

Original Article

AFFECTION OF IMMUNE ZONES IN LEPROSY: A CLINICO-EPIDEMIOLOGICAL STUDY

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The study was undertaken to evaluate the prevalence of involvement of immune zones in leprosy and to assess the clinico-epidemiological characteristics of the disease in patients presenting with immune zone involvement. 200 leprosy cases were included in this study and detailed history, clinical examination, slit-skin smears and skin biopsies were carried out on all patients. Those cases presenting with immune zone involvement were further evaluated for clinical and epidemiological characteristics of disease process. Immune zone involvement was detected in 7% of cases with male preponderance in the study. Majority of patients (85.5%) had borderline tuberculoid leprosy and midline of back was the commonest site of involvement (50% of cases). Morphologically, macular lesions were the commonest presentation (85.68%) of immune zone involvement. The study heightens the clinical awareness of the possibility of occurrence of leprosy lesions on uncommon and unusual sites, which should be termed as relatively immune, rather than absolutely immune zones of leprosy.

INTRODUCTION

Skin lesions of leprosy, whether tuberculoid or lepromatous, can appear on any part of the skin surface. However, some areas of skin, the so-called immune zones are relatively immune to the development of the lesions. These are scalp, axillae, groin, genitalia, palms and soles, eyelids, transverse band of the skin over lumbosacral area, midline of back and perineum (Cochrane & Davey, 1964; Jopling & McDougall, 1996; Aggarwal *et al*, 1987).

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The reason for sparing these zones is the relatively high local temperature as *Mycobacterium leprae* has a distinct predilection for cooler areas of the body (Anish, 1971; Tutakne *et al*, 1983). However, the concept of the immune zones has been questioned in view of occasional involvement of these so-called immune zones. Involvement of immune zone areas is likely to be missed, unless a thorough clinical examination is carried out with resultant implications on transmission and elimination of the disease process. Even though there are rare and isolated case reports of immune zone involvement in leprosy, there is a paucity of clinical studies on the subject in the available literature.

The aim of the study was to (1) evaluate the prevalence of the immune zone involvement in leprosy, and (2) assess the clinico-epidemiological characteristics of the disease in patients presenting with immune zone involvement.

MATERIAL AND METHODS

200 leprosy cases (new, untreated or under treatment) attending the Department of Dermatology, STD and Leprosy of the R L Jalappa Hospital and Research Centre, Tamaka, and the SNR District Hospital, Kolar, during the period of March 2002 to April 2004 were selected for the study. Detailed history, clinical examination, slit-skin smears and skin biopsies were carried out on all patients as part of routine examination. Cases presenting with immune zone involvement were further evaluated for clinical and epidemiological characteristics of the disease process, and the findings were recorded. The following criteria were adopted: **inclusion criterion:** all diagnosed cases of leprosy presenting with involvement of immune zones; **exclusion criterion:** clinical involvement of immune zones by a disease process other than leprosy was excluded.

RESULTS

200 patients (129 males and 71 females) were included in this study. The maximum number of cases (105) were of borderline tuberculoid (BT) type. Involvement of immune zones was detected in 14 (7%) patients (Table 1). Of the 14 cases, 12 were males and 2 females.

Table 1. Incidence of immune zone involvement

Type of disease	No. of patients	Immune zone involvement	Percentage
TT	35	Nil	Nil
BT	105	12	11.42
BL	27	Nil	Nil
LL	14	1	7.14
Others	19	1	5.26
Total	200	14	7

The youngest patient was 7 years of age and the oldest 78 years. The peak incidence of immune zone involvement was in the age-groups of 21-30 and 41-50 years. The majority of the patients (12) with immune zone involvement had BT type of leprosy. One case each of lepromatous and histoid leprosy was seen. Midline of back was the commonest site of involvement detected in 8 (50%) of cases, followed by genitalia in 3 (18.75%) patients. Involvement of scalp, palms, axillae, eyelids and lumbosacral area was observed in one (6.25%) patient each in the study (Table 2).

Table 2. Sites of immune zone involvement

Sites	Type of leprosy					Total	Percentage
	TT	BT	BL	LL	Others (Histoid)		
Midline of back	—	8	—	—	—	8	50.00
Genitalia	—	1	—	1	1	3	18.75
Scalp	—	—	—	1	—	1	6.25
Palms	—	1	—	—	—	1	6.25
Axilla	—	1	—	—	—	1	6.25
Lumbosacral area	—	1	—	—	—	1	6.25
Eyelids	—	1	—	—	—	1	6.25
Total	—	13	—	2	1	16	100

Morphology of lesions was macular/patch in 12 (85.68%) patients and plaque in one patient of lepromatous leprosy. Nodular lesion on scrotum was observed in one patient of histoid leprosy (Table 3). Out of 14 (7%) cases with immune zone involvement, only one case of borderline tuberculoid leprosy presenting with scrotal involvement was in Type 1 reaction. 10 patients out of total 14 cases of immune zone involvement were bacteriologically positive in the routine sites as well as in immune area sites.

Table 3. Morphology of immune zone involvement

Morphology	Type of leprosy					Total	Percentage
	TT	BT	BL	LL	Others (Histoid)		
Macule	—	1	—	—	—	1	7.14
Patch	—	11	—	—	—	11	78.57
Plaque	—	—	—	1	—	1	7.14
Papule	—	—	—	—	—	—	—
Nodule	—	—	—	—	1	1	7.14
Total	—	12	—	1	1	14	100

Histopathological findings correlated with clinical diagnosis in all the biopsy specimens.

DISCUSSION

The site of lesion in leprosy has been a matter of discussion amongst leprologists. It is accepted that leprosy lesions have affinity for hands, feet, extensor surface of the body which are relatively cooler parts of the body (Tutakne *et al*, 1983). Immune zone involvement was detected in 7% of cases in the present study; however, Sahni *et al* (1982) observed affection of immune zones in 40% of cases in their study. Immune zone involvement in leprosy was found to be more common between 41 and 50 years of age, followed by the age-group of 21-30 years. Thus, the majority of the patients were over 21 years of age, which is consistent with the findings of Arora *et al* (1989). However, majority of the patients belonged to the age-group of 11-30 years in a study by Indira *et al* (1999).

Males outnumbered females in this study. Male preponderance observed in our study is consistent with male-to-female ratio of 2: 1 in leprosy patients based on population surveys in India (Naik *et al*, 1995). The sex difference is attributed to ascertainment bias, environmental or biological factors (Noordeen, 1994). There may not be any special occupational or clothing factors operating in the subjects evaluated in the present study. Female preponderance was observed in a study by Indira *et al* (1999). The 12 patients with immune zone involvement had borderline tuberculoid type of leprosy, out of whom 4 had less than 5 lesions BT (PB) and 8 patients had more than 5 lesions BT (MB), whereas immune zone involvement was reported predominantly in mid-borderline and borderline lepromatous leprosy cases in previous studies (Arora *et al*, 1989; Indira *et al*, 1999).

This disparity could be explained as majority of cases screened for involvement of immune zones belonged to borderline tuberculoid type of leprosy in the present study. Immune zone involvement was observed in 25.8% cases of lepromatous leprosy type in a study by Kumar *et al* (2001), whereas only one case with immune zone involvement had lepromatous leprosy in our study. Scrotal involvement was seen in one case of histoid leprosy in our study, which is similar to the earlier case report of genital involvement in histoid leprosy (Nigam & Singh, 1990).

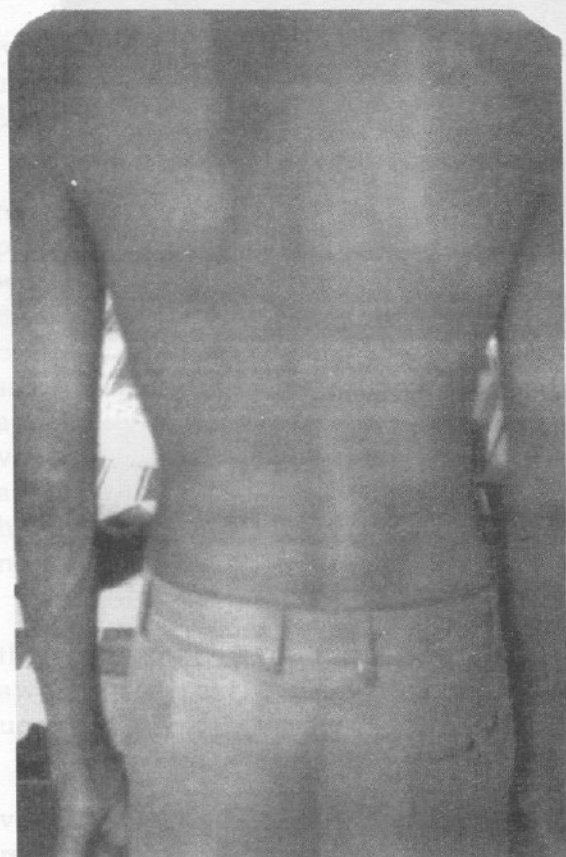
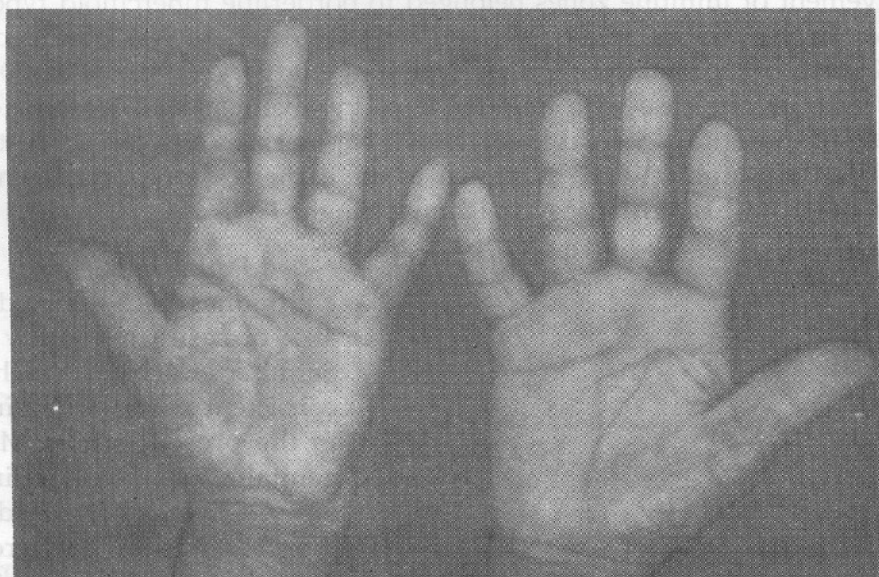


Fig 1. Involvement of midline back

Midline of back was the commonest site affected in 40% of cases in a study by Sahni *et al* (1982), which is consistent with the findings in the present study. Male genitalia was involved in 3 out of 129 males screened in the present study whereas Kumar *et al* (2001) detected genital involvement in 31 out of 467 male patients. Involvement of other immune zones, such as palms and soles, hairy scalp, axillae, eyelids and lumbosacral area, was in 1% each in the present study.

Lesions over the palms and soles have been reported by several workers in all types of the disease (Aggarwal *et al*, 1987; Mukerjee *et al*, 1958; Rajendran 1987; Sharma 1994; Chattopadhyay *et al*, 1989;

Grover *et al*, 1997; Baslas *et al*, 1992). Indira *et al* (1999) reported palmo-plantar lesions in 28 cases. Scalp involvement in leprosy has been documented in several case reports (Parikh *et al*, 1985; Shaw *et al*, 2001; Chattopadhyay & Gupta 1988). Involvement of bald scalp is more common than hairy scalp, probably due to higher temperature of hairy scalp as demonstrated by Anish

Fig 2. Palmar involvement**Fig 3. Scrotal involvement**

(1971). Fleury *et al* (1973) showed 13% of cases with clinical involvement of scalp before shaving and 83% after shaving. Involvement of axillae and groin was observed in 15% of leprosy patients in a study by Sahni *et al* (1982).

Involvement of multiple immune zones in a single case of lepromatous leprosy patient was documented by Jaikumar *et al* (1992).

Morphologically macular lesions were commonest, detected in 12 (85.68%) patients in our study. Similar observations were made by Sahni *et al* (1982), where macular lesions were seen in majority (87.5%) of cases. Nodular lesions on the scrotum in histoid leprosy, observed in a 8-year child in our study, have been documented (Nigam & Singh 1990).

Only one case of borderline tuberculoid with scrotal involvement had type 1 reaction in the present study. However, genital and palmo-plantar involvement has been found more frequently in patients with type 1 reaction (Arora *et al*, 1999, Indira *et al*, 1999).

No skin area is immune from invasion of *Mycobacterium leprae*, as studies have documented bacteriological and histopathological evidence of disease process in clinically uninvolved skin in leprosy patients. No immune zones were found on the skin as judged by the results of bacteriological examination by Kaur & Kumar (1978), who found leprous bacilli in 100% of lepromatous leprosy and 75% of borderline lepromatous cases in slit-skin smears taken from the scalp, axillae and inguinal regions in a study of apparently uninvolved skin in leprosy as regards bacillary population at various sites. Skin biopsies from clinically normal skin of the scalp, axillary and groin regions in 20 lepromatous leprosy patients revealed significant histopathological findings in up to 25% of the patients, in a study of clinically normal appearing skin in lepromatous leprosy (Bedi *et al*, 1979).

Therefore, it is not uncommon to find cutaneous lesions of leprosy in the so-called immune zones. The present study heightens the clinical awareness of the possibility of the occurrence of leprous lesions in uncommon and unusual sites.

Based on the present study and previous observations on the subject, validity of the concept of immune zones in leprosy remains questionable and requires reconsideration.

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