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Research Article

## FREQUENCY OF ONYCHOMYCOSIS & TINEA PEDIS IN PATIENTS SUFFERING FROM TYPE-2 DIABETES AND DEVELOPMENT OF FOOT ULCER

<sup>1</sup>Dr Salman Ahmed, <sup>2</sup>Sumaira Liaqat, <sup>3</sup>Dr Tehreem Azmat

<sup>1</sup>Shalamar Hospital

<sup>2</sup>House Officer, Aimth Sialkot

<sup>3</sup>House Officer, Services Hospital Lahore

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**Abstract:**

**Objective:** Decreased cellular immunity leads to the development various infection of bacteria and fungi because of the not controllable hyperglycemia in the patients suffering from diabetes. This research work aimed to evaluate the frequency of tinea pedis and onychomycosis in the patients with Type-2 diabetes and impacts on the development of other complications like foot ulcer.

**Methodology:** The recruitment of 227 patients of diabetes carried out in this research work. Total 43 patients were present with diabetic foot ulcer. Screening of the patients carried out and record of the traits of demography was maintained. We also recorded the levels of HbA1c of the patients as well as availability of the complications. The examination of the patients carried out dermatologically and gathered specimens by scalpel from the skin between sole, toes, nails of toe and area around nails which was suspected to have infection of fungi.

**Results:** There was high native positivity between toes in males as compared to females ( $P < 0.050$ ). We found an important association between evaluation of level of HbA1c and native positivity among toes ( $P < 0.050$ ). Infection because of fungi between toes, sole and nails of toe nail significantly enhanced in the diabetic patients with foot ulcer as compared to the diabetic patients without foot ulcers ( $P < 0.050$ ). Moreover, native positivity in diabetic patients with foot ulcer associated with the availability of the fungal infection according to the findings of examination ( $P < 0.050$ ).

**Conclusion:** There was more fungal infections in the patients with poor glycemic control in the patients of diabetes and the infection due to fungi may be accountable for development of diabetic foot ulcer.

**KEY WORDS:** Foot ulcer, Type-2 diabetes, accountable, onychomycosis, glycemic control, positivity, toes, HbA1c.

**Corresponding author:**

**Dr. Salman Ahmed,**  
Shalamar Hospital

QR code



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**INTRODUCTION:**

Type-2 diabetes is very significant metabolic disease with an increasing frequency gradually [1, 2]. Different lesions of skin are present in about 30.0% patients suffering from diabetes and infections of fungi are an important part of these abrasions [3]. It is important to note that hyperglycemia influences the cellular immunity and it disturbs the phagocytic functions. As an outcome of this very situation, progression of cutaneous fungal as well as bacterial infections can be easily seen in such patients [4, 5].

There are very minimum symptoms of tinea infections in the patients without diabetes, they can create entry points which can lead to the severe infections due to bacteria in the patients suffering from diabetes. Involved regions are pruritic, macerated, squamous and erythematous. There can be formation of vesicles and pustules. Long-lasting tinea pedis has its involvement in nails by making thick, rough and yellowish nail and subungual debris [6]. This research work carried out to evaluate the rate of occurrence of tinea pedis and onychomycosis in the patients suffering from diabetes and its impacts on the development and progress of various chronic complications especially foot ulcers.

**METHODOLOGY:**

Inclusion of total 227 patients in the year of 2019 suffering from diabetes getting treatment at Endocrinology Department of General Hospital, Lahore carried out in this research work. Total 43 patients were present with DFU (Diabetic Foot Ulcer). We recorded all the data about demography of the patients on a well-organized questionnaire after taking the written consent from the patients.

We also recorded the information about age of patients, sex, and diabetes duration, levels of HbA1c and frequency of daily washing of feet in same questionnaire. We also gathered the data associated with neuropathy and diseases of peripheral vascular system, which are highly chronic abnormalities of Type-2 DM by checking the available records of the patients. Assessment of the abrasions of the patients suffering from DFU carried out in accordance with the Wagner classification.

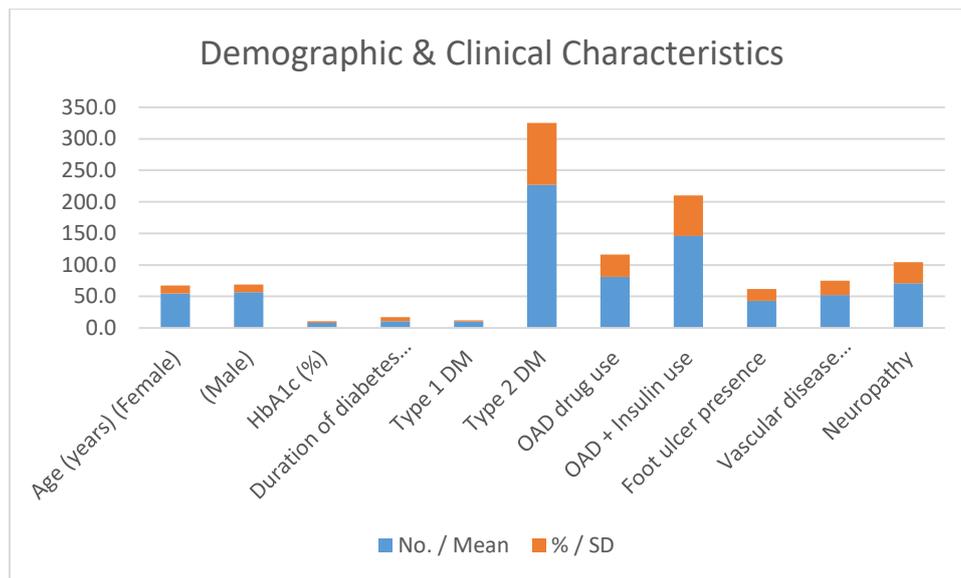
All the patients underwent a complete examination of dermatology. The cleaning of the skin present between toes and sole, near nails and nails carried out with alcohol 70.0%, and collection of the samples carried out with the utilization of the scalpel. Collection of the materials carried out in envelopes of sterile paper. The collection of the samples carried out from the most affected regions in the patients suggesting the presence of onychomycosis. Examination of the abrasions carried out with the help of microscope by magnification of X40. In the patients present with the negative fungal test, we repeated the complete procedure twice at the similar region. SPSS V.23 was in use for the statistical analysis of the collected information. We also performed the descriptive assessments. P value of less than 0.050 was significant.

**RESULTS:**

There were total 62.10% (n: 141) female and 37.90% (n: 86) male patients (Table-1). Most common detected fungal infection in these patients was onychomycosis present in 34.90% patients and 2<sup>nd</sup> most common was tinea pedis present in 26.30% patients.

**Table-I: Demographic and clinical characteristics of patients.**

Characteristics	No. / Mean	% / SD
Age (years) (Female)	54.8	12.80
(Male)	56.9	11.90
HbA1c (%)	8.3	2.21
Duration of diabetes (years)	10.5	6.90
Type 1 DM	10.0	1.90
Type 2 DM	227.0	98.10
OAD drug use	81.0	35.70
OAD + Insulin use	146.0	64.30
Foot ulcer presence	43.0	18.90
Vascular disease presence	52.0	23.00
Neuropathy	71.0	33.60

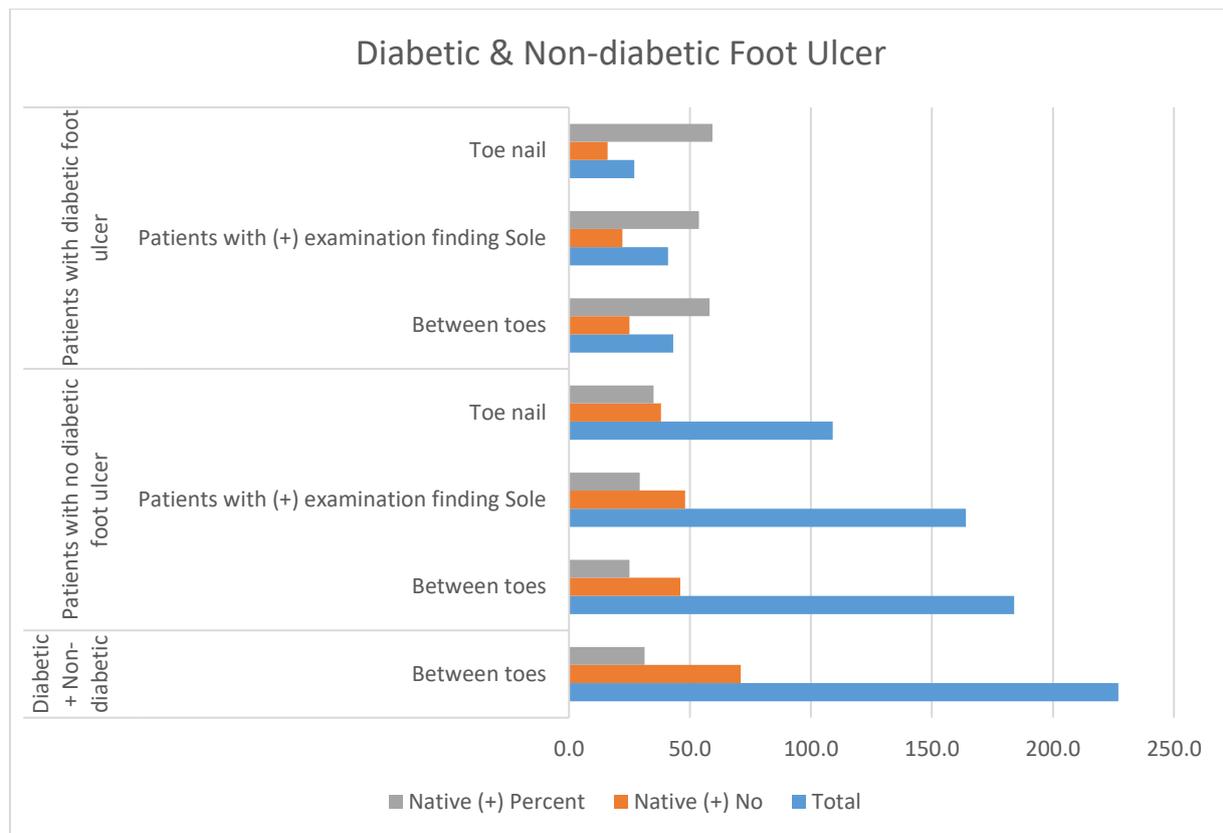


Approximately 22.70% female patients and 45.30% males were present as natively positive. Whereas native-positivity among toes & at sole was highly observed in patients of male gender ( $P < 0.050$ ,  $P < 0.050$ ; correspondingly), native-positivity at toe-nail was present similarly in both genders ( $P > 0.050$ ). Native-positivity among toes & at sole increased as associated with the increase in age and native-positivity between the toes increased as associated with the increase in average levels of HbA1c ( $P < 0.050$ ,  $P < 0.050$ ; respectively). There was no detection of relationship between average diabetes duration, occupation, method of treatment, availability of comorbid complications and native-positivity. The prevalence of fungal infection was present to be extensive at skin available between toes, at sole & at nail in the patients suffering from peripheral vascular complications ( $P < 0.050$ ).

Average frequency of daily washing of foot was  $2.70 \pm 2.0$  per day in patients of this research work. The frequency of daily washing of foot was much high among females as compared to the male patients ( $P = 0.00010$ ). In the meantime, when there was decrease in the frequency of washing of foot, there was an increase in the frequency of fungal infections at sole and nail ( $P = 0.0040$ ). There was no important association between the frequency of daily foot washing and treatment type, presence of DFU, peripheral vascular complications and peripheral neuropathy. Fungal infection was much high in the patients present with DFU as compared to the patients without DFU. The examination outcome of fungal infection and native outcomes of DFU are present in Table-2.

**Table-II: Between toes, sole, and toe nail native results of patients with diabetic & non-diabetic foot ulcer**

Ulcer Site	Total	Native (+)		p value	
		No	Percent		
Diabetic + Non-diabetic	227.0	71.0	31.30	0.0010	
Patients with no diabetic foot ulcer	Between toes	184.0	46.0	25.00	0.0000
	Patients with (+) examination finding Sole	164.0	48.0	29.30	0.0050
	Toe nail	109.0	38.0	34.90	0.2200
Patients with diabetic foot ulcer	Between toes	43.0	25.0	58.10	<0.0500
	Patients with (+) examination finding Sole	41.0	22.0	53.70	<0.0500
	Toe nail	27.0	16.0	59.30	<0.0500



### DISCUSSION:

The prevalence of fungal infections is very high in patients with adverse glycemic control and other peripheral vascular complications. There is also high presence of the frequent fungal infection in presence of DFU. There is presence of more systemic infections in the patients suffering from diabetes as compared to general public [7]. Onychomycosis & tinea pedis are some of eminent infections [8]. In the patients of this research work, onychomycosis was the most common fungal infection present in 34.90% patients followed by tinea pedis in 26.30% patients. Results of various research works conducted in many regions of Turkey also supported these findings [9, 10]. One research work on 288 patients of diabetes stated the incidence of onychomycosis as 22.0%. The prevalence of onychomycosis was 4.90% in population of Europe and disease of DM is a facilitator for onychomycosis [11, 12, and 13]. Different factors facilitating the prevalence of onychomycosis are very frequent in the patients suffering from diabetes as compared to normal general public [14, 15].

In current research work, the amount of the patients present with peripheral neuropathy was very low as compared to the available literature [16]. Gender of the patients may be a determinant in the formation of the onychomycosis by the availability of the peripheral neuropathy [17]. The prevalence of onychomycosis is high in male patient as compared

to the female population in general public because of high exposure [18]. Some research works on patients of diabetes suggested that frequency of onychomycosis is high in males but Ilkit stated the equal frequencies in both genders [19]. Shahzad in his research work found the association between fungal infections with the duration of diabetes [20]. The prevalence and morbidity of various fungal infections can be decreased by controlling the DM and utilization of antifungals [20, 21]. The frequencies of onychomycosis & tinea pedis are low in the patients present with normal levels of HbA1c. A research work conducted by Alteras supported the finding [22] but Romano stated that there was no association between duration of diabetes and infections of dermatology [23]. The focus of most of the research works linked with fungal infections is on onychomycosis in diabetics [24, 25]. There are some limitations of this research work as the number of the patients suffering from DFU is very low and there is no comparison of the normal healthy controls with the fungal infection in the patients suffering from diabetes.

### CONCLUSION:

The findings of this research work concluded that there was more fungal infections among the patients with adverse glycemic. Infections due to fungi can support the development of diabetic foot ulcer in the patients suffering from diabetes because fungal infections are more common in the diabetic patients

suffering from foot ulcer. Awareness training programs of patients suffering from diabetes on complications, infections, timely treatment and prevention of the disease are much necessary to avoid unfavorable outcomes.

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