ORIGINAL RESEARCH PAPER

Paediatrics

Volume - 7 | Issue - 1 | January - 2017 | ISSN - 2249-555X | IF : 3.919 | IC Value : 79.96

GROWTH PROFILE OF CHILDREN WITH THALASSEMIA MAJOR

KEYWORDS

Thalassemia, Auxology , Puberty

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ABSTRACT *Beta Thalassemia, the commonest form of thalassemia is associated with retarded growth, delayed development of secondary sexual characteristics and abnormal physical features. The present study longitudinally evaluated the auxological and pubertal status in 27 diagnosed children of Beta Thalassemia major in respect to their haemoglobin levels, Bio-chemical parameters, Endocrine functions and skeletal maturation.*

Results – Mean pre-transfusion blood haemoglobin levels were 7.28gm% and 10.49 gm % (Pre and Post transfusion). The children were significantly stunted and wasted. The mean serum ferritin level was 3591 ng/dl and 4293 ng/dl at 1st and 3rd visit, respectively. The degree of stunting and wasting was directly proportional to the values of serum ferritin. Liver function tests were derailed. Calcium levels were low. Thyroid function tests , blood sugar levels and onset of puberty was not delayed .Regular long term follow-up for evolving endocrine abnormalities will be needed.

Introduction

Thalassemia is a blood disorder in which the body makes an abnormal form of haemoglobin (Hb). A decrease in the rate of production of a certain globin chains (α, β, γ, and δ) impedes haemoglobin synthesis and creates an imbalance with the others, normally produced globin chains.

Beta Thalassemia, the commonest form of thalassemia is associated with retarded growth, delayed development of secondary sexual characteristics and abnormal physical features secondary to chronic hypoxia, anaemia and iron overload due to recurrent transfusions [1, 2]. Maintaining adequate pre-transfusion haemoglobin, chelation therapy [3] can prevent long term auxological and pubertal problems [4, 5, and 6].

The present study longitudinally evaluated the auxological and pubertal status in 27 diagnosed children of Beta Thalassemia major in respect to their frequency of transfusion, pre-transfusion and post-transfusion haemoglobin levels, Chelation therapy, Bio-chemical parameters, endocrine functions and skeletal maturation.

Subjects and Methods

In an observational, cross sectional field study conducted over a period of 20 months(Dec 2014 - Aug 2016) 27 diagnosed children with β- thalassemia major(19 males) aged between 5-15 years who were on regular follow up and received blood transfusions were evaluated for auxological parameters(Height and weight) biochemical parameters like blood sugar levels, serum calcium and liver function tests, endocrine parameters like LH,FSH ,TSH and Testosterone and specialised tests like Echocardiography and bone age (BA).

The auxological parameters were recorded during each visit and the endocrine work up was done once yearly.

The height and weight were plotted on the Revised IAP growth charts for height, weight and body mass index for 5-18 year old –girls & boys, [7] during the follow up visits. Tanner staging was done for pubertal assessment and BA was estimated by TW2 method.

All the data collected was entered into Microsoft Excel Sheets and were analysed using SPSS software. Descriptive statistics with respect to obtained parameters was also used.

Results

The total numbers of children included in the study was 27. There were 9 girls (Mean Age 9.3 years) while the boys were 18(Mean age 8.9 years)

Mean pre-transfusion blood haemoglobin levels were 7.28gm% while post transfusion was 10.49 gm% during the study period. Only 2 (7.4%) children were on chelation therapy.

In our study the mean height of our patients was significantly lower. At visit 1st, 2nd, 3rd and4th, 29.6%, 40.8%, 45.5%, and 40.9% of patients were stunted (height z-score <-2) respectively. Regarding body weight; at visit 1st, 2nd, 3rd and 4th visit 25.9%, 22.2%, 27.3% and 22.7% of our patients were underweight (z-score<-2) respectively. BMI remained normal during all the four visits.

Table 1: Height and weight parameters on follow-up visits plotted on IAP 2015 growth charts

	Height				Weight			
Z score	Visit 1	Visit2	Visit 3	Visit4	Visit 1	Visit2	Visit 3	Visit4
>1	00	00	00	00	00	00	00	00
-1 to 0	70.4	55.5	54.5	59.1	74.1	74.1	72.7	77.3
< -3 to -2	29.6	40.8	45.5	40.9	25.9	22.2	27.3	22.7

The mean serum Ferritin level was 3591 ng/dl and 4293 ng/dl at 1st and 3rd visit, respectively. It was observed that the degree of stunting and wasting was directly proportional to the values of serum ferritin.

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Figure 1: Scatter diagram showing correlation of serum ferritin levels with various growth parameters studied at first visit. The regression lines along with the individual R square values are also shown in the figure.

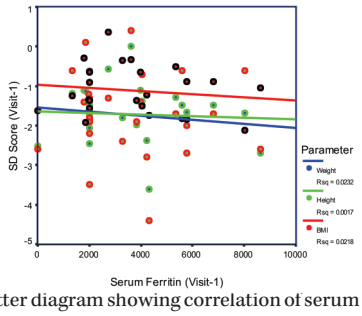
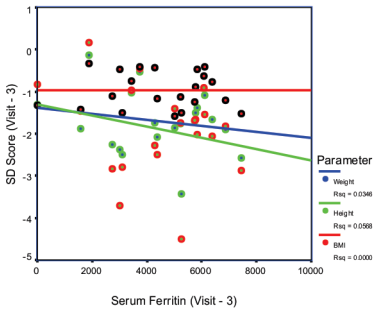


Figure 2: Scatter diagram showing correlation of serum ferritin levels with various growth parameters studied at third visit. The regression lines along with the individual R square values are also shown in the figure.



Liver enzymes; serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT) are raised in transfusion dependent Β-thalassemia major patients. Serum level of SGOT >40 IU/L and SGPT >40 IU/L were considered abnormal. We observed the mean SGOT at 1st and 3rd visit were 65.56 and 54.00. Similarly, SGPT at first and third visit were 54.96 and 49.50, which were higher than normal value ($p<0.05$).

The serum total calcium level was significantly lower in our patients on 1st (8.738 mg/dl) and the third visit (8.828 mg/dl) respectively.

33 % of girls had Luteinizing hormone levels more than 0.2 mIU/ml at a mean age of 10.7 years and 16.7% of boys had serum testosterone levels more than 20 ng/dl at a mean age of 13.7 years indicating normal onset of puberty.

Random blood sugar levels and Thyroid function tests were normal in all the children.

A screening 2D echo was done to rule out complications of cardiac overload and was normal in all the patients.

Discussion –

Growth failure is common in patients with thalassemia. It is multifactorial in thalassemia, related to chronic hypoxia due to chronic anaemia, chelation toxicity, low serum zinc level, hepatic iron overload with hepatic dysfunction and iron associated endocrinopathies such as hypogonadism, hypothyroidism, and growth hormone deficiency [8, 9, 10, and 11].

In our study the mean height of our patients was significantly lower. It was comparable with other studies were stunting ranged from 24 – 65 % [12]. Similarly our children were wasted which is also reported from 20 -45% by other studies [13]. It was observed that the auxological parameters showed a worsening trend with each follow-up. The possible explanation for auxological findings is due to poor follow up for blood transfusions and lack of chelation therapy due to the higher cost involved. There seems to be decrease in percentage in stunted patients on the 4th visit. This could possibly be due to pubertal onset in some children. BMI, which takes both height and weight into consideration, was normal as both these parameters were affected.

Liver enzymes; serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT) are raised in transfusion dependent Β-thalassemia major patients. Though liver biopsy is gold standard test to know iron overload state in liver but it is invasive method and T2*MRI is best non-invasive method of determining liver iron. Relatively simpler way of knowing the liver damage is by estimation of liver enzymes which are raised due to oxidative injury and direct toxic effect of iron on liver cells [14]. In our study both SGOT and SGPT was raised indicating hepatic involvement.

High serum ferritin levels during puberty cause growth retardation. The mean serum ferritin level was 3591 ng/dl and 4293 ng/dl at 1st and 3rd visit, respectively. In our study we found the levels of the liver enzymes to rise with a rise in serum ferritin level also noted by other authors [15, 16].

Several studies reported abnormalities of serum levels of calcium in thalassemia patients [17]. Disturbance of calcium homeostasis is also known in thalassemia major that could be due to hypoparathyroidism [18]. The serum total calcium level was significantly lower in our patients than that of normal range. There were no clinical symptoms produced due to calcium deficiency. As hypoparathyroidism a known complication in thalassemia is known to occur in second decade of life, our patients were probably yet to develop the clinical symptoms and biochemical abnormalities.

33 % of girls had onset of puberty at a mean age of 10.7 years and 16.7% of boys had serum testosterone levels more than 20 ng/dl at a mean age of 13.7 years indicating normal onset of puberty. There was no significant delay in onset of puberty [19].

Thyroid function tests [20], random blood glucose levels [21], 2D Echo [22] and bone age were also normal in our observations. This could be explained by the fact that our study had a shorter duration of observation for identifying endocrinopathies that evolve over a period of time sometimes even in the second decade of life.

We would like to conclude that due to frequently encountered auxological and endocrinological complications, beta thalassemia patients should be regularly followed-up by both haematology and endocrinology departments. The endocrine complications which mainly evolve over a period of time should be regularly monitored.

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