



Original Article

SOCIO DEMOGRAPHIC FACTORS AFFECTING MALNUTRITION IN BETA THALASSEMIA MAJOR PATIENTS IN A GOVERNMENT TERTIARY CARE CENTRE IN SOUTH INDIA

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ABSTRACT

Background and Objectives: Beta thalassemia is a hereditary hemoglobinopathy characterized by the defects in the beta globin chain of haemoglobin. In India, For about 12000 infants born every year have major form of the disease and half of these patients die before reaching adulthood. Large proportion of these early deaths are due to malnutrition. With this background, this study was conducted with the objective to know the prevalence of malnutrition and socio demographic factors influencing malnutrition in Beta thalassemia major patients.

Methods: The present cross sectional observational study was carried among 100 children aged 6 months to 18 years with confirmed beta thalassemia major patients. A detailed history taking, examination was done. Based on BMI, malnutrition was assessed using age and sex specific WHO BMI charts and factors affecting malnutrition was assessed. Statistical data was analysed by IBM SPSS 25.0 version software and statistical significance for all analyses was set at $P < 0.05$.

Results: Among the study participants, 50.0% were malnourished with a mean body mass index of 14.46 kg/m². The children with lower Class (Class IV, V) of socio economic status (adjusted odds ratio [AOR], 3.25; 95% CI, 2.05–5.20) and the children having mother with lower level (Illiterate/primary school) of education (adjusted odds ratio [AOR], 9.30; 95% CI, 4.50–11.2) had a higher risk of malnutrition.

Interpretation & Conclusion: In our study half of the study participants had malnutrition, and low socio economic status, poor literacy status of mother and father are the significant predictors of malnutrition in these patients.

Keywords: Malnutrition; Thalassemia major; Body Mass Index.

INTRODUCTION

Thalassemia is autosomal recessive single gene disorder. About 200 million people globally are affected by thalassemia, with half of these cases having the severe form of the disease that is beta thalassemia major.¹⁻³

Beta thalassemia is a hereditary hemoglobinopathy characterized by the defects in the beta globin chain of haemoglobin. Homozygous and compound heterozygous forms have an imbalance in the production of alpha and non alpha globin chains, which results in ineffective erythropoiesis and decreased production of normal haemoglobin A.⁴

In India, For about 12000 infants born every year have major form of the disease {10% of global burden} and half of these patients die before reaching adulthood. Large proportion of these early deaths are due to malnutrition.⁵

There is multi factorial association for malnutrition in thalassemia. According to the existing literature, children with thalassemia have an average energy intake lower than the recommended daily dietary allowances. Most of them belong to a more economically weaker section of the society. As a result, thalassemia patients develop multiple micronutrients deficiency which can be quoted as “hidden hunger”. So, socio economic status and literacy of parents play a major role in this regard.⁵

So, this study was taken up to assess the malnutrition status in beta thalassemia patients and various factors influencing the same in them. So that early identification of malnutrition in these patients will help in the early management of malnutrition, so that the quality of life of these patients can be improved and thereby helping to reduce the early deaths associated with malnutrition in thalassemia major patients.

METHODOLOGY

This cross sectional observational study was conducted from August 2022 to January 2025 among 100 confirmed cases of beta thalassemia major children attending department of Paediatrics, Gulbarga institute of Medical sciences, Kalaburagi in the age group of 6months to 18years. Beta thalassemia major children who are having neurological disorders, complex syndromes/genetic disorders, chronic kidney disease or chronic lung disease were excluded from the study.

The study was conducted after obtaining the ethics committee approval from Institutional Ethics committee. Informed consent was obtained from all eligible participants after explaining the objectives and nature of this study in their own language.

Malnutrition was assessed in the study subjects as soon as they are first seen and enrolled into the study. A detailed history taking, examination and relevant investigations was done. Details such as age, sex, place of residence (rural or urban), caste, per capita monthly income, socio economic status (classified based on modified B G Prasad classification)⁶, were taken. On examination, Length (for children less than 2 years), Height (for children more than 2 years), Weight was measured and BMI was calculated. Based on BMI, malnutrition was assessed using WHO BMI charts^{7,8} and the effect of above factors on the malnutrition was assessed.

In our study, malnutrition was assessed in beta thalassemia major patients using WHO BMI growth charts. The BMI was plotted on age and sex specific WHO BMI charts. WHO BMI charts of birth to 5 years was used for children aged 6 months to 5 years.⁷ And WHO BMI charts of 5 to 19 years was used for the children aged 5 to 18 years.⁸

The nutritional status of 6 months to 5 years old children was classified according to BMI based WHO classification for birth to 5 years of age as follows:⁹

Obese: BMI for age greater than +3 standard deviations (SD) of the median.

Overweight: BMI for age greater than +2 SD but equal or less than +3 SD of the median.

Normal: BMI for age equal or less than +2 SD and but more than -2 SD of the median.

Moderate acute malnutrition: BMI for age equal or less than -2 SD but equal or more than -3 SD of the median

Severe acute malnutrition: BMI for age less than -3 SD of the median.

The nutritional status of 5-18 years old children was classified according to BMI based WHO classification for 5-19 years of age as follows:⁸

Obese: BMI for age more than +2 SD.

Overweight: BMI for age more than +1 SD but equal or less than +2 SD.

Normal: BMI for age equal or more than -2 SD but equal or less than +1 SD.

Thin: BMI for age less than -2 SD but equal or more than -3 SD.

Severely thin: BMI for age less than -3 SD of the median.

Statistical data was analyzed by using statistical package for social sciences (SPSS, version 20.0). If p value is <0.05, it is considered as statistically significant.

RESULTS

Table 1: Age and gender wise distribution of children

Age in years	Males		Females		Total	
	Number	Percentage	Number	Percentage	Number	Percentage
0.5—5 years	20	33.9	16	39.0	36	36.0
5.1—18.0 years	39	66.1	25	60.9	64	64.0
Total	59	100.0	41	100.0	100	100.0
Mean ± SD	7.57 ± 4.48		8.05 ± 5.05		7.77 ± 4.68	

Table 1 shows that, 36 (36.0%) children were belonging to the age group of 0.5—5 years, 64(64.0%) children were belonging to the age group of 5.1—18.0 years. Minimum age of children in the study was 1.5 years and maximum age was 17.25 years. The mean age of male children was 7.57 years, and the mean age of female children was 8.05 years. Mean age of all children was 7.77 years. In the study, Male children were 59 (59.0%) and female children were 41 (41.0%).

In the study, 65 (65.0%) children were residing in rural area and 35 (35.0%) children were residing in urban area.

In the present study, 91 (91.0%) children were belonging to Hindu Religion and 9 (9.0%) children were belonging to Muslim. Among Hindu religion, 51 (51.0%) children were belonging to SC/ST (scheduled caste/scheduled tribe), followed by 34 (34.0%) children were belonging to OBC category.

Table 2: Socio-economic status wise distribution of children

Socio economic status Classification	Number of children	Percentage (%)
Upper Class	0	0.0
Upper Middle Class	4	4.0
Middle Class	23	23.0
Lower Middle Class	61	61.0
Lower Class	12	12.0
Total	100	100.0

Table 2 shows, Socio-economic status wise distribution of children (As per modified B G Prasad classification). Majority of children, 61 (61.0%) were belonging to Lower middle class, followed by 23 (23.0%) children were belonging to middle class, 12 (12.0%) children were belonging to lower class, 4 (4.0%) children were belonging to upper middle class and none of the children were belonging to upper class.

In our study, it was observed that; the mean height of children was 103.16 cm, the mean weight of children was 15.83 kg, the mean BMI of children was 14.46

Table 3: Age wise classification of BMI and prevalence of malnutrition in beta thalassemia major children

Age	BMI categories	Number of children	Percentage
6 months to ≤ 5 years	SAM	0	0.0
	MAM	4	11.1
	Normal	32	88.9
	Over weight	0	0.0
	Obese	0	0.0
Sub total	Total	36	100.0
5.1—18.0 years	Severe Thin	28	43.8
	Thin	18	28.1
	Normal	17	26.6
	Over weight	1	1.5
	Obese	0	0.0
Sub total	Total	64	100.0
Grand Total	---	100	100.0

Table 3 shows: In the study, out of 36 beta thalassemia major children aged 6 months to 5 years, **4 (11.1%) children were malnourished and were belonging to BMI category of MAM** and 32 (88.9%) children were belonging to normal BMI category and None of the Children were seen in the BMI categories of SAM, Overweight and Obese.

Study observed that 64 (64.0%) children were belonging to the age of 5.1 to 18 years, among them 28 (43.8%) children were belonging to BMI category of severely thin, 18 (28.1%) children were belonging to BMI category of thin, 17 (26.6%) children were belonging to BMI category of normal and only 1 (1.5%) child was overweight and None of the children were seen in the obese category of BMI. In this age group of 5.1 to 18 years, malnourished children were 46 (71.9%). So in the study the prevalence of malnutrition in beta thalassemia major children in the age group of 6months to 18 years was 50.0%. Total number of malnourished children in the study was 50. The children in the age group of 5.1 to 18 years had higher percentage of malnourished children as compared to the children in the age group of 6 months to 5 years.

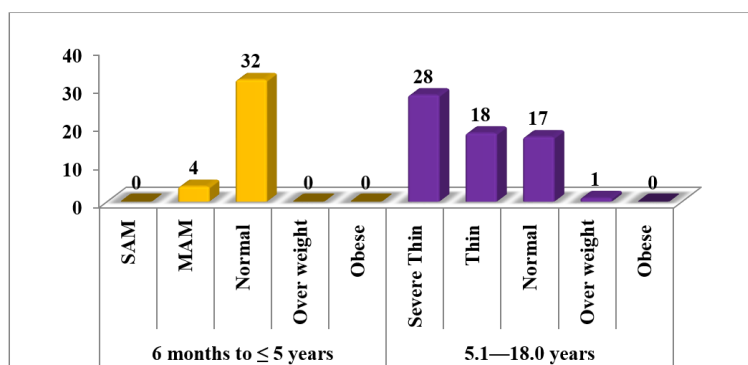


Figure 1: Age wise classification of BMI and prevalence of malnutrition in beta thalassemia major children.

Table 4: Association and predictors of malnutrition among thalassemia children with respect to demographical factors

Demographical variables	Categories	No. of malnutrition (%)	OR (95% CI)	Adjusted OR (95% CI)	Association P-value
Age	0.5—5 yrs	4 (11.1%)	1.91 (1.10-2.14)	1.94 (1.2-2.15)	$X^2= 34.02$ P = 0.000, HS
	5.1—18 yrs	46 (71.9%)			
Gender	Male	27 (45.8%)	1.53 (0.73-1.70)	1.55 (0.75-1.75)	$X^2= 1.034$ P = 0.309, NS
	Female	23 (56.1%)			
Area	Rural	42 (64.6%)	6.16 (3.3-7.12)	6.20 (3.32-7.15)	$X^2= 15.868$ P = 0.000, HS
	Urban	8 (22.8%)			
Religion/caste	Muslim	6 (66.7%)	-----	-----	$X^2= 7.89$ P = 0.049, S
	H-General	0 (0.00%)			
	H-OBC	16 (47.0%)			
	H-SC/ST	28 (55.0%)			
Mother Education	Illiterate/primary school	44 (66.7%)	9.33 (4.31-10.9)	9.30 (4.50-11.2)	$X^2= 21.57$ P = 0.000, HS
	Above Primary	6 (17.6%)			
Father Education	Illiterate/primary school	44 (65.7%)	8.60 (4.78-10.1)	8.60 (4.80-10.2)	$X^2= 19.946$ P = 0.000, HS
	Above Primary	6 (18.2%)			
Socio economic status	Class I, II, III	8 (29.6%)	3.21 (2.01-5.12)	3.25 (2.05-5.20)	$X^2= 6.14$ P = 0.013, S
	Class IV, V	42 (57.5%)			

H-Hindu, OBC-Other backward classes, SC-scheduled caste, ST-scheduled tribe, NS-Non significant, HS-highly significant, S-significant.

Table 4 shows the multivariable logistic regression analysis of association and predictors of malnutrition among thalassemia children with respect to demographical factors. The higher 46 (71.9%) number of malnourished children were in the age group of 5.1-18 years as compared to the children in the age group of 0.5-5 yrs, which is about 4 (11.1%). In the multivariable logistic regression model, **The children with older age group of 5.1 to 18 years (adjusted odds ratio [AOR], 1.94; 95% Confidence Interval (CI), 1.20–2.15) are at higher risk of malnutrition (P<0.001) as compared with children with younger age group of 6 months to 5 years.**

In our study, 27 (45.8%) male children were malnourished and 23 (56.1%) female children were malnourished. In the multivariable logistic regression model, the children with female gender (adjusted odds ratio [AOR], 1.53; 95% CI, 0.75–1.75) had no higher risk of malnutrition (P>0.05) as compared to children with male gender.

In our study, 42 (64.6%) children with rural residence were malnourished and 8 (22.8%) children with urban residence were malnourished. In the multivariable logistic regression model, the children with rural residence (adjusted odds ratio [AOR], 6.20; 95% CI, 3.32–7.15) had a higher risk of malnutrition (P<0.001) as compared to children with urban residence.

In our study, 6 (66.7%) children among Muslim religion were malnourished, 16 (47.0%) children from OBC category were malnourished and 28 (55.0%) children from SC/ST category were malnourished.

In our study, 44 (66.7%) children having mother with lower level (Illiterate/primary school) of education were malnourished and 6 (17.6%) children having mother with higher level (Above Primary) of education were malnourished. In the multivariable logistic regression model, the children having mother with lower level (Illiterate/primary school) of education (adjusted odds ratio [AOR], 9.30; 95% CI, 4.50–11.2) had a higher significant risk of malnutrition (P<0.001) as compared to children having mother with higher level (Above Primary) of education.

In our study, 44 (65.7%) children having father with lower level (Illiterate/primary school) of education were malnourished and 6 (18.2%) children having father with higher level (Above Primary) of education were malnourished. In the multivariable logistic regression model, the children having father with lower level (Illiterate/primary school) of education (adjusted odds ratio [AOR], 8.60; 95% CI, 4.80–10.20) had a higher risk of malnutrition (P<0.001) as compared to children having father with higher (Above Primary) level of education.

In our study, 8 (29.6%) children with higher Class (Class I, II, III) of socio economic status were malnourished and 42 (57.5%) children with lower Class (Class IV, V) of socio economic status were malnourished. In the multivariable logistic regression model, the children with lower Class (Class IV, V) of socio economic status (adjusted odds ratio [AOR], 3.25; 95% CI, 2.05–5.20) had a higher risk of malnutrition (P<0.05) as compared to children with higher Class (Class I, II, III) of socio economic status.

DISCUSSION

In India, For about 12000 infants born every year have major form of the disease {10% of global burden} and half of these patients die before reaching adulthood. Large proportion of these early deaths are due to malnutrition.⁵ There is multi factorial association for malnutrition in thalassemia. According to the existing literature, children with thalassemia have an average energy intake lower than the recommended daily dietary allowances. Most of them belong to a more economically weaker section of the society. As a result, thalassemia patients develop multiple micronutrients deficiency which can be quoted as “hidden hunger”.⁵

So, this study was taken up to assess the malnutrition and various factors influencing malnutrition in beta thalassemia patients, So that early identification of malnutrition in these patients will help in the early management of malnutrition. The sample size in the present study is comparable to the other studies like Mirhosseini et al,¹⁰ Upadhye et al,¹¹ and Fahim et al.¹² except for study conducted by Bijit Biswas et al,⁵ where the sample size was larger compared to our study. In our study, about 36.0% children were belonging to the age group of 0.5—5 years and 64.0% children were belonging to the age group of 15.1-18.0 years.

The mean age of male children was 7.57 years, and the mean age of female children was 8.05 years. Mean age of all children was 7.77 years.

In our study, Male children were 59.0% and female children were 41.0%.

In a study conducted by Bijit Biswas et al,⁵ Most of the study participants (37.2%) were aged between 11 and 12 years (range, 5–12 years). The mean age in the study was 8.0 years. There was almost equal representation of both sexes that is 54.0% were males and 46.0% were females.

The study conducted by Mirhosseini et al,¹⁰ had participants aged 8-18 years. The mean age in the study was 13.5 years and this study included 56.4 % boys and 43.6 % girls. In a study conducted by Sheikh et al.¹³ age range of the patients of thalassemia major was 2 to 16 years with mean age of 7.88 years.

In our study, Majority of children, 61.0% were belonging to Lower middle class, followed by 23.0% children were belonging to middle class. Similar observations were seen in a study conducted by Bijit Biswas et al, ⁵ where 48.8% were belonging to lower middle class followed by 24.1% were belonging to middle class.

In our study, Majority of children, 61.0% were belonging to Lower middle class, followed by 23.0% children were belonging to middle class. Similar observations were seen in a study conducted by Bijit Biswas et al, ⁵ where 48.8% were belonging to lower middle class followed by 24.1% were belonging to middle class.

Prevalence of malnutrition in beta thalassemia major children

In our study, out of 36 beta thalassemia major children aged 6 months to 5 years, **11.1% children were malnourished and were belonging to BMI category of MAM** and 88.9% children were belonging to normal BMI category and None of the Children were seen in the BMI categories of SAM, Overweight and Obese. 64.0% children were belonging to the age of 5.1 to 18 years, among them 43.8% children were belonging to BMI category of severely thin, 28.1% children were belonging to BMI category of thin, 26.6% children were belonging to BMI category of normal and only 1.5% child was overweight and None of the children were seen in the obese category of BMI. **In this age group of 5.1 to 18 years, malnourished children were 71.9%. So in our study the prevalence of malnutrition in beta thalassemia major children in the age group of 6 months to 18 years was 50.0%. Total number of malnourished children in the study was 50. The children in the age group of 5.1 to 18 years had higher percentage of malnourished children as compared to the children in the age group of 6 months to 5 years.**

In our study, BMI was plotted on age and sex specific WHO growth charts and other studies like Qaisar I et al,¹⁶ and Pemde et al,¹⁴ also have used WHO growth charts.

In the present study, half (50.0%) of the study participants were malnourished, which was higher than the value reported in a study of Pemde et al, ¹⁴(24.2%), study of Mirhosseini et al, ¹⁰(33.6%) and a study of Trehan et al, ¹⁵ (26.7%) and similar to the value reported in a study of Qaisar I et al, ¹⁶ (50.6%) study of Sheikh et al, ¹³ (58.69%), study of Bijit Biswas et al, ⁵ (48.2%) and a study of Fahim et al, ¹² (47.0%). The variability of the findings may be attributed to the differences in the participants' age, ethnicity, and geographical plausibility.

Association and predictors of malnutrition among thalassemia children with respect to demographical factors

In our study, The children with older age group of 5.1 to 18 years were at higher risk of malnutrition. which was similar to the findings of a study of Sheikh et al, ¹³ a study of Bijit Biswas et al⁵ and a study of Qaisar I et al.¹⁶ this indicates as disease progresses the risk of malnutrition increases.

In our study, the children with rural residence had a higher risk of malnutrition as compared to children with urban residence and higher percentage (55.0%) of children from SC/ST category were malnourished. In the study conducted by Bijit Biswas et al, ⁵ those who belonged to the SC/ST were more likely to have malnutrition.

In our study, the children having mother with lower level (Illiterate/primary school) of education had a higher significant risk of malnutrition which was similar to the findings of a study of Bijit Biswas et al, ⁵ In a study of Sheikh et al,¹³ no

significant association between parents' educational status and nutritional status of children was seen. So health education of parents regarding the disease process and complication is necessary to prevent malnutrition in thalassemia major patients.

In our study, the children belonging to lower Class (Class IV, V) of socio economic status had a higher risk of malnutrition. In a study of Bijit Biswas et al,⁵ as most of the study participants belonged to a more economically impoverished section of the society, such as those living in remote rural areas, the high incidence of malnutrition was seen. So parents of children with thalassemia major needs to have adequate monetary support from governing bodies to overcome malnutrition in their children with thalassemia major.

CONCLUSION

In our study the prevalence of malnutrition in beta thalassemia major children in the age group of 6months to 18 years was 50.0%. So periodic growth assessment once in every 3 months is necessary for early detection and management of malnutrition in these patients for better outcome.

In our study, The children with older age group of 5.1 to 18 years were at higher risk of malnutrition as compared to children in the age group of 6months to 5years, the children with rural residence had a higher risk of malnutrition as compared to children with urban residence, the children having mother with lower level (Illiterate/primary school) of education had a higher significant risk of malnutrition and the children belonging to lower Class (Class IV, V) of socio economic status had a higher risk of malnutrition. All these point towards the socio demographic factors significantly influencing malnutrition in these patients, So these thalassemia major children and their families needs to have adequate monetary support from governing bodies to overcome malnutrition in their children with thalassemia major as malnutrition has a multifactorial association in these patients, one among them is the presence of hidden hunger in these patients due to poor calorie intake as well as disease process itself predisposing to malnutrition in these patients.

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