

# Venous insufficiency in patients of toenail onychomycosis

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**Abstract** *Objective* To determine the association between toenail onychomycosis and venous insufficiency.

*Methods* 100 patients and 100 controls fulfilling inclusion and exclusion criteria were enrolled in the study after taking informed consent. Venous insufficiency was detected by performing color Doppler ultrasound of lower limb veins.

*Results* Out of 100 cases, 3% patients had venous insufficiency. Two persons among controls were found to have venous incompetence.

*Conclusion* A positive association was found between venous insufficiency and toenail onychomycosis, however, this was not significant statistically.

**Key words**

Toenail onychomycosis, venous insufficiency, Doppler ultrasonography.

## Introduction

Onychomycosis refers to any fungal infection of the nail caused by dermatophytes, nondermatophytes and yeasts. It is the most common nail disorder accounting for 50% of all onychopathies.<sup>1</sup> Besides other factors, it can originate secondary to vascular abnormalities especially venous insufficiency.<sup>2</sup> Venous insufficiency is a common and advanced disease that causes specific skin and subcutaneous tissue changes of lower extremities.<sup>3</sup>

Basic pathophysiology is venous hypertension leading to hypervolemia causing endothelial damage which provokes interstitial edema due to

capillary leakage. This results in inadequate removal of waste and insufficient supply of nutrients and oxygen to the tissues.<sup>4</sup> Vascular abnormalities leading to stasis and hypoxemia create an environment where dermatophytes thrive. In another study Kulac *et al.*<sup>5</sup> elucidated the association between toenail onychomycosis and venous insufficiency and found it to be 35.7%.

Our study intends to establish relationship between toenail onychomycosis and venous insufficiency in our population. Early detection of venous insufficiency by performing Doppler ultrasound of lower limb veins in patients of toenail onychomycosis may help in intervention to delay the progression to varicose veins and venous ulceration by life style modification and thus improved quality of life. Furthermore, it may reduce the duration of expensive antifungal medication for recalcitrant toenail onychomycosis due to venous insufficiency.

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## Methods

This was a case-control cross-sectional study conducted in the Outpatient Department of Dermatology, Unit II, Mayo Hospital, Lahore from 1<sup>st</sup> January 2012 to 30<sup>th</sup> June 2012. One hundred patients with clinical and laboratory evidence of toenail onychomycosis and 100 persons with clinically normal toenails were enrolled as cases and controls, respectively. Exclusion criteria were history of preexisting cardiovascular disease, diabetes mellitus, smoking and immunosuppression assessed by history, clinical examination and relevant investigations for both groups.

Venous insufficiency was detected by performing color Doppler ultrasound of lower limb veins in both groups. Doppler was performed with General Electric (GE) Logic 5 system using 10MHz linear probe. The radiologist was blind about all the participants of the study to minimize bias.

Data were stratified for number of toenails involved to address effect modifiers. Data were analyzed through statistical package of SPSS 17. Quantitative variables were represented as mean±SD and venous insufficiency as frequency and percentages in both groups. Odds ratio (OR) was calculated to see association between venous insufficiency and toenail onychomycosis. OR>2 was considered statistically significant.

## Results

Demographic profile showed that cases and controls were matched for age and gender (Table 1).

Among the patients, 3% had subclinical venous insufficiency. 2 out of 3 patients had bilateral nail involvement and venous insufficiency. The

**Table 1** Demographic data of study population.

	Cases N=100	Controls N=100
Age (years)		
Mean	34.14±15.18	30.49±12.27
Minimum	12.00	13.00
Maximum	70.00	65.00
Gender		
Male	37	44
Female	63	56

**Table 2** Descriptive statistics for venous insufficiency in cases (n=100) and controls(n=100).

	Cases N (%)	Controls N (%)
Venous insufficiency	3 (3)	2 (2)
Unilateral	1 (1)	0 (0)
Bilateral	2 (2)	2 (2)

Odds Ratio=1.5

third patient had unilateral venous insufficiency on the side of involvement of toenail whereas the contralateral toenail was normal.

2% of controls were found to have venous insufficiency; both had bilateral venous reflux. Result analysis showed positive association between venous insufficiency and toenail onychomycosis (OR=1.5), which was statistically not significant (Table 2).

## Discussion

Many factors such as genetic susceptibility, old age, smoking, trauma, immunosuppression, diabetes mellitus, peripheral arterial disease and venous insufficiency are predisposing factors for the development of onychomycosis.<sup>6,7</sup>

There is no reported study in Pakistan regarding the association of venous insufficiency in patients of toenail onychomycosis.

The male to female ratio in our study was 1:1.7. This is comparable to the study conducted by Sauyi and Laiyin in Hong Kong.<sup>8</sup> Prevalence of onychomycosis is higher in males in general population.<sup>9</sup> In our study, females were affected

more as they are involved in household work such as washing. Also, application of nail lacquer and manicure procedures are practiced more by females which is an important risk factor for the development of onychomycosis.

Our study showed venous insufficiency in 3% patients among cases. In contrast to our study, Kulac *et al.*<sup>5</sup> found venous insufficiency in 35.7% of total 42 enrolled patients. This may be due to the fact that relatively younger patients (34.14±15.18 year) of toenail onychomycosis were included in our study, whereas the mean age was 50 years in the aforementioned study.<sup>5</sup> Prevalence of venous insufficiency is generally higher in older population.<sup>10</sup> Another factor is difference in geographical area and race. This study was conducted in Turkey where prevalence of venous insufficiency is higher as compared to Asia.<sup>11</sup>

Among controls, 2% had venous incompetence. This is in contrast to the study conducted by Beebe-Dimmer *et al.*<sup>12</sup> who found prevalence of venous insufficiency as 17% and 40% in males and females respectively out of 2059 patients. Lower prevalence in our study may be due to limited number of patients, relatively younger age group and professions that do not involve prolonged standing.

Venous reflux was bilateral in 2 of 3 patients among cases and onychomycosis was also bilateral in them. Onychomycosis and venous reflux was unilateral in one case. Kulac *et al.*<sup>5</sup> also found venous insufficiency on same side as that of onychomycosis whether unilateral or bilateral.

In our study, reflux was detected in superficial venous system only whereas deep veins were normal in all patients. Maurins *et al.*<sup>13</sup> also found superficial venous reflux more common than deep venous incompetence.

Among cases, 2 out of 3 patients and both the patients in control group were females. Prevalence of venous insufficiency is higher in females in general population due to effects of estrogen and changes during pregnancy.<sup>11,14</sup>

The odds ratio was calculated to be 1.5. This showed that patients with onychomycosis are 1.5 times at risk of developing venous insufficiency as compared to the people who do not have fungal nail infection. However, this difference in prevalence of venous insufficiency in two groups was not significant statistically. More studies with larger population size may be needed to ascertain further aspects of this association.

## Conclusion

A positive association was found between venous insufficiency and toenail onychomycosis, however this was not significant statistically. More studies with larger population size may be needed to ascertain further aspects of this association.

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