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Clinico-epidemiological profile of dermatophytosis in district Samba: a cross sectional study from the state of Jammu and Kashmir, India.

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Abstract

Background

Fungi are ubiquitous in nature, single celled or very complex multicellular organisms. Its distribution and their etiological agents varies with geographical location. The aim of the present study was to determine the clinical pattern of dermatophytosis and species of dermatophyte prevalent in district Samba, Jammu and Kashmir, India.

Methods

The present study was conducted in different hospitals of Jammu for the period of two years. All suspected patients with dermatophytoses, were included and specimens collected from them. The presence of fungal filaments by direct microscopy in KOH mount and culture was undertaken to isolate the fungal pathogen in each case.

Results

Among the 140 clinically suspected patients of dermatophytoses, 80% were positive for fungus in direct microscopy and 47.86% were culture positive. *Tinea corporis* was the most common clinical presentation followed by *Tinea cruris*. The commonest age group affected was 21–30 years (34.29%) and the male to female ratio was 2.5:1. The predominant pathogen were *Trichophyton rubrum* (41.8%) and *Trichophyton tonsurans* (22.4%) followed by *Trichophyton mentagrophytes* (10.5%).

Conclusion

Anthropophilic species of genus Trichophyton dominated this study area. *Trichophyton ruburm* was the most common isolate followed by *Trichophyton tonsurans.* Direct microscopy and culture both should be done to increase the chances of definitive diagnosis in fungal infections.

Key words

Dermatophytes, fungal infections, keratin, Tinea, Trichophyton

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Background

Fungi are ubiquitous in nature and Dermatophytes are specialized groups which mainly infect keratinous structures like skin, hair and nails. The main characteristics of these organisms are the ability to invade keratinized tissue producing a most common type of dermatophytosis, ringworm. In the year 1934, American medical mycologist Chester Wilson Emmons classified Dermatophytes into anthropophilic, zoophilic and geophilic fungi. He had also established the current classification of the dermatophytes, which was based on the spore morphology and accessory organs, recognizing three genera Microsporum, Trichophyton, and Epidermophyton on the basis of mycological principles [1, 2]. An interesting fact is that dermatophytoses infection is present worldwide, irrespective of race, or geographical location [3]. Dermatophytes produce keratinases which is able to degrade the layer of keratin and subsequently, invade the superficial skin tissue. All these infections mostly cutaneous and mostly restricted in the cornified layers of the skin. It has also been seen that, in chronic conditions, infection invade deeper tissues, particularly observed in coexisting infections along with other different types of organisms. Generally, dermatophytes are unable to invade deeper tissue structures of the host [4]. Although there is a global prevalence of tinea infections but prevalence in tropical regions are more. Humid geographical areas with over-population and poor hygienic living conditions [2, 5] are added risk factor. In India, hot and humid climate favors dermatophytic growth in skin [6]. In Asia there are several studies revealing the epidemiological scenario. A research conducted in Singapore stated that dermatophytosis is the fourth commonest skin disorder seen in the National Skin Centre in Singapore [7].

Dissimilar researches conducted several states in India namely Chennai, Madhya Pradesh, Andhra Pradesh, West Bengal, Gujarat, Chandigarh, Karnataka revealed the prevalence of dermatophysis [8-16]. Although there is a documented case report on dermatophytosis, still more insight is required in the state of Jammu and Kashmir [17]. Distribution of dermatophytes depends on lifestyle factors, population types and some etiological factors. Some other influential factors include migration of people, climatic conditions, which restrict some species to be confined in a particular place, and allow some to distribute worldwide [12, 8]. The present study was therefore undertaken to determine the clinical pattern of dermatophytosis and species of dermatophyte prevalent in district Samba, Jammu and Kashmir.

Material and Methods

Study Period

This prospective study was carried out from January 2011 to December 2012.

Study design, participants and the collection of data

Clinically suspected cases of dermatophytoses were considered for this study. Samples were collected from the patients attending the outpatient department of two government sub district hospitals, CHC Ramgarh, and Accidental Hospital Vijaypur of District Samba, Jammu and Kashmir.

Data collection

To obtain the samples aseptically, the infected areas or lesions were wiped with 70% alcohol. This removed the dirt and environmental contaminants. Afterwards nail clippings, subungual debris, hair and skin scrapings were collected from advancing margins of the lesions in paper envelope with the help of sterile scalpel/ tweezers.

A detailed clinical history including age, sex, duration, site and extent of infection, type of lesion, occupation, socioeconomic status, family and personal history was taken in a predesigned proforma.

The samples were transported to and processed at the Microbiology laboratory of the V-Care Diagnostics, Bakshi Nagar, Jammu.

Microscopic examination

All scrapings were subjected to direct microscopic examination for the presence of unstained refractile fungal elements in 10% potassium hydroxide (KOH) wet mount, while 40% KOH was employed for hair & nail specimens [1].

Culture

Commercially available Sabouraud's Dextrose agar with cycloheximide and chloramphenicol was used for culture to prevent growth of contaminants. Cultures were incubated at 25°C for a period of 28 days, and twice in a week and it was checked for the growth. The tubes that did not show evidence of fungal growth at the end of 4 weeks were considered negative and discarded. Identification of dermatophyte isolates was done on the basis of macroscopic and microscopic examination. Surface morphology and pigment production by the dermatophytes is used for the macroscopic examination. Microscopic examination was done by preparing teased mounts from the isolates with a drop of lactophenol cotton blue. Standard laboratory techniques such as hair perforation test, urease production or slide culture were used for the identification of the dermatophytes [18, 19, 20].

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Table – 1: Age wise distribution of clinical types of dermatophytosis

Types of dermatophytosis	Age group (yrs) n(%)							Total %
	0-10	11-20	21-30	31-40	41-50	51-60	>60	
T.corporis	2(22.2)	15(46.9)	21(43.7)	15(57.6)	4(36.4)	5(50)	2(50)	64(45.7)
T.cruris	0(0)	2(6.2)	5(10.4)	5(19.2)	4(36.4)	1(10)	1(25)	18(12.9)
T.unguium	0(0)	4(12.5)	8(16.7)	3(11.5)	0(0)	2(20)	0(0)	17(12.1)
T.mannum	1(11.1)	2(6.2)	5(10.4)	1(3.9)	2(18.2)	1(10)	1(25)	13(9.3)
T.capitis	6(66.7)	3(9.5)	2(4.2)	1(3.9)	0(0)	1(10)	0(0)	13(9.3)
T.pedis	0(0)	4(12.5)	4(8.3)	1(3.9)	1(9.0)	0(0)	0(0)	10(7.1)
T.faciei	0(0)	2(6.2)	3(6.3)	0(0)	0(0)	0(0)	0(0)	5(3.6)
P value				0.02*				

*P<0.05 statistically significant

Table - 2: Lab results of clinically diagnosed dermatophytosis

KOH	Culture	*T.corporis*	*T.cruris*	*T.unguium*	*T.mannum*	*T.capitis*	*T.pedis*	*T.faciei*	Total (%)
+	+	25(39.1)	10(55.5)	6(35.3)	4(30.8)	10(76.9)	4(40)	3(60)	62(44.3)
-	+	3(4.7)	1(5.6)	1(5.9)	0(0)	0(0)	0(0)	0(0)	5(3.6)
+	-	26(40.6)	6(33.3)	6(35.3)	5(38.4)	2(15.4)	3(30)	2(40)	50(35.7)
-	-	10(15.6)	1(5.6)	4(23.5)	4(30.8)	1(7.7)	3(30)	0(0)	23(16.4)
	P value				0.41x				

xP>0.05 statistically not significant

Inclusion criteria

All patients visiting the Outpatient department in the hospital showed dermatophytic lesions based on clinicians report were included for this study. There was no age limit and gender bias for this study.

Exclusion criteria

There was some exclusion criteria such as use of antifungal therapy (oral or topical) within few months before the study, severe underlying systemic conditions and bacterial infections as well as fungal in the skin folds and nails (e.g. paronychia) *etc.*

Ethical committee approval

Written informed consent from was taken from the subjects, after explaining the study objectives. This study was performed according the declaration of latest version of Helsinki. Ethical approval also taken. Written consent was obtained from the parents of the participants, below 18 years. Participants were clearly instructed not to mention their name or any identification marks in the questionnaire.

Outcome variable

Types of dermatophytosis, KOH positivity or negativity, type of tinea infection by different organism were set up as outcome variable.

Explanatory variables

Demographic variables, age, gender etc. were considered as explanatory variables.

p<0.05 was considered as statistically significant.

Data management and statistical analysis

Data analysis and interpretation was done by descriptive statistics with the use of Statistical Package for Social Science (SPSS) software, version 16. Chi-square test was performed to obtain the correlations between different variables.

Results

A total of 140 samples were collected from clinically diagnosed cases of dermatophytosis, with a male: female ratio of 2.5:1.

The commonest age groups affected by deramatophytosis were 21–30 years (34.29%) followed by 11–20 years (22.86%) and the age range was from a 6 months old female to 82 years male. In terms of anatomical site of infection, *Tinea corporis* (64%) was the commonest and *Tinea faciei* (5%) was the least common clinical type of dermatophytosis. *Tinea capitis* was the predominant dermatophyte infection in children below 10 years of age (Table - 1).

Out of 140 clinical cases, a total of 62(44.29%) were positive on direct microscopic examination of KOH preparation as well as on culture. Culture was positive in 67 (47.86%) cases and out of these five (3.57%) had no evidence of fungus by direct microscopy while 50(35.71%) out of 73(52.41%) culture negative cases were positive by direct microscopy, therefore presence of fungal hyphae was observed in 112 (80%) cases by direct examination (Table - 2).

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Table 3: frequency of dermatophytes according to type of tinea (n, %)

Species	Type of lesion							Total (%)
	Tinea corporis	*Tinea cruris*	*Tinea unguium*	*Tinea mannum*	*Tinea capitis*	*Tinea pedis*	*Tinea faciei*	
Trichophyton rubrum	18(64.3)	3(27.3)	4(57.1)	1(25)	0(0)	1(25)	1(33.3)	28(41.8)
Trichophyton tonsurans	5(17.8)	3(27.3)	2(28.6)	0(0)	3(30)	1(25)	1(33.3)	15(22.4)
Trichophyton mentagrophytes	2(7.1)	1(9.1)	1(14.3)	0(0)	0(0)	2(50)	1(33.3)	7(10.5)
Trichophyton violaceum	1(3.6)	1(9.1)	0(0)	0(0)	3(30)	0(0)	0(0)	5(7.5)
Trichophyton schoenleinii	0(0)	0(0)	0(0)	2(50)	2(20)	0(0)	0(0)	4(5.9)
Microsporum gypseum	1(3.6)	1(9.1)	0(0)	1(25)	0(0)	0(0)	0(0)	3(4.5)
Microsporum canis	1(3.6)	0(0)	0(0)	0(0)	2(20)	0(0)	0(0)	3(4.5)
Epidermophytonflocossum	0(0)	2(18.1)	0(0)	0(0)	0(0)	0(0)	0(0)	2(2.9)
P value				0.02*				

In terms of correlation of the isolates to the sites of infection T.rubrum was the commonest isolate from cases of *Tinea corporis* and *Tinea cruris* followed by *T.tonsurans*. Among all the pathogens identified from cases of *Tinea capitis* Trichophyton violaceum and *T.tonsurans* were co-dominant with three isolate each (Table - 3).

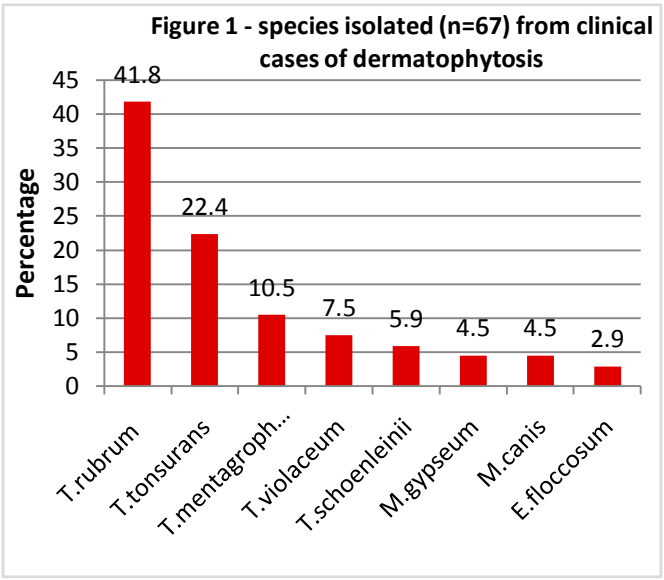

Figure 1 shows that out of the 67 dermatophyte isolates, the predominant pathogen were *Trichophyton rubrum* (n=28,41.8%) and *Trichophyton tonsurans* (n=15, 22.4%) followed by *Trichophyton mentagrophytes* (n=7, 10.5%), *Trichophyton violaceum* (n=5,7.5%), *Trichophyton schoenleinii* (n=4, 5.9%), *Microsporum gypseum* (n=3, 4.5%), *Microsporum canis* (n=3, 4.5%) and *Epidermophton floccosum* (n=2, 2.9%).

Therefore anthropophilic dermatophytes made up 91% of the dermatophytosis isolates. Of the geophilic and zoophilic dermatophytes, *M.gypseum* and *M.canis* respectively were the only species isolated in our study.

Discussion

The present study which includes 140 clinically diagnosed cases of dermatophytosis showed a male preponderance with male to female ratio of 2.5:1. Most of the workers in India have also reported a higher male incidence with ratio ranging from 1.5:1 to 3:1 [13, 21-23]. This higher male incidence is due to higher physical and outdoor activities in males leading to excess of perspiration in a hot and humid climate. Secondly the use of occlusive footwear is more common amongst men leading to warmth, trauma and maceration which have been noted to be conducive to growth of dermatophytes [24]. Hormonal factors may predispose to infection; the female hormone progesterone is an effective inhibitor of fungal growth. The male dihydrotestosterone is an effective inhibitor of progesterone binding site [25].

Age group as an influential factor of dermatophytosis

In our study the incidence of dermatophytosis was seen to be highest in age group 21-30 Years and the two extremes of age showed the least incidence of infection. The findings are consistent with other studies which also showed the highest incidence in the age group 21-30 years [5, 21, 22, 26].

This is probably due to the heavy physical activity predisposing to increased perspiration in this age group. *Tinea corporis* was the most common clinical type reported followed by *Tinea cruris* in our study. The findings are endorsed by earlier reports from other parts of the country [5, 8, 13, 21, 23]. Further in our study 9 out of 13 cases of T.capitis were below the age of 15 years which is in concordance with other studies [5, 13, 22]. This may be due to hormonal changes in post puberty, resulting acidic types of secretions from sebaceous gland [27].

Lab results (KOH positivity rate) of dermatophytosis

The KOH positivity rate from various studies across the country varies from 44% to 90% [5, 13, 21-23, 26]. Our study

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showed a KOH positivity rate of 80% which is comparable to that reported from tiruchirapalli [23]. Our culture positivity rate was 47.86%, the findings were close to other Studies from Assam (51%) and baroda (44.62%). Five (3.57%) specimens were positive by culture alone and 50 (35.71%) by direct microscopy alone lays stress on the fact that both direct microscopy and culture should be done to increase the yield of diagnosis in dermatophytosis.

Frequency of dermatophytes according to type of tinea

In our study 59 dermatophytes belonged to genus *Trichophyton*, 6 to *Microsporum* and only 2 isolates belonged to genus *Epidermophyton*. Among the *Trichophyton* genera the majority of case showed *T.rubrum* species (41.8%). Several reports from India and abroad also show *Trichophyton* as the commonest genus and *T.rubrum* as the commonest species [5, 8, 13, 21-23, 28, 29]. Our finding was close to two other studies which showed an isolation rate of *T.rubrum* as 43.7% and 42.3% [5, 29]. The probable reason for overall high isolation of *T.rubrum* from most of clinical variants is its remarkable adaptability as it generally exhibits asymptomatic infections with immediate type hypersensitive immune reaction and also *T. rubrum* infection are highly, communicable [30, 31]. The next dominant isolate in our study was *T.tonsurans* which reflects the difference in etiology in district samba compared to studies from other parts of the country which reported *T.mentagrophytes* as the second most prevalent dermatophyte [5, 8, 21-23]. In our study *T.tonsurans* was isolated from all clinical types except *T.mannum.* Our study coincides with a study from central India which has also reported *T.tonsurans* as second dominant isolate [26]. Present study showed the isolation of three *M.gypseum* (geophilic dermatophyte), one from a daily labourer and two from farmers which could be explained by the patient's routine interaction with soil. Some studies from Tamilnadu have also isolated *M.gypseum* [8, 23]. Further three isolates of *M.canis* were obtained from children below 10 years of age and all of them had a history of playing with stray cats and dogs.

Conclusion

Tinea corporis was the most frequently encountered clinical condition followed by *Tinea cruris* and that the majority of the patients were in the 3rd decade of their life. Climatic conditions of Jammu and Kashmir favour dermatophytosis in the population. Consequent distribution of dermatophytes in this study area was dominated by the anthropophilic species of which *Trichophyton ruburm* was the most common isolate followed by *Trichophyton tonsurans* which reflects the difference in etiology in district samba compared to most of the other studies across the country. Direct microscopy and culture both are important tools and should be done to increase the chances of definitive diagnosis of the fungal infections. Awareness programmes should be launched from the govt. for better skin and nail hygiene. Findings of this research will help therapeutic and preventive management of these conditions.

Limitations & future scope of the study

The present research was limited to few hospitals, so more systematic study covering all hospitals with a larger population and relatively longer period of time may be helpful in this context. It will give a better epidemiological scenario of dermatophytosis in the state of J & K.

Abbreviations

Nongovernmental Organization (NGO), no-scalpel vasectomy (NSV), United Nations Population Fund (UNFPA), World Health Organization (WHO)

Competing interests

Authors do not have any competing interests.

Authors' contribution

Dr. Dipender Kaur Najotra, Dr. Vijay Choudhary and Dr. Bhavna Sahni designed the study. Dr. Vijay Choudhary & Dr.Ajay Choudhary did the sample collection. All the authors were involved in the microscopic analysis of sample. Culture was done by Dr. Dipender Kaur Najotra. Interpretation of the data, drafting of the manuscript and revision was done by all authors.

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