



GLYCOSYLATED HAEMOGLOBIN AND ITS CORRELATION WITH ULCER AREA IN DIABETIC FOOT ULCERS

General Surgery

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ABSTRACT

Introduction- Diabetic foot ulcer is most frequent and distressing complication of type 2 diabetes mellitus (T2DM). Glycosylated hemoglobin represents the chronicity of disease and is used to monitor ulcer healing. We studied the correlation between glycosylated hemoglobin with ulcer area. **Methodology-** This is a descriptive study of 100 newly diagnosed T2DM with foot ulcers. Blood test for HbA1c has been performed. All the ulcers are washed and debrided. The ulcer parameters are measured, ulcer area is calculated and compared with HbA1c. **Results-** A total of 100 patients has been studied with male predominance. The mean age of presentation is 49.23 years (26- 87years). Fasting blood glucose is more than 110 mg/dl in all the patients. More than half of patients has HbA1c greater than 7%. Majority of patients has ulcer duration of less than 6 months. Ulcer area is less than 10cm² in most of the cases followed by area of 10-20cm² in 31 patients. Most of the patient has Hb1Ac greater than 7% and ulcer size of less than 10cm². Among patients with ulcer larger than 20cm², no significant difference is found in patients with HbA1c either <7% or >7%. **Summary-** Glycosylated hemoglobin is being used to study the chronicity of the disease. However, no correlation can be established between the ulcer area and glycosylated hemoglobin.

KEYWORDS

Glycosylated hemoglobin, Diabetic foot ulcer, Ulcer area.

INTRODUCTION

Type 2 diabetes mellitus is one of the fastest-growing non-communicable disease globally. Among all other diabetic complications, diabetic foot ulcers are more characteristic of which 60–80% will heal, whereas 10-15% will remain active, and up to 24% of them will finally lead to lower extremity amputation (1). Prolonged hyperglycemia increases the prevalence of foot ulcers from 4 to 10%, and its lifetime incidence may be as high as 25% (2). Glycosylated hemoglobin (HbA1c) reflects glycemia over 2 to 3 months in diabetic patients and is used to monitor glycemic state and ulcer healing rate in a few studies (3). None of the previous studies has shown the relationship between the glycemic state with the ulcer area. Thus the aim is to study the correlation of HbA1c level with ulcer area in diabetic patients.

METHODOLOGY

This descriptive study is carried out in a single surgical unit of tertiary care hospital from august 2017 to July 2019. The study is carried out in 100 patients with foot ulcers in newly diagnosed Type 2 Diabetic Mellitus. The patients with systemic sepsis, immunocompromised, or taking immunosuppressive drugs have been excluded.

The patient's demographic data has been recorded. Along with general systemic examination, and foot examination, a detailed examination of wounds, including anatomical location, dimensions, wound area, discharge, slough, base, and edges, has been studied. All the wounds are initially washed with normal saline. Dirty wounds are debrided under local anesthesia. The translucent sterilized graph paper is placed over the wound to mark the margin. The two maximum perpendicular diameters are measured using a ruler. These two diameters are multiplied to get the wound area. Wound grading and staging have been done according to the University of Texas Diabetic Wound Classification.

Blood investigations like complete hemogram, liver, and renal profile along with fasting blood sugar (FBS) and glycosylated hemoglobin (HbA1c) has been performed.

RESULTS-

A total of 100 patients has been studied with male predominance. The mean age of presentation is 49.23 years (26- 87years). The majority has a body mass index of less than 24.9kg/m² (83%). Fasting blood glucose is more than 110 mg/dl in all the patients. More than half of patients has HbA1c greater than 7% (table 1).

Majority of patients has ulcer duration of less than 6 months. Ulcer area is less than 10cm² in most of the cases followed by area of 10-20cm² in 31 patients (table 2).

Table 1-

Characteristics		No. of patient
BMI	≤ 18.49	04
	18.5-24.9	79
	≥25	17
Creatinine (mg/dl)	<1.2	09
	1.2-2	78
	>2	13
FBS (mg/dl)	<110	0
	≥110	100
HbA1c (%)	<7	44
	≥7	56

Table 2-

Ulcer characteristics		No. of patient
Duration of ulcer (months)	<6	67
	6-12	17
	>12	16
Ulcer area (cm ²)	<10	54
	10-20	31
	>20	15

Most of the patient has Hb1Ac greater than 7% and ulcer size of less than 10cm². Among patients with ulcer larger than 20cm², no significant difference is found in the two groups (Table 3). When compared to the serum creatinine level, ulcer area shows that long-standing ulcer patients have higher creatinine level (>2mg/dl). While all the patients with ulcer duration of less than 6 months have a creatinine level <2mg/dl (Table 4). The comparison between ulcer size and creatinine level has been shown in table 5.

Table 3-

Comparison between ulcer area and glycosylated hemoglobin

Ulcer area (cm ²)	HbA1c	
	<7	>7
<10	18	36
10-20	19	12
>20	07	08

Table 4-

Comparison between Serum Creatinine and Duration of Ulcer

Duration of Ulcer (months)	Serum Creatinine (mg/dl)		
	<1.2	1.2-2	>2
<6	7	60	0
6-12	1	14	2
>12	1	4	11

Table 5-

Comparison between Serum Creatinine and Ulcer area showing most of the ulcers has Creatinine value between 1.2 to 2mg/dl. Although no patients with smaller ulcer area has Creatinine more than 2mg/dl, negligible larger ulcers has Creatinine more than 2mg/dl.

Ulcer area (cm ²)	Serum Creatinine (mg/dl)		
	<1.2	1.2-2	>2
<10	5	49	0
10-20	2	17	12
>20	2	12	1

DISCUSSION-

Diabetes Mellitus is a prevalent global health disease. Diabetic foot ulcer is one of the most frequent and dreadful complication (3). According to the World Health Organization and the International Working Group on the Diabetic Foot, diabetic foot is defined as the foot of diabetic patients with ulceration, infection and/or destruction of the deep tissues, associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb (4). Glycosylated hemoglobin reflects the average plasma glucose level over 8 to 12 weeks (5). It is a readily available test and can be performed anytime, irrespective of fasting status (6).

All the patients in our study group have more than 110mg/dl fasting blood sugar, and most have glycosylated hemoglobin more than 7. Ekpebegh Chukwuma O et al. 2014, in his study, approved that glycosylated hemoglobin is elevated in most newly diagnosed DM. Most patients present with a total duration of ulcers less than six months and a small ulcer area (<10cm²).

Our study shows that most patients, although it has raised glycosylated hemoglobin, presented with early ulcers (<10cm²) and more massive ulcers, have no obvious correlation with glycosylated hemoglobin.

However, when serum creatinine level has been compared with the duration of ulcer and ulcer area, it has been observed that most of the long duration ulcers have higher serum creatinine while none of the small duration ulcers has creatinine higher than 2mg/dl. Furthermore, thus, serum creatinine can be used as a predictor of chronicity of ulcer as the neuropathic diabetic foot ulcers can easily be unnoticed by patients because of loss of sensation (7). Also, the ulcer area and serum creatinine level seems to be unrelated.

Thus the study demonstrates no direct correlation between glycosylated hemoglobin and the ulcer area. Nevertheless, the ulcer duration and the serum creatinine can be correlated, suggesting all the patients especially longer ulcer duration should also be evaluated for renal function.

CONCLUSION-

Diabetic foot ulcer is a common complication of type 2 diabetes mellitus. Glycosylated hemoglobin is being used to study the chronicity of the disease. However, no correlation can be established between the ulcer area and glycosylated hemoglobin.

DECLARATION-

The authors declares no conflict of interest.

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