

Frequency of associated factors of onychomycosis

Mahwash Rana, Faria Altaf*, Bushra Bashir**, Zahida Rani***

Department of Dermatology, Continental Medical College, Lahore

* Department of Dermatology, Gujranwala Medical College, Gujranwala

** Department of Dermatology, KEMU/ Mayo Hospital, Lahore

*** Department of Dermatology, Khawaja Safdar Medical College, Sialkot

Abstract

Objective To determine the frequency of associated factors of onychomycosis in patients presenting in a tertiary care hospital.

Methods In this cross-sectional survey conducted in Dermatology Unit-I, Outpatient Department, Mayo Hospital, Lahore, 120 patients fulfilling the inclusion criteria were analyzed. After taking informed consent and recording demographic data, complete history was taken. Examination was performed and investigations were carried out where ever needed, for determination of factors associated with onychomycosis.

Results Females were 80.8% of study cases and elderly constituted 5.8%. Positive family history for onychomycosis and smoking, each was observed in 10%. Trauma was present in 11.7% cases. 5% of patients wore occlusive shoes and 9.2% subjects were diabetic.

Conclusion Onychomycosis affected females four times more than males. The most frequent factor observed was trauma. Smoking, positive family history and diabetes mellitus were other important factors.

Key words

Onychomycosis, smoking, diabetes mellitus, occlusive footwear, trauma, family history.

Introduction

Onychomycosis refers to infection of the nail caused by dermatophyte fungi, nondermatophyte fungi, or yeasts.^{1,2} It is the most common nail disease,¹ and has a substantial impact on the patients' quality of life.³ The reported prevalence of onychomycosis is quite variable. It is about 8 percent in the general population,⁴ and is increasing worldwide both in adults and children.^{1,5}

The clinical types are distal subungual, proximal subungual, white superficial, endonyx, total

dystrophic and candidal onychomycosis.^{1,2}

Various risk factors for onychomycosis include increasing age, male gender, obesity, diabetes mellitus, smoking, trauma to nails, peripheral vascular disease, wearing of closed shoes, family history of onychomycosis and others.

Gurcan *et al.*⁶ established that the presence of fungal nail infection in the family increases the risk of onychomycosis. Chang *et al.*⁷ elucidated an association of nail mycosis with male gender, older age, obesity, and diabetes.

Gupta *et al.*⁸ found a male preponderance of 75%, a positive family history in 26% and a history of trauma to nails in 13.8% of patients with onychomycosis.⁸ Sujatha *et al.*⁹ discovered diabetes mellitus in 20% of their patients

Address for correspondence

Dr. Mahwash Rana, Assistant Professor
Department of Dermatology,
Continental Medical College, Lahore
Email: anamash@live.com

suffering from fungal nail infection. Veer *et al.*¹⁰ reported a history of smoking in 8% of Indian subjects.

A history of occlusive footwear was found in up to 44% of Nepalese patients by Agarwalla *et al.*¹¹ while elderly patients constituted up to 36% in a study done by Sauyi *et al.*¹²

Several recent reviews have highlighted the shifting epidemiology of fungal infections worldwide with consequent changes in associated factors.¹³ Furthermore, some known risk factors like the elderly population and diabetes mellitus are increasing in Pakistan.^{14,15} No prior studies have evaluated the factors associated with onychomycosis in our population. Our study aimed to determine the frequency of common factors associated with onychomycosis. Early detection and modification of these factors, where possible, will improve the patients' quality of life and will also lead to a better management of these patients.

Methods

Settings Dermatology unit I outpatient, Mayo Hospital, Lahore.

Study design Cross-sectional survey

Sample size Sample size of 120 cases was calculated with 95% confidence level, 5% margin of error and taking expected percentage of history of smoking i.e. 8% (least among all) factors associated with onychomycosis.

Sample technique Non-probability purposive sampling.

Sample collection

Inclusion criteria Male or female patients having clinical (discoloration and/or thickening

or brittleness of one or more finger /toenails) and laboratory evidence of onychomycosis (positive KOH smear for fungal hyphae on light microscopy).

Exclusion criteria Patients taking any antifungal therapy up to 6 months prior to diagnosis of onychomycosis.

Data collection 120 patients presenting to the Outpatient Department of Dermatology, Unit I, Mayo Hospital, Lahore, and fulfilling the inclusion criteria were entered in the study. After taking informed consent and recording demographic data, complete history was taken and examination done for determination of factors associated with onychomycosis.

Patients not taking any hypoglycemic drugs were asked to fast for 10-12 hours and 4 ml of blood was collected from the antecubital vein. Blood glucose level was measured.

Data analysis Data were entered and analyzed through SPSS (version 17). Data master sheet was generated for the variables under study. The quantitative data like age were presented as the mean and standard deviation. Qualitative data like gender, smoking, diabetes, elderly, history of occlusive footwear and trauma and family history were presented in the form of frequency and percentages.

Results

In this study the mean age of the subjects was 33.86 ± 14.57 years, with the youngest patient aged 4 years and the oldest 75 years of age. The gender ratio observed was 4.2 females for every male (23 males and 97 females). Fungal disease affected the fingernails alone in 77 (64.2%) subjects, and 29 (24.1%) individuals had involvement of toenails only.

Table 1 Demographic and clinical features of the study population (n=120).

	N (%)
Age (years)	
> 60	7 (5.8)
< 60	113 (94.2)
Sex	
Male	23 (19.2)
Female	97 (80.8)
Family history	
Yes	12 (10.0)
No	108 (90)

Table 2 Factors associated with onychomycosis (n=120).

	N (%)
Elderly	7 (5.8)
Males	23 (19.2)
Family history	12 (10)
Trauma	14 (11.7)
Smoking	12 (10.0)
Occlusive footwear	6 (5.0)
Diabetes mellitus	11 (9.2)

Both fingernails and toenails were affected in 14 (11.7%) cases. As regards to gender variation, male patients had involvement of fingernails and toenails in 42 (34.8%) each. Females, however, had predominant fingernail pathology 85 (71.1%), with 26 (21.7%) having only toenail involvement, and 9 (7.2%) affected by fingernail as well as toenail mycosis (**Table 1**).

Factors associated with onychomycosis were observed in 58 (48.3%) of the study subjects (**Table 2**). Among these, elderly individuals constituted 7 (5.8%), with a female predominance (80.8%), (**Table 2**). A positive family history of onychomycosis was present in one-tenth of the cases, and the same number of patients gave a history of smoking. A history of prior trauma was present in 14 (11.7%). Only 5% routinely wore occlusive shoes throughout the year.

Discussion

There are various factors that increase the chances of developing onychomycosis.^{4-6,12,16,17,18}

The mean age of the subjects in our study was 33.86 ± 14.57 years. These results are comparable to previous studies from Pakistan,^{19,20} as well as to studies from Saudi Arabia, Indonesia, India and Brazil.^{16,21,22,23} In contrast, published literature from some countries like Canada, Iceland and Chile, has reported a higher mean age.^{4,24,25} The younger age group observed in our study may be explained by the fact that young individuals are more cosmetically conscious. Furthermore, all the countries with a younger mean age have warm weather and their residents usually wear open shoes with more chances of trauma to the nails. The higher mean age reported in countries like Canada, Chile and Iceland, on the other hand, may be due to a higher ratio of geriatric population in these countries and better availability of healthcare facilities.

Among the factors associated with onychomycosis, elderly individuals comprised 5.8% of our subjects. This is comparable with studies from India, Bangladesh and Brazil.^{22,23,26} However, studies from Spain and Canada have reported a higher prevalence (50% or more) of elderly cases.^{4,27} The high percentage of elderly subjects in these studies may be due to the greater life expectancy in the industrialized countries leading to a greater proportion of elderly population. Furthermore, the aged individuals in the developed nations have easy access to health facilities with more chances of disease diagnosis.

Female cases accounted for 80.8% of our study cases, while males comprised only 19.2%. The study by Bokhari *et al.*¹⁹ from Lahore, also revealed that females are more frequently affected by fungal nail disease. Studies from India, Bangladesh and other Asian countries including the East Asian Branch of the Achilles Survey, have also reported a greater ratio of affected females as compared to males.^{22,28,26} In

contrast, surveyors from China, Thailand, America and Europe have reported a male predominance among patients with nail mycosis.^{12,28,29,30}

The involvement of females in wet household chores probably accounts for the female predominance observed in our study. The moist environment greatly encourages penetration and growth of fungal pathogens.^{19,31} In addition, the majority of our population lacks automated washing machines, and females wash and rinse clothes by hand. The damage to the nail apparatus by this added effect of detergents and soaps further encourages fungal nail infection in females.^{17,32} This is supported by the observation that most of our subjects were young female housewives.

Females are also more concerned about the poor cosmetic appearance of the diseased nails. In addition, the use of tightly fitting high-heeled shoes results in damage to the nails and makes them more vulnerable to infection. Frequent manicure and pedicure increase the chances of developing onychomycosis as well, by introducing infection and damaging the cuticle.³³

It was noted that a large ratio of our female cases (71.1%) had only fingernail involvement while a few (7.2%) had involvement of both fingernails and toenails. Most of our female population do wet household work in routine, such as washing dishes, laundry and child care, which is the likely reason for this overwhelming majority having fingernail involvement.

10% of our subjects had other cases of onychomycosis in their family. A similar ratio of patients reported a positive family history in Tunisia.³⁴ However, a higher frequency of 20-25% was reported in studies from India and Bangladesh.^{8,26} Both these countries are more heavily populated as compared to Pakistan, with

more chances of interfamily spread of infection due to overcrowding. Among those with a positive family history in our study, one-third were less than 18 years of age. A multicentre survey from Canada, Belgium and USA by Gupta *et al.*³⁵ also supports the importance of family history in this age group.

11.7% of patients gave a previous history of injury to the affected nail or nails. This is comparable to the studies from India and Saudi Arabia.^{8,36} In Bangladesh, a greater ratio of subjects (22%) gave a history of prior trauma.²⁶ Occupational differences among the studied subjects might be a reason for this disparity.

A history of smoking was noted in 10% of our subjects. Among these 75% were males while only one-fourth smokers were females. Veer *et al.*¹⁰ from India also reported 8% smokers among their nail mycosis cases. The prevalence of smoking in our general population is around 15.2%.³⁷ The low ratio of smokers in our study is probably due to the female predominance among the onychomycosis cases, as female smokers comprise only 3.4% of our general population.³⁷

Use of closed footwear was reported by 5% individuals. A survey from Bangladesh revealed that 15.8% of onychomycosis subjects wore occlusive shoes,²⁶ while researchers from Nepal have observed an even higher percentage of 44%.¹¹ The lower frequency of closed footwear observed in our study was probably due to more female subjects. These were frequently housewives and did not routinely wear closed shoes at home. In addition, many people do not routinely use occlusive footwear due to the warm weather during most part of the year in our country.

The fewer cases of toenail onychomycosis among our subjects i.e. 24% cases with isolated toenail onychomycosis and 11.7% with both toe

and fingernail involvement, is also likely to be due to this less frequent use of occlusive shoes.

It was seen that 9.2% of the study cases had diabetes mellitus at presentation. When laboratory investigations were undertaken no new cases of diabetes were identified. The Achilles survey reported a similar percentage of diabetic subjects (9.5%).²⁸ Some observers from various eastern and western countries have reported a higher or lower ratio: 22% in Tunisia,³⁴ 20.4% in Brazil,³⁸ and 5% in Bangladesh²⁶ and China.¹² The observed ratio of diabetics in our study was almost equal to the prevalence of diabetes in the general population which is about 9.1%.¹⁵ However, it was observed that individuals with diabetes had more extensive nail disease, with involvement of both toenails and fingernails seen in 54.5% diabetic subjects.

Almost half (51.7%) of the subjects in our study had none of the observed factors associated with onychomycosis. This is comparable to the ratio observed in a study from Mexico.³⁹

Conclusion

Onychomycosis affected females four times more than males in our study. The most frequent factor associated with onychomycosis observed was trauma. Smoking, positive family history and diabetes mellitus were other important factors. Further studies with a larger number of patients may be required to identify any other factor associated with onychomycosis in our population.

References

1. Verma S, Heffernan MP. Fungal Diseases. In: Wolff K, Goldsmith LA, Katz SI et al, eds. *Fitzpatrick's Dermatology in General Medicine, 7th edn*. Philadelphia: McGraw-Hill; 2008. P. 1807-11.

2. Hay RJ, Ashbee HR. Mycology. In: Burns T, Breathnach S, Cox N, Griffiths C, eds. *Rook's Textbook of Dermatology, 8th edn*. London: Blackwell Science; 2010. P. 36.18-35.
3. Szepletowski J, Reich A, Pacan P, Garlowska E, Baran E. Evaluation of quality of life in patients with toenail onychomycosis by Polish version of an international onychomycosis-specific questionnaire. *J Eur Acad Dermatol Venereol*. 2007;**21**:491-6.
4. Gupta AK, Jain HC, Lynde CW, MacDonald P, Cooper EA, Summerbell RC. Prevalence and epidemiology of onychomycosis in patients visiting physicians' offices: A multicenter Canadian survey of 15,000 patients. *J Am Acad Dermatol*. 2000;**43**:244-8.
5. Kaur R, Kashyap B, Bhalla P. Onychomycosis - epidemiology, diagnosis and management. *Indian J Med Microbiol*. 2008;**26**:108-16.
6. Gurcan S, Tikvesli M, Eskiocak M, Kilic H, Otkun M. Investigation of the agents and risk factors of dermatophytosis: a hospital-based study. *Mikrobiyol Bul*. 2008; 42: 95-102.
7. Chang SJ, Hsu SC, Tien KJ, Hsiao JY, Lin SR, Chen HC et al. Metabolic syndrome associated with toenail onychomycosis in Taiwanese with diabetes mellitus. *Int J Dermatol*. 2008;**47**:467-72.
8. Gupta M, Sharma NL, Kanga AK, Mahajan VK, Tegta GR. Onychomycosis: Clinico-mycologic study of 130 patients from Himachal Pradesh, India. *Indian J Dermatol Venereol Leprol*. 2007;**73**:389-92.
9. Sujatha V, Grover S, Dash K, Singh G. A Clinico-mycological evaluation of onychomycosis. *Indian J Dermatol Venereol Leprol*. 2000;**66**:238-40.
10. Veer P, Patwardhan NS, Damle AS. Study of onychomycosis: Prevailing fungi and pattern of infection. *Indian J Med Microbiol*. 2007;**25**:53-6.
11. Agarwalla A, Agrawal S, Khanal B. Onychomycosis in Eastern Nepal. *Nepal Med Coll J*. 2006;**8**:215-9.
12. Sauyi C, Laiyin C. A prospective epidemiological study on tinea pedis and onychomycosis in Hong Kong. *Chin Med J*. 2002;**115**:860-5.
13. Havlickova B, Czaika VA, Friedrich M. Epidemiological trends in skin mycoses worldwide. *Mycoses* 2008;**51**:2-15.
14. Sabzwari SR, Azhar G. Ageing in Pakistan - A new challenge. *Ageing Int*. 2011;**36**:423-7.
15. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;**27**:1047-53.

16. Al-Sheikh H. Epidemiology of dermatophytes in the eastern province of Saudi Arabia. *Res J Microbiol.* 2009;4:229-34.
17. Gharachorlou A, Gharachorlou S, Nazeri M. Study of relationship among androgenic hormones and dermatophytosis due to *Microsporium gypseum*. *Adv Environ Biol.* 2011;5:1195-7.
18. Nzenze-Afene S, Ngoungou EB, Mabika-Mamfoumbi M, Bouyou-Akotet MK, Avome-Mba IM, Kombila M. Onychomycosis in Gabon: Clinical and mycological data. *J Med Mycol.* 2011;21: 248-55.
19. Bokhari MA, Hussain I, Jahangir M, Haroon TS, Aman S, Khurshid K. Onychomycosis in Lahore, Pakistan. *Int J Dermatol.* 1999;38:591-5.
20. Aman S, Haroon TS, Hussain I, Bokhari MA, Khurshid K. Tinea unguium in Lahore, Pakistan. *Med Mycol.* 2001;39:177-80.
21. Bramono K, Budimulja U. Epidemiology of onychomycosis in Indonesia: data obtained from three individual studies. *Jpn J Med Mycol.* 2005;46:171-6.
22. Adhikari L, Gupra AD, Pal R, Singh TS. Clinico-etiological correlates of onychomycosis in Sikkim. *Indian J Pathol Microbiol.* 2009;52:194-7.
23. Lopes JO, Alves SH, Mari CR, Oliveira LT, Brum LM, Westphalen JB *et al.* A ten-year survey of onychomycosis in the central region of the Rio Grande do Sul, Brazil. *Rev I Med Trop.* 1999;41:147-9.
24. Sigurgeirsson B, Steingrimsdottir O, Sveinsdottir S. Prevalence of onychomycosis in Iceland: a population-based study. *Acta Derm Venereol.* 2002;82:467-9.
25. Cruz CR, Ponce EE, Calderon RL, Delgado VN, Vieille OP, Piontelli LE. Superficial mycoses in the city of Valparaiso, Chile: period 2007-2009. *Rev Chil Infect.* 2011;28:404-9.
26. Khondker L, Choudhury AM, Shah MOR, Shahidullah M, Khan MSI, Ahamed ARS. Clinico-epidemiological profile of onychomycosis attending in a tertiary care hospital. *J Bangl Coll Physicians Surg.* 2012;30:78-84.
27. Perea S, Ramos MJ, Garau M, Gonzalez A, Noriega AR, Del Palacio A. Prevalence and risk factors of tinea unguium and tinea pedis in the general population in Spain. *J Clin Microbiol.* 2000; 38: 3226-30.
28. Roseeuw D. Achilles foot screening project: preliminary results of patients screened by dermatologists. *J Eur Acad Dermatol Venereol.* 1999;12:S6-9.
29. Ungpakorn R, Lohaprathan S, Reangchainam S. Prevalence of foot diseases in outpatients attending the Institute of Dermatology, Bangkok, Thailand. *Clin Exp Dermatol.* 2004;29:87-90.
30. Ghannoum MA, Hajjeh RA, Scher R, Konnikov N, Gupta AK, Summerbell R *et al.* A large-scale North American study of fungal isolates from nails: the frequency of onychomycosis, fungal distribution, and antifungal susceptibility patterns. *J Am Acad Dermatol.* 2000;43:641-8.
31. Jayatilake JA, Tilakaratne WM, Panagoda GJ. Candidal onychomycosis: a mini-review. *Mycopathologia.* 2009;168:165-73.
32. Morishita N, Ninomiya J, Sei Y, Takiuchi I. Effects of temperature, humidity, minor injury and washing on penetration of dermatophytes into human stratum corneum. *Jpn J Med Mycol.* 2003;44:269-71.
33. Torres-Rodriguez JM, Lopez-Jodra O. Epidemiology of nail infection due to keratinophilic fungi. *Rev Iberoam Micol.* 2000;17:122-35.
34. El Fekih N, Belghith I, Trabelsi S, Skhiri-Aounallah H, Khaled S, Fazaa B. Epidemiological and etiological study of foot mycosis in Tunisia. *Actas Dermosifiliogr.* 2012;103:520-4.
35. Gupta AKRG, Sibbald CW, Lynde PR, Hull R, Prussick NH, Shear P *et al.* Onychomycosis in children: prevalence and treatment strategies. *J Am Acad Dermatol.* 1997;36:395-402.
36. Zimmo SK. Prevalence of dermatologic foot diseases in Saudi Arabia. *J Pan Arab League Dermatol.* 2007;18:9-13.
37. Ahmad K, Jafary F, Jehan I, Hatcher J, Khan AQ, Chaturvedi N *et al.* Prevalence and predictors of smoking in Pakistan: results of the National Health Survey of Pakistan. *Eur J Cardiovasc Prev Rehabil.* 2005;12:203-8.
38. Costa-Orlandi CB, Magalhaes GM, Oliveira MB, Taylor ELS, Marques CRS, de Resende-Stoianoff MA. Prevalence of dermatomycosis in a Brazilian tertiary care hospital. *Mycopathologia.* 2012;119:1-9.
39. Bonifaz A, Cruz-Aguilar P, Ponce RM. Onychomycosis by molds. Report of 78 cases. *Trauma.* 2007;7:9.