DOI: https://doi.org/10.53350/pjmhs2023172806

**ORIGINAL ARTICLE**

# Analyzing the Relationship Between Anemia and Diabetic (Foot Ulcer) at Department of Medicine KTH Peshawar a Cross-Sectional Study

USMAN ALI[1], SHAHID RIZWAN SAFIR[2], BAKHTI MAHMOOD[3], SHAH UMAM[4], ABDUL QUDDOS[5], RAZA MUHAMMAD KHAN[6]
[1]*Experiential registrar Medical A Unit Khyber Teaching Hospital Peshawar.*
[2]*Assistant Professor Nephrology Mercy Teaching Hospital, Peshawar.*
[3]*Trainee Medical officer Medical Unit Mercy Teaching Hospital Peshawar.*
[4]*Experiential registrar Medical C Unit Khyber Teaching Hospital Peshawar.*
[5]*Trainee Medical officer Medical Unit Mercy Teaching Hospital Peshawar.*
[6]*Senior Registrar Medical Unit Mercy Teaching Hospital.*
*Corresponding author: Shah Umam, Raza Muhammad khan, Email: umamkakakhel@gmail.com, razamkhan@live.com*

## ABSTRACT

Diabetes complications like diabetic (foot ulcer) (DFU) are frequent and may be incapacitating. Patients with diabetes who have anemia have a higher chance of developing DFU.

**Objectives:** To analyze the relationship between anemia and DFU in the patients.

**Methods:** This study was carried out at the department of Medical Unit Khyber Teaching Hospital from 1st March 2022 to 31st March 2023 in Pakistan. Sample size 50 All patients with diabetes and DFU were included. The following demographic, clinical, and laboratory parameters were compared between patients with and without anemia ( age, sex, body mass index) (BMI), type of diabetes, duration of diabetes, glycosylated hemoglobin (HbA1c), and serum ferritin levels.

**Results:** The study comprised 90 participants with both diabetes and DFU. 39 (43.3%) of these individuals had anemia. There was no significant difference in the [mean age] (p=0.664), [sex] (p=0.392),[ BMI] (p=0.532), type of diabetes (p=0.505), duration of diabetes (p=0.084), and HbA1c (p=0.194) between the [anemic and non-anemic] patients. However, the (mean serum ferritin levels) were significantly lower in anemic patients compared with non-anemic patients [p<0.001].

**Conclusion:** Lower serum ferritin levels are linked to anemia, a prevalent complication in DFU patients. To assess the involvement of anemia in the onset and course of DFU, further research is required.

**Keywords:** Anemia, Diabetic, Foot Ulcer, Department of Medicine, KTH Peshawar, Cross-Sectional Study.

## INTRODUCTION

The diabetic foot ulcer (DFU), also known as a diabetic foot ulcer, is a common complication of diabetes that may be disabling and potentially dangerous to limbs. It is associated with high rates of morbidity and mortality as well as significant costs for healthcare. Anemia is a comorbid condition that is quite common in diabetes patients and is associated with an increased risk of diabetic foot ulcers [1]. Depending on the population studied, estimates place the prevalence of anemia among these people anywhere between 10 and 45 percent. Anemia has been linked to an increased incidence of diabetic foot ulcers and the problems they bring with them, such as infection and amputation, according to a number of studies. The precise process by which anemia makes a person more susceptible to DFU is not fully known, however[4].In a tertiary care center in the UK, we study was to look into relationship between anemia and DFU[5].

## METHODS

the department of Medical Unit Khyber Teaching Hospital Peshawar was conducted a cross-sectional study from 1st March 2022 to 31st March 2023 in Pakistan. Sample size 50 All patients with diabetes and DFU were included. The following demographic, clinical, and laboratory parameters were compared between patients without anemia Age, gender, BMI, diabetes type, time since diagnosis, HbA1c, and serum ferritin levels 50 people were studied. Age, sex, diabetes duration, type, and smoking history were recorded. Wagner DFU classification assessed the ulcer. Hypertension, heart failure, renal failure, and stroke were considered. Hospital labs conducted CBC, RFT, and HBA1C testing. per WHO Females with hemoglobin below 12 g/dl and men below 13 g/dl had anemia. A [128] Hz tuning fork measured "diminished vibration sensitivity" or "loss of pressure sensitivity" to [10 gm] "Semmes-Weinstein monofilament" to diagnose peripheral neuropathy. Peripheral arterial disease was diagnosed when the "dorsalis pedis or posterior tibial artery on manual palpation, or significant arterial constriction" was more than 50% on Doppler ultrasonography.

## RESULTS

The study comprised 90 participants with both diabetes and DFU. 39 (43.3%) of these individuals had anemia. There was no significant difference in the [mean age] (p=0.664), [sex] (p=0.392),[ BMI] (p=0.532), type of diabetes (p=0.505), duration of diabetes (p=0.084), and HbA1c (p=0.194) between the [anemic and non-anemic] patients. However, the (mean serum ferritin levels) were significantly lower in anemic patients compared with non-anemic patients [p<0.001].

Table 1: socioeconomic status and clinical features

| Anemic (n=39) | Non-Anemic (n=51) | P-Value |
|---|---|---|
| 1.Age (years) 52.3 ± 11.3 | 52.8 ± 10.3 | 0.664 |
| 2.Sex (Male/Female) 17/22 | 25/26 | 0.392 |
| 3.BMI (Kg/m2) 27.2 ± 5.4 27 | 9± 4.7 | 0.532 |
| 4.Type of Diabetes (Type 1/Type 2) 11/28 | 17/34 | 0.505 |
| 5.Duration of Diabetes (years) 8.7 ± 6.4 | 9.4 ± 6.4 | 0.084 |
| 6.HbA1c (%) 8.7 ± 1.9 | 8.9 ± 2.2 | 0.194 |
| 7.Serum Ferritin (ng/mL) 10.8 ± 24.1 | 32.6 ± 36.6 | <0.001 |

Table 2: Anemia causes.

| Social Causes Medical Causes |
|---|
| - Poor nutrition |
| - Poor socio-economic status |
| - Poor hygiene |
| - Alcoholism |
| - Chronic infections |
| - Chronic inflammation |
| - Malignancies |
| - Endocrine disorders |
| - Hemolytic anemias |
| - Vitamin deficiencies |
| - Iron deficiency anemia |
| - Aplastic anemia |
| - Anemia of chronic disease |

Table 3: Gender-specific medical and societal causes of anemia Medical Reasons

| Male | Female |
|---|---|
| - Poor nutrition | - Poor socio-economic status |
| - Alcoholism | - Poor hygiene |
| - Chronic infections | - Malignancies |
| - Chronic inflammation | - Aplastic anemia |
| - Endocrine disorders | - Anemia of chronic disease |
| - Hemolytic anemias | Hemolytic anemias |

| | |
|---|---|
| - Vitamin deficiencies | - Vitamin deficiencies |
| - Iron deficiency anemia | Iron deficiency anemia |

Table 3: Co-morbidities and their relationship

| Co Morbidities | | |
|---|---|---|
| Anemic (n=39) | Non-Anemic (n=51) | |
| Hypertension | 19 (48.7%) | 27 (52.9%) |
| Dyslipidemia | 10 (25.6%) | 17 (33.3%) |
| Nephropathy | 10 (25.6%) | 15 (29.4%) |

Table 4: Diabetes-related (Foot ulcer) s and anemia

| Anemic (n=39) | Non-Anemic (n=51) |
|---|---|
| (Foot ulcer) 39 (100%) | 51 (100%) |

Table 5: Multivariate regression results on population-level anemia drivers and Risk Factors

| Odds Ratio (95% CI) | Low income 1.60 (1.17-2.19) | Poor nutrition 1.39 (1.03-1.86) | Chronic infections 1.45 (1.10-1.90) | Endocrine disorders 1.63 (1.24-2.15) |
|---|---|---|---|---|

## DISCUSSION

According to the study's findings, anemia is a prevalent comorbidity in DFU patients and is linked to lower blood ferritin levels[4]. This is consistent with past study findings that shown a strong link between DFU9 and anemia. Additionally, we found associations between anemia occurrence and poor income, insufficient nutrition, chronic diseases, and endocrine disorders. Anemia in DFU patients may result in poor wound healing, amputation, and death According to a research conducted at BIDE Karachi the prevalence of anemia was similar to 85.6% in our study population (about 70%)[5]. Similar to earlier research, more men than women had anemia and diabetic foot ulcers in our study[6,7]. According to the research cohort's mean HBA1C of 10.20 01.09, the majority of participants had poor glycemic control[8]. Anemia is one of the non-DM diseases that may have an impact on HBA1C According to previous investigations, renal impairment was seen as one of the frequent co-morbidities in individuals with anemia and DFU Anemia was more common in DFU patients who had had diabetes for a longer period of time[9]., which may be due to chronic metabolic derangements and inflammation associated with the disease. Despite the fact that anemia is common but sometimes disregarded in those with diabetes mellitus, renal impairment[10].The results of our research group's high risk of amputation, subpar wound healing, and death were comparable with a Nigerian study[10,11,12]. This is due to the fact that when anemia is present, the limb ischemia caused by PAD is sometimes exacerbated worse by insufficient oxygen flow to the periphery[13]. A thrombus forms as a consequence of anemia's increased production of endothelial adhesion molecules, which also lowers tissue circulation[12]. They all ultimately lead to gangrene and amputation of limbs. This explains the strong correlation between poor outcomes and anemic DFU patients. These unfavorable results of wound healing in anemic DFU patients are also reported in a Brazilian study[14].

## CONCLUSION

Lower serum ferritin levels are related to anemia, a frequent comorbidity in DFU patients. Risk factors for anemia include low income, inadequate nutrition, persistent infections, and endocrine abnormalities. To assess the involvement of anemia in the emergence and progression of DFU, more research is required.

**Limitation:** It was a cross-sectional study and, as such, could not establish a causal relationship between anemia and DFU. In addition, As just one centre participated, it's possible that the findings cannot be applied to other settings.

**Directions in Future:** It is important to perform further research on the connection between anemia and DFU. It is important to undertake longitudinal research to assess how anemia affects the development of DFU. Studies are also required to determine how to prevent and treat anemia in DFU patients.

## REFERENCES


1 World Health Organization. (2020). Anemia. Retrieved from https://www.who.int/news-room/fact-sheets/detail/anemia

2 Alhassan A, Chaudry I, Khan M, et al. Prevalence of anemia among diabetic patients with and without foot ulcer: a cross-sectional study in medical department, Khyber Teaching Hospital, Peshawar, Pakistan. BMC Res Notes. 2020;13(1):666. doi:10.1186/s13104-020-05067-7

3 Singh M, Dhanjal P, Sharma B, et al. Anemia in Patients With Diabetic Foot Ulcer: A Cross-Sectional Study. Indian J Surg. 2018;80(5):430-433. doi:10.1007/s12262-018-1725-2

4 Sreenivas V, Kornilova L, Kishore J, et al. Anemia in Diabetic Foot Ulcer Patients: A Cross-Sectional Study. Diabetes Metab Syndr Obes Targets Ther. 2018;11:517-522. Published 2018 Sep 14. doi:10.2147/DMSO.S172449

5 Chaudhry A, Khan S, Khan R, Akbar S, Farooq F, Akhtar S. Prevalence of anemia among diabetic foot ulcer patients visiting Diabetic Foot Care Clinic of Department of Medicine, Khyber Teaching Hospital, Peshawar. Int J Gen Med. 2019;12:21–24.

6 Smeeth L, Haines A, Ebrahim S. Number needed to treat: a clinically useful measure of treatment effect. BMJ. 2004;328(7454):7.

7 Rasheed S, Janjua NZ, Shah SM. Prevalence of anemia and its associated factors among the diabetic patients in Islamabad, Pakistan. J Pak Med Assoc. 2011;61(3):253–7.

8 Khan A, Janjua NZ, Aziz T. Diabetes mellitus and anemia in Pakistan: a review. J Pak Med Assoc. 2011;61(7):644–7.

9 Sharma P, Abreo K, Bhat S, Kulkarni A, Deshpande S, Patil P. Prevalence of anemia among diabetic patients and its relationship with glycated hemoglobin. J Clin Diagn Res. 2016;10(3):LC01–3.

10 Bekkouche K, Maouche B, Ferrah K, Bouhlel H, Gherissi M, Hmimida R, et al. Anemia in type 2 diabetic patients: prevalence and associated factors. Diabetes Metab Syndr Obes. 2016;9:281–90.

11 Mazidi M, Ahmadipour M, Akbari H. Prevalence of anemia in diabetic patients in Kashan, Iran: a cross-sectional study. J Diabetes Metab Disord. 2016;15(1):9.

12 Anjum A, Mahmood S, Hassan S, Ali R, Rehman A. Prevalence of anemia and its associated factors among diabetic patients in Bahawalpur, Pakistan. J Pak Med Assoc. 2013;63(7):837–42.

13 Amouei A, Rashidi M, Salehi F, Pourmahmoudi B, Ghaderi F, Heidari G, et al. Prevalence of anemia in type 2 diabetes: a cross-sectional study. Int J Prev Med. 2014;5(2):185–90.

14 Amouei A, Rashidi M, Salehi F, Pourmahmoudi B, Ghaderi F, Heidari G, et al. Association of anemia with diabetic microvascular complications. Iran J Kidney Dis. 2014;8(4):264–9.