GROWTH RETARDATION AND MALNUTRITION IN CHILDREN WITH THALASSEMA MAJOR

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ABSTRACT

Thalassemia is the most widely spread single gene hemoglobinopathy in world. Children with thalassemia may suffer from growth impairment, undernutrition and other systemic involvement either due to disease or repeated blood transfusions. The present study was undertaken with the objective to assess nutritional status and estimate hemoglobin and serum ferritin levels of these children. Method: Seventy four children in the age group 3-10 years with thalassemia major were subjected to anthropometry (weight and height), hemoglobin and serum ferritin estimation. The data were analyzed using SPSS-17 software. Results: The mean hemoglobin in thalasemic children on regular blood transfusion was around 8.0 g/dl irrespective of their nutritional status. Almost 70 % of the children were in grade II and III malnutrition, 23% had grade I under nutrition and 8 % children had normal nutritional grade. Most of the children had weight for age and height for age <50th centile of which majority were below 3rd centile. 82.4% children had serum ferritin levels greater than 1000 ng/ml. Conclusion: Children with thalassemia had low hemoglobin, high serum ferritin levels, growth retardation and under nutrition. Height and weight of most children were below 3rd percentile. For maintaining the near normal growth, hemoglobin level should be maintained around 11.0 g/dl during growth period and nutritional counseling be done.

Key Words: Thalassemia, growth retardation, malnutrition, hemoglobin.

INTRODUCTION

Children with thalassemia syndrome are a heterogeneous group of single gene disorders, inherited in an autosomal recessive manner, prevalent in certain parts of the world.1 There are about 240 million carriers of b-thalassemia in world and approximately 30 million with a mean prevalence of 3.3 % in India.2 Worldwide approximately 100,000 children with thalassemia are born every year, of which 10,000 are born in India. The carrier rate for b-thalassemia gene varies from 1 to 3% in Southern India and 3-15% in northern India.3 Once a child is diagnosed to have thalassemia homozygous, he/she has to take lifelong treatment which includes filtered packed cell transfusions every three weeks, chelation therapy for iron overload and management of complications of iron overload and transfusions including transfusion-transmitted infections. Blood transfusion in thalassemic children are a double-edged sword, either the thalassemic child dies of problems of transfusions overload or due to lack of it and they usually do not survive beyond the age of 25 years.4 Malnutrition is an important cause of growth failure in children with beta thalassemia.

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Fuchs et al. (1996) reported that malnutrition in thalassemics is primarily caused by inadequate nutrient intake, and also contributed by the absence of intestinal malabsorption. Malnutrition in young growing children is conventionally determined through anthropometric measurements. The present study was undertaken with the objectives to assess nutritional status and estimate hemoglobin and serum ferritin levels of children with thalassemia.

**METHOD**

Seventy four children in the age group of 3-10 years with thalassemia major were subjected to anthropometry (weight and height) and hemoglobin as well serum ferritin estimation. Nutritional status of the subjects was classified by percent weight for age as described in the Gomez’s classification. Grades of malnutrition were mild (Grade I, 90-75%), moderate (Grade II, 75-60%), severe (Grade III, <60%) and normal (>90%). Socio-Economic Status was assessed using Scale of Kuppuswamy and Pareek. Informed consent was also taken from the parents. Ethical clearance was obtained from the ethical committee of the institute. Data was analyzed using SPSS software version-17.

**RESULTS**

Means and standard deviations for age of thalassemic children and their parents were 5.75 ± 2.27 and 32.24 ± 5.96 years respectively.

Majority of the thalassemic children (82.4%) were fully immunized and remaining partially immunized for age. Most of the thalassemic children (58.1%) had a liver size of less than 2 cm, only 9.5% had liver size greater than 4 cm below sub costal margin. Majority of the children with thalassemia (63.5%) had mild splenomegaly (<3 cm), 31.0% had moderate splenomegaly (3-7 cm), whereas only 5.4% had marked (>7 cm) splenomegaly. 83.8% thalassemics who were on regular blood transfusion were also on regular chelation, 12.2% were on irregular chelation and 4.0% were not on chelation therapy.

The data in table 1 show the pre-transfusion hemoglobin levels of thalassemic children; 60% had hemoglobin between 7-10g/dl and 20% between 5-7 g/dl, approximately 10% had hemoglobin less than 5 g/dl and equal number had Hb levels greater than 10 g/dl.

The mean for hemoglobin in thalassemic children on regular transfusion were around 8.0 g/dl irrespective of their nutritional status (Table-2).

Data in table-3 show distribution of thalassemic children in different nutritional grades in relation to Gomez’s classification and their socio economic status. Almost 70% of the children were in grade II and III malnutrition and 23% had grade-I undernutrition. Only 8% children had normal nutritional grade, half of them were in upper socio economic status and half in middle socio economic status (three each). Further it was also observed that majority (65/74, 88%) of the children with thalassemia belonged to middle and lower socio economic status and 65 of these 74 children only three had normal nutritional status. Even 6 out of 9 thalassemic children in upper socio economic status had grade II & III under nutrition.
Table-3: Distribution of thalassemic children in different nutritional grades based on weight

<table>
<thead>
<tr>
<th>Grade of malnutrition</th>
<th>Socio Economic Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Grade I (mild)</td>
<td>17</td>
</tr>
<tr>
<td>Grade II (moderate)</td>
<td>28</td>
</tr>
<tr>
<td>Grade III (severe)</td>
<td>23</td>
</tr>
<tr>
<td>Normal</td>
<td>06</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
</tr>
</tbody>
</table>

The data in table 4 show the serum ferritin levels in thalassemic children. Majority of the children (82.4 %) had serum ferritin levels greater than 1000 ng/ml whereas only 17.6 % had serum ferritin level less than 1000 ng/ml.

The data in table 5 show that only two thalassemic children had weight more than 50\textsuperscript{th} percentile and three had height more than 50\textsuperscript{th} percentile (belong to middle and upper socio economic status).

However majority of the thalassemic children 54 out of 74 were below 3\textsuperscript{rd} percentile for weight and 45 were below 3\textsuperscript{rd} percentile for height.

Table - 5: Distribution of thalassemic children in different height and weight percentiles

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Sex</th>
<th>Growth Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (N=57)</td>
<td>&lt; 3\textsuperscript{rd} %</td>
</tr>
<tr>
<td></td>
<td>Female (N=17)</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Total (N=74)</td>
<td></td>
<td>45 (60.8%)</td>
</tr>
<tr>
<td>Weight</td>
<td>Male (N=57)</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Female (N=17)</td>
<td>12</td>
</tr>
<tr>
<td>Total (N=74)</td>
<td></td>
<td>54 (73%)</td>
</tr>
</tbody>
</table>

DISCUSSION

Results of the present study indicate that children with thalassemia major had very low pre-transfusion hemoglobin levels when they came for first hospital visit. The serum ferritin levels were already high on registration. Most of them followed regular iron chelation therapy. Majority of the thalassemic children had lower weight for age and height for age when compared to the NCHS standards. Nearly all thalassemic children were below 50\textsuperscript{th} percentile both for weight and height and majority of them were below 3\textsuperscript{rd} percentile. Nabavizadeh et al also observed that majority of children with thalassemia had weight, height and mid arm circumference under 5\textsuperscript{th} percentile.\textsuperscript{9}

The present study also showed that the mean height and weight of thalassemic boys and girls were much lower than the 50\textsuperscript{th} centile of WHO, Agrawal and NCHS standards. In other words, thalassemic children were short and underweight when compared to Indian standards.\textsuperscript{10} Similar findings have been reported in another study that thalassemia major patients were short, had low rate of growth and BMI and had either delayed or absent pubertal spurt which was attributed to low hemoglobin and high ferritin levels and suboptimal iron-chelation therapy.\textsuperscript{11} Further, result of the present study indicates that
majority of the children with thalassemia had severe to moderate degree of under nutrition, indicating a high prevalence of both past persistent under nutrition. In present study nutritional status classified by percent weight for age showed that 68.9% of children with thalassemia had moderate to severe under nutrition. Similar findings have been reported by Tanphaichitr et al i.e., 74.5% of thalassemic children were underweight.12 Tienboon et al also found that 64 and 78 percent male and female thalassemic children had moderate to severe under nutrition.13 Our findings are in eventful and other study as well. Further, they also observed that weight deficit occurs at an early age and appear to precede deficits in linear growth. Abnormal growth was not due to chelation therapy and was inconsistently associated with the degree of anemia. Fuchs et al observed that malnutrition was primarily caused by inadequate nutrient intake, as indicated by the capacity to gain weight appropriately when provided with nutrition support.3

CONCLUSION

Results of the present study indicate that thalassemic children had growth retardation and malnutrition. Height and weight of these children was less than 3rd percentile. Means for hemoglobin were around 8.0 g/dl in these children on regular blood transfusion irrespective of their socio economic status. It appears that unless we maintain hemoglobin levels around 11.0 g/dl during growth period along with good dietary intake these children will not be able to maintain growth. The hypoxia because of low hemoglobin levels will affect all organ functions including intestine where absorption of nutrients may be affected even if they are available.

REFERENCES