

## Original Research Article

# Prevalence and spectrum of dermatophytes in patients attending a tertiary care hospital Srinagar, Kashmir

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## ABSTRACT

**Background:** Dermatophyte infections are a global health problem but very neglected in Kashmir. India. This work aimed at determining prevalence and spectrum of dermatophytosis isolated from patients attending tertiary care hospital Srinagar. Kashmir.

**Methods:** A total of 510 samples of skin, hair and nail scrapings were collected and processed using standard microscopy (KOH) and cultural methods as per the standard protocol.

**Results:** Out of 510 samples collected, 272 (53.33%) patients were confirmed cases of dermatophytosis (confirmed clinically and on fungal culture). The prevalence of dermatophytosis was significantly associated with age groups of participants with higher infection among those aged 18-32 which accounted for 35.29%, followed by age group 1-17 with 30.14%. Out of 510 samples, 110 (21.56%) were both KOH (microscopy) and culture positive, 162 (31.76%) cases were only culture positive and 130 (25.49%) clinical samples were only positive for fungal elements on microscopy. 133 (26.07%) fungal isolates were obtained which included both dermatophyte and non-dermatophytic fungi (excluded in this study). *T. mentagrophytes* had highest distribution 40.44% among dermatophytes species and *T. Unguium* 114 (41.96%) accounted for most common site for dermatophytic infections. Poor hygiene was predominant risk factor in 143 cases (52.57%). Patients from lower socioeconomic status were affected more than others (34.92%).

**Conclusions:** In this study we have focused to determine the prevalence, clinical pattern and pathogenic profile of dermatophytosis according to the age, gender, site, and fungal distribution. Improvization of these conditions more accurately can result in decreased incidence of dermatophytosis in this area.

**Keywords:** Superficial fungal infections, Tinea, Trychophyton

## INTRODUCTION

Superficial skin infections are the most common skin disease caused by fungal pathogens. These affect millions of people throughout the world. The majority of these superficial skin infections are caused by dermatophytes.<sup>1</sup> Dermatophytes are a group of closely related keratinophilic fungi, which produce keratinase that can

invade the stratum corneum of skin or other keratinized tissues derived from epidermis such as hair and nails.

Dermatophytosis on the other hand is an infection produced by a dermatophytic fungi in the keratinized tissues like hair, nails and stratum corneum of skin<sup>1</sup>. Dermatophytosis in general is called "tinea" or "ringworm".

Certain species of dermatophytes are geographically restricted and are present or endemic only in particular parts of world while some species are sporadic. The prevalence of dermatophytosis depends on the environmental conditions, personal hygiene and individual susceptibility from place to place.<sup>2</sup> Although the disease hardly causes death, it is a common infection which affects both the quality of life socially and disrupting the day to day activities.<sup>3</sup>

Dermatophytes like microsporon, epidermophyton and trichophyton are among the major causes of superficial mycosis and is also followed by many of the non-dermatophytic molds and yeasts.<sup>4</sup> Now a days because of suppression of host immune defense mechanisms by underlying diseases humans are now susceptible not only to pathogenic fungi but to contaminants as well.<sup>5,6</sup>

In this study we have focused to determine the prevalence, risk factors, clinical pattern and the pathogenic profile of dermatophytosis according to the age, gender, site, and fungal distribution as no such study has been done before in this part of Jammu and Kashmir.

## METHODS

This was a prospective cross sectional study. The study involved 510 patients that were diagnosed clinically with superficial mycosis and were referred to our laboratory for further investigations. It was conducted over a period of 1 year and 2 months from December 2018 to February 2020 in Department of Microbiology, Government medical college (GMC) Srinagar, Kashmir.

### Inclusion criteria

Patients of all age groups and either sex with clinical presentation of dermatophytosis who gave their consent to be the part of the study were included. The patients were categorized based on clinical material collected from different sites *Tinea corporis* (non-hairy skin), *Tinea unguium* (nails), *Tinea cruris* (groin), *Tinea capitis* (scalp and hair), *Tinea pedis* (feet), *Tinea manuum* (hand) and further confirmed through fungal culture as per the standard protocol.

### Exclusion criteria

Patients on medications like antifungal therapy (oral or topical) within few months before the study. Patients with non dermatophytic infections, bacterial infections in the skin folds and nails were excluded from the study.

Samples were directly received from OPD and IPD from the dermatology department. Each specimen was collected under aseptic precautions. Standard protocol was followed while collecting the information. Nail, hair, skin and scalp scrapings were taken with the help of sterile scalpel / blades and sent to the department of microbiology in autoclaved folded paper with proper

labeling and subjected to microscopy and culture for fungal growth.

### Laboratory diagnosis

Identification was done by phenotypic methods that included observing the colony obverse and reverse for pigmentation, type of growth, and preparation of lactophenol cotton blue mount from colony for final identification. In addition, certain biochemical tests, such as urease, were also performed as and when required.

### Procedure

#### KOH mount

The samples were treated with 20% (KOH) potassium hydroxide (for digestion of keratin and non-fungal elements), for 10– 20 minutes in case of skin and scalp scrapings in a microscopic slide and overnight for nail clippings /scrapings in test tubes and then transferred over to the glass slides for microscopic examination. Examination was done for fungal elements under low (10x) and high power (40 x) magnification.

#### Culture

The samples were inoculated and streaked on the Sabouraud's dextrose agar containing chloramphenicol (Himedia) and Dermatophyte test medium (himedia) and Potato dextrose agar (himedia). The inoculated specimens were incubated at 37°C and 25°C for 4 weeks and checked every day for 1st week and then twice in 2nd, 3rd and 4th week for fungal growth. Mold-form fungi were identified using colony morphology, microscopic findings and slide culture technique. Yeast-form fungi were identified according to standard clinical laboratory methods, including the grams staining, culture on SDA and these samples were excluded from this study. Texture, rate of growth and pigmentation of the front and reverse side of cultures were used to characterize fungal isolates macroscopically. Lactophenol cotton Blue staining was done for each culture positive sample to observe mycelial type, conidial arrangement (macro and micro conidia) to differentiate between species and genera.

For differentiation of *T. tonsurans*, *T. rubrum* and *T. violaceum*, urease test was done. All these procedures were done following the standard protocol.

### Statistical analysis

Statistical software: JASP 0.14 was used to analyse the data and p value of <0.05 was taken as significant.

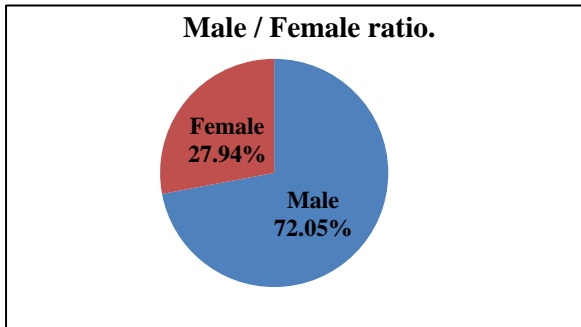
## RESULTS

In the present study, a total of 510 clinical samples were collected from the suspected cases of dermatophytosis of

which 272 (53.33%) patients were confirmed cases of dermatophytosis (confirmed clinically and on fungal culture), 133 (26.07%) samples accounted for non dermatophytes and 105 (20.58%) showed no growth.

**Male female ratio**

Out of the total positives 196 (72.05) were male and 76 (27.94%) were female patients.



**Figure 1: Gender distribution revealed that 72.05% were male and 27.94% were female.**

Out of the total 510 samples 110 (21.56%) were both KOH and culture positive, 162 (31.76%) cases were only culture positive and 130 (25.49%) clinical samples were only positive for fungal elements on KOH.

Fungi were not detected nor showed fungal growth in 108 (21.17%) samples. 133 (26.07%) cases showed non

dermatophytic infections which were excluded in this study (Table 1).

In terms of the anatomical site involved *Tinea unguium* was the most predominant clinical manifestation present that involved a total of 114 (41.91%) cases followed by *Tinea corporis* 77 cases (28.30%), *Tinea capitis* 44 (16.17%) cases and *Tinea pedis* 26 (9.55%) cases respectively. Least number of cases 11 (4.04%) were of *Tinea manum* (Table 2).

**Table 1: Distribution and correlation of KOH and culture.**

	Culture positive	Culture negative	Total (KOH Positive)
<b>KOH positive</b>	110	130	240 (47.05%)
<b>KOH negative</b>	162	108	270
<b>Total</b>	272	-	-
<b>(Culture positive)</b>	-	53.33%	

**Age distribution**

Dermatophytosis was seen to be highest in age group of 18-32 which accounted for 35.29% (no-96) followed by age group 1-17 with 30.14% (no-82) and age group 48-60 with 19.11% (no-52) respectively. Least number of cases affected with dermatophytosis were of age group 33-48 accounting for 15.44% (42 cases).

**Table 2: Demographic profile of dermatophytosis in relation to different age groups and gender of patients.**

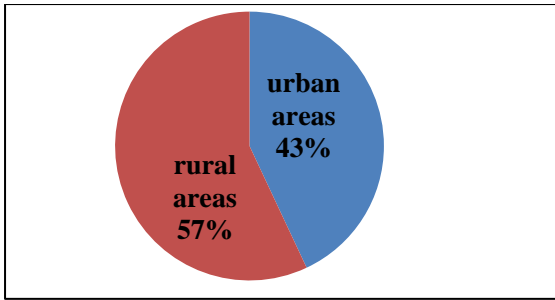
Characteristics site of dermatophytic infections						
Demographic characteristics	<i>T. unguium</i>	<i>T. corporis</i>	<i>T. capitis</i>	<i>T. pedis</i>	<i>T. mannum</i>	Total
	114	77	44	26	11	272
	-41.96%	-28.30%	-16.17%	-9.55%	-4.04%	-53.33%
<b>Age (years)</b>						
1-17	27 (23.68%)	28 (36.36%)	23 (52.27%)	0	4 (36.36%)	82 (30.14%)
18-32	45 (39.47%)	23 (29.87%)	13 (29.54%)	9 (34.61%)	6 (54.54%)	96 (35.29%)
33-48	16 (14.3%)	13 (16.88%)	4 (9.09%)	9 (34.61%)	0	42 (15.44%)
49-60	26 (22.80%)	13 (16.88%)	9 (34.61%)	8 (30.76%)	1 (9.09)	52 (19.11%)
<b>Sex</b>						
Male	92 (80.70%)	53 (68.83%)	27 (61.36%)	17 (65.38%)	7 (63.63%)	196 (72.05%)
Female	22 (19.29%)	24 (31.16%)	17 (38.63%)	9 (34.61%)	4 (36.36%)	76 (27.94%)

Out of 114 patients with *Tinea unguium*, 39.47% (no=45) patients were of the age group 18-32. The study subjects in the age group of 1-17 were the second most affected with *Tinea corporis* no=28 (36.36%) being the highest in them followed by *Tinea capitis* 52.27% (no=23) and *Tinea pedis* which showed equal no of cases 34.61% (no-9) in age groups 18-32 and 33-48. *Tinea annuum* was seen mostly in age group 18-32 showing 54.54% (no=06) respectively (Table 3). The total number of patients belonging to the rural areas were 155 (56.98%) and that

belonging to the urban areas were 117 (43.01%). These included both males and females (Figure 2).

**T. mentagrophytes**

*T. mentagrophytes* was the major organism isolated and accounted for 40.44 %. Out of the 110 cases of *T. mentagrophytes* 47 were from *tinea unguium*, 31 cases from *tinea corporis*, 18 cases from *tinea capitis*, 10 cases from *Tinea pedis* and 04 cases from *tinea manum*.



**Figure 3: Distribution of dermatophytes in relation to the clinical manifestations.**

**T. rubrum**

*T. rubrum* was the second most isolate in the present study comprising of 53 cases (19.48%). Out of which 18 cases were from *Tinea unguium*, 20 cases were from *T. corporis* and 08 cases from *T. capitis* and 06 cases from *T. pedis* respectively.

**T. tonsurans**

*T. tonsurans* was the third most dominant isolate accounting for 14.33%. Out of 39 cases of *T. tonsurans*, 18 cases were from *T. unguium*, 08 cases were from *T.*

*corporis*, 07 cases from *T. capitis*, 04 cases from *T. pedis* and 02 cases from *T. manum* respectively.

**T. violaceum**

In the present study *T. violaceum* was seen in 32 (11.76%) cases. 14 cases were from *T. unguium*, 04 cases were from *T. corporis*, 06 cases from *T. capitis*, 03 cases were from *T. pedis* and 02 cases from *T. mannum*.

**T. verrucosum**

This was seen in 24 patients (8.82%) with 10 cases of *T. unguium*, 06 cases of *T. corporis*, 05 cases of *T. capitis* and 03 cases of *T. pedis*.

**Epidermophyton floccosum**

This was seen in 08 (2.94%) cases and 6 cases were seen in *T. unguium* followed by 2 cases with *T. mannum* respectively.

**Microsporon canis**

Least number of cases (06) were of *Microsporon canis* accounting for 2.20% and 5 cases were from *T. corporis* followed by *T. mannum* with only 1 case.

**Table 4: Distribution of dermatophytes in relation to the clinical manifestations.**

Fungal isolates	<i>T. unguium</i>	<i>T. corporis</i>	<i>T. capitis</i>	<i>T. pedis</i>	<i>T. manum</i>	Total fungal isolates
<i>T. mentagrophytes</i>	47	31	18	10	4	110 (40.44%)
<i>T. rubrum</i>	19	20	8	6	0	53 (19.48%)
<i>T. tonsurans</i>	18	8	7	4	2	39 (14.33%)
<i>T. violaceum</i>	14	7	6	3	2	32 (11.97%)
<i>T. verrucosum</i>	10	6	5	3	0	24 (8.82%)
<i>Epidermophyton floccosum</i>	6	0	0	0	2	08 (2.94%)
<i>Microsporon canis</i>	0	5	0	0	1	06 (2.20%)
<b>Total</b>	114	77	44	26	11	272

**Table 5: Distribution according to the occupation.**

Occupation	Male	Female	Total	%
Farmers/ labourers	76	19	95	34.92
Students	54	12	66	24.26
Office workers	40	5	45	16.54
House makers	-	38	38	13.97
Miscellaneous	19	9	28	10.29

According to the socio economic status and occupational distribution 34.92% cases were farmers/ laborers followed by students 24.26%, office workers 16.54%, housemakers 13.97% and least number of cases 10.29% were miscellaneous. Higher percentage of patients were of low socioeconomic status which accounted for 43.75% (no=119) in this study (Table 5).

Among the risk factors, poor hygiene was predominant in 143 cases (52.57%) followed by Steroid usage which included 58 cases (21.32%), diabetes mellitus 38 cases (13.97%), trauma 25 (9.19%). Least number of cases 08 (2.94%) were seen in patients having HTN (Table 6).

**Table 6: Risk factors associated with dermatophytosis.**

Risk factors assessed	No of cases (%)
Poor hygiene	143 (52.57)
Steroid usage	58 (21.32)
Diabetes mellitus	38 (13.97)
Trauma	25 (9.19)
Hypertention	08 (2.94)

**Seasonal distribution of dermatophytosis**

The overall prevalence of dermatophytosis in the present study was reported maximum in winter season from

December to February (135 cases with 49.63%) while in summer (June to August) 55 cases with 20.22% were encountered. Around 44 cases (16.17%) were seen in spring and 38 (13.97%) were seen in autumn. (Table 7).

**Table 7: Seasonal distribution of Dermatophytosis.**

Clinical types	No of cases	Winter	Spring	Summer	Autumn
		Dec- Feb	March- May	June- August	Sep- Nov
<i>Tinea unguium</i>	114	68	19	22	5
<i>Tinea corporis</i>	77	37	14	11	15
<i>Tinea capitis</i>	44	18	9	7	10
<i>Tinea pedis</i>	26	9	1	10	6
<i>Tinea manuum</i>	11	3	1	5	2
<b>Total (Percentage)</b>	<b>272</b>	<b>135 (49.63)</b>	<b>44 (16.17)</b>	<b>55 (20.22)</b>	<b>38 (13.97)</b>

**DISCUSSION**

Dermatophytic infections are widespread and cause significant distress to the patients socially, emotionally and financially. This study was conducted to determine the most common clinical presentation along with the causative agent and the co-relation of microscopic evidence and culture findings of clinical specimens used in the study for diagnosing dermatophytosis.

**Gender distribution**

In the present study, 510 clinically suspected dermatophytoses cases were studied. In our study, among 272 patients who were diagnosed with dermatophytoses infection, the males were 196 (72.05%) which is marginally higher than the percentage of females 76 (27.94%) with the male to female ratio 2.5:1. Higher prevalence in males have also been reported in India in many previous researches done by Singh et al, Balakumar et al.<sup>7,8</sup> The reason for increased percentage of males may be due to the fact of increased outdoor exposure and more physical activity resulting in increased sweating.

**Demographic distribution**

In present study majority of the cases were from rural areas 155 (56.98%) while 117 (43.01%) cases were from urban areas. Higher number of cases from rural areas may be due to low socioeconomic status, more outdoor exposure, poor personal hygiene and sanitation. This is in accordance with the studies done by Janardhan et al.<sup>9</sup>

**Seasonal distribution**

Dermatophytosis was reported throughout the year with more prevalence in summer and winters. In the present study, highest incidence of dermatophytosis was reported in winter season December to February (135 cases with 49.63%), followed by summer season (June to August) with 94 cases accounting for 34.55%, 44 cases (16.17%) were seen in spring season (March to May) and least number of cases were seen in autumn season (September

to November) with 38 cases (13.97%). Balamuruganvelu et al observed higher incidence of *Tinea unguium* in colder months which is similar to this study.<sup>10</sup> Because of long span of cold climate in this part of country many patients in this study wore woolen garments in winters, which were often unwashed for weeks creating a damp environment favorable for proliferation of dermatophytes.

**Socio-economic status and distribution according to the occupation**

Patients from lower socioeconomic status were affected more than others. In this study most dominant cases were farmers or laborers (34.92%) followed by students (24.26%) which was similar to a study done by Vineetha et al which showed majority of cases of dermatophytosis (52%) as laborers.<sup>11</sup> This may be due to poor hygienic conditions, sharing of linen, towels, poor nutrition and increased sweating which could have contributed to the spread of infection. Objects such as clothing, bedsheets and towel harbor the fungal pathogens and are capable of transmitting the disease among family members. Fungal spores remain viable for months in household dust leading to recurrent episodes of clinical disease.<sup>12,13</sup>

**Clinical manifestation in relation to age**

In the present study, almost all ages were susceptible to the dermatophytic infections. This study shows that the dermatophytic infection is predominant in the adult age group of 18-32 years (35.29%), which is similar to the studies done by Tonita et al and Balamurgagunvelu et al which showed the most common age group for dermatophytosis as 21-30 years (22.7%) and 21- 30 years (27.5%) respectively.<sup>10,14</sup> The reason for this may be due to increased level of physical activity in this particular age group thus leading to excessive sweating which favours the growth of dermatophytes.

**Distribution in relation to clinical types**

This study showed about five different types of tinea among which *Tinea unguium* was the dominant clinical

manifestation accounting for 114 cases (41.91%). *Tinea corporis* was the second most common clinical type accounting for 77 cases (28.30%) which is similar to a study by Nazir et al.<sup>15</sup> Males are more commonly involved in farming and labour activities here and frequent exposure to moist conditions might be the reason for increased *Tinea unguium* and *Tinea corporis* in this gender.<sup>15</sup> Least number of cases were seen in *Tinea mannum* accounting for 11 cases (4.04%).

#### **Distribution according to the risk factors**

The major risk factor in this study was poor hygiene seen in 143 ( 52.57%) patients followed by steroid usage in 58 (21.32%), Diabetes mellitus was seen in 38 cases (13.97%), trauma in 25 (9.19%) cases and least no of cases 08 (2.94%) were seen having HTN .This is similar to the study done by Hothota et al.<sup>16</sup>

#### **Correlation of mycological Study by KOH and culture**

Direct microscopy of samples was positive in 240 (47.05%) cases which is similar to few other studies done by Hanumanthappa et al and Bindu et al.<sup>17,18</sup> Few Other studies have reported KOH mount positivity of 43%, 50.5% in clinically suspected cases.<sup>19</sup> This indicates that KOH is only a sensitive and screening test and not a specific test to diagnose dermatophytosis. Therefore for better diagnosis and treatment, fungal culture should be advised as well. The culture positivity rate was 53.33% in our study this may also be due to the higher fungal load as well as due to better collection and processing of samples. Fungal culture has the advantage of differentiating the causative agent to generic and species level. From 272 culture-positive samples, 59.55% (162) of them showed no fungal elements on direct KOH mount, which could be because of fungus in an inactive sporulating phase which is difficult to be seen by microscopy but is able to grow in appropriate media.<sup>20</sup>

#### **Distribution of isolated species of dermatophytes**

The most common dermatophytic isolates were found in 272 samples of which *T.mentagrophytes* was the most dominant species involving 110 (40.44%) of the total isolates that were isolated from the nail. Our findings were close to the study done by Nazir et al which showed *T.mentagrophytes* (47%) from *T.ungium*. Sahai et al and Mahajan et al also have reported *T. mentagrophytes* to be the most common species isolated in dermatophytic infections.<sup>15,21,22</sup> Several other reports from India also show Trichophyton as the commonest genus and *T.mentagrophytes* as the commonest species.<sup>23,24</sup> *T.rubrum* accounted for 53 (19.48%) as the second most common species in this study which is similar to study done by Mahajan et al which showed 21.9% cases of *T.rubrum*. *Trichophyton rubrum* and *Trichophyton mentagrophytes* are the common species infecting the nails.<sup>25,26</sup>

*T. tonsurans* 39 (14.33%) isolated in this study, ranked third in frequency and was mostly isolated from *Tinea unguium* and *Tinea corporis*. This is similar to a study done by jahromi S B et al 27 with 11.7% of such cases. *T. violaceum* was seen in 32 cases (11.76%) in this study. *E.flocossum* was seen in 8 cases (2.94%) in this study. *E. floccosum* were also isolated in studies done by Mahajan et al and Sahai et al which is in concordance with this study.<sup>21,22</sup> The least number of cases 6 (2.20%) were identified with *Microsporon canis*. All of these cases had contacts with pet animals (cats and dogs). Fungi were not detected nor showed fungal growth in 108 (21.17%) subjects. These were suspected of having superficial mycosis indicating that clinical means only is not reliable for differentiation of dermatophytosis from other superficial infections. Both clinical diagnosis and laboratory diagnosis are essential for better and accurate diagnosis before starting the therapy.

#### **CONCLUSION**

This study was carried out with the aim to assess the magnitude and epidemiological status of dermatophytosis, to identify the organisms responsible for it and determine the various risk factors associated with the disease in Kashmir Valley. Dermatophytosis is mainly a disease of young and middle age adults, particularly males because of more chances of exposure to the risk factors due to physical exertion and contact with infected persons. Patients from lower socioeconomic status involving rural areas predominated in this study due to poor personal hygiene. Personal hygiene is seen to be an important factor along with clothing patterns which also play a part in occurrence of the disease.

Dermatophytosis when associated with intake of steroids and diabetes mellitus appears to be chronic and severe due to immunological factors. The other associated conditions in this study were hypertension and trauma. Dermatophytosis was most prevalent in winters because of infrequent baths (twice weekly or less) and use of unwashed woollen clothes which harboured most of the fungal elements causing dermatophytic infections. A significant association between KOH and culture was seen, the two variables being dependent on each other. *Tinea unguium* and *Tinea corporis* were the most common clinical conditions and *T.ungium* accounted the predominant clinical type. Trichophyton species formed the commonest etiological agents of dermatophytosis and *T. mentagrophytes* was the commonest species isolated from most clinical types. This data helps us in assessing the prevalence and etiological distribution of the dermatophytic infections. Improvization of these conditions more accurately can result in decreased incidence of dermatophytosis in this area.

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*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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