

Prevalence of anemia of chronic disease and iron deficiency anemia among adult diabetic patients in Erbil City

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Abstract

Background and objective: Anaemia is often an unrecognized complication of diabetes mellitus that has adverse effect on the progression of diabetes related complications. Contributors to its development include erythropoietin insufficiency and iron deficiency. The aim of this study was to assess the prevalence of iron deficiency anaemia and anaemia of chronic disease among diabetic patients.

Methods: Over a period of six month from November 2010 to May 2011, 250 diabetic patients, attending Layla Qasim diabetic center were studied, their age ranged between 18 -73 years. Venous blood samples were collected from each of them. A complete blood picture, iron study, HbA_{1c}% and fasting blood glucose were performed. According to the duration of diabetes, patients were divided into three groups: group I patients (duration of diabetes < 5 years), group II (duration of diabetes between 5-9 years) and group III (duration of diabetes ≥10 years).

Results: One hundred ten patients (44%) were found to have anaemia. The frequency of anaemia was more among group III (46.6%). Higher prevalence of anaemia was found among female patients (53.9%) than male patient (24.1%). Among anemic patients, 72 patients (65%) considered as having anaemia of chronic disease (ACD), 26 patients (24%) were iron deficiency anemia (IDA), 11 patients (10%) were thalassemia trait and one patient (1%) had autoimmune hemolytic anaemia. ACD was more frequent among group II (80%) and group III (70.4%), while IDA was more frequent among group I (12.6%). both ACD and IDA were more frequent among female patient than male patients (34.7% and 13.8% respectively). There was no significant correlation between HbA_{1c} and Hb, serum iron parameters and S.ferritin.

Conclusion: It was concluded that anaemia is common among diabetics and remains unrecognized by both physicians and patients; it is more common among female diabetics. The commonest type of anaemia among diabetic patients is ACD followed by IDA.

Keywords: Diabetes Mellitus, Anaemia, Erbil, Anaemia of chronic disease, Iron deficiency anaemia

Introduction

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both¹. Diabetes is epidemic and its increasing prevalence affects all aspects of society. While some populations are at higher risk for diabetes and may be more prone to the complications of diabetes, this is a disease that has no boundaries and can affect anyone at

any point in one's lifetime². Diabetes is of an epidemic scale, with prevalence estimates of 26 million people in the United States³ and 347 million people worldwide⁴. There are two main types of diabetes: type 1, which accounts for 5–10% of cases, and type 2, which account for 90–95%. Gestational diabetes and other forms related to pancreatic disease, endocrine disorders, drugs, and genetic mutations make up a small percent of all cases².

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Anaemia is a common finding in patients with diabetes. In a recent cross-sectional survey of patients with diabetes in a single clinic in Australia nearly quarter of all outpatients were found to be anaemic⁵. The National Kidney Foundation (NKF) defines anemia in CKD as an Hb level <13.0 g/dl in men and < 12.0 g/dl in women⁶. Health and Nutrition Examination Survey found that patients with diabetes were twice as likely to have anaemia as those with renal impairment from other causes given a similar degree of renal impairment⁷. Interestingly, reductions in haemoglobin level often occur before the onset of overt diabetic nephropathy⁸. Anaemia has been shown to impact significantly on quality of life scores leading to chronic fatigue, reduced energy levels and a lower quality of life⁷. The aim of this study was to assess the prevalence of iron deficiency anemia and anemia of chronic disease among diabetic patients.

Methods

This study was designed as cross sectional study of patients attending Layla Qasim diabetic center, which is the only diabetes outpatient centre in Erbil city. During the period of this study, which is extended from November 2010 to May 2011, two hundred fifty adult diabetics (age more than 18 years), attending this center were conveniently selected (95% have type 2 diabetes and only 5% have type 1 diabetes). The majority of patients attending this center are referred by other outpatient clinics and hospitals in the city, all patients included were interrogated and a full history was taken and was physically examined by the author. Majority of cases were regular attendants, none of them was ever screened for anaemia. The study includes the adult diabetic patients (type I or type II) whether newly diagnosed or follow up cases. Patients aged less than 18 years, recently transfused the pregnant patients were excluded from the study. Relevant clinical data were obtained from each patient according to a special data

collection sheet. According to the duration of diabetes, patients were divided into three groups:

Group 1: included (119) patients in which the duration of diabetes was less than 5 years.

Group 2: included (73) patients whose duration of diabetes was between 5 to 9 years.

Group 3: included (58) patients whose duration of diabetes was ≥ 10 years.

From each patient a sample of 10 ml of venous blood was withdrawn from. Three ml were collected into EDTA-tubes for measurement of HbA1c and for the performance of routine haematological tests (Hb, PCV, MCV, MCH, MCHC, RDW, RBC count, WBC count, and Platelet count and blood film), the other 7 ml were collected into plain tubes, the serum was separated, fasting blood sugar was performed and the remainder of serums was stored at -20°C for the later estimation of serum iron, TIBC and serum ferritin. Patients were considered to have the different types of anemia according to the following criteria:

1. Anaemia of chronic disease when: normal or reduced red cell indices, low serum iron and low TIBC with normal or increased S. ferritin⁶.
2. Iron deficiency anaemia when: low red cell indices, low S.iron, high TIBC and low S. ferritin.
3. Thalassaemia trait when: low red cell indices, normal or high S. ferritin and increased HbA₂ (Low HbA, HbA₂ >3.7% on Hb-electrophoresis).

Data were analyzed using computer software Statistical Package of Social Sciences (SPSS) version 18; proportions of categorical variables were analyzed using Chi-square test. The p-values ($p < 0.05$) associated with these tests were regarded as significant.

Results

The total number of studied patients was 250 (83 male, 167 female) with male to female ratio equals 1:2. The studied

patients were grouped according to their age into 5 age groups. As shown in Figure 1. The majority of patients, 230 patients (92%) were on treatment, the remaining 20 patients (8%) (All from group I) were on dietary restriction system to control their diabetes. 61 patients (24.4%) were on insulin, 140 patients (56%) were on oral hypoglycemic agents alone and 29

patients (11.6%) were on both insulin and oral hypoglycemic agents. The duration of diabetes ranged from newly diagnosed patient to up to 30 years, the mean duration of diabetes was 6.08 years. The fasting blood glucose level ranged between 74-502 mg/dl and the mean fasting blood glucose was 205.5 mg/dl. HbA1c ranged from 6.7%-19.19% (mean 7.47%), Table 1.

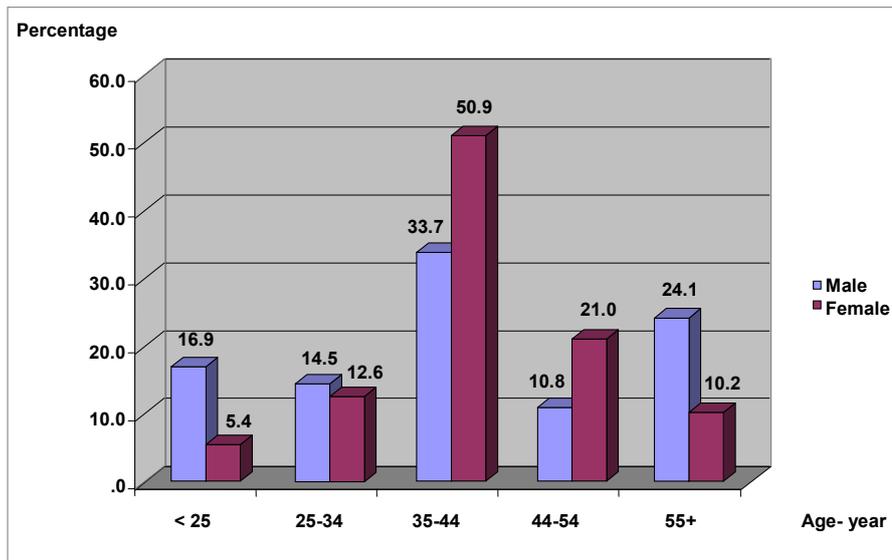


Figure 1: Age and gender distribution of the studied patients.

Table 1: Summary of the haematological and biochemical parameters of the studied patient

Parameters	Means \pm SD	Range
Hb (g/dl)	12.3 \pm 1.58	6-17.7
Haematocrit (%)	40.4 \pm 5.21	19.8-59
MCV (fl)	81.4 \pm 7.01	51-98
MCH(Pg)	24.8 \pm 2.7	14.4-32.9
MCHC(g/dl)	30.4 \pm 1.41	25.4-34.6
RDW (%)	14.02 \pm 1.58	11.4-23.7
RBC $\times 10^{12}/l$	4.99 \pm 0.67	2.02-7.84
S.Iron (μ g/dl)	88.06 \pm 51.5	8.7-291
TIBC (μ g/dl)	402.8 \pm 119.5	102.4-846
Transferrin Saturation (%)	24.3 \pm 15.68	2.96-68.7
S.ferritin (ng/dl)	65.07 \pm 91.3	3-519.6
FBS (mg/dl)	205.5 \pm 74.2	74-502
HbA1 _c (%)	7.47 \pm 1.62	6.7-19.19

Among the studied patients, 110 (44%) were anaemic. the prevalence of anemia among males was 24.1% (20 out of 83), while among females the prevalence was 53.9% (90 out of 167). According to the duration of the disease: out of 250 patients, 119 patients (47.6%) belonged to group I, in which 53 patients (44.5%) were anemic, 73 others (29.2%) were in group II, in which 30 patients (41.1%) were anemic and the remaining 58 cases (23.2%) were in group III with long history of diabetes, in which 27

patients (46.6%) were anaemic. Depending on the diagnostic criteria 72 patients (65%) had anaemia of chronic disease, 26 patients (24%) had iron deficiency anaemia, and 11 others (10%) found to have thalassaemia trait. One patient (female 42 years old) was found to have autoimmune hemolytic anaemia AIHA (Coomb's test was positive with anaemia and reticulocytosis). This study showed that the prevalence of ACD was higher in group III and group II than group I, Table 3.

Table 2: Prevalence of anaemia by age group.

Age (years)	N (%)	Anaemia N (%)	p value
<25	23 (9.2%)	8 (34.8%)	0.145
25-34	33 (13.2%)	13 (39.4%)	
35-44	113 (45.2%)	59 (52.2%)	
45-54	44 (17.6%)	14 (31.8%)	
>55	37 (14.8%)	16 (43.2%)	
Total	250 (100%)	110 (44%)	

Table 3: Distribution of types of anaemia among the three groups.

Groups N (%)	Type of anaemia				Total	P value
	ACD N (%)	IDA N (%)	Thal. Trait N (%)	AIHA N (%)		
Group I 119 (47.6%)	29 (54.7%)	15 (28.3%)	8 (15.1%)	1(1.9%)	53 (100%)	0.812
Group II 73 (29.2%)	24 (80%)	5 (16.7%)	1(3.3%)	0 (0%)	30 (100%)	
Group III 58 (23.2%)	19 (70.4%)	6 (22.2%)	2 (7.4%)	0 (0%)	27 (100%)	
Total 250 (100%)	72 (65.5%)	26 (23.5%)	11 (10%)	1 (1%)	110 (100%)	

Discussion

Anaemia is known to occur frequently in patients with diabetes; causes are multiple and include toxic marrow suppression due to frequent infections, nutritional deficiency resulting from dietary restriction and nephropathy associated with renal insufficiency where anaemia can occur earlier and more severely than in non-diabetic patients with similar levels of renal dysfunction. In this study, out of 250 patients, 110 patients (44%) were anaemic. Frequency of anaemia among diabetics in different countries depends largely on the quality of health care, figures as low as 13% have been reported from some European countries (Ireland (13%)¹⁰, Australia (20%)¹¹, UK 2008 25%^{5,12} and Japan (33%)¹³. Surprisingly Iranian figures were much lower with a prevalence of 19.6% reported in 2011¹⁴ however the iron deficiency anemia was excluded in the Iranian study. Anaemia was more common in female diabetic patients (90 patients 53.9%) were female and 20 patients (24.1% were male), this sex discrimination is related to the increased demands on iron and menstrual blood loss in females in the reproductive period of life. Close figures were also reported in Ireland¹⁰, in China¹⁵ and Iran¹⁴. Some workers have reported higher frequency of anemia among male diabetic patients^{8,9}. A slightly higher frequency of anemia was found among group III patients in comparison to group I and group II patients (44.5%, 41.1% and 46.6% in-group I, II and III respectively). This is due to the higher possibility of occurrence of diabetic complications including nephropathies in this group. This finding agrees with that reported in 2008 in UK where a higher prevalence of anaemia was found in those with long duration of diabetes⁹. In this study the commonest type of anaemia was ACD (72 patients, 65%). Similar results were reported from UK (56%) in 2010⁸ in diabetic patients with impaired renal function. Bosman in 2001 reported a frequency of 48%¹². The prevalence of iron deficiency anemia in this study was 24.1%

(26 patients). Higher frequency were reported in 2010 in UK (53%)⁸ and in Israel in 2010 (38%)¹⁶ while Lower frequency (12%) was reported in another study done in 2008 in UK⁹. IDA was more common in female than in male in our study. This is probably because most of our female patients were in reproductive age and IDA is more frequent among these patients¹⁷, for the same reason IDA was more frequent in group I patients. Thalassaemia trait was reported in 10% of anaemic patients (11 cases out of 110 cases), this is close to the frequency of thalassaemia minor in Erbil in a study done in 2012¹⁸.

Conclusion

Anemia is common among diabetic patients with a prevalence of 44% in the studied population and it is more common among female than male diabetic patients. The commonest type of anemia is ACD followed by iron deficiency anemia.

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