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Anaemia and hypoalbuminemia in diabetic foot ulcers patients- An observational study

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Abstract--Background- Diabetic foot is a severe public health issue. Nutrition is important in the repair of soft tissue injuries and wound healing and specific nutrients have been shown to enhance wound healing. Anemia and hypoalbuminemia are among the commonly encountered deficiencies in patients Objectives- To investigate the prevalence of anemia and hypoalbuminemia in diabetic foot ulcers patients. Methods- It was prospective observational study conducted in August 2020 to July 2021.The study was carried out in Department of Surgery in a tertiary medical college. All diabetic foot ulcer visited the OPD during the study period were included as the sample size which was found to be 170. Purposive sampling technique was used. SPSS (Version 22.0) was used Results- The patients ranged in age from 21-87 years, with a mean age of 57±15.64 years. 50 (29%) patients were female while 120 (71%) were males. 15 of the 170 patients (9%) had type 1 diabetes mellitus and 155 patients (91%) had type 2 diabetes mellitus. The duration of diabetes in these patients ranged from 1 year to 25 years, with a mean duration of 10.46±6.10 years. The values of glycosylated hemoglobin ranged from 5.6 g/dl to 14 g/dl. The mean value of glycosylated hemoglobin was 8.2±1.76 g/dl. Of the 170 patients, 127 (73%) had poor glycaemic control with HbA1c levels of more than 7 g/dl while 43 (27%) had good glycaemic control. Out of 170 individuals, 72 %(122) were anaemic and 28% were non-anaemic. Among 50 female's patients, 64% were anaemic and in 75% of males were anaemic but it was not statistically significant. Conclusions- Anemia and hypoalbuminemia are common

in patients with diabetic foot ulcers, with males being more commonly affected by both than females and older age group being more commonly affected than younger age group.

Keywords---Albumin, Anemia, Diabetic foot, Malnutrition, Obesity, Wound healing.

Introduction

Diabetic foot is a severe public health issue affecting diabetic patients of all ages and both genders. The global diabetic foot ulcer prevalence was 6.3%, with highest prevalence in North America and lowest in Oceania.[1,2] They reported the prevalence in Asia to be around 5.5%.[3]

The lifetime risk of developing a diabetic foot ulcer is between 19% and 34%.[2] approximately 20% of moderate or severe diabetic foot infections result in lower extremity amputations. The mortality at 5 years for an individual with a diabetic foot ulcer is 2.5 times as high as the risk for an individual with diabetes who does not have a foot ulcer.[4,5]

Nutrition is important in the repair of soft tissue injuries and wound healing and specific nutrients have been shown to enhance wound healing.[6] Healing in a patient with diabetic foot ulcer involves consumption of large quantities of energy by inflammatory cells and fibroblasts in the production of collagen and matrix. The protein status of the patient is indicated by albumin levels, and increased protein needs for malnourished persons have been correlated with depressed levels of albumin.[7,8]

Thus, early detection of nutritional deficiencies and their prompt treatment is imperative for the effective management of diabetic foot ulcers. The aim of the study was to investigate the prevalence of anemia and hypoalbuminemia in diabetic foot patients presenting at our institution.

Material and Methods

It was prospective observational study conducted in August 2020 to July 2021. The study was carried out in Department of Surgery in a tertiary medical college. All diabetic foot ulcer visited the OPD during the study period were included as the sample size which was found to be 170. Purposive sampling technique was used.

Inclusion criteria

Patients above 18 years with diabetes mellitus with diabetic foot infections were included.

Exclusion criteria

Patients below age 18 years and with non-diabetic ulcers were not included in the

study.

Written informed consent from the patient was taken and objectives of the research was explained to them and permission from Institutional ethics committee was taken before the start of the study. The patient details such as age, sex, and duration of diabetes were collected. At admission, the patients underwent blood tests for hemoglobin, HbA1c and albumin among other tests. These data were collected and tabulated. A hemoglobin cut off level of 12 g/dl was chosen to detect anemia, and albumin levels below 3.5 g/dl were considered as hypoalbuminemia. HbA1c levels of more than 7 g/dl indicated poor glycaemic control.

Statistical Analysis

Analysis of data was done by using SPSS software ver. 22. Data were statistically described in terms of mean (\pm SD), frequencies (number of cases) and percentages when appropriate. Comparison of quantitative variables between the study groups was done using Student t test for independent samples if normally distributed. For comparing categorical data, Chi square test was performed. A probability value (p value) less than 0.05 was considered statistically significant.

Results

Table 1- Demographic profile and Clinical Presentation of Study participants

Variables	Number	Percentage	
Mean age in years	57 \pm 15.64	-	
Gender	120	71	
Males			
Females	50	29	
Diabetes	15	9	
Type 1			
Type 2	155	91	
Mean duration of diabetes	10.46 \pm 6.10	-	
Mean Hba1c	8.2 \pm 1.76	-	

As per table 1 the patients ranged in age from 21-87 years, with a mean age of 57 \pm 15.64 years. 50 (29%) patients were female while 120 (71%) were males. 15 of the 170 patients (9%) had type 1 diabetes mellitus and 155 patients (91%) had type 2 diabetes mellitus. The duration of diabetes in these patients ranged from 1 year to 25 years, with a mean duration of 10.46 \pm 6.10 years. The values of glycosylated hemoglobin ranged from 5.6 g/dl to 14 g/dl. The mean value of glycosylated hemoglobin was 8.2 \pm 1.76 g/dl. Of the 170 patients, 127 (73%) had poor glycaemic control with HbA1c levels of more than 7 g/dl while 43 (27%) had good glycaemic control.

Table 2- Association of Anaemia with Gender having Diabetic foot ulcers

Gender	Anaemia	Non-anaemic	p-value
Females	32	18	0.07
Males	90	30	

As per table 2 out of 170 individuals, 72 % (122) were anaemic and 28% were non-anaemic. Among 50 female's patients, 64% were anaemic and in 75% of males were anaemic but it was not statistically significant.

Table 3- Association of Albumin levels with Gender having Diabetic foot ulcers

Gender	Normal Albumin	Low Albumin	p-value
Females	17	33	0.11
Males	60	60	

As per table 3 the albumin levels ranged from 1.6 g/dl to 5.4 g/dl, with a mean of 3.2 ± 1.04 g/dl. Of the 170 patients, 93 (55%) had hypoalbuminemia while 77 (45%) had normal levels of albumin. 33 of the 50 female patients (66%) had hypoalbuminemia while 17 (34%) had normal levels of albumin. 60 (50%) of the 120 male patients had hypoalbuminemia while 60 (50%) had normal levels of albumin but this was significant.

Discussion

In the present study the patients ranged in age from 21-87 years, with a mean age of 57 ± 15.64 years. 50 (29%) patients were female while 120 (71%) were males. 15 of the 170 patients (9%) had type 1 diabetes mellitus and 155 patients (91%) had type 2 diabetes mellitus. The duration of diabetes in these patients ranged from 1 year to 25 years, with a mean duration of 10.46 ± 6.10 years. The values of glycosylated hemoglobin ranged from 5.6 g/dl to 14 g/dl. The mean value of glycosylated hemoglobin was 8.2 ± 1.76 g/dl. Of the 170 patients, 127 (73%) had poor glycaemic control with HbA1c levels of more than 7 g/dl while 43 (27%) had good glycaemic control.

This is consistent with the findings of Imran Shaik et al who observed that Wagner grade 4 and 5 ulcers had significantly lower hemoglobin.[9] Also, Devaprasanth M observed in their study that anemia was detected in 180 (53.6%) subjects with 88 (48.9%) of them requiring blood transfusion. Anemia was significantly associated with poor wound healing ($p < 0.009$), amputation ($p < 0.036$) and risk of death ($p < 0.034$).[10]

Sohn et al [11] reported a significant J-shaped association between BMI and diabetic foot ulcers in addition Yekta et al [12] also reported that a BMI less than 25 was significantly associated with amputation.

The albumin levels ranged from 1.6 g/dl to 5.4 g/dl, with a mean of 3.2 ± 1.04 g/dl. Of the 170 patients, 93 (55%) had hypoalbuminemia while 77 (45%) had normal levels of albumin. 33 of the 50 female patients (66%) had hypoalbuminemia while 17 (34%) had normal levels of albumin. 60 (50%) of the 120 male patients had hypoalbuminemia while 60 (50%) had normal levels of albumin but this was significant. Deakin et al in their study observed that 61.5% of patients had hypoalbuminemia with a mean albumin level of 2.5 g/dl.[13]

Conclusion

Diabetic foot ulcers are common and need full assessment. In many parts of underdeveloped countries it is uncommon to assess the nutritional status. Both anemia and hypoalbuminemia are common occurrences in patients with diabetic foot ulcers, with males being more commonly affected and older age group being more commonly affected than the younger age group but it was not significant. Additional studies on a larger scale are needed for better validation.

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Conflict of Interest- None declared

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