

## Clinico-mycological study of dermatophytosis in a tertiary care centre in North Eastern India

Pranab Kumar Saha<sup>1</sup>, Barunesh Kishore<sup>2</sup>, Ichchhit Bharat<sup>3</sup>, Saurav Kundu<sup>4\*</sup>, Deblina Bhunia<sup>5</sup>, Pijush Kanti Datta<sup>6</sup>

<sup>1</sup>Associate Professor, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar 855108, India

<sup>2</sup>Senior Resident, Department of Dermatology, Sri Krishna Medical College, Uma Nagar Muzaffarpur, Bihar 842004, India

<sup>3</sup>Assistant Professor, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar 855108, India

<sup>4</sup>Associate Professor, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar 855108, India

<sup>5</sup>Assistant Professor, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar 855108, India

<sup>6</sup>Professor & Head, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar 855108, India

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### Abstract

**Background:** The dermatophytosis constitutes a group of superficial fungal infections of keratinized tissues, namely, the epidermis, hair, and nails. The present study was undertaken to find out the clinical profile of dermatophytosis and to identify the causative fungal species in the various clinical presentations. **Materials & Methods:** This was a hospital-based observational study. One hundred clinically suspected patients attending OPD of M. G. M. Medical College and Lion Seva Kendra Hospital were included in the study. History was taken, general physical and cutaneous examination was done and details of skin lesions noted. Direct microscopy in 10% KOH (40% KOH for nail) and fungal culture on SDA with 0.05% chloramphenicol and 0.5% cycloheximide was done in every case. Chi-square test and contingency coefficient test were used as significant tests for analysis. **Results:** In the present study, tinea accounted for 22.68 % of the total Dermatology OPD cases of which male constituted 59 % and 41 % females. The mean age was  $38.4 \pm 16.98$  years. Majority were of age group 21-30 years followed by age group 31-40 years. Out of all the samples 68 cases were KOH positive as compared to 61 cases which were culture positive. Two KOH negative cases were culture positive and 9 culture negative cases came out to be KOH positive. Out of 81 skin scraping samples 54 were KOH positive and 47 were culture positive, 11 nail clipping samples 8 were KOH as well as culture positive and out of 8 hair pluck samples 6 were KOH as well as culture positive. In 61 culture positive cases there were 7 non-dermatophytic growth which included 4 aspergillus spp. and 3 candida spp. **Conclusion:** Dermatophytosis is one of the most common if not the commonest dermatological condition we come across the Dermatology OPD. It most commonly affects the young age group rather than extremes of age.

**Key Words:** Dermatophytosis, Tinea, Fungal infection, Bihar.

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\*Correspondence

**Dr. Saurav Kundu**

Associate Professor, Department of Dermatology, Mata Gujri Memorial Medical College and LSK Hospital, Purabpali, Dinajpur Road, Kishanganj, Bihar- 855108, India.

**E-mail:** [dr.skundu@yahoo.com](mailto:dr.skundu@yahoo.com)

## Introduction

Dermatophytes are related fungi capable of causing skin changes of the type known as ringworm or dermatophytosis [1]. Dermatophytes are the most common cause of fungal infections worldwide. The WHO estimates global prevalence of dermatomycosis to be approaching 20% [2]. Thus defined, the ringworm species are all moulds belonging to three asexual genera: *Microsporum*, *Trichophyton* and *Epidermophyton*. The three asexual dermatophyte genera are distinguished by the morphology of the large, multicellular macroconidia that are produced.

Apart from the mycological classification of dermatophytes, it has been traditional for clinical and epidemiological reasons to group dermatophytes that infect humans according to their ecological niche: geophilic species originating in the soil zoophilic species with animal origins; and anthropophilic species, which are largely restricted to human skin.<sup>3</sup> Characteristically, zoophilic species tend to produce highly inflammatory reactions in humans and this may lead to a spontaneous cure. Anthropophilic species produce mild but chronic lesions [3].

An important characteristic of the dermatophytes as parasites is their restriction to dead keratinized tissue. Although the inflammatory responses of ringworm infection involve the dermis and the Malpighian stratum of the epidermis, the fungus itself is found growing only within the stratum corneum of the epidermis, within and around the fully keratinized hair shaft, and in the nail plate and keratinized nail bed. Within these keratinized tissues, the fungus exists only as mycelium and arthroconidia. In dermatophyte infections involving hair, the fungus invades the follicle from the adjacent stratum corneum and follows one of several precise patterns of growth [4]. Although dermatophytosis is a superficial infection, immunocompromised patients may experience severe disseminated disease [5]. Dermatophytosis is common in the tropical and subtropical countries including India where the hot and humid climatic condition helps in acquisition and maintenance of the mycotic disease [6, 7].

Our patients come from Eastern part of India where the monsoons are heavy and relative temperature and humidity is high most of the time. This climate retards sweat evaporation due to high environmental moisture content, thus facilitating fungal growth resulting in a high incidence of fungal diseases in this area [8, 9].

Kerion is an inflammatory type of tinea capitis [Fig. 1]. It is often seen with zoophilic ectothrix dermatophytes such as *Microsporum canis*, but it is increasingly

caused by endothrix infections such as *T. tonsurans*, especially in urban areas [10]. Kerion is caused by a T cell-mediated hypersensitivity reaction to the causative dermatophyte [11]. It is characterized by a tender, erythematous, suppurative swelling with associated alopecia and regional lymphadenopathy and is often misdiagnosed as a bacterial infection, which may lead to unnecessary antibiotic or surgical interventions. Treatment delay may result in permanent hair loss [12]. Based upon their genera, dermatophytes can be classified into three groups: *Trichophyton* (which causes infections on skin, hair, and nails), epidermophyton (which causes infections on skin and nails), and *Microsporum* (which causes infections on skin and hair). Based upon mode of transmission, these have been classified as anthropophilic, zoophilic, and geophilic. Finally, based upon the affected site, these have been classified clinically into tinea capitis (head) [Fig.4], tinea faciei (face), tinea barbae (beard), tinea corporis (body) [Fig. 2], tinea manus (hand), tinea cruris (groin), tinea pedis (foot), and tinea unguium (nail). Other clinical variants include tinea imbricate [Fig. 3], tinea pseudoimbricata, and Majocchi granuloma [13].

The present study was undertaken to find out the clinical profile of dermatophytosis and to identify the causative fungal species in the various clinical presentations.

## Materials and Methods

The patients attending OPD of Mata Gujri Medical College, Kishanganj, Bihar and the patients admitted in Lion Seva Kendra Hospital. One hundred cases were taken for study. A total of 100 samples which included 81 skin samples and 8 hair samples and 11 nail samples from clinically diagnosed Dermatophytosis cases were collected. The patients having lesions of papules with scales over the body would be selected for study, and scraping from the lesions or hair plucking or nail clipping taken for KOH mount and fungus culture. The patient attending Dermatology OPD in showing lesions typical of dermatophytosis based on the judgment of the clinician were eligible to participate in this study. Age limit and sex bias were not used and patients of all age groups and both the sexes were included. Use of antifungal therapy (oral as well as topical) within 2–3 months prior to the commencement of the study and presence of serious underlying systemic conditions were adjudged inappropriate by the clinician. Other infections bacterial as well as fungal in the skin folds and nails such as paronychia, intertrigo etc. were excluded.

Scrapings of skin were treated with 10% KOH for 20 minutes, hair and nail in 20% KOH for 2 hours and overnight and examined next morning respectively were mounted on a glass slide and examined under microscope for the presence of fungi under low power of magnification. The positive samples were processed for the isolation of the dermatophyte species on Sabouraud's Dextrose Agar (SDA). For primary isolations, SDA slopes with chloramphenicol and cycloheximide were used. Subculture was done in SDA without antibiotics. One set is incubated at 37°C and another set at room temperature for one month. Growth is usually seen by 2 weeks. Growth was identified based on macroscopic and microscopic features. Gross morphology of the colony was studied by checking the following characteristics:

1. Rate of growth
2. General topography: flat, heaped, regularly or irregularly folded.
3. Texture: powdery, velvety, fluffy etc.
4. Surface colour and pigment colour on reverse.

If no growth was observed at the end of 4 weeks, the culture was labelled as negative. Statistical analysis was done using SPSS 17.0 software. Chi-square test and contingency coefficient test were used as significant tests for analysis.

### Results

In the present study, 100 patients of cutaneous dermatophytic infection attending the Dermatology OPD of M. G. M. Medical College, Kishanganj, were included. Among 79,458 patients attending dermatology department 18,032 were of tinea infection during the study period which accounted for an

incidence of 22.68% of total dermatology patients. Tinea accounted for 22.68 % of the total dermatology outpatient cases [Table 1]. In the 100 cases taken majority of patients were male 59 % as compared to 41 % females. Mean age of the patient was  $38.4 \pm 16.98$  years. Majority of patients were of age group 21-30 years followed by patients in age group 31-40 years.

Out of all the samples which were taken skin scrapping constituted to be maximum of 81% followed by nail clipping 11% and hair pluck 8%. 68 cases were KOH positive as compared to 61 cases which were culture positive [Table 2]. 2 KOH negative cases were culture positive and 9 culture negative cases came out to be KOH positive. Out of 81 skin scrapings samples 54 were KOH positive and 47 were culture positive, 11 nail clipping samples 8 were KOH as well as culture positive and out of 8 hair pluck samples 6 were KOH as well as culture positive [Table 2, Fig. 5, 6, 7].

In 61 cultures positive cases there were 7 non-dermatophytic growths which included 4 aspergillus spp. and 3 candida spp. In 54 cultures which showed dermatophytic growth *T. rubrum* was the most common dermatophyte isolated i.e. 27 cultures (44.26%) followed by *T. mentagrophytes* 17 cultures (27.86%) [Table 3]. *T. Corporis* was most common presentation occurring in 64 cases followed by *T. cruris* in 43 cases. Many cases presented with tinea infections at different locations. *T. Rubrum* was the most common dermatophyte isolated in *T. cruris* (10 cases), *T. corporis* (7 cases), *T. pedis* (3 cases) and *T. mentagrophytes* along with *E. floccosum* (3 cases each) were most common dermatophyte isolated in *T. unguium* [Table 4].

**Table 1: Distribution of cases according to KOH and culture findings**

Number of cases	KOH positive	KOH negative	Total cases
Culture on SDA +ve	59	2	61
Culture on SDA -ve	9	30	39
Total cases	68	32	100

**Table 2: Sample wise KOH and culture positive cases**

Type of sample	No. of samples	KOH positive	Culture positive
Skin scrapping	81	54	47
Nail clipping	11	8	8
Hair pluck	8	6	6

**Table 3: Species identification on culture media**

Name of the species	No. in skin scrapping	No. in nail clipping	No. in hair pluck	Total	Percentage of total culture positive
<i>T. rubrum</i>	22	2	3	27	44.26%
<i>T. mentagrophytes</i>	12	3	2	17	27.86%
<i>T. tonsurans</i>	1	0	0	1	1.63%
<i>M. audouinii</i>	3	0	1	4	6.55%
<i>M. gypseum</i>	1	0	0	1	1.63%
<i>E. floccosum</i>	1	3	0	4	6.55%

**Table 4: Clinical type in relation to etiological agent**

Distribution of tinea								
Etiological agent	<i>Tinea corporis</i>	<i>Tinea cruris</i>	<i>Tinea pedis</i>	<i>Tinea manus</i>	<i>Tinea faciei</i>	<i>Tinea capitis</i>	<i>Tinea unguium</i>	Total
<i>T. rubrum</i>	10	7	3	1	1	3	2	27
<i>T. mentagrophytes</i>	7	4	1	–	–	2	3	17
<i>T. tonsurans</i>	1	–	–	–	–	–	–	1
<i>M. audouinii</i>	2	1	–	–	–	1	–	4
<i>M. gypseum</i>	1	–	–	–	–	–	–	1
<i>E. floccosum</i>	–	1	–	–	–	–	3	4
Total	23	13	4	1	1	6	8	54

**Figure 1: Kerion, an inflammatory type of tinea capitis**



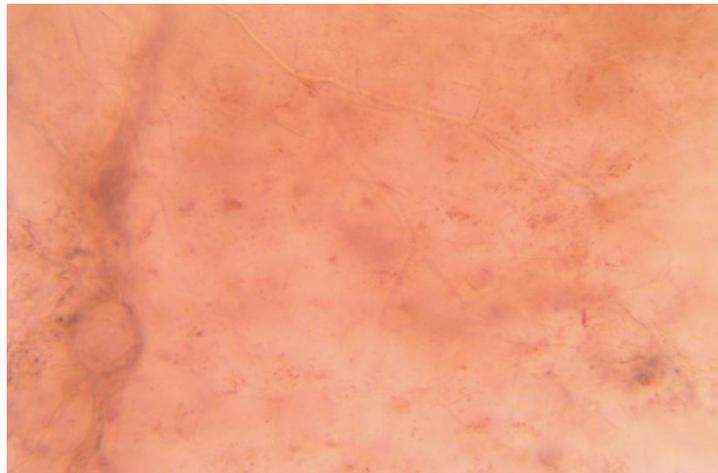
**Figure 2: Tinea Corporis**



**Figure 3: Tinea imbricata**



**Figure 4: Blackdot T. Capitis**



**Figure 5: Septate hyaline hyphae**



**Figure 6: Culture showing growth of trichophyton rubrum**



**Figure 7: Flat and white colony-microporum audouinii**

## Discussion

The present study 100 patients of dermatophytic infection attending the Dermatology OPD of M. G. M. Medical College and L.S.K. Hospital, Kishanganj, were included. The incidence of dermatophytic infection was 22.68 % which is very similar to result obtained by de Hoog GS et al [1]. In the present study the sex distribution was 59 males to 41 females which constituted a majority of male patients. The male to female ratio in this study came out to be 1.45. This is in with concurrence with majority of the Indian studies in which higher incidence in males have been noted.

In Nita Patwardhan et al (1999) study [14] male to female ratio in the study was 2:1. In Bindu V (2002) et al study [15] male to female ratio was 2.1:1. Singh S et al (2003) [16] in their study male to female ratio was 1.57:1. Sen SS et al (2006) [17] male to female ratio was 2.85:1. Veer P et al (2007) [18] male to female ratio was 1.8:1. Neetu Jain et al (2008) [19] males (67.5%) predominated over females (32.5%). Madhavi S et al (2011) [20] males outnumbered females 1.3:1. These all numbers suggest the similar findings as collaborated in our study about male predominance in dermatophyte infections. The mean age was 38.4±16.98 years. Peak incidence was found in age group 21-30 years. Nita Patwardhan et al (1999) [14] studied 175 clinical samples, maximum number of cases of dermatophytosis belonged to the age group 21-30 years (22.8%). Aruna Aggarwal et al (2002) [21] in their study of 500 clinically diagnosed cases of dermatomycosis found that (68.8%) of the infections occurred above 20 years of age and was most prevalent in the third decade. Bindu V (2002) [15] studied 150 patients with dermatophytosis and found maximum patients were seen in the age group 11-20 years (23.3%) and Singh S et al (2003) [16] in their study of 260 clinically suspected cases found that young adults in the age group of 16-30 years (45.38%) were mainly affected.

Sen SS et al (2006) [17] studied 100 clinically suspected cases of dermatophytosis and found that infection was common in adults aged 21-30 years (44%). Veer P et al (2007) [18] undertook a mycological study of onychomycosis in 88 patients. Commonest age group was 31-40 years. Samita Sarma et al (2007) [22] studied 100 clinically diagnosed patients of fungal infections of the skin. Maximum patients were found in the age group of 21-30 years (39%) [22]. So, our finding generally matched with overall presence in young adults. The youngest patient was of age 6 years and the oldest was of age 74 years. KOH positive cases were 68 % and culture positive

cases were 61%. *T. rubrum* was the commonest pathogen isolated (44.26%) followed by *T. mentagrophytes* (27.86%). Nita Patwardhan et al (1999) [14] study showed *trichophyton rubrum* being the commonest species (28.12%). Aruna Aggarwal et al (2002) [21] study *trichophyton rubrum* (62.3%) was the commonest species. Bindu V (2002) [15] et al study *trichophyton rubrum* was the most common species isolated (66.2%). Singh S et al (2003) [16] *trichophyton rubrum* was the most common isolate 73.27%. Vijaya D et al (2004) [23] studied 100 patients of onychomycosis *trichophyton rubrum* was the most common dermatophyte. Sen SS et al (2006) [17] studied 100 clinically suspected cases of dermatophytosis. *Trichophyton rubrum* was the most common etiological agent isolated in this study (68.63%). Venkatesan G et al (2007) [24] study etiological agent *Trichophyton rubrum* was the most common isolate 73.3%. Veer P et al (2007) [18] undertook a mycological study of onychomycosis, which *trichophyton rubrum* was most common (42.3%). Samita Sarma et al (2007) [22] study *trichophyton rubrum* was the most common dermatophyte isolated (47.54%) [10-18]. These all result near about corresponded to our result of *trichophyton rubrum* (46.4 %) being most common etiology isolated. *T. corporis* was the most common presentation and *t. rubrum* was the most common pathogen isolated from skin scrapping from *t. corporis*.

## Conclusion

Dermatophytoses is one of the most common if not the commonest dermatological condition we come across the Department of Dermatology. It most commonly affects the young age group rather than extremes of age. Hair is affected mostly in children. Male constitutes 3/5<sup>th</sup> of the patient which reflects the attitude of more male patients to approach for treatment rather than increase prevalence in males.

Skin is the most affected organ in dermatophytosis as compared to nail and hair. KOH and culture on S.D.A. are important lab tests with high predictive value. Non-dermatophytes generally occur due to sample contamination or could predict moulds may have a role in tinea infection. *T. rubrum* is the most common pathogen causing tinea around this center followed by *t. mentagrophytes*. *T. corporis* is the most common type of tinea infection followed by *t. cruris*. *T. rubrum* is the most common pathogen causing *T. cruris* as well as *T. corporis* around this center. Limitations of the study are small sample size, technical expertise needed in

preparing as well as interpreting KOH as well as culture and selection bias by the selecting physician.

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