International Journal of Contemporary Pediatrics
Bavaliya V et al. Int J Contemp Pediatr. 2026 Jul;13(7):1122-1126
https://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20261901

Original Research Article

A study of anthropometric parameters in children with beta thalassemia major

Vijay Bavaliya*, Khushbu Chaudhari

Department of Pediatrics, New Civil Hospital Surat, Gujarat, India

Received: 21 March 2026
Revised: 15 April 2026
Accepted: 19 May 2026

***Correspondence:**
Dr. Vijay Bavaliya,
E-mail: bavaliyavijay140@gmail.com

ABSTRACT

Background: Growth failure is a common and persistent complication in children with beta thalassemia major despite advances in regular blood transfusion, bone marrow transplantation and supportive care, which have improved survival.
Methods: This cross-sectional study was conducted among 100 children with beta thalassemia major attending the pediatric outpatient department or admitted to a tertiary care center in Surat. Anthropometric measurements were recorded and correlated with serum ferritin levels.
Results: The majority of children were aged 6–10 years (47%), followed by 1–5 years (39%), while 1% were below 1 year. Boys constituted 60% of the study population. Among children with hemoglobin <8 g/dl, 58.62% had serum ferritin >2000 µg/l, while 69.23% of those with Hb ≥8 g/dl also had ferritin >2000 µg/L. The mean weight, height and BMI were 17.9 kg, 109 cm and 15.02 kg/m², respectively. Nearly one-third of children had weight below the 3rd centile and about one-fifth were between the 3rd and 10th centiles.
Conclusions: Growth impairment remains highly prevalent among children with beta thalassemia major, with significant stunting and underweight. Most children were aged 6–10 years and predominantly male. Nearly half were stunted. While weight centiles showed no significant association with serum ferritin levels, height and BMI centiles demonstrated significant correlation, indicating a greater impact of iron overload on linear growth.

Keywords: Anthropometric parameters, Beta thalssemia major, Children, Outcome

INTRODUCTION

Beta-thalassemia major is a common inherited blood disorder, particularly prevalent in Asia, with approximately 100,000 patients requiring regular red blood cell (RBC) transfusions.[1] However, the repeated transfusions lead to iron overload, which can be fatal without treatment by the second decade of life.[2] Iron-chelating therapy has been a key component in managing thalassemia over the past 2 decades, helping to mitigate the harmful effects of excess iron in the body.[3] Iron overload in transfusion-dependent thalassemia patients can lead to a variety of endocrine dysfunctions, including hypogonadotropic hypogonadism, growth hormone deficiency and diabetes mellitus.[4] To prevent these complications, iron chelation therapy should be initiated before significant iron overload develops, usually after 10-20 transfusions.

Starting iron chelation therapy early is crucial in ensuring normal pubertal development and maintaining healthy growth in most patients.[5] Growth failure in thalassemia major has been a recognized complication for many years, persisting despite advancements in regular blood transfusion and other therapeutic interventions. While recent decades have seen significant progress, including the advent of bone marrow transplantation and improved supportive care, which have substantially increased the

life expectancy of patients, growth retardation remains a prevalent and unresolved issue. Despite advancements, many children with thalassemia major struggle with delayed growth and associated challenges that impact their self-esteem and social interactions.[6] Over 20 million people carry the thalassemia gene, with its prevalence varying significantly across regions. Annually, it is estimated that 6,000 to 8,000 children are born with homozygous β-thalassemia in India.[7]

Unfortunately, many of these children remain undiagnosed or receive inadequate treatment due to limited healthcare facilities, absence of social awareness, poor management and financial constraints.[8] The lack of widespread access to specialized Thalassemia care units exacerbates this issue. This gap in care highlights the need for improved access to comprehensive management, regular growth monitoring.[9]

India has a large number of young patients with transfusion dependent thalassemia and very few studies have reported the issues related to physical growth and development in children. Keeping this in mind, present study is undertaken with the aim to study anthropometric parameters in transfusion dependent thalassaemic children and correlation it to serum ferritin level. To assess the anthropometric measurements and its correlation with serum ferritin level in children with beta thalassemia major.

METHODS

Study design

This was an observational-cross sectional study.

Study place

A cross-sectional study was conducted among 100 patients of Beta Thalassemia Major at tertiary care centre, New Civil Hospital, Surat.

Sample size

Total 100 patients of thalassemia major included in my study, who attended OPD or admitted in ward for the blood transfusion during 9 months of data collection period. Sample Size calculated on the basis of Average numbers of patients enrolled in OPD register in a last year.

Sampling technique site

Purposive sampling, paediatric OPD and paediatric ward at tertiary care center, New Civil Hospital-Surat.

Study duration

Total 18 months (October 2023 to April 2025) including initial 3 months for formulation of research topic, literature research and protocol writing for the ethical clearance +9 months for data collection +3 months for data analysis +3 month for thesis writing =total 18 months.

Inclusion criteria

Confirmed case of beta thalassemia major up to 12 years of age.

Exclusion criteria

Parents who are not willing to participate. Patients with hemoglobinopathies other than beta thalassemia major.

Ethical approval

Study has been started after the final approval (25 October 2023) of Human research Ethical committee, research protocol entitled on 23 June 2023 while research protocol discussed in ethical committee held at dean office-New civil hospital, Surat on 14 September2023.

A detailed history was taken from the patients and/or their parents regarding their presenting complaints, dietary history, age at diagnosis, number of blood transfusion in the past, interval between each blood transfusion, Serum Ferritin level, history of splenectomy or use of chelation therapy. Anthropometric measurements like weight, height (length in children up to 2 years of age), BMI, mid arm circumference (from 2 to 5 years) was taken from all patients and plotted on standard growth chart. Master chart prepared and analysed with SPS software.

RESULTS

A cross sectional study was conducted among 100 patients of Beta Thalassemia Major at tertiary care centre, New Civil Hospital, Surat. Majority of children were aged 6–10 years (47%), followed by those aged 1–5 years (39%), while a small proportion were less than 1 year old (1%). The majority of participants were boys (60%) compared to girls (40%). Among children with hemoglobin <8 g/dl, majority (58.62%) had S. Ferritin >2000 µg/l; similarly, in those with Hb ≥8 g/dl, a majority (69.23%) also had S. Ferritin >2000 µg/l. The mean weight was 17.9 kg, mean height was 109 cm and mean BMI was 15.02 kg/m^2.

As per Table 1, majority of subjects were between 6-10 years of age (n=47, 47%), followed by 39 subjects who were between 1-5 years of age, 13 were in >10 years of age range and only one subject was <1 year of age. As per Table 2, majority of subjects were male (n=60, 60%) and remaining 40 were females. As per Table 3 maximum subjects belonged to upper lower class (n=52, 52%), followed by 34 subjects of lower middle class, 10 were from lower class and 4 were of upper middle class. As per Table 4, when mean Ferritin level was compared

according to weight centile, no significant difference was found with p value of 0.54 (not significant). As per Table 5, When mean ferritin level was compared according to height centile, a statistically significant difference was found with p value of 0.032. As per Table 6, when mean ferritin level was compared according to BMI centile, a statistically significant difference was found with p value of 0.014.

Table 1: Age distribution among the study subjects (n=100).

Age group (in years)	N	%
<1	1	1.0
1-5	39	39.0
6-10	47	47.0
>10	13	13.0
Total	100	100.0
Mean age	6.43±3.07	

Table 2: Gender distribution among the study subjects.

Gender	N	%
Male	60	60.0
Female	40	40.0
Total	100	100.0

Table 3: Socioeconomic status among the study subjects.

Socioeconomic status	N	%
Lower	10	10.0
Lower middle	34	34.0
Upper lower	52	52.0
Upper middle	4	4.0
Total	100	100

Table 4: Comparison of ferritin level according to weight centile.

Weight centile (kg)	Mean ferritin (mcg/l)	SD
<3	2454.9839	1839.90148
3 to 10	2977.6688	1717.07997
10 to 25	2894.0476	1729.55848
25 to 50	2095.2143	1423.88705
50 to 75	2953.8750	1668.48498
75 to 90	4012.0000	
P value	0.54	

Table 5: Comparison of ferritin level according to height centile.

Height centile (cm)	Mean ferritin (mcg/l)	SD
<3	2689.3664	1861.17398
10 to 25	2081.4615	1436.06468
25 to 50	4506.4444	2072.83002
3 to 10	2292.5455	1032.98235
50 to 75	3231.6000	584.27417
75 to 90	1260.0000	-
90 to 97	2556.0000	2059.09495
>97	1314.0000	.
P value	0.032*	

*Statistically significant

Table 6: Comparison of ferritin level according to BMI centile.

BMI centile (kg/m^2)	Mean ferritin (mcg/l)	SD
<3	1274.5000	20.50610
>50	3106.6500	1809.99207
10 to 25	3334.4130	2207.71396
25 to 50	2967.4118	1141.59001
3 to 10	2816.5000	1022.85556
P value	0.014*	

*Statistically significant

DISCUSSION

The present study reports a mean age of 6.43±3.07 years, which is slightly lower compared to the mean ages reported in other referenced studies. Simhachalam et al reported a mean age of 7.40±1.85 years, equivalent to 88.75±22.18 months, which is higher than that of the present study but with a narrower standard deviation, indicating a more homogeneous sample.[10] In the present study, males comprised 60% of the sample, while females accounted for 40%. This pattern is similarly reflected in Sharma et al where the male representation was even higher at 70%, suggesting a potentially significant gender disparity.[11] The study by Rathaur et al.[12] Also, supports this trend, reporting 65.7% male and 34.3% female participation.

In the present study, the mean serum ferritin level among thalassemia patients was found to be 2627.97 µg/l. This value is lower compared to several other studies conducted in similar patient populations. For instance, Koreti et al reported the highest mean ferritin level of 3879 µg/l, followed by Choudhry with 3785 µg/l, Shah et al with 3456 µg/l and Gomber et al with 3422.65 µg/l.[13-16] These elevated levels may indicate more frequent transfusions, poorer adherence to chelation therapy or limited access to healthcare facilities in their respective regions.

The present study found that 3% of patients had a BMI below the 3rd centile, which is relatively lower compared to findings in other similar studies in a study conducted by Badiger et al 27.27% of thalassemic children were reported to have a BMI below the 3rd centile.[17] Mahanta et al observed that children with height velocity below the 3rd percentile had significantly higher Ferritin (2637±892.84 ng/ml) than those above the 3rd percentile (1875±564.007 ng/ml), with a significant p value (p=0.012).[18]

Huang et al reported that ferritin levels above 1000 ng/ml were associated with significantly lower Z-scores for height-for-age, weight-for-age and BMI-for-age (p<0.05), linking high iron load with poor growth.[19] Hashemi et al noted that although ferritin was higher in shorter children, the difference in height was not statistically significant (p=0.072), but Ferritin showed a significant inverse correlation with weight (p=0.017).[20]

Single-center study

Conducted in one tertiary hospital in South Gujarat, limiting generalizability to other regions.

Small sample size

Around 100 participants, possibly insufficient to detect subtle but important differences.

Purposive sampling

May introduce selection bias by including mostly compliant patients under regular care.

Uncontrolled confounder

Factors like nutrition, socioeconomic status, endocrine issues and chelation compliance were not fully assessed.

No control group

Limits comparison with healthy children.

Limited endocrine evaluation

Delayed puberty and hormonal factors were not studied, reducing completeness of growth assessment.

CONCLUSION

The study highlights significant growth impairments among children with thalassemia major, with a high prevalence of stunting and underweight status. Notably, nearly half of the children were stunted, while weight centiles did not show strong associations with serum ferritin, height and BMI centiles shows significant correlation with serum ferritin, suggesting that iron overload may contribute more significantly to linear growth retardation.

Overall, the findings emphasize the importance of early and effective management of iron overload and regular monitoring of growth parameters in children with thalassemia major to mitigate long-term complications.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Brittenham GM. Iron-chelating therapy for transfusional iron overload. N Engl J Med. 2011;364(2):146-56.
2. Olivieri NF, Brittenham GM. Iron-chelating therapy and the treatment of thalassemia. Blood J American Soc Hematol. 1997;89(3):739-61.
3. Grundy RG, Woods KA, Savage MO, Evans JP. Relationship of endocrinopathy to iron chelation status in young patients with thalassaemia major. Arch Dis Child. 1994;71(2):128-32.
4. Hashemi A, Ghilian R, Golestan M, Akhavan Ghalibaf M, Zare Z, Dehghani MA. The study of growth in thalessemic patients and its correlation with serum ferritin level. Iranian J Pediat Hematol Oncol. 2021;1:3984.
5. Bronspiegel-Weintrob N, Olivieri NF, Tyler B, Andrews DF, Freedman MH, Holland FJ. Effect of age at the start of iron chelation therapy on gonadal function in beta-Thalassemia major. N Engl J Med. 1990;13(11):713-9.
6. Badiger S, Baruah A. A study of growth pattern in regularly transfused thalassaemic children of age group of 2 years to 12 years. Int J Contemp Pediatr. 2019;6(4):1575-81.
7. Lokeshwar MR, Manglani M, Shaw N, Swathi Kanakia S. Modern trends in the management of Thalassemia. Indian J Pract Pediatr. 1997;5:287-96.
8. Choudhry VP, Desai N, Pati HP, Nanu A. Current Management of homozygous ß Thalassemia. Indian Paediatr. 1991;28(10):1221-9.
9. Shriharsha Badiger, Aditi Baruah. A study of growth pattern in regularly transfused thalassaemic children of age group of 2 years to 12 years. Int J Contemp Pediatr. 2019;6(4):1575-81.
10. Simhachalam M, Sahoo M, Kuppili U. A study on growth profiles in children with thalassemia major between 2-10 years of age on regular transfusions and oral chelation therapy. Int J Paediatr Res. 2018;5:78-87.
11. Ayoub MD, Radi SA, Azab AM, Abulaban AA, Balkhoyor AH, Bedair SE, et al. Quality of life among children with beta-thalassemia major treated in Western Saudi Arabia. Saudi Med J. 2013;34(12):1281-6.
12. Rathaur VK, Imran A, Pathania M. Growth pattern in thalassemic children and their correlation with serum ferritin. J Family Med Prim Care. 2020;9(2):1166-9.
13. Koreti S, Gaur BK, Das G, Gaur A. Study of Serum ferritin levels in β-Thalassemia major children. Int J Pediatr Res. 2018;5(6):308-13.
14. Neha D, Shekhar S, Akhouri MR. Observation on ECG changes in thalassemia major patients. IOSR J Dental Med Sci. 2016;15(7):28-31.
15. Shah N, Mishra A, Chauhan D, Vora C, Shah NR. Study on effectiveness of transfusion program in thalassemia major patients receiving multiple blood transfusions at a transfusion centre in Western India. Asian J Transf Sci. 2010;4(2):94-8.
16. Gomber S, Saxena R, Madan N. Comparative efficacy of desferrioxamine, deferiprone and in combination on iron chelation in thalessemic children. Indian Paed. 2004;41:21-6.
17. Shriharsha Badiger. A study of growth pattern in regularly transfused thalassaemic children of age group of 2 years to 12 years. 2019.
18. Bhat V, Dar MI, Digra SK, Sharma S. Impact of pretransfusion hemoglobin and ferritin levels on growth and clinical parameters in children with transfusion-dependent thalassemia major. J Scient Soc. 2025;52(3):283-9.
19. Huang YL, Liu S, Xia T. Relationship between growth disorders and iron overload in children with beta-Thalassemia major. Chin J Contemporary Pediatr. 2008;10(5):603-6.
20. Hashemi A, Ghilian R, Golestan M, Akhavan GM, Zare Z, Dehghani MA. The study of growth in thalassemic patients and its correlation with serum ferritin level. Iranian J Pediat Hematol Oncol. 2011;1(4):147.

Cite this article as: Bavaliya V, Chaudhari K. A study of anthropometric parameters in children with beta thalassemia major. Int J Contemp Pediatr 2026;13:1122-6.