

Original Research Article

Study of anemia in diabetes and its association with diabetic retinopathy

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ABSTRACT

Background: Anemia is an increasingly recognized entity in patients with diabetes mellitus. Reduced hemoglobin levels identify diabetic patients with an increased risk of microvascular complications.

Methods: A hospital based observational prospective study was conducted in Department of medicine, J.A. Group of Hospitals, Gwalior from June 2014 to October 2015. Adults with diabetes mellitus both type 1 and type 2 were selected as subjects are included and anemia due to blood loss and anemia due to chronic kidney diseases were excluded from the study. Estimation of hemoglobin was done by using capillary method by calorimetric hemoglobinometer. Anemia was defined as hemoglobin <13 g/dl in men and <12 g/dl in women. All the patients were examined for diabetic retinopathy and graded as none, mild, moderate, severe and proliferative retinopathy as per International clinical diabetic retinopathy disease severity scale.

Results: 100 patients were enrolled as subjects. Most of the patients 26 (26%) were in the age group 46-55 years. There were 53 males and 47 females. 42%, 45% and 13% had diabetes of <5 years, 5-10 years and > 10 years duration respectively. HbA1c levels were <7.5 in 74 (74%), 7.5-10 in 23 (23%) patients and > 10 in 3 (3%) patients. Overall 67 (67%) diabetics had anemia. Out of 53 males 30 (56.6%) had anemia and amongst females, out of 47 cases 37 (78.72%) had anemia P value 0.009. Anemia was more common in patients less than 50 years 36 (70.59%) compared to 31 (63.2%) with anemia in patients more than 50 years. 65 (65%) patients had diabetic retinopathy (DR). 30 (46.1%) males and 35 (53.8%) females had diabetic retinopathy. All patients with diabetic retinopathy had anemia. Among 35 (35%) patients without DR only 2 (5.71%) had anemia. P value <0.001.

Conclusions: Anemia is a common accompaniment to diabetes. Anemia was more common in females and in those less than 50 years. Anemia was frequently associated with diabetic retinopathy. The high prevalence of anaemia supports regular screening for anemia, alongside that for other diabetes-related complications. This might help to delay the progression of vascular complications in these patients.

Keywords: Anemia, Diabetes mellitus, Diabetic retinopathy

INTRODUCTION

Anemia is an increasingly recognized entity in patients with diabetes mellitus. Anemia potentially contributes to the pathogenesis of complications of diabetes. Multifactorial etiology of anemia in diabetes includes inflammation, nutritional deficiencies, autoimmune

diseases, drugs and kidney diseases. Anemia may contribute to the development and progression of micro- and macro-vascular complications of diabetes.¹

Diabetic patients with anemia express proinflammatory cytokines as compared to diabetic patients only. In anemic patient increase in IL-6 production, and B cell

activity shows the association between IL-6 and antierythropoietic action. Diabetic and anemic patients have high levels of C-reactive protein and ferritin indicating chronic inflammatory process.²

Uncoupling of the hemoglobin concentration from renal erythropoietin synthesis seems to be the key factor underlying the development of anemia. Systemic inflammation, functional hematinic deficiencies, erythropoietin resistance and reduced red cell survival also contribute. Reduced hemoglobin levels identify diabetic patients with an increased risk of microvascular complications, cardiovascular disease and mortality.³ There is an oxidative stress state in type 2 diabetes patients compared with healthy subjects.⁴

Regular screening for anemia, alongside that for other diabetes-related complications, might help to delay the progression of vascular complications in these patients.³

METHODS

A hospital based observational prospective study was conducted in Department of medicine, J.A. Group of Hospitals, Gwalior from June 2014 to October 2015. The study was approved by institutional ethical committee and informed consent was taken from all subjects.

Adults with diabetes mellitus both type 1 and type 2 were selected as subjects included in study and anemia due to blood loss and anemia due to chronic kidney diseases were excluded from the study.

100 patients were enrolled as subjects. There were 53 males and 47 females. After thorough clinical examination of the patients and biochemical tests data were recorded in a pre-typed proforma.

Estimation of hemoglobin was done by using capillary method by calorimetric hemoglobinometer. Anemia was defined as hemoglobin <13 g/dl in men and <12 g/dl in women.

All the patients were examined for diabetic retinopathy and graded as none, mild, moderate, severe and proliferative retinopathy as per International clinical diabetic retinopathy disease severity scale.

Statistical analysis was performed using SPSS software. The results were expressed as mean \pm SD if the variables were continuous, and as percentage, if categorical. Student t test was used for comparing continuous variable.

RESULTS

100 patients were enrolled as subjects. 15 cases were type 1 DM and 85 cases were type 2 DM. Mean age of the patient was 52.46 ± 14.31 years. Most of the patients 26 (26%) were in the age group 46-55 years (Table 1). There

were 53 males and 47 females (Table 2). 42%, 45% and 13% had diabetes of <5 years, 5-10 years and > 10 years duration respectively (Table 3). HbA1c was <7.5 in 74 (74%), 7.5-10 in 23 (23%) patients and > 10 in 3 (3%) patients (Table 4).

Table 1: Distribution of patient according to age.

Age	No. of patients	Percentage (%)
<25	1	1
25-35	12	12
36-45	22	22
46-55	26	26
56-65	23	23
>65	16	16
Total	100	100

Table 2: Distribution of patient according to gender.

Gender	No. of patients	Percentage%
Male	53	53
Female	47	47

Table 3: Distribution of patient according to duration of diabetes.

Duration of diabetes	No. of patients	Percentage%
< 5	42	42
5-10	45	45
>10	13	13
Total	100	100

Table 4: Distribution of patient according to HbA1c level.

HbA1c level (%)	No. of patients	Percentage%
<7.5	74	74
7.5-10	23	23
>10	3	3
Total	100	100

Table 5: Distribution of patient according to presence of anemia.

Gender	With anemia	Without anemia	P value
Male 53	30 (56.60%)	23 (43.39%)	0.009
Female 47	37 (78.72%)	10 (21.27%)	

Table 6: Comparison of mean hemoglobin between men and women.

Gender	No. of patients	Hemoglobin levels g/dl	P value
Male	53	11.32 ± 2.62	0.017
Female	47	10.06 ± 2.52	

Overall 67 (67%) diabetics had anemia. Out of 53 males 30 (56.6%) had anemia and amongst females, out of 47 cases 37 (78.72%) had anemia P value 0.009 (Table 5).

Comparison of mean hemoglobin between men and woman showed a mean hemoglobin of 11.32 ± 2.62 g/dl and 10.06 ± 2.52 g/dl in men and woman respectively. P value 0.017 (Table 6).

Anemia was more common in patients less than 50 years 36 (70.59%) compared to 31 (63.2%) in patients more than 50 years.

65 (65%) patients had diabetic retinopathy (DR) 30 (46.1%) males and 35 (53.8%) females had diabetic retinopathy. All patients with diabetic retinopathy had

anemia. Among 35 (35%) patients without DR only 2 (5.71%) had anemia. P value <0.001 (Table 7).

Most of the patients 47 (72.3%) had mild retinopathy. 16 (24.6%) had moderate retinopathy and 2 (3.07%) had severe retinopathy. Severe retinopathy was associated with hemoglobin <5 g/dl (Table 8).

Table 7: Distribution of patients according to retinopathy.

Parameters	Anemia present	Anemia absent	P value
With retinopathy 65	65 (100%)	0	<0.001
Without retinopathy 35	3 (5.71%)	33 (94.29%)	

Table 8: Correlation of hemoglobin levels with grades of retinopathy.

Hemoglobin (g/dl)	Normal	Mild retinopathy	Moderate retinopathy	Severe retinopathy
<5 (3)	0	0	1 (33.3%)	2 (66.67%)
5-10 (56)	0	41 (73.21%)	15 (26.79%)	0
>10 (41)	3 (85.37%)	6 (14.63%)	0	0

DISCUSSION

Anemia is common in diabetes, potentially contributing to the pathogenesis of complications of diabetes. Overall 67 (67%) diabetics had anemia. According to previous studies prevalence of anemia in diabetics ranged from 12-15% which was much less than ours. Poor dietary pattern could be the reason behind high prevalence of anemia in our setup. Out of 53 males 30 (56.6%) cases had anemia and amongst female out of 47 cases 37 (78.72%) cases had anemia. Anemia was more common in diabetic females compared to males (P value 0.009). Similar observations were made in a study by Thomas MC et al. Anemia was more common in females probably due to menstruation, child bearing in addition to poor dietary pattern.⁵

Anemia was more common in patients less than 50 years in our study. 36 (70.59%) in patients less than 50 years had anemia compared to anemia in 31 (63.2%) patients who were more than 50 years. According to a study anemia was more prevalent among those ≥ 70 years of age.⁶ This study does not agree with ours. Anemia was more common in patients < 50 years.

Out of 65 patients with diabetic retinopathy (DR), all the patients had anemia. Only 2 (5.71%) without DR had anemia (Table 7) P value <0.001.

In patients with DR, low blood oxygen-carrying capacity was associated with more severe DR. Low hemoglobin

levels may have an important role in the development and progression of DR.⁷

When mild anemia is found in patients with diabetes mellitus one should carry out intensive examinations for the detection of diabetic micro- and macroangiopathies in addition to evaluating the causes of anemia.⁸

Anemia is a preventable condition. Reduced hemoglobin levels identify diabetic patients with an increased risk of microvascular complications, cardiovascular disease and mortality. Correction of anemia certainly improves performance and quality of life in diabetics.⁹ It is suggested that the level of hemoglobin should be evaluated periodically in diabetic patients.

Early identification of anemia can be achieved by means of regular screening. Patients with diabetes and anemia are at high risk of cardiovascular disease. Normalization of hemoglobin level prevents an increase in left ventricular hypertrophy, is safe, and improve quality of life.¹⁰

Limitations the main etiology for anemia was not investigated.

CONCLUSION

Anemia is a common accompaniment to diabetes. 67 (67%) diabetics had anemia. Anemia was more common in females and in those less than 50 years. Anemia was frequently associated with diabetic retinopathy. The high

prevalence of anaemia supports regular screening for anemia, alongside that for other diabetes-related complications. This might help to delay the progression of vascular complications in these patients.

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