International Journal of Research in Medical Sciences
Ranganatha A et al. Int J Res Med Sci. 2025 Jul;13(7):2917-2924
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20252027

Original Research Article

Isolation, identification, and antifungal susceptibility of dermatophytes from patients in a tertiary care hospital

Akash Ranganatha*, Mathigatta Rudrappa Rajeswari

Department of Microbiology, JJM Medical College, Davangere, Karnataka, India

Received: 27 April 2025
Revised: 05 June 2025
Accepted: 10 June 2025

***Correspondence:**
Dr. Akash Ranganatha,
E-mail: akashrjr3@gmail.com

ABSTRACT

Background: Fungal infections affecting the body's surface are common in tropical and subtropical climates worldwide. Many antifungal medicines can treat the illness, although the dermatophytes that respond vary by time and site. The study aimed to isolate, identify and analyse the antifungal susceptibility patterns of dermatophytes obtained from patients visiting the dermatology department of a tertiary care hospital.
Methods: This 3-month trial included 200 clinically diagnosed individuals with skin and nail dermatophytosis from a tertiary care hospital's Dermatology outpatient clinic.
They consulted the Department of Microbiology to isolate, cultivate and test for fungal sensitivity.
Results: Results show that persons aged 21-30 were most profoundly affected. Tinea corporis was the most common clinical symptom at 49.5%, followed by tinea cruris at 24.5%. The most common dermatophytes were Trichophyton species (82.4%). About 67.6% of our isolates had MICs (>1 µg/ml) for fluconazole, regardless of species. The MIC of luliconazole and amorolfine hydrochloride was<0.004 µg/ml for all dermatophytes isolates, while other antifungals had MICs of ≥0.25 µg/ml. The narrowest MIC range was for luliconazole and amorolfine hydrochloride (0.002-0.128 µg/ml), whereas fluconazole and itraconazole had the greatest range (0.125-64 and 0.0321-16) respectively.
Conclusions: The study found that luliconazole and amorolfine hydrochloride were the most effective medications against all dermatophytes isolates, followed by itraconazole and fluconazole. Some of our isolates have greater and wider MIC values for itraconazole and fluconazole, which may increase resistance.

Keywords: Antifungal drugs, Antifungal susceptibility, Dermatophytes, Tertiary care hospital

INTRODUCTION

Fungi have been shown to naturally exist on Earth, representing several kingdoms as a result of evolution.[1] Dermatophytes are a type of cutaneous fungi found throughout all fungi. They possess both keratinophilic and keratolytic characteristics.[2,3] They possess the capacity to infiltrate keratinized tissue in both people and animals, resulting in dermatophytosis.[4] The integumentary system in humans and animals, which includes the skin, hair, nails and subcutaneous tissues, can be infected by many organisms, particularly fungus known as dermatophytes, resulting in a condition called dermatophytosis. Dermatophytosis refers to superficial infections of keratinized tissue that are caused by dermatophytes. Fungal infections, also known as dermatophytosis, currently account for around seventy percent of the total patients seen by dermatologists. Dermatophytes refer to fungi that specifically infect the skin and the resulting infections are known as dermatophytosis. Dermatophytosis is a common skin disorder in humans.[3,4]

Dermatophytosis has various unique skin symptoms.[3,4] The severity of the disease is determined by several factors, such as the specific strain or species of the infecting dermatophyte, the host's sensitivity and the

location of the infection.[5] Dermatophyte is classified into three groups: Trichophyton, Epidermophyton and Microsporum.[4] Additionally, these organisms are categorized into anthropophilic, zoophilic and geophilic based on their inherent environment.[4,5] These fungi produce different types of proteolytic enzymes especially keratinases that have key roles in fungal invasion and pathogenesis in human and animal dermatophytosis.[5] Dermatophytes are capable of causing superficial infections on the skin, hair and nails and they require keratin in order to thrive. Dermatophytes can be transmitted by direct contact with humans (anthropophilic organisms), animals (zoophilic organisms) and soil (geophilic organisms), as well as indirectly through contaminated objects (fomites).[5]

An annular lesion is the term used to describe a dermatophytosis lesion. It manifests as one or more circular lesions with inflamed borders. Pruritus, erythema and desquamation with a vesicle are also reportable.[6] Other words used to describe tinea infections based on their anatomical location include *Tinea capitis* (scalp), *Tinea barbae* (beard area), *tinea corporis* (body), *tinea cruris* (groin), *Tinea manuum* (hands), *Tinea pedis* (feet) and *Tinea unguium* (nails).[4,7]

Despite being seen as a minor ailment, Dermatophytosis has major psychological consequences due to its high morbidity and the challenge of treating it quickly. The amplified problem of prevalence and incidence of dermatophytosis needs to be studied and analyzed thoroughly at the microbiological level to gain an idea of the changing pattern of fungal growth. Recent studies and surveys have indicated that the most common clinical types are Tinea corporis and Tinea cruris with the most common causative fungi being the Trichophyton species.

This fungus affects both individuals who are in good health and those who have weakened immune systems.[7] The estimated lifetime probability of acquiring a dermatophytic infection is between 10% and 20%.[8] Their geographic distribution exhibits significant variability.[9] The variable prevalence can be attributed to factors such as climate, lifestyle, engagement in outdoor activities and pre-existing co-morbidities such diabetes mellitus, hypothyroidism and malnutrition.[9,10] The prevalence of dermatophytosis ranges from 13% to 49% subject to the geographical spread of each nation.[11,16]

Dermatophytes, while not posing a risk to life, can become significant public health concerns due to their high morbidity rates and the aesthetic damage they cause.[17] Dermatophytic infections have characteristic features.[17] Occasionally, it is mistaken for other dermatological conditions. A papulosquamous presentation of a tinea corporis eruption might be misidentified as psoriasis, nummular eczema, seborrheic dermatitis or pityriasis rosea.[18] Multiple dermatophytes can invade the crural region and produce symptoms resembling those of tinea cruris.[13] Tinea cruris can be mistaken for inverse psoriasis, seborrheic dermatitis, candidiasis, erythrasma, lichen simplex chronicus, Darier's disease and pemphigus vegetans. Distinguishing between male tinea cruris and female vaginal candidiasis can be achieved by identifying the presence of white pustules and satellite lesions, which are characteristic of candida, but not of dermatophytes.[16] Hence, in order to prevent an incorrect diagnosis, the detection of dermatophyte diseases necessitates timely and systematic laboratory testing.[17,18] Identification of dermatophyte infections necessitates fungal culture and light microscopic mycological examination.18 Microscopic examination is a convenient, quick and cost-effective diagnostic tool nonetheless, it can yield false negative results in as many as 15% of instances.[19] Culture procedures are specialized diagnostic tests used to identify dermatophytes. However, it typically takes around 4 weeks for the fungus to grow in the culture and for the species to be identified.[19]

Over the past twenty years, there has been a significant rise in the occurrence of dermatophyte infections, with certain cases showing resistance to antifungal treatment.[20] Given the very contagious and widespread nature of many diseases, especially among individuals in lower socioeconomic groups, it is imperative to administer prompt and secure treatment. Currently, there is a growing trend of dermatophytes developing resistance to routinely prescribed antifungals such as Fluconazole and Itraconazole. That is why we have to do the anti-fungal sensitivity test for the commonly used and newly introduced antifungal drugs.

The most common treatment for this condition is the use of topical antifungal medications, such as fluconazole, clotrimazole, ketoconazole, econazole, terbinafine and tolnaftate. These medications have been shown to have antifungal action in laboratory tests.[18] Nevertheless, the most serious and persistent fungal infections of the skin, specifically *Tinea capitis* and *Tinea unguim*, typically necessitate the use of systemic antifungal medications such griseofulvin, terbinafine and itraconazole.

Amorolfine and luliconazole, which are new systemic antifungal medicines, have demonstrated effectiveness in laboratory tests against dermatophytes and are currently being evaluated in the treatment of chronic dermatophytosis.[18,23] Given the wide range of medications that can be used to treat dermatophytosis, it is necessary to have methods for testing the susceptibility of the fungus in a laboratory setting. Additionally, it is important to evaluate the effectiveness of various antifungal approaches on different clinical isolates.

The accuracy in diagnostic methods and anti-fungal susceptibility tests are important to provide definitive treatment of dermatophytosis.[20,21] The objective of this study is to determine the various species of dermatophytes that cause dermatophytosis and to analyze the sensitivity of these isolates to antifungal treatments at J.J.M. Medical College, Davangere, a tertiary care hospital.

METHODS

This cross-sectional study was carried out in the Department of Microbiology, Jay Jagadguru Murugarajendra Medical College, located in Davangere, Karnataka, India. The study was conducted for the duration of 1 year from March 2022 to March 2023 and this study received approval from the Ethical Review Committee of Jay Jagadhguru Murugarajendra Medical College. Two hundred (200) study volunteers were chosen based on the selection criteria. Individuals of any age and gender who visited the Dermatology and Venereology outpatient department at JJMMC, Davangere, throughout the study period were included in the study. This study comprised patients who were thought to have ringworm infection based on clinical evaluation and excludes the patients who have other concurrent skin illnesses such as pityriasis versicolor, seborrheic dermatitis, eczema, lichen planus and psoriasis vulgaris.

Specimen collection

Following a thorough clinical evaluation, the patient's lesions were meticulously evaluated under appropriate lighting conditions, while taking necessary measures to prevent contamination. The affected area was thoroughly cleansed using a 70% ethyl alcohol solution. Subsequently, in accordance with established protocols, skin scales, crusts and nail fragments were carefully gathered by gently scraping along the inflamed edge of the lesions.

For skin, the area is first cleaned with 70% alcohol and then scrapped with a blunt scalpel across the inflamed margin of the lesion into apparently healthy tissue and the scrapping is collected in a clean white sterile white envelope. For nails, the affected nail is cleaned with 70% alcohol and the specimen is collected by clipping from the distal border and scrapping across the affected area beneath the nail.

Microbiological methods

Potassium hydroxide mount of skin scrapping, infected nail clippings.

Potassium hydroxide mount of a skin scraping is a commonly performed procedure to demonstrate the evidence of fungal infection in skin, hairs and nails. Advantages include simplicity of procedure, reliability and rapid availability of results. The scales were placed on a clean glass slide and 2-3 drops of 10% KOH were added and covered with a cover slip.

The under surface of the glass slide can be gently heated with a low-lit flame and then observed under a microscope for hyphae. Care should be taken to avoid overheating which can cause crystallization of the slide material.[22] KOH clears or digests the keratin and epithelial debris within 5-20 minutes depending on the thickness. For nails, it requires a longer duration of 24-48 hours and 40% KOH to dissolve the hard keratin of nails. When observed under a microscope, the presence of branching and septate hyphae with angular or spherical arthroconidia (arthrospores) arranged in a chain is indicative of a dermatophyte. All specimens of skin and nails of dermatophyte infection have a similar appearance.

Analysis of the specimen under a microscope

Take a little amount of 10% potassium hydroxide (KOH) solution and place it on a glass microscope slide. Then, transfer a small piece of the specimen onto the KOH drop and cover it with a cover slip. The slide will be kept undisturbed for a minimum of 20-30 minutes to allow the skin and hair to settle on a petri dish. For the examination of nails, samples will be immersed in a 20% potassium hydroxide (KOH) solution overnight and analyzed the following morning. Branching and septate hyphae with angular or spherical arthroconidia (arthrospores) usually in the chain will be recognized under the microscope as a dermatophyte. All skin and nail specimens of ringworm fungi exhibit a uniform look.

Specimen's cultural characteristics

The fungus will be primarily isolated using Sabouraud Dextrose Agar (SDA) supplemented with antibiotics. Saprophytic fungi will be inhibited by the addition of Cycloheximide, whereas Chloramphenicol will be administered to suppress bacteria. The skin and nails samples are directly inoculated onto the medium by gently pressing the specimen into the surface of the media using a sterile wire loop. The tubes containing SDA with antibiotics were placed in an incubator set at a

temperature range of 27°C to 30°C. The SDA tubes that were inoculated were checked every other day starting from the day of inoculation. The SDA tubes were examined during a period of 4 weeks.

The presence of expansion was regarded as favorable. The isolates were macroscopically and microscopically analyzed by observing their colony morphology on media. This involved examining the gross appearance, colony texture and color of the top and reverse sides of the tube. Additionally, microscopic morphology and in-vitro tests were conducted. The colony was examined at a microscopic level and additional assessment was conducted to identify the dermatophyte species using lactophenol cotton blue.[7]

Urease test

The urease activity of the isolated dermatophyte species will be observed using a test tube containing Christensen's urea agar. A pure culture of test fungi will be applied to the inclined surface of the media and kept at room temperature (27°C) for a duration of 7 days. The alteration of color (from straw to pink) in the media signifies a favorable test

outcome, whereas the absence of any colour change will be regarded as a negative result.

Anti-fungal susceptibility

Antifungal susceptibility testing was performed using four antifungal agents: Fluconazole, Itraconazole, Amorolfine hydrochloride and Luliconazole. The susceptibility testing was conducted using the broth microdilution assay in accordance with the authorized standard M38-A2 recommendations of the Clinical Laboratory Standards Institute.[24]

RESULTS

Demography

The mean age of the patients enrolled in the study was 32.81 years. The most frequently affected age group was 21-30 years (32%) followed by 31-40 years (28%). The incidence was lower in the elderly age group. The selected cohort exhibited a higher proportion of males (61.5%) compared to females (38.5%), as seen in Table 1.

Clinical presentation

The predominant clinical presentation was tinea corporis (49.5%), followed by tinea cruris (24.5%) and a combination of tinea corporis and tinea cruris at two sites (20%). These presentations were more in males compared to females as represented in Table 2.

Identification of dermatophytes

Out of 200 samples, 34 samples were cultured positive. The most common dermatophytes isolated were Trichophyton species in 82.4% (28/34)-T. rubrum (32.4%), *T. mentagrophtes* (47.1%) and T. tonsurans (2.9%) of cases, while *Microsporum gypseum* was detected in 11.8% of cases (4/34) followed by *Epidermophyton flocusum* in 5.8% (2/34) as represented in Table 3. The most common clinical manifestation was tinea corporis with the maximum number different dermatophytes species isolated, 47.05% followed by tinea corporis and tinea cruris 20.5%. While *tinea faciei* showed only *T. rubrum* isolate as represented in table 4.

Antifungal susceptibility testing

The study found that Trichophyton mentagrophytes, T. rubrum, *E. floccosum*, *M. gypseum* and *T. tonsurans* had high minimum inhibitory concentration (MIC) values for fluconazole, with a geometric mean greater than 1 µg/ml. T. tonsurans also exhibited high minimum inhibitory concentration (MIC) values for itraconazole. Regardless of the various species, approximately 67.6% of our isolates demonstrated high minimum inhibitory concentrations (MICs) (>1 µg/ml) to fluconazole, as shown in tables 5 and 6.

Fluconazole exhibited elevated minimum inhibitory concentration (MIC) values ranging from 0.125 to 64 µg/ml against all tested dermatophyte isolates. Luliconazole and amorlfine hydrochloride exhibited the lowest minimum inhibitory concentration (MIC) values, ranging from 0.002 to 0.128, indicating their high potency. All dermatophyte isolates exhibited susceptibility to antifungal drugs, with the exception of fluconazole. According to these findings, the efficacy of fluconazole was inferior to that of the other medications that were evaluated. The MIC50, MIC90 and GM values of all drugs against the tested dermatophyte isolates are represented in Table 5-8.

The in vitro activity of luliconazole and amorlfine hydrochloride against all isolates was more potent than Itraconazole and fluconazole, represented in tables 7 and 8. The MIC50 and MIC90 for luliconazole and amorlfine hydrochloride were 0002-0.004 µg/ml, respectively, to all the dermatophytes isolates tested, compared to other antifungal agents that were 0.25 µg/ml The minimum inhibitory concentration (MIC) range was most limited for luliconazole and amorlfine hydrochloride, with values ranging from 0.002 to 0.128. In contrast, the MIC range was the broadest for fluconazole and itraconazole, with values ranging from 0.125 to 64 and 0.0321 to 16, respectively. These findings are reported in Table 5-8.

Table 1: Distribution of the study population based on age and gender.

Age in years	Males	Females	Total	%
01-Oct	6	7	13	6.5
Nov-20	27	8	35	17.5
21-30	39	25	64	32
31-40	28	18	46	23
41-50	10	8	18	9
51-60	9	5	14	7
>61	4	6	10	5
Total	123	77	200	100

Table 2: Distribution of clinical lesions in study population bases on site involved.

Clinical diagnosis	Males	Females	Total no of cases	%
T. Corporis	63	36	99	49.5
T. Cruris	34	15	49	24.5
T. Corporis and T. Cruris	22	18	40	20
T. Capitis	2	5	7	3.5
T. Facei	2	3	5	2.5
Total	123	77	200	100

Table 3: Frequency of various species of dermatophytes isolated.

Species	Number	(%)
T. mentagrophytes	16	47.1
T. rubrum	11	32.4
M. gypseum	4	11.8
E. floccosum	2	5.8
T. tonsurans	1	2.9
Total	34	100

Table 4: Dermatophyte isolates in different clinical types of tinea.

Dermatophyte species	T. Corporis	T. Corporis and T. Cruris	T. Cruris	T. Capitis	T. Facei
T. mentagrophytes **(16)**	6	4	3	3	0
T. rubrum **(11)**	7	2	0	1	1
E. floccosum **(2)**	1	1	0	0	0
M. gypseum **(4)**	1	0	3	0	0
T. tonsurans **(1)**	1	0	0	0	0
Tota l (34)	16	7	6	4	1

Table 5: MIC for drug Itraconazole.

Species	Drug concentration in (µg/ml)										GM	MIC50	MIC90
	0.0321	**0.063**	**0.125**	**0.25**	**0. 5**	**1**	**2**	**4**	**8**	**16**			
T. mentagrophytes **n=16**	5	4	2	0	0	0	1	2	1	1	1.223	0.063	4
T. rubrum **n=11**	4	3	2	0	0	0	0	0	1	1	1.38	0.063	8
E. floccosum **n=2**	0	0	0	0	0	1	1	0	0	0	1.414	1	2
M. gypseum **n=4**	1	0	1	0	0	0	2	0	0	0	1.429	0.125	2
T. tonsurans **n=1**	0	0	0	0	0	1	0	0	0	0	1	NA	NA

Table 6: MIC for drug Fluconazole.

Species	Drug concentration in (µg/ml)										GM	MIC50	MIC90
	0.125	0.25	0.5	1	2	4	8	16	32	64			
T. mentagrophytes **n=16**	3	2	3	1	1	1	0	1	2	2	1.5	0.5	64
T. rubrum **n=11**	0	0	0	1	1	1	1	1	2	3	1.452	32	64
E. floccosum **n=2**	0	0	0	0	0	0	0	0	2	0	8	32	32
M. gypseum **n=4**	0	1	1	0	0	0	0	0	2	0	2.5	0.5	32
T. tonsurans **n=1**	0	0	0	0	0	0	0	0	1	0	32	NA	NA

Table 7: MIC for drug Luliconazole.

Species	Drug concentration in (µg/ml)							GM	MIC50	MIC90
	0.002	0.004	0.008	0.016	0.032	0.064	0.128			
***T. mentagrophytes* n=16**	7	4	1	1	1	1	1	0.935	0.002	0.032
***T. rubrum* n=11**	6	0	0	1	1	2	1	0.863	0.002	0.064
***E. floccosum* n=2**	2	0	0	0	0	0	0	0.109	0.002	0.002
***M. gypseum* n=4**	4	0	0	0	0	0	0	0.2	0.002	0.002
***T. tonsurans* n=1**	1	0	0	0	0	0	0	0.002	NA	NA

Table 8: MIC for drug Amorolfine hydrochloride.

Species	Drug concentration in (µg/ml)							GM	MIC50	MIC90
	0.002	0.004	0.008	0.016	0.032	0.064	0.128			
***T. mentagrophytes* n=16**	7	4	1	1	1	1	1	0.935	0.002	0.032
***T. rubrum* n=11**	6	0	0	1	1	2	1	0.863	0.002	0.064
***E. floccosum* n=2**	2	0	0	0	0	0	0	0.109	0.002	0.002
***M. gypseum* n=4**	4	0	0	0	0	0	0	0.2	0.002	0.002
***T. tonsurans* n=1**	1	0	0	0	0	0	0		NA	NA

DISCUSSION

The mean age of the patients enrolled in our study was 32.81 years. The most frequently affected age group was 21-30 years (32%) followed by 31-40 years (28%). The incidence was lower in patients above 50 years age group. The mean age of patients and the incidence of dermatophytosis were similar to studies by Dabas et al and by Konda et al, with an incidence of 37% in 21-30 years followed by 18% in 31-40 years age group.[25,26,28] The higher incidence of dermatophytes in younger ages may be due to increased physical activity and easy exposure to infections among close contacts.

A higher incidence of males (61.5 %) over females (38.5%) was observed in this study. The most common clinical presentation was tinea corporis (49.5%), followed by tinea cruris (24.5%) and dual site tinea corporis and tinea cruris (20%). Tinea corporis was the most prevalent clinical manifestation, accounting for 49.5% of cases, followed by tinea cruris at 24.5% and a combination of tinea corporis and tinea cruris at 20%. Trichophyton species were found to be the most prevalent dermatophytes, accounting for 82.4% (28/34) of cases. *Microsporum gypseum* was detected in 11.8% (4/34) of cases, followed by *Epidermophyton flocusum* in 5.8% (2/34) of cases. *T. Mentagrophyte* was the most often isolated species in our investigation. The most common clinical manifestation with a maximum of multiple species involved was tinea corporis followed by tinea cruris. Irrespective of the different species, about 67.6% of the isolates exhibited high MICs (>1 µg/ml) to fluconazole. The MIC50 and MIC90 for luliconazole and amorlfine hydrochloride were ≤0.004 µg/ml to all the dermatophytes isolates tested, compared to other antifungal agents that were ≥0.25 µg/ml. The MIC range was narrowest for luliconazole and amorlfine hydrochloride,0.002-0.128 µg/ml and high for fluconazole, 0.124-64 µg/ml.

The preponderance in males compared to females was also observed in the studies by Dabas et al and Konda et al. The clinical presentation of dermatophytosis was also observed by Konda et al, for tinea corporis (31%) and tinea cruris (25%). The species of the isolates were in line with the findings in our study. Murtaza et al, showed 96.25%, 2.5% and 1.25% of Trichophyton, Epidermophyton and Microsporum species, respectively and Dabas et al, demonstrated a prevalence of 95.4% for Trichophyton and 4.5% for Microsporum.[10,25] Trichophyton species, *Microsporum gypsium* and Epidermophyton species were isolated in 11.8% and 5.8% respectively. *T. Mentagrophyte* was the most often isolated species in our investigation as has been reported by Dabas et al, where *T. Mentagrophyte* was the predominant isolate (37.74%). The

most common clinical manifestation with a maximum of multiple species involved was tinea corporis followed by tinea cruris. Similar results were reported by Dabas et al, tinea corporis.

Our study revealed higher MIC values were obtained for *T. mentagrophytes*, *T. rubrum*, *E. floccosum*, *M. gypseum* and *T. tonsurans* to fluconazole. T. tonsurans, in addition, had high MIC values to both itraconazole A study conducted by Dabas et al, found that T. tonsurans had high minimum inhibitory concentration (MIC) values (geometric mean, >1 µg/mL) for terbinafine and griseofulvin, while T. rubrum showed high MIC values for griseofulvin. Irrespective of the different species, about 67.6% of our isolates exhibited high MICs (>1 µg/ml) to fluconazole. The minimum inhibitory concentration (MIC) values for luliconazole against all tested dermatophyte isolates were found to be ≤0.004 µg/ml, whereas other antifungal drugs exhibited MIC values of ≥0.25 µg/ml. The MIC range was narrowest for luliconazole and amorlfine hydrochloride 0.002-0.128 µg/ml and the widest for fluconazole, 0.124-64 µg/ml. In a similar study by Baghi et al, the MIC range was the narrowest for luliconazole and amorlfine hydrochloride 0.016-0.032 µg/ml and the widest for fluconazole, 2-64 µg/ml.[25]

The in vitro activity of luliconazole and amorlfine hydrochloride against all isolates was more potent than itraconazole and fluconazole. In a study conducted by Baghi et al, it was found that luliconazole exhibited greater potency against all the isolates in vitro compared to fluconazole, miconazole, griseofulvin, lanoconazole, econazole, butenafine, itraconazole, terbinafine and tolnaftate. The activity of luliconazole was also found to be similar to that of anidulafungin and caspofungin.[23] Superficial cutaneous mycosis is a worldwide health problem and this study has improved our understanding of the epidemiology of such common fungal infection in this part of central Karnataka. Our study confirms that there is a probability of an increased development of resistance to the older azole antifungals. The limitation of our study was that we did not correlate laboratory microbiological testing with patient response to treatment with the drugs and their tolerability.

CONCLUSION

Two hundred (200) study participants in total participated in this cross-sectional investigation. The mean age of the patients enrolled in the study was 32.81 years, the most commonly affected age group was 21-30 years (32%) followed by 31-40 years (28%), the incidence was lower in the elderly age group and there was a preponderance of males (61.5%) over females (38.5%). These findings were reached after adhering to all of the mentioned methodologies.

In addition, our investigation revealed that the most effective medications against all dermatophyte isolates were luliconazole and amorolfine hydrochloride. Nevertheless, these isolates exhibited good resistance to established medications like itraconazole, except for fluconazole. Antifungal resistance may have increased in some of the isolates due to the larger and wider range of MIC values for fluconazole and itraconazole.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sharma V, Kumawat TK, Sharma A, Seth R, Chandra S. Distribution and prevalence of dermatophytes in semi-arid region of India. Adv Microbiol. 2015;5(2):93-106.
2. Simpanya MF. Dermatophytes: their taxonomy, ecology and pathogenicity. Rev Iberoam Micol. 2000;17:1-2.
3. Kushwaha RK, Guarro J. Biology of dermatophytes and other keratinophilic fungi. 2000.
4. Weitzman I, Summerbell RC. The dermatophytes. Clin Microbiol Rev. 1995;8(2):240-59.
5. Richardson MD, Warnock DW: Fungal infection: diagnosis and management. 4th edn. Oxford (ed): Wiley- Blackwell. 2008: 256–258.
6. Forbes BA, Sahm DF, Weissfeld AS: Diagnostic microbiology. 12th edn. St Louis. Mosby. 2005 :288-302.
7. Chander J: Textbook of medical mycology. 4th edn. JP Medical. 2009: 161-162.
8. Drake LA, Dinehart SM, Farmer ER, et al.: Guidelines of care for superficial mycotic infections of the skin: tinea corporis, tinea cruris, tinea faciei, tinea manuum and tinea pedis. Guidelines/Outcomes Committee. American Academy of Dermatology. J Am Acad Dermatol. 1996;1:282-6.
9. Seebacher, Claus & Bouchara, jean-philippe & Mignon, Bernard. (2008: Updates on the Epidemiology of Dermatophyte Infections. Mycopathologia. 2008;166:335-52.
10. Murtaza M, Rajainthran S, George B. A Mycological Study of Superficial Mycoses at the Skin Clinic in Sabah, Malaysia. International J Pharma Sci Inv. 2014;2:45-8.
11. Sudha M, Ramani CP, Anandan H. Prevalence of dermatophytosis in patients in a tertiary care centre. Int J Contemp Med Res. 2016;3(8):2399-401.
12. Weitzman I, Summerbell RC. The dermatophytes. Clinical Microbiol Rev. 1995;8(2):240-59.
13. Ameen M. Epidemiology of superficial fungal infections. Clin Dermatol. 2010;28(2):197-201.
14. Islam TA, Majid F, Ahmed M, Afrin S, Jhumky T, Ferdouse F. Prevalence of dermatophytic infection and detection of dermatophytes by microscopic and culture methods. J Enam Med Coll. 2018;8(1):11-5.
15. Bitew A: Dermatophytosis: Prevalence of Dermatophytes and Non-Dermatophyte Fungi from Patients Attending Arsho Advanced Medical

Laboratory, Addis Ababa, Ethiopia. Dermatol Res Pract. 2018;3:8164757.
16. Taufik Kakande, Yonah Batunge, Emmanuel Eilu, et al.: Prevalence of Dermatophytosis and Antifungal Activity of Ethanolic Crude Leaf Extract of Tetradenia riparia against Dermatophytes Isolated from Patients Attending Kampala International University Teaching Hospital, Uganda. Dermatol Res Pract. 2019;11:9328621.
17. Khan S, Singhal S, Mathur T, Upadhyay DJ, Rattan A: Antifungal susceptibility testing method for resource constrained laboratories. Indian J Med Microbiol. 2006;24:171-6.
18. Gupta AK, Kohli Y. In vitro susceptibility testing of ciclopirox, terbinafine, ketoconazole and itraconazole against dermatophytes and nondermatophytes and in vitro evaluation of combination antifungal activity. Br J Dermatol. 2003;149:296-305.
19. Ardakani ME, Ghaderi N, Kafaei P. The diagnostic accuracy of potassium hydroxide test in dermatophytosis. J Basic Med Clin. 2016;5(2):4-6.
20. Dhib I, Fathallah A, Yaacoub A, Hadj Slama F, Said MB, Zemni R. Multiplex PCR assay for the detection of common dermatophyte nail infections. Mycoses. 2014;57(1):19-26.
21. Behzadi P, Behzadi E, Ranjbar R. Dermatophyte fungi: infections, diagnosis and treatment. SMU Med J. 2014;1(2):50-9.
22. Kumar M. Study of Clinico-Mycologic Profile and Antifungal Susceptibility Pattern of Dermatophytic Infection in the North-Western Zone of Rajasthan. International J Curr Microbiol Applied Sci. 2018;7:762-5.
23. Gupta AK, Leonardi C, Stoltz RR, Pierce PF, Conetta B; Ravuconazole onychomycosis group. A phase I/II randomized, double-blind, placebo-controlled, dose-ranging study evaluating the efficacy, safety and pharmacokinetics of ravuconazole in the treatment of onychomycosis. J Eur Acad Dermatol Venereol. 2005;19(4):437-43.
24. Clinical Laboratory Standards Institute: Reference Method for Broth Dilution Antifungal Susceptibility Testing of Filamentous Fungi; Approved Standard. CLSI Document No. M38- A2. Wayne, PA, USA: Clinical and Laboratory Standards Institute. 2008.
25. Dabas Y, Xess I, Singh G, Pandey M, Meena S: Molecular Identification and Antifungal Susceptibility Patterns of Clinical Dermatophytes Following CLSI and EUCAST Guidelines. J Fungi. 2017;23:3.
26. Konda C, Surekha JK, Jahnavi I. Isolation and Identification of Dermatophytes in a Tertiary Care Hospital. International J Cur Microbiol Appl Sci. 2018;6:4088-101.

Cite this article as: Ranganatha A, Rajeswari MR. Isolation, identification, and antifungal susceptibility of dermatophytes from patients in a tertiary care hospital. Int J Res Med Sci 2025;13:2917-24.