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Original Research Article

Study of hematological profile of anemia in type 2 diabetes mellitus patients

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Abstract: Anaemia is a common condition in type 2 diabetes mellitus (T2DM) patients. It has been associated with the development and progression of both microvascular and macrovascular complications of diabetes. Hence there is need to find the proportion of anemia in T2DM patients and to establish the association of anemia with complications of T2DM. A record based case series study using data of 100 diabetic patient's ≥18 years of age was done. History and clinical examination related to diabetes and its complication, complete blood count, creatinine, urea, blood glucose levels, urine examination and fundoscopy findings was extracted. Patients were classified as anemic as per the WHO criteria, in males less than 13 g/dl and in females less than 12g/dl. Mean age in the study was 55.5 years ± 13.87, with 51 male and 49 female patients. More number of patients had diabetes for 1-5 years (31%). 16% of them had Diabetic nephropathy, 12% had neuropathy and 5% had retinopathy. The prevalence of anemia was 45% in diabetics out of which 64.4% was normocytic normochromic anemia. Among anemia patients 60% had mild, 24.4% had moderate and 15.6% had severe grade of anemia. 62.4% of patients with Diabetic nephropathy had anemia. It is important to screen routinely for anemia in diabetes patients, including those without renal impairment. There will be great impact in managing microvascular and macrovascular complications of diabetes mellitus by identifying and treating anemia as early as possible.
Keywords: Anemia, Type 2 Diabetes mellitus, Diabetic nephropathy

INTRODUCTION:

Rapid Urbanisation and industrialization has lead to increase in lifestyle related diseases like diabetes mellitus, which has emerged as a major public health problem [1]. Diabetes mellitus (DM) is a common metabolic disease [2], accounting for increase in the incidence of morbidity leading to various events including micro and macro vascular complications [3].

Anaemia is one of the important conditions among patients with type 2 diabetes mellitus (T2DM) [4]. There are number of possible mechanisms for the development of anemia in diabetes patients. Failure of the kidney to increase erythropoietin (Epo) release in response to a decreasing hemoglobin (Hb) level appears to be the key contributor to the development of renal anemia [5, 6]. However, numerous hypotheses have been proposed including efferent denervation of the kidney due to symptomatic autonomic neuropathy leading to reduced erythropoietin production, chronic renal hypoxia, tubulointerstitial disease, altered iron metabolism, drugs, hyper glycaemia and systemic inflammation [7].

The microvascular and macrovascular complications of diabetes have been linked with anemia [8]. Anemia has significant impact on development and progression of these complications [4]. Anemia is associated with a more rapid decline in the GFR and is considered to be an important cardiovascular risk factor [9]. The HbA1c levels are recorded as falsely low due to presence of anemia, leading to poor control of hyperglycemia; further this may aggravate the intensity of diabetic complications [10]. People who have both diabetes and anemia have high mortality rate than those who have diabetes but not anemia [11]. Hence identifying anemia at early stages of diabetes and correcting it may reduce the morbidity and mortality related to diabetes complications.

OBJECTIVES OF THE STUDY:

1. To find the proportion of anemia in a sample of type 2 diabetic mellitus patients.
2. To establish the association of anemia with complications of type 2 diabetes mellitus.

MATERIAL AND METHODS:

Study design: Record based case series study.

Sample size: 100

Method of Collection of Data:

A record based case series study using data of 100 diabetic patient's ≥18 years of age who were admitted in HSK hospital, Bagalkot between January 2015 and June 2016 was done. The patients with the following diagnosis were excluded from the study: Age <18 years, Type 1 diabetes mellitus, malignancy, post surgery patient and pregnant women.

History and clinical examination related to habits, diabetes and its complication was extracted for the study. Data regarding complete blood count including hemoglobin level and peripheral smear, creatinine, urea, blood glucose levels, urine examination and fundoscopy findings was also extracted.

Patients were classified as anemic as per the WHO criteria, in male less than 13 g/dl and in non-pregnant female less than 12g/dl. Clinical grading based on Hb level as mild (female: 11 – 11.9 g/dL; male: 11-12.9 g/dL), moderate (8-10.9 g/dL) and severe (< 8 g/dL) was done. The proportion of anemia in patients with T2DM and association of anemia with T2DM and its complications were identified.

Statistical Analysis of the Study:

Data was entered in Microsoft excel sheet and later it was analysed using Open Epi- Software Version 2.3.1. Proportions and percentages were used for representing qualitative data. Mean ± SD were used for quantitative data. Chi-Square test and Fisher's exact test were applied to measure association between categorical data. P<0.05 was considered statistically significant.

RESULTS:

Mean age in the study was 55.5 years ± 13.87, with 51 male and 49 female patients. 15% of them were alcoholic, 8% were smokers and 6% were both alcoholics and smokers. In the present study 20% of patients were diabetic for less than a year, 31% for 1-5 years, 25% for 6-10 years and 24% for >10 years.

Out of 100 patients 16% of them had Diabetic nephropathy, 12% had neuropathy and 5% had retinopathy. Anemia was present in 45% of patients, out of which 60% had mild, 24.4% had moderate and 15.6% had severe anemia. 64.4% of anemic patients had normocytic normochromic anemia, 31.2% had microcytic hypochromic anemia, whereas megalo blastic and dimorphic anemia was present in 2.2% each. 42.9% of patients with anemia were alcoholics. 62.4% of patients with Diabetic nephropathy had anemia, 60% of patients with Diabetic retinopathy had anemia and 41.67% of patients with Diabetic neuropathy had anemia [Figure 1].

In this study 25% of patients with diabetes for <1 year had anemia, 51.6% had anemia who were diabetic for 1-5 years, 64% had anemia who were diabetic for 6-10 years and 33.34% had anemia who were diabetic for >10 years [Figure 2].

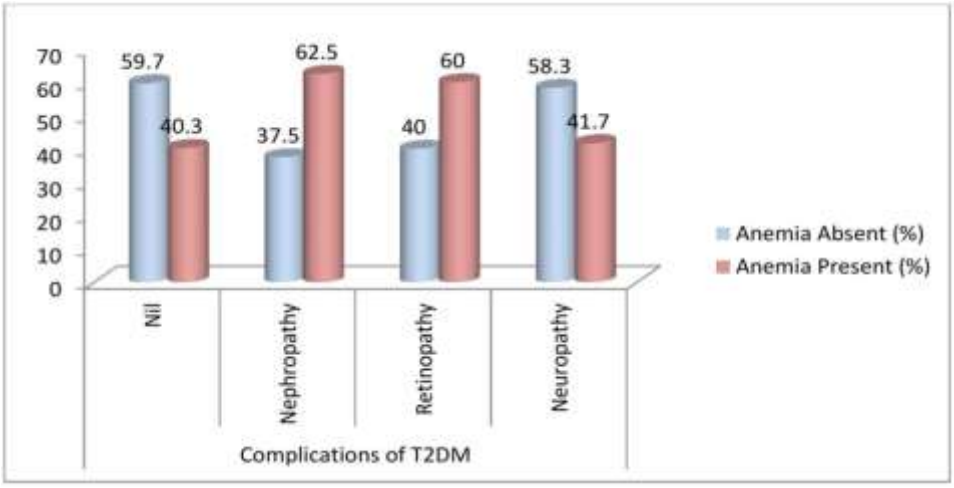

Fig 1: Distribution of anemia with complication of T2DM

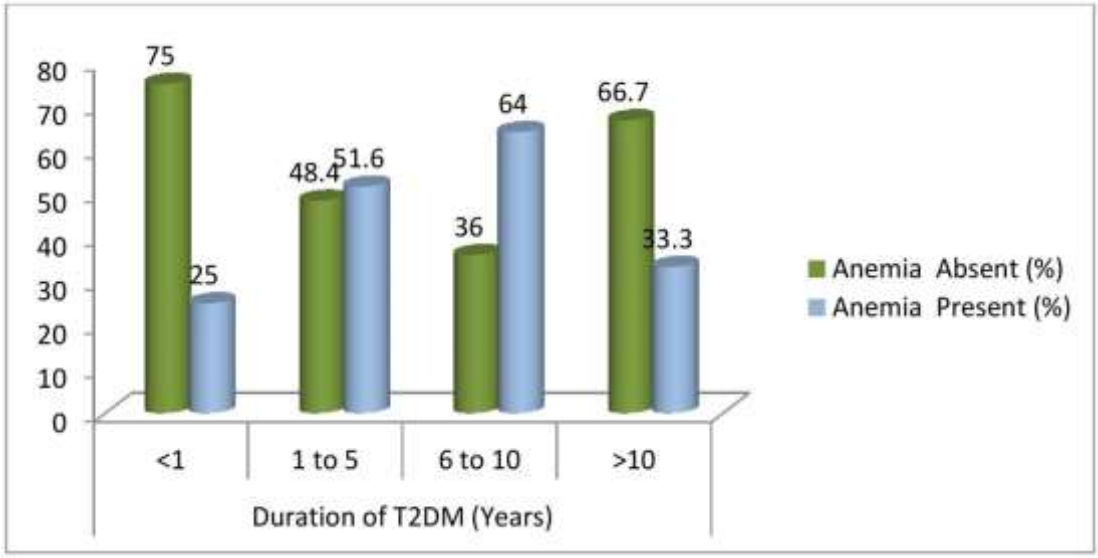

Fig 2: Distribution of anemia with duration of T2DM

DISCUSSION:

In this study the proportion of anaemia was relatively high compared to other populations whereby the prevalence ranged between 11 to 23% [7, 12]. This higher proportion could be attributed to the smaller study population with long-standing, poorly controlled DM with possible increased susceptibility to impaired Epo production and release as a result of diabetic nephropathy and autonomic neuropathy [13].

Erythropoietin production and release is regulated in part by autonomic nervous system, suggesting that erythropoietin production could be prematurely impaired in patients with poor glycaemic control with diabetic autonomic neuropathy [14]. In addition, diabetic patients with stable metabolic control and milder complications are more likely to be managed in the primary care and therefore have a lower prevalence of anaemia compared to those managed in this tertiary setting.

The majority of patients with anemia had normocytic normochromic (64.4%), mild anaemia (60%), similar to a recent study done by Thambiah SC *et al.;* [15], while fewer had microcytic (31.2%) and macrocytic (2.2%) anaemia. Previous studies on diabetic patients have shown that longstanding poorly controlled diabetes is associated with normocytic normochromic anaemia and precedes clinical evidence of renal impairment [14]. Normocytic mild anaemia is a characteristic presentation of anaemia in chronic diseases and it evolves into microcytic as the severity of the anaemia increases [16].

In the present study percentage of anemia was higher in patients with diabetes for more than 5 years. In study done by Rathod GB *et al.;* individuals with duration of diabetes of more than 5 years had 1.56 times higher risk of developing anemia than those with diabetes for less than 5 years [1].

Diabetic retinopathy management requires early detection and treatment of anemia. According to study done by Friedman *et al* there is significant resolution of macular hard exudates in patients with both anemia and diabetes mellitus who were treated with erythropoietin [17]. Vascular endothelial growth factor (VEGF) production is reduced due to improved tissue oxygenation as a result of correction of anemia. Level of neovascularization is reduced because of this process [17].

CONCLUSION:

Screening for anemia should be considered in diabetes patients who are attending out-patient clinic, as the proportion of anemia is high in T2DM. This screening should not be limited to patients with diabetic nephropathy, as it can be seen that significant proportion of anemia occurs even in patients with normal renal function. Microvascular and macrovascular complications of diabetes mellitus can be prevented by identifying anemia and its aggressive correction. This can be achieved by making routine haematological tests mandatory for diabetic patients in their regular visits.

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