

## Epidemiology and Risk Factors of Superficial Fungal Infections in Toukh Primary Health Care Centre

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### ABSTRACT

**Background:** Fungal skin infection has become a significant problem. Therefore accurate diagnosis and treatment of the active disease as well as the reduction of the re-infection by continued screening, follow up of relatives, treating asymptomatic carriers and disinfecting their environment is mandatory.

**Objective:** The study was conducted to determine the frequency of superficial cutaneous fungal infections in Toukh City and to identify the risk factors underlying superficial cutaneous fungal infections.

**Patients and Methods:** Our study investigated prevalence of fungus infections in Toukh Primary Health Care Center, 420 study participants were examined for presence of fungus infection of glabrous skin, hair and nails. All participants completed a questionnaire to estimate their knowledge about superficial fungal infections (SFIs) and to record presence of risk factors for SFIs.

**Results:** The study showed more prevalence of fungal infection (18.6%). Dermatophyte infections were more prevalent than non-dermatophyte (51.2% vs 37.2%) of infected cases. Onychomycosis had prevalence 1.2% of our study participants and 6.4% of infected participants. Candidal infection was (5.2%), tinea (T.) pedis was (3.6%), T. cruris was (2.1%), T. capitis was (1.7%), T. versicolor was (1.7%), T. circinata was (1.2%), T. barbae was (0.5%) and T. corporis was (0.5%) of study participants. Females represent (62.8%) of cases, while males represent (37.2%). Concerning with predisposing factor was contact with animals (70.5%). (57.1%) of infected participants were diabetics, (71.4%) of infected participants were usually wearing synthetic clothes, (64.1%) of infected participants shared towel between family members and (73.1%) shared hair brush.

**Conclusion:** Skin fungal infections are widely prevalent among the population and there is need to increase the awareness of risk factors contributing to skin fungal infections. Awareness in relation to personal hygiene, education status and occupation do play a part in genesis of SFIs.

**Keywords:** Superficial Fungal Infections – Dermatophytes – Yeasts.

### INTRODUCTION

Superficial fungal infections are caused by heterogeneous group of fungi. As they involve stratum corneum, outermost layer of the skin, they are called superficial fungal infections. They can be classified as dermatophytic and non dermatophytic. Dermatophytic superficial fungal infections affect keratinized tissues and are also known as tinea. The non dermatophytic superficial fungal infections include tinea versicolor, tinea nigra, piedra and candidiasis. 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. The risk factors include socio-economic conditions like overcrowding, poverty and poor personal hygiene <sup>(1)</sup>.

According to World Health Organization (WHO), the prevalence rate of superficial mycotic infection worldwide has been found to be 20-25% <sup>(2)</sup>.

**Abdel-Hafez et al.** <sup>(3)</sup> found that the prevalence of SFIs in rural areas of Assiut Governorate was 16.17%.

### AIM OF THE WORK

To determine the frequency of superficial cutaneous fungal infections in Toukh City. To identify the risk factors underlying superficial cutaneous fungal infections.

### PATIENTS AND METHODS

**Type of Study:** Observational cross sectional study.

**Study Setting:** The study was conducted in Toukh Primary Health Care Centre.

**Study Period:** From June to November 2017. The researcher visited the centre on alternating 4 days weekly to cover the whole week (6 working days).

### Study Population:

**Inclusion criteria:** Both genders (males and females), all age groups who are seeking medical advice at Toukh Primary Health Care Centre were eligible for inclusion in our study. The centre include clinics for internal medicine, paediatrics, obstetric and family planning clinics. Internal medicine clinic was chosen to select adult participants and paediatrics clinic was chosen to select children participants. Any

patient receiving topical or systemic antifungal treatment was also included.

**Sampling Method:** Systematic random sample was taken from Toukh Primary Health Care Centre Outpatient Clinics. Based on average flow of 40 patients per day to the outpatient clinic, every fifth patient was invited to participate in the study.

**Sample Size:** A sample of 210 from pediatric clinic and 210 from internal medicine clinic was calculated using prevalence equals to  $16\% \pm 5\%$  and confidence interval = 95%. The sample was calculated using Epi Info 2002 program, based on prevalence of fungal skin infections in rural areas of Assiut Governorate in Egypt equals to 16%<sup>(3)</sup>.

**Ethical Considerations:** An approval from the research ethical committee of faculty of medicine Ain Shams University was taken. A written informed consent was obtained from the study subjects/ children's guardians which addresses all the steps of the study, the right to withdraw from the study at any time, privacy and confidentiality of data that will be obtained. Approval from the manager of the centre was taken. Verbal consent for photographing was also taken.

**All patients were subjected to:** A self-reported interview questionnaire pilot study. Clinical examination: For site of infection to detect signs of fungal infection. Potassium hydroxide (KOH) test. Treatment: Dermatological treatment was offered to patients to encourage them to participate in the current study. Health education session: A brochure was designed by researcher to educate study participants about the methods of prevention against fungal infections, using simple illustrative information. The brochure was explained to study participants and printed copies were disseminated to them.

**Statistical Analysis:** Data were reviewed for missing and coded then entered to excel sheet. Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows. Quantitative data were presented as mean, standard deviation (SD) and range values. Qualitative data were expressed as frequencies (n) and percentage (%). Chi square test was done for qualitative variable analysis. Independent t test and one way ANOVA were used for comparing quantitative data. P-value  $\leq 0.05$  was considered significant.

**Statistical Package:** Statistical package for social science (SPSS) version 20.

## RESULTS

**Table (1):** Knowledge of study population about SFIs:

		N	%
Heard about SFIs	Yes	180	42.9%
	No	240	57.1%
Know site of SFIs	Yes	168	40.0%
	No	252	60.0%
Sites of SFIs	Head	18	10.8%
	Chin	3	1.8%
	Body	35	21.1%
	Hip	22	13.3%
	Feet	77	46.4%
	Nails	11	6.6%
Know route of infection	Yes	135	32.0%
	No	285	68.0%
Routes of infection	Skin contact	23	5.5%
	Use of hair brush of others	14	3.3%
	Personal items exchange	62	14.8%
	Wear of others' shoes	55	13.1%

**Table (2):** Frequency of risk factors of SFIs among the study participants.

		N	%
Do blood glucose test in last 3 months	Yes	60	14.3%
	No	360	85.7%
Known as diabetic patient	Yes	20	33.3%
	No	40	66.7%
Lowe limbs varicose veins	Yes	3	0.7%
	No	417	99.3%
Raynaud's phenomena	Yes	0	0.0%
	No	420	100.0%
Artificial nails	Yes	0	0.0%
	No	420	100.0%
Public swimming pools	Yes	0	0.0%
	No	420	100.0%
Wear shoes more than 8 hours	Yes	12	2.9%
	No	408	97.1%
Synthetic clothes	Yes	206	49.2%
	No	213	50.8%
Use others' shoes	Yes	22	5.3%
	No	397	94.7%
Use towel to dry body parts	Yes	329	78.3%
	No	91	21.7%
Each person has his own towel	Yes	228	54.3%
	No	192	45.7%
Each person has his own hair brush	Yes	178	42.4%
	No	242	57.6%
Unprescribed use of antibiotics	Yes	62	14.8%
	No	358	85.2%
Pervious health education about SFIs	Yes	45	10.7%
	No	375	89.3%

**Table (3):** Clinical dermatological diagnosis of the study participants.

Diagnosis	N	%
Free	342	81.4%
Infected	78	18.6%
Candidal infection	22	5.2%
Tinea pedis	15	3.6%
Tinea cruris	9	2.1%
Tinea capitis	7	1.7%
Pityriasis versicolor	7	1.7%
Tinea circinata	5	1.2%
Onychomycosis	5	1.2%
Multiple infections	4	1.0%
Tinea barbea	2	0.5%
Tinea corporis	2	0.5%

**Table (4):** Relation between free and infected participants according to knowledge of study population about SFIs.

		Dermatological diagnosis				X2	P
		Free		Infected			
		N	%	N	%		
Heard about SFIs	Yes	139	40.6%	41	52.6%	3.686	0.055
	No	203	59.4%	37	47.4%		
Know sites of SFIs	Yes	129	37.7%	39	50.0%	3.991	0.046*
	No	213	62.3%	39	50.0%		
Know routes of infection	Yes	107	31.1%	28	35.9%	0.676	0.411
	No	235	68.9%	50	64.1%		
Skin contact	No	90	84.9%	22	78.6%	0.648	0.421
	Yes	16	15.1%	6	21.4%		
Use of hair brush of others	No	92	86.8%	28	100.0%	4.130	0.041*
	Yes	14	13.2%	0	0.0%		
Personal items exchange	No	60	56.6%	12	42.9%	1.684	0.194
	Yes	46	43.4%	16	57.1%		
Wearing others' shoes	No	62	58.5%	17	60.7%	0.045	0.832
	Yes	44	41.5%	11	39.3%		

**Table (5):** Relation between free and infected participants according to risk factors of SFIs.

		Dermatological diagnosis				X2	P
		Free		Infected			
		N	%	N	%		
Do blood glucose test in last 3 months	Yes	39	11.5%	21	26.9%	12.323	0.001*
	No	301	88.5%	57	73.1%		
Known as diabetic patient	Yes	8	20.5%	12	57.1%	8.242	0.004*
	No	31	79.5%	9	42.9%		
Lowe limbs varicose veins	Yes	2	0.6%	1	1.3%	0.435	0.509
	No	340	99.4%	77	98.7%		
Raynaud's phenomena	Yes	0	0.0%	0	0.0%	---	---
	No	342	100.0%	78	100.0%		
Artificial nails	Yes	0	0.0%	0	0.0%	---	---
	No	342	100.0%	78	100.0%		
Public swimming pools	Yes	0	0.0%	0	0.0%	---	---
	No	342	100.0%	78	100.0%		
Wear shoes more than 8 hours	Yes	5	1.5%	7	9.0%	12.915	0.001*
	No	337	98.5%	71	91.0%		
Synthetic clothes	Yes	151	44.2%	55	71.4%	18.709	0.001*
	No	191	55.8%	22	28.6%		
Use others' shoes	Yes	15	4.4%	7	9.0%	2.671	0.102
	No	326	95.6%	71	91.0%		
Use towel to dry body parts	Yes	287	83.9%	42	53.8%	33.842	0.001*
	No	55	16.1%	36	46.2%		
Each person has his own towel	Yes	200	58.5%	28	35.9%	13.052	0.001*
	No	142	41.5%	50	64.1%		
Each person has his own hair brush	Yes	157	45.9%	21	26.9%	9.373	0.002*
	No	185	54.1%	57	73.1%		
Unprescribed use of antibiotics	Yes	43	12.6%	19	24.4%	7.012	0.008*
	No	299	87.4%	59	75.6%		

Additional risk factors for SFIs in the present study include certain occupations as (33.3%) of infected participants work as farmers and (70.5%) of infected participants owned pet animals.

**DISCUSSION**

Skin is mechanically protective layer as well as cosmetically significant anatomical structure. SFIs involve only outer layer of skin including hair and nail <sup>(4)</sup>.

Fungi are everywhere and no geographical area or any group of people is spared from this organism <sup>(5)</sup>.

Therefore accurate diagnosis and treatment of the active disease as well as the reduction of the re-infection by continued screening, follow up of relatives, treating asymptomatic carriers and disinfecting their environment is mandatory <sup>(6)</sup>.

The prevalence of SFIs in the present study was found to be (18.6%). No studies available in the literature reported the prevalence of SFIs in Egypt, however, some studies such as that performed by **Khairy** <sup>(7)</sup> reported that the prevalence of SFIs in rural Montazah, Alexandria is (20.5%). **Abdel-Hafez et al.** <sup>(3)</sup> found that the prevalence of SFIs is rural areas of Assuit Governorate is (16.17%). These variation could be attributed to variation in the climate and hygienic factors in these different cities.

The most common type of SFIs detected in the present study was cutaneous and mucosal candidiasis (5.2%). This is explained by the presence of 210 case from pediatric clinic where napkin dermatitis were most common infection. **Tüzün et al.** <sup>(8)</sup> in Istanbul reported that diaper dermatitis prevalence is estimated at 7–35 % in children, and incidence is highest in infants between 9 and 12 months of age and 24% of infected study participants use unprescribed antibiotics, which explains the increasing in oral candidiasis

Among SFIs caused by dermatophytes, tinea pedis was the most common type (3.6%) followed by T. cruris (2.1%) and this agrees with **Abdel-Hafez et al.** <sup>(3)</sup> who found that tinea pedis was the most common fungal infection detected in rural areas of Assiut (7.96%).

The incidence of tinea capitis varies according to the climate, temperature, relative humidity, economic status, and precipitation of different geographic regions, as well as, the natural reservoir of infection <sup>(9)</sup>.

In our study onychomycosis had prevalence 1.2% of our study participants and 6.4%

of infected participants. This can be attributed to that females do household wet work. On other hand these results differ from some other studies which showed that onychomycosis was more common in males than females<sup>(10)</sup>.

In our study the first significant risk factor for SFIs was overcrowding, more than half of the infected cases were living more than one person in one room and this allow spread of infection between family members. This was in accordance with the studies carried out by **Zaraa et al.**<sup>(11)</sup> and **Nweze and Okafor**<sup>(12)</sup> who suggested that; lack of hygiene, close family contact and sharing of personal items like combs, towels, pillows and barbering instruments doubles the risk of spreading of infection.

Additional risk factors for SFIs in the present study include certain occupations as (33.3%) of infected participants work as farmers and (70.5%) of infected participants owned pet animals.

According to **Badali et al.**<sup>(13)</sup> SFIs develop as a result of direct contact with the lesion or contaminated animal, but contamination via apparatus and soil may also occur. **Kaur et al.**<sup>(14)</sup> have reported that SFIs have a high prevalence among children especially those having contact with domestic animals such as kitten, puppy dog, rarely, foal and other domestic animals.

Chronic health problems (e.g. D.M) and poor peripheral circulation are important risk factors for the development of SFIs<sup>(15)</sup>. Also, diabetic patients who have SFIs are more resistant to treatment due to hyperglycemia and poor foot hygiene<sup>(16)</sup>. In the present study (57.1%) of infected participants were diabetics. However, no one of our participants had a peripheral vascular disease which increases the risk of development of onychomycosis according to **Gupta et al.**<sup>(17)</sup> and this could explain the lower prevalence of onychomycosis among the study participants (2.2%).

Wearing synthetic clothes was an important risk factor for the development of SFIs in the present study (71.4% of infected participants). **Gupta et al.**<sup>(17)</sup> suggested that SFIs are more likely to occur in anatomical sites that are covered by clothing suggesting the role of increased heat, moisture and excessive sweating in the pathogenesis of the disease.

In our study wearing occlusive shoes didn't show significant association with SFIs and this may be explained by that the patients become more interested in wearing summer opened shoes.

About (24.4%) only of affected participants were using unprescribed antibiotics and this agree with **Martins et al.**<sup>(18)</sup> who suggested that use of systemic drugs like broad-spectrum antibiotics, immune-suppressants and drugs with xerostomic side-effects, alter the local oral flora or disrupt mucosal surface or reduce the salivary flow, creating a favorable environment for candida to grow.

89.3% of study participants didn't have any pervious health education sessions about SFIs and this explain the high percentage of lack of knowledge about SFIs among the study participants. There were 57.1% of study participants didn't hear previously about SFIs and 68% of study participants didn't know route of infection with SFIs.

## CONCLUSION

Diabetes was common risk factor for SFIs so control of diabetics is important. In our study, significant association was found between family history and fomite sharing which suggests that infection is spread among family members by fomite sharing.

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