COEXISTENCE OF IRON DEFICIENCY ANAEMIA (IDA) AND BETA THALASSAEMIA TRAIT (β-TT)

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Abstract

Background: *The WHO estimates that about 7% of the world population are thalassaemia trait and increasing number of cases are being detected. The world population of carrier of β thalassamia is reported to be more than 100 million. Bangladesh also lies in thalassaemic Belt. A conservative world health report estimates that 3% of our populations are carrier of β thalassaemia which means that there are 3-6 million of β thalassaemia are in Bangladesh. To manage thalassaemia and thalassaemia trait, our traditional concept is not to give iron or iron conaining food. But concomitant iron deficiency anaemia in thalassaemia trait patient may be fatal. Those patients should be evaluated by serum ferritin or by the iron profile and treatment should be supplemented with rational amount of iron.*

Methodology: *This cross sectional observational study was carried out on 75 patients from 03 to 59 years of age of both sex of Beta Thalassaemia Trait, in the department of Medicine and Haematology of Dhaka Medical College Hospital (DMCH) and Bangabandhu Sheikh Mujib Medical University (BSMMU) from January, 2015 to December, 2015. The patients previously diagnosed as Beta Thalassaemia Trait was included in study population.*

Result: *In this study out of 75 Beta Thalassaemia Trait patients, 21 had evidence of Iron Deficiency Anaemia (IDA) and 54 patiens had no evidence of IDA. Thus the frequency of coexistent Beta Thalassaemia Trait and IDA in this study is 28%. The mean Hb concentration was 9.66 gm/dL (±1.54) which is 8.48 gm/dL (±1.43) and 10.12 gm/dL(±1.34) in Beta Thalassaemia Trait with IDA patients and Beta Thalassaemia Trait without IDA patients respectively. So the Hb concentration is significantly lower in β-TT with IDA patients than those without IDA (p-value < 0.001). The mean of Hb A_2 level was 4.87(%) (±0.54) which is 4.44(%) (±0.40) and 5.03(%) (±0.50) in Beta Thalassaemia Trait with IDA patients and Beta Thalassaemia Trait without IDA patients respectively. So the Hb A_2 level is significantly lower in Beta Thalassaemia Trait with IDA patients than those without IDA (p-value < 0.001).*

Conclusion: *From this study, it could be concluded that the frequency of IDA in Beta Thalassaemia Trait is about 28%. The degree of anaemia is more severe and the level of Hb A_2 is much lower in Beta Thalassaemia Trait with IDA patients than Beta Thalassaemia Trait without IDA.*

Key Words: *Iron Deficiency Anaemia (IDA), Beta Thalassaemia Trait, Hb electrophoresis.*

DOI: https://doi.org/10.3329/jdmc.v31i2.73122
J Dhaka Med Coll. 2022; 31(2) : 182-186

Introduction:

The thalassaemias are a group of genetic disorders of haemoglobin synthesis, all of which result from a reduced rate of production of one or more of the globin chains of haemoglobin[1]. Several types of thalassaemia have been described and named according to the affected globin chain, the most common type of clinical importance being α, delta beta and beta thalassaemia[3].

Thalassaemia is considered the most common genetic disorder worldwide[4]. 0.3-0.5 millions of children are born each year with the severe homozygous states of this diseases. The diseases is highly prevalent in Mediterranean countries, Middle East, Southern and Eastern Asia, the Soth

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Received: 21/04/2022 ***Revision:*** 19/05/2022 ***Accepted:*** 06/06/2022

Pacific and South China with reported carrier rates ranging from 2% to 30%[3]. A conservative World Health report estimates that 3% of our populations are carrier of β thalassaemia which means that there are 3-6 million of â thalassaemia are in Bangladesh. Affected births per thousand of β thalassaemia are 0.106. That means more than two thousand thalassaemia children are born every year in Bangladesh[2].

Iron deficiency is widely prevalent in our country and β thalassaemia is also common. Both produce microcytic hypochromic blood picture of the red cell which is one of the commenest abnormalities that a clinician comes across in Bangladesh. Iron deficiency may coexist with β thalassaemia trait. Iron deficiency is found in 27.2% of Beta Thalassaemia Trait in Northern India[5]. In area where iron deficiency is common, the carrier state of β thalassaemia may be missed. It is often impossible to differentiate between iron deficiency anaemia and Beta Thalassaemia Trait either examing the red cell morphology or by the red cell indices.

In this situation the present study has been undertaken to find out the pattern of iron status in β thalassaemia trait patient to determine the presence or absence of coexisting iron deficiency. Therfore, detection iron deficiency in Beta Thalassaemia Trait would assist in decisions regarding therapy with iron[6].

Materials and Method:

This cross sectional observational study was carried out on 75 patients of both sex of β-TT, in the department of Medicine and Haematology of DMCH and BSMMU from January, 2015 to December, 2015. The patients previously diagnosed as Beta Thalassaemia Trait on the basis of capillary Hb electrophoresis was included in study population. Then informed written consent was taken and history taking with physical examination were done in a predesigned data collection sheet. Then required investigation like complete blood count (CBC), serum iron profile and calculated transferrin saturation (TSAT) were done to diagnose IDA. The mean and standard deviation (SD) of variables were calculated and two sample z- test were used, statistical analysis was done using SPSS for windows version 20. Result was expressed as frequency, percentage, mean (±SD), and range. Statistical significance is set at 0.05 level and confidence interval at 95% level.

Operational Definitions

- **For Beta Thalassaemia Trait:** Hb A_2 level > 3.5% [1, 4]
- **For iron deficiency:**

1. Serum ferritin level <15 µgm/L (Normal value, 15-300 µgm/dl)[7] with or without
2. Serum Iron <40µgm/dl (Normal value 41-141µgm/dl)[8]
3. Serum TIBC >407 µgm/dl (Normal value, 251-406 µgm/dl) [8]
4. Serum Transferrin saturation (T Sat) <16% (Normal value 16-35%) [8,9]

Results

This cross sectional descriptive study was carried out a total 75 patients of Beta Thalassaemia Trait, in the department of medicine and department of haematology DMCH and the department of haematology of BSMMU from January, 2015 to December, 2015. The mean age was 25.46(±13.99) years with a range from 03 to 59 years. The mean age was found 28.46 (±13.53) in male and 24.71 (±14.11) in female. Among the patients 15 (20%) were male and 60 (80%)were female

Table-I

Age and Sex distribution of the study subjects (n=75)

Age group	Sex		Number of Patients (n=75)	Percentage (%)
	Male	Female		
0-9 Years	2	7	9	12
10-19 Years	1	17	18	24
20-29 Years	5	19	24	32
30-39 Years	4	8	12	16
40-49 Years	2	4	6	8
> 50 Years	1	5	6	8
Total	15 (20%)	60 (80%)	75	100
Mean (±SD)	28.46 (±13.53)	24.71 (±14.11)	25.46 (±13.99)	
Minimum, Maximum	3, 54	3, 59	3, 59	

Among the 75 patients of Beta Thalassaemia Trait, 21 (28%) patients had coexisting IDA and 54 (72%) patiens had no evidence of IDA. Among the Beta Thalassaemia Trait patient with IDA only 03 were male (4% of total patient) and 18 were female (24% of total patient).

Table-II

Distribution of Beta Thalassaemia Trait (β-TT) with coexistent IDA (n = 75)

β-TT patients	Sex		Total	Percentage (%)
	Male (15)	Female (60)		n= 75
β-TT with IDA	3 (4%)	18 (24%)	21	28.0
β-TT without IDA	12 (16%)	42 (56%)	54	72.0

The mean Hb concentration of total Beta Thalassaemia Trait patient was 9.66 gm/dL (±1.54) but it was 8.48 gm/dL (±1.43) in Beta Thalassaemia Trait with IDA patient and 10.12 gm/dL (±1.34) in those without IDA. So the Hb concentration is significantly lower in Beta Thalassaemia Trait with IDA patients than those without IDA (p-value < 0.001).

Table-III

Hb Concentration (gm/ dL) in β-TT patients in IDA and those without IDA (n= 75)

β-TT patients	Mean	Minimum	Maximum	SD	SE	z Value	p value
β-TT with IDA (n=21)	8.48	6.10	10.90	1.43	0.31	4.59	< 0.001
β-TT without IDA (n=54)	10.12	7.30	13.10	1.34	0.18		
Total β-TT (n=75)	9.66	6.10	13.10	1.54	0.17		

In this study, the mean Hb A_2 level (%) of total Beta Thalassaemia Trait patient was 4.87% (±0.54) but it was 4.44% (±0.40) in Beta Thalassaemia Trait with IDA patient and 5.03% (±0.50) in those without IDA. So the Hb A_2 level is significantly lower in Beta Thalassaemia Trait with IDA patients than those without IDA (p-value < 0.001).

Table-IV

Hb A_2 (%) level in β-TT patients (n = 75)

β-TT patients	Mean	Minimum	Maximum	SD	SE	z value	p value
β-TT with IDA (n=21)	4.44	3.90	5.40	0.40	0.088	5.36	< 0.001
β-TT without IDA (n=54)	5.03	3.88	6.37	0.50	0.068		
Total β-TT(n=75)	4.87	3.88	6.37	0.54	0.063		

Discussion

In this study out of 75 patients of both sex of Beta Thalassaemia Trait from January 2015 to December 2015, 21 (28%) patients had coexisting IDA of which 03 were male and 18 were female patients. Out of 75 patients 0f Beta Thalassaemia Trait there is 54 (72%) patiens had no evidence of IDA of which 12 were male and 42 were female patients. Thus the prevalence of coexisting Beta Thalassaemia Trait and IDA in this study is 28% which is more common in female patients. Majority (32%) of the respondents was found in the age group of 21-29 years. The mean age was found 28.46 (±13.53) in male and 24.71 (±14.11) in female.

In India, Mehta BC (1989) examined 150 of beta thalassemia minor patients which comprises of 59 males and 91 females and 29.67% of females and 3.38% of males are found to be iron deficient [10]. N.Madan, Sikka, Sharma, Rusia [5] in a Delhi based study noticed coincidental iron deficiency in 33 (37%) out of 88 â-TT children. In a study based on Lohana children in Bombay (1989) Mehta found 20.8% suffering from coincidental iron deficiency [11]. A cross sectional observational study was conducted in department of pediatrics in a multispeciality hospital in Kolkata, from March 2009 to August 2011 was carried out to determine the frequency of coexistence of IDA among children with β-TT

aged 1 to 12 yrs. Only 6 of 46 beta thalassemia carriers (13%) were found to have coexisting iron deficiency anaemia. This frequency of coexistence was lower than that was noted by Hinchcliffe and Lilleyman (1995) who found coexisting iron deficiency in 26 out of 77(34%) Beta Thalassaemia Trait children in a large multicentric study among British Asian Children [12].

The mean Hb concentration was 9.66 gm/dL (±1.54) with a range from 6.10 to 13.10 gm/dL. In Beta Thalassaemia Trait with IDA patient the mean Hb concentration was 8.48 gm/dL (±1.43) with a range from 6.10 to 10.90 gm/dL. In Beta Thalassaemia Trait without IDA patient the mean Hb concentration was 10.12 gm/dL (±1.34) with a range from 7.30 to 13.10 gm/dL. So the Hb concentration is significantly lower in Beta Thalassaemia Trait with IDA patients than those without IDA (p-value < 0.001). However, a study by Alperin et al. in 1976 included 33 patients of Beta Thalassaemia Trait with evidence of iron deficiency and showed lower initial Hb evels, which improved after iron replacement therapy [13] . Saraya et al. (1984) in their study, attempted to explain that iron deficiency in Beta Thalassaemia Trait leads to lack of hemopoietic nutrients in addition to imbalance in globin chain synthesis resulting in further reduction in Hb production[14].

In this study The mean Hb A_2 level (%) of total Beta Thalassaemia Trait patient was 4.87% (±0.54) but it was 4.44% (±0.40) in Beta Thalassaemia Trait with IDA patient and 5.03% (±0.50) in those without IDA. So the Hb A_2 level is significantly lower in Beta Thalassaemia Trait with IDA patients than those without IDA (p-value < 0.001). Few authors have reported a significantly lower Hb A2 levels in patients with concomitant Beta Thalassaemia Trait and iron deficiency compared to those with uncomplicated Beta Thalassaemia Trait [12,13,15] , while others have failed to elicit such a difference [8,16] . One of the reasons of these discrepant results appears to be the variance in cutoff level of serum ferritin to define iron deficiency. Wasi et al. (1968) have suggested that beta chains may be more competitive than delta chains in heme binding leading to less Hb A2 formation in heme deficiency. Lack of iron may also interfere with delta chain synthesis [15] .

Conclusion

From the study it could be concluded that the prevalence of coexisting Beta Thalassaemia Trait and iron deficiency anaemia (IDA) is about 28%. In patients of Beta Thalassaemia Trait with IDA the degree of anaemia is more severe and the level of Hb A_2 is much lower than those of Beta Thalassaemia Trait patients without IDA.

Limitations

Sample size is relatively small in relation to huge number of populations and will not reflect the exact picture of the country. No follow-up could be carried out to revisit the investigation. The diagnosis of Beta Thalassaemia Trait at the time of diagnosis of IDA and previously diagnosed Beta Thalassaemia Trait were not differentiated.

Ethical Issues and Conflict of Interest

Patients (subjects) and key relatives were clearly informed about the scope and limitation of study. Informed written consent was obtained from the patients (subjects) or from parents if patient (subject) was unable to provide reliable information. Confidentiality of the patients (subjects) about personal information were strictly maintained. The study was accepted by Bangladesh College of Physicians and Surgeons (BCPS) for FCPS Medicine examination. No conflict of interest was declared by the authors regarding the study.

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