



DIABETIC FOOT ULCERS; CORRELATION OF NUTRITIONAL STATUS OF TYPE 2 DIABETIC PATIENTS OF HYDERABAD SINDH PAKISTAN.

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Article received on:

07/01/2017

Accepted for publication:

25/03/2017

Received after proof reading:

06/05/2017

ABSTRACT... Objectives: To know the correlation of foot ulcers to the nutritional status of type 2 Diabetic patients of Hyderabad. **Study Design:** Cross sectional study. **Place of Study:** Private clinics of consultants of Hyderabad, Sindh, Pakistan. **Duration of study:** February 2015 to June 2016. **Methodology:** 387 diabetic type 2 patients were selected from different clinics of physicians, orthopedics and diabetic consultants of sadder Hyderabad Sindh Pakistan. The mean age was 40 ± 11.5 years. All patients were enrolled on prescribed proforma. Thorough clinical examination was done. Wagner's classification was used to categorize diabetic foot ulcers. Nutritional status was classified on Mini Nutritional Assessment score and patients were divided into three groups according to Mini nutritional score. Blood samples were obtained for Hemoglobin%, blood sugar, serum calcium and serum albumin estimation. All patients were assessed radiologically by x-rays of involved foot. ANOVA test was used and p value < 0.05 was considered statically significant. **Results:** There was linear correlation in between Mini nutritional assessment and severity of diabetic foot ulcer ($p < 0.03$). Biochemical parameter were also significantly associated with the severity of ulcers. Serum albumin was decreased in grade 4 ulcer significantly (p value < 0.04), while hemoglobin was also decreased in grade 4 ulcer, p value (< 0.05). There was no association of serum calcium to severity of foot ulcer, (p value > 0.07). **Conclusion:** Diabetic foot ulcers are common in type 2 diabetic patients and nutritional status is strongly associated with grade of severity. It is important to assess nutritional status of all diabetic patients.

Key words: Nutrition, diabetic, foot ulcer, Hyderabad, Sindh.

Article Citation: Shaikh IA, Masood N, Shaikh FA, Shaikh MA. Diabetic foot ulcers; correlation of nutritional status of type 2 diabetic patients of Hyderabad Sindh, Pakistan. Professional Med J 2017;24(5):707-712. DOI: 10.17957/TPMJ/17.3869

INTRODUCTION

Foot ulcers due to peripheral neuropathy or peripheral vascular disease and in combination of both seen in diabetic patients.¹ The infection, depth, size and duration of wound also involved in impaired healing. These all factors lead to non-healing and amputation of foot.²⁻⁴ The wound healing needs collagen synthesis and recovery of muscle injury.⁵

One of the most important factor is nutrition, which improves repair of soft tissue injuries and wound healing.⁶ Specific nutrients have been shown to enhance wound healing.⁷

Some studies have shown that wound healing enhanced by supplementation with the combination of arginine, glutamine and β -hydroxy- β -methyl butyrate which increases

collagen deposition.

Diabetic foot ulcer is one of the commonest problems in medical practice. Foot ulcers are a source of major morbidity and also increase considerable financial burden on patient and families.

More than 15% of diabetic patients during their lives experience foot ulcers.⁸ These ulcers contributed more than 80% of non-traumatic lower limb amputations.⁹

As the diabetes advances, BMI, nutritional indicators (hemoglobin, serum albumin, total cholesterol) deteriorated gradually. Moreover, these nutritional indicators will more worse in patients with Wagner grade 4 and 5 ulcers.

One study shown that the treatment of diabetic foot ulcers focused not only on pharmacological agents but also improvement in nutritional status.¹⁰

Low serum albumin concentrations and BMI were independent nutritional indicators, associated with mortality, frequency of dialysis and other possible complications in diabetic nephropathy.¹¹

Diabetic foot ulcer needs good nutrition and albumin is very good indicator.¹² Multiple studies have shown 3–4% diabetic patients have septic foot ulcer.¹³

Prevalence studies of diabetes in Pakistan conducted by Shera et al shown prevalence of type 2 Diabetes among the adult population (>25 years) was 13.9% in Sindh and 8.6% in Baluchistan.

The gender distribution was 11.1% male and 13.4% female with impaired glucose tolerance (IGT) in the two provinces.¹⁴

There were over 7 million cases of diabetes in Pakistan in 2015 and prevalence is 6.9.¹⁵

The rationale of our study is to correlate the nutritional status to grade of diabetic foot ulcers as the impaired nutritional status is a major contributory in diabetic foot ulcers.

MATERIAL AND METHODS

This study was conducted by a team of two physicians, one statician and one junior doctor for filling Performa. This cross sectional study was included 387 patients from different clinics of sadder Hyderabad, Sindh, Pakistan.

The sample size was calculated by taking prevalence of diabetes in Pakistan was 6.9% in Pakistan in2105, confidence level 95%. Sampling technique was non probability convenience.

The inclusion criteria were diabetic foot ulcer first time in life in either gender and age range was 30-70 years. Out of 387, 130 were females (33%) and 257 were males (66.4%). The exclusion criteria

were immunological, traumatic or vascular ulcers because of non diabetic causes, and already diagnosed diabetic foot ulcers. Foot Ulcers under age of 30 years also been excluded. The mean duration of study was 16 months from February 2015 to June 2016.

A proper questionnaire was used to collect bio data from all patients along with duration of diabetes. Through clinical examination including general physical, sensory, motor examinations of feet and grading of foot ulcer was done.

Blood samples were collected included hemoglobin%, albumin and calcium in 5cc disposable syringe and send to different laboratories of sadder. Random blood glucose was done on Medisign glucometer.

All foot ulcers were categorized according to WEGNER-MEGITT classification.

Wagner-Meggitt Classification Of Diabetic Foot	
G0	Foot symptoms only like pain
G1	Superficial ulcer
G2	Deep ulcer
G3	Ulcer with bone involvement
G4	Fore foot ulcer
G5	Full foot ulcer

Assessment of nutritional status

Nutritional status was recorded on Mini Nutritional Assessment (MNA) Nestle Nutritional institute which contains screening; self questions and scales to assess adult nutrition. It contains three degrees of nutrition according to obtained score, < 17 malnourished, 17-23.5 risk of malnutrition > 24 is normal status.

Base line demographic characteristics were noted, were including age, sex, BMI and duration of diabetes.

307 patients out of 387 were undergone for x ray of affected foot. The radiological changes were consisting of soft tissue swelling, erosions, proximal bone involvement and Osteomyelitis.

Data were expressed as the mean and standard

error (continuous variables) or as a number and percentage (categorical variables).

Comparisons of means and proportions were performed with an ANOVA. The homogeneity of groups was determined when the means had significant differences.

Multiple stepwise regression analysis was conducted to examine the main factors affecting nutrition status. SPSS 16.0 for Windows was used for all analyses. $P < 0.05$ was considered statistically significant.

RESULTS

387 patients were enrolled after proper consent, examination, biochemical and radiological investigation. All patients were assessed on two scales; Wegener grading for foot ulcer and Mini nutritional assessment scale.

The mean age and duration of diabetes was 40.5 ± 11.5 and 5 ± 7.8 years. Most of these patients had poor blood glucose control, mean random blood sugar was $255 \pm 27\%$.

Wagner grade 4 and 5 ulcers had significantly lower hemoglobin, and serum albumin levels $p < 0.05$, and < 0.04 . while serum calcium was not associated to severity of ulcer $p > 0.07$.

Poor control of diabetes was significantly correlated with degree of ulcer ($p < 0.04$) (Table-I).

There was linear correlation in between Mini nutritional assessment and severity of ulcer. Patients mini nutritional assessment score was < 17 having more severe ulcer $p < 0.03$ (Table-II).

Malnutrition was also associated with more severe radiological changes (Table-III).

Variables	G0	G1	G2	G3	G4	G5	P value
Age	35 ± 5.6	41 ± 6.2	52 ± 5.5	50 ± 4.7	55 ± 4.5	57 ± 5.7	
Male	40	60	50	50	30	27	
Female	20	25	20	40	20	10	
BMI	29 ± 3.5	28 ± 4.2	29 ± 3.7	27 ± 2.9	24 ± 4.8	23 ± 4.7	
Duration of Diabetes	2.5 ± 2.5	5 ± 3.5	6 ± 3.5	5 ± 4.1	8 ± 2.6	10 ± 2.5	0.06
Serum albumin	4.1 ± 1.2	4.1 ± 1.2	3.5 ± 1.9	3.3 ± 2.4	3.1 ± 1.2	2.8 ± 1	0.04
Blood sugar	250 ± 44	255 ± 40	290 ± 43.2	270 ± 23.9	273 ± 26.7	277 ± 25.6	0.05
Hemoglobin	12.5 ± 1	12 ± 1.4	12.5 ± 1.4	11.4 ± 1.8	10.4 ± 2.3	11.2 ± 2.5	0.05
calcium	9.5 ± 1.7	9 ± 2.1	9.1 ± 2.1	8.6 ± 2.8	9 ± 1.9	8.5 ± 3.1	0.07

Table-I. Demographic and biochemical analysis of 387 patients

MNA	G0	G1	G2	G3	G4	G5	P VALUE
< 17	2	10	12	20	25	21	0.03
17-23.5	10	25	35	20	25	15	0.05
> 23.5	45	50	25	30	10	7	0.06
Total	57	85	72	70	60	43	

Table-II. Mini nutritional assessment of 387 patients correlated to grade of ulcer

X ray findings	MNA > 23.5	17-23.5	< 17
Soft tissue swelling	20	50	110
Erosions	4	15	24
Subluxation/fracture	4	10	10
Osteomyelitis	7	10	43

Table-III. 307 patients with radiological changes according to mini nutritional assessment score

DISCUSSION

Diabetic foot disease affects 15% of the diabetic patients. The diabetic patients are 15 times more likely to undergo lower extremity amputation

than their non diabetic.¹⁶

In Pakistan with an approximate population of 160 million, the incidence of diabetic foot ulcer is

10%.¹⁷

In our study the mean age and duration of Diabetes was 47 ± 11.5 years, respectively and age range was 30-70 years, which was comparable to study done by Oyibo et al¹⁸, shown mean age of patients was 58.09 years, range of age was 29 to 78 years.

Gender distribution 59.7% were male which is matched to our study where male dominated 66%. It was also reported by Veves et al¹⁹ with same age and sex distribution.

Sohn et al²⁰ reported a significant J-shaped association between BMI and diabetic foot ulcers in addition Yekta et al²¹ also reported that a BMI less than 25 was significantly associated with amputation. In our study BMI was significantly associated with severity of ulcer, BMI 29 was associated to Grade 1 ulcer and low BMI 23 with grade 5 foot ulcer.

Malnutrition was identified in 62. % of the studied patients and malnutrition at presentation was predictive of poor outcome.²² In our study patients were categorized according to Mini Nutritional Assessment, score less than 23.5 was associated with advanced foot ulcers, score <17 was associated with significant p value <0.03 and score in between 17-23.5, p value was 0.05.

Gau-BR et al²³ were identified patients at risk of malnutrition (70.5%) or malnourished (14.6%) (Mean MNA score, 20.6 ± 3.4).

Mini Nutritional Assessment score decreased with increasing severity of leg amputations; p for linear trend <0.001.²⁴ In our study the risk of malnutrition was 33.5% p value was <0.05 while malnutrition observed in 23% p <0.03.

Receiver operating characteristic analysis determined a hemoglobin cutoff of 12.3 g/dl (females) and 12.1 g/dl (males) to identify a high-risk population of diabetic foot ulcer patients who would have adverse outcomes.²⁵ So anemia is common in patients with diabetic foot ulcer. Although typically mild or moderate, anemia has

been associated with substantial morbidity and mortality in patients with diabetic foot ulcer.

In our study the mean hemoglobin was 12 g/dl. The correlation of anemia to diabetic foot ulcer was significant in our study p value < 0.05

In north India, Shahi SK²⁶ et al shown diabetic foot ulcers grading, the percentage of grade3 lesion was highest (31.06%) followed by grades 2 and 5.

In our study Grade 3 -5 lesions was 45% while most common lesion was grade 1 ulcer This bias was might be early treatment seeking behavior in certain areas of our region, Hyderabad.

Naymu Pn et al shown in Nairobi that Wagner stage 2 ulcers were the commonest (49.4%).²⁷

The incidence of ulcer was highest (100%), followed by cellulitis (97.93%) and gangrene (14.43%).²⁸ Further assessment revealed that 56.70% of patients had limb-threatening ulcers while 43.29% had non-limb-threatening ulcers shown by Manda V.²⁹

In our study 36.6% had G1 and 2 ulcer and only 26% had foot threatening ulcers .it could because our patients were younger than the patients were selected by Manda V.

CONCLUSION

Diabetic foot ulcers are common and need full assessment. In many parts of underdeveloped countries it is uncommon to assess the nutritional status.

Our study clearly shown the strong relationship of nutrition to severity of diabetic foot ulcers. The good parameters of nutrition are BMI, serum albumin and hemoglobin. The appropriate scale for nutritional status of adult is mini nutritional assessment scale.

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