CLINICO-BACTERIOLOGICAL STUDY OF NEW LEPROSY CASES- AN EXPERIENCE AT A TERTIARY CARE CENTRE IN EASTERN NEPAL

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ABSTRACT

BACKGROUND

Early detection of new cases is a major part of leprosy control programme. The diagnosis of leprosy is primarily clinical which is usually confirmed by demonstration of acid-fast bacilli (AFB) in slit-skin smear (SSS). There are very few studies on clinico-bacteriological patterns of leprosy from Eastern Nepal at this post-elimination phase.

Aim- This study was performed to know the clinical profile of new leprosy patients attending this tertiary centre and to determine the significance of SSS in confirming clinically diagnosed leprosy.

MATERIALS AND METHODS

This is a descriptive prospective study. All consecutive, new clinically diagnosed leprosy cases at the Department of Dermatology of B.P. Koirala Institute of Health Sciences (BPKIHS) over a period of 12 months were included. Detailed history was taken and systemic examination was done. SSS were obtained from the patients and sent to Microbiology Department. Presence of AFB and BI was calculated using Ridley's logarithmic scale.

RESULTS

Borderline tuberculoid cases (BT) were the commonest types of leprosy 24 (48%). There were total 3 (6%) patients of paediatric age group. All the patients presented either with single type or mixed type of skin lesion. Nerve involvement was observed in 44 (88%) patients with ulnar nerve 33 (66%) being the commonest nerve. Grade 1 and grade 2 disability was found in 10 (20%) and 6 (12%) patients respectively. Skin smears were positive for AFB in 9 [18%; 95% CI, (9.54-31.02)] cases. Area under ROC curve of SSS is 0.906.

CONCLUSION

Cases of BT leprosy are predominant. Presence of leprosy in paediatric age group indicates continued transmission. Notable disabilities were observed in our study. Although the slit-skin smear has low sensitivity, AUC of SSS was 0.906 indicating it being a good diagnostic tool. Being a simple and rapid method with high specificity, SSS can be used to confirm the diagnosis in clinically suspected patients of leprosy.

KEYWORDS

Leprosy, Clinical Examination, Slit-skin smear.

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BACKGROUND

Leprosy is a chronic granulomatous disease caused by *Mycobacterium leprae*, an acid fast, rod shaped bacilli which eventually leads to disabilities if untreated. Although Nepal has achieved the leprosy elimination goal on 2010 at the national level, but sustaining the achievement and further reducing disease burden at the district level are still the major challenges. Early detection of new cases is a major part of leprosy control programme.¹

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The diagnosis of leprosy is primarily clinical which is usually confirmed by demonstration of acid-fast bacilli (AFB) in slit-skin smear (SSS) by Ziehl-Neelsen (ZN) staining.² The Ridley-Jopling (RJ) classification provides the optimal classification of leprosy disease spectrum which ranges from a form with a robust immune response and very few organisms (tuberculoid or paucibacillary) to a form with a weaker immune response and high burden of organisms (lepromatous or multibacillary).³ Likewise, the WHO classification system is based upon the number of skin lesions present, paucibacillary (PB) if five or fewer skin lesions without detectable bacilli on skin smears and multibacillary (MB) if six or more lesions and may be skin smear positive.⁴

SSS is a simple, rapid and cost effective conventional diagnostic tool for leprosy. In untreated patients, it helps in diagnosis of leprosy excluding clinical mimickers and for classification of leprosy within the RJ type and WHO type. Regardless of its low sensitivity, SSS remains gold standard for all diagnostic techniques due to its specificity of nearly 100%.⁵ The density of organisms in the smears is expressed

as bacterial index (BI) which reflects the bacterial load of the patient.⁶ With regard to the drawbacks of SSS, WHO had recommended all smear-positive leprosy cases be treated as MB patients,⁴ which was later changed to a purely clinical classification with patients having >5 skin lesions considered as MB and <5 as PB.⁷ But, classifying leprosy only on basis of skin lesions may lead to over or under diagnosis with significant number of MB cases being treated with PB regimen.⁸ SSS still retains practical importance to sustain quality leprosy control services in this maintenance phase of leprosy elimination in Nepal. Therefore, this minimal invasive technique is preferred in different health centres of this region. This study was performed to know the clinical profile of new leprosy patients attending this tertiary centre and to determine the significance of SSS in confirming clinically diagnosed leprosy.

MATERIALS AND METHODS

Study Design

This is a descriptive prospective study.

Study Area and Population

All consecutive new clinically diagnosed leprosy cases at the Department of Dermatology of B. P Koirala Institute of Health Sciences (BPKIHS) over a period of 12 months from May 2012- April 2013 were included. Ethical clearance was obtained from institutional review board of BPKIHS, Dharan, Nepal. Patient who did not give consent and those patients who had received treatment for leprosy were excluded from the study. Detailed history was taken and systemic examination was done. Patients were clinically classified into tuberculoid (TT), borderline tuberculoid (BT), borderline (BB), borderline lepromatous (BL), and lepromatous (LL).³ Likewise, patients were also classified based on skin lesions into paucibacillary (PB) and multibacillary (MB).⁴

Sampling Procedure and Processing

SSS from six sites (two from earlobes, two from forehead just above the medial aspect of eyebrows, one from lesion and one from apparent normal skin) were obtained from each patient and sent to Microbiology Department. All the smears were stained by modified ZN staining⁹ and seen by a microbiologist. Presence of AFB and BI was calculated using Ridley's logarithmic scale¹⁰ by using at least 100 oil immersion field of smears. The BI from each patient was reported as an average BI value determined from SSS performed on six sites. The data were recorded in a predesigned proforma.

Statistical Analysis

SPSS Version 16.0. (Chicago, SPSS Inc.) was used for statistical analysis. Data were statistically described in terms of range, mean $\pm$ standard deviation (SD), frequency (number of cases), relative frequency (percentages), and confidence interval when appropriate. In addition, the ROC curve was analysed for SSS by ROC Analysis (www.jrocf.org).¹¹

RESULTS

We studied 50 untreated cases of clinically proved leprosy.

Demographic Features

Patient's age ranged between 10-75 years with 42.12 ± 17.11 years being mean age of presentation. There were total 3 (6%) patients of paediatric age group and none of them had family history of leprosy. There were 27 (54%) male and 23 (46%) female patients. History of contact with a leprosy patient was found in 11 (22%) of patients.

Clinical Features

All the patients presented either with single type or mixed type of skin lesion. Skin lesions were erythematous in 33 (66%), hypoaesthetic in 24 (48%), hypopigmented in 18 (36%) and anaesthetic in 7 (14%). Plaque 39 (78%), macule 17 (34%) and nodule 7 (14%) were the common types of skin lesions. Nerve involvement was observed in 44 (88%) patients. Multiple nerve involvement was present in 5 (10%) patients. There were 11 (22%) patients with involvement of eye. Photophobia and lacrimation were the most common eye symptoms with 6 (12%) each. As the disease progresses from tuberculoid end of spectrum to lepromatous end, patients develop deformities. Disability was found in 16 (32%) patients and was further graded according to WHO protocol with grade 1, ten (20%) and grade 2, six (12%) patients. Characteristic features of advanced disease were also noted in some patients; loss of hair and sweating 6 (12%), nasal stuffiness and epistaxis 4 (8%) and orchitis 2 (4%). (Table 1). Clinically, cases were classified according to RJ classification: TT 1 (2%), BT 24 (48%), BB1 (2%), BL14 (28%), LL 9 (18%) type. (Table 2). There was 1 (2%) case of pure neuritic (PN) variety. All the 3 paediatric cases (100%) were of BT variant of leprosy. Cases were also categorised according to WHO classification with 41 (82%) MB type and 9 (18%) PB.

SSS

Skin smears were positive for AFB in 9 [18%; 95%CI, (9.54-31.02)] cases; BI ranged from 1+ to 6+. (Fig. 1) Amongst them, 6 (67%) of LL and 2 (14%) of BL patients were positive for AFB. There was only 1 case of BB in this study which also was AFB positive. All cases of TT and BT showed no AFB in skin smears. The BI in different types of leprosy in relation to RJ classification is shown in Table 2. Receiver Operating Characteristic (ROC) curve analysis was performed for SSS with RJ classification. Area under ROC curve of SSS is 0.906. (Fig. 2). The SSS were positive in 9 (22%) of the 41 WHO-MB cases whereas, none of the 9 WHO-PB cases were AFB positive. Correlation of report of SSS and WHO classification in diagnosing MB cases is shown in Table 3.

Symptoms		Number	%
Skin lesion		50	100
	Anaesthesia/ Hypoesthesia	31	62
Peripheral Nerve Involvement		44	88
	Ulnar nerve	33	66
	Lateral Popliteal	29	58
	Radial Cutaneous	21	42
	Posterior Tibial	16	32
	Radial nerve	4	8
Eye involvement		11	22
Deformity		16	35

Table 1. Clinical Features (n=50)

Clinical Types of Leprosy	TT	BT	BB	BL	LL
Number of patients	1 (2%)	24 (48%)	1 (2%)	14 (28%)	9 (18%)
Bacterial Index	Highest BI in AFB Positive				
BI-0	1	24	0	12	3
BI-1+			1		
BI-2+					
BI-3+				2	1
BI-4+					2
BI-5+					
BI-6+					3

Table 2. Performance of SSS for BI with RJ Clinical Types

Figure 1. AFB in SSS

Figure 2. ROC Curve of SSS with RJ Classification
Smooth Line above and below Dotted ROC Curve:
95% Confidence Interval of the ROC Curve.

SSS	WHO Classification		Total
	Positive	Negative	
Positive	9 (18%)	0 (0%)	9 (18%)
Negative	32 (64%)	9 (18%)	41 (82%)
Total	41	9	50 (100%)

Table 3. Diagnosis of MB Leprosy through SSS and WHO Classification; n = 50

DISCUSSION

The present national strategy of leprosy control is to sustain quality leprosy services by early detection of new cases and timely completion of treatment. Clinical signs and bacilloscopy (AFB) of skin smears are the conventional tools for the detection of leprosy patients. Therefore, the present study was carried on 50 untreated patients to see the clinical profile of new leprosy cases attending this tertiary centre and determine the significance of SSS microscopy in establishing the diagnosis of leprosy.

In the present study, mean age of presentation was 44 which is similar to studies by other authors.^{12,13} This older age of presentation may be explained by the long incubation period of the disease. History of contact with the leprosy patient was noted in 11 (22%), a comparable finding to 20% as reported by R Dayal.¹⁴ There were total 3 (6%) patients of paediatric age group with none of them having family history of leprosy. This shows that there is still continuous transmission of disease, and likelihoods of acquiring the infection in children outside the family is persistently high.¹⁵

Only skin lesions were seen in 12% of the patients, while 88% of the patients had both skin lesions and nerve thickening which is similar to the findings of a study conducted by Dayal et al.¹⁴ Most common skin lesions in present study was plaque followed by macule. These type of skin manifestations correlates with the study performed by Manandhar et al.¹⁶ Ulnar nerve (55%) was the most common clinically thickened peripheral nerves in leprosy in present study, a comparable result to that seen in a study from India with involvement of same nerve being commonest (55%).¹⁷ The most predominant clinical subtype was BT (48%) which shows that cases are being reported at initial stage of disease for diagnosis and treatment. Another study from Nepal¹⁶ reported similar trend of early cases (TT) being reported which is an optimistic sign in this maintenance phase of leprosy elimination. All the paediatric leprosy cases of BT variant in our study is comparable to the findings of other childhood leprosy study.¹⁸ As leprosy is a disabling disease, 32% cases from our study also presented with disabilities with 20% grade 1 and 12% grade 2 deformity. This burden of leprosy disabilities reported from this hospital might be due to our setup being a tertiary centre, all the cases with problem from this eastern region are expected to be referred here. The proportion of grade 2 deformity of our study is lower than another prospective clinico-bacteriological study on newly diagnosed leprosy from India who have reported visible grade 2 deformities in 22% patients.¹⁷

SSS has the advantage of being easily performed, cost effective and almost 100% specific as it directly demonstrates the bacilli in the smear. But this laboratory test suffers from low sensitivity varying from 10-50%.³ The results of this study revealed that SSS was positive in 18% patients with clinically diagnosed leprosy with 67% of LL and 14% of BL patients. Several studies have reported similar SSS

sensitivities. In a study by Kamal et al,¹⁹ 20% cases were skin smear positive with 44% positivity in BL/LL variety. Similar rate of positivity of SSS was observed by Dayal et al¹⁴ with only 10% positivity out of total cases and that of BL variety. The sensitivity of SSS is affected by the reliability of the technique of taking smear, staining, and interpreting the slide which can be improved by regular quality control and regular training and supervision of laboratory staff. Literatures also have mentioned low sensitivity of SSS when compared to specificity.^{5,20} As our study showed the AUC of SSS to be 0.906, this indicates this method to be a good diagnostic tool.²¹

SSS detects the most infectious patients (MB type), 22% in this study, which with timely initiation of treatment will prevent from consequent complications and horizontal transmission. Sensitivity of SSS reported was quite high in the study conducted at Kolkata in which 59.8% of MB type and 1.8% of PB type was positive.²² All negative results in PB cases as observed in our study were comparable to above study which can be explained by the scarcity of AFB in skin tissues in this spectrum.

CONCLUSION

Cases of BT leprosy are predominant. Presence of leprosy in paediatric age group indicates continued transmission. Notable disabilities 16 (32%) were observed in our study. Although the slit-skin smear has low sensitivity, AUC of SSS was 0.906 indicating it being a good diagnostic tool. Being a simple and rapid method with high specificity, SSS can be used to confirm the diagnosis in clinically suspected patients of leprosy.

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