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Research Article

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Changing Trend of Dermatophyte Infections: A Five Year Study

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ABSTRACT

Background- Dermatophytosis is a common infection affecting humans globally. According to WHO, the prevalence rate of superficial mycotic infections worldwide is 20-25%. The fungal infections of the skin and its appendages are more common in tropical countries like India, due to environmental factors like heat and humidity. In the recent past, there has been an increase in dermatophytic infections, which are caused by non-dermatophytic species of fungi. This study was undertaken to note the changing trend of dermatophytic infection for five years.

Methods- A total of 459 skin, hair and nail samples from clinically diagnosed cases of dermatophytoses attending Dermatology clinics were included in the study. Out of 459 samples, 116 (25.27%) fungi were isolated, which included dermatophytic and non-dermatophytic fungi.

Results- Amongst dermatophytes, the most common isolate was *Trichophyton mentagrophytes* (28.57%) followed by *Trichophyton rubrum* (21.42%) and *Epidermophyton floccossum* (21.42%). The most common non-dermatophyte isolated was Aspergillus species (50.93%) followed by Candida (15.68%) and Fusarium (9.80%).

Conclusion - In our study, non-dermatophytic isolates outnumbered dermatophytes and this reflects the changing trend of dermatophytic infections with a high isolation rate of non-dermatophytic fungi.

Key-words: Changing trend, Dermatophytosis, Dermatophytes, Non dermatophytes, Superficial mycotic infections

INTRODUCTION

Dermatophytes are a group of closely related fungi that tend to invade keratinized tissue, skin, hair and nails commonly referred to as ringworm [1]. The isolation of these agents from clinical specimens may pose a challenge to the clinicians unless there is proper identification of the organisms. Successful treatment of these infections requires a high index of clinical suspicion and knowledge of etiological agents [2]. The etiological agents of dermatophytoses are classified as Trichophyton, Epidermophyton and Microsporum and they are differentiated based on conidia formation [3].

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According to WHO, the prevalence rate of superficial mycotic infections worldwide is 20-25% [1].

The fungal infections of the skin and its appendages are more common in tropical countries like India due to environmental factors like heat and humidity [4]. Although it does not cause mortality, it causes high morbidity and worsens the quality of patients' life [4]. The prevalence of dermatophytic infections with different species of dermatophytes varies with geographical locations and conditions. In the recent past, there has been an increase in dermatophytic infections which are caused by non-dermatophytic species of fungi. In addition to the accepted pathogens, there are significant numbers of non-dermatophytic fungi, which have been implicated in superficial mycoses [5,6].

Dermatophytic and non-dermatophytic fungi implicated as a cause of dermatophytoses have been recorded all over the world but with variation in distribution, incidence, epidemiology, clinical manifestations and

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target hosts from one location to another [6]. Though several reports on dermatophyte infection are available from different parts of the country, there are only a few reports on non-dermatophytic fungi [1].

The present study was undertaken to study the fungal etiology of dermatophytic infections in patients attending Dermatology clinics and to study the rising trend of non-dermatophytic fungi causing dermatophytosis over five years.

MATERIALS AND METHODS

The present study was conducted in the Department of Microbiology, Government Medical College, Nagpur from January 2015 to November 2019. A total of 459 skins, hair and nail samples from clinically diagnosed cases of dermatophytoses attending Dermatology clinics were included in the study.

The skin, hair and nail samples were processed as per standard recommended procedures. The samples were collected in sterile petri dishes and direct microscopy using 10-20% KOH was done and was screened for fungal hyphae, spores or yeast cells. They were then inoculated on two sets of Sabouraud's Dextrose Agar containing Chloramphenicol and Cycloheximide and incubated at 25^{o} C and 37^{o}C. The cultures were examined once a week and were declared negative if no growth was obtained till 4 to 6 weeks. The isolates were further identified by studying the culture characteristics, pigment production and microscopic examination using Lactophenol Cotton Blue mount and slide culture were done wherever necessary for identification of species [8].

RESULTS

A total of 459 samples of skin, hair and nail were collected during the study period. The most common sample collected was of nail followed by skin and hair (Table 1).

Table 1: Specimen-wise distribution

Years	Nail	Skin	Hair	Total
2015	40	5	0	45
2016	84	2	0	86
2017	92	1	1	94
2018	100	2	0	102
2019	131	1	0	132
Total	447	11	1	459

Out of 459 samples, 116 (25.27%) fungi were isolated. It was observed that there is an increase in sample size over the years (Table 2).

Table 2: Fungi isolation rate from samples received

Years	No. of samples	No. of fungi
2015	45	12
2016	86	18
2017	94	24
2018	102	28
2019	132	34
Total	459	116 (25.27%)

Table 3: Fungi isolation rate from dermatophytosis in various places

Study	Years	Place	Percentage (%)
Teklebirhan *et al.* [11]	2015	Ethiopia	73.40
Naglot *et al.* [12]	2015	Assam	59.66
Kannan *et al.* [13]	2016	Tamilnadu	66.30
Hazarika *et al.* [7]	2019	Assam	47.69
Angadi *et al.* [15]	2019	Pune	73.57
Present study	2019	Nagpur	25.27

In our study, out of 116 fungi isolated 14 (12.06%) were dermatophytes and 102 (87.93%) were non dermatophytes (Table 4).

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Table 4: Dermatophytic and Non Dermatophytic fungi isolated from dermatophytosis cases

Years	No. of fungi isolated	Dermatophytes	Non-dermatophytes
2015	12	4	8
2016	18	3	15
2017	24	3	21
2018	28	2	26
2019	34	2	32
Total	116	14 (12.06%)	102 (87.93%)

Table 5: Dermatophytic and Non-dermatophytic fungi isolated from dermatophytosis cases in different studies

Authors	Years	Dermatophytes (%)	Non-dermatophytes (%)
Teklebirhan *et al.* [11]	2015	58	42
Bitew [14]	2018	54.43	47.56
Hazarika *et al.* [7]	2019	43.54	56.46
Present study	2019	12.06	87.93

During the study period (2015-2019), out of 116 fungi isolated, 14 (12.06%) were dermatophytes. The year-wise identification of dermatophytes is shown in Table 6.

Table 6: Year wise Identification of Dermatophytes (n= 14)

Dermatophytes	No. of isolates					
	2015	2016	2017	2018	2019	Total
T. mentagrophytes	2	2	–	–	–	4
T. rubrum	–	1	–	1	1	3
T. violaceum	2	–	1	–	–	3
T. tonsurans	–	–	–	1	–	1
E. flocossum	–	–	2	–	1	3
Total	4	3	3	2	2	14

In this present study, the commonest isolate among dermatophytes was *T. vmentagrophytes* (28.57%). Some studies have shown *T. mentagrophytes* as the common isolate while other workers have found *T. rubrum* as the common isolate (Table 7).

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Table 7: Dermatophytic fungi isolated from Dermatophytosis cases in different studies

Authors	*T. mentagrophytes* (%)	*T. rubrum* (%)	*T. tonsurans* (%)	*T. violaceum* (%)	*E. flocossum* (%)
Sharma *et al.* [5]	40.33	6.6	–	–	–
Uma *et al.* [15]	30.58	37.64	–	–	–
Rathod *et al.* [16]	28.57	51.19	7.15	3.57	–
Kannan *et al.* [9]	16.7	70.83	–	–	8.33
Gunasekaran *et al.* [10]	30.69	39.2	–	3.2	3.2
Present study	28.57	21.42	7.14	21.42	21.42

A total of 102 (87.93%) non-dermatophytes were isolated in our study. The species wise distribution of non-dermatophytes is shown in Table 8.

Table 8: Species wise distribution of Non-dermatophytes (n= 102)

Non-dermatophytes	No. of isolates
Aspergillus sp.	52
Aspergillus niger	32
Aspergillus fumigatus	12
Aspergillus flavus	4
Aspergillus nidulans	2
Aspergillus glaucus	1
Aspergillus versicolor	1
Candida sp.	16
Candida albicans	10
Candida tropicalis	3
Candida krusei	2
Candida glabrata	1
Fusarium sp.	10
Fusarium solani	8
Fusarium oxysporum	2
Penicillium sp.	5
P. marneffi	5
Rhizopus sp.	6
R. arrihizus	6
Mucor sp.	6
M. racemosus	6
Curvularia sp.	2
C. geniculata	2
Alternaria sp.	1
A. alternata	1
Cladosporium sp.	2
C. bantiana	2
Exophiala sp.	1
E. werneckii	1
Fonsaeca pedrosii	1
Total	102

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The most common non-dermatophyte isolated in our study was Aspergillus sp. (50.98%) followed by Candida spp. (15.68%) and Fusarium sp. (9.8%). In a study by Sharma *et al.* [5], the most common NDM isolated was Aspergillus sp. (64.51%). Kannan *et al.* [8] found a higher isolation rate of Candida (58.6%). The bar diagram is shown below shows increasing sample size over the years and increased isolation of non-dermatophytes (Fig. 1).

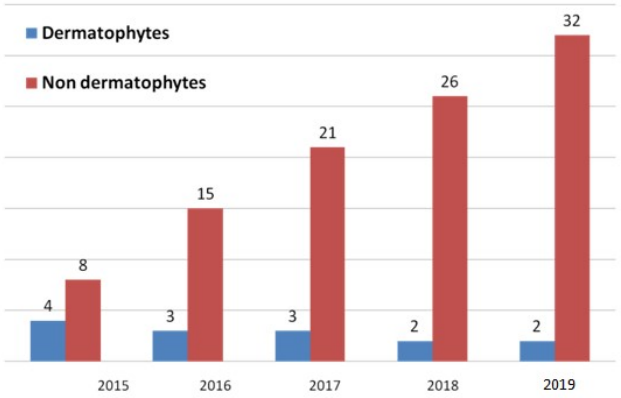

Fig. 1: Dermatophytes v/s Non-dermatophytes

Dermatophytosis caused by non-dermatophytic fungi is not uncommon now. The myth that non-dermatophytes are to be considered as laboratory contaminants does not hold always. To consider non-dermatophytic fungi as a causative agent, it should be positive indirect microscopy and re-isolation.

DISCUSSION

A total of 459 samples of skin, hair and nail were collected during a five year study period. The most common sample collected was of nail infection followed by skin and hair. However, Kannan *et al.* [9] and Gunasekaran *et al.* [10] found skin samples to be the common sample collected. Out of 459 samples, 116 (25.27%) fungi were isolated in our study and there was an increase in sample size over the years. In our study in the year 2016, the isolation rate was 20.9%, which gradually increased to 25.75% in 2019. Other workers have shown different isolation rates of dermatophytosis from various places. Teklebirhan *et al.* [11] in the year 2015 in Ethiopia found an isolation rate of 73.40%. In a study by Kannan *et al.* [9] in 2016 in Tamil Nadu, they found an isolation rate of 66.30%. However, Angadi *et al.* [13] in 2019 in Pune found an isolation rate of 23.57%.

Further, in our study, the isolation rate of dermatophytes versus non-dermatophytes had an increasing trend over the years from 2015 to 2019 as shown in Table 4. Similarly, other workers have shown an increasing isolation rate of non-dermatophytes from various regions as shown in Table 5. Hazarika *et al.* [7], in 2019, isolated 43.54% dermatophytes and 56.46% non-dermatophytes. In our study, we isolated 12.06% dermatophytes and 87.93% non-dermatophytes, which clearly show an increasing trend of isolation of non-dermatophytic isolates from cases of dermatophytosis.

In the present study, the most common isolate among dermatophytes was *T. mentagrophytes* (28.57%) followed by *T. rubrum* (28.42%). Sharma *et al.* [5] isolated 40.33% of *T. mentagrophytes* and 6.6% of *T. rubrum.* However, Gunasekaran *et al.* [10] isolated 30.69% of *T. mentagrophytes* and 39.2% of *T. rubrum* as shown in Table 7.

The most common non-dermatophyte isolated in our study was *Aspergillus* species (50.98%) followed by *Candida* (15.68%) and other non-dermatophytic moulds isolated were 23.52%. This study done by Sharma *et al.* [5], the most common non-dermatophytic mould isolated was *Aspergillus* species (64.51%) and Kannan *et al.* [9] found higher isolation rate of *Candida* species (58.6%) among the non-dermatophytes.

CONCLUSIONS

In our study, nail infections were commonly found. Among dermatophytes, Trichophyton species were more common. Among non dermatophytes, Aspergillus species was the most common isolate. A rising trend of non-dermatophytic isolates from cases of dermatophytosis is seen in the study. Dermatophytosis caused by non-dermatophytic fungi is not uncommon now.

The myth that non-dermatophytes are to be considered as laboratory contaminants does not hold always. Accurate diagnosis is important for successful treatment, which requires laboratory confirmation.

CONTRIBUTION OF AUTHORS

Research concept- Sunita Gajbhiye, Nirmal Channe, Sunanda Shrikhande

Research design- Sunita Gajbhiye, Nirmal Channe

Supervision- Dr. Sunita Gajbhiye, Dr. Nirmal Channe, Dr. Sunanda Shrikhande

Materials- Sunita Gajbhiye, Nirmal Channe

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Final approval- Sunita Gajbhiye, Nirmal Channe, Sunanda Shrikhande

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