Assessment of Non-Dermatologists' Knowledge Regarding Clinical Diagnosis of Leprosy and Practice in Slit-Skin Smear as a Basic Investigation

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ABSTRACT

Background: Leprosy is diagnosed based on cardinal signs. According to this, patients with one or more of the following characteristic symptoms are suspected of leprosy: hypo-pigmented or reddened skin lesion(s) with loss of sensation and/or involvement of the peripheral nerves and positive slit-skin smear for acid-fast bacilli. Physicians who are not engaged in leprosy work and no experience may fail to diagnosis it.

Objective: To evaluate the diagnostic ability for leprosy, by identification of basic investigation and related factors to correct diagnosis, in general practitioners and non-dermatological specialists who attended annual short-course training in dermatology.

Methods: During the year 2011-2012, 122 participants who attended in short-course training in dermatology for general practitioners, which was annually conducted by the Dermatological Society of Thailand, were evaluated by pre-test answer sheets which were retrospectively reviewed. These tests were composed of viewing a clinical picture of leprosy with a brief patient's history. Participants were asked to answer three questions for a diagnosis, physical examinations and further investigations respectively.

Results: One hundred and seven physicians voluntarily turned in their answer sheets. Most physicians were female (75.7%). About half of the participants were aged between 26 to 30 years. Eighty-three of them (77.6%) were general practitioners and the rest (22.4%) were non-dermatological specialists. Most of them were able to make a diagnosis of leprosy (60.7%), but only 15 (23.1%) participants could describe physical examinations completely. Only 20 (30.8%) participants documented a slit-skin smear for an appropriate investigation.

Conclusion: Most general practitioners and non-dermatological specialists are able to diagnose leprosy. However most of them could not perform physical examinations completely and also had lack of knowledge for a slit-skin smear which is a basic diagnostic tool for making a diagnosis of leprosy.

Keywords: Non-dermatologists, leprosy diagnosis, slit-skin smear

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INTRODUCTION

Leprosy or Hansen disease is a chronic, slow progressive infectious disease caused by *Mycobacterium leprae (M.leprae)*. It spreads by the droplet transmission. Skin and peripheral nerves are primarily affected.[1] In spite of high infectivity, it shows low pathogenicity and low virulence.[2] More recently, case-detection numbers and rates have declined in almost all countries, reflecting both improvements in socioeconomic conditions and the efficacy of leprosy control programs. The prevalence rate in South-East Asia was 0.68 per 10,000 popula-

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tions with new cases detection rate at 9.39 per 100,000 population.[3] In Thailand, the number of new cases detected annually has continued to fall to 638 cases in 2005 (case detection rate 1.03 per 100,000 populations) due to leprosy elimination campaigns.[4] Although it is not very common, it may progress to a variety of deformities and disfigurements associated with social stigma and many economic problems.[5] Therefore, early accurate diagnosis and treatment is the most effective strategy for the control of leprosy.[2]

Diagnosis of leprosy is based on cardinal signs consisting of definite loss of sensation of the skin lesion, thickened or enlarged peripheral nerve with impaired sensation or weakness of muscles supplied by that nerve and the finding of acid-fast bacilli in skin smears[3] by slit- skin smear technique: smears of scrapings from skin lesions stained for AFB, which is the standard technique used to estimate the number of *M.leprae* in the patient's lesions (Bacterial Index, BI) and the proportion of viable bacteria (Morphological Index, MI, solid ratio). The advantage of slit- skin smear is for diagnosis (new case and relapse), classification, monitoring for response to treatment and applying control measures.[6]

The specificity of slit-skin smear is almost 100% but its sensitivity is low and varies from type of leprosy patients, high sensitivity in multibacillary (MB) and low sensitivity in paucibacillary (PB). In new cases, acid- fast bacilli are absent in typical tuberculoid (TT) lesion and ether absent or scanty in borderline-tuberculoid (BT) lesions. Borderline – borderline (BB), Borderline-lepromatous (BL) and lepromatous (LL) smears show many bacilli, (BI 3+ - 6+). Since the yield of AFB in tissue section is reported to be better, histological examination from skin biopsy may provide many advantages.[7] Nevertheless, the availability of laboratory facilities for skin biopsy and pathologists are restricted in many endemic areas. Therefore, slit-skin smear remains the conventional method for leprosy detection due to its practicality and reproducibility by general practitioners and non-pathologists.

The aims of this study were to evaluate the diagnostic ability for leprosy, by identification of basic investigation, and find related factors to correct diagnosis in general practitioners and non-dermatological specialists who attended annual short-course training in Dermatology for general practitioners.

MATERIALS AND METHODS

This study was approved by the Siriraj Hospital Institutional Review Board (SIRB). We retrospectively collected the pre-test answer sheets from participants attending the short-course training in dermatology for the general practitioners, which was held annually, conducted by the Dermatological Society of Thailand during 2011-2012, with approval from the Committee Chairman. The following data were collected: demographic data (age, sex, and background specialty), workplace, numbers of patients with skin diseases who visit per week and confidence level of the way to approach the skin diseases in general practice. The answer sheets were anonymous and the participants were asked to return their answer sheets before starting the lectures.

The tests were composed of viewing a clinical picture of a lepromatous leprosy patient as shown in Fig 1 with a brief patient's history as follows: a Thai 50-year-old, male with skin lesions as shown in the picture which gradually extended for 6 years and he also had numbness at his skin lesions. Then three open-ended questions; asking for the diagnosis, physical examinations and further investigations, respectively, were given to the participants.

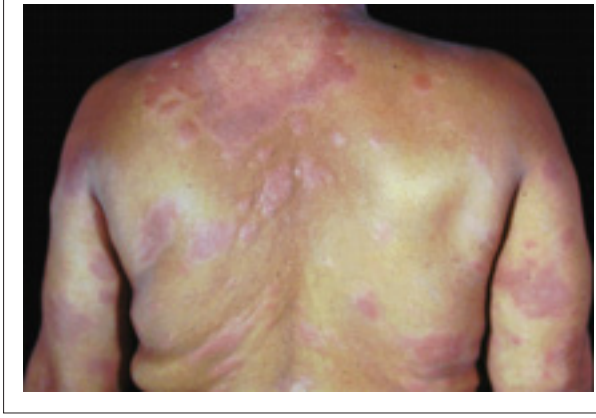

Fig 1. Clinical picture of lepromatous leprosy patient shown in the test.

Descriptive statistics were used to demonstrate the demographic data. Pearson Chi-square test was used to analyze the association between two categorical variables. Multiple logistic regressions were performed to test the association between correctness in diagnosis and physicians' factors simultaneously. All statistical analyses were performed using PASW statistics 18.0 (IBM Corporation, New York, NY, USA). $P < 0.05$ was considered statistically significant.

RESULTS

From 122 doctors who registered for short-course training in dermatology during the year 2011 to 2012, 107 physicians (87.7%) voluntarily returned their answer sheets. Eighty one participants (75.7%) were female and 26 participants (24.3%) were male. Fifty percent of the participants were in the age range of 26-30 years. Eighty-three of them (77.6%) were general practitioners and 24 (22.4%) were non-dermatological specialists. The numbers of patients with skin diseases who visit per week were classified into five groups from 0-5 patients to more than 30 patients per week. The percentage of participants with the confidence level of the way to approach skin diseases in general practice was as follows: very low (24.3%), low (40.2%), moderate to high (35.5%). The workplace was divided into 3 categories; government (69.2%), private hospital (20.6%) and private clinic (10.3%).

Most participants answered the first question about the diagnosis as leprosy (60.7%), fungal infection (12.1%), psoriasis (9.3%), other skin diseases (13.1%) and no answer (4.7%) respectively. From 65 participants who answered leprosy, 15 (23.1%) participants could answer the second question about physical examinations completely and 20 (30.8%) participants answered the third question about further investigations as slit-skin smear (Table 1).

From all participants, those who had more numbers of patients with skin diseases who visit per week had more confidence level of practice in dermatology with statistical significance ($p<0.0001$). Also a statistically significant relationship was found between the workplace and numbers of patients with skin diseases who visit per week ($p=0.048$). On the other hand, work place also associated with correctness in diagnosis of leprosy ($p=0.034$) (Table 2). However, there was no significant difference between sex and age group with correctness of diagnosis.

The factors related to correct diagnosis of leprosy, which had p-value < 0.2, were chosen to analyze by multiple logistic regression (Table 2). Physicians who had moderate to much confidence level in dermatology practice could answer the right diagnosis more than those with very low confidence level with adjusted odds ratio of 2.24 (95%CI OR 0.76-6.59, $p=0.142$), but less than the low confidence group with adjusted odds ratio of 2.92 with no statistical significance. Nonetheless, compared to very low confidence group, the doctors who had low confidence level were associated with more right diagnosis of leprosy with adjusted odds ratio of 2.92 (95%CI OR 1.00-8.48, $p=0.049$) (Table 3).

DISCUSSION

Leprosy is a chronic infectious disease. Nowadays, it is not very common due to many leprosy control programs in different countries. The diagnosis is based on cardinal signs: 3 clinical aspects of leprosy, two from physical examinations and one from finding of AFB in slit-skin smear, which has also been used for classification of the disease.

TABLE 1. Slit-skin smear and physical examination in right diagnosed leprosy group.

	Slit-skin smear		Total
Physical examinations	Yes	No	
Complete	7 (10.8%)	8 (12.3%)	15
Incomplete	13 (20.0%)	37 (74.0%)	50
Total	20	45	65

TABLE 2. Physicians' factors related to correctness in diagnosis of leprosy.

Variables	Diagnosis of leprosy			
	Incorrect (%)	Correct (%)	p-value	Crude OR (95%CI)
Sex				
Male	12 (46.2%)	14 (53.8%)	0.408	1
Female	30 (37.0%)	51 (63.0%)		1.46 (0.60-3.56)
Age (years)				
20-25	4 (28.6%)	10 (71.4%)	0.669	1.54 (0.36-6.60)
26-30	24 (44.4%)	30 (55.6%)		0.77 (0.27-2.16)
31-35	6 (33.3%)	12 (66.7%)		1.23 (0.33-4.60)
> 35	8 (38.1%)	13 (61.9%)		1
Numbers of patients /wk				
0-5	8 (36.4%)	14 (63.6%)	0.303	1
6-10	10 (28.6%)	26 (71.4%)		1.43 (0.46-4.45)
11-20	6 (37.5%)	10 (62.5%)		0.95 (0.25-3.62)
21-30	6 (46.2%)	7 (53.8%)		0.67 (0.17-2.69)
> 30	12 (57.1%)	9 (42.9%)		0.43 (0.13-1.46)
Confidence				
Very low	14 (53.8%)	12 (46.2%)	0.150	1
Low	13 (30.2%)	30 (69.8%)		2.69 (0.98-7.39)
Moderate to much	15 (39.5%)	23 (60.5%)		1.79 (0.65-4.91)
Workplace				
Government	23 (31.1%)	51 (68.9%)	0.034	2.66 (0.74-9.62)
Private hospital	13 (59.1%)	9 (40.9%)		0.83 (0.19-3.58)
Private clinic	6 (54.5%)	5 (45.5%)		1
Specialty background				
General practitioners	35 (42.7%)	47 (57.3%)	0.118	1
Non-dermatologist specialists	6 (54.5%)	18 (75.0%)		2.30 (0.83-6.38)

TABLE 3. Multiple logistic regression analysis of the physicians' factors related to correctness in the diagnosis of leprosy.

	Adjusted OR	95% CI of OR	p-value
Work places			
Government	2.71	0.72-10.23	0.143
Private hospital	0.75	0.16-3.43	0.706
Private clinic	1		
Specialty background			
General practitioners	1		
Non-dermatologist specialists	2.47	0.84-7.33	0.102
Confidence			
Very low	1		
Low	2.92	1.00-8.48	0.049
Moderate to much	2.24	0.76-6.59	0.142

Many previous studies have assessed the knowledge, attitude and practice towards leprosy among physicians and other healthcare workers in different populations by questionnaires or interviews.[1,5,8-11] The results of them showed concordantly that there was inconsistency and deficiencies in physicians' knowledge and some prejudices and misconceptions still existed in general healthcare workers. Therefore, the conclusion of those studies emphasized continuous training and education about leprosy among doctors and other healthcare workers.

However, this is the first study that used a clinical picture to evaluate physicians' knowledge on diagnosis, physical examinations and investigations. We could not find any other previous study in assessment of the knowledge and practice of physicians about leprosy in Thailand.

From results of this study, the physicians who had more numbers of patients with skin diseases who visit per week, had more confidence level of practice in dermatology. The more numbers of patients who they meet, the more experience they gain. Also, the low confidence group could make the right diagnosis more than the very low confidence group with statistical significance (Table 3), but the moderate to much confidence group significantly could not make the right diagnosis more than the other groups s. This may imply that confidence alone was not enough to diagnose leprosy but awareness was also needed. The physicians who worked in government hospitals provided correct diagnosis of leprosy more than those worked in private hospitals or clinics (Table 2). This may be due to the former had more experience from more numbers of patients they had taken care of as mentioned above.

Complete physical examinations of leprosy patients according to cardinal signs consisted of examination of skin lesions (type of lesion, sensation, loss of hair and sweating), peripheral nerves (enlargement, tenderness, sensory and motor distribution of the nerve) such as ulnar nerves at the elbows, median nerves at the wrists, great auricular nerves in the neck and common peroneal nerve at the popliteal fossa and other associated features (nasal sepal perforation, collapsed nose and hoarseness) or deformities.[12]

From the study of Chen S M et al in 2004, which aimed to assess knowledge and attitude of dermatologists in Shangdong province, China by questionnaires, 19.6% of 51 dermatologists knew how to palpate the ulnar nerve, but no one (0%) knew how to provide examination of sensory and motor nerve function.[5]

After suspecting a case of leprosy, a further investigation for diagnosis needed is slit-skin smears which may be taken from lesions. Multibacillary (MB) patients were performed slit-skin smears at 4 sites (both ears and two most active lesions), paucibacillary (PB) patients were performed slit-skin smears at 3 sites (both ears and the most active lesion). A fold of skin is firmly squeezed between two fingers of an examiner to avoid bleeding, and a small incision is made with a scalpel blade No.15. The smears are 5-7 mm. diameter, and fixed by flame (Bunsen burner or spirit lamp) and allowed to dry. Each smear is usually stained by the Fite-Faraco or Ziehl-Neelsen method and examined for red rods on a blue background (Fig 2) in 100 oil immersion fields (PB) and 25 oil immersion fields (MB).[13] (Fig 3). Due to its higher sensitivity, a skin biopsy can help greatly in the diagnosis of difficult non-specific cases. Nevertheless taking biopsies is rarely feasible under routine program conditions.[14]

In a recent study, there were only 7 (10.8%) physicians who provided the right diagnosis, complete physical examinations and chose slit-skin smear as further investigation for diagnosis (Table 1). This ignorance of practice may cause the physicians to delay diagnosis and treatment leading to permanent deformities which are strongly associated with greater level of stigma.[15]

Because general practitioners were usually the first one to screen most of the patients with either major or minor illnesses, they should be able to recognize and diagnose leprosy since in its early stage. Slit-skin smear is a basic and practical investigation for general practitioners which could help to confirm the diagnosis of leprosy due to its high specificity. This is important to encourage both general practitioners and non-dermatological specialists themselves to attend regular dermatological training courses provide by associated organizations to update their knowledge in the

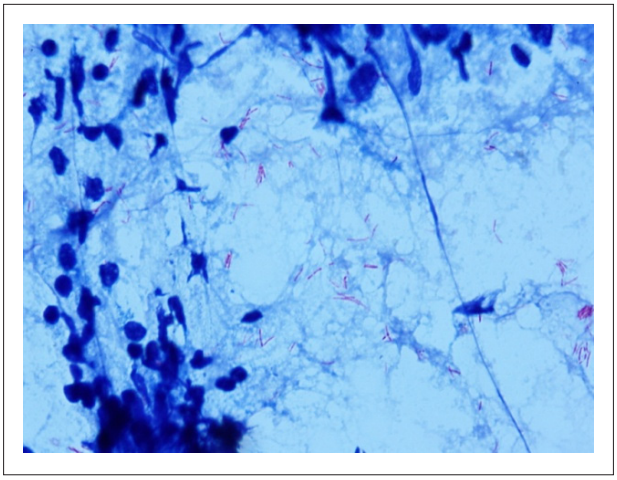

Fig 2. The red rods of lepromatous leprosy with bacterial index (BI) = 5+ from light microscope with oil immersion.

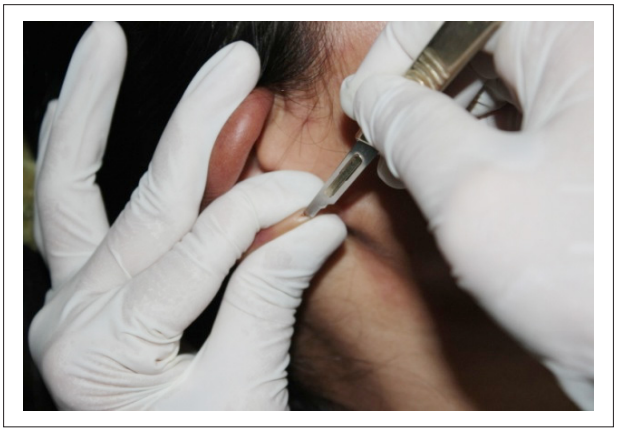

Fig 3. Slit-skin smear was done at the earlobe of the patient.

guideline for management of leprosy for general healthcare workers especially in the endemic areas of our country.

CONCLUSION

Most general practitioners and non-dermatological specialists can make a diagnosis of leprosy by a clinical picture. However most of them could not perform complete physical examination and lacked knowledge about slit-skin smear, a basic diagnostic tool for leprosy.

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