DERMATOPHYTIC PROFILE OF CHHOTANAGPUR

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Summary

216 clinically diagnosed cases of dermatophytoses in a cross section of the population of Chhotanagpur platcau were studied mycologically. Two scrapings from each patient totalling 432 were collected. Both scrapings were culture negative in 40 patients and one scraping was culture negative in 53 cases. Altogether 133 scrapings were culture negative and 299 culture positive. 176 patients had culture positive scrapings. Only one type of species was isolated from 85 patients. 38 patients had multiple-mixed infections. 104 patients had positive wet smears as well as positive cultures. 112 patients had negative wet smears of which 72 were culture positive.

Incidences of species isolated namely T. rubrum, T. mentagrophyte, T. verrucosum, T. violaceum, T. rosaceum, E. floccosum and M. audouine were 30.9, 19.6, 10.3, 5.6, 0 93 and 0.93 percents respectively.

Lower prevalence rate of dermatophytoses among the tribals was probably due to racial variation in immunity.

E. floccosum occured more frequently than in other parts of the country.

Mycologically and immunologically integrated into one group and taxonomically divided among three genera, Trichophyton, Microsporum and Epidermophyton, the dermatophytes, no doubt, have a world-wide distribution. Owing to local factors of hygiene and climate as well as racial properties influencing susceptibility i.e. euthenically, different species predominate in different parts of the world[1] and big countries. India occupying a vast area with a huge population, is a subcontinent of varied topography and climate. In the north it is walled by the Himalayan range which prevents the chilly wind of Siberia from blowing over the Indo-Gangetic plain. Vindhyachal projects prominently in the centre separating out the plateau of Deccan from the plains of northern India. Hot and dry climate of the 'Thar' desert reigns the western part where there is little or no rain while eastern part comprising Assam, West Bengal and Gangetic plains of Bihar, remains under the influence of scorching rays of the sun and high humidity for a few months every year because it lies in the tropical and subtropical zones. However the plateau of Chhotanagpur situated between 83.5° east and 87° east longitudes and 22° north and 24.5° north latitudes at an altitude of 300 to 700 meters above the sea level and covered with thick and thin forests, is different in climate from the Gangetic plains. It is less hot and humid. Population of the plateau is evenly constituted by the

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tribals and immigrant non-tribals from different parts of the country. The population differs from the inhabitants of the gangetic plains which is greatly dominated and mainly constituted by the non-tribals. Excess of heat and moisture in an atmosphere of cloudy weather and absence of blowing air promote growth of dermatophytes on the integument. Under the influence of such enviornmental factors, the skin often shows tendency to maceration. Although medical mycology antedates bacteriology and Powell reported prevalence of dermatophytes in Assam[2] as far back as 1909, similar reports continue to pour in only in the recent past from all parts of the country (Table No. 4).

The present work was intended (a) to study the panoramic view of the unexplored species of dermatophytes prevalent and imported in the plateau, (b) to find out the difference in the pattern of dermatophytosis from other parts of the state, the country as well as other countries, and (c) to study racial difference in the dermatophytic affection of the population. This communication is the first in a series of studies of dermatophytes in the different geographical regions of Bihar.

Material and Methods

The materials for the present study consisted of skin and nail scrapings and hairs from 216 clinically diagnosed cases of dermatophytoses attending the out-patient section of Rajendra Medical College Hospital, Ranchi who represented the cross section of the people of the plateau because it is the solitary dermatological service centre in the plateau located in its middle. Clinical statistics of age, sex, duration of illness, sites affected and details of lesions were recorded on separate sheets. Scrapings were obtained from two sites in each patient. In cases having multiple lesions the choice of sites for taking scrapings were two different lesions but in cases having single lesion, the two poles of the patch widely apart from each other provided the requisite material. Major portion of the scraping from the skin and nails cleaned with 70% alcohol was collected with sterilised scalpel in a sterile paper envelope or petridish and a minor portion was directly innoculated onto Sabouraud's dextrose agar slants containing chloramphenicol and actidione. Routine microscopic examination of the slide prepared with scraped materials collected in the paper envelope and subsequently dissolved in 10 to 40 percent KOH depending on the nature of the tissue, was made to detect the presence of filaments, hyphae and arthrospores of the fungi present therein.

Cultures in Sabouraud's dextrose agar medium were kept at room temperature and watched over a period of one month. When there was no growth at the end of that period, the culture was recorded negative. Slants with growth were further examined by slide mount using lactophenol cotton blue and by slide culture. Size, shape, margin, surface, differentiation, colour of the pigment on the surface of the colony and appearance of the same on the reverse along with the time taken for growth of the culture, determined the external morphology while the microscopic features e.g. the conidia, sides of the hyphae, mycelia, spores etc. were used for identification of different fungal species.

Observations and Discussion

Dermatophytes prosper in conditions facilitating maceration and dissolution of the building stuff of the hairs, nails and the keratinous layer of the epidermis. Incidence of dermatophytoses is largely influenced by climatic conditions e.g. heat, humidity and rains[3,4,5] but in the present series factors such as nature of occupation, environment and personal hygiene played none the less important roles. A high incidence

TABLE 1

Showing age and sex incidence of Dermatophytoses

Age groups in years	Sex				Total		Tribal / Non-tribal	Ratio M : F
	Male		Female					
	No	%	No	%	No	%		
Below 13	10	4.63	4	1.85	14	6.48		
13-30	102	47.22	14	6.48	116	53.70	8/138	6.2 : 1
31-45	50	23.14	8	3.70	58	26.84		
Above 45	24	11.11	4	1.85	28	12.96		
Total	186	86.10	30	13.88	216	100	216	

during winter at Lucknow reported by Gupta and Shome[6] substantially corroborates the above observation.

No age and sex are exempted by dermatophytes. Higher proportion of males are affected than females[3,7,8,9,10]. Men who freauently have prolonged and vigorous out-door activity are prone to increased perspiration and thus create for themselves environment suitable for the development of ringworm fungi. Bulk of the non-tribal patients in the present series among a population with equal distribution of tribals and non-tribals who are similarly employed indicates existence of a relative racial immunity in the tribals. Relatively higher incidence of dermatophytoses amongst the fair sex of big cities (3 males:1 female) like Delhi[8], Calcutta[9] and Bombay[4] in comparison to small cities of Rohtak[3] and Ranchi (6 males : 1 female) is significant and may be due to increased participation in out-door activities of the greater number of females in the big cities. Highest incidence (53.70%) as noted in this sutdy in the age group 13 to 50 years during the period of maximum physcial activity is in consistence with the report of other workers[3,7,8,11]. Prevalence of ringworm infection shows a gradual ascending trend from infancy to adolescence shooting up suddenly to the peak during the early adult life (13 to 30 years). Thereafter prevalence steadily declines. Minimum physical activity in the childhood and old age could explain a low incidence at these age periods.

TABLE 2

Comparative study of Clinical manifestation in present series with the reports of other workers (in percentage)

No.	Authors	Place of work	Tinea						
			Capitis	barbae	corporis	cruris	pedis	unguium	manum
1	Prasad & Prakash (Present series)	Ranchi	2.7	2.7	39.80	21.3	17.6	10.2	5.4
2	Desai & Bhatt	Bombay	9.9	0.69	80.5		2.5	5.1	1.1
3	Gupta & Shome	Lucknow	3.2	3.9	39.6	35.6	15.6	1.9	—
4	Kalra et al	Delhi	3.0	—	54.6	26.6	13.0	2.2	—
5	Kandhari & Sethi	Delhi	2.1	—	57.5	21.2	13.9	5.1	—
6	Mehta	Delhi	—	—	45.5	43.8	6.3	0.7	3.6
7	Mulay et al	Delhi	0.18	—	51.1	38.2	1.4	1.2	0.7
8	Sobhanadri et al	Guntur	0.5	0.5	46.0	51.5	1.0	0.5	—
9	Vasu	Warangal	0.4	2.9	60.0	23.6	9.3	3.4	—
10	Verma & Singh	Rohtak	6.0	1.0	35.0	41.5	11.0	4.5	1.0
11	Verma et al	Baroda	—	4.0	43.5	46.5	—	4.0	—

No part of the body has been reported immune to dermatophytosis. Trunk including the axilla, crura of the thighs, under surface of the root of the toes, nails, hands and scalp are the sites of predeliction in this order. Trunk including axilla and crura, usually covered with clothes, are the most vulnerable sites due to maximum maceration of the skin caused by prolonged and close contact with wet garments soaked in sweat. Although the incidence of tinea corporis (39.8%) and tinea cruris (21.3%) in the present series are lowest in comparison to the reports of other workers, the 17.6% incidence of tinea pedis is highest. However, on the whole, there is no deviation in their relative position and is commensurate with the report of other workers (Table 2).

Amin Shah et al[17] (68%). However this is more than double in comparison to the reports of Mulay & Garg[8] (35.2%), Verma et al[10] (36%), Kalra et al[12] (32%) and Mankodi et al[18] (42%).

T. rubrum (31.8%), E. floccosum (30.9%), T. mentagrophyte (19.6%), T. verrucosum (10.3%), T. violaceum (5.6%) T. rosaceum and M. audouini (0.93%) were detected. M. canis was conspicuously absent. High incidence of T. rubrum infection ranging from 31.80% to 92.6% has been reported from all over the country. The relatively low incidence in our series is at par with the observations made by a group of workers[19,20] and is almost one-third of that reported by another group[7,17]. According to Carion[20] T. mentagrophyte

TABLE 3
Showing results of wet smears and cultures of scrapings and their inter-relation

Result of wet smear	Cases		Culture			
	No	%	Positive		Negative	
			No	%	No	%
Positive	104	48.14	104	48.14	0	0
Negative	112	51.86	72	33.33	40	18.51
Total	216	100.00	176	81.47	40	18.51

Enzymatic digestion of soft and hard keratin[16] of healthy glossy skin, hairs and nails by dermatophytes results in cosmetic disfigurement. In addition, affection of the skin causes intense pruritus.

Out of a total of 81.47% culture positive cases, only 48.14% were KOH positive and 33.33% were KOH negative. 18.51% showed negative results on microscopic as well as culture examination. Rate of positive culture (81%) in the present series is the highest of all but is commensurate with the observations of Sobhanadri et al[11] (69%) Mulay et al[7] (75.2%), Desai et al[4] (70%) and

was predominant in Rico. In many series reported from India T. mentagrophyte is the second commonest causative organism in dermatophytosis. In eastern states of West Bengal, Bihar E. floccosum occupies its position. Incidence of E. floccosum is high also in South India[15,19]. T. mentagrophyte has been reported non-existent at Ahmedabad[17] and Rohtak[3]. T. violaceum has been detected with greater frequency at certain places[19,21].

Multiplicity of the lesions, especially caused by anthropophilic fungi, have been observed to be of common occurrence but the different species of

TABLE 4

Incidence of different species of Dermatophytoses isolated in the present series compared to the reports of other workers (in %)

Sl. No.	Place	Authors	T. rubrum	T. mentag-rophyte	T. Simii	T. rosa-ceum	T. viola-ceum	T. verru-cosum	T. tonsu-rans	E. floc-cosum	M. audo-uini	Others
1	Ranchi	Prakash & Prasad	31.80	19.6	—	0.93	5.6	10.3	—	30.9	0.93	—
2	Ahmedabad	Amin Shah	92.60	—	—	—	4.25	—	2.1	1.05	—	—
3	Baroda	Verma et al	88.90	8.30	—	—	—	—	—	2.80	—	—
4	Bengal	Ghosh	63.00	2.36	—	—	1.41	—	—	32.23	—	—
5	Bombay	Desai	84.45	2.32	—	—	8.81	—	1.8	2.32	—	0.23
6	Delhi	Kalra et al	80.61	9.91	—	—	3.52	0.66	0.2	3.08	—	0.23
7	Delhi	Kandhari & Sethi	68.50	9.50	—	—	1.00	—	15.00	2.50	1.00	1.00
8	Delhi	Mehta	75.2	15.4	—	—	6.00	—	0.7	2.7	—	—
9	Delhi	Mulay & Garg	88.8	3.4	2.6	—	0.44	—	0.97	3.2	—	0.08
10	Delhi	Mulay et al	92.00	2.3	2.7	—	0.06	—	1.6	1.8	—	—
11	Ahmedabad	Kankodi	84.88	—	—	—	4.34	—	4.34	4.34	—	2.10
12	Hyderabad	Nagabhushnam	51.43	2.78	—	—	14.68	6.96	6.78	4.17	—	—
13	Warangal	Vasu	62.60	16.8	—	—	4.8	—	3.6	12.00	—	—
14	Vellore	Klokke & Durairaj	33.9	12.5	0.8	—	32.4	—	10.1	9.3	—	—
15	Orissa	Panda	78.43	10.78	—	—	—	—	0.88	1.96	—	8.00
16	Lucknow	Gupta & Shome	56.73	31.73	—	—	—	9.6	—	1.92	—	—
17	Rohtak	Verma & Singh	71.42	—	—	—	9.53	—	1.58	9.53	—	7.94
18	Guntur	Sobhanadri et al	41.00	1.00	—	0.00	6.00	0.5	—	20.5	—	30.00
19	Puerto Rico	Carion	36.20	41.7	—	—	—	—	8.3	3.1	0.2	10.5

TABLE 5
Showing frequency of association of different species of fungi in multiple infections

Species of fungi	Associate species (In no. of cases)			
	T. mentagrophyte	T. Verrucosum	E. floccosum	Total
T. rubrum	6	3	30	39
T. mentagrophytes	–	–	18	18

TABLE 6
Correlating the duration of dermatophytoses with the species of the fungi

Duration of Dermatophytoses	Trichophyton					Epid. flocco-sum	Micro-audou-ini	Total
	rubrum	menta-groph-yte	rosa-ecum	viola-ceum	verru-cosum			
Less than one month	6	4	—	—	2	4	—	16
Less than one year	16	16	—	8	10	10	2	62
More than one year	46	22	2	4	10	52	—	156
Total	68	42	2	12	22	66	2	214

ringworm fungi infrequently and rarely occur together. If they do so, E. floccosum is commonly seen with T. rubrum (18 cases) and T. mentagrophyte (6 cases). T. rubrum has also been found to occur with T. mentagrophyte and T. verrucosum. Sobhanadri et al[11] rarely found mixed infection.

Anthropophilic species have the peculiarity of inciting relatively non-inflammatory but persistent types of infection. Zoophilic and geophilic fungi on the other hand promote marked inflammation resulting in their own peril and spontaneous cure in a short time for the patient. Large proportion of patients in the present study who had prolonged infection with E. floccosum, T. rubrum, T. mentagrophyte and T. verrucosum infection in that order of frequency no doubt lends support in this regard to the observations of previous workers[4,9,22,23]. T. rubrum was detected most often by other workers to cause the chronic infection perhaps due to the low incidence of E. floccosum infection in their series.

Out of 205 strains of the five species of Trichophyton cultured, most (156) were encountered in skin scrapings and occasional ones (38) in nails and rare ones (11) in hairs (Table No. 7). They produced ringworm in all parts of the integument T. rubrum sparing the scalp and T. mentagrophytes the beard (Table No. 8). M. audouini being the sole representative of the genera and isolated with equal frequency from the skin and hairs (Table 7) affected the beard area only (Table 8). 92 strains of E. floccosum inciting tinea corporis, pedis, manuum barbae and unguium in order of frequency (Table 8) were grown in the scrapings of the skin and the nails (Table 7) confirming the observations of others[1,4,13].

Conclusion

Seven species of dermatophytes were isolated by culture. T. rubrum, the commonest fungi (31.80%) was closely followed by E. floccosum (30.9%). Incidence of T. mentagrophyte (19.6%) T. verrucosum (10.3%) and T. violaceum (5.6%) was in that order of frequency. T. rosaceum and M. audouini which occurred with equal frequency (0.93%) were least common. T. rubrum infections were not as significantly high as in some other reported series because

TABLE 7

Showing the species of fungi affecting the different tissues.

Genus	Species	No. of scrapings giving + culture	Tissues		
			Hairs	Skin	Nail
Trichophyton	rubrum	95	3	68	24
	mentagrophyte	59	3	48	8
	rosaceum	3 (205)	(11)	3 (156)	— (38)
	violaceum	17	5	12	—
	verrucosum	31	—	25	6
Epidermophyton	floccosum	92	—	90	2
Microsporum	audouini	2	1	1	—
Total	5+1+1	299	12	247	40

TABLE 8

Correlating the Clinical manifestation with the Culture of the dermatophytic scrapings.

Species	No. of strains cultured	Tinea						
		Capitis	barbae	corporis	cruris	pedis	unguium	manum
T. rubrum	95	—	3	30	21	13	24	4
T. mentagro	59	3	—	14	3	30	8	1
T. rosaceum	3	—	—	3	—	—	—	—
T. violaceum	17	5	—	11	—	—	—	1
T. verrucosum	31	—	—	25	—	—	6	—
E. floccosum	92	—	2	3	61	22	2	12
M. audouini	2	—	2	—	—	—	—	—
Total	299	8	7	86	85	65	40	8

of a significantly large proportion of E. floccosum infection in this series. In the eastern part of the country where this study was conducted the relatively low prevalence rate of dermatophytosis is probably due to some racial immunity among the tribal population.

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Announcement

Conference on Photo-medicine and Photobiology will be held on August 3 & 4, 1979 in Nagoya, Japan. The subject of this meeting will cover not only photo-related medical science and its clinical application but also basic photobiology and related technology. Contributions from the foreign countries are welcome. Information request should be addressed as Kunihiko Yoshikawa, M. D., Secretary, Conference on Photo-medicine and Photobiology, Dept. of Dermatology, Nagoya City University Medical School, Mizuho-cho, Mizuho-Ku, Nagoya, Japan.