

Original Research Article

Clinico-etiological analysis of annular skin eruptions: a cross-sectional study from Western Maharashtra

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ABSTRACT

Background: Annular skin eruptions commonly present in dermatology outpatient department. The most common cause of annular lesions encountered among the adult population in developing nations is dermatophytosis. The aim of the study was to identify risk factors and determine etiology of annular skin lesions after correlation of clinical, pathological, serological and mycological features and to analyze the clinical and laboratory features.

Methods: A cross-sectional study was conducted on 103 patients presenting with annular skin eruptions to the Dermatology outpatient/inpatient department of BJ Government Medical College and Sassoon Hospital, Pune during a two year period (2015 to 2017).

Results: During a two year period from 2015 to 2017, 103 patients with annular skin eruptions were enrolled. Of these, 67% (65.05%) had superficial dermatophytosis while 16 (15.5%) had Hansens disease. Other groups of sporadic cases found were chronic plaque psoriasis (54.85%), pityriasis rosea (43.9%), pityriasis versicolor (21.9%), secondary syphilis (21.9%), granuloma annulare (21.9%), annular elastolytic giant cell granuloma (11%), Bowsens disease (11%), erythema multiforme (11%), porokeratosis (11%) and sarcoidosis (11%). Statistically significant association was found between number, color, site and symptoms in superficial dermatophytosis.

Conclusions: This was a novel study that attempted a comprehensive clinico-etiological compilation of annular skin eruptions analyzing a large number of clinical variables and risk factors. Based on the observations, an algorithmic clinical approach has been suggested to facilitate early diagnosis and treatment initiation.

Keywords: Annular skin eruption, Dermatophytosis, Clinical algorithm

INTRODUCTION

Annular skin eruptions commonly present in Dermatology practice. The term “annular” stems from the Latin word “annulus,” meaning ringed.¹ The lesions may appear as circular or ovoid macules or patches with an erythematous periphery and central clearing. The most common cause of annular lesions encountered among the adult population in developing nations is dermatophytosis. However, other conditions may present

with much the same appearance. The clinician must exclude other diagnoses, especially if the patient has failed previous treatment for dermatophytosis.²

The differential diagnosis of annular skin eruptions is quite extensive. Lesions with this configuration are etiologically classified as infections (dermatophytosis, syphilis), inflammatory (urticaria), papulosquamous disorders (psoriasis, lichen planus), vesiculobullous disorders (linear Ig A disease, bullous pemphigoid),

granulomatous disorder (sarcoidosis, granuloma annulare), connective tissue disorder (subacute cutaneous lupus erythematous), eczematous disorder (seborrheic dermatitis, nummular eczema), figurate erythema (erythema annulare centrifugum, erythema gyratum repens), vascular (purpura annularis telangiectoides), neoplastic (superficial basal cell carcinoma, mycosis fungoides) and drug eruptions (fixed drug eruption, erythema multiforme).³ They can occur as manifestation of various skin diseases which may mimic each other leading to difficulty in diagnosis and delay in treatment. The aim of the study was to identify risk factors and determine etiology of annular skin lesions after correlation of clinical, pathological, serological and mycological features and to analyze the clinical and laboratory features which would facilitate early treatment initiation.

METHODS

The present cross-sectional study was conducted on 103 patients (irrespective of age and gender) presenting with annular skin eruptions to the Dermatology outpatient/inpatient department of BJ Government Medical College and Sassoon Hospital, Pune during a two year period (2015 to 2017) after obtaining approval from institutional ethics committee. In every patient, a detailed history was sought regarding the site of onset of annular skin eruption, rate of progression, associated symptoms and family history of similar lesions. Information was also elicited regarding use of any topical or systemic medication. Any other associated or past history of diabetes, hypertension, tuberculosis, and serostatus was noted.

During clinical examination, the morphology, distribution, extent of involvement, surface, color, border, shape, symmetry, erythema, induration, sensations and nerve examination was recorded. Changes in oral, ocular and genital mucosa, hair and nails were also noted. Relevant systemic examination findings were studied for association of any underlying condition.

In every patient, the following investigations were carried out: complete hemogram with renal function tests, liver function tests and urine routine microscopy, blood sugar level, KOH mount and fungal culture of skin scrapings (whenever required), skin biopsy for histopathological examination whenever indicated (special stains wherever necessary), slit skin smear for leprosy whenever required, serological tests like ELISA, VDRL, TPHA, RA, ESR, CRP, serum calcium, angiotensin converting enzyme levels, etc. Final diagnosis was made after correlation of clinical, pathological, serological and mycological features.

Chi-square test and Fisher’s exact test were used to analyze the association between various qualitative data variables (age, gender, HIV status, histopathology,

serology, mycological features). P<0.05 was considered as significant.

RESULTS

Sociodemographic data

A total of 103 cases with annular skin lesions presented in this study, out of which maximum cases (53, 51.5%) were in the age group of 11 to 30 years. This age group is followed by the age group of 41-50 years (18.87%). It was found that 73 (70.9%) were males and 30 (29.1%) were female. There was no statistically significant correlation between gender and eruption of annular skin lesions (p=0.999). Maximum proportion (37%) of patients were students followed by unskilled workers (57.14%) (Table 1).

Table 1: Socio-demographic data.

Socio-demographic characteristics	Frequency
	N (%)
Age group (in years)	
Less than 10	11 (10.7)
11-20	25 (24.3)
21-30	28 (27.2)
31-40	15 (14.6)
41-50	18 (17.5)
More than 50	06 (5.8)
Gender	
Male	73 (70.9)
Female	30 (29.1)
Total	103 (100)
Occupation	
Housewife	14 (13.59)
Professional	08 (7.76)
Skilled	15 (14.56)
Student	38 (36.89)
Unskilled	28 (27.18)
Total	103 (100)
Duration	
Less than 6 months	82 (79.6)
More than 6 months	21 (20.4)
Total	103 (100)
History of exposure to pet animals	
Present	07 (6.8)
Absent	96 (93.2)
Total	103 (100)
History of topical application	
Present	91(88.3)
Absent	12 (13.7)
Total	103 (100)

Symptomatology

Patients presenting with duration of symptoms less than 6 months was maximum (82, 79.6%), whereas 21 (20.4%)

had symptoms of more than 6 months duration There was no statistically significant association between annular skin eruptions and duration (p value for superficial dermatophytosis 0.204 and for leprosy-0.999) (Table 2).

Table 2: Symptomatology.

Symptoms	Frequency
	N (%)
Asymptomatic	25 (24.3)
Itching	78 (5.7)
Total	103 (100)
Number of episodes	
Single	86 (83.5)
Multiple	17 (16.5)
Total	103 (100)
Number of lesions	
Single	19 (18.4)
Multiple	84 (81.6)
Total	103 (100)
Distribution of lesions	
Asymmetrical	86 (83.5)
Symmetrical	17 (16.5)
Total	103 (100)
Surface changes	
Scaling	75 (72.8)
Non-scaly	28 (27.2)
Color of lesion	
Erythematous	83 (80.6)
Skin colored/others	20 (19.4)
Induration (consistency)	
Present	22 (21.4)
Absent	81 (78.6)
Total	103 (100)
Sensations	
Decreased	12 (12.6)
Normal	91 (87.4)
Total	103 (100)
Nerve thickening	
Yes	13 (12.6)
No	90 (87.4)
Total	103 (100)

Out of 103 cases, maximum number of patients (78, 75.72%) presented with complaint of itching. Of these, 63 (80.77%) were diagnosed as superficial dermatophytosis followed by pityriasis rosea (4, 5.13%), Hansen’s disease (3, 3.85), chronic plaque psoriasis (2, 2.56%), porokeratosis (1, 1.28%), pityriasis versicolor (1, 1.28%), and annular elastolytic giant cell granuloma (1, 1.28%) (Figure1). There was a statistically significant correlation between patients presenting with annular itchy lesions and superficial dermatophytosis (p=0.001), and leprosy and non-itchy annular lesions (p=0.001). There was no statistically significant relationship between single or recurrent episodes of annular skin eruptions and

occurrence of superficial dermatophytosis (p value 0.102) or leprosy (p=0.725) in our study.

We found significant association between superficial dermatophytosis and patients presenting with annular skin eruptions over inguinal folds (p=0.001), upper limb (p=0.001) and lower limb (p<0.037). Also, statistically significant association was noted between occurrence of multiple annular lesions and superficial dermatophytosis (p<0.001) and leprosy (p<0.001). There was statistically significant association between patients presenting with erythematous annular lesions and superficial dermatophytosis (p<0.001) However no such association was found with leprosy (p=0.508). In our study, 2 cases (one each of superficial dermatophytosis and secondary syphilis) were detected to be HIV seropositive. Out of 103 cases, 91 (88%) patients had history of some topical application in the form of topical steroid, triple combination (steroid+antifungal+antibiotic) or over the counter medications. A statistically significant association was observed between superficial dermatophytoses and history of topical applications. Amongst 103 cases of annular skin lesions, 31 gave consent for skin biopsy. Histopathological findings confirmed the clinical diagnosis in 28 (90.32%) (Table 3).

Table 3: Investigations.

Sero status (HIV)	Frequency
	N (%)
Nonreactive	101 (98.1)
Reactive	02 (1.9)
Total	103 (100)
Deranged random blood sugar level (BSL)	
Present	04 (3.9)
Absent	99 (96.7)
Total	103 (100)
KOH mount	
Positive	02 (1.8)
Negative	101 (98.2)
Total	103 (100)
Fungal culture	
Positive	15 (14.6)
Negative	88 (85.4)
Total	103 (100)
Histopathological examination	
Biopsy not done	72/103(69.9)
Conclusive	28/31 (90.3)
Inconclusive (clinical correlation advised)	03/31 (9.7)

DISCUSSION

Annular lesions are extremely common and striking in appearance, but can also be misleading. Annular (ring-shaped) implies that the edge of the lesion differs from the center, either by being raised, scaly, or differing in

color (e.g., granuloma annulare, *Tinea corporis*, erythema annulare centrifugum).³ The most common cause of annular lesions encountered in adult population is dermatophytosis, which is usually successfully diagnosed without investigations. In our study, we classified annular eruptions into 13 groups. Major group was of superficial dermatophytosis (67, 65%) followed by Hansens Disease (16, 15.5%). As we were unable to find any similar study documenting such a clinico-etiological analysis for comparison, we herein describe our observations according to individual etiological categories and attempt an interpretation wherever possible.

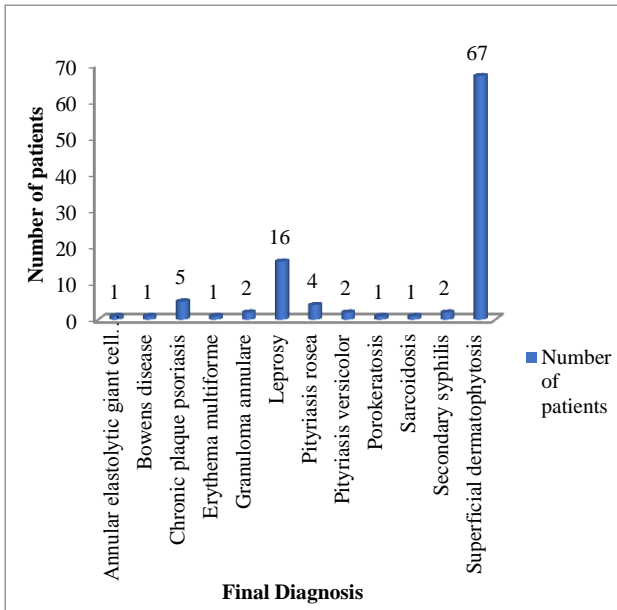


Figure 1: Final diagnosis.

Superficial dermatophytosis

The age preference (11-30 years) in patients with dermatophytosis could be the increased level of physical activity in this particular age group leading to excessive sweating favoring the growth of dermatophytes. Socialization with different people is also comparatively higher in this age group which potentially assists the spread of infection.⁴ This is in accordance with the findings of Surendran et al in a study of 100 patients with clinically suspected dermatophytosis randomly selected from the Dermatology outpatient department of a Medical College hospital (August 2005 to July 2006).² In the present study, the youngest patient with superficial dermatophytosis was a four month old baby while the eldest was 71 years old, reflecting the current trend of rampant dermatophytic infections that affect a large population without sparing even extremes of age. The higher incidence in males indicates that this gender is probably either more prone or more concerned about skin lesions especially over face, trunk and inguinal folds and hence more likely to approach health facilities more readily. Various types of coexisting forms of dermatophytic infections were also encountered in our

study. *Tinea corporis* (95%) was the most common clinical pattern observed followed by *Tinea cruris* (46.26%), *Tinea unguium* (14.06 %) and *Tinea faciei* (10.45%). Nearly half the individuals with superficial dermatophytosis had involvement of multiple sites. Hence the total number of clinical patterns was 132, which was higher than the total number of patients with this diagnosis. In hot and humid climates, the incidence of *Tinea corporis* increases. It is usually more common along the waistline of Indian ladies who wear sarees.⁵ *Tinea corporis* (95%) was the most common clinical pattern followed by *Tinea cruris* (46.26%) in both males and females, which is not in accordance with the findings of Surendran et al wherein *Tinea corporis* was reported to be more common in males with *Tinea cruris* more common in females.² Dermatophytosis was noted to be more common in males younger than 30 years and in females older than 30 years in the above-mentioned study.²

Maximum number of patients who presented with annular skin lesions was students. Of these, 43.28% had superficial dermatophytic infections indicating the health-seeking behavior as well as predilection for sweating due to tight clothing. Second major group affected was unskilled worker which reflects low socio-economic status, poor hygienic conditions, lack of awareness of health seeking, limited resources, cost of treatment and poor compliance to treatment.⁶ There was a statistically significant co-relation between patients presenting with annular itchy lesions and superficial dermatophytosis. These findings suggest that superficial dermatophytosis should be considered as first differential diagnosis in patients presenting with itchy annular skin lesions. However there was no statistically significant relationship between single or recurrent episodes of annular skin eruptions and occurrence of superficial dermatophytosis or leprosy in our study. Descending order for site-wise involvement was trunk (50.5%), followed by lower limb (45.6%), inguinal folds (36.9%), upper limb (34%), face (22.3%), feet (6.8%) and neck (4.9%) while least affected site was scalp (1.9%). Environmental factors are important in the initiation and propagation of *Tinea cruris*. A warm and humid climate, as in India, particularly in the monsoon season, favors *Tinea cruris*.⁷⁻¹⁰ Familial *Trichophyton rubrum* infections are known to occur.¹¹ In the present study, *Trichophyton*, *Candida albicans* and non-albicans *Candida* were isolated as causative agents of infection. Out of the total number of 5 different isolates, *Trichophyton mentagrophytes* (53.33%) was the highest followed by *Trichophyton tonsurans* (26.67%) and *Trichophyton rubrum* (7.67%). Two cases showed co-infection by *Candida albicans* and non-albicans leading to the total number of isolates as 15. In our study the major isolate remains the *Trichophyton* species which is not in accordance with an Iranian study by Shahindokht et al, wherein *Epidermophyton floccosum* was identified as the most prevalent pathogen.¹² Similar to our findings, Agarwal et al reported *Trichophyton mentagrophytes* species as the most common isolate

(37.9%).¹³ The difference in these isolates among various studies may be primarily due to the regional differences in causative species and factors involved in the collection, transport and inoculation of specimens, culture conditions, severity, type and stage of disease and the effect of locally preferred antifungal agents.

Topical steroid application may be one of the fore-most reasons for low yield of KOH mounts and fungal culture underlining the importance of implementation of health education and regulations. Rampant use of over-the-counter topical medications has promoted emergence of resistant fungal strains and atypical presentations of various dermatological conditions leading to difficulty in diagnosis and treatment of these conditions.

Hansens disease

The second major etiological group was Hansen's disease comprising 15.5% cases. Maximum leprosy cases belonged to third to fifth decade. Annular lesions (Figure 2A) are more common in borderline leprosy and the occurrence of the borderline type of leprosy is relatively more common as compared to other forms, hence this part of the spectrum was more predominant in our group of patients. The reason for fewer number of patients of other types of leprosy in this study is probably due to annual new case detection rate (ANCDR) being 9.71 per 100,000 population with prevalence rate (PR) of 0.66 per 10,000 population according to the Annual report of NLEP.¹⁴ In the tertiary teaching hospital where the current study was conducted, during the period of January 2016 to January 2017 total cases registered were 196 and the new cases detected were 173. The greatest risk factor for developing leprosy is considered to be contact with another case of leprosy. Individuals with unskilled profession are usually associated with low socio-economic status and over-crowding which explains the predominance of unskilled professionals in the present cohort.

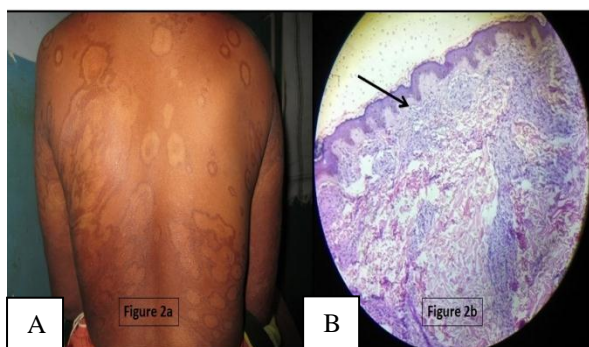


Figure 2: Borderline lepromatous leprosy; (A) borderline lepromatous leprosy, clinical photograph showing multiple varied size annular plaque with symmetrical distribution and (B) Grenz zone between epidermis and dermis, multiple granulomas in dermis.

In this group, we found statistically significant correlation between asymptomatic nature, multiplicity, induration and symmetrical distribution of annular lesions and leprosy. There was significant inverse relationship between symmetrical annular lesions and possibility of Hansen's disease. This can be explained by the fact that annular lesions in leprosy are usually a feature of Borderline part of the spectrum (as seen in this study) while symmetrical distribution is a feature of lepromatous leprosy which is associated with infiltrated nodules and plaques rather than annular morphology.

Amongst the total 103 cases, on evaluation, two cases were detected to be HIV sero-positive. The first case was a 45 year housewife with single episode of multiple asymptomatic asymmetrical lesions showing oval and polycyclic plaques with pustules over borders along with erythema and scaling and was diagnosed as superficial dermatophytosis. The second case was a 28 year male driver who presented with asymptomatic skin-colored asymmetrical oval rupioid plaques with scaling at border over soles. The clinical diagnosis of secondary syphilis was confirmed on serology with an elevated VDRL titer (1:56). Differential diagnosis of annular lesions in HIV-infected patients includes granuloma annulare, disseminated porokeratosis, superficial dermatophytosis and secondary syphilis.¹⁵ Generalized annular lichen planus though rare, has been reported in HIV-seropositive patients by Chakraborty et al.¹⁵

Five cases of chronic plaque psoriasis with annular arrangement of lesions were found in our study. The patients belonged to age group of second to fifth decade and presented with itchy scaly round raised lesions over trunk and extremities. Examination revealed erythematous, indurated, silvery scaly plaques which were asymmetrically arranged. The clinical diagnosis of psoriasis was confirmed by characteristic histopathological findings of psoriasiform epidermal hyperplasia, neutrophils in the upper layers of the overlying parakeratotic scales and neutrophils migrating to the 'summits' of the parakeratotic mounds. Terunuma et al and Guill et al have reported three cases of non-pustular annular psoriasis (similar to our cases) and suggested that annular psoriasis has features of both typical plaque-type and pustular psoriasis and needs to be regarded as an intermediate disease entity.^{16,17} Further, Takahashi has recommended careful follow up of such cases for possible future evolution of pustular psoriasis.¹⁸

Four cases of pityriasis rosea presented during this study period with itchy lesions over trunk and upper limb since 2 to 4 weeks. History suggestive of preceding upper respiratory infection was elicited only in half the patients. In two cases, lesions were multiple, symmetrical, annular plaques with collarette scales distributed along cleavage lines as typically described by Sharma et al.¹⁹ One case additionally showed skin-colored to erythematous round and oval non-indurated lesions while two cases showed an isolated plaque with collarette scale over trunk

characteristic of herald patch. KOH mount and fungal culture of scales was negative. Histopathological findings of acanthosis and mild psoriasiform hyperplasia, small 'Pautrier simulants' (pityriasiform spongiosis), composed of inflammatory cells in a spongiotic focus were seen. Two female children presented with single well-defined normoaesthetic non-indurated skin-colored annular patch over neck with fine furfuraceous scale. KOH mount and fungal culture were negative. Diagnosis of pityriasis versicolor was made on the basis of history, clinical findings and Wood's lamp examination. Annular variant of pityriasis versicolor seems to be rarely reported in literature.

In our study period, 2 cases were diagnosed as granuloma annulare (elderly female with multiple recurrent generalized lesions and 5 year old child with annular plaques and papules over both palms and right middle and ring fingers coalescing to form fusiform swelling). Sarcoidosis and juvenile xanthogranuloma were considered as clinical differentials respectively.

In the present study, two cases of suspected syphilis were encountered. Both cases were sexually active males who presented with asymptomatic skin-colored and hyperpigmented scaly lesions over palms and soles since 1 to 2 weeks. Lesions were asymmetrical, annular, non-indurated, normo-aesthetic, scaly, plaques. KOH mount and fungal culture of scales was negative. Serology confirmed the diagnosis of secondary syphilis with positive VDRL titers. One case was HIV seropositive. History, clinical features and serology were consistent with the diagnosis of secondary syphilis. Revathi et al have reported annular lesions of benign nodular tertiary syphilis as presenting manifestation of HIV.²⁰ Thus individuals with high-risk behavior presenting with annular lesions warrant complete clinical and serological evaluation for syphilis.

A 70 year male presented with asymptomatic single, normo-aesthetic skin colored indurated non- scaly annular plaque with verrucous surface and well defined border over left arm (Figure 3A) since 10 years (diagnosed previously as cutaneous tuberculosis) without any improvement despite antituberculous treatment for 5 years. Further histopathological examination showed psoriasiform hyperplasia with a thick supra papillary plate. Atypical keratinocytes (epidermal dysplasia) involving the full thickness of the epidermis; with sparing of the basal layer and the acrosyringium. Mitoses and dyskeratotic cells were suggestive of Bowen's disease. (Figure 3B and 3C). Caca et al have reported giant Bowen's disease in an elderly individual. The site of involvement was the face, a sun exposed area as seen in our case (arm).²¹

Annular elastolytic giant cell granuloma is considered a distinct entity characterized by appearance of annular erythematous to skin colored lesions on sun exposed areas and histopathologically with granulomatous

reaction with elastin degeneration, multinucleated giant cells and elastophagocytosis. The single case encountered by us was consistent with the case series reported by Arora et al.²²

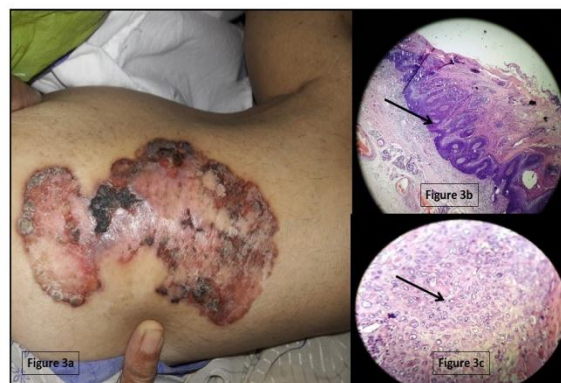


Figure 3: Bowen's disease; (A) clinical Photograph showing well-margined, crusted annular plaque with variegates pigmentation over left arm; (B) H and E (10X)- Full thickness dysplasia and (C) H and E (40X)- Dysplastic keratinocytes with increased mitotic figures.

We found a single case of porokeratosis in a young male who presented with few, gradually progressing, round to oval erythematous to skin-colored annular plaques with well-defined raised thin keratotic borders and atrophic center. Lesions were non-indurated and normo-aesthetic. Histopathological examination across the edge of the peripheral rim showed the typical coronoid lamella with invagination of the epidermis at the site of the coronoid lamella with adjacent mild papillomatosis. Basal vacuolar change and vacuolated cells in the spinous layer were seen beneath the coronoid lamella suggestive of porokeratosis.⁴ Bhaskar et al have reported a case of porokeratosis involving almost all parts of the body with simultaneous occurrence of various forms of the disease in the same individual.²³

A 47 year old male presented with asymptomatic lesions over forehead, trunk, upper and lower limb since 2 months. On examination, multiple papules and oval and annular plaques with skin-colored, normal surface and well-defined raised borders were noted. The lesions were non-indurated and normo-aesthetic. Serum calcium levels were normal and serum angiotensin converting enzyme levels could not be done. However histopathology showed granulomas typically surrounded by a paucity of lymphocytes ("naked granulomas"). Multinucleated giant cells of the Langhans type resulting from the fusion of epithelioid cells were also seen. These findings confirmed the diagnosis of sarcoidosis.

One patient (with two months history of annular erythematous indurated plaques) previously treated without improvement by private practitioner with multidrug therapy (WHO-MDT) for Hansen's disease, was diagnosed clinically by us as sarcoidosis and

confirmed histopathologically. Lesions of cutaneous sarcoidosis (called as “great mimickers”) are divided into two groups as specific or nonspecific lesions histopathologically. Turkoglu et al have reported a case of sarcoidosis which was previously mis-diagnosed and treated as *Tinea faciei* and granuloma annulare.²⁴ This illustrates the ability of sarcoidosis to masquerade as other more common causes of annular lesions.

A six year old boy presented with itchy lesions with burning sensation over face, arms, trunk and lower legs. On examination, he had multiple erythematous, oval polycyclic annular plaques with central dusky hue and well-defined raised borders. Lesions were non-indurated and normo-aesthetic. Conjunctival congestion was seen without other mucosal involvement. As patient was not willing for skin biopsy, diagnosis of erythema multiforme was reached based on history and clinical findings which were in concordance with typical morphology described.³

CONCLUSION

The strength of our study lies in its probable novelty. Despite thorough search through available literature (using search engines: Google, Google scholar, Pubmed) we were unable to find such a comprehensive clinico-etiological compilation of annular skin eruptions analyzing a large number of clinical variables and risk factors. Hence there was no similar study available for comparison. The study was limited by the cross-sectional design. Except for superficial dermatophytosis and leprosy statistical analysis could not be performed for the other etiological groups due to small number of cases encountered. Histopathological examination of all subjects was not possible due to consent issues. Further studies involving larger sample size would be more robust and productive. The low yield of KOH mount and fungal culture in our study may be attributable to inadvertent use of topical agents in the form of corticosteroids (most common), antifungals, antibacterial and antivirals. Histopathological examination was confirmatory in a quarter of patients, however in majority, clinico-pathological correlation was required to reach the final diagnosis.

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