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Prevalence of Delta Beta Thalassemia Minor in Southern Iran

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Abstract

Background: Hb A2 is elevated in subjects with beta thalassemia minor but small percent of carriers have normal Hb A2 with elevated levels of HbF (2-10%). This type of thalassemia is called delta beta thalassemia, and can be missed in pre-marriage hematologic consults or screening which leads to increased risk of child birth with beta thalassemia major.

Materials and Methods: In this prospective descriptive study, 17768 subjects participated from January 2007 to January 2008.

Complete blood count was checked for subjects. If MCV was below 80 fl or MCH was below 27pg, HbA2 was checked with column chromatography. If HbA2 was higher than 3.4 %, subject was labelled as beta thalassemia minor. If HbA2 was normal, 45 days of iron therapy were started for patients whom serum iron, serum ferritin and total iron-binding capacity were in favour of iron deficiency anemia. CBC was rechecked after iron therapy and if MCV or MCH still was below normal range, HbF was checked using alkaline denaturation method as well as Hb electrophoresis. Patients with HbF in the range of 2-10% were diagnosed as delta beta thalassemia minor.

Results: 17768 subjects were recruited in this study and 1326 subjects (7.4%) were diagnosed as beta thalassemia minor. 1133 of 1326 thalassemia minor subjects (85.4%) had MCV below 70 fl and 193 subjects (14.6%) had MCV between 70 fl and 80 fl. Three subjects from 17768 (0.01%) had normal HbA2 with HbF between 2% and 10% (delta beta thalassemia).

Conclusion: It is very important to use Hb electrophoresis and check HbF by alkaline denaturation method for all people coming for pre-marriage hematologic consultation to detect delta beta thalassemia or other hemoglobinopathies.

Keywords: Delta-Beta Thalassemia, screening, consultation, Iran.

Introduction

Delta beta thalassemia (DBT) consists of a heterogeneous group of disorders that share the common phenotype characterized by decrease synthesis of δ and β globin chains and increased synthesis of fetal γ globin chains [1]. The increase in γ globin chain cannot compensate for the lack of β chain and this imbalance leads to thalassemia phenotype development [2].

Thalassemia major is an important health problem for some countries and the prevention of thalassemia major births has a great priority in public health programs [3]. Iran stands on the thalassemia belt. It is estimated that 20000 thalassemia major and 5 million thalassemia minor cases are living in Iran [3].

Pre marriage screening test for detection of thalassemia minor is advantageous in prevention of thalassemia major birth [4]. Since HbA2 is normal in patients with DBT, the diagnosis of DBT carriers might be missed in hematologic screening which results in increased risk of thalassemia major births. This study was conducted to evaluate the prevalence of delta beta thalassemia carriers in southern Iran.

Materials and Methods

In this prospective descriptive study, 17768 subjects participated from January 2007 to January 2008.

Participants were males and females with the age range of 27 to 50 years old who were referred to our outpatient clinic for premarital screening program. Complete blood count (CBC) was obtained with a Sysmex KX21 cell counter (Sysmex America, Mundelein, IL, USA). If MCV was below 80 fl or MCH was below 27pg, HbA2 was checked with column chromatography. If HbA2 was higher than 3.4 %, subject was labelled as beta thalassemia minor. If HbA2 was normal or below normal limit, 45 days of iron therapy were started for patients whom serum iron, serum ferritin and total iron-binding capacity were in favour of iron deficiency anemia. CBC was rechecked after iron therapy and if MCV or MCH still was below normal range, HbF was checked by alkaline denaturation method as well as Hb electrophoresis. Patients with HbF in the range of 2-10% were diagnosed as delta beta thalassemia minor. Informed consent was obtained from all participants. The study was approved by the Ethics Committee of Shiraz University of Medical Sciences. Data were analysed using SPSS software (version13, Chicago, IL, USA).

Results

17768 subjects were recruited for this study. 2421 (13.6%) of 17768 subjects had MCV below 80 fl, MCH below 27 pg and normal HbA2 and HbF (microcytic hypochromic pattern).From 2421 patients with microcytic hypochromic pattern, 482 patients (19.9%) had anemia (Hb<13). From 17768 participants 1326 subjects (7.4%) were diagnosed as beta thalassemia minor. 1133 of 1326 thalassemia minor subjects (85.4%) had MCV below 70 fl and 193 subjects (14.6%) had MCV between 70 fl and 80 fl.

1304 (98.4%) of 1326 thalassemia minor subjects had RBC count more than 5.5 million per ml and 1224 (92.3) of 1326 thalassemia minor subjects had RDW more than 14 and 28 subjects (7.7%) had RDW below 14. Out of 1326 thalassemia minor patients, 1134 (85.5%) subjects had MCV below 70 fl and 192(14.5%) subject had MCV between 70 to 80 fl. No thalassemia minor patient had MCV more than 80 fl.

Three subjects from 17768 (0.01%) had normal HbA2 and HbF between 2% and 10% (delta beta thalassemia). The prevalence of delta beta thalassemia in patients with MCV below 80 fl and normal HbA2 was 0.12%.Prevalence of other hemoglobinopathies such as HbD,HbE,HbS was 0.4%.

Discussion

Programs for education and counselling of young couples about thalassemia major have existed for more than 20 years in Iran. All couples must have hematologic consultation for prevention of thalassemia major births. Diagnosis is made by the means of CBC findings and if thalassemia is suspected, column chromatography will be performed for suspected subjects to evaluate the HbA2 level and confirm the diagnosis of beta thalassemia minor.

There is no previous data about the prevalence of delta beta thalassemia not only in Iran, but also in Middle East region. In one study published by Imamura et al5 in 1980 in kyushu of japan, 100000 patients referred to kyushu hospital was evaluated for thalassemia during 15 years. Electrophoresis results revealed 17 (0.17%) beta thalassemia, 3 (0.03%) alpha thalassemia, 1 delta thalassemia (0.01%) and 1(0.01%) delta beta thalassemia. In this research we found that 0.01% of the participants had delta beta thalassemia that will be undiagnosed without Hb electrophoresis which increases the risk of child births with thalassemia major.

This study showed that 0.12% of subjects with MCV below 80 fl and normal HbA2 were diagnosed as delta beta thalassemia. It means that normal HbA2 cannot completely rule out the diagnosis of thalassemia carriers and Hb electrophoresis is mandatory for all suspected subjects.

Coclusion

One in 10000 subjects carries delta beta thalassemia allele and normal HbA2 cannot rule out hemoglobinopathies in these subjects. It is very important to use Hb electrophoresis and check HbF by alkaline denaturation method for all people coming for pre-marriage hematologic consultation to detect DBT or other hemoglobinopathies. We suggest Hb electrophoresis for all suspected subjects for premarital screening in order to retain minor subjects DBT leading to prevent thalassemia major births.

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