

Original Article

Evaluation of onychomycosis among diabetic patients of Yazd diabetic center

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Abstract *Background* The population suffering from diabetes is increasing all over the world. In Iran, the prevalence of diabetes is reported from 5 to 8 percent and the highest figure is for Yazd and Booshehr Province. In diabetic patients infections of nail and skin pose a great danger.

Objective To determine the prevalence of onychomycosis in diabetic patients and its relation with age, gender, period of diabetes and its control.

Patients and methods This descriptive study involved 262 diabetic type 2 patients which were referred to the Yazd diabetic clinic during years of 2008 to 2009. All the patients were examined by a dermatologist and the patients with clinical doubt were sent for the laboratory tests i.e. smear and culture. Confirmed cases of onychomycosis were treated with terbinafine 250mg/day for four months. The patients were followed up clinically every month and data were recorded. In the end of treatment protocol, direct smear and culture from nails was taken.

Results 262 diabetic patients (123 men and 139 women) were examined. The mean age of patients and diabetic duration were 59.12 ± 10.96 years and 7.24 ± 12.8 years, respectively. Onychomycosis was diagnosed clinically in 18 patients (6.9%) and proved by culture only in 10 patients (3.8%). 70% of onychomycosis cases were men and 60% were over 60 years old. No significant relation was found between the frequency of onychomycosis and the diabetic duration but in the patients having a weaker control of diabetes onychomycosis was more frequent.

Conclusion The frequency of onychomycosis in diabetic patients type 2 is 3.8% and it had a significant relation with the weak control of diabetes.

Key words

Diabetes mellitus, onychomycosis, Yazd.

Introduction

Considering the high number of diabetic patients the world over and its rising trends, the WHO estimated that there will be 300 million diabetics in 2025. This group of patients will be exposed to a large number of problems, a fact which these patients and their treating clinicians should acknowledge.¹ One of these problems is the fungal infections of skin and nails that account for a higher frequency in diabetic patients. Nail fungal

infections, in turn, can result in the increase frequency of diabetic foot.^{2,3}

Onychomycosis comprise about 33% of all skin fungal infections and 50% of all nail disorders. If ignored, it can result in damage to the skin and nails that itself provides a suitable environment for the growth of microorganisms leading to the increases chances of secondary infection, necrosis and diabetic foot. Onychomycosis also causes deformity of fingernails and toenails and thus prevents the person from being in the public places and society. Therefore, the determination of its frequency, timely diagnosis and treatment can help to prevent the serious drawbacks in these patients.⁴

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Patients and methods

In this descriptive, cross-sectional study, referred patients (type 2 only) to Yazd diabetes clinic, from 2008 to 2009 were examined for onychomycosis by dermatologist. General information such as age, gender, control of diabetes, the period of diabetes since its diagnosis and the type of diabetes were recorded and also result of cutaneous examination of patients. Therefore, for the patients who were suspected as onychomycosis clinically i.e. change of the color of nail, deformity of nail, or subungual hyperkeratosis etc. mycology tests, direct smear and culture were done.

The patients having positive smear and culture were considered positive onychomycosis but for the patients having negative culture and having serious clinical doubts of infection, fungal cultures were repeated.

The proven onychomycosis cases were treated with terbinafine 250mg/day for 4 months. Two weeks after treatment, samples were again cultured. Then negative cultures from lesion were considered as cured. The data were further analyzed.

Results

In this survey, 262 type 2 diabetic patients, 123 (47%) men and 139 (53%) women of our diabetic clinic in Yazd province were checked for onychomycosis. 18 patients (6.9%) were suspected clinically but the diagnosis was proved only in 10 patients (3.8 %) by using direct smear and culture.

Distribution of onychomycosis according to sex in our diabetic patients is shown in **Table 1**. The number of affected men was more than the women (7 vs. 3) but statistical analysis was not significant. ($p=0.197$).

The mean age of patients was 59.12 ± 10.96 years and the range was 35-95 years. Among them, 147 (56.1%) were below 60 years and 115 (43.9%) were over 60 years; there was no significant difference. Onychomycosis in diabetic patients according to age is shown in **Table 2**. There were 4 patients below the age of 60, but 6 patients over 60 years ($p=0.342$).

In our population, mean duration of diabetes was 12.81 ± 7.24 years, 45% of them below 10 years and 55 percent had over 10 years history of diabetes.

Table 3 shows the onychomycosis distribution according to duration of the diabetes. There were 5 patients with <10 year duration and 5 patients with >10 year duration ($p=0.758$)

Related to the diabetic control, among the patients of this survey 103 (39.3%) patients had HbA1C <7% and 159 (60.7 %) patients >7%. **Table 4** shows onychomycosis and diabetic control in patients by HbA1C index. Among 10 patients suffering from onychomycosis, one patient had HbA1C <7% and 9 patients had HbA1C >7% i.e. onychomycosis patients had a weaker control of diabetes. But the statistical analysis was insignificant. ($p= 0.094$, Fisher's exact test)

All the patients responded well to terbinafine therapy and two weeks after the treatment period all the patients were negative on culture.

Discussion

In this study the prevalence of onychomycosis among 262 type II diabetic patients was 3.8%. This subject has been extensively investigated world over (**Table 5**). Comparing our results with the previous studies, the prevalence of onychomycosis in our study population was much less than the studies done in other countries. The prevalence of onychomycosis in

Table 1 Onychomycosis distribution in diabetic patients according to sex

Sex	Without onychomycosis N (%)	With onychomycosis N (%)	Total N (%)
Female	136 (97.8)	3 (2.2)	139 (53)
Male	116 (94.3)	7 (5.7)	123 (47)
Total	252 (96.2)	10 (3.8)	262 (100)

Fisher's exact test, $p = 0.197$

Table 2 Onychomycosis distribution in diabetic patients according to age.

Age (years)	Without onychomycosis N (%)	With onychomycosis N (%)	Total N (%)
<60	143 (97.2)	4 (2.8)	147 (56.1)
>60	109 (94.8)	6 (5.2)	115 (43.9)
Total	252 (96.2)	10 (3.8)	262 (100)

Fisher's exact test, $p = 0.342$

Table3 Onychomycosis distribution in diabetic patients according to duration of diabetes.

Duration (years)	Without onychomycosis N (%)	With onychomycosis N (%)	Total N (%)
<10	113 (95.7)	5 (4.3)	118 (45)
>10	139 (96.5)	5 (3.5)	144 (55)
Total	252 (96.2)	10 (3.8)	262 (100)

Fisher's exact test, $p = 0.758$

Table4 Onychomycosis distribution in diabetic patients according to HbA1C.

HbA1C	Without onychomycosis N (%)	With onychomycosis N (%)	Total N (%)
<7%	102 (99)	1 (1)	103 (39.3)
>7%	150 (94.3)	9 (5.7)	159 (60.7)
Total	252 (96.2)	10 (3.8)	262 (100)

Fisher's exact test, $p = 0.094$

Table 5 Comparison of prevalence reported in different studies.

Researcher	Year/country	Study population	Prevalence of onychomycosis	Reference
Dumont	2009/ Belgium	100 diabetics	20%	[5]
Chang <i>et al</i>	2208/Taiwan	1245 type 1, 2 DM	30.76%	[6]
Manzano-Gayosso <i>et al.</i>	2008/Belgium	250 type 2 DM	28%	[7]
Saunte <i>et al.</i>	2006/Denmark	271, type 1, 2 DM	22%	[8]
Bouquerra <i>et al.</i>	2004/Tunis	307, type 1, 2 DM	30%	[9]
Dogra <i>et al.</i>	2002/India	400, type 1, 2 DM	17%	[10]
Sürücüoğlu <i>et al.</i>	1998/Turkey	77, type 2 DM	55%	[11]
Eckhard <i>et al.</i>	2008/Germany	95, type 1 DM	69%	[12]
Present	2010/Iran	262, type 2, DM	3.8%	

diabetics depends on different factors like age, gender, background illnesses, occupation, climate, environment, trauma to the nails, lack of hygiene, humid environment and the repeated contact of nails with water; besides the diagnostic criteria used.¹³ Relatively lower prevalence rate in our diabetic patients can be due to different reasons which include warm and dry climate in Yazd, relatively better economic conditions and good hygiene, the

instructions given to the diabetic patients in Yazd diabetic center and the repeated examination by dermatologist can be other reasons for low prevalence of onychomycosis among our diabetic patients. Another reason may be that we included only culture-positive cases.

As males are exposed to relatively more shoe trauma and perspiration than females, the

prevalence of onychomycosis in both genders was also compared. Apparently, more males had onychomycosis than females; however, the difference was not significant. Male predominance has been reported previously.^{6,9,10} However, other studies showed similar frequency in both sexes.^{5,8}

In the present study, the prevalence of onychomycosis regarding age was also examined. The mean age of patients with onychomycosis was similar to that in patients without disease (62.2 years vs. 59.80 years). Similar results have been reported in the previous literature.^{6,8,9,10} In contrast, no such relation was observed by Suheyla *et al.*¹¹ and Manjao *et al.*⁷

The relation between the prevalence of onychomycosis and control of diabetes was also studied. Mean HbA1C concentration in onychomycosis patients was 8.2% as compared to 7.61% in patients without onychomycosis. This shows that diabetic patients who had a weaker control of disease, the prevalence of onychomycosis was higher. This is also in accordance with most other studies.^{6,12} But Suheyla did not observe any such relation.¹¹

Regarding the relationship between the prevalence of onychomycosis and the duration of diabetes, no significant difference was found in the mean duration of disease between patients with onychomycosis and those without onychomycosis, 12.8 years in both groups. Similar results were reported by Suheyla who found no relation between the prevalence of onychomycosis and the period of diabetes.¹¹ However, this finding was different from other studies^{7,9,10,12}; in all these a relation between the prevalence of onychomycosis and the period of diabetes was observed.

According to the existing data, the drugs approved by FDA for onychomycosis are terbinafine and itraconazole. Comparing these two antifungal drugs, terbinafine was found superior to itraconazole. In a multicenter clinical trial comprising 508 patients, efficacy of continuous terbinafine (250mg/day) and itraconazole pulse therapy (400mg/day 7 days each month) was compared. In terbinafine group, 54% and 60% patients showed improvement after 12 and 16 weeks, respectively; whereas in itraconazole group, 32% of patients showed improvement. In terms of absolute treatment (negative fungal test and the normal nail) with terbinafine and itraconazole, after 12 weeks of therapy the improvement was 46% and 23%, respectively which rose to 55% and 26%, respectively after 16 weeks.³ This is the reason, we treated all our patients with terbinafine 250mg/day and all responded well to therapy.

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