

A Study on Superficial Fungal Infection from West Bengal: A Brief Report

Krishnendu Das¹, Sukumar Basak² and Subha Ray¹

¹Department of Anthropology, University of Calcutta, Kolkata, West Bengal, India

²Department of Microbiology, School of Tropical Medicine, Kolkata, West Bengal, India

KEYWORDS Superficial Fungal Infection. Socio-economic Variables. West Bengal

ABSTRACT The present study attempts to find out the distribution of superficial fungal infection with respect to socio-economic and demographic variables among a symptomatic group (112 individuals) in West Bengal. Moreover, an attempt has also been made to find out the risk factors associated with the superficial fungal infection type. The results show that *Tinea corporis* is the most common infection type and the risk factors associated with this infection are age, occupational types, history of prior *corporis* infection and unexposed parts of the body.

INTRODUCTION

Superficial fungal infections arise from a pathogen that is restricted to the stratum corneum, with little or no tissue reaction. These fungi have the capability to produce keratinase, which allows them to metabolize and live on human keratin like, skin, nail, and hair. The infections caused by a dermatophyte (species of fungi belonging to the genera *Trichophyton*, *Microsporum*, or *Epidermophyton*) are referred to as *tinea*. *Tinea* is a Latin word for worm or grub because the infections were originally thought to be caused by worm-like parasites (Brooks et al. 2007). Commonly the infection types are named with respect to the affected body parts— *tinea corporis* or ring worm (general skin), *tinea cruris* or jock itch (groin), *tinea unguum* (nails), *tinea capitis* or ring worm of scalp (scalp), *tinea barbae* (beard area) and *tinea manuum* (hands).

In the United States, dermatophytosis is one of the most frequently reported skin diseases (Stern 1999), of which majority are caused by superficial fungal infections related to *tinea* group (Aly 1994). An estimated lifetime risk of acquiring these types of *tinea* infections (dermatophytosis) is between 10 and 20% (Drake et al. 1996). A number

of studies have confirmed that *tinea* infection is related to the activity pattern, living condition and age groups (English et al. 1967; Mahapatra 1989; Rogers et al. 1996; Caputo et al. 2001; Vito et al. 2004).

To the best of the knowledge of the authors, from the State of West Bengal, there is hardly any published literature on the epidemiological aspects of superficial fungal infection types. Thus, the present study attempts to examine the distribution of superficial fungal infection among a symptomatic group, with respect to sociocultural and demographic variables and the risk factors associated with superficial fungal infection.

MATERIALS AND METHODS

The present study has been conducted on a symptomatic group who visited the School of Tropical Medicine (STM), located in the city of Kolkata (West Bengal) for therapeutic purpose. This is the only medical hospital of this State which exclusively provides treatment for various types of tropical diseases. Moreover, this institute is a public enterprise, where treatment is offered at a cheap rate and the frequency of visit by the patients from all over the state is the highest.

Selection of the Subjects

Medical investigation was carried out on individuals who visited the 'out patient department' (OPD) of Dermatology of STM with complain of skin infection. Individuals, who were clinically diagnosed with superficial fungal

Address for correspondence:

Dr. Sukumar Basak, MD

Professor and Head

Department of Microbiology, School of Tropical
Medicine, C.R Avenue, Kolkata 700 073

West Bengal, India

Telephone: +91 9830409494

Fax: +91 3322414915

E-mail: sbasakcal@yahoo.com

infection, have been referred to the Mycology Unit of Microbiology Department for proper etiological investigation. During the period of study, a total number of 112 such individuals were referred to this department for medical attention and they represent the universe of study.

A well-tested questionnaire schedule has been designed to collect data on socio-demographic (age, sex, occupational types and family income), household condition and hygiene behaviour (number of family members, per capita sharing of room, sources of water, use of soap and wiping of body parts) and on infection types. The diagnosis of the infected individuals and of infection types have been done by one of the authors (SB).

Microbiological investigation of infection type has been done following Chander (2002).

Logistic regression has been done to find out the risk factors of *tinea corporis* infection. A number of sociodemographic features (educational level, household income, occupational types, household size, per capita space use, sex and religion), behavioural factors (regular use of soap, sharing of towels, frequency of bath/day, sources of water, carefully wiping of body parts) and other related variables (history of previous *corporis* infection, site of infection, duration of work per day and nature of work) have been used as independent variables in predicting the probability of getting *corporis* infection. In the table, only the significant predictor variables have been presented. The rest of the infection types have been excluded from the analysis since these are less in number. The entire analysis was done using "Statistical Package for Social Sciences" version 7.5 (SPSS Inc., Chicago IL, USA).

Prior to the collection of data, the nature of research was explained to the participants and a verbal consent was taken from them. The study was conducted during the period February 2008 to July 2008.

RESULTS

Table 1 shows that half of the study participants are affected by *tinea corporis* type, followed by *pityriasis versicolor* and *tinea capitis*. Less than 10% of the participants are affected with other *tinea* types – *cruris*, *manuum*, *unguium* and *pedis*. Majority of the participants has been suffering from any of these problems for a period of 1-6 months and beyond. The most frequently

Table 1: Superficial fungal infection and its related variables

	Frequency	Percent
<i>Present Infection Types</i>		
<i>Tinea pedis</i>	7	6.3
<i>Tinea manuum</i>	9	8.0
<i>Tinea cruris</i>	9	8.0
<i>Tinea corporis</i>	56	50.0
<i>Tinea unguium</i>	1	0.9
<i>Tinea capitis</i>	13	11.6
<i>Pityriasis versicolor</i>	17	15.2
<i>Duration of Present Illness</i>		
<1 month	17	15.2
1-6 months	38	33.9
>6 months- <1 year	30	26.8
> 1 year	27	24.1
<i>Site of Present Infection</i>		
Face	3	2.7
Palm or Planter surfaces	16	14.3
Groin	9	8.0
Trunk portion	56	50.0
Scalp	13	11.6
Finger or toe nail	1	0.9
Proximal part of leg or arm	14	12.5
<i>Types of Previous Infection</i>		
Subjects without any history of previous infection	72	64.3
Subjects with any history of previous infection	40	35.7
<i>Tinea pedis</i>	2	5.0
<i>Tinea manuum</i>	2	5.0
<i>Tinea cruris</i>	6	15.0
<i>Tinea corporis</i>	21	52.5
<i>Tinea capitis</i>	2	5.0
<i>Pityriasis versicolor</i>	7	17.5
<i>Time Interval Between the Last and Present Infections</i>		
<6 months	1	0.9
6 month-1 year	17	15.2
More than 1 year	22	19.6
Total	40	35.7
Subjects without any previous infection	72	64.3
<i>Affected Family Members, if Any</i>		
Yes	20	17.9
No	92	82.1
<i>Affect Night Sleep</i>		
Yes	73	65.2
No	39	34.8
<i>Affect in Social Life</i>		
Yes	77	68.8
No	35	31.3

affected body parts include trunk or torso, followed by scalp region and other proximal parts. Around 35% of the study participants have a prior history of similar type of infection. A prior history of *corporis* infection is the highest, followed by *pityriasis versicolor* and *cruris* types. The time interval between the subsequent phases of infection is mostly beyond six months period. Nearly one fifth of the participants have at least

one of their household members affected by any of the types of superficial fungal infection. An overwhelming majority of the participants seems to have their social life and night sleep affected due to these problems.

Table 2 shows that most of the participants, who are affected with any type of superficial fungus infection, fall in the age groups beyond 20 years. Again, majority of the participants, irrespective of the age group has been found to be affected by *tinea corporis*, followed by *pityriasis versicolor*. Moreover, the females seem to be more affected than the males with respect to infection related to *corporis*, *pedis* and *capitis* types. Participants belonging to the Hindu religious group seem to be more affected than those from the Muslim community. Individuals who work as unskilled labours are more likely to

be affected with various superficial infection types than those who are in other profession. The least affected ones who are in service and business. Moreover, affected individuals mostly belong to the income group Rs. 5,000-10,000.

Table 3 shows that the household size and per capita sharing of room of majority of the affected individuals is <5 (60, 53.5%) and <0.5 (80,71.42%) respectively. Largely, the participants use piped water and take bath at least for once a day and have the habit of using soap on regular basis. However, nearly half of these individuals do not wipe their wet body parts with care.

Logistic Regression

Table 4 shows that chance of *tinea corporis* infection can be significantly predicted from age,

Table 2: Infection types in relation with other variables

	<i>Tinea corporis</i>	<i>Tinea pedis</i>	<i>Tinea manuum</i>	<i>Tinea unguium</i>	<i>Tinea cruris</i>	<i>Tinea capitis</i>	<i>Pityriasis versicolor</i>	Total
<i>Age Groups (Completed Years)</i>								
Up to 10 Years	1(12.5)	-	-	-	-	7(87.5)	-	8(100)
11-20 Years	3(30.0)	-	1(10.0)	-	2(20.0)	2(20.0)	2(20.0)	10(100)
21-30 Years	14(41.2)	5(14.7)	3(8.8)	-	2(5.9)	2(5.9)	8(23.5)	34(100)
31-40 Years	15(65.2)	2(8.7)	3(13)	-	1(4.3)	1(4.3)	1(4.3)	23(100)
41-50 Years	11(55.0)	-	1(5.0)	-	2(10.0)	1(5)	5(25)	20(100)
51 years and above	12(70.0)	-	1(5.9)	1(5.9)	2(11.8)	-	1(5.9)	17(100)
<i>Sex Groups</i>								
Males	23(41.8)	7(12.7)	3(5.5)	-	8(14.5)	4(7.3)	10(18.2)	55(100)
Females	33(57.9)	-	6(10.5)	1(1.8)	1(1.8)	9(15.8)	7(12.3)	57(100)
<i>Religious Groups</i>								
Hindus	44(50.0)	5(5.7)	8(9.1)	1(1.1)	8(9.1)	9(10.2)	13(14.8)	88(100)
Muslims	12(50.0)	2(8.3)	1(4.2)	-	1(4.2)	4 (16.7)	4(16.7)	24(100)
<i>Nature of Work</i>								
Associated with water	28(63.6)	5(11.4)	-	1(2.3)	4(9.1)	2(4.5)	4(9.1)	44(100)
Associated with chemicals	6(60.0)	3(30.0)	1(10.0)	-	-	-	-	10(100)
Work at public places	13(56.5)	2(8.7)	-	-	2(8.7)	1(4.3)	5(21.7)	23(100)
Associated with others	9(25.7)	2(5.7)	3(8.6)	-	3(8.6)	10(28.6)	8(22.9)	35(100)
<i>Types of Work</i>								
Skilled labour	9(45.0)	3(15.0)	2(10.0)	-	3(15.0)	2(10.0)	1(5.0)	20(100)
Unskilled labour	20(66.7)	3(10)	1(3.3)	-	2(6.7)	1(3.3)	3(10)	30(100)
Service	5(55.6)	-	-	-	2(22.2)	-	2(22.2)	9(100)
Business	2(40)	-	-	-	1(20)	-	2(40)	5(100)
Home maker	17(68)	-	3(12)	1(4)	-	1(4)	3(12)	25(100)
Student	-	3(13.0)	1(4.3)	3(13.0)	1(4.3)	9(39.1)	6(26.1)	23(100)
<i>Income Groups (Rs.)</i>								
< 1000	14(60.9)	2(8.7)	1(4.3)	-	3(13)	1(4.3)	2(8.7)	23(100)
1000-5000	31(45.6)	5(7.4)	5(7.4)	1(1.5)	4(5.9)	9(13.2)	13(19.1)	68(100)
5000-10000	10(52.6)	-	3(15.8)	-	2(10.5)	3(15.8)	1(5.3)	19(100)
>10000	1(50)	-	-	-	-	-	1(50)	2(100)
<i>Affect Night Sleep</i>								
Yes	52(71.2)	4(5.5)	2(2.7)	1(1.3)	9(12.3)	5(6.8)	1(1.4)	73(100)
No	4(10.3)	3(7.7)	7(17.9)	1(2.6)	3(9.1)	8(20.5)	16(41.0)	39(100)
<i>Affect Social Life</i>								
Yes	50(64.9)	4(5.2)	6(7.8)	-	9(11.7)	8(10.4)	-	77(100)
No	6(17.1)	3(8.6)	3(8.6)	1(2.9)	-	5(14.3)	17(48.6)	35(100)

The figure in the parenthesis indicates percentage

Table 3: Living condition and hygienic practice of the affected individuals

	Frequency	Percent
<i>Number of Individuals in the Family</i>		
1-4	60	53.5
5.00	17	15.2
6.00	13	11.6
≥ 7.00	22	19.7
Total (5-7)	52	46.5
<i>Per capita Sharing of Rooms</i>		
0.1-0.5	80	71.42
0.51-1.0	24	21.42
1.0 and above	8	0.07
<i>Sources of Water</i>		
Piped water	61	54.5
Tube well	22	19.6
Pond	23	20.5
Well	6	5.3
<i>Bath Per Day</i>		
Once	73	65.2
Twice	32	28.6
Three times	4	3.6
Four times	3	2.7
<i>Regular Use of Soap</i>		
Yes	58	51.8
No	54	48.2
<i>Careful in Wiping of Wet Body Parts</i>		
Yes	59	52.7
No	53	47.3

occupational types, previous history of *corporis* infection and site of the body, after controlling for other variables. The likelihood of *corporis* infection increases with increase in age and is eight times more among the homemakers, skilled and unskilled workers than the reference category. A history of previous *corporis* infection increases the chance of further infection by four times. The unexposed parts of the body are eight times more likely to be affected than the exposed part.

DISCUSSION

With the control of most bacterial infections in the developed countries, fungus infections

have assumed greater importance (Black 2005). Fungal infections are extremely common in the tropical region and some of them are serious and even fatal. They produce diverse human infections ranging from superficial skin infections to internal organ invasion (systemic disease). These infections usually occur as a result of decrease in natural human defenses (immuno-compromised individuals), or opportunistic heavy exposure to the fungus (Kauffman 2006). Although rarely life threatening, they can have debilitating effects on a person's quality of life and may in some circumstances spread to other individuals or become invasive. Most superficial and subcutaneous fungal infections are easily diagnosed and readily amenable to treatment (Gary 2001).

It appears from the present study that *tinea corporis* is the most common variant of the superficial fungal infection types and risk factors like age, occupational types and prior history of similar infection and unexposed parts of the body are closely associated with this type of infection. In Indian context, a number of hospital based studies have also confirmed that majority of the individuals have *tinea corporis* infection and the males are more affected than the females (Kar et al. 1990; Belurkar et al. 2004). On the other hand, a study from Singapore has found that the most common infection is *tinea pedis*, followed by *pityriasis versicolor* and *tinea cruris* (Tan 2005), which is unlike the finding from the present study. The trend in the distribution of *tinea* infection of the present study population also do not corroborate with the findings from USA (Aly 1994). Thus, it appears that superficial fungal infection pattern and its types are not the same everywhere. Moreover, in India, a detailed investigation is needed to identify the risk factors associated with *corporis* infection.

Table 4: Determinants of having *tinea corporis* infection

	Exp (B)	CI 95%	p
Age	1.5695	1.1761-2.0947	0.0221*
<i>Occupational Types</i>			
Others (ref.)	1.0		
Home maker, skilled and unskilled labour	8.0806	1.8500-35.2945	0.0055*
<i>History of Previous corporis Infection</i>			
No (ref.)	1.0		
Yes	4.7464	1.1644-19.3476	0.0298*
<i>Site of Infection (Skin)</i>			
Exposed (Ref.)	1.0		
Unexposed	8.0520	2.4814-26.1287	0.0005*

*Significant

REFERENCES

- Aly R 1994. Ecology and epidemiology of dermatophyte infections. *J Am Acad Dermatol*, 31: S21-S25.
- Belurkar DD, Bharmal RN, Kartikeyan S, Vadhavkar RS 2004. A Mycological Study of Dermatophytoses in Thane. *Bombay Hospital Journal*. (http://www.bhj.org/journal/2004_4602_april/index.htm, retrieved on December 8, 2008).
- Black JG 2005. *Microbiology: Principals & Explorations*. 6th Edition. New York: Willey Publications.
- Brooks GF, Carroll KC, Butel JS, Morse SA 2007. *Jawetz, Melnick, Adelberg's Medical Microbiology*, 24th Edition, New York: Mc Graw Hill.
- Caputo R, Boule K De, Rosso J Del, Nowicki R 2001. Prevalence of superficial fungal infections among sports-active individuals: results from the Achilles survey, a review of the literature. *Venereology*, 15: 312-316.
- Chandar J 2002. *Text Book of Medical Mycology*. Second Edition. New Delhi: Meheta Publisher.
- Drake LA, Dinehart SM, Farmer ER, Goltz RW, Graham GE, Hardinsky M.K, Lewis CW, Pariser DM, Skouge JW, Webster SB, Whitaker DC, Butler B, Lowery BJ, Elewski BE, Elgart ML, Jacobs PH, Leshner JL, Scher Jr. RK 1996. Guidelines of care for superficial mycotic infections of the skin: tinea corporis, tinea cruris, tinea faciei, tinea manuum, and tinea pedis. *J Am Acad Dermatol*, 34: 282-286.
- English MP, Wethered RR, Duncan Ethel HL 1967. Studies in the Epidemiology of Tinea Pedis. VIII: Fungal Infection in a Long-stay Hospital *Br Med J*, 3: 136-139.
- Gary G 2001. An overview of fungal infections. *Drugs*, 61 (Supplement 1): 1-12.
- Kar PK, Mushtaqali GS, Raval RC, Bilimoria FE, Shah BH 1990. Mycological study of tinea corporis and tinea cruris in Ahmedabad. *Indian J Dermatol*, 35: 115-117.
- Kauffman CA 2006. *Atlas of Fungal Infections*. 2nd Edition. Hong Kong: Springer Science and Business Media LLC.
- Mahapatra LN. 1989. Study of Medical Mycology in India - An Overview. *Indian J Med Res*, 89: 351-53.
- Rogers D, Kilkenny M, Marks R 1996. The descriptive epidemiology of tinea pedis in the community. *Australas J Dermatol*, 37: 178-184.
- Stern RS 1999. The Epidemiology of Cutaneous Disease. In: IM Freedberg, TB Fitzpatrick (Eds.): *Fitzpatrick's Dermatology in General Medicine*. 5th Edition, New York: McGraw-Hill, pp. 7-12.
- Tan Hiok-Hee 2005. Superficial fungal infection seen at the National Skin Centre, Singapore. *Jpn J Med Mycol*, 46: 77-80.
- Vito I, Naldi L, Fracchiolla S, Colecchia B 2004. Prevalence and risk factors for superficial fungal infections among Italian Navy cadets. *Dermatology*, 209: 190-196.