

Management of Dermatophytosis: Real-World Indian Perspective

Abstract

Background: In spite of the availability of multiple consensus statements on dermatophytosis management, different treatment approaches have been experienced in India and require more scrutiny to further update guidelines and improve patient care. **Aim:** To determine the different approaches in dermatophytosis diagnosis and management among dermatologists in India. **Materials and Methods:** A web-based questionnaire was created and validated by five panelists with experience of >15 years in dermatophytosis and then circulated to about 2,000 dermatologists in India in September 2021 for a real-world management scenario. **Results:** Out of 2,000 dermatologists, 459 responded. About half of the dermatologists (51%) routinely conduct potassium hydroxide mount (KOH) at the initiation of therapy. Similarly, about 53% of dermatologists initiate the management of dermatophytosis with combination therapy in all types of dermatophytosis for 4–6 weeks depending upon severity. Different types of combinations are being practiced, such as either two systemic and one topical, two topicals and one systemic, but the combination of one systemic and one topical (69%) is the most commonly practiced. Itraconazole (100 mg twice a day) and luliconazole are the most commonly prescribed antifungal medications. In case of non-response to routine dose of systemic anti-fungals, about 72% of dermatologists up dose them. Most of them continue these drugs for additional 1–2 weeks after clearance of the disease. Additionally, keratolytics and moisturizers are commonly prescribed. Additionally, 62% advise liver function tests (LFTs) at the initiation of therapy, whereas 72% advise monitoring adverse effects due to systemic antifungal drugs during treatment. **Conclusion:** Combination therapy stood out as the need of the hour in the current menace of dermatophytosis with timely monitoring of laboratory tests for adverse events due to the use of systemic antifungals for a longer duration.

Keywords: Combination therapy, dermatophytosis, India, itraconazole, real world management

Introduction

In comparison to yesteryears, the current scenario of dermatophytosis in India is marked by changes in epidemiological, clinical, and mycological features.^[1] Infections that are chronic, recurrent, non-responsive, or slowly responsive to conventional treatment regimens are becoming more common. *Trichophyton mentagrophytes complex* has emerged as the dominant pathogen, with a shifting pattern of dermatophyte isolates.^[2,3] A multidrug-resistant clad different from the *T. mentagrophytes/T. interdigitale complex* has recently been discovered.^[4] Additionally, the newly emerged fungus—*T. mentagrophytes* genotype VIII, now called *T. indotineae*, often causes pruritic and inflammatory forms of tinea infections, which are found to be terbinafine resistant.^[5,6] There was a paucity of guidelines/recommendations

for the management of dermatophytosis in India, especially in recalcitrant cases. Consequently, in 2018, experts created a consensus on dermatophytosis management [Expert Consensus on the Management of Dermatophytosis in India (ECTODERM India)]^[7], and in 2020, the Indian Association of Dermatologists, Venereologists, and Leprologists (IADVL) Task Force against Recalcitrant Tinea (ITART) published the consensus on the management of glabrous tinea (INTACT).^[1]

However, further research is required to fully grasp the real-world practice regarding the management of tinea infections and to determine the influence of these guidelines on diagnostic workup and treatment strategy selection. Many concerns, such as the dermatologist's awareness of guidelines, their practical implementation in clinical practice, and the causes for divergence

Manjunath Shenoy,
Shital Poojari¹,
Madhu Rengasamy²,
Maya Vedmurthy³,
Shyamanta Barua⁴,
Dhiraj Dhoot⁵,
Hanmant Barkate⁵

Department of Dermatology,
Yenepoya Medical College,
Mangalore, Karnataka,
¹Department of Dermatology,
K J Somaiya Medical College,
Mumbai, Maharashtra,
²Department of Dermatology,
Venereology and Leprosy, Madras
Medical College, ³Consultant
Dermatologist, Apollo
Hospital, Chennai, Tamil Nadu,
⁴Department of Dermatology,
Assam Medical College and
Hospital, Dibrugarh, Assam,
⁵Department of Global
Medical Affairs, Glenmark
Pharmaceuticals Ltd, Mumbai,
Maharashtra, India

Address for correspondence:

Dr. Dhiraj Dhoot,
Department of Global
Medical Affairs, Glenmark
Pharmaceuticals Ltd, B D
Sawant Marg, Chakala,
Andheri (E), Mumbai - 400 099,
Maharashtra, India.
E-mail: Dhiraj.dhoot@
glenmarkpharma.com

Access this article online

Website: www.idoj.in

DOI: 10.4103/idoj.idoj_643_22

Quick Response Code:



This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Shenoy M, Poojari S, Rengasamy M, Vedmurthy M, Barua S, Dhoot D, et al. Management of dermatophytosis: Real-world Indian perspective. Indian Dermatol Online J 2023;14:347-56.

Received: 29-Nov-2022. Revised: 04-Jan-2023.
Accepted: 21-Jan-2023. Published: 27-Apr-2023.

from standard recommendations, require more scrutiny to further update guidelines and improve patient care.

Consequently, expert dermatologists from India, who treat dermatophytic infections on large scale, created a questionnaire to get feedback on a wide range of topics related to the management of dermatophytosis and the perspectives related to the application of concerned national guidelines. Hence, this survey was conducted with the purpose to evaluate how well dermatologists across India know and follow the established guidelines, as well as reasons for deviation from guidelines and different treatment strategies in the real-world setup.

Materials and Methods

To assess the real-world experience of dermatophytosis management, an expert panel was formed comprising five dermatologists with a minimum experience of 15 years in management and research in the field of dermatophytosis.

A web-based multiple-choice questionnaire was created and circulated amongst panel members. The questionnaire comprised 47 questions pertaining to awareness, adherence, and/or deviation of current guidelines, laboratory work-up in dermatophytosis, and treatment options used. The survey was beta tested and approved by panelists before dissemination to other participants. The survey questionnaire was disseminated via a web link to 2,000 randomly selected dermatologists in September 2021, followed by a reminder to participate in October–December 2021. Participants were given 15 days to reply and were guaranteed complete anonymity.

Results

Out of 2,000 dermatologists from India who were sent the questionnaire, 459 (23%) completed the survey. Most dermatologists (72%) reported having clinical experience of more than 5 years and 69% had their own clinical setup. About 64% of dermatologists reported to be seeing more than 60 cases of dermatophytosis per week.

Rising trend of recalcitrant dermatophytosis

Increased incidence of chronic/recurrent or recalcitrant dermatophytosis has been noted in the current survey. As

per the results, 92% of dermatologists have noted that 50% of cases of dermatophytosis were chronic. As per the responses, there were many causes of chronicity as shown in Table 1. Additionally, 73% of dermatologists reported an increasing incidence of familial dermatophytosis in up to 25% of the total cases.

Adherence to guidelines

More than 90% of dermatologists generally follow guidelines, but most of them deviate occasionally. Almost all dermatologists (98%) were aware of one or more dermatophytosis guidelines/treatment recommendations. Fifty-eight percent of them complied with the IADVL textbook of dermatology followed by ECTODERM India and ITART guidelines (26% each). About 18.2% of dermatologists follow other guidelines. About 87% of dermatologists who follow guidelines reported to have deviated from them occasionally due to various reasons as shown in Figure 1.

Diagnostic test/lab workup for dermatophytosis

About half of the dermatologists (51%) often perform either potassium hydroxide mount (KOH) microscopy or fungal culture at the initiation of therapy for various reasons as shown in Figure 2. Additionally, 62% advise liver function tests (LFTs) at the initiation of therapy, whereas 72% advise them during treatment to monitor adverse effects due to systemic antifungal drugs.

Table 1: Reasons for non/poor therapy responsive or recalcitrant dermatophytosis

Reasons for non/poor therapy responsive or recalcitrant dermatophytosis	% response
Poor adherence to treatment	50%
Continued transmission from affected family members	37%
Poor hygiene	39%
Topical corticosteroid usage	44%
Comorbidities such as diabetes, HIV disease, malnutrition	26%
Antifungal resistance	52%
Increased virulence of dermatophytes	32%
Poor drug-quality of antifungals	24%

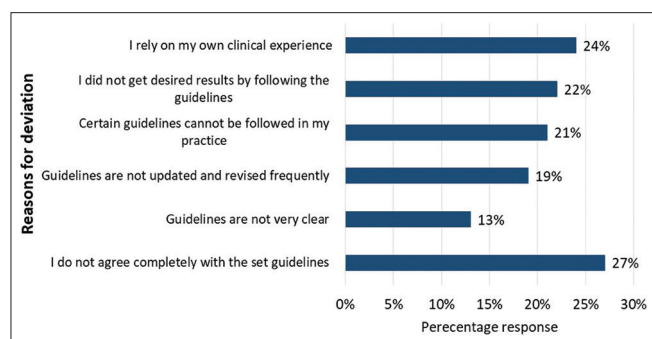


Figure 1: Various reasons for deviation from guidelines

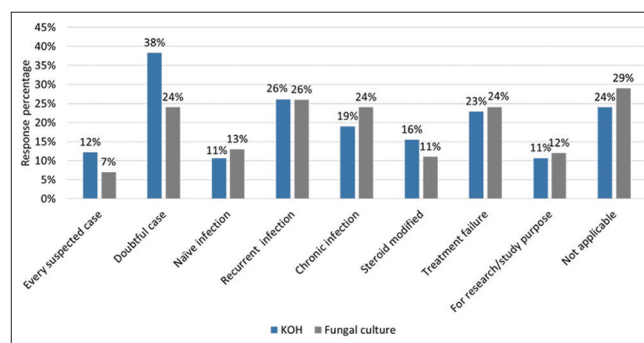


Figure 2: Indications for KOH/fungal culture in dermatophytosis management

Treatment strategy adopted for the management of dermatophytosis

About 53% of dermatologists initiate the management of dermatophytosis with combination therapy in all types of dermatophytosis. Different types of combination therapies are prescribed by dermatologists such as the combination of systemic and topical antifungals, a combination of one systemic and two topicals, and a combination of two systemic and one topical or two topical antifungals. Of these, 69% of them prescribe a combination of systemic and topical antifungals, of which itraconazole and topical azole (33%) is the most commonly prescribed combination followed by itraconazole and a non-azole topical antifungal drug (32%). A combination of one systemic and two topical antifungals (17%) is well prescribed in chronic and relapse cases. Other combination therapies such as the combination of either two systemic and one topical or two topical antifungals (14% each) are also prescribed in these cases [Figure 3a-c]. Recurrent (50%), chronic (38%), and treatment failure (34%) are the most common indications for use of a combination of systemic and topical antifungals.

Itraconazole (79%) is the most commonly prescribed systemic antifungal followed by terbinafine (61%) in all cases of dermatophytosis. The most common regimen of itraconazole prescribed is 100 mg twice a day (39%) followed by 200 mg once a day (28%). Only 7% of dermatologists prescribe itraconazole 200 mg twice a day. About 39% of dermatologists prescribe systemic therapy for 4–6 weeks in localized infection, whereas in chronic cases, 21% prescribe up to 6–8 weeks, and 17% for more than 8 weeks [Figure 4]. In case of non-response to routine dose of systemic anti-fungals, about 72% of dermatologists updose them.

Luliconazole (65%) is the most commonly prescribed topical antifungal drug followed by ciclopirox olamine (38%) [Figure 5]. All topical antifungals are prescribed for up to 4–6 weeks depending upon the severity of the disease. Additionally, both systemic and topical antifungal drugs are prescribed for additional 2 weeks for better clearance of lesions as reported by 82% and 89% of the respondents, respectively.

Adjuvant treatment in dermatophytosis

Moisturizers are prescribed by 78% of dermatologists, whereas keratolytics are prescribed by 73% in various phases of dermatophytosis management. H2 antihistamines are also commonly prescribed, whereas 57% prescribe immunomodulators. Topical tacrolimus is the most commonly prescribed immunomodulator (23%), followed by isotretinoin (17%). Dapsone and zinc are less commonly prescribed. All these adjuvant therapies are prescribed for 2–4 weeks depending on the clinical response [Figure 6].

Topical corticosteroid applications

As per 36% of dermatologists' responses, topical corticosteroids (TCS) are useful in some of the patients at the initiation of therapy. According to them, TCS are useful in inflamed or severe tinea infection and eczematization or severe dermatitis due to previous topical medications. Amongst dermatologists who prescribe TCS, 52% prescribe two-drug combinations (antifungal + topical steroid combination), whereas 38% prescribe three-drug combinations (antifungal + antibacterial + topical steroid combination). Most of them (84%) prescribe these combinations for the first 1–2 weeks, whereas the rest prescribe for more than 2 weeks.

Discussion

In India, very few recommendations and consensus papers for the treatment of dermatophytosis have been developed. However, several studies have been conducted nationwide to guide dermatologists in their routine clinical practice. This is the first survey that we are aware of that looked at the real-world management of dermatophytosis in India in reference to the established guidelines, adherence, and reasons for poor adherence if any.

Epidemiology

In the last 6–7 years, Indian dermatologists have seen an increase in chronic and recurrent dermatophytosis cases. Although there is no data on the prevalence of this infection at the population level, multiple hospital-based investigations have found disease burdens ranging from 36.6% to 78.4%^[1-4,7] This was in corroboration with findings of the present survey, wherein 42% of the dermatologists responded that they encounter >30 patients, with dermatophytosis per week, out of which 10% encounter >100 patients per week. These figures are simply the tip of the iceberg, given that they come from highly specialized skin care clinics.

The chronicity and recurrence of dermatophytosis are two conspicuous features of this epidemic.^[8] Any chronic skin ailment has a significant psychological and social impact on the patient.^[2,9,10] Another notable aspect of the current outbreak is the extensive dermatophytosis covering a substantial body surface area (BSA). Tinea corporis, alone or in conjunction with tinea cruris, has surpassed tinea cruris as the most common dermatophytosis presentation.^[11] A worrying increase in instances of resistant dermatophytosis has been reported in several studies in India.^[2-4] For cases that cannot be classified as chronic or recalcitrant, a new term called “unresponsive dermatophytosis” has been coined.^[12] It is unclear if people with this illness have relapsed owing to an undiscovered nail infection or if there is undetected intra-family transmission.^[3]

Apart from the obvious explanations for such a rise, the increased importance of familial dermatophytosis

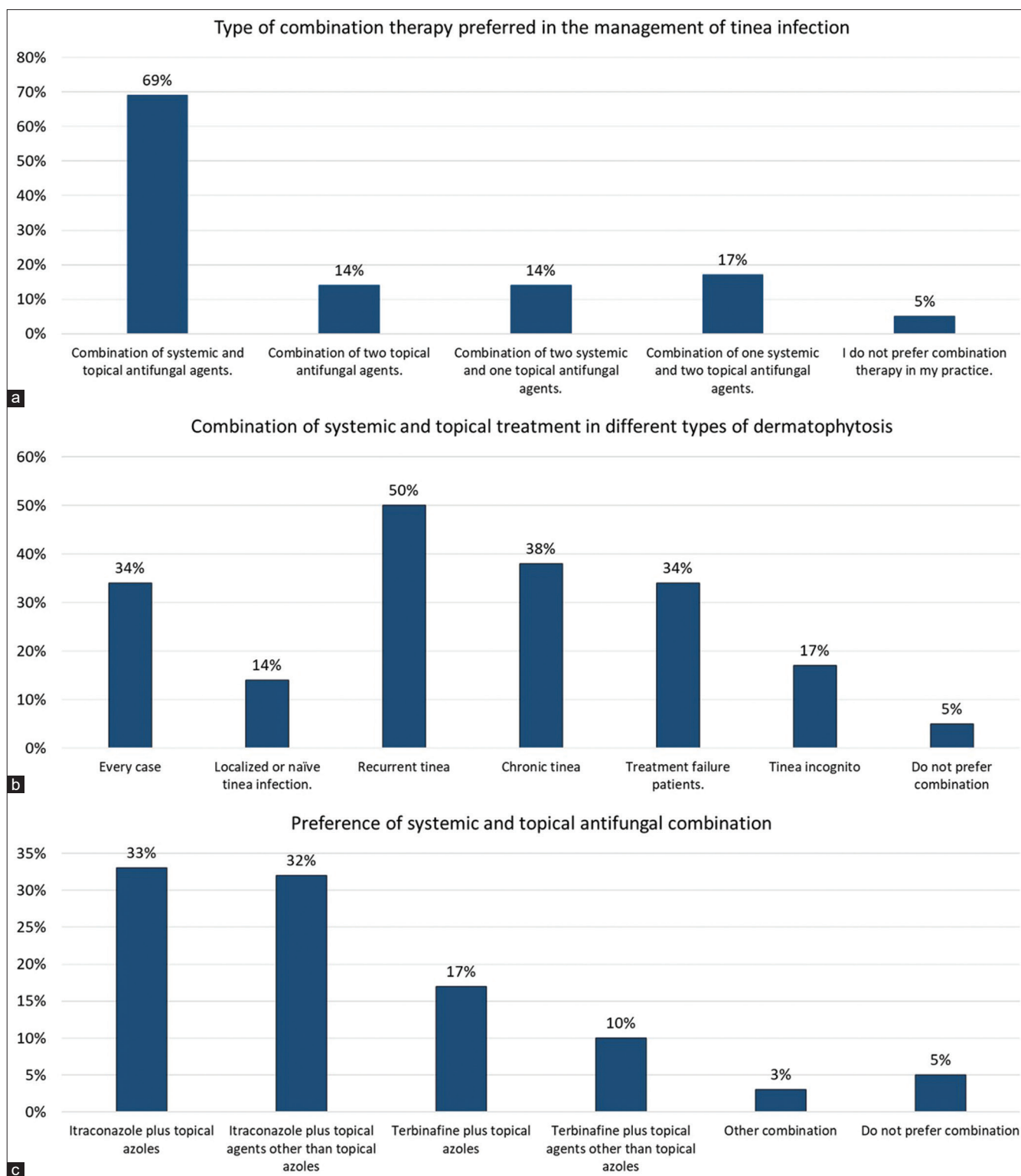


Figure 3: (a-c) Treatment approach for the management of dermatophytosis

transmission has emerged as one of the most important factors in the current survey. Undetected/untreated cases of dermatophytosis have been linked to recurrent infections in a particular family, according to research.^[1-3] In patients with recurring or chronic dermatophytosis, therapeutic failure cases frequently tend to have more than one afflicted family member, according to research.^[3,4] The entire family

is put in a financial bind as a result of this. Because it is an infectious disease, fomites play a significant part and their implication might differ depending on the traditional culture and behaviors. The practice of hand-washing garments in a single vessel in India, as opposed to using high-temperature washing machines in the West, is thought to have a significant influence on the spread of infection.^[3,4,7-9] In

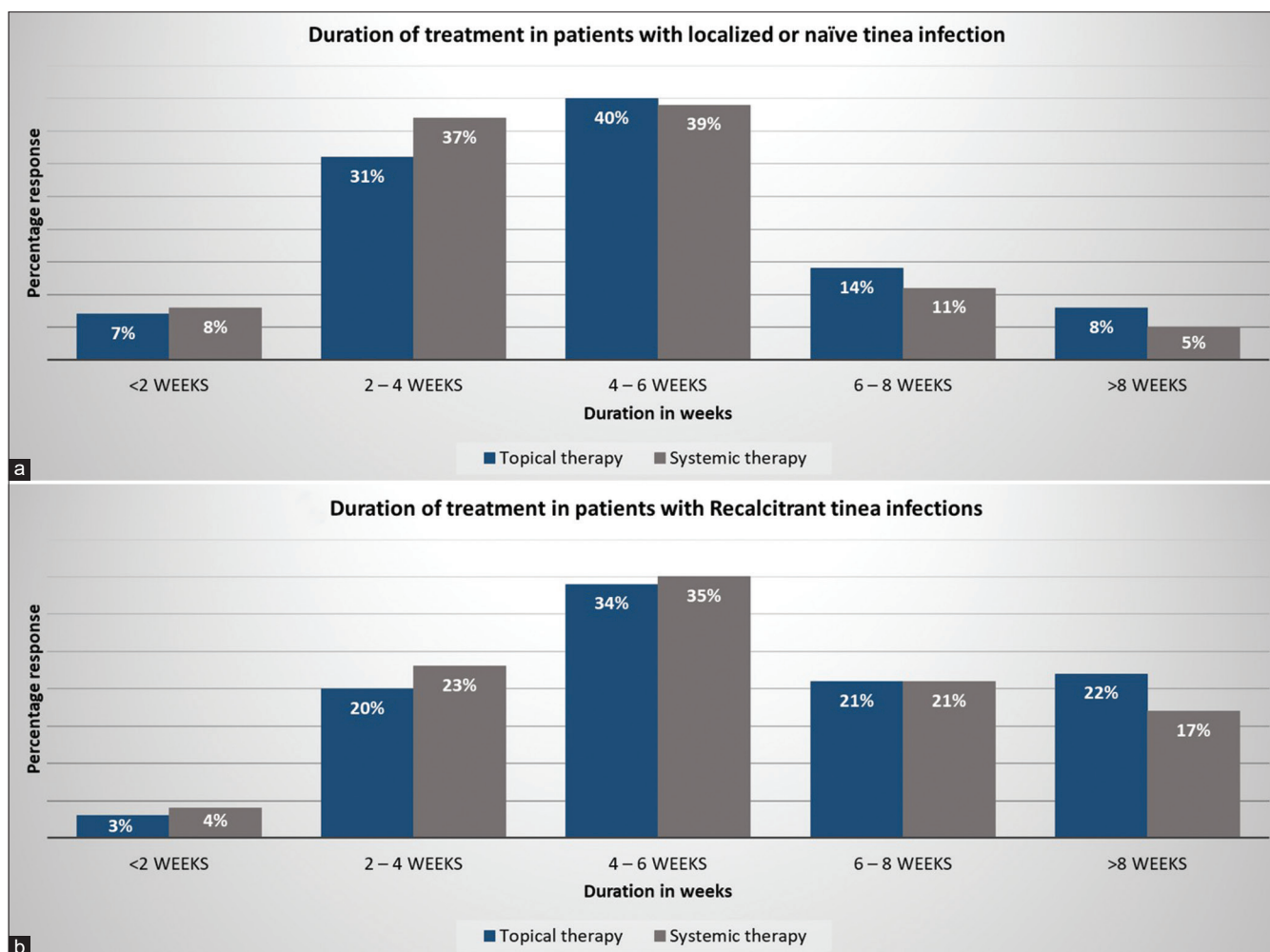


Figure 4: (a and b) Duration of treatment in different types of dermatophytosis

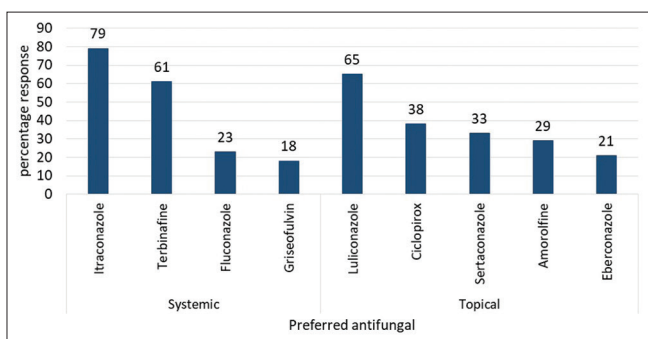


Figure 5: Preferred antifungal in management of dermatophytosis

India, sharing a bathing stool for sitting while taking a bath is quite common unlike showering in the West.

The majority of physicians are aware of and follow recommendations in their clinical practice on a regular basis, yet they occasionally diverge

Approximately 98% of dermatologists opined that they are aware of dermatophytosis guidelines and follow them in their clinical practice. However, several of them

have reported that they deviate from it for a variety of reasons. Non-agreement with current recommendations and dependence on own clinical expertise were the most common explanations mentioned. The number of patients with chronic/recalcitrant dermatophytosis has increased dramatically in the last 6–7 years across the country. The widespread usage of creams containing a mix of antifungals, ultra-potent corticosteroids, and antibiotics, either by self-medication or owing to prescription by the misguided practitioner, has exacerbated or possibly created this problem.^[2,8-11]

As a result, existing treatment protocols are no longer relevant.^[2] This indicates that the rules need to be restructured to reflect the present reality in India.

Impact on diagnostic tests

Although dermatophytosis is usually diagnosed clinically, atypical presentations, which often mimic other dermatoses, have become more widespread in recent years, making diagnosis more challenging at times.^[11,13,14] As a result, at the start of therapy, either KOH microscopy or fungal culture is indicated for confirmation.

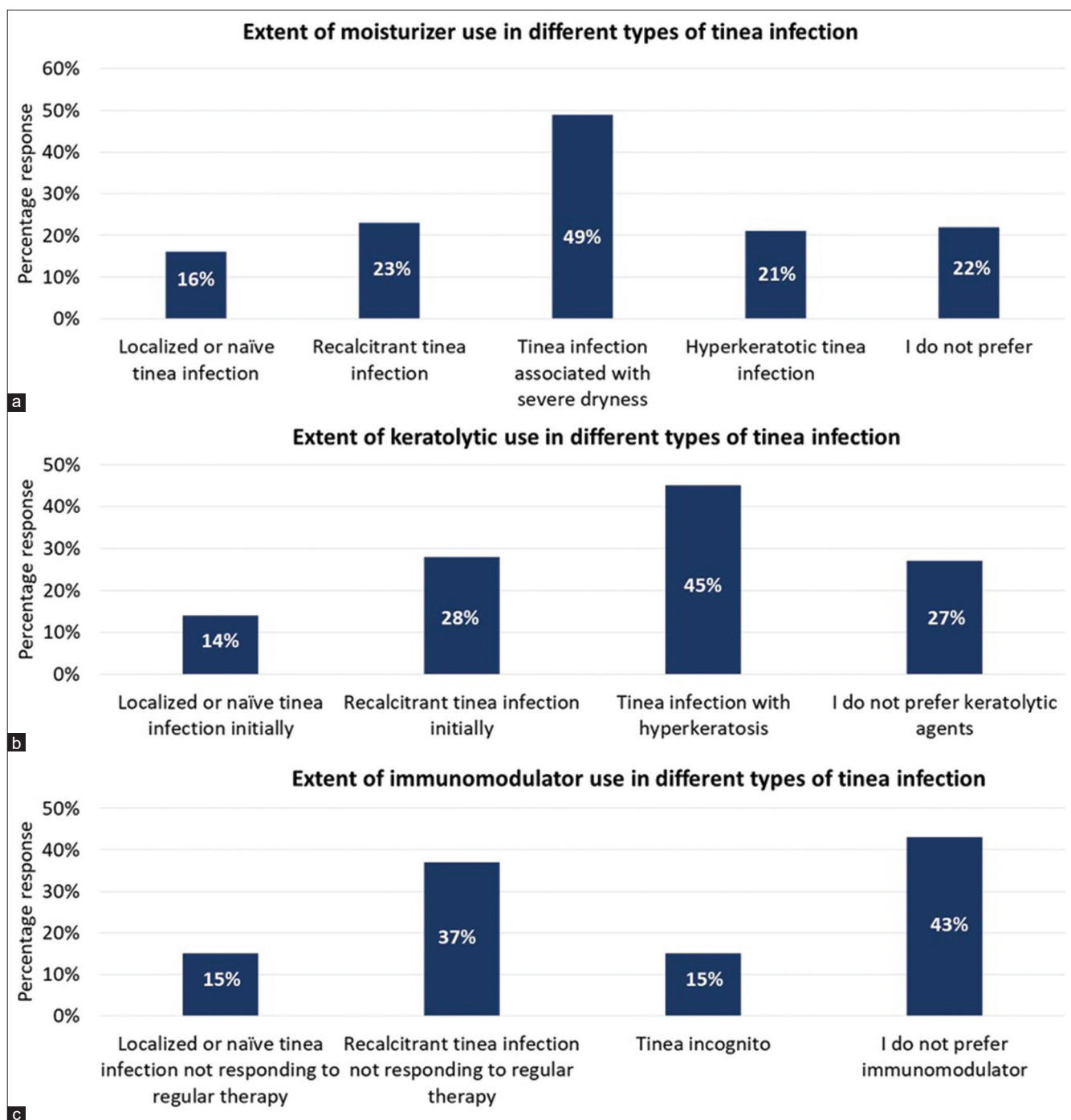


Figure 6: (a-c) Preference of moisturizers, keratolytics, and immunomodulators in the management of dermatophytosis

In our survey, only half of the dermatologists recommended a 10% KOH test to their patients. The most probable reason for this might be the lack of feasibility to order this test in each case, especially in private practice. Verma *et al.* have reported that although it is considered necessary in many countries, it is not feasible because it is time-intensive and most dermatologists do not have qualified assistants to help them.^[2] Although a KOH examination is not required for the initial diagnosis of dermatophytosis unless the diagnosis is unclear, it is necessary to do the test before

continuing therapy with the newer oral antifungals after 1 month in case of partial remission.^[2] Dermatologists in the current survey confirmed this by ordering KOH mount tests in patients with chronic, recurring, steroid-modified, or therapy failure dermatophytosis.

In the current Indian scenario, systemic antifungals are often used, and for longer periods than is indicated in earlier protocols. As a result, it is critical to keep the track of adverse effects of these medications. In recalcitrant dermatophytosis, ECTODERM India^[5] suggested basal

LFTs with frequent monitoring. Numerous dermatologists follow these guidelines, according to our survey results.

Combination therapy: First choice, the right choice

Dermatologists across the country have been baffled by an increase in frequent clinical failures with conventional antifungal dosage and duration (1 to 2 weeks of treatment).^[2,9] In the study on the management of dermatophytosis, Majid *et al.* found that regular (250 mg OD for 2 weeks) terbinafine therapy had reduced effectiveness and increased recurrence.^[15] Similarly, itraconazole monotherapy, at its standard dosage (100 mg OD) and duration of 2 weeks as mentioned in standard textbooks, appears to be ineffective in treating these infections.^[16] As a result, the use of combination regimens has increased in India in recent years.

Patients with extensive lesions or resistant tinea infections should be treated with a combination of systemic and topical antifungals, according to several evaluations.^[1,7,17] When it came to using the same or different antifungal classes in combination, there was some disagreement. However, the majority of the authors suggested that when utilizing combination therapy, medications from two distinct classes be utilized for broader coverage, additive or synergistic activity, and reduced resistance risk.^[7]

According to the present report, 53% of dermatologists begin treatment with a combination of drugs. There are several variants of combinations that can be administered; however, the most frequent is a topical and systemic antifungal combination. This might be owing to the fact that topical antifungals achieve a high concentration at the action site and are hence preferable to be used in conjunction with systemic antifungal medications.^[18] Various *in-vitro* investigations have shown varied findings of antagonism when two medicines operating on the same target are combined.^[19,20] There are several research articles available that show the benefits of combination therapy.^[21-27] However, there is no clarity for using medications from the same or other classes as those described above. Though some reviews advocate combining two separate classes of medicines, synergistic benefits of luliconazole and itraconazole have been demonstrated in a recent paper.^[28] Even in the newly issued INTACT consensus guidelines, there was no unanimity on whether to utilize the same or different antifungal classes.^[1]

In the present survey, the most often prescribed antifungals were found to be itraconazole and luliconazole. This might be because they have a lower minimum inhibitory concentration (MIC) than other drugs and hence are more effective. Both drugs were recently discovered to be the most powerful molecules in their respective medication classes, according to a recent report.^[29] Sardana *et al.* suggested that both of these drugs had a synergistic

impact.^[28] About 14% of respondents said that they would administer a mixture of two systemic and one topical antifungal, whereas 17% said they would prescribe one systemic and two topical antifungal combinations. Only a few studies have demonstrated that itraconazole and terbinafine can be used together; however, evidence on other combinations is very scarce.^[21-25]

In the event of non-response, roughly 72% of dermatologists increase the systemic antifungal dosage. Sahoo *et al.* advocated itraconazole (200–400 mg) in split doses coupled with topical antifungals in resistant cases.^[17] In tinea incognito patients, ECTODERM India guidelines^[7] suggested prescribing itraconazole (200–400 mg per day) for 4–6 weeks. INTACT guidelines suggested accentuating terbinafine dosage in non-responsive cases.^[1] However, some recent studies have concluded no benefits in increasing the dose but suggested prolonged treatment duration.^[30,31]

Confidence in adjuvant therapy

Prescriptions for adjuvant medicines such as keratolytics and moisturizers have skyrocketed in recent years. Because dermatophytosis causes increased epidermal thickness, hyperkeratosis, and skin scaling, topical antifungal medications alone may be ineffective.^[32,33] Keratolytics were proven to be useful in these situations.^[34] According to one study, a brief combined therapy of antifungal and salicylic acid was shown to be successful and safe, as well as a helpful choice for hyperkeratotic dermatophytosis to reach clinical cure sooner and with improved patient compliance.^[35] In our poll, 73% of dermatologists reported that they use keratolytics to treat dermatophytosis.

In dermatophytosis, there is a substantial rise in trans-epidermal water loss, which leads to a disruption in skin barrier function.^[32] As a result, it is advised that moisturizer be used in the treatment of dermatophytosis, as evidenced by the 78% response rate in the present survey. The most common recommendation for moisturizer usage was 2–4 weeks.

Itching is one of the most common symptoms of dermatophyte lesions. Itching can be so bad that it interferes with daily tasks, especially if it occurs in intimate places. Additionally, sleep may be disrupted by nocturnal itching. All these factors might have an impact on one's quality of life.^[36] Antihistamines should be used in the initial phase of dermatophytosis management, according to a consensus statement titled "ECTODERM India".^[7] This corresponded to the dermatologists who took part in the survey's real-world clinical practice patterns.

Due to a growth in the proportion of recalcitrant cases, dermatologists have indeed been experimenting with newer regimens that include increased doses and durations, as well as the use of unusual drugs such as isotretinoin, immunomodulator drugs, and newer systemic

antifungal drugs such as voriconazole. There have been conflicting reports available on isotretinoin.^[37,38] The immunomodulatory impact of isotretinoin in resistant dermatophytosis has been attributed to enhanced epidermal cell turnover, which eliminates the dermatophyte, and an increase in skin pH, which limits dermatophyte development.^[7,8] When taken in conjunction with oral itraconazole, isotretinoin has a greater favorable effect.^[7] However, because isotretinoin increases cell turnover and decreases sebum production, it is probable that isotretinoin with itraconazole may result in rapid clearance of itraconazole from the skin, resulting in the decreased therapeutic efficacy of itraconazole, according to one study.^[39] According to another study, adding isotretinoin to terbinafine provided no further effect in treating recurrent dermatophytosis patients.^[40]

The calcineurin pathway has been linked to the pathophysiology of dermatophytosis and other aggressive fungal infections, notably in terms of fungal cell wall integrity and medication resistance.^[41,42] The suppression of calcineurin signaling has emerged as a unique method for inhibiting fungal virulence and increasing the efficacy of current antifungal medications.^[43] Tacrolimus coupled with itraconazole revealed synergistic antifungal effectiveness against five strains of *Trichophyton mentagrophytes in vitro* using MIC testing and cell growth measurement.^[41,44] Patients with persistent tinea incognita who received topical tacrolimus with oral itraconazole had 100% adherence to antifungal medication and 100% remission of lesions with no recurrence in non-randomized clinical research by Kumar *et al.*, compared to only 60% resolution in patients who were treated with oral itraconazole.^[41] However, the small sample size ($n = 10$) remained the major limitation of this study and hence could not be generalized.

Poor adherence to treatment has been identified as one of the reasons for poor therapeutic response. Inflammatory symptoms and lesion flare-ups in the early stages of the illness are major factors contributing to poor adherence.^[41] Despite the fact that there have been a few case reports of tacrolimus-induced tinea incognita, it can be considered a “lesser evil” when compared to topical corticosteroids for reducing inflammation because it does not cause cutaneous atrophy even after long-term use. Also, it can be used on flexural areas and the face.^[41] Authors found that tacrolimus improved the activity of itraconazole and fluconazole in *in vitro* research.^[45] Topical tacrolimus improved adherence to antifungal treatment in persistent tinea incognita, according to one study.^[41]

Twenty-eight percent of dermatologists opined that newer systemic antifungals such as voriconazole can be tried in cases that do not respond to conventional antifungal drugs. In a clinical trial done by Khondker *et al.*, it was found that patients with treatment failure dermatophytosis showed clinical cure in 68% and

improvement in 31% of patients, whereas mycological cure was seen in 99% of the cases at the end of the study period.^[46] Chandrashekhar *et al.* concluded a good efficacy and safety profile with a very low rate of recurrence with voriconazole for the treatment of recurrent and resistant dermatophytosis.^[47] In susceptibility studies done on patients of dermatophytosis, there was no resistance noted in cases of voriconazole, whereas terbinafine and fluconazole showed maximum resistance.^[48,49] However, the majority of the dermatologists in the present survey opined that voriconazole should not be used in the treatment of dermatophytosis as it is a very important broad-spectrum, cost-effective drug in the therapeutic armamentarium of patients with deep mycoses.

Antifungal and steroid combination

Despite the fact that limited/no use of TCS has been highly suggested in all review articles,^[1,7] in real-world practice, roughly 36% prescribe TCS in combination at the start of treatment for 1–2 weeks. TCS, alone or in conjunction with antifungals, had no role in the treatment of inflammatory dermatophytosis, according to INTACT recommendations. The anti-inflammatory properties of topical azole antifungals may be useful in individuals having inflammatory and corticosteroid-modified dermatophytic lesions.^[1]

Limitations of the study

In physician survey studies carried out on a voluntary basis, a selection bias is always likely to occur. Though the survey was performed with dermatologists only, the response rate was on the lower side (23%). However, we strongly believe that this limitation is less likely to essentially change the characteristic of our results.

Conclusion

From the findings of the present survey, combination therapy and duration of treatment play important role in the complete resolution of symptoms and it is preferred to continue antifungal medication for an additional period of 1–2 weeks. Moreover, routine monitoring of laboratory tests also plays a definitive role due to the extensive use of systemic antifungals. All these factors need to be worked upon by continuous medical education of dermatologists and the updation of guidelines to improve the clinical outcome and avoidance of unfitting treatment strategies.

Acknowledgment

We acknowledge our sincere gratitude to the team of the Global Medical Affairs Department of Glenmark Pharmaceuticals Limited for help in data collation, analysis, and preparation of the manuscript of this expert consensus. We also acknowledge dermatologists for sharing their valuable inputs.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

What this real-world survey adds

Though dermatologists are aware about consensus or guidelines, they deviate from it many times, and relying on clinical experience has emerged as one of the factors for it.

About half of the dermatologists routinely opt for KOH testing for better management of dermatophytosis.

Although combination therapy is routinely practiced in dermatophytosis management, a combination of one topical and one systemic agent is preferred in recurrent, chronic, and treatment-failure cases.

Itraconazole and luliconazole are the most commonly prescribed antifungals in the management of dermatophytosis.

Most dermatologists updose systemic antifungals in case of non-response.

In current scenario, dermatologists rely on adjuvant therapies such as moisturizer, keratolytic, or immunomodulator for better management.

References

- Rengasamy M, Shenoy MM, Dogra S, Asokan N, Khurana A, Poojary S, et al. Indian Association of Dermatologists, Venereologists and Leprologists (IADVL) Task Force against Recalcitrant Tinea (ITART) Consensus on the Management of Glabrous Tinea (INTACT). *Indian Dermatol Online J* 2020;11:502-19.
- Verma S, Madhu R. The great Indian epidemic of superficial dermatophytosis: An appraisal. *Indian J Dermatol* 2017;62:227-36.
- Mala MS. Mellow to the malicious: Could Trichophyton mentagrophytes be the malefactor?. *Clin Dermatol Rev* 2017;1(Suppl S1):1-2.
- Singh A, Masih A, Monroy-Nieto J, Singh PK, Bowers J, Travis J, et al. A unique multidrug-resistant clonal Trichophyton population distinct from Trichophyton mentagrophytes/Trichophyton interdigitale complex causing an ongoing alarming dermatophytosis outbreak in India: Genomic insights and resistance profile. *Fungal Genet Biol* 2019;133:103266.
- Uhrlaß S, Verma SB, Gräser Y, Rezaei-Matehkolaei A, Hatami M, Schaller M, et al. *Trichophyton indotineae*-An emerging pathogen causing recalcitrant dermatophytoses in India and Worldwide-A multidimensional perspective. *J Fungi (Basel)* 2022;8:757.
- Kano R, Kimura U, Kakurai M, Hiruma J, Kamata H, Suga Y, et al. *Trichophyton indotineae* sp. nov.: A new highly terbinafine-resistant anthropophilic dermatophyte species. *Mycopathologia* 2020;185:947-58.
- Rajagopalan M, Inamadar A, Mittal A, Miskeen AK, Srinivas CR, Sardana K, et al. Expert consensus on the management of dermatophytosis in India (ECTODERM India). *BMC Dermatol* 2018;18:6.
- Dogra S, Uprety S. The menace of chronic and recurrent dermatophytosis in India: Is the problem deeper than we perceive?. *Indian Dermatol Online J* 2016;7:73-6.
- Panda S, Verma S. The menace of dermatophytosis in India: The evidence that we need. *Indian J Dermatol Venereol Leprol* 2017;83:281-4.
- Nagesh TS, Akhilesh A. Topical steroid awareness and abuse: A prospective study among dermatology outpatients. *Indian J Dermatol* 2016;61:618-21.
- Kumar S, Goyal A, Gupta YK. Abuse of topical corticosteroids in India: Concerns and the way forward. *J Pharmacol Pharmacother* 2016;7:1-5.
- Tuknayat A, Bhalla M, Kaur A, Garg S. Familial dermatophytosis in India: A study of the possible contributing risk factors. *J Clin Aesthet Dermatol* 2020;13:58-60.
- Ansar A, Farshchian M, Nazeri H, Ghiasian SA. Clinico-epidemiological and mycological aspects of tinea incognito in Iran: A 16-year study. *Med Mycol J* 2011;52:25-32.
- Dutta B, Rasul ES, Boro B. Clinico-epidemiological study of tinea incognito with microbiological correlation. *Indian J Dermatol Venereol Leprol* 2017;83:326-31.
- Majid I, Sheikh G, Kanth F, Hakak R. Relapse after oral terbinafine therapy in dermatophytosis: A clinical and mycological study. *Indian J Dermatol* 2016;61:529-33.
- De Doncker P, Pande S, Richarz U, Garodia N. Itraconazole: What clinicians should know?. *Indian J Drugs Dermatol* 2017;3:4-10.
- Sahoo AK, Mahajan R. Management of tinea corporis, tinea cruris, and tinea pedis: A comprehensive review. *Indian Dermatol Online J* 2016;7:77-86.
- Rengasamy M, Chellam J, Ganapati S. Systemic therapy of dermatophytosis: Practical and systematic approach. *Clin Dermatol Rev* 2017;1(Suppl S1):19-23.
- Harman S, Ashbee HR, Evans EGV. Testing of antifungal combinations against yeasts and dermatophytes. *J Dermatol Treat* 2004;15:104-7.
- Johnson MD, Perfect JR. Use of antifungal combination therapy: Agents, order, and timing. *Curr Fungal Infect Rep* 2010;4:87-95.
- Sharma P, Bhalla M, Thami GP, Chander J. Evaluation of efficacy and safety of oral terbinafine and itraconazole combination therapy in the management of dermatophytosis. *J Dermatolog Treat* 2020;31:749-53.
- Singh SK, Subba N, Tilak R. Efficacy of terbinafine and itraconazole in different doses and in combination in the treatment of tinea infection: A randomized controlled parallel group open labeled trial with clinico-mycological correlation. *Indian J Dermatol* 2020;65:284-9.
- Bidaud AL, Schwarz P, Chowdhary A, Dannaoui E. *In Vitro* antifungal combination of terbinafine with itraconazole against isolates of *Trichophyton* species. *Antimicrob Agents Chemother* 2022;66:e0144921.
- Brescini L, Fioriti S, Morroni G, Barchiesi F. Antifungal combinations in dermatophytes. *J Fungi (Basel)* 2021;7:727.
- Zhang D, Liao W, Chen C, Lai H, Liu S. Terbinafine hydrochloride combined with itraconazole for fungal skin diseases: A randomized controlled trial. *Am J Ther* 2021;28:e179-86.
- Vishwanath V, Londhe P, Tare D, Deshmukh G, Barkate H, Dhoot D. Effectiveness and safety of combination of itraconazole and amorolfine in management of patients with recalcitrant multi-site dermatophytosis who failed previous combination antifungal therapy. *IP Indian J Clin Exp Dermatol* 2020;6:391-6.
- Shah B, Shah S, Jangid N, Dhoot D, Deshmukh G, Barkate H. Comparative evaluation of efficacy and safety of terbinafine and

- itraconazole in the management of tinea corporis et cruris. *IP Indian J Clin Exp Dermatol* 2020;6:231-6.
28. Sardana K, Gupta A, Sadhasivam S, Gautam RK, Khurana A, Saini S, *et al.* Checkerboard analysis to evaluate synergistic combinations of existing antifungal drugs and propylene glycol monocaprylate in isolates from recalcitrant tinea corporis and cruris patients harboring squalene epoxidase gene mutation. *Antimicrob Agents Chemother* 2021;65:e0032121.
 29. Das S, De A, Saha R, Sharma N, Khemka M, Singh S, *et al.* The current Indian epidemic of dermatophytosis: A study on causative agents and sensitivity patterns. *Indian J Dermatol* 2020;65:118-22.
 30. Singh SK, Subba N, Tilak R. Efficacy of terbinafine and itraconazole in different doses and in combination in the treatment of tinea infection: A randomized controlled parallel group open labeled trial with clinico-mycological correlation. *Indian J Dermatol* 2020;65:284-9.
 31. Khurana A, Agarwal A, Agrawal D, Panesar S, Ghadlinge M, Sardana K, *et al.* Effect of different itraconazole dosing regimens on cure rates, treatment duration, safety, and relapse rates in adult patients with tinea corporis/cruris: A randomized clinical trial. *JAMA Dermatol* 2022;158:1269-78.
 32. Jensen JM, Pfeiffer S, Akaki T, Schröder JM, Kleine M, Neumann C, *et al.* Barrier function, epidermal differentiation, and human beta-defensin 2 expression in tinea corporis. *J Invest Dermatol* 2007;127:1720-7.
 33. Shi TW, Zhang JA, Tang YB, Yu HX, Li ZG, Yu JB. A randomized controlled trial of combination treatment with ketoconazole 2% cream and adapalene 0.1% gel in pityriasis versicolor. *J Dermatolog Treat* 2015;26:143-6.
 34. El-Gohary M, van Zuuren EJ, Fedorowicz Z, Burgess H, Doney L, Stuart B, *et al.* Topical antifungal treatments for tinea cruris and tinea corporis. *Cochrane Database Syst Rev* 2014;(8):CD009992.
 35. Kharkar RD, Dhoot DS, Deshmukh GA, Barkate H. Real world retrospective analysis of luliconazole 1% and salicylic acid 3% as fixed dose combination in the management of hyperkeratotic dermatophytosis in India. *Int J Res Dermatol* 2021;7:18-21.
 36. Verma SB, Panda S, Nenoff P, Singal A, Rudramurthy SM, Uhrlass S, *et al.* The unprecedented epidemic-like scenario of dermatophytosis in India: I. Epidemiology, risk factors and clinical features. *Indian J Dermatol Venereol Leprol* 2021;87:154-75.
 37. Ardeshta KP, Rohatgi S, Jerajani HR. Successful treatment of recurrent dermatophytosis with isotretinoin and itraconazole. *Indian J Dermatol Venereol Leprol* 2016;82:579-82.
 38. Hasibur Rahman, Role of Itraconazole Pulse therapy with adjuvant Isotretinoin daily in treating recurrent and recalcitrant Dermatophytosis, *Dermatology Medicine* 2020, 15th International Conference on Dermatology and Cosmetic Medicine, London, UK-April 13-14, 2020.
 39. Srivastava A, Kothiwalla SK. Isotretinoin may affect pharmacokinetics of itraconazole in the skin: Is it rational to combine both for the treatment of dermatophytosis?. *Indian J Dermatol Venereol Leprol* 2017;83:68-9.
 40. Verma KK, Senthilnathan G, Bhatia S, Xess I, Gupta V, Dwivedi SN, *et al.* Oral isotretinoin combined with oral terbinafine versus oral terbinafine alone to treat recurrent dermatophytosis: An open-label randomised clinical trial. *Indian Dermatol Online J* 2021;12:820-25.
 41. Kumar A, Deshmukh K, Deora MS. The role of topical tacrolimus in adherence to antifungal therapy in recalcitrant tinea incognito: A preliminary non randomised controlled study. *Int J Res Dermatol* 2019;5:183-6.
 42. Scorzoni L, de Paula E Silva AC, Marcos CM, Assato PA, de Melo WC, *et al.* Antifungal therapy: New advances in the understanding and treatment of mycosis. *Front Microbiol* 2017;8:36.
 43. Juvvadi PR, Lee SC, Heitman J, Steinbach WJ. Calcineurin in fungal virulence and drug resistance: Prospects for harnessing targeted inhibition of calcineurin for an antifungal therapeutic approach. *Virulence* 2017;8:186-97.
 44. Ozawa H, Okabayashi K, Kano R, Watanabe S, Hasegawa A. Antifungal activities of the combination of tacrolimus and itraconazole against trichophyton mentagrophytes. *J Vet Med Sci* 2005;67:629-30.
 45. Borba-Santos LP, Reis de Sá LF, Ramos JA, Rodrigues AM, de Camargo ZP, Rozental S, *et al.* Tacrolimus increases the effectiveness of itraconazole and fluconazole against sporothrix spp. *Front Microbiol* 2017;8:1759.
 46. LubnaKhondker. Efficacy and safety of voriconazole in the treatment failure cases of Dermatophytosis. *The Gulf Journal of Dermatology and Venereology* 2020;27:24-30.
 47. Chandrashekar BS, Poojitha DS. Evaluation of efficacy and safety of oral voriconazole in the management of recalcitrant and recurrent dermatophytosis. *Clin Exp Dermatol* 2022;47:30-6.
 48. Hoq AJMS, Sultana F, MJ Abedin, GM Matiur Rahman. Efficacy of Voriconazole among 500 Dermatophytes Patients: A Study in a Tertiary Care Hospital, Cumilla, Bangladesh. *Am J Dermatol Venereol* 2020;9:17-20.
 49. Islam R, Islam MN, Hossain MM. Efficacy and Safety of Voriconazole in Patients with Dermatophytes. *Ann Int Med Den Res* 2021;7:DT01- DT04.