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Epidemiological Profile of Leprosy in Patients Attending a Tertiary Care Hospital in Western Uttar Pradesh

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ABSTRACT
Leprosy, caused by Mycobacterium leprae, is the oldest infection known to mankind, but still remains a major public health concern. Early and accurate diagnosis of leprosy is necessary which can easily be made by slit skin smear (SSS) microscopy that helps not only in classification of leprosy into paucibacillary and multibacillary but also has role in deciding the treatment regimen and monitoring response to treatment. A retrospective observational study was conducted in a tertiary care hospital from June 2022 to June 2024 to analyze epidemiological profile of leprosy patients. All the clinically suspected cases of leprosy who had attended the dermatology OPD irrespective of age and gender, were included in the study. SSS were prepared from ≥3 sites and stained with modified Ziehl-Neelsen stain and bacteriological index (BI) and morphological index (MI) were evaluated. Out of 191 clinically suspected cases of leprosy 41 (21.4%) were found to be positive for lepra bacilli in SSS examination. Among 41 smear positive cases, 12 (29.2%) cases showed BI 6+ while 5 (12.1%) cases had BI 1+. We have observed, MI >50% in 18 (43.9%) cases and MI <50% in 23 (56.1%) cases. Even after elimination in 2005, leprosy is still a significant public health problem in India. Early and accurate diagnosis of leprosy cases is important for initiation of appropriate treatment as well as implementation of effective preventive strategies.

INTRODUCTION

Leprosy, also known as Hansen's disease, is the oldest infection known to mankind and previously believed to be highly contagious and incurable. However, leprosy is no longer considered as a social stigma owing to mass awareness campaigns, wide availability of free of cost facilities for diagnosis, treatment and rehabilitation. It is caused by a slow growing obligate intracellular bacteria called Mycobacterium leprae[1,2]. Despite the landmark achievement of global elimination in 2000s, it still remains a major public health problem in various developing countries where substantial number of leprosy cases are being reported. According to WHO, globally 211009 new cases of leprosy were detected in 2017 and 174087 new cases were reported in 2022[3].

Leprosy has a long incubation period of about 5-7 years. It usually presents with cardinal signs like hypopigmented or reddish skin patches with loss of sensation, thickened peripheral nerves and weakness of the muscles supplied by the affected nerve. Although leprosy is curable with timely and appropriate treatment, if left untreated it can lead to mutilating deformities and significant disability which in turn affects the livelihood of the patients and also increases the chances of transmission in the community[2].

Diagnosis of leprosy can be easily made by slit skin smear (SSS) microscopy that helps in demonstration of lepra bacilli and for estimating bacteriological and morphological indices (BI and MI). SSS microscopy also has a role in monitoring response to treatment and in differentiation of relapse from reaction[4].

India has achieved the milestone of <1 leprosy case per 10,000 population as per WHO criteria for elimination of leprosy in 2005. Despite the elimination status, India still contributes to 53.6% of global new leprosy cases with 5.52 annual new case detection rate per 1,00,000 population. A steady decline in new leprosy cases was observed during the period of 2013-2019 but there was a marked dip in the detection of new cases in the year 2020 (number of new cases 114451 in 2019 vs 65147 in 2020). However, a gradual resurgence has been observed in India with detection of 75394 and 103819 new leprosy cases in 2021 and 2022, respectively[5]. The drastic reduction in detection of leprosy cases in pandemic period may be attributed to poor access to health services and diversion of most of available resources towards control of COVID-19. Meanwhile significant increase in new leprosy cases in post COVID era is probably due to improved and focused health services for neglected tropical diseases. Substantial number of new leprosy cases are being reported from various parts of the country depicting persistent active transmission in the community. As there is no vaccine available for leprosy, we are only left with preventive measures like community awareness, improving immune status and hygiene for curtailing the infection transmission. Besides these preventive measures, screening of close contacts of leprosy cases is equally important to prevent the spread of infection in the community[5]. This study was carried out to elucidate the trend of leprosy cases in our region which will help in timely initiation of multi-drug therapy and implementation of preventive measures in the community.

MATERIALS AND METHODS

A retrospective observational study was conducted in the department of Microbiology in a tertiary care hospital in Bareilly, Uttar Pradesh from June 2022 to June 2024, after seeking approval from Institutional Ethics Committee. All the clinically suspected cases of leprosy who had attended the dermatology OPD irrespective of age and gender, were included in the study. Required data from patients and laboratory record was reviewed and analyzed. Personal details of the patients were kept confidential and were not disclosed to anyone. SSS were prepared from $\geq$3 sites (ear lobes, nasal mucosa, forehead and edge of lesions) and stained with modified Ziehl-Neelsen stain (5% Sulfuric acid). The smears were examined under oil immersion for the presence of intra and extracellular acid-fast bacilli. Bacteriological index (BI) and morphological index (MI) were evaluated[4,6].

Bacteriological Index (BI)[4,6]: Bacteriological index depicts the density of both uniformly stained (living) and fragmented or granular (dead) leprae bacilli in the smear. According to Ridley's logarithmic scale, BI ranges from 0-6+ and is calculated as the average of all the pluses scored in all the smears examined.

Negative: No bacilli in 100 oil immersion fields.
1+: 1-10 bacilli in 100 oil immersion fields.
2+: 1-10 bacilli in 10 oil immersion fields.
3+: 1-10 bacilli per oil immersion field.
4+: 10-100 bacilli per oil immersion field.
5+: 100-1000 bacilli per oil immersion field.
6+: >1000 bacilli per oil immersion field.

Morphological Index (MI) (4, 6):

Morphological index is the percentage of uniformly stained bacilli in the smears.

RESULTS AND DISCUSSIONS

A total of 191 clinically suspected cases of leprosy who had attended dermatology OPD were included in the study. The suspected cases showed a spectrum of clinical manifestations ranging from hypoaesthetic hypopigmented macules to ulcerative lesions and deformities. Among these suspected cases, 41 (21.4%) were found to be positive for lepra bacilli in SSS examination. Out of total smear positive cases, 31 (75.6%) cases were found in male patients and 10 (24.4%) cases in female patients.

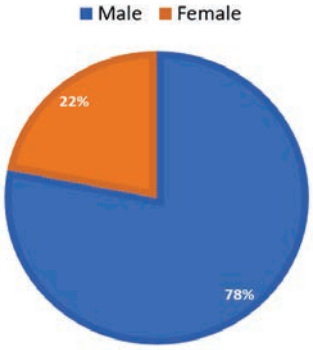

Fig. 1: Gender Distribution in Study Population

Maximum number of the cases 19 (46%) were from age group 20-40 years followed by 41-60 (41.4%) age group.

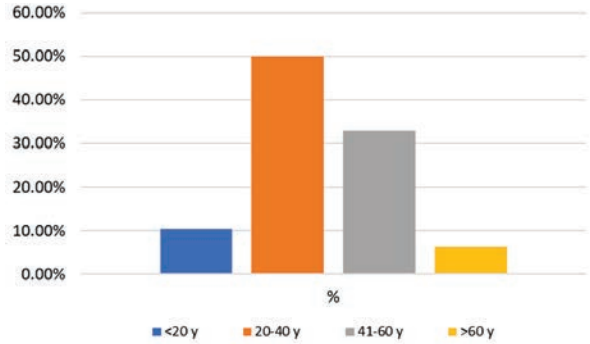

Fig. 2: Age wise Distribution of Study Population

Hypopigmented macule was the predominant clinical presentation in the smear positive leprosy patients.

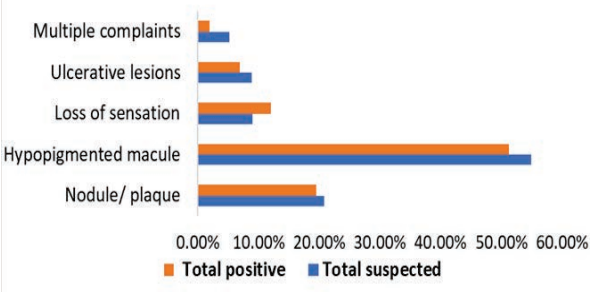

Fig. 3: Distribution of Clinical Manifestations in Study Population

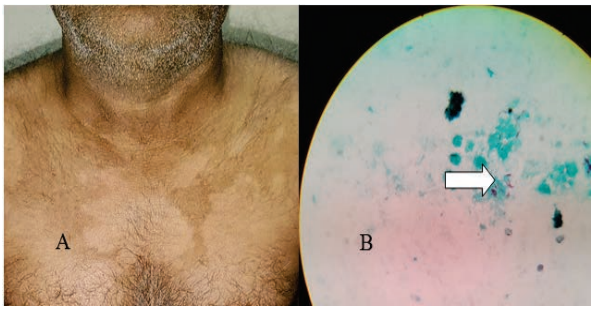

Fig. 4: Image Showing A) Patient with Hypopigmented Macules Over Chest B) Acid Fast Lepra Bacilli in Slit Skin Smear Examination

Majority (65%) of leprosy patients belonged to rural background and most of them were from lower socioeconomic class. Among 41 smear positive cases, 12 (29.2%) cases showed BI 6+ while 5 (12.1%) cases had BI 1+.

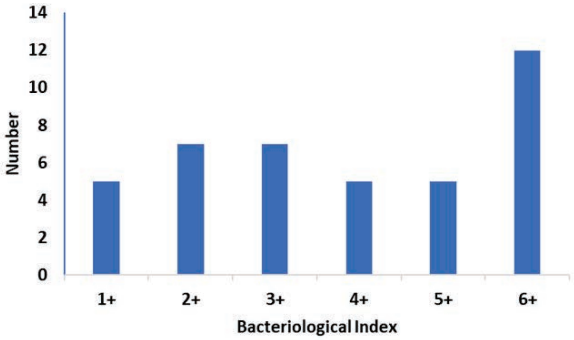

Fig. 5: Bacteriological Index in Slit Skin Smear Positive Patients

We have observed, MI >50% in 18 (43.9%) cases and MI <50% in 23 (56.1%) cases.

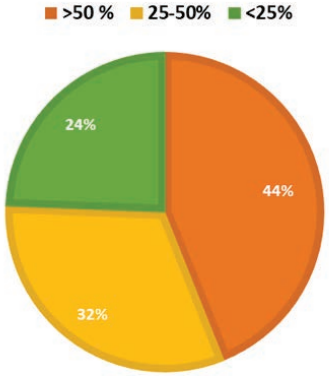

Fig. 6: Morphological Index in Slit Skin Smear Patients

Leprosy is a slowly progressive and chronic granulomatous disease caused by Mycobacterium leprae that primarily affects skin and peripheral nerves[7]. India successfully achieved elimination status of leprosy in 2005 by implementation of effective national leprosy elimination program[5]. However, even after two decades leprosy continues to be an important public health concern in our country and contributes to majority of leprosy cases worldwide. In the recent years, the new case detection rate of leprosy has been steady indicating ongoing active transmission in the community. Therefore, to curtail the number of new cases, sustained and integrated health services are warranted in the form of active case detection, screening of contacts, appropriate treatment of cases and their rehabilitation.

In the present study, we have observed 21.4% occurrence of leprosy cases with male preponderance over a period of two years. Comparable results were observed by Kumar and Kumar et al and Nalamada S *et al* while Patil AS *et al* and Bishnoi S *et al* reported

higher occurrence[8,9,10,11]. In our study, 20- 40 years age group (46%) was found to be most affected followed by 41-60 years age group (41.4%) probably because of increased chances for exposure owing to more social interaction in this age group. We have observed a smaller number of positive cases (7%) in <20 years age group as leprosy has a long incubation period and infection acquired during childhood will manifest later in life. This observation is in concordance with findings of Jindal *et al* and Mathan *et al*[12,13].

Hypopigmented macule was the predominant clinical manifestation (54.9%) among suspected patients of leprosy in our study. On SSS examination, approximately half of the smear positivity was also seen in patients with hypopigmented macule which is similar to the work of Kumar *et al* and Roy *et al*[8-14].

BI is the total bacterial load in smears including both living and dead bacilli. It is a useful tool for monitoring the response to treatment which is easy to assess but can be affected by quality of SSS[4,6]. In our study BI 6+ was most common which was observed in 29.2% smear positive patients. This observation implies high bacterial load and can be linked to more infection transmission in the community. This finding is corroborated by Kumar *et al*[8] While Kilikdar M *et al* reported 2+ BI to be more common in their studies[15].

MI is defined as percentage of solid and uniform stained bacilli on microscopic smear examination. It is considered as a more sensitive prognostic indicator to determine non-compliance, drug resistance or therapeutic failure[4,6].We observed MI >50 in 18 (43.9%) smear positive cases, indicating more viable bacilli, high infectivity and a higher chance of treatment failure.

Since achievement of leprosy elimination in 2005, with continuous efforts of National leprosy elimination programme (NLEP) number of new leprosy cases have come down to 1,03,819 in 2022-2023 from 1,14,451 in 2019-2020. During the COVID pandemic, the leprosy data in India showed a sharp dip in the detection of new cases (65147 new cases in 2020-2021 and 75,394 new cases in 2021-2022). In our study, occurrence of leprosy cases in 2022 was 19%, in 2023 it was 29.4% and in 2024 (till June) it was 12% which is consistent with NLEP data[5].

Limitations: Limitations of our study are small sample size and retrospective assessment of records.

CONCLUSION

Even decades after statistical elimination of leprosy, there still are multiple endemic areas and new case detection rate is not declining as expected in our country. This signifies the need of effective and sustained measures like leprosy awareness, strengthening laboratory facilities and accessible treatment to achieve zero transmission of leprosy and eradication by 2027.

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