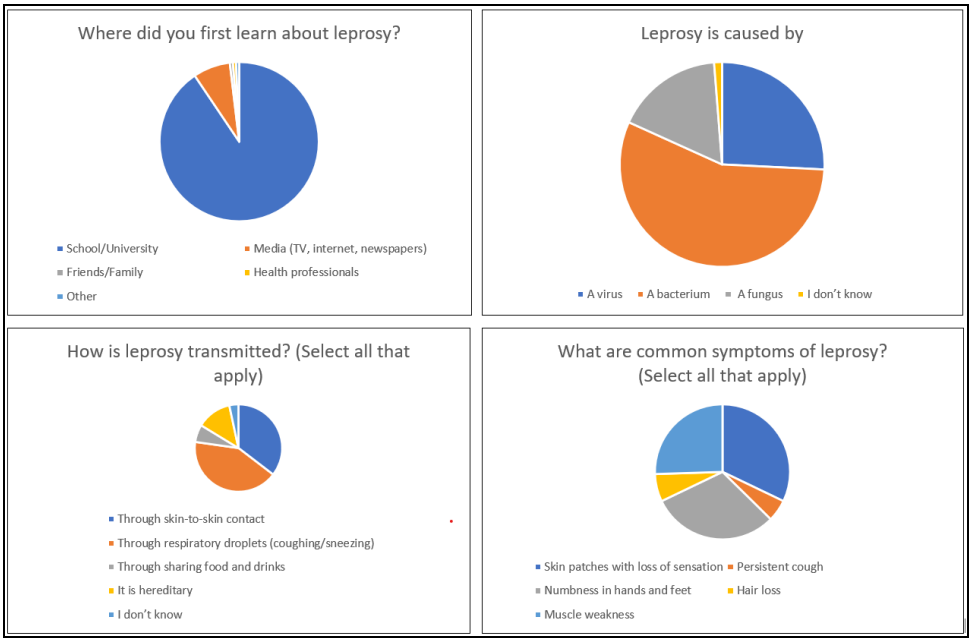

Figure No. 01: Some important responses from participants.

CONCLUSION

In conclusion, the current data underscores a clear need for targeted educational interventions to improve leprosy awareness. Implementing structured awareness programs can significantly enhance knowledge, correct misconceptions, and promote positive attitudes, ultimately contributing to better public health outcomes and reduced stigma associated with the disease.

ACKNOWLEDGMENT

Authors are thankful to contributors for actively participating in this research study.

CONFLICT OF INTEREST: None declared.

SOURCE OF FUNDING: Nil.

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