

ASSOCIATION OF LEVEL OF EDUCATION AND OCCUPATION WITH DIABETIC FOOT ULCER IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Objective: Diabetic foot ulcer (DFU) is a well-known microvascular complication of Type 2 Diabetes mellitus (T2DM) with several risk factors. This study intended to determine the association of the level of education and occupation with the severity and outcome of DFU in diabetic patients.

Materials and Methods: This study was conducted from 1st January 2023 to 25th January 2023 in the Endocrinology Division of the Department of Medical Specialties, Khyber Teaching Hospital, Peshawar. Adult diabetic patients with DFU were enrolled in the study. All the relevant demographic, clinical, and biochemical characteristics were measured.

Results: Out of 148 patients, only 50 (33.8%) patients were educated. The study participants had a mean age, BMI, HbA1c, and duration of DM of 56.48 years, 27.3 kg/m², 10.3 % and 9.4 years, respectively. There was a substantial association between the level of education and occupation with the severity of DFU which was statistically significant (p-value = 0.001 and p-value = 0.01, respectively). Regarding the outcome of DFU, it was found that patients with medium and high levels of literacy and skilled occupation had lower rates of major amputations. These results were statistically non-significant however they were found to be clinically significant.

Conclusion: A significant association was observed between the education level and occupation with the severity and outcome of DFU. This underpins the significance of structured education of patients with low and medium literacy levels and those with unskilled and semiskilled jobs regarding their foot care.

Keywords: Type 2 Diabetes Mellitus, Diabetic Foot ulcer, Occupation, Education.

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INTRODUCTION

Diabetes mellitus (DM) is a widely spread metabolic disorder with devastating complications leading to increased morbidity and mortality. ¹ According to the International Diabetes Federation's survey in 2021, around 537 million people have DM globally, and in Pakistan, 33 million people have DM. ² Type 2 diabetic patients are at higher risk of lower limb complications like diabetic foot infection and diabetic foot ulcers (DFU) which are among

the most disabling and costly problems. ³ According to the estimations, 19 to 34% of diabetic patients will suffer from DFU once in their life. Moreover, patients with DFU have a 2.5-fold higher probability of death at 5 years in contrast to those without DFU. ⁴

Patients with DFU are at higher risk of lower limb amputations. ⁵ Due to lengthy hospital stays and the severity of ulceration, it has been estimated that the foot care of patients with DM accounts for a considerable amount of health care expenses in a developed country like England. This is more than the combined expenses of lung, prostate, and breast carcinomas. ⁶ In Pakistan, the prevalence of DFU is 7.02 %. ⁷ Common risk factors for DFU are foot deformities, peripheral arterial disease, diabetic peripheral neuropathy, and uncontrolled glycemic status. ⁸ Most of the risk factors are due to the poor educational status of the patient. Patients with adequate education had a lower risk of severe DFU and thus amputations. A study

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conducted in Iran showed that gender, disease duration, occupation, and literacy level of patients had a significant association with the healthcare practice of patients with DFU.⁹

In Pakistan, various studies have been conducted to ascertain the contributing factors for DFU but none of them assess the effect of occupation and level of education on the occurrence of DFU. Thus, the objective of the current study is to find the association between the level of education and occupation with the severity and outcome of DFU in type 2 diabetic patients. The outcomes of this study will emphasize the importance of the educational status and occupation of patients in relation to DFU.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted from 1st January 2023 to 25th January 2023 in the Endocrinology Division of the Department of Medical Specialties, Khyber Teaching Hospital, Pakistan after getting approval from the hospital's ethical committee (Ref. No. 92/DME/KMC dated 26/12/2022). The calculated sample size was 101, taking the 7.02% prevalence of DFU in T2DM patients with a 95% confidence interval.⁷ After taking informed written consent, type 2 diabetic patients of both genders with DFU were registered in the study through non-probability consecutive sampling. Patients with type 1 DM, pregnancy, end-stage renal disease, and those with any critical illness were excluded from the study.

The diagnosis of DM was established according to the American Diabetes Association (ADA) guidelines.¹⁰ Ulcer on the foot and severity of DFU was classified as per Wagner-Meggitt Classification.¹¹ Outcome of DFU was classified as conservative when only debridement was performed, minor when the amputation level was at or below the ankle joint, and major when the amputation level was above the ankle joint.¹²

The education status of the patients was categorized as uneducated and educated. The education level was classified according to the International Standard Classification of Education-11 (ISCED-11) into the following literacy levels: Low: early childhood education/primary education/lower secondary education; Medium: upper secondary education and High: bachelor/master or equivalent.¹³

Occupation of the patients was categorized into the following categories: Unemployed, Unskilled (fast food workers, Laborer, maids, furniture movers) Semi skilled (drivers, flight attendants, security guards, shopkeepers, and waiters), Skilled (carpenters, police officers, firemen, doctors, nurses, lawyers, welders, plumbers, administrative jobs, electricians & computer operators) and Housewife.¹⁴

The SPSS software was applied for the analysis of

data. Mean \pm standard deviation was calculated for the numerical variables. Frequencies and percentages were computed for the categorical variables. The association of the level of education of patients and occupation with the severity and outcome of DFU was analyzed via the Chi-square test. Results having p-value ≤ 0.05 were considered to be statistically significant.

RESULTS

A total of 148 T2DM patients with DFU were included in the study. There were 75 (50.7%) males and 73 (49.3%) females having an average age of 56.48 years. The mean BMI, HbA1c, and duration of DM were 27.3 kg/m², 10.3 % and 9.4 years, respectively. The baseline demographic profile and clinical features of the study participants are presented in Tables I and II, respectively.

The relation between the occupation and literacy level of patients with the severity and outcome of DFU was also assessed and is presented in Tables III and IV, respectively. Out of 148 patients, only 50 (33.8%) patients were educated, of whom only 12 patients had a high education level. It was evident that none of the patients with a higher education level had a higher-grade ulcer. Regarding occupation, the majority of the patients with unskilled and semiskilled occupations had a higher grade of DFU. It was found that the association of the employment status of patients and their literacy status with the severity of DFU was statistically significant (p-value = 0.001 and p-value = 0.01, respectively).

Similarly, the association of education level and occupation was assessed with the outcome of DFU and it was found that patients with medium and high levels of education and skilled occupation had lower rates of major amputations. These results were statistically non-significant however they were found to be clinically significant.

Table 1: Baseline Demographic profile of the study Participants

	Characteristic	Frequency (n=148)	Percentage (%)
Age(years)	<50	30	20.3
	>50	118	79.7
Gender	Male	75	50.7
	Female	73	49.3
Level of Education	Uneducated	98	66.2
	Low	12	8.1
	Medium	26	17.6
	High	12	8.1
Occupation	Un Employed	3	2.0
	Unskilled	19	12.8
	Semiskilled	35	23.6
	Skilled	21	14.2
	Housewife	70	47.3

Table 2: Baseline clinical characteristics of the study participants

		Frequency (n=148)	Percentage (%)
Duration of DM	< 10 years	81	54.7
	≥ 10 years	67	45.3
Treatment of DM	Oral	42	28.4
	Oral plus Basal insulin	18	12.2
	Twice daily insulin	69	46.6
	Basal Bolus Insulin	19	12.8
HbA1c	≤ 7 %	11	7.4
	7.1 to 8.5 %	14	9.5
	≥ 8.6 %	123	83.1
Grade of DFU	Grade I	17	11.5
	Grade II	46	31.1
	Grade III	39	26.4
	Grade IV	36	24.3
	Grade V	10	6.8
Type of DFU	Neuropathic	71	48.0
	Ischemic	61	41.2
	Neuroischemic	16	10.8
Cause of DFU	Blister	35	23.6
	Cellulitis	105	70.9
	Trauma	8	5.4
Risk Assessment of foot	No	130	87.8
	Yes	18	12.2
Education for Foot Care	No	91	61.5
	Yes	57	38.5
Outcome of DFU	Conservative	91	61.5
	Minor Amputation	45	30.4
	Major Amputation	12	8.1
Retinopathy	No	48	32.4
	Yes	100	67.6
Nephropathy	No	80	54.1
	Yes	68	45.9
Hypertension	No	59	39.9
	Yes	89	60.1
Stroke	No	135	91.2
	Yes	13	8.8
MI	No	107	72.3
	Yes	41	27.7
Heart Failure	No	129	87.2
	Yes	19	12.8

Table 3: Association of Education and Occupation with the severity of Diabetic Foot ulcer

Association of Education with the severity of Diabetic Foot ulcer								
Grade of Diabetic Foot Ulcer								
Level of Education		Grade I	Grade II	Grade III	Grade IV	Grade V	Total	p value
	Uneducated	11	25	30	25	7	98	0.001
	Low	0	1	4	7	0	12	
	Medium	2	12	5	4	3	26	
	High	4	8	0	0	0	12	
	Total	17	46	39	36	10	148	
Association of Occupation with the severity of Diabetic Foot ulcer								
Grade of Diabetic Foot Ulcer								
Occupation		Grade I	Grade II	Grade III	Grade IV	Grade V	Total	p value
	Unemployed	0	1	1	1	0	3	0.01
	Unskilled	1	2	6	9	1	19	
	Semiskilled	1	9	8	13	4	35	
	Skilled	6	11	2	2	0	21	
	Housewife	9	23	22	11	5	70	
	Total	17	46	39	36	10	148	

Table 3: Association of Education and Occupation with the severity of Diabetic Foot ulcer

Association of Education with the Outcome of Diabetic Foot Ulcer						
Outcome of Diabetic Foot Ulcer						
Level of Education		Conservative	Minor Amputation	Major Amputation	Total	p value
	Uneducated	53	36	9	98	0.123
	Low	8	2	2	12	
	Medium	21	5	0	26	
	High	9	2	1	12	
	Total	91	45	12	148	
Outcome of Diabetic Foot Ulcer						
Occupation		Conservative	Minor Amputation	Major Amputation	Total	P value
	Unemployed	3	0	0	3	0.144
	Unskilled	11	4	4	19	
	Semiskilled	18	14	3	35	
	Skilled	17	4	0	21	
	Housewife	42	23	5	70	
	Total	91	45	12	148	

DISCUSSION

This study demonstrated that the association between the literacy level of patients and the severity of DFU was statistically significant (p-value = 0.001). Most of the uneducated patients had DFU Grade II to V, while patients with a high level of education had DFU Grade I to II. A study conducted in Punjab, Pakistan found a substantial relation between the education status of diabetic patients with the risk of DFU.⁵ Similarly, a study by Madmoli et al. revealed a strong association between literacy status and

DFU (p-value=0.002).¹⁵ These findings are very comparable to our study. Another study conducted in Saudi Arabia also identified that patients with secondary and university level education had better knowledge of diabetic foot and thus lower risk of DFU.¹⁶

Our study demonstrated a substantial association between the literacy status of patients and the severity of DFU (p-value = 0.01). Pourkazemi et al. also noticed a significant association between employment status and literacy level with diabetic foot.⁹ None of the patients with

skilled occupations had Grade V ulcers while the majority of patients with unskilled and semiskilled occupations had Grade II to V ulcers. A study performed in India showed that patients with higher literacy and skilled and semiskilled occupations had a better knowledge of self-care activities and thus low risk and severity of DFU.¹⁴ Another study also found that patients with skilled occupations had a lower risk of severe DFU.¹⁶ These findings are quite similar to the findings of our study.

This study also revealed an association between education status and occupation with the outcome of DFU which was clinically significant but statistically non-significant (p-value = 0.123 and p-value = 0.144, respectively). In a study by Madmoli et al. there was a substantial association of education status with DFU (p-value = 0.002).¹⁵ Likewise, in a study by Rostami et al. patients with low education levels were more likely to have an amputation.¹⁷ The findings of a study by Madmoli et al. also revealed a significant association of occupation with lower limb amputation (p-value = 0.03) among T2DM patients with DFU.¹⁵ The difference between the findings of our study and these studies could be due to that the fact the majority (66.2%) of patients in our study were uneducated and all of these patients had conservative or minor amputations with very few patients undergoing major amputation. Only one out of 12 patients with high education levels had a major amputation and none of the 26 patients had had a major amputation. These findings are clinically significant but not statistically significant (p-value = 0.123)

Regarding employment status, our study identified that 4 out of 19 (21.1%) and 3 out of 35 (8.6%) of unskilled and semiskilled occupations respectively, had a major amputation. While none of the patients with skilled occupation had a major amputation. These findings are clinically significant however they didn't reach a statistical significance (p = 0.144). A study by Amalraj et al. demonstrated that 23 % of the patients who underwent lower limb amputation were unemployed.¹⁸ Similarly, a study by Madmoli et al. observed a strong association between limb amputation and occupation (p-value = 0.03).¹⁵ Study by Rastomi et al. also demonstrated similar results.¹⁷

Our study also found that 87.8% and 61.5% of the study participants had never had risk assessments of their feet and had never been educated about foot care, respectively. Another study demonstrated that 34.2% of the patients were examined by physicians for risk assessment and 36.7% of the patients received structured education regarding their foot care.¹⁹ The findings of our study are quite alarming, enhancing the importance of timely risk assessment and structured education of our patients. This also highlights the literacy rates of our population, in that the majority of our patients are uneducated which acts as a barrier in imparting education of foot care.

Our study revealed that 67.6% and 45.9% had diabetic retinopathy and nephropathy, respectively. It also showed that 60.1% and 12.8% of the patients had hypertension and heart failure, respectively. The study by Abdulghani et al. found that 61.4%, 14.4%, and 23.3% had hypertension, heart disease and retinopathy, respectively.¹⁹ Our study had more patients with retinopathy, the reason for the difference could be that most of the study participants had advanced diabetic foot disease imparting that they had more risk factors for diabetic retinopathy.

The result of this study has some limitations. Firstly, this is a cross-sectional study where associations between different factors are difficult to ascertain. Secondly, it was a single-centered study, so it is suggested that such a study should be carried out in multiple centers on a large scale for a better understanding of this association and generalization of the findings.

CONCLUSION

A considerable relationship was observed between the literacy rate and occupation with the severity and outcome of DFU. It emphasizes that patients with a low and medium level of education and patients with unskilled and semiskilled jobs should be properly educated regarding their foot care. This reiterates the importance of timely and regular risk assessment of feet and structured education of diabetic patients regarding their foot care. Optimum glycemic control, structured education, risk assessment, and control of associated risk factors will reduce the number of foot ulcers and thus hospital admissions and lower extremity amputations, which will further reduce the economic burden on our health system, especially in our resource-limited country.

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Following authors have made substantial contributions to the manuscript as under

- Malik SE:** Concept, Design, and Proofreading
Kanwal S: Acquisition and critical review
Javed J: Analysis and interpretation of data
Naeem H: Analysis and interpretation of data
JehandadZ: Analysis and interpretation of data
Haider I: Data collection, Final approval

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.



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