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RESEARCH ARTICLE

ANAEMIA: UNRECOGNIZED RISK FACTOR IN TYPE II DIABETES MELLITUS.

Dr. Khan Saba Anjum and Dr. Sangita Phatale,

Department of Physiology, MGM's Medical College, Aurangabad, MS.

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Keywords:-

Diabetes, anaemia, HbA1c.

Abstract

Introduction: Diabetes has reached epidemic proportion in the world and anaemia is increasingly recognised entity in patients with diabetes mellitus. Studies have shown that anaemia is twice as common in diabetes as compared to non-diabetic subjects.

Aim: The aim of our study is to determine the prevalence of anaemia in type-II diabetes and to assess its association with degree of glycaemic control with respect to HbA1c.

Material and method: 30 diabetic male patients with 30 normal male subjects of age group 40-60 years.

Result: Our study showed statistically significant decrease in haemoglobin concentration as the level of HbA1c increased in the uncontrolled diabetic patients without any diabetic nephropathy.

Conclusion: Regular screening of anaemia along with blood glucose levels should be mandatory in diabetic patients to prevent further complications.

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Introduction:-

Diabetes has reached the epidemic proportion in the world [1,2]. Epidemiological data of 2010, show that there were 285 million people affected with the disease in the world and it is estimated that it will be about 440 million till the year 2030 [3,4]. Its prevalence is increasing worldwide more among the developing country, DM -II is about 7% of total population [5]. The increasing prevalence of type -II diabetes is due to urbanization, sedentary life style, increase in the prevalence of obesity, increase in population and improper eating habits [3,6].

Anaemia is a common blood disorder, it is a clinical condition characterised by reduction of haemoglobin concentration of blood below 13gm/dl in males and 12gm/dl in females as for the particular age and sex of the person (as per the WHO criterion) [7].

It is increasingly recognized entity in patients with diabetes mellitus [7,8]. Studies show that anaemia is twice as common in diabetic patients as in the non-diabetic group [9, 10]. It is studied that patients with diabetes are more vulnerable to the effects of anaemia [11, 12]. Studies also show that anaemia causes hypoxic damage to the β -cells of pancreas leading to fast progression of DM-II. [12, 13, 14]. Anaemia is associated with increasing risk of vascular complication which are caused by diabetes like nephropathy, retinopathy, autonomic- neuropathy, delayed wound healing and macro-vascular changes [15, 16].

In spite of many studies on presence of anaemia in diabetic patients with chronic renal disease, limited study exist on the incidence of anaemia in diabetes prior to evidence of renal impairment. [17, 18].

Corresponding Author:- Dr.Khan Saba Anjum.

Address:- Department of Physiology, MGM's Medical College, Aurangabad, MS.

Materials and method:-

The study was conducted in the department of Physiology, MGM's Medical College, Aurangabad, after obtaining ethical clearance from the ethical committee of the college.

This is a cross sectional and retrospective study, comprising data of 30 diabetic male patients and 30 normal healthy males of same age group.

Inclusion criterion:

1. Males of same socioeconomic background.
2. Age group between 40-60 years.
3. 30 diabetic group diagnosed as per ADA criterion that is fasting blood sugar level above 120mg/dl and post prandial blood sugar level more than 200mg/dl.

Exclusion criterion:

1. Cases off anaemia from other known causes.
2. Presence of other associated co-morbid conditions like hypertension cardiac and respiratory disease.
3. Diabetic patients with any micro or macro-vascular diabetic complications like retinopathy neuropathy, nephropathy, etc
4. Any malignancy. Subjects were selected on the basis of inclusion and exclusion criterion by thorough clinical and laboratory evaluation.

Sampling

Blood samples were collected under all aseptic precautions using venepuncture, the samples were collected in EDTA bulb for complete blood count and HbA1c estimation, in fluoride bulb for fasting and post prandial blood sugar level estimation.

Complete blood count was done by automated blood counter (coulter counter) using volume conductivity and light scatter technology.

Fasting and post prandial blood sugar levels were measured by using UV hexokinase method on automated biochemistry analyser.

Plasma glycosylated haemoglobin (HbA1c) utilized the principle of ion exchange high performance liquid chromatography (HPLC) on BIORAD system.

Data collected were statistically analysed using t-test. The outcome variables were compared between two groups (diabetic and non- diabetics) using Levene's test for equality of variances.

Results:-

All the variables show statistical significance except age, RBC(P=0.00), Hb (0.00), HbA1c(P=0.00) where level of significance $P < 0.05$.

	DIABETIC ±STD		NON-DIABETIC ±STD	
AGE	52.36	6.22	51.33	4.58
RBC	4.78	0.43	5.52	0.38
Hb	13.08	1.07	15.11	0.56
HbA1c	9.19	1.71	5.25	0.3
PL.GLUKOSE	250.28	58.63	109.51	10.71
FBSL	153.94	27.05	89.83	3.67
PPBSL	217.11	35.31	129.2	5.29

	GROUP	N	MEAN	STD. DEVIATION	ERROR MEAN	LEVENE'S TEST F	SIGNIFIC
AGE	I	30	52.36	6.22	1.13	2.048	0.15
	II	30	51.33	4.58	0.83		
RBC	I	30	4.78	0.43	0.07	0.38	0.84
	II	30	5.52	0.38	0.70		
Hb	I	30	13.08	1.07	0.19	10.20	0.00

	II	30	15.11	0.56	0.10		
HbA1c	I	30	9.19	1.71	0.31	36.31	0.00
	II	30	5.2	0.30	0.05		
PL.GLUKOSE	I	30	250.28	58.63	10.7	32.31	0.00
	II	30	109.51	10.70	1.95		
FBSL	I	30	153.94	27.05	4.93	68.87	0.00
	II	30	89.83	3.67	0.67		
PPBSL	I	30	217.11	35.31	6.44	33.87	0.00
	II	30	129.2	5.2	0.96		

Discussion:-

Our study showed that there was statistically significant decrease in haemoglobin concentration as the level of HbA1c increased in the uncontrolled diabetic patients without any diabetic nephropathy.

The probable etiology of early onset of anaemia in diabetes is multifactorial which can be severe autonomic neuropathy, causing efferent sympathetic denervation of the kidney and damage to the renal interstitium, thus decreasing the production of erythropoietin [3,15,17,19]. Furthermore, if anaemia is treated in early stages of renal failure the rate of decline in GFR is slowed down [19].

Both deficiency of RBC's and hypo-secretion with hypo-responsiveness to erythropoietin contributes to anaemia in diabetic patients. Deficiency is due to the shortening of survival rate of RBC's (about 80 days instead of 120 days, this can be due to the hyperactive state of mononuclear phagocytic system, leading to early removal of circulating RBC's [3,11]. There is strong impact of oxidative stress on haemoglobin due to the decrease in antioxidants and increase in free radicals like H₂O₂, superoxide and nitrous oxide, which again leads to unstable RBC's [20]. Hypo-responsiveness is due to systemic inflammation and micro-vascular damage to the bone marrow, inflammation causes increased production of cytokines such as Tumour Necrotising factor, Interleukin-1 or interferons [3,19] which suppresses bone marrow production of RBC's [3]. The other causes of anaemia in diabetic patients are also due to nutritional deficiency such as iron, folate, vitamin B-12 leading to anaemia [3, 7, 21, 22, 23]. Increased levels of inflammatory cytokines such as interleukin-6 enhances the production of hepcidin, which interferes with the absorption of iron from intestine and also impairs the transport of iron [3]. It is also studied that chronic use of anti-diabetic drug metformin is associated with Vit B-12 deficiency, the cause can be due altered small bowel motility leading to bacterial growth, competitive inhibition or inactivation of vitB12 or inhibition of calcium dependant absorption of VitB-12. [21, 22].

Our study is in correlation with the study of Bhargava Karan [24], Babatunde Ishola Adejuno, Katherine J. Craig, which states that there is significant prevalence of anaemia in diabetic patients as compared to non-diabetics and anaemia is higher among uncontrolled diabetic patients.

Anaemia in diabetic persons have a debilitating effect on the quality of life and also on the progression of comorbid conditions. Thus regular screening of anaemia along with blood glucose levels should be mandatory in diabetic patients.

Summery & Conclusion:-

Our studies show that there is definite association between degree of glycaemic control and anaemia. Anaemia further hastens the progression of other micro and macro-vascular changes in diabetic patients.

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