

# Epidemiology and Mycological Analysis of Superficial Mycosis in a Northern Indian Tertiary Care Hospital

Nishima Sharma<sup>1\*</sup>, Jasmina Javaid<sup>2</sup>, Pankaj Kaul<sup>3</sup>

## Abstract

**Background:** A fungal infection that affects the outer layer of the skin and its connective tissue, including hair and nails, is called superficial mycosis. These infections are typically caused by fungi, which thrive on keratin, the protein that makes up the nails, hair, and skin. A common disease that can affect people of any age, gender, or race is superficial mycosis. Usually, it appears as a streaky red rash that can be uncomfortable or painful. In some cases, the infection may lead to hair loss, nail discoloration, or thickening of the affected area. **Aim And Objectives:** The aim of this research is to conduct an observational study to investigate the clinico-mycological characterization of superficial mycosis among patients in a tertiary care hospital in North India. **Material And Methods:** This study was conducted at National Hospital Section 6, Mohali, Punjab, over a period of four months, from February to May, using prospective laboratory controls from patients who had superficial mycoses, and samples forty in all gave forty. The specimens underwent macro- and microscopical examinations, and growth was tracked for a maximum of four weeks. The present study was planned to characterize the different dermatophytes, budding yeast like fungi in various types of superficial mycosis. Examine skin scrapings, hair plucking and nails with direct bacterial examination (KOH mount) and culture on Sabouraud dextrose agar **Result:** Trichophyton species occurred in 7 cases (17.5%) of 40 samples taken from individuals with suspected superficial mycosis, making it the most frequent clinical group in the Sample, 14 (35%) regular showed positive results in KOH mounts, while 22 (55%), positive in culture Results were shown. Females 16 (72%) were the most commonly affected than males 6(18%). **Conclusions:** The research conducted in this research has revealed that superficial mycosis is commonly caused by dermatophytes, common types include tinea corporis (ringworm), tinea pedis (athlete's foot), tinea capitis (scalp ringworm), and Trychophyton species. Any clinical diagnosis must be backed up with a lab diagnosis. To conclusively identifying the etiological agent, culture is an essential supplement to direct microscopic inspection.

**Keywords:** Superficial mycosis, dermatophytosis, fungal infections, trichophyton, tenia pedis

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## INTRODUCTION

Infections caused by fungi that are limited to human hair, nails, cuticles and mucous membranes are called superficial fungal infections. Although these diseases are rarely dangerous. Human-to-human transmission and morbidity. Fungal diseases are very common in the tropics, and some are serious and even fatal. They cause many human diseases, from skin diseases to invasion of internal organs (systemic diseases) [6]. Dermatitis, pityriasis, tinea versicolor, tinea nigra, and candidiasis all fall into this group. Besides being beautiful, they have an affinity for keratin rich tissue that can cause a dermal inflammatory response and irritation. Several surveys of surface mycoses have been

conducted throughout the country [7]. Due to the high humidity of the environment, this climate affects the evaporation of sweat, which in turn promotes the growth of fungi causing a high incidence of fungal diseases in the region. This study was conducted to investigate the clinical manifestations of the disease in our institution and to identify the primary fungus causing superficial mycoses [9, 10].

These fungi need keratin to grow, so they cannot spread over mucosal surfaces. Dermatophytosis is registered as part of the affected body (For example jock itch, tinea capitis, tinea pedis, ringworm). Tinea versicolor is a fungal yeast commonly found in humans as part of the natural skin microbiome [11]. Candidiasis is caused by yeastlike fungi of the genus *Candida* (mainly *Candida albicans*), which are part of the human gut (including mouth) and genital microbiota. The signs and symptoms of candidiasis appear as changes in the body's normal immune system. In this review, we apply a practical approach to the diagnosis of *Aspergillus* infection, dermatophytosis, and other fungal diseases [12,13].

### **Aim**

The aim of this research is to conduct an observational study to investigate the clinico-mycological characterization of superficial mycosis among patients in a tertiary care hospital in North India.

### **Objectives**

- To describe the spectrum of pathogenic fungi causing superficial (skin, hair, nail) infections at tertiary care hospital in North India and to identify these fungi by using conventional methods.
- To investigate the clinical and demographic features of patients with superficial mycoses at a tertiary care hospital in North India.
- To identify the prevalent fungal species responsible for superficial mycosis.

### **REVIEW OF LITERATURE**

In 2012, Dr. Pradeep Nawal, et al enrolled 215 patients for the study. Out of which 138/215 were males (64.2%) and 77/215 were females (35.8%). Commonest age group involved was adults of 19 to 59 years in 143/215 (66.5%) cases followed by 12-18 years (adolescent) in 38/215 (17.7) cases [4]. In 2014, A Malik, et al. observed that out of 425 samples, Dermatophytoses was manifested clinically more in the males between the age of 11-30 years. In our study, the percentage of KOH positivity was 61.2%, while the culture positivity was 58.8%. Direct microscopy alone detected 21.2% of the samples, whereas culture alone detected 18.8%. In 123 (9.5%) cases, skin mold (7.2%), candidiasis (3.5%), and other fungal skin pathogens were the most common superficial fungal infection. The most common pathogen was *T. rubrum*, and *T. mentagrophytes* followed [8]. Compared to other superficial mycoses (794,847 cases), skin organisms (16,035,399 cases) were found to be more prevalent during the study period with this rate decreasing from 0.01% to 0.19% per year. Jeolla-do was widespread throughout the area [1, 2]. Males and females had comparable rates (7.01% and 6.26%, respectively). Interestingly, frequency is higher in adults aged 50-79 compared to children and younger adults. Compared with other superficial mycoses, dermatophytopathy generally required longer treatment times and significantly higher total treatment costs [2–5].

### **MATERIALS AND METHODS**

This is a 5 months (February 2023 to June 2023) observational study, was conducted at one of the teaching hospital which is also a tertiary care hospital in North India. A total of 40 symptomatic patients attending the dermatology clinic were taken as study group.

*Study design:* Observational

*Sample Size:* The sample size of 40 participants were conveniently selected.

*Patients Included:* Patients with symptoms of superficial mycosis. This includes redness, scaling, and itching of the skin; abnormal nail appear- acne, damaged hair follicles were evaluated.

### Patients Excluded

1. Patients with additional skin conditions such as eczema or psoriasis
2. Patients who have had recent treatment with antifungal medication or topical steroids

*Patient enrollment:* All consecutive patients presenting Dermatology OPD with complaints suggestive of superficial mycoses was included for 3 months. A detailed history was taken in a clinical Performa (attached) from all the patients which includes age, sex, site, type and duration of the lesion along with similar history in the past on in family, contact with animals and known case of diabetes, AIDS or immunocompromised status.

### Sample Collection

- *Skin:* Clinical specimens like skin scrapping were obtained from the active edge of the lesion after thorough cleansing with 70% alcohol.
- *Hair:* infected hair (by hair plucking) (Figure 1)
- *Nail:* clipped nails



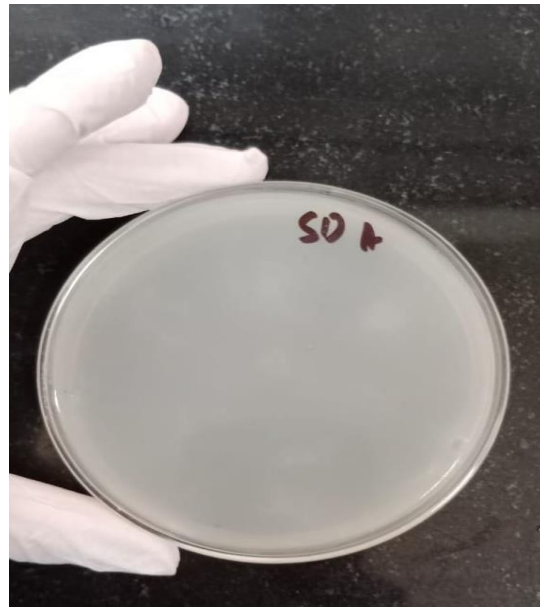
**Figure 1.** Container containing samples of the patient.

### Sample Processing

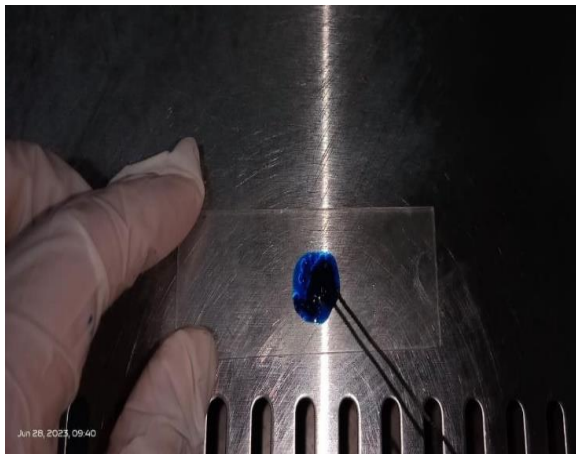
- *Microscopic examination:* All specimens will be subjected to direct microscopy for fungal elements in 10% KOH(40% for nails).
- *Fungal culture:* Cultured in Sabouraud's Dextrose Agar(SDA)(Figures 2 & 3) with antibiotics Gentamicin and cycloheximide and incubated at room temperature. All cultures were examined bi-weekly for growth and incubated for four weeks before declaring them negative. The growth were noted for colony characteristics in the form of texture, surface, colour, colour on the reverse and any diffusible pigment.
- *Fungal identification:* For molds, slide and lactophenol cotton blue (LPCB) (Figure 4) ease mount preparation was undertaken phenotypic identification. For yeast, gram stain smear, germ tube test was performed and the cultures were reported.



**Figure 2.** Glass Tube containing SDA.



**Figure 3.** Plate Containing SDA



**Figure 4.** LPCB preparation.

Table below (1) shows the history of Patient History.

**Table 1.** Patient History.

S. N.	Cr No.	Name	Age/sex	Date	Ward	Specimen	Clinical diagnosis	Microscopy	Result
1.	2563/783	Harinder Singh	48/M	1/2/23	SKIN OPD	Skin scraping	Rashes on hand	No fungal elements in KOH	Culture shows <i>Tenia corporis</i>
2.	2021/5714	Jagdish	63/F	2/2/23	Medicine opd	Skin scraping	Dryness on foot	Thin hyaline hyphae seen in KOH.	Culture shows <i>Tenia pedis</i>
3.	30796/7086	Yogesh	26/M	2/2/23	SKIN OPD	Nail clippings	Thickened nails	No fungal elements seen in KOH.	No growth seen on culture.
4.	167/3313	Pardeep Kumar	71/M	3/2/23	MEDICINE OPD	Skin scraping	Itchy patch on arms	No fungal elements seen in KOH	No growth seen on culture.
5.	21796/4	Harmann	21/F	4/2/2	SKIN OPD	Nail clip-	Thickened and	Thin hyaline	<i>Aspergillus</i>

	132	preet		3		ping	discoloured nails	hyphae seen in KOH.	species seen on culture.
6.	E-3411/3259	Kulwant Singh	61/M	4/2/23	SKIN OPD	Skin scraping	Dried skin of foot	No fungal elements seen in KOH.	No growth seen on culture.
7.	E-3411/3259	Kulwant Singh	61/M	4/2/23	SKIN OPD	Nail clippings	Dried nails	No fungal elements seen in KOH.	Trichophyton species seen on culture.
8.	E-3412/5094	Pinky	34/F	7/2/23	SKIN OPD	Skin scraping	Dark patches on breast.	No fungal elements seen in KOH.	Tenia corporis seen on culture.
9.	E-3487/0434	Satpal	29/M	8/2/23	SKIN OPD	Nail clippings	Thickened and brittle nails.	Thin hyaline septate hyphae seen.	Trichophyton species seen on culture.
10.	601/79483	Mehak	17/F	8/2/23	SKIN OPD	Hair plucking	Itchy scalp	No fungal elements seen in KOH.	No growth seen on culture.
11.	E-2609/5866	Jasmeet	35/F	9/2/23	Skin opd	Hair clipping	Itchy, scaly patches on head	Thin hyaline hyphae seen in KOH	Tenia capitis seen in culture
12.	690/109	Sandeep	41/M	10/2/23	Skin OPD	Skin scrapping	Itchy patches on legs	No fungal elements seen in KOH.	Trychophyton species seen on culture.
13.	2917/0616	Raj Rani	38/F	11/2/23	Skin opd	Nail clipping	Dried nails	Budding yeast cells seen in KOH.	Yeast species seen in culture
14.	2748/1445	Kamla	70/F	11/2/23	Skin opd	Nail clipping	Discoloration of nails	No fungal elements seen in KOH.	Tenia unguium seen in culture
15.	3169/4174	Raja	14/M	15/2/23	Skin OPD	Nail clipping	Nail Dystrophy	No fungal elements seen in KOH.	No growth seen on culture.
16.	E-3850/5325	Husted Begum	55/F	12/3/23	SKIN OPD	Hair plucking	Circular, scaly patches	No fungal elements seen in KOH.	No growth seen on culture.
17.	5323/6358	Pratima	42/F	13/3/23	Skin OPD	Nail clipping	C/O Paronychia	No fungal elements seen in KOH.	No growth seen on culture.
18.	5418/4440	Sukhinder Singh	60/M	14/3/23	Skin OPD	Nail clipping	Discoloured and dried nails.	No fungal hyphae seen in KOH.	No growth seen on culture.
19.	14588/6287	Tarunam	10/F	15/3/2023	SKIN OPD	Hair plucking	Itchy scalp	No fungal elements seen in KOH.	No growth seen on culture.
20.	5774/06	Paramjit	51/F	17/3/23	Skin opd	Hair plucking	Scaly and circular	Thin hyaline hyphae seen	Tenia capitis
21.	5959/8118	Kiran	50/F	17/3/23	SKIN OPD	Nail Clipping	C/O Paronychia	Budding yeast cells seen in KOH.	Yeast Species seen on culture.
22.	30501/4985	Manisha	20/F	19/3/23	SKIN OPD	Skin Scraping	Dark patch	No fungal elements seen in KOH.	No growth seen on culture.
23.	30522/2130	Ankur	18/M	23/3/23	SKIN OPD	Skin Scraping	Itchy rash	No fungal elements seen in KOH.	No growth seen on culture.

24.	3015/4892	Mehakpreet	36/F	27/3/23	Skin Opd	Hair Plucking	Baldness with scaly patches	Thin hyaline hyphae seen in KOH.	Culture Shows Tenia Capitis
25.	7524/4065	Amarjit Kaur	45/F	6/4/23	SKIN OPD	Skin Scraping	Fungal infection on right foot.	Few hyaline hyphae seen in KOH.	Trychophyton species seen on culture.
26.	I-319/1620	Umesh Chand	64/M	11/4/23	Skin Opd	Nail clipping	Dried and yellow nails	No fungal elements seen in KOH.	No growth seen on culture.
27.	E-8661/0247	Ranjit	50/M	25/4/23	Skin Opd	Nail clipping	Brittle nails	No fungal elements seen in KOH.	Tenia Unguium seen in Culture
28.	E-8929/4803	Naib Singh	55/M	26/4/23	Medicine opd	Hair Plucking	Rashes on scalp	No fungal elements seen in KOH.	No growth seen on culture.
29.	10186/9362	Gurbachan	75/F	26/4/23	Medicine opd	Skin Scraping	Rashes on foot	Thin hyaline hyphae seen in KOH	Tenia Pedis seen in Culture
30.	10476/2	Nargis	73/M	28/4	SKIN OPD	Nail clippings	Paronychia	No fungal elements seen in KOH.	No growth seen on culture.
31.	1859158/2413	Honey	20/M	23/28/4/23	Skin Opd	Hair Plucking	Baldness with rashes	no fungal elements seen in KOH.	No growth seen on culture.
32.	10545/0062	Samriya	30/F	28/4/23	SKIN OPD	Skin scraping	Itchy and discoloured patch on arm.	Epithelial cells are seen but no fungal elements seen in KOH.	No growth seen on culture.
33.	E-5356/6368	Shiv Kumar	52/M	29/4/23	SKIN OPD	Nail clippings	Thick and discoloured nails.	No fungal elements seen.	Tenia pedis seen on culture.
34.	E-14648/0769	Rashika	25/F	30/4/23	SKIN OPD	Nail clippings	Brittle and dried nails.	Septate hyaline seen in KOH.	Trychophyton species seen on culture.
35.	12446/1221	Paramjeet Kaur	67/F	1/5/23	SKIN OPD	Skin scraping	Itchy and scaly rash	Thin hyaline septate hyphae seen in KOH.	Tinea corporis seen on culture.
36.	10678/8973	Shobha	43/F	2/5/23	SKIN OPD	Nail clippings	Dried nails	Thin hyaline hyphae seen in KOH.	Aspergillus flavus seen on culture.
37.	11099/9334	Anjali	28/F	5/5/23	SKIN OPD	Nail clippings	Mucormycetes	Septate hyaline seen in KOH.	Trychophyton species seen on Culture
38.	I-5190/5565	Mohinder Kaur	66/F	12/5/23	Skin opd	Hair clipping	Itchy patches on head	Thin hyaline hyphae seen in KOH.	Trychophyton species seen in culture.
39.	30461/7990	Pal Singh	70/M	12/5/23	SKIN OPD	Skin scraping	Scaly patch	No fungal elements seen in KOH.	No growth seen on culture.
40.	1089/7629	Jia	18/F	13/5/23	SKIN OPD	Hair plucking	Itchy scalp	No fungal elements seen in KOH.	No growth seen on culture.

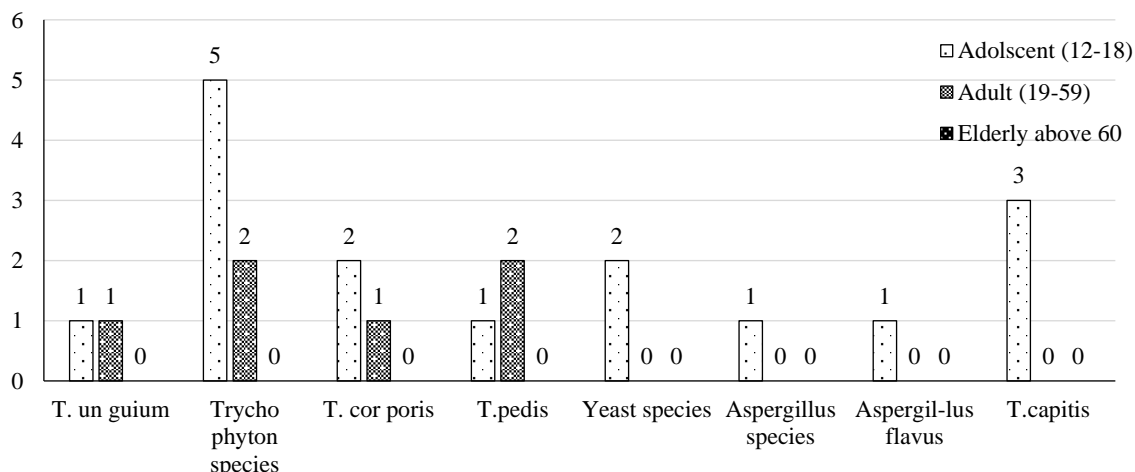
## RESULT

### Distribution of Clinical Types According to Age and Sex

A total of 22/40 patients were positive in the study. Out of which 6 /22 were males (27.3%) and 16/22 were females (72.7%). Commonest age group which comes positive was adults of 19-59 years in 16/22 (72.7%) cases followed by above 60 years (elders) in 6/22 (27.3%) cases. [Table 2 & Figure 5]

**Table 2.** Distribution Of Clinical Types According To Age And Sex.

Mycosis	Adolscnt (12-18)	Adult (19-59)	Elderly above 60	Total	Male	Female	Total
T. unguium	0	1	1	2	1	1	2
Trichophyton species	0	5	2	7	3	4	7
T.corporis	0	2	1	3	1	2	3
T.pedis	0	1	2	3	1	2	3
Yeast species	0	2	0	2	0	2	2
Aspergillus species	0	1	0	1	0	1	1
<i>Aspergil-lus flavus</i>	0	1	0	1	0	1	1
T.capitis	0	3	0	3	0	3	3
Total	0	13	5	22	6	16	22



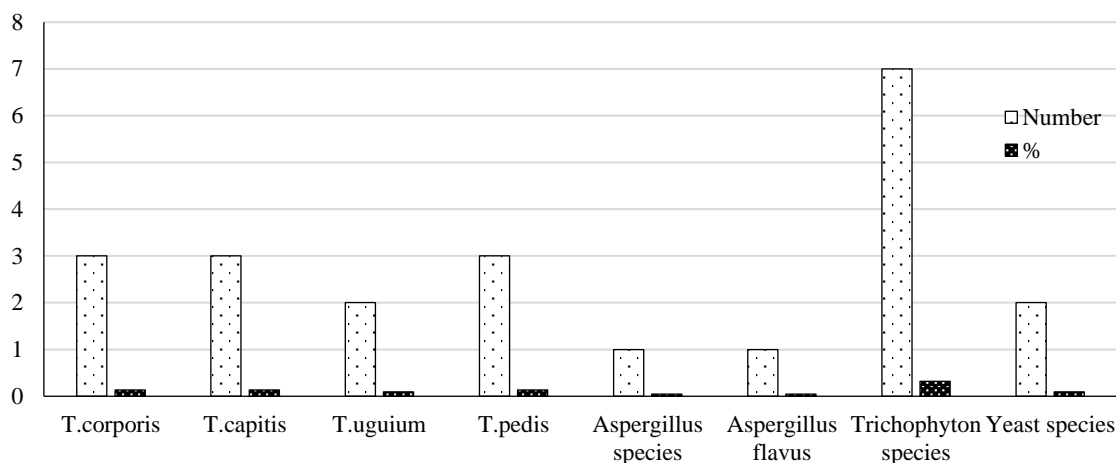
**Figure 5.** Distribution of clinical types according to age.

### Distribution According To Mycological Isolates

Dermatophytosis in 18/22 (81.8%) was the commonest superficial fungal infection followed by Trichophyton species in 7/22 (31.8%) cases. Non Dermatophytic Mold (NDM) Aspergillus species was isolated in 2/22 (9.09%) cases and Yeast species was isolated in 2/22 (9.09%) cases [Table 3 & Figure 6].

**Table 3.** Distribution according to mycological isolates.

Types	Number	%
T.corporis	3	13.6%
T.capitis	3	13.6%
T.unguium	2	9.09%
T.pedis	3	13.6%
Aspergillus species	1	4.54%
<i>Aspergillus flavus</i>	1	4.54%
Trichophyton species	7	31.8%
Yeast species	2	9.09%
Total	22	100%



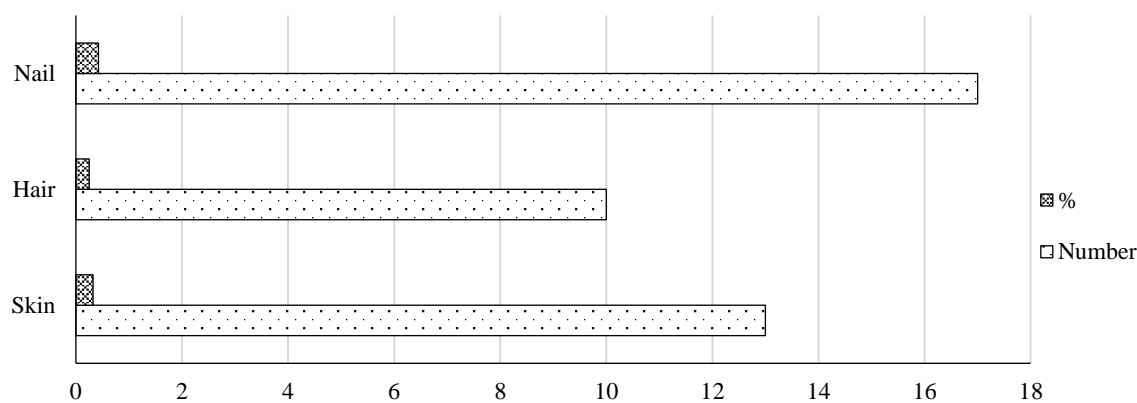
**Figure 6.** Distribution According to mycological isolates.

**Distribution Of Clinical Types According To Sample Type**

Out of 40 samples of suspected superficial mycosis, Nail was the most common isolated sample (42,6%) followed by skin (32,4%) and hair (25%). [Table 4 & Figure 7].

**Table 4.** Distribution of clinical types according to sample type.

Sample	Number	Percentage
Skin	13	32.4%
Hair	10	25%
Nail	17	42.6%
Total	40	100%



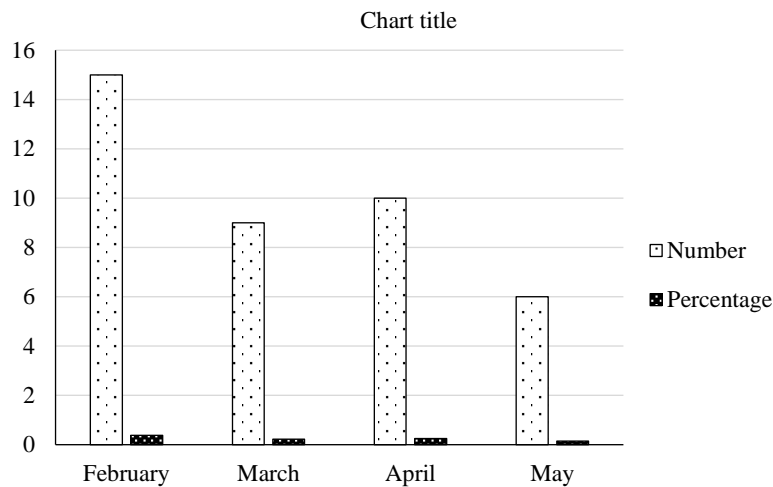
**Figure 7.** Graphical representation of distribution of clinical types according to sample type.

**Distribution Of Clinical Types According To Month**

The maximum number of samples were collected in the month of February (37.5%), followed by April (25%), March (22.9%) and May (15%). [Table 5 & Figure 8]

**Table 5.** Distribution of clinical types according to month.

Month	Number	Percentage
February	15	37.5%
March	9	22.5%
April	10	25%
May	6	15%
Total	40	100%



**Figure 8.** Distribution of clinical types according to month.

### Culture And Koh Characteristics

Direct microscopy KOH mount was positive in 15 (68.1%) and culture was positive in 22 (55%) cases [Table 6].

**Table 6.** Culture and koh characteristics of clinical types.

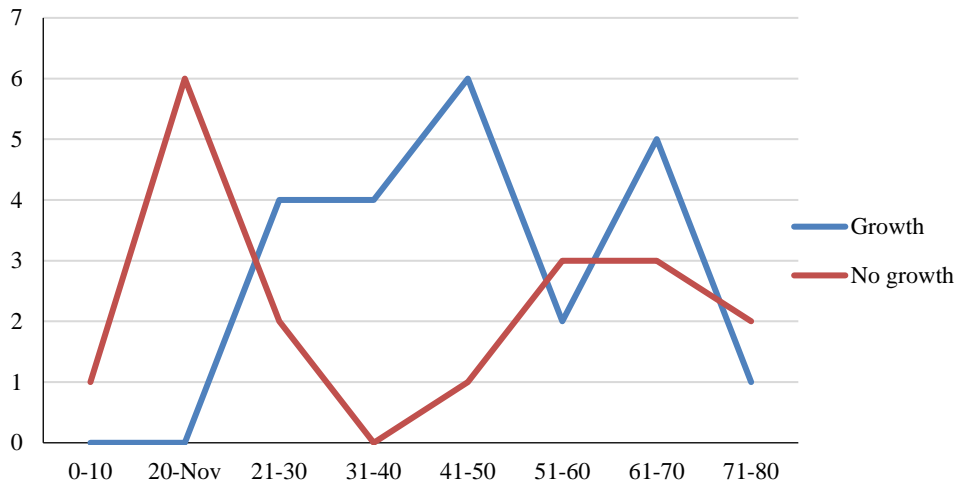
Clinical types	Culture +	
	KOH+	KOH-
T. capitis	3	0
T. pedis	2	1
T.corporis	1	2
T. Unguium	0	2
Aspergillus species	1	0
<i>Aspergillus falcum</i>	1	0
Trychophyton species	5	2
Yeast species	2	0
<b>Total</b>	<b>15</b>	<b>7</b>

### Pattern Of Fungal Growth According To Age Groups

Majority growth of fungi (8) (36.3%) was isolated from age group 61–70 followed by 41-50(31.8%) from age group 11–20 and 21-30 (6,6) (27.2, 27.2%) respectively, from age group 31–40 (4) (18.8%), from age group 71-81 (3) (13.6%) and from age group 0-10 (1) (4.54%) [Table 7 & Figure 9].

**Table 7.** Pattern of fungal growth according to age groups.

Age(Years)	Culture		Total
	Growth	No growth	
0-10	0	1	1
11-20	0	6	6
21-30	4	2	6
31-40	4	0	4
41-50	6	1	7
51-60	2	3	5
61-70	5	3	8
71-80	1	2	3
<b>TOTAL</b>	<b>22</b>	<b>18</b>	<b>40</b>



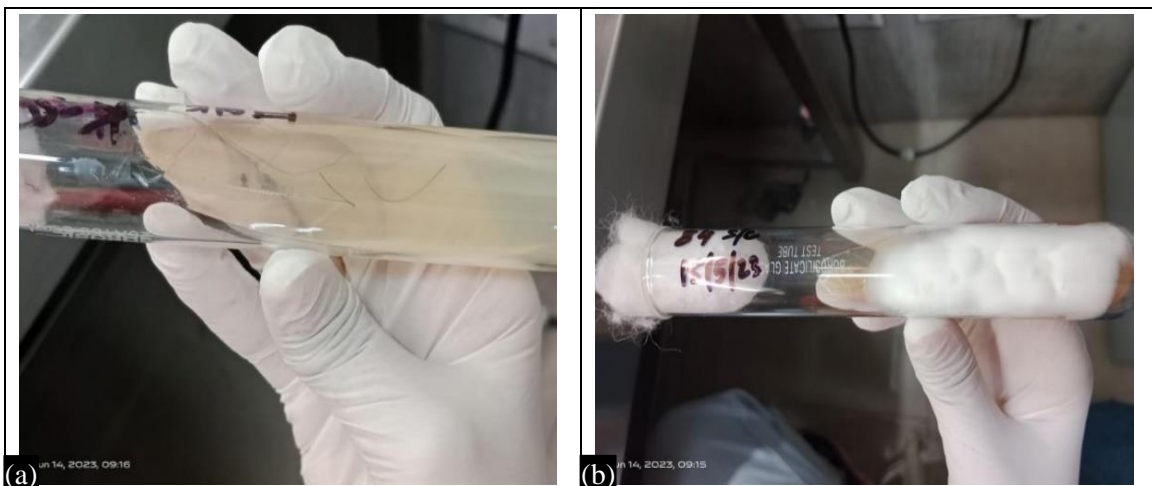
**Figure 9.** Pattern of fungal growth according to age groups.

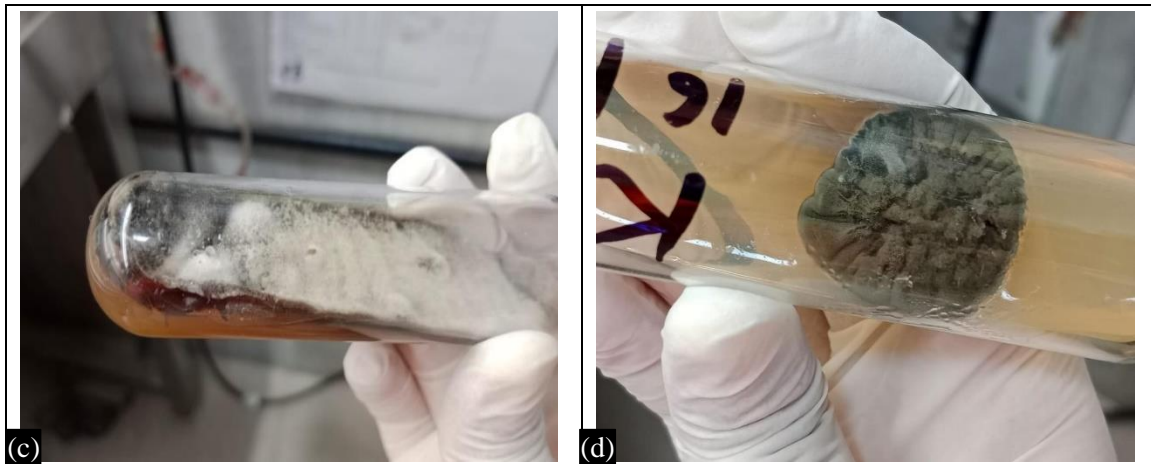
**Fungal Growth Seen on SDA**

Below in the Figures 10 & 11 (a-d) depicts the different fungal growth in the Petri plate & test tubes.

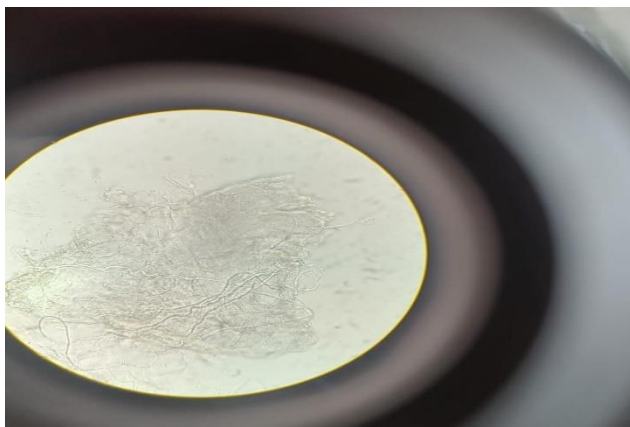


**Figure 10.** Fungal growth on petri plate.





**Figure 11.** (a-d) Shows different stages of fungal growth.



**Figure 12.** Thin hyaline hyphae seen on KOH mount

## DISCUSSION

Accurate identification of surface mycoses requires fungal culture and KOH mounts. The percentage of KOH in this study was 37.5%, while the culture positivity was 55%. The KOH positivity rate observed in various studies ranged from 35.6% to 88.6%, while the culture positivity rate ranged from 36% to 53.6%. The percentage of culture-positive and KOH-negative samples showed variation greater, with 5.6 % and from 56.7% [15].

In our study, five cases (12.5%) had positive cultures but negative fungal sections on KOH mounts. As a result, the fungal culture had a higher detection rate (55%) in the presence of KOH than direct microscopy (37.5%). These results highlight the importance of using KOH mounts in conjunction with culture for accurate identification of surface mycoses. According to our research, dermatology was the most common treatment. In fungal culture, 22 out of 40 samples were positive for fungi [16].

Among 22 isolates, majority growths of 18 (81.8%) isolates were dermatophyte, 2 (9.09%) isolates were nondermatophytes moulds (NDM), and 2 (9.09%) isolates were yeasts. Our finding showed that, among the nondermatophytes (NDM) 2/22 (9.09%) cases, *Aspergillus* spp. were the only isolates. Superficial mycoses were more common in females (72.7%) than in males (27.2%). According to this study, people between 61 and 70 years of age had superficial mycosis (36.3%), which can be associated with hormonal fluctuations and poor hygiene.

## CONCLUSION

According to the studies in this topic, skin bacteria often cause superficial mycosis. Common species include diseases caused by trichophyton species, tinea corporis (muscle worm), tinea pedis (athlete's

foot), and tinea capitis (scalp fungus). Any clinical diagnosis must be backed up with a lab diagnosis. For the purpose of conclusively identifying the etiological agent, culture is an essential supplement to direct microscopic inspection. To advance our understanding and successfully battle the burden of these fungal illnesses, more research and education are required

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