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Original Article

Clinical and Epidemiological Characteristics of Leprosy Patients in the Post Elimination Era: We Need to be Vigilant

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After 15 years post elimination it is perhaps an opportune time for an appraisal of newly detected leprosy cases. The medical records of leprosy patients registered from 2009 to 2020 at Dermatology Clinic of Dr. Rajendra Prasad Government Medical College, Kangra (Tanda), Himachal Pradesh were analyzed retrospectively. The 381 (M:F 2.8:1) patients were aged between 5 and 90 years (mean 43.4 years). The majority, 76.9% patients were aged 21-60 years and 1.3% were children aged <15 years. Only 13.1% patients were migrants from other states. The MB leproasy was seen in 80.8% comprising mainly patients with BL (41.5%) and LL (31%). The 19.8% patients with PB leprosy had 17% in BT and 2% in TT spectrum. Fewer patients had pure polyneuritic (3.9%) and histoid (2.6%) leprosy in the MB spectrum. Lepra reactions occurred in 157(41.2%) patients and 85(54.1%) of them had recurrent type-2 lepra reaction with MB spectrum and 72(45.9%) patients in PB spectrum had type-1 lepra reaction. More 62.2% patients had grade-2 disabilities compared to 49.6% patients having grade-1 disabilities of hands and feet. Ocular and nasal disabilities happened in 3.9% and 1.3% patients, respectively. Perforation of the hard palate occurred in 1% patients. Relapse occurred 1.3% patients and 1.8% patients required extended MDT due to high MI even after 12 months' MDT. Our observations of high proportion of MB cases remain a major concern as it reflects delayed diagnosis, risk for disabilities /complications, magnitude of community infection, and poor access to the services. It belies the expectations of recognizing early signs of the disease and self-reporting by the patients during the integration of vertical control program with general health services. Frequent active case detection campaigns at national level especially in high endemic pockets will perhaps help in their early detection. We must remain vigilant and not be complacent of declared leprosy elimination. It is perhaps too complex a disease to eliminate with treatment alone.

Keywords : Disability, Delayed Diagnosis, Lepra Reactions, Leprosy, New Case Detection

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Introduction

With the implementation of WHO recommended fixed duration MDT for leprosy, the national prevalence of leprosy declined to <1/10.000 in Dec 2005 and India could officially claim elimination of leprosy as a public health problem (Dhillon 2006). This was followed by integration of leprosy services with general health services leading to decreased focus for funds, research and manpower exclusively dedicated to the control program. The success was further consolidated to achieve elimination of leprosy in 34 of 36 states and union territories (UTs) by the end of March 2011-2012 when 551 (82.4%) of the 669 districts achieved targeted prevalence of <1/10,000 population. The prevalence has further decreased to 0.66/10,000 in 2016 (NLEP 2015-16). Despite such a success India along with Indonesia still contributes >67% of new cases of leprosy detected globally each year (WHO 2018). Few states (Chhatisgarh, Odisha, Bihar, Goa) and UTs (Dadra & Nagar Haveli, Lakshadweep) still continue to report a prevalence of >1/10,000 with their own endemic foci for the active disease (NLEP 2016-17). Nevertheless, the excellent role played by WHO-MDT is evident from impressive decline in the prevalence of leprosy from 57/10,000 to 5.2/10,000 between 1981 and 1999 that has plateaued between 2007 and 2015 even after the elimination status (Dharmshaktu et al 1999, Rehlan et al 2016). Concurrently, annual new case detection rate also showed a gradual fall from initial 5.9/10,000 in 1991 to 2.5/10,000 in 2005 with small peaks in 2005 and 2015 (Thyvalappil et al 2019).

Although leprosy patient becomes non-infectious after a full course of WHO-MDT, the treatment will not prevent occurrence of new cases. Thus, the new case detection rate will remain a more important parameter of leprosy control than its prevalence rate. This is evident as both prevalence rate of 0.66/10,000 and annual new case detection rate of 1.02/10,000 have remained almost in a plateau state since 2005 except for small peaks during special leprosy detection campaigns in 2012-13 and 2016-17 detecting nearly 25% of the annual new cases (Rao and Suneetha 2018). Almost 50% of the total newly detected cases were of multibacillary leprosy with grade-2 disability rate of 3.87% while 8.5% to 8.9% were children indicating delayed diagnosis and continued transmission of infection (Dogra et al 2014, WHO 2017, NLEP 2016-17, Rao and Suneetha 2018).

Himachal Pradesh, a small hill state of north India, had been a low endemic region with a prevalence of 0.78/10,000 in 1991 which has further declined to 0.2/10,000 in 2015-16 (NLEP 2016-2017). However, trends in annual new case detection have not changed over the years in an urban leprosy center at Shimla (Mahajan et al 2003, Jindal et al 2009, Rattan et al 2017, Tegta et al 2019). We retrospectively analyzed 10-year data from our clinic to study trends in new case detection and clinicoepidemiological characteristics of leprosy patients presenting at the Dermatology Clinic of Dr. Rajendra Prasad Government Medical College, Kangra (Tanda), another tertiary care center of the state. The observations will be of utmost significance in this post elimination era.

Patients and Methods

The medical records of all patients registered in leprosy clinic of Dermatology Outpatient clinic of Dr Rajendra Prasad Government Medical College, Kangra (Tanda) HP, were analyzed retrospectively. The study was approved by the Institutional Ethics Committee. All procedures followed were in

accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975 as revised in 2013. All patients were provided with standard treatment and counseling.

The patients from the whole district and adjoining districts were visiting the clinic voluntarily and no active case detection was carried out. The data was analyzed for age at diagnosis, gender, domicile, history of contact, the type of leprosy, lepra reactions and disabilities, personal medical history and treatment(s) received previously including WHO-MDT (by asking them to identify the shown blister packs). Details of number and distribution of lesions, number of nerves affected, sensory loss, motor weakness, presence of neuritis, lepra reaction, and grades of disability were noted.

The diagnosis of leprosy was based on cardinal signs of leprosy that is presence of characteristic skin lesions, anesthesia (lesional or in glove and stocking distribution), thickened nerve trunks (at the sites of predilection) and demonstration of lepra bacilli in slit skin smear microscopy (WHO 1988). Slit skin smears (SSS) were performed in all patients for bacteriological index (BI) and morphological index (MI) by standard methods at first visit, at every 6-month interval, and before release from treatment (Mahajan 2013). Skin or nerve biopsy was performed in all cases for histological diagnosis at first visit only but in case of discordant clinicopathological features clinical diagnosis was given precedence for disease classification. The disease was classified into tuberculoid (TT), borderline tuberculoid (BT), mid borderline (BB), borderline (BL), lepromatous (LL) leprosy and neuritic leprosy (thickened nerve(s) and corresponding sensory/motor symptoms with or without tenderness, and no skin lesions) according to Ridley-Jopling classification and Indian Association of Leprologists (Ridley and Jopling 1966, IAL 1982).

The patients were classified into multibacillary (MB) or paucibacillary (PB) leprosy based on number of skin lesions, and positive slit skin smears (WHO 1988). All patients with positive SSS or having polyneuritic leprosy (involvement of $\geq$ 2 nerves) were grouped in MB leprosy while those with single lesion leprosy or mononeuritis were classified in PB spectrum. Type-1 lepra reaction was diagnosed when erythema, edema and/or tenderness of preexisting lesions with or without the appearance of new lesions, edema of hands, feet or face, or tenderness of one or more nerves with or without impairment of nerve function was present. The diagnosis of type-2 lepra reaction/erythema nodosum leprosum (ENL) with or without recurrences was based on presence of multiple, evanescent, tender, small nodules or plaques and accompanying fever, malaise, lymphadenitis, and/or musculoskeletal symptoms. The disabilities were classified into grade-0 no disability, grade-1 disability (glove and stocking anesthesia without visible alteration of form), and grade-2 disability as visible alteration in the form of limb (trophic ulcers, atrophy of small muscles of hands, muscular weakness, claw hand, foot drop, clew toes, resorption of digits), and/or inability to close eyes and visual impairment (WHO 1988, Brandsma and van Brakel 2003). Expert ophthalmologic examination was performed in all patients for presence of orbicularis oculi weakness, conjunctival redness, corneal erosions/ulcers/opacities, iridocyclitis, cataract, glaucoma and visual impairment attributable to leprosy.

All patients received WHO MDT-MB or MDT-PB as per their diagnosis. All patients with lepra

reactions were hospitalized for management. Mild episodes with only cutaneous involvement were managed with non-steroidal anti-inflammatory agents (NSAIDs). Any neuritis or episodes of acute type - 2 lepra reactions with/without systemic involvement were treated with systemic prednisolone in tapering doses as per standard protocol with / without immunosuppressive agents (azathioprine 50-100 mg/d), along with bed rest and supportive care such as slings, anti-inflammatory agents, and physiotherapy (WHO1988, Tiwary et al 2011). Patients with nasal or ophthalmologic complications were managed by concerned specialists.

A relapse of leprosy was defined as recurrence of disease or recrudescence of disease was defined as reactivation of disease after or within 5 years (for MB leprosy) and 2 years (for PB leprosy) of completion of WHO-MDT, respectively.

The MS Office™ Excel® software was used to tabulate and analyze the data. The continuous data are presented as means and categorical variables are calculated as frequencies and percentages.

Results

Table 1 depicts clinico-demographic characteristics of 381 patients with leprosy registered over a period of 10 years between 2009 and 2019. Except for 50(13.1%) patients belonging to other states (Bihar, Uttar Pradesh, Jharkhand), all were native to the state hailing from Kangra and adjoining districts (Fig. 1). Thirteen (3.4%) patients had contact with leprosy patient in the family but exact details of spectrum of leprosy among contacts were not available. None of the patients confirmed receiving the WHO-MDT blister packs before visiting us.

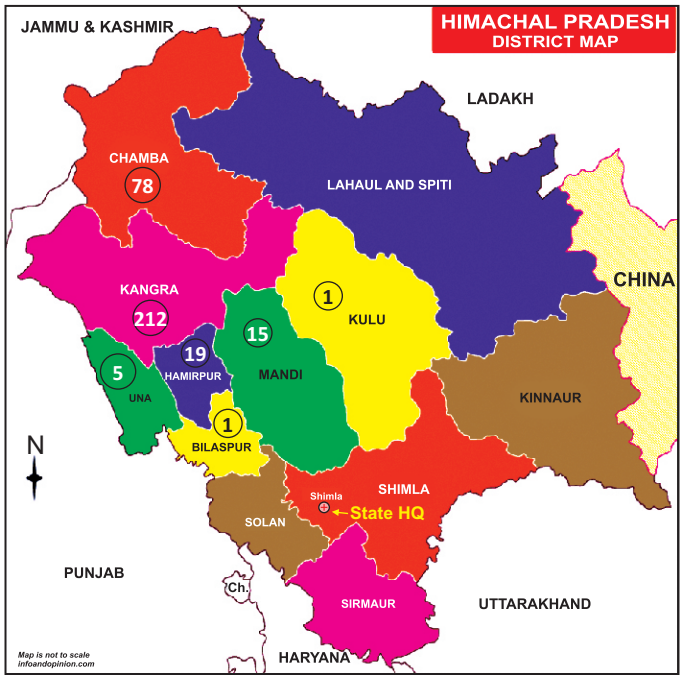

Fig. 1 : New leprosy cases detected between 2009 and 2020 belonging to various adjoining districts.

Table 1 : Baseline Clinico-demographic characteristics of leprosy patients

Characteristics	Number of patients (%) n =381	
Gender	Men	281 (73.8)
	Women	100 (26.2)
	Men: Women	2.8:1
Age in years	Range	5-90
	Mean	43.4
	<15(Boys= 3,Girls =2)	5 (1.3)
	15-20	11 (2.9)
	21-40	137 (36.0)
	41-60	156 (40.9)
	61-80	69 (18.1)
	>80	3 (0.8)
Domicile	Natives	331(86.9)
	Non-natives (migrants)*	50 (13.1)
Duration of disease at presentation	Range	1 month - 40 years
	Mean	20.2 years
	<5 years	279 (73.2)
	>5 years	102 (26.8)

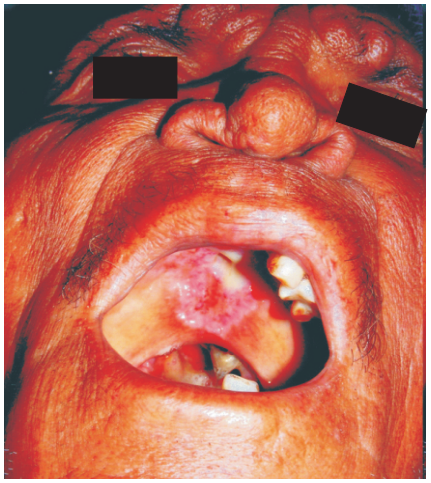

Fig. 2 : A 90-year-old male with LL leprosy who remained undiagnosed for nearly 40 years had diffuse skin infiltration, developed nodular lesions over forehead, had collapsed flattened nose, palatal perforation, destruction of uvula and nasal twang.

There were 281(73.8%) males and 100(26.2%) females (M:F 2.8:1) aged between 5 and 90 years (mean 43.4 years). The majority, 293(76.9%) patients were aged 21 to 60 years and 228(59.8) patients were >40 years of age. Seventy two (18.9%) patients were aged above 60 years. A 90-year-old LL patient was diagnosed after the appearance of facial lesions, palatal perforation and nasal deformity (Fig. 2). He had a hypopigmented patch over gluteal area for about 40 years and never sought treatment. Only 5(1.3%) patients were children (boys 3, girls 2) aged <15 years. The year wise distribution of the new cases is shown in Fig. 3. A steady increase in number of new leprosy cases from 21 in 2009-10 to 49 cases in 2011-12 was observed and number of annual new cases plateaued thereafter.

Table 2 : Clinical features of leprosy patients

Clinical features			Number of patients (%) n =381
Clinical Spectrum	PB = 73	TT	8 (2.1)
	(19.2%)	BT	65 (17.1)
	MB = 308 (80.3%)	BB (SSS positive =7)	7 (1.8)
		BL (SSS positive = 158)	158 (41.5)
		LL (SSS positive =118)	118 (31.0)
		Polyneuritic leprosy (≥ 2 or more nerve involvement) without skin lesions	15 (3.9)
		Histoid leprosy (SSS positive = 10)	10 (2.6)
Disabilities*	Hands = 223 patients	Grade-1	101 (26.5)
(number of patients)		Grade-2	122 (32.0)
	Feet = 203 patients	Grade-1	88 (23.1)
		Grade-2	115 (30.2)
	Eye = 21 patients	Madarosis	3 (0.8)
		Lagophthalmos	3 (0.8)
		Zygomatic nerve palsy/Ectropion	4 (1.0)
		Conjunctivitis	9 (2.4)
		Iridocyclitis	5 (1.3)
		Corneal ulcer	8 (2.1)
	Others = 24 patients	Nasal disability (Collapsed	5 (1.3)
		nasal bridge, Crooked nose)	
		Nasal septal perforation	15 (3.9)
		Palatal perforation	4 (1.0)
Number of patients		Present	157 (41.2)
with Lepra reactions		Type-1	72 (45.9%)
		Type-2	85 (54.1%)
Clinical spectrum	Histopathological diagnosis	Non specific mixed inflammation	–
Total discordant histopathology	**93**	**17**	**110 (28.9)**
TT (n=8)	TT =6	2	
BT (n=65)	BT = 52, TT = 8	5	
BB (n=7)	BB = 2, BT =4	1	
BL (n=158)	BL = 98, LL =56	4	

LL (n=118)	LL = 105, BL =9	4
Neuritic Leprosy (n= 15)	Neuritic Leprosy = 14	1
Histoid Leprosy (n= 10)	Histoid Leprosy = 8, LL =2	0

*Some patients had multiple disabilities.
Abbreviations: BB, mid borderline leprosy; BL, borderline leprosy; LL, lepromatous leprosy; BT, borderline tuberculoid leprosy; LL, lepromatous leprosy; SSS, slit skin smear.

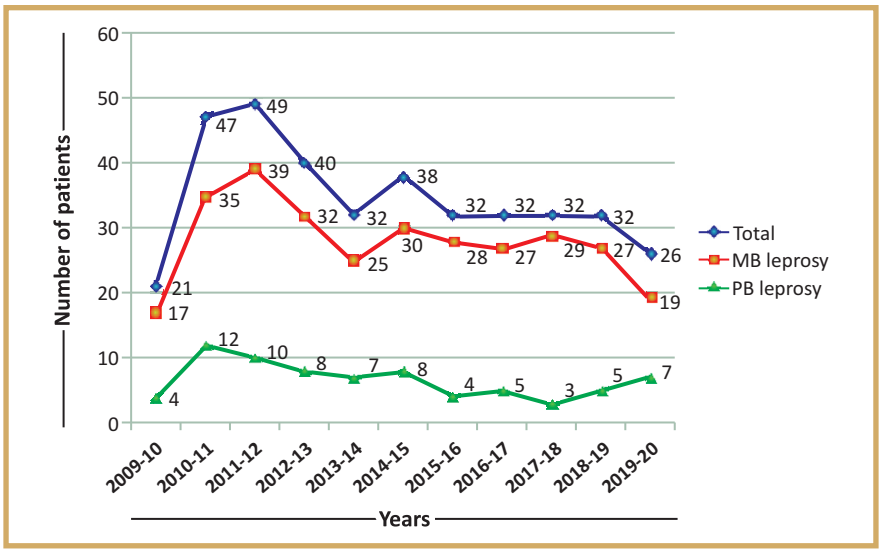

Fig 3 : Year wise distribution of new leprosy cases detected between 2009 and 2020 and their clinical spectrum. The MB cases comprised the majority across all years.

Disease spectrum

The disease spectrum of all patients is shown in Table 2. The majority, 308(80.8%) patients had MB leprosy comprising 118(31.0%) in LL, 158(41.5%) in BL, and 7(1.8) patients in BB spectrum, respectively. The pure-neuritic leprosy in 15(3.9%) patients was treated as MB leprosy based on number of nerves involved and/or radial cutaneous or sural nerve biopsy demonstrating lepra bacilli in Fite-Faraco stained smears. Histoid leprosy was seen in 10(2.6%) patients in the lepromatous spectrum. Seventy-three (19.2%) patients were of PB leprosy and comprised 65(17.1%) patients in BT and 8(2.1%) patients in TT spectrum. Three (0.8%) patients with initial diagnosis of indeterminate leprosy developed lesions of TT leprosy during follow up. Among 5children with leprosy, two each had BT and TT leprosy while BL was diagnosed in one child. The mean duration of disease at the time of first presentation was 20.2 years (range 1 month to 40 years). However, most patients attributed their disease to recent skin lesions/neurological symptoms despite presence of sensory-motor deficit, spontaneous blistering, anosmia or other features of long duration.

Five (1.3%) patients (MB leprosy in 4, PB leprosy in one) presented with signs of relapse/ recrudescence in the treated spectrum of the disease.

Slit skin smear positivity and Histopathology spectrum

Table 2 shows results of SSS and histopathology. Slit skin smears were positive in 293(76.9%) patients in multibacillary spectrum only. Clinicopathological diagnostic concordance was seen in 271(71.1%) cases while 17(4.5%) showed nonspecific and variable histological features.

Lepra Reactions and Disabilities

Lepra reactions were seen in 157(41.2%) patients and the majority patients, 85(54.1%) of them, in BB, BL, and LL spectrum had type-2 reaction/ENL while type-1 lepra reaction occurred in 72(45.9%) of them with BT and BL spectrum. Grade-1 disabilities for hand and feet were present in 101(26.5%) and 88(23.1) patients, respectively. Grade-2 disabilities in 237(62.2%) patients occurred as involvement of hands in 122(32.0%) and of feet in 115(30.2%) patients, respectively. Twenty one (5.5%) patients had one or more ocular disabilities such as madarosis, lid lag, ectropion, conjunctivitis, chronic iridocyclitis, and corneal ulcer. Twenty (5.2%) patients had nasal disabilities (anosmia, turbinate atrophy, collapsed nose, nasal septal perforation). Hard palate perforation was noted in 4(1.04%) patients.

Management

Depending upon classification of their disease, all patients, both newly diagnosed and with relapse, received WHO-MDT MB or MDT PB for 12 or 6 months, respectively. All patients remained under follow up until release from treatment or collected blister packs from nearby drug delivery health centre when not able to visit us. Seven (1.8%) patients with MB leprosy required extended treatment for 18-24 months due to high MI (15-20%) in SSS examination at the end of one year.

All patients with lepra reactions received MDT along with NSAIDs, systemic prednisolone with or without immunomodulators and supportive care as per standard guidelines. Patients with lepra reaction and acute ulnar/lateral popliteal neuritis improved with systemic prednisolone, slings and other supportive measures. The recent onset motor dysfunction/foot drop in two patients with lateral popliteal neuritis improved after systemic prednisolone, splinting and physiotherapy. Palatal perforation healed after using prosthetic obturator. Two patients required lateral tarsoraphy for ectropion. No other reconstructive surgery was performed in any patient. General measures comprised physiotherapy of hands and feet, management of trophic ulcer(s), education for home care and advice for prevention of disabilities.

Discussion

Despite substantial reduction in national prevalence of leprosy to <1/10,000 after implementation of WHO MDT program and achieving the target of leprosy elimination as a public health problem in 2005, the trends in annual new case detection rates have remain static (NLEP 2015-2016). Whereas, a near static child leprosy rate of about 9% also means continued transmission of leprosy in the community. A recent 7-year study from other center in the state reported 85.5% cases of MB leprosy and 2.3% childhood leprosy among 221 patients seen between 2010 and 2017 (Tegta et al 2019). The number of new cases detected was also between 35 and 40 every year. Most of their cases were from district Shimla and adjoining districts. Conforming to these and overall epidemiologic trends we also noted similar pattern of new case detection varying between 32 and 49 cases every year and 1.3% of them were children.

Slit skin smears were positive for lepra bacilli in 76.9% of patients consistent with diagnosis of MB leprosy implying its significance in early diagnosis when performed accurately. On the other hand, clinico-pathological discordance is not uncommon in leprosy and the reported concordance rate is between 50% and 89% (Sehgal and Joginde 1989, Kumar et al 2000, Ghunawat et al 2018 Thyvalappil et al 2019). Being spectral disease leprosy will have lesions in varied stages at a given time and the exact pathological features will depend on the spectrum of the selected lesion for biopsy (Nadkarni and Rege 1999). Thus, proper selection of lesion/site for biopsy is imperative for improved clinico-pathological concordance. For the same reasons perhaps clinico-pathological concordance was 71% in this study. The non-specific histological features in other 4.5% indicate the need of further improvement in biopsy procedure. The majority, 80.8% patients, was of MB leprosy while 62.2% patients with disabilities had grade-2 disabilities of hands and/or feet in this study. Most of our cases were native to district Kangra and adjoining districts whereas 13.1% patients were migrants from high endemic states of Bihar, Jharkhand and Uttar Pradesh working in various developmental projects in the state. Similar trends have been reported in the past and are still seen in the state and other parts of the country as well (Mahajan et al 2003, Chandumasa et al 2007, Singal and Sonthalia 2013, Rehlan et al 2016, Rathod and Mistry 2017, Tegta et al 2019). It remains distinctly possible that detection of hidden cases too is contributing to this unchanged scenario of annual new case detection (Mahajan et al 2003, Katoch et al 2017). The decreased number of new cases in later years in our center is perhaps due to their management by trained dermatologists in newly established medical colleges in the adjoining districts of Chamba, Mandi and Hamirpur during this period. Overall, our observations reflect dissociation between new cases detected and actual disease existing in the community as well as problem of a delayed diagnosis.

The high proportion of MB cases, as was also noted by us, indicates advanced disease, risk of complications and disabilities, magnitude of infection in the community, and poor access to services. Thus, an early diagnosis of leprosy is of paramount importance to prevent disease progression, disabilities, and community transmission. However, the problem of delayed diagnosis has been the bane of most leprologists (Lockwood and Reid 2001, Mohite and Durgawale 2011, Rodriguez et al 2016, Katoch et al 2017, Tegta et al 2019, Marfatia et al 2020). It is also evident in this study from 59.8% patients aged above 40 years, a long gap of 40 years for diagnosis in a patient, diagnosis being made in a 90 years old, and presence of advanced disabilities. This belies the expectations of recognizing early signs of the disease and self-reporting by the patients during the integration of vertical control program with general health services. Apart from low level of training of healthcare providers for early detection of leprosy, other possible reasons for low self-reporting that need attention of the program managers could be high social stigma and low community awareness for reduced IEC activities, absence of typical skin lesions or neurological symptoms in the early stage (Rao et al 2008). Thus, frequent active leprosy case detection campaigns at national level particularly in high endemic pockets such as national sample survey and *Sparsh* leprosy awareness campaign (NLEP 2016-2017, Katoch et al 2017) perhaps are highly desirable until easy to perform and affordable cutting edge diagnostic tools with short turn-around time become widely available to detect

early asymptomatic cases. These will identify more PB (TT/BT) cases which are usually missed in currently practiced passive reporting by hospitals/institutes.

As such the fixed duration of MDT for multi-bacillary leprosy has been reduced from 24 to 12 months without defining criteria for actual cure (Pattyn et al 1989, Malathi and Thappa 2013). On the other hand, it has been observed that nearly 10% of the patients treated for 2 years continue to have viable persisters or remain clinically active despite being bacteriologically negative or having 0% MI (Jethva et al 2014). Moreover, the risk of relapse is more if initial BI is high or the duration of therapy is short (Malathi and Thappa 2013, Jethva et al 2014). The relapse/recrudescence in 1.3% and high MI in 1.8% patients requiring extended treatment, respectively, after regular MDT-MB for 12 months suggests possibility of under treatment in such patients. This calls for need of continued treatment beyond fixed duration of 6 or 12 months, or until smears are negative for solidly stained bacilli even when BI may remain high. With this background the universal MDT program with 6 months duration in MB cases, though not yet recommended, too needs a cautious enthusiasm (WHO 2018). The past practice of regular follow up and post MDT surveillance for relapse and development and prevention of complications/disabilities also needs a revival as has been advocated by some workers (Lockwood and Suneetha 2005, Scollard 2019). Clofazimine possesses anti-inflammatory properties and reduces/prevents recurrent/severe ENL (Balagon et al 2011). It has been also associated with improved clinical outcomes in PB leprosy when given in combination with MDT PB (WHO 2018). However, with reduced duration of MDT MB from 24 to 12 months this advantage perhaps has been lost and a significant proportion of MB patients develop type-2 lepra reactions as was also observed in our 54.1% cases. This causes a significant morbidity during clinical course and even after release from treatment (RFT) due to frequent recurrences, neuritis and resultant disabilities (Chhabra et al 2015, Relhan et al 2016, Thyvalappil et al 2019). Thus, continuing MDT beyond 12 months will perhaps be useful especially in patients with advanced disease, recurrent lepra reactions, and high BI/MI (when SSS follow up is possible). Delayed diagnosis and high proportion of MB cases with high BI could be another reason for recurrent type-2 lepra reactions in some of our patients.

Conclusion and Comments

The integrating leprosy control program with general health services provided services of large number of medical and paramedical personnel, and a vast set-up for leprosy diagnosis and MDT services. However, continued new case detection, proportion of MB cases and those with disabilities, and childhood cases remain high as noted in this study as well. This indicates the need for active case detection, improving health education/services, periodic orientation/training of healthcare providers, the need of high index of clinical suspicion, and strengthening of referral services. Increased thrust on IEC activities is also needed to encourage early self-reporting by the patients. The health care providers must also maintain high degree of patient counseling and knowledge empowerment about the disease and its complications/sequalae to reduce their suffering. However, training curriculum at undergraduate level to develop the skill to detect, diagnose and treat leprosy (it is optional at present), coordination between the health care providers at field level and the program managers at national/state level, and flexibility of the program itself as per patients' need are highly desirable. Poor understanding of mechanism(s) of

disease transmission, non-availability of vaccine or drug prophylaxis, drugs which are affordable and effective in short courses, lack of staff dedicated to leprosy work at ground level, compelling non-leprosy work load of general health care providers, and the most importantly the complacency of leprosy elimination among governments, society and even medical fraternity perhaps remain important limitations in leprosy elimination (Scollard 2019, Lockwood and Suneetha 2005). We must remain vigilant as leprosy is perhaps too complex a disease to eliminate with treatment alone.

Limitations

Single center, hospital-based, and retrospective study design are important limitations. For the same reasons, a recall bias especially for recollecting duration or exact age of onset is possible especially in patients with long duration of disease. Histology was not performed at the time of RFT.

Disclosures:

The data of patients in this manuscript have been routinely submitted to the office of the Director, State Leprosy Control Program, (H.P.) in the form of monthly/annual reports.

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