Discrimination of types of hypochromic microcytic anemia using screening laboratory test

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Abstract:
Aim:
To differentiate iron deficiency anemia from β-thalassemia minor in patients visiting National Center of Hematology/Baghdad complaining of hypochromic anemia.

Material & methods:
In this prospective study which involve (161) patients complaining from anemia Hb >13gm/dl in males Hb >12gm/dl in females, anemic patients undergo a series of tests as complete blood count using an electronic cell counter (converygs,5) Germany and Hemolyzers, Germany,hemoglobin electrophoresis ,using D10 high pressure liquid chromatography from Bio-Rad company United States of America ,serum iron, iron binding capacity, serum ferritin tests done using Kits from Human Company Germany.

Results:
Out of (112) patients 84females (75%) 28 males (25%) from this study who recognized to have iron deficiency anemia while (47) patients 30 females (63.8%),17males (36.2%) had β-thalassemia minor, two patients had mixed iron deficiency and β-thalassemia minor.

Conclusion:
Multiple red cells indices with many chemical tests and hemoglobin A2 estimation by doing hemoglobin high pressure liquid chromatography are used as main tools for differentiation of tested anemic patients.

Key Words: β-thalassemia minor, iron deficiency anemia, Hemoglobin electrophoresis.

Introduction
The world health organization (WHO) defines anaemia as a haemoglobin level below 13gm/dl in men over 15 years of age and below 12gm/dl, in non-pregnant women over 15 years of age and below 11gm/dl, in pregnant women (1).

Iron deficiency anaemia (IDA) and β-thalassemia minor are the most two common causes of hypochromic anaemia in developing countries with multiple ethnic groups.

The diagnostic criteria for IDA vary between published studies (2-7), and the following tests are the most used tests for differentiations and diagnosis which are the followings:

1- Modern automated cell counters provide measurements of changes in red cells which accompany both IDA and β-thalassemia minor which include:
   - Reduced mean cell haemoglobin (MCH) causes hypochromic red cells.
   - Reduced mean cell volume (MCV) causes microcytic red cells (8).
   - Red blood cell count (RBCs).
   - RBC distribution width (RDW) also used as a parameter for differentiation between the above types of anaemia (9).

2- Chemical tools used for differentiation are:
   - Serum iron, Total iron Binding Capacity.
   - Serum ferritin
   - Haemoglobin high pressure liquid chromatography (HPLC) (10).

Very low S.ferritin levels < 10-15ng/ml is said to be the most specific diagnostic tool to confirm IDA (1).
Materials and methods
Blood samples taken from (161) patients males 46(28.57%), females 115(71.43%) with a ratio of 2.5 F./1M. as follow:
2ml blood collected in EDTA tubes and 4ml blood collected in plain tubes from all patients attending National Centre of Haematology (NCH) in Baghdad during the period from 27/5/2013 until 26/6/2014.

The following tests were done:

1-complete blood picture using two automated cell counters (CONVERGYS 5/GERMANY and HEMOLYZER also from Germany) to obtain different red cell parameters as listed above (RBC count, MCV, MCH, MCHC, RDW....etc.)

2-HbA2 was measured by using HPLC Hb-variant (D10 from Bio-Rad, USA).

3-Serial biochemical tests done for samples to measure S.I, T.I.B.C, S. ferritin using material from (Human Company/ Germany) which was done by using photometric machine (CECIL CE 1011/FRANCE) and by ELISA method for S.ferritin by using (Mandray MR-96 A china).

Results
This study involved 161 patients with age ranging from 1.5-75 years 31 paediatric patients while 126 adults and elderly patients (mean age 38.25 years median age 32.3 years as showing in Fig.1) presented to the National Centre of Haematology/Baghdad during the period from 27th/5/2013 till 26th/6/2014 after doing full investigations involving type of hypochromic anaemia which was their main presenting complaint, 47 patients(29.19% of total No.) found to have thalassemia minor from them 30(63.8%) females and 17(36.2%) males, two patients (1.24%) complain mixed I.D.A + thalassemia minor.

112 patients (69.56% of total No.) found to complain IDA 78(69.66%) females, 34(30.4%) males as shown in Fig. 2.

Results which include range, median, S.D. of Hb, PCV, MCH, MCHC, HbA2 level, S.I, T.I.B.C, and S. Ferritin in I.D.A patients are shown in table 1 and β-thalassemia patients shown in table 2.
Fig 1 Diagram representing age distribution of patients

Fig 2 Diagram showing No. of IDA patients, Thalassemia minor patients against total No.
**Discussion**

Hypochromic anaemia appears to be common among Iraqi peoples prevailing in the last two decades specially IDA due mainly to the economic sanction on the country, while thalassemia minor is also increasing but to a lesser extent due mainly to consanguineous marriages (in Iraq) are still common and there is no screening program among couples intending to marry.

**Recommendations**

1- All newly marrying couples should be screened for β-thalassemia by issuing a law controlling this procedure.
2- Adding nutritional supplements to the food items supplied by government to the majority of people to avoid IDA.

**References**


