ISSN:0975-3583,0976-2833 VOL12,ISSUE06,2021

A cross sectional study of co-relation between anemia and diabetic retinopathy in type II DM

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ABSTRACT

BACKGROUND-

Anemia is commonly found in diabetes mellitus patients. Low level of hemoglobin can cause ischemia at level of retinal tissue andconsequent proliferation of new blood vessels over retina.

METHODS-

A hospital based cross-sectional study was conducted in a tertiary care teaching hospital from 2018 to 2019. Hundred adults with type II diabetes mellitus > 40 years of age and > 5 years of disease duration were enrolled in the study. Patients with concomitant chronic kidney disease, systemic hypertension, anemia due to acute / chronic blood loss, patient taking treatment for anemia were excluded from the study. Estimation of hemoglobin was done by Hematology Cell countermethod . Fundus examination was done and diabetic retinopathy was graded as none, mild, moderate, severe non proliferative diabetic retinopathy (NPDR) and proliferative retinopathy (PDR) as per International clinical diabetic retinopathy disease severity scale. Anemia was defined as hemoglobin <13 g/dl in men and <12 g/ dl in women according to World Health Organisation Criteria.

RESULTS-

Fifty five percentof studies patients were found to be anemic. Mean hemoglobin (Hb) in female was 11.68±2.84 gm/dl and 11.11±2.39 gm/dl in males. Out of 54 female 16 (29.6%), 14 (25.9%), 12 (22.2%), 7 (13.0%), 5 (9.3%) had absent, mild, moderate, severe non proliferative diabetic retinopathy and proliferative diabetic retinopathy respectively. Out of 46 males 8 (17.4%), 13 (28.3%), 14 (30.4%), 5 (10.9%), 6 (13%) had absent, mild, moderate, severe NPDR and PDR respectively. In our study most of the patients were of age group 44-60 years (74%). Below the age of 60 years, 67.56% cases had diabetic retinopathy and after 60 years 100% of patients had evidence of retinopathy. MeanHb in patients without diabetic retinopathy was 13.60±1.57 gm/dl, with mild NPDR 12.46±1.52 gm/dl, with moderate NPDR 10.74±2.07 gm/dl, with severe NPDR 9.59±2.10 gm/dl and with PDR it was 7.27±1.27 gm/dl. Odds ratio for anemia was 2.296.

CONCLUSION-

Diabetic retinopathy is inversely proportional to presence of anemia& its severity. These findings might have clinical implications for prevention of development and progression of Diabetic retinopathy.

1. INTRODUCTION

According to World Health Organisation (WHO) approximately 150 million people have diabetes mellitus (DM) in the whole world. DM can lead to end-stage renal disease (ESRD),

ISSN:0975-3583,0976-2833 VOL12,ISSUE06,2021

nontraumatic lower extremity amputations, cardiovascular diseases and adult blindness[1]. Person with DM are 25 times more prone to become blind than individuals without DM. Blindness in DR is due to diabetic retinopathy is due to new blood vessel formationwith resultant macular edema followed by traction &scarring. Various factors are there which can affect the development and progression of diabetic retinopathy includes hypertension, duration of diabetes, uncontrolled blood sugar level, renal disease, anemia[2]. According to WHO anemia is defined as hemoglobin level < 13 g/dl in men and <12g/dl in women[3]. Anemia in patients with diabetes mellitus is usually multifunctional and also occurs after development of diabetic nephropathy. Chronic anemia causes hypoxia at tissue level leadingto ischemic insult of retinal tissue and subsequent local production of vascular endothelial growth factor (VEGF)that mediates ischemia-induced retinal neovascularization[4].

2. METHODS

Aobservational cross-sectional study was conducted in a tertiary care teaching hospital during period of 2018 to 2019.

Permission from institutional ethics committee obtained prior to undertaking enrollment. Hundred adults with type II diabetes mellitus > 40 years of age and > 5 years of disease duration were enrolled in the study. Patients with concomitant chronic kidney disease, systemic hypertension, anemia due to acute / chronic blood loss, patient taking treatment for anemia were excluded from the study. Estimation of hemoglobin was done by Hematology Cell counter method. Fundus examination was done and diabetic retinopathy was graded as none, mild, moderate, severe non proliferative diabetic retinopathy (NPDR) and proliferative retinopathy (PDR) as per International clinical diabetic retinopathy disease severity scale. Fundus examination was done and diabetic retinopathy was graded as none, mild, moderate, severe non proliferative diabetic retinopathy (NPDR) and proliferative retinopathy as per International clinical diabetic retinopathy disease severity scale. For statistical analysis, mean, standard deviation, percentages were calculated. For comparing the variables chi square test and T test were used. Multivariate regression test appliedfor calculation of ODD'S ratio.

3. RESULTS-

Prevalence and distribution of patient according to presence of anemia& its severe is presented in table no.1

Table No. 1

Distribution of anemia

Sex	**Anemia Grade**				**Total** N (%)
	No anemia N (%)	**Mild Anemia** N (%)	**Moderate anemia** N (%)	**Severe anemia** N (%)	

ISSN:0975-3583,0976-2833 VOL12,ISSUE06,2021

Female	21 38.9%	19 35.2%	12 22.2%	2 3.7%	54 100.0%
Male	23 50.0%	14 30.4%	6 13.0%	3 6.5%	46 100.0%
Total	44 44.0%	33 33.0%	18 18.0%	5 5.0%	100 100.0%

Table No. 2

Distribution of diabetic retinopathy

Sex	**Retinopathy Grade**					**Total**
	No retinopathy N (%)	**Mild NPDR** N (%)	**Moderate NPDR** N (%)	**Severe NPDR** N (%)	**PDR** n (%)	N (%)
Female	16 29.6%	14 25.9%	12 22.2%	7 13.0%	5 9.3%	54 100.0%
Male	8 17.4%	13 28.3%	14 30.4%	5 10.9%	6 13.0%	46 100.0%
Total	24 24.0%	27 27.0%	26 26.0%	12 12.0%	11 11.0%	100 100.0%

gender and retinopathy grad

ISSN:0975-3583,0976-2833 VOL12,ISSUE06,2021

Table No. 3

Comparison of mean hemoglobin level in relation to retinopathy grade

Retinopathy Grade	**No.**	**Hemoglobin Gm/dl [Mean±SD]**	**P Value**
Absent	24	13.60 ± 1.57	<0.0001
Mild NPDR	27	12.46 ± 1.52	
Moderate NPDR	26	10.74 ± 2.07	
Severe NPDR	12	9.59 ± 2.10	
PDR	11	7.27 ± 1.27	

The mean diabetes duration in patients without any retinopathy was 7.00 ± 1.32 years.In patients with mild NPDR it was 9.59 ± 3.67 years, in moderate NPDR it was 8.77 ± 1.90 years, in severe NPDR it was 9.75 ± 3.69 years and in PDR it was 12.27 ± 4.90 years.

The mean age in patients without any retinopathy was 51.71 ± 4.68 years, in patients with mild NPDR it was 56.89 ± 7.89 years, in moderate NPDR it was 57.27 ± 8.18 years, in severe NPDR it was 58.08 ± 10.36 years and in PDR it was 61.18 ± 13.83 years.

Majority of the patients were having normocytic normochromic anemia (79%).

4. DISCUSSION

In our study prevalence of anemia was 56%. It was 50% in men and 61.11% in women. In her studies Raniet.al[5].found prevalence of anemia 12.3%. It was 11.6% in men and 13.1% in women. Anemia in 67% diabetics (56.6% male and 78.72% female). Iran found anemia in 45.9% of patients. Prevalence of anemia is more in our study[6]. This may be due to low socio-economic status, poor nutrition, poor hygiene, low literacy rate in habitants of MP. Anemia was more common in diabetic females compared to males probably due to menstruation and child bearing in addition to poor dietary pattern, however severity was not different across genders.

In our study,24 (24%), 27 (27%), 26 (26%), 12 (12%), 11 (11%) had absent, mild, moderate, severe NPDR and PDR respectively. Mild retinopathy in 47 (72.3%), moderate retinopathy in 16 (24.6%) and severe retinopathy in 2 (3.07%). Retinopathy in 18.03% of their patients, out of which 15.20% had non sight threatening DR and 2.82% had sight threatening DR. Prevalence of DR was less in this Chennai study because 57.92% of patient had duration of DM <5 years, which we have excluded in our study. Similarly they found 12.3 % prevalence of anemia while in our study it was 55% which might have affected the prevalence of DR.

ISSN:0975-3583,0976-2833 VOL12,ISSUE06,2021

Below the age of 70 years 54.73% cases had anemia and after the age of 70 years 80% had anemia[7]. prevalence of anemia was more in age group more than 70 years (20.37%) compared to less than 70 years of age (11.26%).

In our study below the age of 60 years, 67.56% cases had DR and after 60 years prevalence was 100%. Qiao et al[1] found DR was present in 10.36% cases below the age of 65 years and in 4.60% cases more than 65 years of age. The prevalence of DR was low in Finland study because 29% patient had duration of DM between 0-4 years which we have excluded and they have taken the patient who are >18 years of age. Also the prevalence of anemia was only 5% in their study and in our study it was 80% after the age of 60 years, which might have affected the results.

Mean Hb in patients without DR was 13.60±1.57 gm/dl, with mild NPDR 12.46±1.52 gm/dl, with moderate NPDR 10.74±2.07 gm/dl, with severe NPDR 9.59±2.10 gm/dl and with PDR it was 7.27±1.27 gm/dl. Mean hemoglobin level in patients without DR (12.73±1.38 g/dl) was significantly higher than the patients with mild to moderate NPDR (12.25±1.38) and advanced retinopathy (11.89±1.76) (p=0.007 and 0.001, respectively). Hb was less than 5 gm/dl, 33% patient had moderate DR and 66.6% had severe DR. When Hb was 5-10 gm/dl, 73.21% had mild and 26.79% had moderate DR. When Hb was more 10 gm/dl 85.37% had normal fundus and only 14.63% had mild DR. With regards to anemia and DR, our findings are similar to other studies[8].

The mean diabetes duration was highest in patients with PDR and lowest was in patients without retinopathy. Similar result was found in study done by qiao that prevalence and severity of DR increase with duration of DM.

5. CONCLUSION

Anemia was frequently associated with diabetic retinopathy. The mean hemoglobin level was highest in patients without retinopathy and lowest in patients with PDR. Hemoglobin is inversely proportional to severity of DR. In patients with diabetes, it is advisable to monitor Hb level periodically for early detection and correction of anemia to prevent development and progression of DR. Prospective studies with more number of cases designed to test these associations are needed to confirm low values of Hb as a risk factor for DR.

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