

## A STUDY OF DERMATOMYCOSES

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### Summary

150 cases of dermatophytes in patients attending Civil Hospital, Ahmedabad have been studied morphologically, culturally and whenever necessary by special tests. The positive isolation rate was 73.3%. The commonest dermatophyte was *Trichophyton Rubrum* comprising 65.5%. Next in frequency was *epidermophyton floccosum* with an incidence of 12.7%. The least common species isolated were *Trichophyton Tonsurans* 0.9% and *Microsporum canis* 0.9%, while *Trichophyton mentagrophyte*, *Trichophyton violaceum*, *Microsporum gypseum* and *Candida albicans* had an incidence of 7.3%, 4.6%, 1.8% and 6.3% respectively. The commonest clinical type was *Tinea corporis*. The highest incidence of dermatomycoses was in the age group between 20 to 40 years except in *Tinea capitis* which was seen between 0-10 years. The male to female ratio was 2:1 except in the case of *Tinea pedis*. The highest incidence was seen during the summer season.

### Introduction

Mycotic infections are world-wide in distribution, most common infection being of the superficial type. This is true for India, as it is true for other countries. For the proper orientation of the dermatologists and mycologists, it is essential to obtain data regarding the prevalence of dermatophytes, commonly encountered in various parts of the country. Several workers have reported the prevalence of different species in Bengal<sup>1</sup> Uttar Pradesh<sup>2</sup> Poona<sup>3</sup> Bombay<sup>4</sup> Kerala<sup>5</sup> Delhi<sup>6</sup> Warangal<sup>7</sup> Burla<sup>8</sup> Ahmedabad<sup>9</sup> Hyderabad<sup>10</sup> Ahmedabad<sup>11,12</sup>.

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The present study was undertaken with a view to assess,

1. The incidence of dermatomycosis in this part of country (Gujarat).
2. The frequency of occurrence of various species.
3. Correlation between site of involvement and causative species.
4. Incidence in relation to age and sex.
5. The seasonal incidence.

### Materials & Methods

The material consists of 150 patients from the skin out-patient department of Civil Hospital, Ahmedabad, Gujarat, who were clinically diagnosed or suspected of fungal infection of skin.

A complete history of the patient as regards age, sex, site of the lesion, type of the lesion and duration of the lesion was taken.

The material was collected aseptically from the affected area and mounted in 10% KOH solution and examined for the presence of hyphae and spores. Wet preparation was examined also with lactophenol blue to differentiate fungus from artefacts. In case of nail infection, if the material was thick, it was kept in 10% KOH for 3 to 4 hours before examination. In infection of hair and scalp, the stump of broken hair was examined.

The deeper specimen from the same lesion was inoculated routinely on sabouraud's dextrose agar at pH 5.4. Chloramphenicol 0.05 mg/ml. was added to the medium. The media were kept at room temperature and examined every second day for four weeks. Those which did not show any growth in 4 week's time were discarded.

In some cases, besides the sabouraud's medium, Littman oxagall agar medium was used.

Corn-meal agar medium was used for sub-culture in all cases of candida infections.

In most cases, slide culture by Riddell's method was done in order to examine spores and mycelia at various stages of growth.

Positive cultures were examined for gross and microscopic morphology. Wherever required biochemical tests were done to identify the species.

### Observations

Out of the total 150 cases studied, 110 cases showed positive cultures, giving isolation ratio of 75.3%. Out of the remaining 40 cases, 37 cases were culturally negative. In 7 cases contaminants were isolated.

When the results of direct microscopic examination were compared with cultural examination, it was observed

that out of 110 culture positive cases, 73 cases were positive on direct microscopic examination, while 37 were negative. In 12 cases, direct microscopic examination was positive but cultures were repeatedly negative. In 28 cases, both examinations were negative (Table 1).

The results of clinical and mycological study of 110 positive cases of dermatomycoses are shown in Tables 2 and 3.

During the present study, the maximum number of cases (67 cases) were seen during the summer season. 28 cases were recorded during the monsoon season and 15 cases during the winter.

### Discussion

In the present study, positive cultures were obtained in 110 cases, (73.3%) out of 150 studied. This finding compares favourably with that of Desai et al<sup>4</sup> 69.6%; Mankodi and Kanvinde<sup>13</sup> 80.0%; Sobhanadri et al<sup>14</sup> 69.0%.

When the results of direct microscopic examination and culture examination were compared (Table 1), it was seen that in some cases where direct microscopic examination was positive, culture was negative and vice versa. Other workers Kandhari and Sethi<sup>15</sup>, Vasu<sup>7</sup>, Mankodi et al<sup>9</sup>; Mankodi and Kanvinde<sup>13</sup> etc. have also noted similar findings. This suggests that both direct microscopic as well as culture examination are important and both should be done simultaneously.

The most common clinical type encountered was *T. Corporis* (54.5%). Next in frequency were *T. cruris* (20%); *T. Pedis* (19.0%); *T. Capitis* (7.3%) and *T. Unguium* (4.6%). The least common was intertriginous type which occur in the web spaces (3.6%). There was total absence of *T. Barbae* infection in the present series. The high incidence of *T. Corporis* was also

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TABLE 1

Results of direct microscopic examination (KOH) and culture in relation to clinical type

Clinical	Total No. of cases	KOH Positive Culture Positive	KOH Positive Culture Negative	KOH Negative Culture Positive	KOH Negative Culture Negative	Total Culture Positive
Tinea Corporis	74	41	5	19	9	60
Tinea Cruris	31	14	3	8	6	22
Tinea Pedis	18	7	2	4	5	11
Tinea Capitis	12	4	—	4	4	8
Tinea Unguium	10	4	2	1	3	5
Webs	5	3	—	1	1	4
Total	150	73	12	37	28	110

TABLE 2

Age and Sex distribution of Dermatomycosis in relation to clinical types and in culture Positive cases.

Clinical types	Age in Years														Total	Culture + ve.		Total Culture Positive cases.		
	0-10		11-20		21-30		31-40		41-50		51-60		61-70			M.	F.			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F						
Tinea Corporis	—	—	8	5	18	6	17	5	5	3	3	2	2	—	53	21	74	44	16	60
Tinea Cruris	1	—	3	—	9	3	6	3	3	2	1	—	—	—	23	8	31	17	5	22
Tinea Pedis	—	—	1	2	2	5	2	4	1	—	—	1	—	—	6	12	18	1	10	11
Tinea Capitis	6	3	2	1	—	—	—	—	—	—	—	—	—	—	8	4	12	5	3	8
Tinea Unguium	—	—	2	1	3	2	1	1	—	—	—	—	—	—	6	4	10	3	2	5
Webs	—	—	2	1	1	—	1	—	—	—	—	—	—	—	4	1	5	3	1	4
Total	7	3	18	10	33	16	27	13	9	5	4	3	2	—	100	50	150	73	37	110

TABLE 3

Dermatophytes isolated from different clinical types

Species of Dermatophytes	Number of Strains	Tinea Corporis	Tinea Cruris	Tinea Pedis	Tinea Capitis	Tinea Unguium	Webs	Percent age
Trichophyton Rubrum	72	48	15	5	2	2	—	65.5
Epidermophyton Floccosum	14	6	5	3	—	—	—	12.7
Trichophyton Mentagrophyte	8	3	1	2	—	2	—	7.3
Trichophyton Violaceum	5	—	—	—	5	—	—	4.6
Trichophyton Tensurans	1	1	—	—	—	—	—	0.9
Microsporum Gypseum	2	1	—	—	1	—	—	1.8
Microsporum Canis	1	1	—	—	—	—	—	0.9
Candida Albicans	7	—	1	1	—	1	4	6.3
Total	110	60	22	11	8	5	4	100

reported by other workers in India like Kalra et al<sup>6</sup>; Kandhari and Sethi<sup>15</sup>; Vasu<sup>7</sup>; Mankodi et al<sup>9</sup>; Dutta and Raman Rao<sup>16</sup>, the range being 50 to 60%. However, high rate of *T. Cruris* was noted by Pande et al<sup>8</sup>. Infections of web spaces were not studied separately by workers other than Desai et al<sup>4</sup>, who observed it in 12 cases out of 1774 cases and Mankodi et al<sup>9</sup> who reported it in 1.8% of cases.

Barring *T. capitis*, the highest incidence of dermatomycoses was noted between ages of 20 to 30 years (70%), (Table 2). Other workers have made similar observations. All cases of *T. capitis* were seen in the prepubertal age. Gupta and Shome<sup>2</sup> recorded 75% cases of *T. capitis* below 12 years, 15% between 12 to 20 years and 10% above the age of 20 years. According to Desai et al<sup>17</sup>, 83% of cases of *T. capitis* were between 6 to 15 years.

Out of 11 culture positive cases of *T. Pedis*, 9 (81.8%) were between the age of 20 to 50 years and 2 (18.2%) between 11 to 20 years. These findings were in agreement with those of Gupta and Shome<sup>2</sup> who observed 97.7% of cases in the age group above 20 years and 1.3% between 12 to 20 years. Other workers Mankodi and Kanvinde<sup>13</sup>, Nagbhusanan et al<sup>10</sup> have reported *T. Pedis* occurring commonly in second decade. This may be due to greater resistance to infection in older age group.

Males were more commonly affected than females (Table 2) giving a Male to Female ratio of 2:1. Similar observations were made by Gupta and Shome<sup>2</sup>; Kandhari and Sethi<sup>15</sup>; Dutta and Raman Rao<sup>16</sup>; Males were more commonly affected than females in all clinical types except *T. Pedis* (Table 2). In the present series, the greater incidence in the females may be due to the fact that Civil Hospital is draining the areas of patients of low economic strata living under poor sanitary conditions.

They walk bare footed. An abrasion may provide a portal of entry and chances of these women having abrasion are much more common. *T. Rubrum* was the commonest species isolated in the present series (65.5%) (Table 3). Next in frequency were *E. Floccosum* (12.7%), *T. mentagrophyte* (7.3%); *Candida albicans* (6.3%); *T. Violaceum* (4.6%). Table 4 shows the incidence of dermatophytes in percentage reported by other workers from different parts of India; in comparison to the present series. *T. Violaceum* was seen in all cases of *T. Capitis* while it was reported from lesions of the skin and nails along with *T. Capitis* by other workers. *M. Gypseum* was isolated from 2 cases (1.8%) in the present study. Desai et al<sup>18</sup>; Kandhari and Sethi<sup>15</sup>; Kalra et al<sup>6</sup> have also reported its low incidence.

*M. canis* is a very rare infection and reports of such from other parts in India are few. In the present study, it was seen in a male aged 14 years, with circinate lesion on the front of the chest. There was no history of animal contact and no lesions were present in the scalp. Kalra et al<sup>6</sup> reported 2 cases of *M. canis* one of which was *T. Corporis* and other *T. Capitis*.

In relation to clinical type, it was observed that *T. Rubrum* was the most common species isolated from all the clinical types except *T. Capitis* and interdigital lesions. This finding corroborates with that of other workers.

In the present study, 4 cases of web spaces infection were seen and all were due to *C. albicans*. Reports of this type of lesion studied separately are very few. Desai et al<sup>4</sup> observed 3 cases with *C. albicans* and 2 cases with *E. floccosum*. Infection of the Interdigital spaces with *C. albicans* was common because skin of this part is often moist and macerated either by prolonged immersion in water or profuse sweating.

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TABLE 4

Incidence of common dermatophytes (in percentage) as reported from different parts of India, compared with present series.

Place	T. Rubrum	T. Mentagrophyte	T. Violaceum	E. Floccosum
Bengal (Ghosh et al <sup>1</sup> )	63.00	2.36	1.41	32.23
Uttar Pradesh (Gupta and Shaoe <sup>2</sup> )	56.73	31.73	—	1.92
Poona (Gokhle et al <sup>3</sup> )	72.38	17.16	2.24	2.24
Bombay (Desai and Bhatt <sup>10</sup> )	84.48	2.32	8.81	2.32
Kerala (Kurup and Ananthanarayan <sup>5</sup> )	68.30	10.00	1.60	3.30
Delhi (Kalra et al <sup>6</sup> )	80.61	9.91	3.52	3.08
Warangal (Vasu <sup>7</sup> )	85.83	18.86	4.81	8.30
Burla (Pande et al <sup>8</sup> )	78.43	10.78	—	1.96
Ahmedabad (Mankodi et al <sup>13</sup> )	84.50	1.50	8.50	2.00
Hyderabad (Dutta and Raman Rao <sup>16</sup> )	65.50	9.40	6.20	10.00
Ahmedabad (Amin et al <sup>11</sup> )	92.00	—	4.25	1.05
Ahmedabad (Amin and Shah <sup>23</sup> )	63.00	3.50	19.00	2.00
Ahmedabad (Shah et al <sup>12</sup> )	80.70	1.10	12.60	0.80
Present series	65.50	7.30	4.60	12.70

In the present series, one case of *T. Rubrum* infection at perianal region was observed in a child of 1½ years. *T. Rubrum* is very rare in children. King et al<sup>10</sup> reported the case of a boy aged 12 months with *T. Pedis* due to *T. Rubrum*.

Maximum number of cases were seen in the summer season. Ahalya Rao<sup>20</sup> stated that dermatomycoses was most common during monsoon season July to October inclusive. Kandhari and Sethi<sup>15</sup> have reported that dermatomycoses was common in hot and humid climate from May to September. Strauss and Kligman<sup>21</sup> suggested that *T. Pedis* was most common during summer season due to excessive perspiration. In cases of *T. Corporis* and *T. Cruris* lesions, sweat retention is common during summer season, which predisposes to infection. Gokhle et al<sup>3</sup> reported that majority of cases of *T. Capitis* were seen between February and August. Then there was a decline and no case was reported in winter.

Hyperhidrosis is a common finding. Peck<sup>22</sup> found that true sweat has fungistatic action but when produced in excess, it caused maceration of the skin, which then became more vulnerable to invasion by fungi.

REFERENCES

1. Ghosh LM, Panja D and Dey NC: Studies on ringworm Part VI. Ringworm of the glabrous skin. A statistical survey, Indian Med Gaz, 83 : 272, 1948.
2. Gupta RN and Shome SK: Dermatomycoses in Uttar Pradesh. An analysis of 620 cases, J Indian Med Ass, 33 : 39, 1959.
3. Gokhle BB, Padhay AA and Thirumalachar MJ: Incidence of dermatophytes in patients examined at Sasoon Hospital, Poona, Symposium of fungus diseases in India, Bull Cal Sch Trop Med, 7: 100, 1959.
4. Desai SC, Marquis L and Bhatt MLA: Mycologic study of 247 cases of dermatomycosis. Symposium of fungus diseases in India Bull Cal Sch Trop Med, 7: 278, 1959.

5. Kurup PV and Ananthanarayanan RA : Preliminary study of 148 cases of dermatophytosis, *Indian Pract*, 14 : 33, 1961.
6. Kalra SL, Mohapatra LN and Gugnani HC: Etiology of dermatomycosis in Delhi, *Indian J Med Res* 52 : 553, 1964.
7. Vasu DRBH : Studies in Medical Mycology Part I: Incidence of dermatophytosis in Warangal, AP (India), *Indian J Med Res*, 54 : 468, 1966.
8. Pande CK, Mohanty D and Mohanty H, et al : Incidence of Dermatomycosis in Burla, *Indian J Path Bact*, 10 : 332, 1967.
9. Mankodi RC, Shah BH and Kanvin e MS et al : A study of 110 cases of superficial mycotic infections, *Indian J Derm Vener*, 33 : 177, 1967.
10. Nagbhusanam P, Thirumalarao D and Patnaik R: Dermatomycosis in Hyderabad *Indian J Derm Vener*, 35 : 120, 1969.
11. Amin AG, Shah CF and Shah HS : Analysis of 141 cases of dermatophytosis, *Indian J Derm Vener*, 37 : 123, 1971.
12. Shah HS, Amin AG, Kanvinde MS et al : Analysis of 2000 cases of dermatomycosis, *Indian J Path Bact*, 18 : 32, 1975.
13. Mankodi RC and Kanvinde MS : Incidence of dermatophytosis in Ahmedabad (Gujarat), *Indian J Path Bact*, 12 : 114, 1969.
14. Sobhanadri C, Tirumala Rao D and Sarat Babu K : Clinical and mycological study of superficial fungal infections at Government General Hospital, Guntur and their response to treatment with Hamycin, Dermostatin and Dermamycin, *Indian Derm Vener*, 36 : 209, 1970.
15. Kandhari KC and Sethi KK : Dermatophytosis in Delhi area, *J Indian Med Assoc*, 42 : 324, 1964.
16. Dutta SB and Rao PVR : Mycological aspects of dermatomycosis in Hyderabad, *Indian J Path Bact*, 13 : 30, 1970.
17. Desai SC, Bhatt MLA and Marquis L : Dermatomycoses in children, *Indian J Child Health*, 311, 1961.
18. Desai SC and Bhatt MLA : Dermatomycoses in Bombay. A study on the incidence, clinical features incriminating species of Dermatophytes and their epidemicity, *Indian J Med Res* 49 : 662, 1961.
19. King WC, Watton JK, Livinghood CS : Superficial fungus infections in infants, *AMA Arch Derm and Syph*, 68 : 664, 1953.
20. Ahalya Rao : Mycotic diseases in India. A critical review, symposium of fungus discases in India, *Bull Cal Sch Trop, Med*, 7 : 13, 1959.
21. Strauss JS and Kligman AM: Quoted by No. 24.
22. Peck SM: Quoted by No. 25.
23. Amin AG and Shah HS: Dermatophytosis, *Indian J Derm*, 19 : 1, 1973.
24. English Mary PE, Gibson Mary D and Warin Robert P: Studies in Epidemiology of Tinea Pedis, *Brit Med J* 1 : 1083, 1961.
25. Lewis GM, Hopper ME, Wilson JW et al: Introduction to medical mycology. The Year Book Publisher, Chicago, 1958.