

Original Research Article

A study to assess anemia and hypoalbuminemia in diabetic patients with ulcers

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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. 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.

Methods: Hemoglobin and albumin levels of 175 patients with diabetic foot were collected. Data was tabulated and analysed with descriptive statistics.

Results: Hemoglobin varied from 6.5 g/dl to 15 g/dl (10.5 ± 2.3 g/dl). 116 (66.28%) patients had anemia. Among the 66 female patients, 43 (65.15%) had anemia. Among the 109 male patients, 73 (66.97%) had anemia. 11 of the 29 patients aged less than 40 had anemia (37.93%), while 105 of the 146 (71.91%) patients above 40 years had anemia. Albumin levels ranged from 1.6 g/dl to 5.4 g/dl (3.3 ± 1.06 g/dl). 93 (53.14%) patients had hypoalbuminemia. 33 of the 66 female patients (50%) had hypoalbuminemia. 60 (55.04%) of the 109 male patients had hypoalbuminemia. 4 of the 29 (13.79%) patients below 40 years had hypoalbuminemia 89 of the 146 patients (60.9%) above 40 years had hypoalbuminemia.

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, Nutritional status

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% according to Zhang et al, with highest prevalence in North America and lowest in Oceania. They reported the prevalence in Asia to be around 5.5%.¹ The incidence of diabetes and diabetic foot infections is expected to rise in the future.

The underlying pathology of diabetic foot is neuropathy and ischemia, which, usually complicated by infection eventually results in increased morbidity and mortality.

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.²

Diabetic foot infections are often associated with poor nutrition which in turn causes delayed healing. Nutrition is important in the repair of soft tissue injuries and wound healing and specific nutrients have been shown to enhance wound healing.³ Chuan et al reported that mild or moderate

anemia is common in patients with diabetic foot ulcer and is associated with substantial morbidity and mortality.⁴ A study by Yammine et al demonstrated a clear association between anemia and diabetic foot ulcers, a clear association between the severity of anemia and the severity of diabetic foot ulcers, and also suggested that anemia could be a predictor of amputation and mortality.⁵

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.⁶

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.

METHODS

Study design

The study design was prospective observational study.

Study period

The study period was April 2020 to April 2021.

Place of study

This study was carried out at Dr. B. R. Ambedkar Medical College and Hospital.

Sample size

The number of patients were 175.

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.

175 patients presenting to with diabetic foot infections were included in the study after oral consent Patients fulfilling the criteria were chosen for the study by simple random sampling. 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. The tabulated data was analysed by descriptive tests such as mean and standard deviation.

RESULTS

The patients ranged in age from 21-89 years, with a mean age of 57 ± 16.72 years. 29 (16.57%) were less than 40 years of age while 146 were more than 40 years of age (83.42%) (Table 1). 66 (37.7%) patients were female while 109 (62.28%) were males. 20 of the 175 patients (11.42%) had type 1 diabetes mellitus and 155 patients (88.57%) had type 2 diabetes mellitus. The duration of diabetes in these patients ranged from 1 year to 25 years, with a mean duration of 10.75 ± 6.17 years.

The values of glycosylated hemoglobin ranged from 5.6 g/dl to 14 g/dl. The mean value of glycosylated hemoglobin was 8.5 ± 2.03 g/dl. Of the 175 patients, 127 (72.57%) had poor glycaemic control with HbA1c levels of more than 7 g/dl while 48 (27.42%) had good glycaemic control.

Table 1: Age.

Variables (years)	Values
Range	21-89
Mean age	57 ± 16.72
Less than 40	16.57%
More than 40	83.42%

The hemoglobin values of the patients ranged from 6.5 g/dl to 15 g/dl, with a mean of 10.5 ± 2.3 g/dl. 116 (66.28%) of the 175 patients had anemia, while 59 patients (33.71%) were not anemic. Among the 66 female patients, 43 (65.15%) had anemia while 23 (34.84%) had normal levels of hemoglobin. Among the 109 male patients, 73 (66.97%) had anemia while 36 (33.02%) had normal hemoglobin (Table 2). 11 of the 29 patients aged less than 40 had anemia (37.93%), while 105 of the 146 (71.91%) patients above 40 years had anemia.

Table 2: Hemoglobin.

Parameters	Percentage patients with anemia (%)	Percentage patients with normal hemoglobin (%)
Total	66.28	33.71
Females	65.15	34.84
Males	66.97	33.02

The albumin levels ranged from 1.6 g/dl to 5.4 g/dl, with a mean of 3.3 ± 1.06 g/dl. Of the 175 patients, 93 (53.14%) had hypoalbuminemia while 82 (46.85%) had normal levels of albumin. 33 of the 66 female patients (50%) had

hypoalbuminemia while 33 (50%) had normal levels of albumin. 60 (55.04%) of the 109 male patients had hypoalbuminemia while 49 (44.95%) had normal levels of albumin (Table 3). 4 of the 29 (13.79%) patients below 40 years had hypoalbuminemia 89 of the 146 patients (60.9%) above 40 years had hypoalbuminemia.

Table 3: Albumin levels.

Parameters	Percentage patients with normal albumin levels (%)	Percentage patients with low albumin levels (%)
Total	46.85	53.14
Females	50	50
Males	44.95	55.04

DISCUSSION

This study was undertaken to assess the prevalence of anemia and hypoalbuminemia in diabetic foot patients presenting at our institution. 175 patients with diabetes mellitus with diabetic foot were included in the study. 66 (37.7%) patients were female while 109 (62.28%) were males.

The patients ranged in age from 21-89 years, with a mean age of 57 ± 16.72 years. The duration of diabetes in these patients ranged from 1 year to 25 years, with a mean duration of 10.75 ± 6.17 years. The values of glycosylated hemoglobin ranged from 5.6 g/dl to 14 g/dl. The mean value of glycosylated hemoglobin was 8.5 ± 2.03 g/dl.

The hemoglobin values of the patients ranged from 6.5g/dl to 15 g/dl, with a mean of 10.5 ± 2.3 g/dl. 116 (66.28%) of the 175 patients had anemia. Anemia was found to be more common among the male patients (66.97%) than the female patients (65.15%). Also, anemia was more common among patients above 40 years of age (71.91%) than patients below 40 years of age (37.93%).

This is consistent with the findings of Imran Shaik et al who observed that Wagner grade 4 and 5 ulcers had significantly lower hemoglobin.⁷ Also, Ibrahim et al 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 ($p < 0.034$).⁸

The albumin levels ranged from 1.6 g/dl to 5.4 g/dl, with a mean of 3.3 ± 1.06 g/dl. Of the 175 patients, 93 (53.14%) had hypoalbuminemia. Hypoalbuminemia was found to be more common among males (55.04%) than females (50%). It was also more prevalent among patients above 40 years (60.9%) than those below 40 years (13.79%). Similar results were published by Shaik et al who observed significantly lower levels of albumin in Wagner grade 4 and 5 ulcers.⁷ Deakin et al in their study observed that

61.5% of patients had hypoalbuminemia with a mean albumin level of 2.5 g/dl.⁹

Limitations

The limitation of the study was a larger sample size would provide better validation of results.

CONCLUSION

From our study it can be concluded that anemia and hypoalbuminemia are common occurrences in patients with diabetic foot ulcers, with males being more commonly affected by both than the females and older age group being more commonly affected than the younger age group. However, further studies on a larger scale are needed for better validation. Also, interventional studies are needed to ascertain the effect of correction of these abnormalities on the prognosis of the ulcer.

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