

Original Research Article

Nutritional Status of Thalassemia Patients

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Abstract

The nutritional status of children is a prominent factor in the economic development of a country. Good nutrition is essential for achieving normal growth and development. Therefore, to rule out any growth abnormality, nutritional assessment becomes an integral step in every pediatric patient care. Measurement of the nutritional status of the thalassemic pediatric population is of utmost importance, as they are known to have iron overload and multiple nutrient deficiencies due to poor absorption. Present research was planned to assess the nutritional status of thalassemic pediatric patients, including components of medical history, biochemical and clinical examination, dietary intake and anthropometrics. A total of 50 patients were assessed, of whom 10 patients were found severely malnourished, while 30% patients were found mildly malnourished. Therefore, it was recommended to counsel families and children properly to follow a suitable diet so that a good nutritional status can be maintained.

Keywords: Thalassemia, children, nutrition status, height, weight, anthropometry, dietary intake, dietary counselling

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Introduction

The pediatric age group covers the age group 0 – 18 years. Optimum growth and development require balanced nutritional support; otherwise, irreversible damage may occur. During infancy and the adolescent phase, nutritional needs are highest due to a growth spurt.

Global prevalence of malnutrition in pediatric patients: The global census of children and adolescents under the age group of 5–19 years is 1.8 billion according to the World Bank (2015) ¹, out of which 90% children belonged to the lower socio-economic group. Malnutrition is an independent risk factor for morbidity and mortality.²

What is thalassemia? It is a type of blood-related disorder with impaired haemoglobin synthesis. It is cured by bone marrow transplantation. According to the National Heart, Lung, and Blood Institute (2014)³, it is more prevalent in the Mediterranean, Southern Asia, Africa and the Middle East. Oxygen transportation is hampered due to impaired haemoglobin synthesis. It is carried forward by an autosomal recessive transition. Microscopic analysis of red blood cells shows a hypochromic, microcytic and poikilocytosis appearance. Thalassemia may be asymptomatic to mild anemia or more severe requiring regular blood transfusions.

Clinical symptoms of thalassemia include Anorexia, pale skin and mucous membranes, tachycardia, weakness, short attention span, hyperactivity, growth retardation, impaired sleep, cracked nails and brittle hair, anaemia, and nosebleeds. Splenomegaly and bone marrow expansion are some of the other features attributed to improper erythropoiesis. It may precipitate into facial deformities, osteomalacia, and other bone deformities. Studies have shown an excess iron deposition (upto 6 gram) annually due to repeated blood transfusions.⁴⁻⁶

Treatment of thalassemia major: It requires iron chelation with regular blood transfusion. Splenectomy may be needed in case of excess iron accumulation in spleen as it leads to splenomegaly. Hematopoietic stem cell transplantation (HSCT) is the newer approach to treat thalassemia major.⁷

Nutritional management of thalassemia:

Besides iron chelation therapy, nutrition also plays an important role in thalassemia. Iron-rich foods should be reduced in the diet. Iron can be obtained from vegetarian and non-vegetarian sources, but in children's diet, these are not restricted entirely to maintain normal growth and development. As calcium hinders iron absorption, iron-rich foods are recommended to be consumed with calcium-rich foods. Similarly, vitamin C, vinegar, soya sauce, pickles, onion, turnip, etc., are known to enhance iron absorption; therefore, consumption of these food sources should be avoided with iron-rich foods in thalassemic patients. On the other hand, some food products are known to decrease iron absorption, such as foods high in fibre, phytate, phenolic compounds (tea, coffee), etc., therefore, consumption of these foods is encouraged to prevent excess iron load. Patients without blood transfusions should consume a moderately low-iron diet that restricts consumption of iron-fortified foods and red meat.

Research Methodology

Baseline survey for assessment of nutritional status was planned. A sample of 50 was taken to study the nutritional status of thalassemic children. A purposive sampling method was used. All pediatric thalassemic patients were taken for study until sample size of 30 was completed.

Inclusion criteria for sample selection -

1. Patients who were willing to take part in the study
2. Patients in the pediatric age group (0 – 18 years)
3. Patients suffering from thalassemia

Exclusion criteria -

1. Patients unwilling to participate
2. Patients above 18 years of age
3. Patients suffering from diseases other than thalassemia

Data collection was done under following subheadings -

1. Collection of general information: General information was collected from a well-structured questionnaire. Information such as patient's name, age, gender, place, education status and economic status was obtained from patient's file or by interviewing the attendant.

2. Assessment of nutritional status

2.1 Anthropometric measurements: In this section of the study, patients' birth weight, present weight, height/ length, mid-upper arm circumference (MUAC), head circumference and chest circumference (up to the 5-year) were noted. WHO (2006) and IAP (2015)^{8,9} growth charts were used to interpret the data obtained in terms of BMI z score/ percentile. Based on growth charts, the child's nutritional status was categorised as following:

1. Undernourished (stunted, wasted, or underweight) - weight measurement < -2 S.D.
2. Severely undernourished – Weight measurement below - 3 z score
3. Stunted child – z score for height for age is below – 2
4. Wasting – Low weight for height as a result of failure to receive adequate nutrition during any acute illness or recent episode of diarrhoea
5. Underweight – weight for age 2 SD below the median resulting from either chronic or acute malnutrition or both (Clinical Dietetics Manual)¹⁰

2.2 Biochemical Profile: Patient's haemoglobin level was recorded.

2.3 Clinical Signs and symptoms: Patients were clinically examined for signs of weakness,

1. Demographic profile of the patients

Parameter	Variables	N = 50	Percentage
Age_(N=50)	0-3 yr	10	20.00%
	4-6yr	9	18.00%
	7-9yr	7	14.00%
	10-14y	17	34.00%
	15 -18 y	7	14.00%
Sex_(N=50)	Male	38	76.00%
	Female	12	24.00%
Education (4-18 yr) (N= 40)	Literate	21	42.00%
	Illiterate	12	24.00%
Economic status (N=50)			
	LIG	8	16.00%
	MIG	40	80.00%
	HIG	2	4.00%

Table 1. Demographic profile of thalassemic pediatric patients

cough, anorexia, wasting, anemia, loss of appetite and taste changes, shortness of breath, recurrent bronchitis/pneumonia, fatigue, headache, nausea/ vomiting to rule out any nutritional deficiency and adequacy of food intake.

2.4 Dietary History: Patient's 24-hour home diet recall was noted for 3 consecutive days, that have two weekdays with one holiday. Their nutrient intake was calculated by taking the mean nutrient intake of three days' diet.

3. Nutritional Diagnosis: In this part of the study, the patient's nutritional diagnosis was documented based on the above data collected.

4. Statistical Analysis: Student 't' test was applied to check any significant difference between the two values. Results have been mentioned after calculating the mean values of the data obtained for different parameters.

Results & Discussion

Data collection was done for 50 thalassemic pediatric patients, who were admitted or visited OPD at Mahatma Gandhi Medical College and Hospital, Jaipur between the age group of 0 -18 years of age. Results have been described under the following subheadings -

Table 1 depicts the general information or demographic profile of the patients between 0 -18 years of age. A significantly higher number ($p<0.05$) of children were found between the age group of 10 -18 years, while other age groups showed similar percentages ranging from 16 – 18 % each (not significant). More children were male (64%), which was significantly higher ($p<0.05$) than females (24%). Educational level was noted

for children above 4 years of age only out of which 42% children were going to school, while 24% children were found illiterate. Eighty percent patients were from middle-income group families. Their origin place was also noted, out of whom children were found from different areas including Jaipur, Jhunjhunu, Sawai Madhopur, Nagaur and one child was from Haryana also.

2. Anthropometric data for thalassemic pediatric patients

	Males		Females	
Age	Mean Height/ Length (cm)	Mean weight (Kg)	Mean Height (cm)	Mean weight (Kg)
<1 y	66.5	4.5	98	6
1-3 y	100.5	9.5	100	9.5
4-6 y	106.5	15.13	115.5	13.57
7-9 y	125	26	135	25.5
10-14 y	138.26	29.5	104	29
16 -18 y	160 cm	50	147	45
Mean birth weight	2.20 Kg		2.55	
MUAC	(N = 38)	Percentage	(N = 12)	Percentage
Normal	10	26.31%	4	25.00%
Less	23	60.52%	8	66.66%
Severely less	1	3.12	1	8.33%
Obese	4	10.52%	0	0.00%
Head circumference (cm) (N= 8) (0 - 1 year)				
Normal	6	75.00%		
Low	2	25 %		
High	0	0		
Chest circumference (N = 50)				
Normal	40	80.00%		
Low	10	20.00%		
High	0	0		
BMI (5- 18 yrs) (N = 33)				
Normal	20	60.6		
Low	10	30.3		
High	3	9.09		

Table 2. Anthropometric measurements of thalassemic pediatric patients

Table 2 is showing mean height and mean weight for different age groups for both males and females separately. It is clear from the table that mean height and mean weight are quite high for females in comparison to males till growth spurt, where they were found to decline significantly ($p < 0.05$). Males showed an average birth weight of 2.2 kg; on the other hand, it was 2.5 kg for their female counterparts. It is showing that male patients had low birth weight than the standard.

Besides this, MUAC levels of the majority of males and females were seen as mild to moderately low. In males, MUAC of 10.52% were found in a higher side, showing symptoms of obesity. Children between 0 and 1 years of age showed normal head circumference (75%). Measurement of chest circumference showed normal levels in 80% pediatric patients, while 20% kids depicted lower values. Sixty percent children showed normal BMI z score when compared to growth charts, but 30.35 children presented BMI z score towards the lower side.

3. Biochemical profile of thalassemic pediatric patients

Parameter	Interpretation	N = 50	Percentage
Hemoglobin	Normal	24	48.00%
	Low	20	40.00%
	Severely low	6	12.00%

Table 3. Biochemical profile of thalassemic pediatric patients

In this part of nutritional assessment, 48% children showed normal hemoglobin levels while 40 percent showed lower level although these were not statistically different from each other. Six

patients showed hemoglobin levels significantly low. Out of these 6 patients 5 were girls of 10 -14 years of age group. It may be attributed to the onset of menarchy.

4. Clinical signs & symptoms

Clinical signs & symptoms	Number (N = 50)	Percentage
Weakness	7	14.00%
Fever	2	4.00%
Cough	5	10.00%
Anorexia	2	4.00%
Wasting	2	4.00%
Anemia	20	40.00%
Nausea & Vomiting	5	10.00%
Headache	4	8.00%

Table 4. Clinical Signs and symptoms of thalassemic pediatric patients

Above table is showing that 20 out of 50 patients showed symptoms of anemia, while 7 patients (14%) showed weakness. Symptoms of cough and nausea / vomiting were reported in the study.

4. Nutrient intake: Table 5 presents the nutrient intake of thalassemic children. Out of 50, only 5 children (10%) showed their energy intake up-to the standard levels, while 74% children were found to have energy intake below 70% of their

requirements. A similar trend was seen for protein also. Fat intake of 50 % was found 80% - 100 % of the requirements. Eighty percent children showed carbohydrate intake near normal

requirements. In minerals, the intake of iron was found below 60% of the requirements in 40% patients. Similarly, intake of calcium was below 79% of requirements in 52% of patients.

Nutrient intake as per RDAs		Total number of patients (N=50)	Percentage (%)
Energy	100.00%	5	10
	80 - 99%	8	16
	70 - 89%	10	20
	60 -79%	15	30
	<60%	12	24
Protein	100.00%	10	20
	80-99%	8	16
	69-79%	20	40
	<60%	12	24
Fat	100.00%	15	30
	80-99%	10	20
	69-79%	12	24
	< 60%	13	26
Carbohydrates	100.00%	20	40
	80-99%	10	20
	69-79%	14	28
	<60%	6	12
Iron	100.00%	13	26
	80-99%	7	14
	69-79%	10	20
	<60%	20	40
Calcium	100.00%	9	18
	80-99%	15	30
	69-79%	10	20
	<60%	16	32

Table 5. Nutrient intake of thalassemic pediatric patients

6. Nutritional diagnosis: Based on above data, the level of nutritional status was derived as follows

Parameters	Total no. of patients (N = 50)	Percentage (%)
Malnourished	10	20
Underweight	30	60
Normal	8	16
Overweight	1	2
Obese	1	2

Table 6. Nutritional status of thalassemic pediatric patients

The above data shows that 60% patients were found to be underweight, while 20% patients were malnourished. Negligible numbers (2% only) of patients were found to be overweight or obese.

Conclusion

Based on present research, it can be concluded that thalassemia was found more in 10 - 14-year-old children. In these, boys were 52% more than girls. The birth weight of boys was noted significantly lower than that of girls. Besides this, the nutritional status of girls was also studied as better than that of boys. The only parameter was haemoglobin level, and clinical signs of anemia was documented more in girls between 10 -12 years in comparison to males of the same age group. The majority of younger boys were wasted and underweight in comparison to girls. In total, 20% patients were severely malnourished, while 30% patients were mildly malnourished. It can be interpreted from the obtained data that the state of nutrition needs more intervention and counselling to maintain a good nutritional status so that thalassemic children can lead a healthy life with lesser side effects of treatment as well as better growth and development.

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