Indian J Lepr 2020, 92 : 19-29

http://www.ijl.org.in

Original Article

Delay in Leprosy Diagnosis

YS Marfatia[1], A Surani[2], D Shah[3]

Received : 30.05.2019 Accepted : 29.11.2019

In the post leprosy elimination era, focus is on diagnosis of early leprosy so as to prevent disabilities or worsening of disabilities. Early lesions of leprosy mimic common dermatologic conditions and neurologic deficit is also minimal. This poses diagnostic challenges. A prospective observational study was carried out at Govt. Medical College attached SSG Hospital, Vadodara (Gujarat), Western India, India over period of 8 months (January 2018 to August 2018) to study the clinical presentation and neurological deficit at the time of diagnosis. All the 40 newly diagnosed cases of Hansen's disease were included in the study. All these cases were thoroughly examined clinically and detailed history taken, AFB smear was taken and skin biopsy was also done in doubtful cases. Out of these 40 cases, 37 presented with both skin and neurological manifestations (including 1 with facial palsy) and 3 with only neurological manifestations. 11 cases were diagnosed as LL, 14 as BL, 10 as BT, 2 as TT and 3 as Pure Neuritic leprosy. Lepra reaction was observed in 5. Trophic ulcers in 7cases were noted. AFB in slit skin smears were positive in 20 cases and this shows of importance of smears in diagnosis of leprosy. Presentation with advanced neurologic deficit specially grade II disabilities in such nearly one third of these self reporting cases indicates late diagnosis. While the need of histopathological examination due to lack of cardinal features was felt in 7/40 (17.5%), it helped in accurate classification of the disease which has therapeutic relevance. Though nearly half of the cases (18/40) consulted their family physicians, diagnosis was missed due to lack of adequate knowledge and expertise. Awareness in people seems to be an issue as 55% presented 6 months after noticing the symptoms. Access to services to migrant population also appears important. Compared with national and state figures, this appears to be local/ regional problem and needs to be addressed by studies at community level in this area.

Keywords : Leprosy, Disability, Reactions, Acid fast bacilli (AFB), Late diagnosis

Introduction

India with the implementation of MDT has succeeded in bringing the national prevalence of leprosy to "elimination as a public health problem" of less than 1/10,000 in December 2005. Despite this achievement the issue of static trends in ANCDR (Annual New Case detection Rates) and rising trends of Grade 2 disabilities seen in NLEP data reflect a gap between the cases detected and actual disease in the community. NLEP Annual report of the year 2015-2016 shows prevalence rate of more than 1 per 10,000 population in Bihar, Jharkhand, Odisha, Dadra & Nagar Haveli & Lakshadweep (NLEP 2016). In

[1] Dr Yogesh S Marfatia, Professor and Head
[2] Dr Ashma Surani, Junior Resident
[3] Dr Dhiral Shah, Junior Resident
Department of Dermatology, Venereology and Leprosy, Govt Medical College Baroda attache SSG Hospital, Vadodara, Gujarat, India.
Correspondence : Dr Ashma Surani, **Email :** ashmasurani786@gmail.com

Gujarat the prevalence rate per 10,000 population in 2016-17 was 0.64, while total leprosy cases were 4400 and percentage of Grade II disability was 1.36% (Narsimha Rao & Suneetha 2018).

India continues to account for 60% of new cases reported globally each year and is among the 22 "global priority countries" that contribute 95% of world leprosy cases, thus warranting a sustained effort to bring the numbers further down. In the year 2007, new cases detected in India were 137,685, and nine years later in 2016, the number remained almost the same at 135,485. There was also a significant increase over the 127,326 new cases detected in 2015. This probably was due to renewed effort of new case finding in the programme. Of the total new cases detected, almost 50% were multibacillary cases and the child rate was about 8.7%, indicating continued transmission of leprosy in the community (NLEP 2016).

In post leprosy elimination era, renewed focus is on diagnosis of early leprosy, so as to identify and treat cases so that disabilities or worsening of disabilities does not occur and to interrupt the chain of transmission of the disease.

Some of the problems associated with the lack of early diagnosis of leprosy are :

1. Clinical diagnosis is based only on clinical diagnosis of the cardinal features and no laboratory tools are available in state health services including tertiary care hospitals. Smear facility for identifying and reporting of AFB was also withdrawn from the public health programme.
2. Early lepromatous cases often go unnoticed due to absence of sensory loss or due to ill-defined lesions mimicking other dermatological conditions.
3. Lack of awareness about Pure Neuritic leprosy among treating physicians.
4. Awareness about leprosy is far from adequate also in the general public.

Though the profile of cases reporting to Tertiary Care institutions like ours may not reflect the exact situation at community level, it can be indicative of prevailing situation and can help in planning strategies for research cum intervention. This study has been carried out to generate such first hand data about the profile of leprosy cases reporting to our Tertiary Care Hospital attached to Medical College.

Materials and Methods

After obtaining ethical clearance from Institutional Ethical Committee, this observational study was carried out in Dermatology Venereology Leprology OPD of SSG Hospital of Government Medical College, Vadodara over period of 8 months (January 2018 to August 2018). This study focused on presenting features of leprosy at the time of diagnosis in terms of number and distribution of skin lesions and their extent, nerve thickening and neurologic deficit, reactional status if any and smear positivity. All the forty newly diagnosed cases of leprosy during this period were enrolled.

Informed written consent including for publication of their pictures was obtained at the start of the study. A pre-tested proforma was used to collect necessary details which included age, sex, presenting complaints and their duration, family history, history of prior medical consultation and illnesses. All the cases were clinically examined thoroughly and dermatological as well as neurological findings were noted and recorded. Details regarding, location, type and number of skin lesions, nerve thickening & involvement, sensory and motor impairments, disabilities (Brandsma & van Brakel 2003) and reactional status if any was recorded. Cases were diagnosed (WHO 1998) and classified on the basis of IAL classification (IAL 1982).

Slit Skin Smears (SSS) for acid fast bacilli (AFB) was taken from average 5 sites including both the earlobes, eyebrows and active skin patch in all cases. With size 15 blade scalpel an about 5 mm long incision was made over the site and tissue fluid and pulp (not blood) was collected, gently smeared on a glass slide. Smear was heat fixed, stained by Zeihl Neelsen (ZN) method and results were recorded. Skin biopsy with 4 mm punch biopsy forceps under aseptic precautions was also done in doubtful cases and sent to the Pathology section for confirmation of diagnosis and classification (Ridley & Jopling 1966).

Results

Age and Sex wise distribution : The age and sex wise distribution of cases studied is shown in Table 1. Out of 40 cases, the youngest case was 10 years old female and oldest case was also a female of 68 years. Representative picture of a Borderline Lepromatous leprosy case is shown in Fig. 1. Ten of the 40 cases (25%) were migrants, who had come for work and economic reasons to the city.

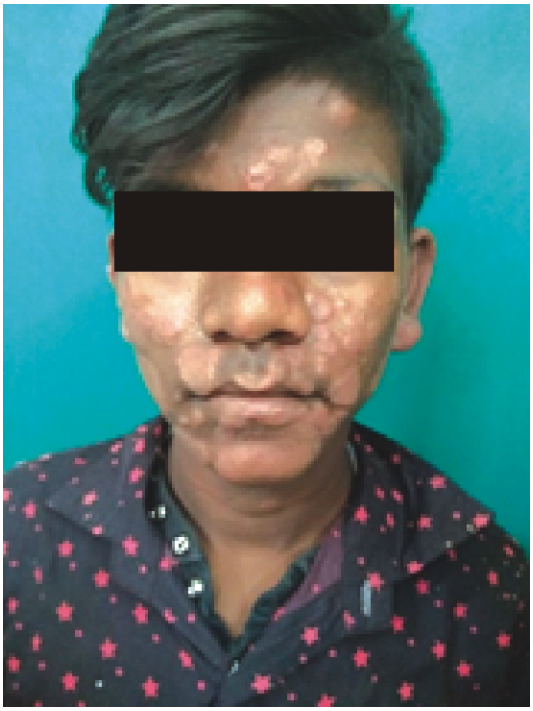


Fig 1 : Facial lesions of Borderline lepromatous leprosy case

Duration of Symptoms : Out of the 40 cases, duration of symptoms as elicited from the patients was less than 6 month in 18 cases (45%),

Table 1 : Age and Sex wise distribution

Age (Years)	Sex (n=40)	
	Male [n=25(62.5%)]	Female [n=15(37.5%)]
10-18	3(7.5%)	1(2.5%)
19-30	7(17.5%)	4(10%)
31-50	9(22.5%)	5(12.5%)
51-70	7(17.5%)	5(12.5%)
Total	25	15

Table 2 : Duration of Symptoms

Duration of symptoms in months	No of cases (N=40)
<6 months	18 (45%)
6 -12 months	19 (47.5%)
>12 months	3 (7.5%)

between 6 to 12 months in 19 cases (47.5%) and more than 12 months in remaining 3 cases (Table 2).

Family history : Seven of 40 cases had a positive family history of one or more of the family members also having the disease (17.5%). In one case the spouse was also suffering from the disease.

History of Prior Consultation : History of prior consultation from the family physicians was positive in 18 cases (45%). However, the diagnosis of leprosy or referral was not made by them.

Presenting Features : Presenting features are summarized in Table 3. In 37 cases (92.5%) the presenting feature was an active skin patch(es)s Erythema nodosum leprosum (ENL) was the reason for attending the hospital in 5 cases (12.5%). Although tingling and numbness was the main complaint in 4 cases (10%), sensory impairment was the commonest sign and observed in 39 cases (97.5%). Trophic ulcers were present in 7 cases (17.5%), difficulty in buttoning**/** unbuttoning was present in 4 cases (10%) and B/L foot drop was present in one case (2.5%), Right eye Lagopthalmos was observed in one case (2.5%). Claw hand deformity was observed in 6 (15%) cases {Right Claw hand in 5 cases and B/L Claw hand in 1 case}.

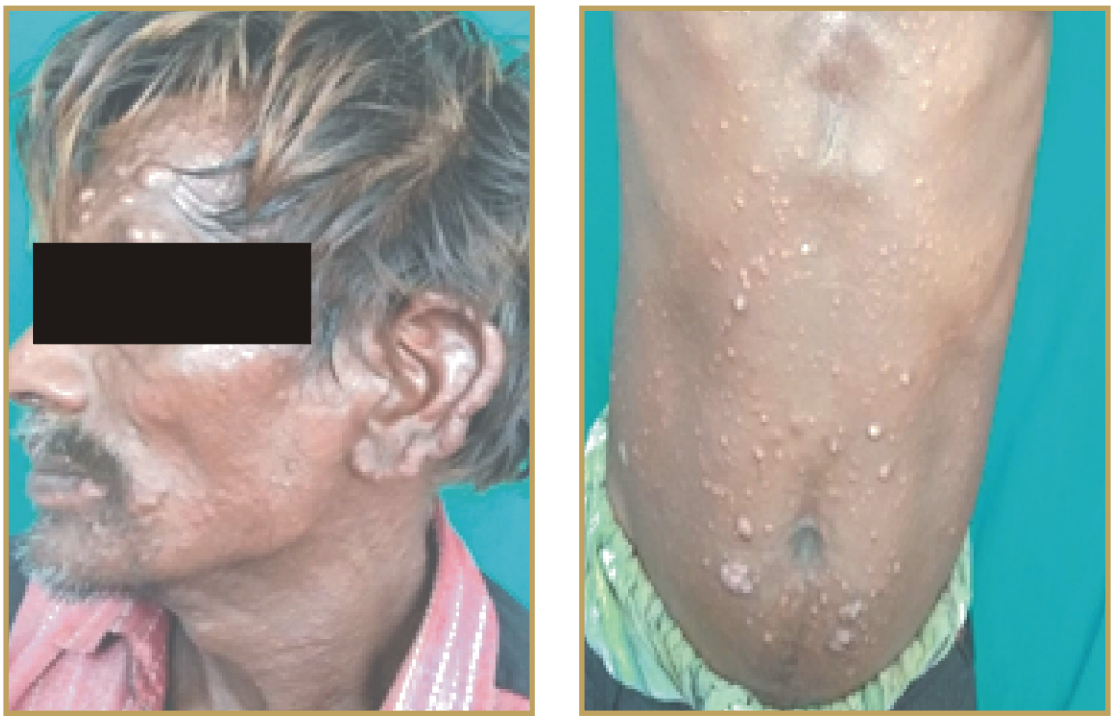
Table 3 : Presenting clinical features

Presenting Features		**No. of cases (n=40)**
Presence of Skin lesions	Active patch	37(92.5%)
Sensory impairments	Tingling & numbness	4(10%)
	Sensory deficit	39(97.5%)
	Blisters	10(25%)
Motor impairments	Difficulty in buttoning/unbuttoning	4(12.5%)
	Foot Drop	1(2.5%)
	Claw Hand	6(15%)
	Lagopthalmos	1(3.3%)
Lepra reactions	Erythema Nodosum Leprosum	5(12.5%)
	Type 1 reaction	0
Trophic ulcers		7 (17.5%)

Table 4a : Table describing the characteristics of the skin lesions

Skin lesions	**Anaesthetic**	**Hypoaesthetic**	**Intact sensation**	**Total No of cases (n=37)**
Hypopigmented patches	5	3	0	8(21.6%)
Erythematous plaque/ papules/nodules	3	12	10	25 (67.6%)
Only Ichthyotic patch	0	3	0	3(8.1%)

Skin Lesions : Table 4a and 4b summarize the characteristics of skin lesions as well as other important features at the time of presentation. Well defined hypopigmented skin patches were present in a total 8 cases (21.6%) with anesthesia over skin patches in 5(12.5%) cases and



Figs. 2(a), (b) : A Histology proven case of Histoid leprosy

Table 4b : Other features observed at the time of presentation clinical features

Others		**No. of cases (n=40)**
Madarosis		9(24.3%)
Ear infiltration		8(20%)
Bilateral		3
Unilateral		5
Swollen Hands		2(5%)
Swollen Feet		2(5%)
Trophic ulcers	**Duration**	**No. of cases (n=7)**
Bilateral Hands	3 months	1(14.2%)
Right hand	6 months	3(42.8%)
Left Hand	15 days	1(14.2%)
Right foot	6 months	1(14.2%)

hypoasthesia in 3(7.5%) cases. Well defined erythematous plaques / papules /nodules were present in a total 25 cases (67.6%) with anesthesia in 3(7.5%) cases, hypo -anesthesia in 12(30%) cases and intact sensation in 10(25%) cases. Only ill defined ichthyotic patch were observed in total 3 cases(8.1%) with hypo-anesthesia in all 3 cases and no anesthesia. No satellite lesions were present. Madarosis was noted in 9 cases (24.3%). Infiltration in the ear lobes was detected in 8 cases (20%) and two cases also presented with swollen hands and feet.

Trophic ulcers were present in 7 cases (17.5%). Out of these, bilateral involvement of hands over 3 months duration was seen in 1(14.2%) case, of Right hand over 6 months duration in 3(42.8%) cases, of Right palm over 1 year duration in 1(14.2%) case and of Left hand over 15 days duration in 1(14.2%) case. Involvement of Right foot over 6 month duration was seen in 1(14.2%) case.

Nerve involvement and thickening : The details of nerve involvement are shown in Table 5. Moderate thickening of the bilateral greater auricular nerve was seen in 13 cases (32.5%), Bilateral ulnar nerves were moderately thickened in 29 cases (48.3%%), severely thickened in 2(3.33%) cases, Right and left ulnar nerve were moderately thickened in 1(2.5%) case each, moderate thickening of Bilateral Common peroneal nerve was seen in 11 cases (32.5%), right and left Common Peroneal nerve in 1(2.5%) case each. Bilateral Superficial radial cutaneous nerves were palpable in 20(50%) cases, right Superficial Radial Cutaneous nerve in 2(5%) cases and left Superficial Radial Cutaneous in 1(2.5%) case, bilateral Posterior tibial nerve in 8(20%) cases & right Sural nerve in 1(2.5%) case. Tenderness in Bilateral ulnar nerve was present in all 5 (12.5%) cases with ENL and in bilateral Superficial Radial nerve in only 2 (5%) cases with ENL. Tingling was

Table 5 : Table showing the neurological involvement

Thickened		**No. of cases (n=40)**		
Nerves		**U/L**	**B/L**	**Total**
	Greater auricular nerve	0	13(32.5%)	13(32.5%)
	Ulnar nerve	2(5%)	31(77.5%)	33(82.5%)
	Common Peroneal nerve	2(5%)	11(27.5%)	13(32.5%)
	Posterior Tibial Nerve	0	8(20%)	8(20%)
	Superficial Radial Nerve	3(7.5%)	20(50%)	23(57.5%)
	Sural Nerve	1(2.5%)	0	1(2.5%)
Sensory Examination		**Decreased**	**Lost**	
Sensations in Upper	**Temperature**	2(5%)	31(77.5%)	
& Lower extremity	**Touch**	4(10%)	21(52.5%)	
	Pain	4(10%)	20(50%)	
		Total cases (n=40)		
Motor examination	**Decreased power**	13(37.5%)		
	Lagopthalmos	1(2.5%)		

present in a total of 4 (10%) cases with bilateral upper limb involvement in 2 (5%) cases and in Bilateral upper as well as lower limb in 2 (5%) cases. Loss of temperature, touch and pain sensations in Bilateral upper extremities was present in 22 cases (55%), 16 cases (40%) and 16 cases (40%) respectively and in Bilateral Lower extremities was present in 21(52.5%) cases, 15(37.5%) cases and 15(37.5%) cases respectively. Impaired temperature, touch and pain sensations were present in both the upper extremities in 2 cases (5%), 3 cases (7.5%) and 3 cases (7.5%) respectively and in Bilateral lower extremity in 1(2.5%) case, 4 (10%) cases and 4(10%) cases respectively. Out of 40 cases, decreased power in B/L hands was present in 7(17.5%) cases in right hand in 3 (7.5%) cases, in bilateral feet in 2(5%) cases, Right feet in 1 (2.5%) case. Right eye Lagopthalmos was present in 1 case (2.5%). It was not associated with nerve tenderness.

Disability : Out of 40 cases, Grade I Disability of hands was present in 1 case (2.5%), and of feet in 4 cases (10%). Grade II Disability of hands was present in10 cases (25%) Out of these 10 cases 2 cases (5%) also had grade II disability of feet. Grade II disability of eyes in 1 case (2.5%) was noted. (Table 6)

Investigations : Out of 40 cases, smears for AFB were positive in 20 cases (50%). In these, Bacteriological index (BI) Grade +2 was present in 6 (30%) cases, Grade +3 in 6 (30%) cases, Grade +4 in 4 (20%) cases and Grade +6 in 4 (20%) cases.

Punch skin Biopsy was done in 7 doubtful cases with atypical skin lesions not fulfilling cardinal features for diagnosis of Leprosy. Histopathological findings are summarized in Table 7. Tuberculoid Leprosy was diagnosed in 2/7 (28%) cases showing Epitheloid granuloma with epitheloid cells and giant cells. Borderline Lepromatous (BL) leprosy was diagnosed in 2 (28%) cases showing macrophage dominant granuloma with

Table 6 : Disabilities graded as per WHO criteria

Grade	Hands	Feet	Eyes
I	1(2.5%)	4(10%)	0
II	10(25%)	2(5%)	1(2.5%)

Table 7 : Histopathological features

Sr no.	Histopathological features	No. of cases (n=7)
1.	Granuloma	2[28%](TT)+2[28%] (BL)+3[42%](LL)
2.	Epitheloid cells	2[28%]((TT)+1[14%](BL)
3.	Foamy Macrophages	2[28%](BL)
4.	Lymphocytes	5[71%]
5.	Plasma cells	2[28%](BL)+3[42%](LL)
6.	Histiocytes	2[28%](BL)+3[42%](LL)
7.	Grenz zone	2[28%](BL)+3[42%](LL)
8.	Giant cells	2[28%](TT)
9.	Spindle cells	3[42%](LL)

Table 8 : Table showing the classification of disease as per IAL classification

Diagnosis	No of cases (n=40)
Lepromatous Leprosy (LL)	11(20%)
Histoid leprosy (biopsy confirmed)	3 (10%)
Borderline Lepromatous (BL)	14 (35%)
Borderline Tuberculoid	10 (25%)
Tuberculoid (TT)	2 (6.7%)
Pure Neuritic Leprosy	3 (10%)

foamy macrophages, epitheloid cells, lymphocytes, plasma cells, histiocytes and Grenz Zone in subepidermal region. Histopathology findings characteristic of Lepromatous leprosy (LL) were positive in 3 (42%) cases showing macrophage dominant granuloma with lymphocytes, Spindle cells, plasma cells, histiocytes and Grenz Zone in subepidermal region were suggestive of Histoid leprosy.

Diagnosis : Out of 40 cases, eleven cases (27.5%) were diagnosed as LL out of which 3 cases (7.5%) were diagnosed as Histoid leprosy by histopathology. One such Histoid leprosy case is shown in Fig. 2 (a) and (b). 14 cases (35%) as BL, 10 cases (25%) as BT, 2 cases (6.7%) as TT, 3 cases **(**10%) as Pure Neuritic Leprosy.

Discussion

In present study of 40 newly detected cases of Leprosy, age wise distribution showed that 35% cases belonged to the age grouping of 20-30 years. About 10% cases were children (10-18 years). As no child case below 10 years was there in our series, this needs special attention. This is similar to the observations of 9.3% by Chhabra et al (2015). The group included 2 young females who were having lepromatous leprosy and borderline lepromatous leprosy, respectively. There was a positive family history in both the cases.

In the present study, 62.5% cases were males with a male: female ratio of 1.6:1 which may be reflecting the difference in chance of exposure to disease or in health seeking behaviour between two sexes. This is an old epidemiological feature of leprosy known over the years.

Duration of symptoms was more than 6 months in 47.5% cases and more than 1 year in 7.5% cases. All 3 cases of Pure Neuritic Leprosy presented after 1 year with disabilities such as Right ulnar claw hand Right finger Trophic ulcer & Difficulty in buttoning/ unbuttoning respectively. The observations in the present study indicate that such Pure Neuritic Leprosy cases with polyneuritic involvement are diagnosed late and are mostly likely to be misdiagnosed at the primary level. These cases may also be presenting as well diagnosed late due to the subtle signs of the disease as well of asymptomatic nature of this spectrum of leprosy.

In the present study there is significant proportion of migrant cases (25%), when compared to 10.4% migrant cases in a study by Samuel et al (2012). This could be due to the small duration of the study and it being in a tertiary care hospital, Also, these cases belong to a moving population who are not easily accessible to screening in programme settings. Targeting this population in leprosy detection activities will identify more undetected cases, provide treatment which will

ultimately reduce the transmission of disease and reduce burden of disease and disabilities.

In the present study, there was a positive family history in 7 cases (17.5%) stressing the importance of family screening of contacts. Contact surveys are considered important for detection of leprosy (van Beers et al 1999, Smit & Aerts 2014 , Singh et al 2016). There was 1 (2.5%) case of leprosy in both the spouses (conjugal leprosy) while in the study by Meléndez et al (2006) 5.4% cases of conjugal leprosy were found. Conjugal leprosy has been considered as rare phenomenon by Mehta et al (2010).

About half of the cases (45%) had history of prior consultation to family physician but the diagnosis was missed including in cases of 3 Pure Neuritic Leprosy, 8 Lepromatous Leprosy cases, 3 Borderline Lepromatous and 2 Borderline Tuberculoid cases probably due to lack of awareness amongst primary care doctors. In the present study, majority (67.6%) of the cases presented with varied dermatological lesions ranging from erythematous plaques, papules and nodules with no or minimal sensory deficit over those lesions including cases with ENL. This could explain some of missed diagnosis at primary level. Our findings indicate the need of trainings for all health care professionals including family physicians.

In this present study, majority (62.5%) were towards Lepromatous pole with Borderline lepromatous leprosy i-e 14/40 cases followed by lepromatous leprosy. 11/40 cases of patients of lepromatous pole (MB cases) presenting to tertiary health care center reflects the possibility of delayed diagnosis and larger number of subclinical undetected leprosy cases in the community which could be contributing to transmission and continuing burden of new cases. This could also be that these cases mimic other common dermatological conditions and have delayed neurological deficit so could be missed during routine examination and screening. In the study by Chhabra et al (2015) 56.7% were BT cases and only 8.1% were LL cases, indicating detection of more early cases.

Histoid leprosy has emerged as an important subgroup within lepromatous leprosy (Mehnidiratta et al 2011). In our study group 3/40 (7.5%) were of Histoid variety showing the importance of this group in the current scenario.

About 50% of the cases were smear positive for AFB which is similar to 56.58% noted in study by Bhushan et al (2008). Though slit smear has been considered as a weakest link in diagnosis of leprosy, it has nearly 100% specificity. Moreover, these smear positive cases are the most infectious group which underlines the significance of doing slit smear examination in the diagnosis as well as understanding the transmission dynamics of the disease. Results of punch skin biopsy in 7 doubtful cases with atypical skin lesions not fulfilling cardinal features for diagnosis of leprosy confirmed the diagnosis of Tuberculoid Leprosy in 2 (28%) cases, Borderline Lepromatous leprosy in 2(28%) cases and Lepromatous (Histoid) leprosy in 3(42%). Our study shows the utility of selective use of histopathological examination in diagnosis and classification of leprosy.

One patient presented with single erythematous plaque on right side of forehead without loss of sensation on plaque with loss of temperature sensation of B/L palms and thickened B/L ulnar Nerves and common peroneal nerves. Skin Biopsy was done in this cases and histopathological findings were suggestive of Borderline lepromatous leprosy. Thus biopsy helps in diagnosis of cases that have atypical presentations.

Five cases (12.5%) presented with Type 2 reaction at the time of diagnosis. One of them was a female child of 10 years with type 2 reaction with lepromatous leprosy. Seven (17.5%) cases presented with Trophic ulcers Out of these,

involvement of Bilateral hands over 3 months duration was seen in 1(14.2%) case, of Right hand over 6 months duration in 3(42.8%) cases, of Right palm over 1 year duration in 1(14.2%) case and of Left hand over 15 days duration in 1(14.2%) case. Involvement of Right foot over 6 month duration was seen in 1(14.2%) case and 6 (15%) cases with claw hand disabilities. All these cases with majority having duration of symptoms of more than 6 months shows delay in diagnosis. These results are similar to the (13.4%, claw hand) observations Geetharani et al (2018) in a study also conducted in tertiary care center in Madurai.

Increasing number of new multibacillary cases and those with disabilities in this post leprosy elimination era may be due to low voluntary reporting in the community due to a lack of awareness as well as the continuing fear, stigma, and discrimination against leprosy. Global Leprosy strategy (2016-20) has defined the road-map towards world free from leprosy, it is the time to reflect on progress and issues peculiar to urban settings as is apparent from other studies (Tiwary et al 2011). For achieving the goal of leprosy eradication, the intensification of leprosy control activities is required including thorough contact tracing (van Beers et al 1999, Smith & Aerts 2014, Singh et al 2016), active case detection (NLEP 2016) and increasing awareness regarding leprosy among the general population as well as treating physicians. Post exposure prophylaxis with Rifampicin has been considered to be an promising intervention (Feenstra et al 2011, Tiwari et al 2017). The SPARSH Leprosy Awareness Campaign (SLAC) was launched on 30th January 2017 by NLEP and is a programme intended to promote awareness and address the issues of stigma and discrimination. These efforts need to be further intensified. Re-orientation and training of private health care providers and primary health personnel including doctors about the disease to ensure early detection, treatment and prevention of disabilities.

References

1. Bhushan P, Sardana K, Koranne RV et al (2008). Diagnosing multibacillary leprosy: a comparative evaluation of diagnostic accuracy of slit-skin smear, bacterial index of granuloma and WHO operational classification. *Indian J Dermatol Venereol Leprol*. **74** : 322-326.
2. Brandsma JW, van Brakel WH (2003). WHO disability grading: Operational definitions. a 5-year retrospective study. *Indian J Dermatol*. **60** : 55.
4. Feenstra SG, Pahan D, Moet FJ et al (2012). Patient-related factors predicting the effectiveness of rifampicin chemoprophylaxis in contacts: 6 year follow up of the COLEP cohort in Bangladesh. *Lepr Rev*. **83** : 292-304.
5. Geetharani G, Pavithra G, Satheesh P (2018). Clinico-epidemiological study of untreated multibacillary leprosy patients visiting a Tertiary Care Hospital in Madurai. *Indian J Lepr.* **90** : 197-206.
6. Global leprosy strategy 2016-2020: Accelerating towards a leprosy-free world. New Delhi, World Health Organization, Regional Office for South-East Asia, 2016.
7. Indian Association of Leprologists (1982). Clinical, histopathological and immunological features of the five type classification approved by the Indian Association of Leprologists. *Lepr India*. **54** : 22-32.
8. Mendiratta V, Jain A, Chander R et al (2011). A nine-year clinico-epidemiological study of Histoid Hansen in India. *J Infect Dev Ctries*. **5** : 128-131.
9. Mehta V, Vasanth V, Balachandran C (2010). Conjugal leprosy: A rarity. *Dermatol Online J*. **16**: 15.
10. Meléndez E, Fuentes J, Rodríguez G (2006). Conjugal leprosy. *Rev Salud Pública*. **8** : 24-32.
11. Narasimha Rao P, Suneetha S (2018). Current situation of leprosy in India and its future implications. *Indian Dermatol Online J.* **9** : 83-89.
12. National Leprosy Eradication Programme. Operational guidelines for Leprosy Case Detection

Campaign. Year 2016. http://nlep.nic.in/pdf/Final_OG_LCDC%20(1).pdf Accessed on 28 August 2016.

13. National leprosy eradication programme (2016). NLEP - Annual Report for the year 2015-16. http://nlep.nic.in/pdf/revised%20annual%20report%2031st%20March%20202015-16.pdf Accessed on 27 August 2016.
14. Ridley DS, Jopling WH (1966). Classification of leprosy according to immunity. A five-group system. *Int J Lepr Other Mycobact Dis*. **34(3)**: 255-7.
15. Samuel P, Bushanam JDRS, Ebenezer M et al (2012). Impact of migration on new case detection rates in leprosy in Gudiyatham Taluk, Tamil Nadu, India. *Indian J Lepr*. **84**: 307-316.
16. Singh RK, Singh A, Marella M et al (2016). Case finding through contact surveys and focal surveys in Bihar, India. *Lepr Rev*. **87** : 436-7.
17. Smith WCS, Aerts A (2014). Role of contact tracing and prevention strategies in the interruption of leprosy transmission. *Lepr Rev*. **85** : 2-17.
18. Tiwary PK, Kar HK, Sharma PK et al (2011). Epidemiological trends of leprosy in an urban leprosy centre of Delhi: A retrospective study of 16 years. *Indian J Lepr*. **83**: 201-208.
19. Tiwari A, Mieras L, Dhakal K et al (2017). Introducing leprosy post-exposure prophylaxis into the health systems of India, Nepal and Indonesia: A case study. *BMC Health Serv Res*. **17**: 684.
20. van Beers SM, Hatta M, Klatser PR (1999). Patient contact is the major determinant in incident leprosy: Implications for future control. *Int J Lepr Other Mycobact Dis*. **67**: 119-128.
21. World Health Organization (1998). Expert Committee on Leprosy, Seventh report. Technical report serial no. 874. WHO, Geneva.

How to cite this article : Marfatia YS, Surani A and Shah D (2020). Delay in Leprosy Diagnosis. *Indian J Lepr.* **92**: 19-29.