

Concept of tinea cruris

Ahmad Aliyu* and Mabekoje Oladele Olatunbosun

Department of Microbiology, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.

*Corresponding author. Email: sheikahmadrufai@gmail.com; Tel: +2348039276117.

Copyright © 2024 Aliyu and Olatunbosun. This article remains permanently open access under the terms of the [Creative Commons Attribution License 4.0](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received 8th September 2023; Accepted 20th November 2023

ABSTRACT: Tinea cruris (Jock Itch) is a pruritic superficial dermatophytic infection, particularly involving the perianal and perineal skin, genitalia and pubic region. Associated morbidities of jock itch include secondary bacterial infection, contact dermatitis from topical medications and lichenification. Risk factors include hyperhidrosis, tight-fitting wear, diabetes mellitus, and obesity, which suppress the immune response to the infection. This study reviewed the current and common dermatophyte species of Tinea cruris including demography, clinical presentation, diagnosis, differential diagnosis and the treatment of the infection. A Google search was conducted using the key terms “Tinea cruris” “Jock Itch” “Dermatophytosis” and “Tinea infections”. The search strategy includes literature reviews, meta-analyses, clinical and observational studies. The result shows that the most commonly affected age group in females was between 31 – 40 years (32.7%), while affected males were between 21 – 30 years (40.0%). The most common clinical presentation was tinea cruris in females (27.3%) and males (25.3%) when compared to dual site tinea cruris and tinea corporis in both genders. The most common dermatophytes of the infection include *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Microsporum gypseum* and *Microsporum audouinii*. Terbinafine, itraconazole and luliconazole 1% are more effective and require a short duration of treatment against the infection when compared to other antifungal agents. Darier disease, psoriasis vulgaris, erythrasma, seborrheic dermatitis, cutaneous candidiasis, intertrigo, pemphigus vegetans, contact dermatitis, langerhans cell histiocytosis, lichen simplex chronicus, majocchi granuloma and tinea versicolor may resemble tinea cruris. There has been a significant rise in the incidence of chronic dermatophyte infections of the skin due to the paucity of research on superficial fungal infections and the poor efficacy of the available antifungal agents. More studies are urgently needed on pathogenesis, diagnosis and effective therapy against tinea cruris.

Keywords: Dermatophytes, jock itch, perianal, pruritic, superficial, therapy, *Trichophyton rubrum*.

INTRODUCTION

Jock itch is a tinea infection most commonly affects adolescent and adult men, involves the portion of the upper thigh opposite the scrotum and usually difficult to diagnose and treat (Darade *et al.*, 2019). Jock itch is a special form of tinea infection that involves the crural fold (groin). The infection is more common in males than in females. It usually begins after physical activities that cause sweating around the groin (Basavarajappa *et al.*, 2022). The buttocks and crotch of adult men are most commonly affected while the scrotum is uncommonly affected. Related skin lesion appears symmetrically as tinea corporis with severe itching and the infection is contagious. Tinea cruris can be spread via skin to skin contact or indirectly through clothes, floors and towels.

Communal locker rooms and showers are common places where tinea infection may be disseminated (Darade *et al.*, 2019). The common frequently affected areas include groin, beneath the breasts, feet and scalp. Dermatophytes need moist and warm environment to thrive. This is why the most sweat-prone and hottest areas of the body are likely areas for the infection to occur. Tinea infections are among the most common stratum corneum ailments throughout the world. These dermatophyte infections are classified by location such as cruris (groin), corporis (body), pedis (foot), capitis (scalp), unguium (nail) (Arshah *et al.*, 2015). Tinea cruris and tinea corporis are commonly referred to as ringworm. The spectrum of dermatophytic fungal infections may vary by geographical location; for

example, tinea cruris comprised 15.1%, 13.5%, and 7.6% of superficial fungal infections in Saudi Arabia, Singapore, and Crete, Greece, respectively (Patel *et al.*, 2009). In a Saudi Arabia, jock itch was the second most common tinea infection among children, while tinea capitis as the most predominate dermatophytes infection (Abanmi *et al.*, 2008). The most common dermatophyte agents of tinea cruris include *Trichophyton rubrum*, *Epidermophyton floccosum*, *Trichophyton interdigitale*, *Trichophyton mentagrophytes* and *Trichophyton verrucosum*. *Trichophyton rubrum* remains the most common cause of the fungal infection worldwide, while *Epidermophyton floccosum* is the associated with fungal infection outbreaks (Seebacher *et al.*, 2008). Tinea cruris are primarily found in children, mostly in economically poor and endemic areas. The etiological agents of tinea cruris thrive in keratinized dead tissue with keratinases, metabolites and antigens disseminating throughout the adjacent living tissue, and generating an immune reaction. Centrifugally, the lesions expand at the periphery. The main factors responsible for tinea cruris dissemination include social activities, traveling, urban areas with dense population, poor living conditions and sports activities. Military recruits, prison inmates, athletes and dormitory residents are more vulnerable to the infection (Patel *et al.*, 2009). Tinea cruris affects adult more commonly than children, dissemination of the infection in teenagers and young adults is higher. Tinea cruris is three times common in males than females (Drake *et al.*, 1996). Men are more frequently affected than women, but recently the number of cases is increasing in women who wear tight jeans, panty hose or obese (Andrews and Burns, 2008). Obesity rate in young males and females have tripped many years ago, increasing the susceptibility of the infection of this age group (Sinha and Kling, 2009). Some systemic and topical antifungal agents are available for the treatment of jock itch, there are studies reporting the resistance of dermatophyte species to antifungal agents (Gupta and Kohli, 2003). This could be due empirical treatment where there are no adequate facilities for evaluating the antifungal susceptibility patterns, long-term of therapy and poor efficacy of antifungal agents. Evaluating the dermatophyte species and *in vitro* antifungal susceptibility tests would help physician in the prescription of appropriate antifungal agents to the patients. This approach would help in preventing failure cases and drug resistance in patients due to superficial fungal infections.

MATERIALS AND METHODS

Data selection and search strategy

This study was conducted following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) strategies (Zeng *et al.*, 2015). Web of Science, PubMed, Google Scholar and Scopus databases were

searched for relevant published articles using the following terms: Tinea cruris, jock itch, dermatophytosis, dermatophytes infection and tinea infections. In each electronic database, a combination of the mentioned terms was used to conduct the search again. The references of the relevant published articles were also searched for finding additional information. The data selection was based on human clinical isolates.

Eligibility criteria

The major inclusion criteria included the published articles that reports studies on the tinea cruris, jock itch, dermatophytosis, dermatophytes infection and tinea infections including retrospective, cohort and case-control studies, meta-analyses, clinical and observational studies and literature reviews. The information regarding the demography of the study, clinical presentation, dermatophyte species, diagnosis, differential diagnosis and the use of antifungal therapy was also extracted from the relevant studies. All studies without relevant data about tinea cruris were excluded. Studies without duplicate reports on different databases, full text available and studies with missing or unclear information was also excluded.

RESULTS

Table 1 is the mean age and gender distribution of the infection in the population from the reported studies. The result shows that the most commonly affected age group in females was 31 – 40 years (32.7%) while affected males was between 21 – 30 years (40.0%). The incidence was lower in elderly age group (60 years and above) compared to other age groups. Table 2 is the frequency of clinical lesions of the infection in the population. The result shows that the most common clinical presentation was tinea cruris in females (27.3%) and males (25.3%) when compared to dual site tinea cruris and tinea corporis in females (23.6%) and males (16.8%) from the reported studies. The presentations were more in females when compared to males as represented in Table 2. Table 3 is the frequency of dermatophytic isolates of tinea cruris from the reported studies. The result shows that the most common dermatophytes causing tinea cruris were *Microsporum gypseum* (75.0%) followed by *Microsporum audouinii* (33.3%). While in dual site tinea cruris and tinea corporis, the most common species include *Microsporum boullardii* (100.0%) followed by *Microsporum audouinii* (33.3%). Table 4 is the common dermatophyte species causing tinea infections in some regions of the world. The result shows that the most common dermatophyte species were *Trichophyton rubrum* followed by *Trichophyton mentagrophytes*. Table 5 is the synopsis of the antifungal agents used in the treatment of tinea cruris. The result

Table 1. Age and gender wise distribution of the infection in the population.

Age Group (in years)	Females (%)	Males (%)	References
10 - 20	12.7	24.2	
21 - 30	21.8	40.0	
31 - 40	32.7	17.9	Basavarajappa <i>et al.</i> , 2022; Konda <i>et al.</i> , 2017; Havlickova <i>et al.</i> , 2008; Dabas <i>et al.</i> , 2017; Sahin <i>et al.</i> , 2004
41 - 50	20.0	8.4	
51 - 60	9.1	7.4	
60 and Above	3.6	2.1	

Table 2. Frequency of clinical lesions of tinea cruris in the population.

Clinical Diagnosis	Females (%)	Males (%)	References
Tinea cruris	27.3	25.3	Basavarajappa <i>et al.</i> , 2022; Konda <i>et al.</i> , 2017
Tinea cruris and Tinea corporis	23.6	16.8	

Table 3. Frequency of dermatophytic isolates of the infections.

Dermatophyte species	Tinea cruris (%)	Tinea cruris and Tinea corporis (%)	References
<i>Trichophyton rubrum</i>	29.5	19.7	
<i>Trichophyton mentagrophytes</i>	23.9	20.9	Dabas <i>et al.</i> , 2017;
<i>Microsporum gypseum</i>	75.0	0	Basavarajappa <i>et al.</i> , 2022; Putta <i>et al.</i> , 2016;
<i>Microsporum boullardii</i>	0	100.0	Sabtharishi <i>et al.</i> , 2017
<i>Microsporum audouinii</i>	33.3	33.3	
<i>Epidermophyton floccosum</i>	10.0	10.0	

Table 4. Common dermatophyte species of tinea infections in some regions of the world.

S/N	Locations	Year	Predominant Dermatophyte Species	References
1.	Davanagere, Southern India	2022	<i>Trichophyton</i> species (88%)	Basavarajappa <i>et al.</i> , 2022
2.	Uttar Pradesh, Northern India	2018	<i>Trichophyton mentagrophytes</i> (52.47%)	Narain <i>et al.</i> , 2018
3.	Chandigarh, India	2018	<i>Trichophyton mentagrophytes</i> (40%) and <i>Trichophyton interdigitale</i> (11.1%)	Pathania <i>et al.</i> , 2018
4.	Uttar Pradesh, Northern India	2017	<i>Trichophyton mentagrophytes</i> (75.9%)	Mahajan <i>et al.</i> , 2017
5.	Delhi, India	2017	<i>Trichophyton schoenleinii</i> (8.1%) and <i>Trichophyton rubrum</i> (8.1%)	Kaur, 2017
6.	Yan'an Region, China	2016	<i>Trichophyton rubrum</i>	Ma <i>et al.</i> , 2016
7.	Punjab, Northern India	2016	<i>Trichophyton mentagrophytes</i> (46.43%)	Kansra <i>et al.</i> , 2016
8.	Bihar, Eastern India	2016	<i>Trichophyton rubrum</i> (62.3%)	Chaudhary and Kumar, 2016
9.	Nepal, Southern Asia	2015	<i>Trichophyton rubrum</i> (58.33%)	Paudel and Manandhar, 2015
10.	Bhutan, Southern Asia	2015	<i>Trichophyton rubrum</i> (88.35%)	Lee <i>et al.</i> , 2015
11.	Pakistan, Southern Asia	2014	<i>Trichophyton interdigitale</i> (3.9%)	Shujat <i>et al.</i> , 2014
12.	Uttar Pradesh, Northern India	2011	<i>Trichophyton mentagrophytes</i> (25%)	Sahai and Mishra, 2011
13.	China	2010	<i>Trichophyton rubrum</i>	Xu and Li, 2010
14.	Chongqing Area, China	2008	<i>Trichophyton rubrum</i>	Xionget <i>et al.</i> , 2008
15.	Sri Lanka, Southern Asia	1998	<i>Trichophyton rubrum</i> (52%)	Attapattu, 1998
16.	Punjab, Northern India	1993	<i>Trichophyton rubrum</i> (42.42%)	Gupta <i>et al.</i> , 1993

shows that the terbinafine and luliconazole 1% are more effective and require short-term (14 days) treatment against tinea cruris when compared to other antifungal

agents, while clotrimazole 1%, econazole 1% and miconazole 1% are also effective but require long-term (42 days) treatment against the infection as represented in

Table 5. Synopsis of the antifungal agents used in the treatment of tinea cruris.

Antifungal Agents	Preparations	Frequency of Application	Duration of Use	References
Allylamines	Terbinafine	Powder, Cream	Twice a day	14 days
	Butenafine 1%	Cream	Once or twice a day	14 – 28 days
	Naftifine 1%	Cream	Once or twice a day	Use 14 days beyond resolution of symptoms
Imidazoles	Eberconazole 1%	Cream	Once a day	14 – 28 days
	Clotrimazole 1%	Lotion, Cream	Twice a day	28 – 42 days
	Luliconazole 1%	Lotion, Cream	Once a day	14 days
	Econazole 1%	Cream	Once or twice a day	28 – 42 days
	Sertaconazole 2%	Cream	Twice a day	28 days
	Oxiconazole 2%	Lotion, Cream	Once or twice a day	28 days
	Miconazole 1%	Lotion, Cream	Twice a day	28 – 42 days

Table 6. Recommended dose of antifungal drugs against Tinea cruris.

Drug	Dose (Oral)	Duration of use	References
Gresiofulvin	500 mg/day (10 – 20 mg/kg/day)	14 – 28 days	Sahoo and Mahajan, 2016; Leshner, 1999
Terbinafine	250 mg once a day, 3 – 6 mg/kg/day	14 – 21 days	Bourlond <i>et al.</i> , 1989; Cole and Stricklin, 1989;
Fluconazole	150 – 300 mg/week	21 – 28 days	Panagiotidou <i>et al.</i> , 1992; Faergemann <i>et al.</i> , 1997; Bell-Syer <i>et al.</i> , 2012
Itraconazole	200 mg/day	7 – 14 days	

Table 7. Differential diagnosis of tinea cruris.

S/N	Resemble Ailments	References
1.	Darier Disease	
2.	Psoriasis vulgaris	
3.	Erythrasma	
4.	Seborrheic dermatitis	
5.	Cutaneous candidiasis	
6.	Intertrigo	Patel <i>et al.</i> , 2009; Andrews and Burns, 2008; Gupta <i>et al.</i> , 2003
7.	Pemphigus vegetans	
8.	Contact dermatitis	
9.	Langerhans cell histiocytosis	
10.	Lichen simplex chronicus	
11.	Majocchi granuloma	
12.	Tinea versicolor	

Table 5. Table 6 is the recommended dose of antifungal drugs against tinea cruris. The result shows that the itraconazole is more effective and require short-term (14 days) treatment against tinea cruris followed by terbinafine which require 21 days treatment against the infection. Table 7 is the differential diagnosis of tinea cruris. The result shows that the Darier disease, psoriasis vulgaris, erythrasma, seborrheic dermatitis, cutaneous candidiasis, intertrigo, pemphigus vegetans, contact dermatitis, langerhans cell histiocytosis, lichen simplex chronicus, majocchi granuloma and tinea versicolor may resemble tinea cruris.

DISCUSSION

Demography

In this study, the most frequently affected age group in females was 31-40 years (32.7%) while affected males was between 21-30 years (40.0%). The incidence was lower in elderly age group (60 and above) years compared to other age groups which is consistent with the studies reported by Basavarajappa *et al.* (2022). The mean age of affected individuals and the incidence of the infections were also consistent to the reported studies by Dabas *et*

al. (2017) and by Konda *et al.* (2017) with an incidence of dermatomycosis of 37% between 21-30 years of age followed by 18% between 31 – 40 years of age group. The higher incidence of the infections in younger age may be due to easy exposure to the affected individuals and increased physical activity. The preponderance in females compared to males was also reported in the studies by Basavarajappa *et al.* (2022). The seasonal preponderance in summers was reported by Kumar *et al.* (2018), where the infections rate was 60% during warmer climate. Basavarajappa *et al.* (2022) reported that the tinea infections were more common during the summer season (February to May) when compared to winter and rainy seasons. The probable reason could be due to extreme sweating and warmer climate in the part of their regions.

Clinical presentation

The most common clinical presentation was tinea cruris in females (27.3%), followed by males (25.3%) when compared to dual site tinea cruris and tinea corporis in females (23.6%) and males (16.8%). The clinical presentation of dermatomycosis was also reported by Basavarajappa *et al.* (2022) for tinea cruris (26%) and dual site tinea corporis and tinea cruris (19.33%) which agreed with the studies reported by Konda *et al.* (2017) that the clinical presentation for tinea cruris (25%) which is in line with the findings of this current study. The presentations were more in females when compared to males as represented in this study which is contrarily to the findings reported by Basavarajappa *et al.* (2022) and by Konda *et al.* (2017).

Laboratory investigations

For a laboratory to provide best results from desire investigation, quality and quantity of specimen to be examined is crucial. Scraping of specimen should be collected from active margin and transported in a presterilized black chart paper to inhibit over growth of bacteria contaminants and keeps the specimen dry. To confirm the diagnosis of dermatophytosis, numerous laboratory tests can be employed such as direct microscopic examination, treatment of skin specimen with 10-20% potassium hydroxide (KOH) which is not costly and quick bedside tool to show evidence of the tinea infection (Kurade *et al.*, 2006). Culture and antifungal sensitivity; Sabouraud dextrose agar is the routinely used isolation media for skin, hair and nail infections and serves as the medium for most morphological description of dermatophytes. Dermatophyte identification; this can be based on microscopic morphology, physiologic tests and colony characteristics. And the dermatophytes can be classified based upon their morphological features of macroconidia. However, special amino acid and vitamin requirements can distinguish *Trichophyton* species from

other dermatophytes. Histology may be used in diagnosis of Majocchi's granuloma in which potassium hydroxide investigation of scale on the surface may usually be negative. Special stains usually used are Gomori's methanamine silver and acid-Schiff which facilitates to highlight hyphae. In polymerase chain reaction and nucleic acid sequence based amplification, the tests also help in determining drug resistance not only help in the rapid and early diagnosis of dermatophytes infection, and include uniplex PCR for direct dermatophyte detection in clinical specimens and multiplex PCR-ELISA assay which distinguishes different dermatophyte species (Yang *et al.*, 2007). Reflectance confocal microscopy provides *in vivo* imaging of the superficial dermis and epidermis at cellular stage resolution and usually used to identify parasitic infestations and cutaneous fungi (Hui *et al.*, 2013). Reflectance confocal microscopy and PCR are often used primarily for the identification of dermatophyte species.

Identification of dermatophytes

The most common dermatophytes causing tinea cruris were *Microsporum gypseum* (75.0%) followed by *Microsporum audouinii* (33.3%) which disagreed with the findings reported by Basavarajappa *et al.* (2022), that *Microsporum* species were detected only in 5.33% of cases and the most common species isolated were *Trichophyton mentagrophytes*. The most common clinical manifestation with numerous dermatophytes involved was tinea corporis followed by tinea cruris. In dual site tinea cruris and tinea corporis, the most common species include *Microsporum boullardii* (100.0%) followed by *Microsporum audouinii* (33.3%). This current study agrees with the findings reported by Sabtharishi *et al.* (2017) shows 1.25%, 2.5% and 96.25% of *Microsporum*, *Epidermophyton*, and *Trichophyton* species respectively and Dabas *et al.* (2017) showed 4.5% and 95.4% for *Microsporum* and *Epidermophyton* species, respectively. In this study, the most common dermatophyte species were *Trichophyton rubrum* followed by *Trichophyton mentagrophytes*. Putta *et al.* (2016) reported that *Trichophyton mentagrophytes* was the common dermatophytes (37.74%). The most common clinical manifestation with maximum numerous dermatophytes involved was tinea cruris followed by dual site tinea cruris and tinea corporis. Similar results were reported by Dabas *et al.* (2017), tinea cruris (53.03%) and tinea corporis (5 of 6 different dermatophytes represented as 83.3%).

Topical antifungal therapy for tinea cruris

Topical antifungal agents have better pharmacokinetics than systemic treatment against tinea cruris. Combination of both topical and systemic therapy is expected to have better mycological cure than topical and systemic alone. The combination treatment should be from different groups

of antifungal agents for wide coverage and to prevent emergence of resistant or therapeutic failure. Antifungal agents given for shorter duration with higher dose provide a less chance of development of resistance when compared to lower dose for longer duration in the treatment of tinea infections (Sahoo and Mahajan, 2016). Drug with lipophilic and keratophilic property, when given in higher doses will lead to better mycological cure rate and have reservoir effect. Numerous topical antifungal agents are available for the treatment of localized tinea cruris. Most of the reported studies in the treatment of tinea cruris have evaluated at the effectiveness of topical agents with very few reports on the use of oral antifungal agents. Rotta *et al.* (2013) reported the effectiveness of antifungal therapy involving 14 different topical agents with 65 randomized controlled trials (RCTs), comparing topical agents with placebo or with one another. Terbinafine and luliconazole 1% was found to be superior with shorter duration of treatment when compared to other antifungal agents such as clotrimazole 1%, econazole 1% and miconazole 1% which is consistent with the findings reported by Sahoo and Mahajan (2016). Similarly, El-Gohary *et al.* (2014) reported that the topical antifungal therapy for tinea cruris and tinea corporis evaluates that the patient treatments with naftifine and terbinafine are more effective with few adverse effects. Sahoo and Mahajan (2016) reported that other topical agents like azoles therapy are effective in terms of mycological and clinical cure rates. However, there is no standard guideline regarding combinations treatment of antifungal agents and topical steroids. Topical antifungal agents are often given once or twice daily for 14 to 42 days as illustrated. Some studies reported some common reasons of failure of therapy against tinea infection such as infection with rare species, drug resistance, poor adherence to treatment, misdiagnosis and reinfection from close contact (Sahoo and Mahajan, 2016). In such condition, affected individuals should be referred to a higher or specialist health care center for appropriate management. Havlickova and Friedrich (2008) reported that additional topical steroid also facilitates the bioavailability of topical antifungal agents such as imidazole groups with better symptomatic relief in early inflammatory stage. Topical antifungal agents with effective anti-inflammatory action such as luliconazole or sertaconazole may be a potential option than an antifungal-steroid combination. Luliconazole has fungicidal effect against numerous *Trichophyton* species that have similar or more effects than terbinafine. Luliconazole is available in 1% cream or lotion formulation, use once daily for 14 days for dermatophytic infections.

Oral antifungal therapy in tinea cruris

Out of the numerous systemic antifungal agents, itraconazole and terbinafine are frequently prescribed. Bourlond *et al.* (1989) reported that fluconazole and griseofulvin are also effective but require long-term

treatment against tinea cruris which is consistent with the current study. Comparative trial between ultramicronized griseofulvin 500 mg/day with itraconazole 100 mg/day for tinea cruris showed significantly better mycological and clinical result in favour of itraconazole after 14 days of treatment against the infections. A double-blinded study between griseofulvin (500 mg/day) and itraconazole (100 mg/day) revealed itraconazole to be more effective in proving mycological cure (Panagiotidou *et al.*, 1992). In a systematic review of the effectiveness of oral antifungal agents, terbinafine was found to be superior to griseofulvin, whereas the effectiveness of itraconazole and terbinafine were similar as reported by Bell-Syer *et al.* (2012), and that disagreed with the current study. There is paucity of any recent studies regarding systemic antifungal agents in the treatment of tinea cruris. Although few newer systemic antifungal agents have been approved in few years ago but most of them are reserved for severe life-threatening invasive systemic mycoses with inadequate of evidence on effectiveness in superficial mycoses. Jachiet *et al.* (2015) reported that posaconazole was found to be effective in a patient with severe dermatophytic nail and stratum corneum infection with underlying CARD9 mutation.

Differential diagnosis of tinea cruris

There is a broad differential diagnosis for a scaling of the groin as represented in Table 7. Darier disease, psoriasis vulgaris, erythrasma, seborrheic dermatitis, cutaneous candidiasis, intertrigo, pemphigus vegetans, contact dermatitis, langerhans cell histiocytosis, lichen simplex chronicus, majocchi granuloma and tinea versicolor may resemble tinea cruris (Patel *et al.*, 2009). Cutaneous candidiasis usually affects women. While in men, the infection is often distinguished by its involvement of the scrotum with satellite lesions, white pustules, lack of central clearing and uniform redness of the site of groin. Erythrasma, caused by bacteria such as *Corynebacterium minutissimum* in intertriginous sites, and under wood's lamp it usually generates coral fluorescence, uniformly brown, no active border with minimal scaling (Andrews and Burns, 2008). Intertrigo is less scaly, more erythematous, and usually found in the moist body folds of affected individuals who are obese, with minimal extension of lesion onto the thighs. Tinea versicolor may be examined by potassium hydroxide preparation, other differential diagnoses such as psoriasis will show negative potassium hydroxide results (Patel *et al.*, 2009).

CONCLUSION

There is paucity of current national and international guidelines on the management of tinea infections, and therapy with systemic antifungal agents is usually pragmatic. Recently, there is sudden increase number of cases of dermatophytes infection globally, and that call for

urgent attention of dermatologists, drug regulatory authorities, microbiologists, public health department, government and general population. The government should help to provide free treatment to vulnerable patients. Awareness should be employed among people through health education and promotion activities, newspaper, social or electronic media. Treatment of tinea cruris has increasingly become difficult, and most of antifungal agents appear to be ineffective and costly. Terbinafine, luliconazole and itraconazole are the most active antifungal agents against tinea cruris infection. However, some dermatophytes that cause the infection might develop the possibility of increased antifungal resistance. Currently, Ciclopirox olamine is one of the most effective topical antifungal agents and should be applied once or twice daily as prescribed by the physician to the affected areas and 2cm to 3cm unaffected areas beyond the scale. Topical antifungal agents may lower the local immunity and facilitate the extensive and atypical lesions. Weight should be decreased to avoid buildup of moisture and recurrence of jock itch. The surrounding groin must be kept clean and dry, wet and tight-fitting wears should be avoided. If superficial fungal infection is present on any other region, separate towels for each area should be used after bathing. Using disposable gloves when cleaning and wearing socks before undergarments can be helpful methods to decrease the dissemination of dermatophytes to the groin. Using antifungal powders can also prevent the spread of the infection. Habit of good personal and environment hygiene is crucial because the infection is contagious.

COMPETING INTERESTS

Author declares no competing interests.

REFERENCES

- Abanmi, A., Bakheshwain, S., El Khizzi, N., Zouman, A. R., Hantirah, S., Al Harthi, F., Al Jamal, M., Rizvi, S. S., Ahmad, M., & Tariq, M. (2008). Characteristics of superficial fungal infections in the Riyadh region of Saudi Arabia. *International Journal of Dermatology*, 47(3), 229-235.
- Alston, S. J., Cohen, B. A., & Braun, M. (2003). Persistent and recurrent tinea corporis in children treated with combination antifungal/corticosteroid agents. *Pediatrics*, 111(1), 201-203.
- Andrews, M. D., & Burns, M. (2008). Common tinea infections in children. *American Family Physician*, 77(10), 1415-1420.
- Arshah, T. M., Muftah al-bakosh, A., Ali, M. M., Ramadan, H. A., Alshawish, S. S., Algonady, M. A., Alrtail, A. & Rzeg, M. (2015). Epidemiology of superficial fungal skin infections in patients attending Zliten teaching hospital. *Journal of Basic Sciences*, 27, 83-93.
- Attapattu, M. C. (1998). The changing patterns of dermatomycoses in Sri Lanka. *Sri Lanka Journal of Dermatology*, 3, 3-8.
- Basavarajappa, S. M., Madhusudhan, K. S., Rudrappa, M. R., & Reddy, K. S. (2022). Evaluation of antifungal susceptibility pattern of dermatophytes isolated in a tertiary care hospital. *National Journal of Physiology, Pharmacy and Pharmacology*, 12(10), 1565-1571.
- Bell-Syer, S. E., Khan, S. M., & Torgerson, D. J. (2012). Oral treatments for fungal infections of the skin of the foot. *Cochrane Database Systematic Reviews*, 10, CD003584.
- Bourlond, A., Lachapelle, J. M., Aussems, J., Boyden, B., Campaert, H., Coninx, S., Decroix, J., Geeraerts, C., Ghekiere, L., Porters, J., & Willocx, D. (1989). Double-blind comparison of itraconazole with griseofulvin in the treatment of tinea corporis and tinea cruris. *International Journal of Dermatology*, 28(6), 410-412.
- Chaudhary, J. K., & Kumar, A. A. (2016). Clinico-Mycolological profile of dermatophytosis at a tertiary care hospital in Bihar. *International Journal of Current Microbiology and Applied Science*, 5(2), 181-189.
- Cole, G. W., & Stricklin, G. (1989). A comparison of a new oral antifungal, terbinafine, with griseofulvin as therapy for tinea corporis. *Archives of Dermatology*, 125(11), 1537-1539.
- Dabas, Y., Xess, I., Singh, G., Pandey, M., & Meena, S. (2017). Molecular identification and antifungal susceptibility patterns of clinical dermatophytes following CLSI and EUCAST guidelines. *Journal of Fungi*, 3(2), 17.
- Darade, R. B., Zambare, K. K., Jaiswal, N. R., & Kaware, A. A. (2019). An overview on pharmacotherapy of Jock itch (Tinea cruris). *World Journal of Pharmaceutical Research*, 9(1), 851-856.
- Drake, L. A., Dinehart, S. M., Farmer, E. R., Goltz, R. W., Graham, G. F., Hordinsky, M. K., Lewis, C. W., Pariser, D. M., Skouge, J. W., Webster, S. B., & Scher, R. K. (1996). Guidelines of care for superficial mycotic infections of the skin: Tinea corporis, tinea cruris, tinea faciei, tinea manuum, and tinea pedis. *Journal of the American Academy of Dermatology*, 34(2), 282-286.
- El-Gohary, M., van Zuuren, E. J., Fedorowicz, Z., Burgess, H., Doney, L., Stuart, B., Moore, M. & Little, P. (2014). Topical antifungal treatments for tinea cruris and tinea corporis. *Cochrane Database of Systemic Reviews*, 8, CD009992.
- Faergemann, J., Mörk, N. J., Haglund, A., & Ödegård, T. (1997). A multicentre (double-blind) comparative study to assess the safety and efficacy of fluconazole and griseofulvin in the treatment of tinea corporis and tinea cruris. *British Journal of Dermatology*, 136(4), 575-577.
- Gupta, A. K., & Kohli, Y. (2003). In vitro susceptibility testing of ciclopirox, terbinafine, ketoconazole and itraconazole against dermatophytes and nondermatophytes, and in vitro evaluation of combination antifungal activity. *British Journal of Dermatology*, 149(2), 296-305.
- Gupta, A. K., Chaudhry, M., & Elewski, B. (2003). Tinea corporis, tinea cruris, tinea nigra, and piedra. *Dermatologic clinics*, 21(3), 395-400.
- Gupta, B. K., Kumar, S., Kumar, R. A., & Khurana, S. (1993). Mycological aspects of dermatomycoses in Ludhiana. *Indian Journal of Pathology and Microbiology*, 36(3), 233-237.
- Haedersdal, M., & Svejgaard, E. L. (2003). Systematic treatment of tinea pedis--evidence for treatment? A result of a Cochrane review. *Ugeskrift for Læger*, 165(14), 1436-1438.
- Havlickova, B., & Friedrich, M. (2008). The advantages of topical combination therapy in the treatment of inflammatory dermatomycoses. *Mycoses*, 51, 16-26.
- Havlickova, B., Czaika, V. A., & Friedrich, M. (2008). Epidemiological trends in skin mycoses worldwide. *Mycoses*, 51, 2-15.
- Hui, D., Xue-cheng, S., & Ai-e, X. (2013). Evaluation of reflectance confocal microscopy in dermatophytosis.

- Mycoses*, 56(2), 130-133.
- Jachiet, M., Lanternier, F., Rybojad, M., Bagot, M., Ibrahim, L., Casanova, J. L., Puel, A., & Bouaziz, J. D. (2015). Posaconazole treatment of extensive skin and nail dermatophytosis due to autosomal recessive deficiency of CARD9. *JAMA Dermatology*, 151(2), 192-194.
- Kansra, S., Devi, P., Sidhu, S., & Malhotra, A. (2016). Prevalence of dermatophytosis and their antifungal susceptibility in a tertiary care hospital of North India. *International Journal of Science and Research*, 5(3), 450-453.
- Kaur, R. (2017). Clinico-mycological pattern of hair and skin infection in New Delhi. *Journal of Intensive and Critical Care*, 3(2).
- Khanna, D., & Bharti, S. (2014). Luliconazole for the treatment of fungal infections: an evidence-based review. *Core evidence*, 9, 113-124.
- Konda, C., Surekha, J. K., Jahnavi, I., Madhuri, D. S., & Nagamani, K. (2017). Isolation and identification of dermatophytes in a tertiary care hospital. *International Journal of Current Microbiology and Applied Sciences*, 6, 4088-101.
- Kumar, M., Swami, T., Pannu, S., Datt, S., & Kumar, R. (2018). Study of clinico-mycologic profile and antifungal susceptibility pattern of dermatophytic infection in the North-Western Zone of Rajasthan, India. *International Journal of Current Microbiology and Apply Sciences*, 7, 762-65.
- Kurade, S. M., Amladi, S. A., & Miskeen, A. K. (2006). Skin scraping and a potassium hydroxide mount. *Indian Journal of Dermatology, Venereology and Leprology*, 72(3), 238-41
- Lee, W. J., Kim, S. L., Jang, Y. H., Lee, S. J., Bang, Y. J., & Jun, J. B. (2015). Increasing prevalence of Trichophyton rubrum identified through an analysis of 115,846 cases over the last 37 years. *Journal of Korean Medical Science*, 30(5), 639-643.
- Leshner Jr, J. L. (1999). Oral therapy of common superficial fungal infections of the skin. *Journal of the American Academy of Dermatology*, 40(6), S31-S34.
- Ma, X.N., Zhang, H., Han, X.H., et al. (2016). Clinical analysis of 1422 cases of superficial mycoses in Yan'an Area. The Chinese Journal of Dermatovenereology, 30(9):908-910.
- Mahajan, S., Tilak, R., Kaushal, S. K., Mishra, R. N., & Pandey, S. S. (2017). Clinico-mycological study of dermatophytic infections and their sensitivity to antifungal drugs in a tertiary care center. *Indian Journal of Dermatology, Venereology and Leprology*, 83(4), 436-440.
- Nadalo, D., Montoya, C., & Hunter-Smith, D. (2006). What is the best way to treat tinea cruris? *The Journal of Family Practice*, 55(3), 256-258.
- Narain, U., Bajaj, A. K., & Kant, A. (2018). Tinea: Incidence during Magh Mela. *International Journal of Advances in Medicine*, 5(4), 993-996.
- Panagiotidou, D., Kousidou, T., Chaidemenos, G., Karakatsanis, G., Kalogeropoulou, A., Teknetzis, A., Chatzopoulou, E., & Michailidis, D. (1992). A Comparison of Itraconazole and Griseofulvin in the Treatment of Tinea Corporis and Tinea Cruris: A Double-Blind Study. *Journal of International Medical Research*, 20(5), 392-400.
- Patel, G. A., Wiederkehr, M., & Schwartz, R. A. (2009). Tinea cruris in children. *Pediatric Dermatology*, 84, 133-137.
- Pathania, S., Rudramurthy, S. M., Narang, T., Saikia, U. N., & Dogra, S. (2018). A prospective study of the epidemiological and clinical patterns of recurrent dermatophytosis at a tertiary care hospital in India. *Indian Journal of Dermatology, Venereology and Leprology*, 84(6), 678-684.
- Paudel, D., & Manandhar, S. (2015). Dermatophytic Infections among the patients attending Di Skin Hospital and Research Center at Maharajgunj Kathmandu. *Journal of Nepal Health Research Council*, 13(31), 226-232.
- Putta, S. D., Kulkarni, V. A., Bhadade, A. A., Kulkarni, V. N., & Walawalkar, A. S. (2016). Prevalence of dermatophytosis and its spectrum in a tertiary care hospital, Kolhapur. *Indian Journal of Basic and Applied Medical Research*, 5(3), 595-600.
- Rotta, I., Ziegelmann, P. K., Otuki, M. F., Riveros, B. S., Bernardo, N. L., & Correr, C. J. (2013). Efficacy of topical antifungals in the treatment of dermatophytosis: a mixed-treatment comparison meta-analysis involving 14 treatments. *JAMA Dermatology*, 149(3), 341-349.
- Sabtharishi, V., Katragadda, R., & Ravinder, T. (2017). A study on the antifungal susceptibility pattern of dermatophytes isolated in a tertiary care hospital. *International Journal Bioassays*, 6, 5379-82.
- Sahai, S., & Mishra, D. (2011). Change in spectrum of dermatophytes isolated from superficial mycoses cases: First report from Central India. *Indian Journal of Dermatology, Venereology and Leprology*, 77(3), 335-336.
- Sahin, I., Oksuz, S., Kaya, D., Sencan, I., & Çetinkaya, R. (2004). Dermatophytes in the rural area of Duzce, Turkey. *Mycoses*, 47(11-12), 470-474.
- Sahoo, A. K., & Mahajan, R. (2016). Management of tinea corporis, tinea cruris, and tinea pedis: A comprehensive review. *Indian Dermatology Online Journal*, 7(2), 77-86.
- Seebacher, C., Bouchara, J. P., & Mignon, B. (2008). Updates on the epidemiology of dermatophyte infections. *Mycopathologia*, 166, 335-352.
- Shujat, U., Ikram, A., Abbasi, S. A., Ayyub, M., Mirza, I. A., & Fayyaz, M. (2014). Spectrum of superficial and deep fungal isolates in Northern Pakistan. *Virology and Mycology*, 3(2), 131.
- Sinha, A., & Kling, S. (2009). A review of adolescent obesity: prevalence, etiology, and treatment. *Obesity Surgery*, 19, 113-120.
- Xiong, Y., Zhou, C., Li, Q., Huang, X. Y., Huang, Y. H., Zhong, B. Y., Tang, S. Q., Dai, W., & Hao, F. (2008). Etiologic analysis of 2135 cases of superficial mycosis in Chongqing region. *Journal of Clinical Dermatology*, 37(11), 711-713.
- Xu, W., & Li, Y. (2010). Clinical analysis of 818 cases of superficial mycosis. *Guide China Medicine*, 8(13), 131-132.
- Yang, C. Y., Lin, T. L., Tzung, T. Y., Cheng, L. C., Wang, J. T., & Jee, S. H. (2007). Direct identification of dermatophyte DNA from clinical specimens by a nested polymerase chain reaction assay. *Archives of Dermatology*, 143(6), 799-816.
- Zeng, X., Zhang, Y., Kwong, J. S., Zhang, C., Li, S., Sun, F., Niu, Y., & Du, L. (2015). The methodological quality assessment tools for preclinical and clinical studies, systematic review and meta-analysis, and clinical practice guideline: a systematic review. *Journal of Evidence-Based Medicine*, 8(1), 2-10.