Research Article

Cuestiones de Fisioterapia

Medicine

CLINICAL PROFILE AND PREDISPOSING FACTORS OF SUPERFICIAL FUNGAL INFECTIONS (DERMATOPHYTOSIS) AMONG PATIENTS ATTENDING A TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY

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Abstract

Background: Dermatophytosis, the commonest superficial fungal infection of keratinised tissue, has emerged as a major public-health concern across India, where the hot and humid climate, changing lifestyles, over-the-counter topical corticosteroid misuse and irrational antifungal use have driven a surge in chronic and recurrent disease. Contemporary regional data describing the clinical profile and predisposing factors in South India remain limited. Objectives: To characterise the demographic and clinical profile, identify predisposing factors, describe the mycological spectrum, and evaluate the diagnostic yield of potassium hydroxide (KOH) microscopy and fungal culture among patients with clinically suspected dermatophytosis attending a tertiary-care dermatology service in South India. Methods: This analytical cross-sectional study analysed 300 consecutive patients with clinically suspected superficial fungal infection. Demographic details, predisposing factors, clinical type, anatomical site and severity were recorded on a structured proforma. KOH microscopy and Sabouraud dextrose agar culture with species identification were performed where feasible. Descriptive statistics were computed and associations tested using the chi-square test, with $p < 0.05$ considered significant. Results: The mean age was 42.8 years (SD 21.6; range 5–80), with a male predominance (176; 58.7%; M:F 1.42:1). Tinea cruris (26.0%) and tinea corporis (22.3%) were the commonest clinical types, together accounting for nearly half of cases. The mean symptom duration was 91.7 days, and severe disease was recorded in 149 (49.7%). KOH microscopy was positive in 166 patients (55.3% of all patients; 79.4% of those tested) and culture in 91 (30.3%). Trichophyton rubrum was the predominant isolate (36; 39.6%). Frequent predisposing factors were previous tinea (32.7%), wet-work exposure (28.7%) and shared clothing or towels (25.3%); topical corticosteroid use (10.3%) and prior antifungal use (19.0%) were notable. Neither topical corticosteroid use versus multi-site involvement ($p = 0.59$) nor diabetes versus severity ($p = 0.31$) reached significance. Conclusion: Dermatophytosis affected all age groups with a male predominance, was dominated by glabrous-skin tinea and T. rubrum, and was frequently chronic and extensive. The pattern underscores the need for preventive counselling, restriction of topical-steroid misuse and antifungal stewardship in South India.

Keywords: dermatophytosis; tinea; Trichophyton rubrum; predisposing factors; topical corticosteroid; South India

Introduction

Superficial fungal infections of the skin, hair and nails are among the most frequent dermatological presentations worldwide, affecting an estimated 20–25% of the global population at any given time [1,3]. Dermatophytosis, caused by keratinophilic fungi of the genera *Trichophyton*, *Microsporum* and *Epidermophyton*, is the predominant superficial mycosis and is conventionally classified by the anatomical region involved — tinea corporis, tinea cruris, tinea pedis, tinea capitis, tinea unguium (onychomycosis), tinea faciei and tinea manuum [1,8]. Although rarely life-threatening, dermatophytosis imposes a substantial burden through chronicity, recurrence, cosmetic disfigurement, pruritus, occupational disruption and impaired quality of life [7,9].

The epidemiology of dermatophytosis is strongly shaped by climate, and tropical and subtropical regions consistently report the highest prevalence [3,10]. India, with its prolonged hot and humid seasons, high ambient temperatures, dense population and frequent physical crowding, offers a particularly permissive environment for dermatophyte transmission and persistence [1,2]. In recent years, dermatologists across the country have documented an unprecedented rise in chronic, recurrent and treatment-refractory tinea, often extensive and involving multiple body sites [1,7]. This changing landscape has been widely attributed to the rampant over-the-counter availability and misuse of potent topical corticosteroids and irrational fixed-dose combination creams, incomplete or inappropriate antifungal courses, sharing of clothing and fomites, and synthetic occlusive garments that trap moisture [2,7]. The resulting "steroid-modified tinea" frequently presents with atypical morphology, extensive involvement and diminished treatment response, complicating both diagnosis and management.

The predisposing factors for dermatophytosis are diverse and include host-related and environmental determinants. Diabetes mellitus, obesity, immunosuppression, atopy, occupational moisture (wet-work) exposure, occlusive footwear, family history, household contact and prior tinea have all been implicated in various settings [4,9,13]. In endemic Indian conditions, moisture, friction and repeated fomite exposure are especially relevant, and identifying the locally dominant risk profile is essential for designing effective prevention. The mycological spectrum also carries clinical and epidemiological importance: *Trichophyton rubrum* has been the leading isolate in most Indian and international series, though *T. mentagrophytes*/interdigitale, *Microsporum canis*, *Epidermophyton floccosum* and *T. tonsurans* contribute variably by geography and clinical type [1,2,3,5].

Accurate diagnosis rests on clinical assessment supported by direct KOH microscopy and confirmatory fungal culture on Sabouraud dextrose agar, yet in routine practice culture is frequently omitted owing to cost, delay and limited laboratory access, and empirical treatment is common [1,3].

Despite the growing burden, contemporary region-specific data from South India that jointly describe the clinical profile, predisposing factors, mycological spectrum and diagnostic yield remain limited. The present study was undertaken to address this gap. The objectives were to describe the demographic and clinical profile of patients with clinically suspected dermatophytosis attending a tertiary-care dermatology service in South India, to identify the prevailing predisposing factors, to characterise the mycological spectrum among culture-positive cases, and to evaluate the diagnostic yield of KOH microscopy and fungal culture, thereby informing prevention and antifungal stewardship.

Materials and Methods

Study design and setting

This was an analytical cross-sectional study conducted in the Department of Dermatology, Venereology

and Leprosy, [name of tertiary care teaching hospital], [city], [state], South India, during [study period]. The department provides outpatient and inpatient dermatological care to an urban and rural catchment population and functions as a referral centre for the surrounding region.

Study population

Consecutive patients of all ages presenting to the dermatology outpatient service with clinically suspected superficial fungal infection (dermatophytosis) during the study period were considered for inclusion. Patients in whom another dermatosis was ultimately established, and those unwilling to participate, were excluded. A total of 300 patients meeting the eligibility criteria were enrolled.

Data collection

Data were recorded on a structured, pre-tested proforma. Demographic variables included age, sex, residence (urban/rural), occupation and socioeconomic class (modified classification). Predisposing factors documented were diabetes mellitus, obesity, immunosuppression, atopy, family history of tinea, previous tinea, sharing of clothing or towels, occlusive footwear, wet-work (occupational moisture) exposure, recent antibiotic use, topical corticosteroid use and household contact with a similarly affected person. Clinical variables comprised presenting symptoms (pruritus, scaling, erythema, annular lesion), symptom duration, primary anatomical site, presence of multi-site involvement, lesion count, estimated body surface area (BSA) involved, clinical type of tinea and clinical severity (mild/moderate/severe). Prior antifungal use was also recorded.

Laboratory methods

Where clinically feasible, skin scrapings, hair or nail clippings were subjected to direct microscopy after treatment with 10–20% potassium hydroxide (KOH) to demonstrate fungal hyphae or arthroconidia. Specimens were inoculated onto Sabouraud dextrose agar (with antibacterial and cycloheximide supplementation as appropriate) and incubated for identification of dermatophyte growth. Species identification was based on colony morphology, pigment production and microscopic features on lactophenol cotton blue mounts. The diagnostic basis for each patient was categorised as culture-confirmed, KOH-supported or clinical-only.

Statistical analysis

Data were compiled and analysed using standard statistical software. Categorical variables were summarised as frequencies and percentages, and continuous variables as means with standard deviations (and medians where appropriate). Associations between categorical variables were tested using the Pearson chi-square test. A two-sided p-value < 0.05 was considered statistically significant.

Results

Demographic and socioeconomic profile

A total of 300 patients with clinically suspected dermatophytosis were analysed. The mean age was 42.8 years (SD 21.6), with a wide range from 5 to 80 years, confirming that the disease affected all age groups. The largest age band was 60 years and above (78; 26.0%), followed by 45–59 years (69; 23.0%), while children (0–12 years) accounted for 24 (8.0%). There was a clear male predominance, with 176 males (58.7%) and 124 females (41.3%), giving a male-to-female ratio of 1.42:1. A majority resided in urban areas (181; 60.3%) compared with rural areas (119; 39.7%). Socioeconomic class III was the commonest (123), followed by class IV (65), class II (58), class I (28) and class V (26). These characteristics are

summarised in Table 1.

Table 1: Demographic and socioeconomic profile of the study population (N = 300)

Variable	Category	n	%
Age (years)	Mean ± SD	42.8 ± 21.6	—
	Range	5–80	—
Age group	0–12	24	8.0
	13–17	26	8.7
	18–29	51	17.0
	30–44	52	17.3
	45–59	69	23.0
	60+	78	26.0
Sex	Male	176	58.7
	Female	124	41.3
	M:F ratio	1.42:1	—
Residence	Urban	181	60.3
	Rural	119	39.7
Socioeconomic class	I	28	9.3
	II	58	19.3
	III	123	41.0
	IV	65	21.7
	V	26	8.7

Clinical profile

The distribution of clinical types is shown in Figure 1. Tinea cruris was the most frequent presentation (78; 26.0%), followed by tinea corporis (67; 22.3%), tinea pedis (40; 13.3%), tinea unguium (37; 12.3%) and tinea capitis (35; 11.7%). Mixed dermatophytosis and tinea faciei each accounted for 15 cases (5.0%), and tinea manuum for 13 (4.3%). Glabrous-skin tinea (cruris and corporis combined) thus represented approximately 48% of all cases.

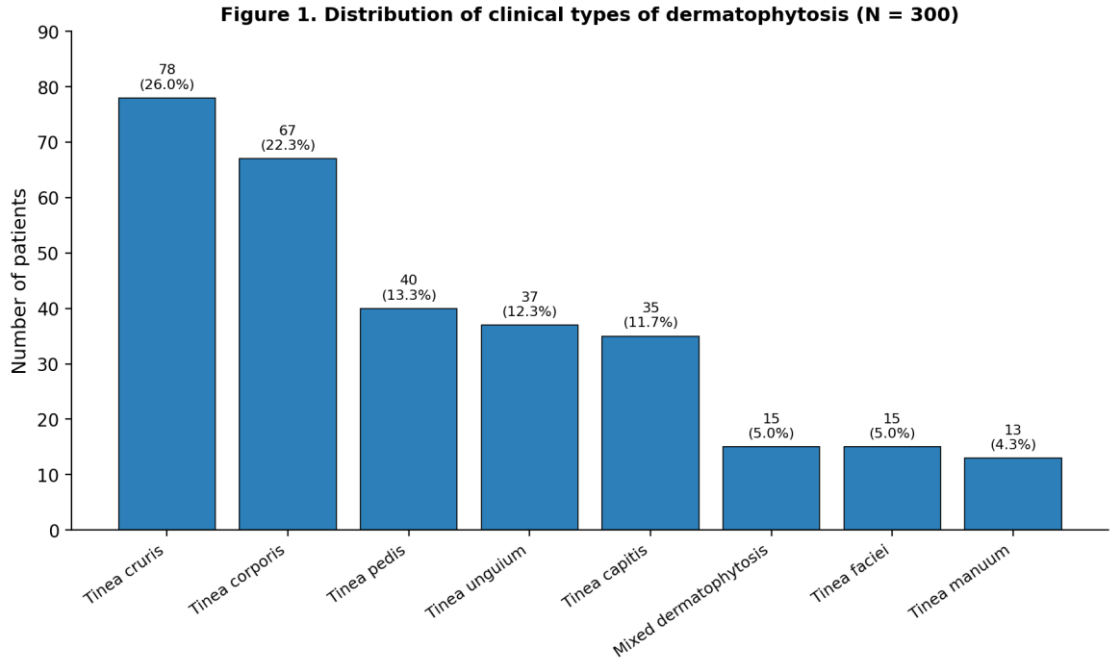

Figure 1: Distribution of clinical types of dermatophytosis among the 300 patients, with counts and percentages.

The primary anatomical sites reflected this distribution, with the groin (80) and trunk (73) most commonly involved, followed by the foot (40), nail (37) and scalp (36); the face (18), hand (14) and multiple sites (2) were less frequent. Multi-site involvement was documented in 54 patients (18.0%). The mean symptom duration was 91.7 days (median 90 days), indicating a substantial chronicity, and the mean lesion count was 4.5 with a mean estimated BSA of 2.9%. The commonest presenting features were scaling (86.0%) and pruritus (84.3%), followed by erythema (70.0%) and annular lesions (60.7%). Clinical severity was graded as severe in 149 patients (49.7%), moderate in 111 (37.0%) and mild in 40 (13.3%), underscoring the large proportion of extensive disease. These clinical characteristics are detailed in Table 2.

Table 2: Clinical types, anatomical sites, severity and symptom features (N = 300)

Category	Subgroup	n	%
Clinical type	Tinea cruris	78	26.0
	Tinea corporis	67	22.3
	Tinea pedis	40	13.3
	Tinea unguium	37	12.3
	Tinea capitis	35	11.7
	Mixed dermatophytosis	15	5.0
	Tinea faciei	15	5.0
	Tinea manuum	13	4.3
Primary site	Groin	80	26.7
	Trunk	73	24.3

	Foot	40	13.3
	Nail	37	12.3
	Scalp	36	12.0
	Face	18	6.0
	Hand	14	4.7
	Multiple	2	0.7
Multi-site involvement	Present	54	18.0
Presenting feature	Scaling	258	86.0
	Pruritus	253	84.3
	Erythema	210	70.0
	Annular lesion	182	60.7
Severity	Severe	149	49.7
	Moderate	111	37.0
	Mild	40	13.3
Symptom duration	Mean (median), days	91.7 (90)	—

Predisposing factors and diagnostic yield

The prevalence of individual predisposing factors is presented, ranked, in Figure 2. Previous tinea was the most frequent factor (32.7%), followed by wet-work exposure (28.7%), shared clothing or towels (25.3%), occlusive footwear (24.7%) and obesity (21.3%). Family history (17.0%), atopy (16.0%), household contact (14.7%), diabetes mellitus (11.3%), topical corticosteroid use (10.3%), recent antibiotic use (6.7%) and immunosuppression (3.0%) were less common. Prior antifungal use was reported by 57 patients (19.0%).

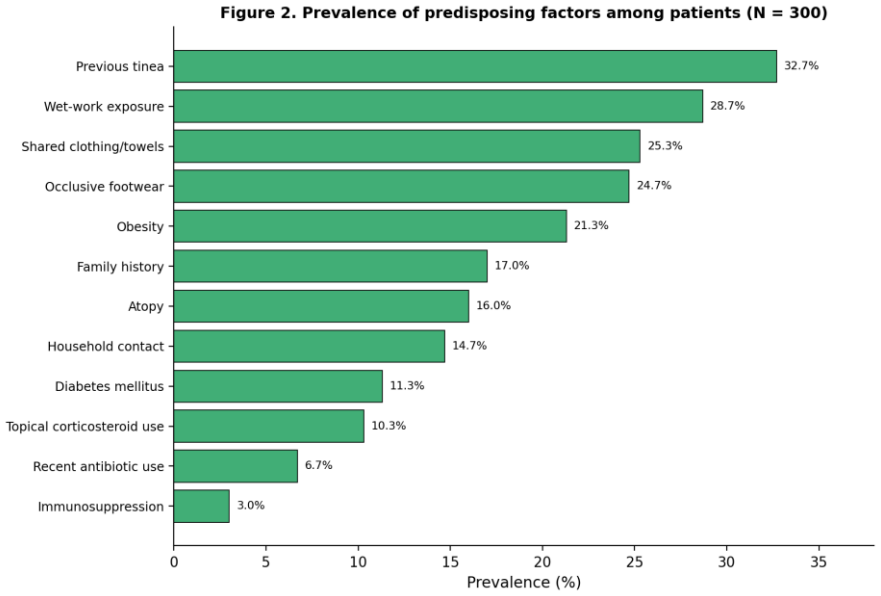

Figure 2: Prevalence (%) of the 12 predisposing factors, ranked from most to least frequent.

Regarding diagnostics, KOH microscopy was performed in 209 patients (69.7%) and was positive in 166, corresponding to 55.3% of all patients and 79.4% of those tested. Fungal culture was performed in 130 patients (43.3%) and was positive in 91, corresponding to 30.3% of all patients and 70.0% of those cultured. The diagnostic basis was KOH-supported in 119 patients, culture-confirmed in 91 and clinical-only in 90. The predisposing-factor prevalences and diagnostic yield are consolidated in Table 3.

Table 3: Predisposing factors and diagnostic yield (N = 300)

Domain	Item	n	%
Predisposing factor	Previous tinea	98	32.7
	Wet-work exposure	86	28.7
	Shared clothing/towels	76	25.3
	Occlusive footwear	74	24.7
	Obesity	64	21.3
	Family history	51	17.0
	Atopy	48	16.0
	Household contact	44	14.7
	Diabetes mellitus	34	11.3
	Topical corticosteroid use	31	10.3
	Recent antibiotic use	20	6.7
	Immunosuppression	9	3.0
	Prior antifungal use	57	19.0
Diagnostic test	KOH performed	209	69.7
	KOH positive (of all patients)	166	55.3
	KOH positive (of those tested)	166	79.4
	Culture performed	130	43.3
	Culture positive (of all patients)	91	30.3
	Culture positive (of those cultured)	91	70.0
Diagnostic basis	KOH-supported	119	39.7
	Culture-confirmed	91	30.3
	Clinical-only	90	30.0

Mycological spectrum

Among the 91 culture-positive patients, *Trichophyton rubrum* was the predominant isolate (36; 39.6%), followed by *T. mentagrophytes*/interdigitale (23; 25.3%), *Microsporum canis* (11; 12.1%), *Epidermophyton floccosum* (11; 12.1%), *T. tonsurans* (6; 6.6%) and other dermatophytes (4; 4.4%). The species distribution is shown in Table 4.

Table 4. Species distribution among culture-positive cases (n = 91)

Species	n	%
Trichophyton rubrum	36	39.6
Trichophyton mentagrophytes/interdigitale	23	25.3
Microsporum canis	11	12.1
Epidermophyton floccosum	11	12.1
Trichophyton tonsurans	6	6.6
Other dermatophyte	4	4.4
Total	**91**	**100.0**

Tested associations

Two a priori associations were formally tested. There was no significant association between topical corticosteroid use and multi-site involvement (chi-square = 0.28; p = 0.59), nor between diabetes mellitus and clinical severity (chi-square = 2.35; p = 0.31). Both associations were therefore non-significant in this dataset.

Discussion

This analytical cross-sectional study of 300 patients with clinically suspected dermatophytosis characterises the clinical profile, predisposing factors, mycological spectrum and diagnostic yield of superficial fungal infection in a tertiary-care setting in South India. The principal findings — an all-age distribution with male predominance, a preponderance of glabrous-skin tinea, chronic and frequently severe disease, *T. rubrum* dominance, and only moderate laboratory confirmation — align closely with the broader Indian and international literature while highlighting locally relevant challenges.

The mean age of 42.8 years and the broad range (5–80 years) confirm that dermatophytosis is not confined to any single age group, although economically active and older adults predominated. The male predominance (M:F 1.42:1) is consistent with numerous Indian series, in which greater outdoor activity, occupational sweating, use of occlusive clothing and footwear, and possibly higher health-seeking among men have been proposed as contributors [1,2]. Surendran et al. and Bhagra et al., in their clinico-mycological studies from southern and northern India respectively, similarly reported a male preponderance and a wide age distribution [1,2]. The urban predominance in the present series may reflect the referral catchment of a tertiary hospital rather than a true urban excess.

The clinical-type distribution, dominated by tinea cruris (26.0%) and tinea corporis (22.3%) — together nearly half of all cases — is highly characteristic of the hot, humid South Indian climate, in which moisture and friction over the groin and trunk favour glabrous-skin tinea [1,7]. This pattern accords with the study by Surendran et al. and with therapeutic trials of tinea corporis and cruris from India, which reflect the predominance of these forms in clinical practice [1,7]. Tinea pedis, unguium and capitis were less frequent but clinically important; the onychomycosis and tinea capitis proportions are broadly in keeping with dedicated Indian studies of toenail onychomycosis and paediatric tinea capitis [5,6], and with international onychomycosis series from Iran, Nepal and populations with HIV infection [4,11,12]. Tinea capitis, a predominantly paediatric infection, is comparable to observations from North India and from paediatric hair-loss studies elsewhere [6,8,14].

The substantial chronicity observed — a mean symptom duration of approximately three months and severe disease in nearly half of patients — mirrors the widely reported contemporary Indian experience of extensive, recurrent and treatment-refractory tinea [1,7]. Multi-site involvement in 18.0% further reflects the extensive nature of current disease. Scaling and pruritus were near-universal presenting features, consistent with the typical symptomatology of superficial mycoses [8].

Trichophyton rubrum was the leading isolate (39.6%), followed by *T. mentagrophytes*/interdigitale (25.3%). This ordering reproduces the classical finding across most Indian and global series, in which *T. rubrum* is the commonest dermatophyte, with *T. mentagrophytes* an important and, in some recent Indian reports, increasingly prominent second [1,2,3]. The presence of *M. canis*, *E. floccosum* and *T. tonsurans* in smaller proportions is likewise consistent with the reported spectrum in laboratory-based epidemiological studies [3,10]. Species distribution has therapeutic and epidemiological relevance, as anthropophilic species such as *T. rubrum* are particularly associated with chronic and recurrent infection.

The predisposing-factor profile is instructive for prevention. Previous tinea (32.7%) was the most frequent factor, reinforcing the recurrent, relapsing nature of the disease, while wet-work exposure (28.7%), shared clothing or towels (25.3%), occlusive footwear (24.7%) and obesity (21.3%) point to modifiable environmental and behavioural determinants centred on moisture, friction and fomite transmission [9,13]. These findings echo risk-factor analyses among Italian navy cadets and community-based surveys, in which occupational moisture, crowding and shared facilities were prominent [9,13]. Topical corticosteroid use (10.3%) and prior antifungal use (19.0%) were notable and clinically concerning, given the well-documented role of over-the-counter steroid and irrational combination-cream misuse in producing steroid-modified, extensive and refractory tinea in India [7]. Although topical corticosteroid use was not significantly associated with multi-site involvement ($p = 0.59$) and diabetes was not significantly associated with severity ($p = 0.31$) in this dataset, these null findings should be interpreted cautiously; the study was not powered for such comparisons, and the associations may simply be undetectable at this sample size rather than truly absent.

The diagnostic yield merits emphasis. KOH microscopy, performed in fewer than three-quarters of patients, was positive in 79.4% of those tested (55.3% overall), while culture was undertaken in fewer than half and was positive in 70.0% of those cultured (30.3% overall). Nearly a third of patients were managed on a clinical-only basis. This gap between clinical suspicion and laboratory confirmation is typical of routine practice, where cost, turnaround time and limited mycology facilities constrain testing [1,3]. The moderate confirmation rate highlights both the value of KOH microscopy as a rapid bedside test and the diagnostic and public-health challenge posed by incomplete culturing, which limits species-level surveillance and antifungal susceptibility monitoring.

Taken together, these findings carry clear implications for South India. Preventive strategies should target modifiable risks — keeping intertriginous areas dry, avoiding occlusive synthetic clothing and footwear, not sharing towels and garments, treating household contacts, and completing adequate antifungal courses. Equally important is curbing the misuse of over-the-counter topical corticosteroids and irrational combination creams, and promoting antifungal stewardship with appropriate drug selection, dosing and duration to counter the rising tide of chronic and recurrent tinea [2,7]. Strengthening access to KOH microscopy and, where feasible, culture would improve diagnostic accuracy and enable ongoing surveillance of the mycological spectrum.

CONCLUSION

In this analytical cross-sectional study from a tertiary-care hospital in South India, dermatophytosis affected patients across all age groups with a male predominance and was dominated by glabrous-skin tinea — tinea cruris and tinea corporis together comprising nearly half of cases — consistent with the region's hot, humid climate. *Trichophyton rubrum* was the leading isolate. Disease was frequently chronic and extensive, with severe involvement in almost half of patients, and common predisposing factors were previous tinea, wet-work exposure, sharing of clothing and towels, occlusive footwear and obesity, alongside concerning levels of topical-steroid and prior antifungal use. The moderate KOH and culture confirmation rates underscore persistent diagnostic and public-health challenges.

REFERENCES

1. Surendran KAK, Bhat RM, Boloor R, Nandakishore B, Sukumar D. A clinical and mycological study of dermatophytic infections. Indian J Dermatol. 2014;59(3):262-7. doi:10.4103/0019-5154.131391
2. Bhagra S, Ganju SA, Kanga A, Sharma NL, Guleria RC. Mycological pattern of dermatophytosis in and around Shimla hills. Indian J Dermatol. 2014;59(3):268-70. doi:10.4103/0019-5154.131392
3. Das S, Goyal R, Bhattacharya SN. Laboratory-based epidemiological study of superficial fungal infections. J Dermatol. 2007;34(4):248-53. doi:10.1111/j.1346-8138.2007.00262.x
4. Surjushe A, Kamath R, Oberai C, et al. A clinical and mycological study of onychomycosis in HIV infection. Indian J Dermatol Venereol Leprol. 2007;73(6):397-401. doi:10.4103/0378-6323.37057
5. Yadav P, Singal A, Pandhi D, Das S. Clinico-mycological study of dermatophyte toenail onychomycosis in New Delhi, India. Indian J Dermatol. 2015;60(2):153-8. doi:10.4103/0019-5154.152511
6. Grover C, Arora P, Manchanda V. Tinea capitis in the pediatric population: a study from North India. Indian J Dermatol Venereol Leprol. 2010;76(5):527-32. doi:10.4103/0378-6323.69078
7. Choudhary SV, Bisati S, Singh AL, Koley S. Efficacy and safety of terbinafine hydrochloride 1% cream vs. sertaconazole nitrate 2% cream in tinea corporis and tinea cruris: a comparative therapeutic trial. Indian J Dermatol. 2013;58(6):457-60. doi:10.4103/0019-5154.119958
8. Andrews MD, Burns M. Common tinea infections in children. Am Fam Physician. 2008;77(10):1415-20.
9. Ingordo V, Naldi L, Fracchiolla S, Colecchia B. Prevalence and risk factors for superficial fungal infections among Italian Navy Cadets. Dermatology. 2004;209(3):190-6. doi:10.1159/000079888
10. Nishimoto K. An epidemiological survey of dermatomycoses in Japan, 2002. Nihon Ishinkin Gakkai Zasshi. 2006;47(2):103-11. doi:10.3314/jjmm.47.103
11. Hashemi SJ, Gerami M, Zibafar E, Daei M, Moazeni M, Nasrollahi A. Onychomycosis in Tehran: mycological study of 504 patients. Mycoses. 2010;53(3):251-5. doi:10.1111/j.1439-0507.2009.01703.x
12. Agarwalla A, Agrawal S, Khanal B. Onychomycosis in eastern Nepal. Nepal Med Coll J. 2006;8(4):215-9.
13. Adefemi SA, Odeigah LO, Alabi KM. Prevalence of dermatophytosis among primary school children in Oke-Oyi community of Kwara state. Niger J Clin Pract. 2011;14(1):23-8. doi:10.4103/1119-3077.79235
14. Al-Refu K. Hair loss in children: common and uncommon causes; clinical and epidemiological study in Jordan. Int J Trichology. 2013;5(4):185-9. doi:10.4103/0974-7753.130393