

Lipid Profile In Thalassemia Patients Common In Eastern India And It's Correlation With Erythroid Bone Marrow Activity

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Abstract

Introduction

Lipid abnormalities, including low levels of all fractions of serum lipids have been repeatedly reported in all phenotypes of Beta- thalassemia patients. In the present study, the low lipid profile of various groups of thalassemia patients have been correlated with erythroid bone marrow activity.

Aims and objectives

The main aim of this cross sectional study is to evaluate the lipid profile in thalassemia patients common in Eastern India and its correlation with erythroid bone marrow activity.

Materials and methods

The study was conducted in the Department of General Medicine, Calcutta National Medical College And Hospital (CNMCH), Kolkata, India. The study population consisted of hundred Beta -thalassemia patients admitted in CNMCH. The period of study was one year and consisted mostly of E-Beta thalassemia patients(61%).

Results

Results proved that the higher erythroid bone marrow activity with the enhanced cholesterol consumption could be the dominant mechanism implicated in the lipid abnormalities of thalassemia patients.

Conclusion

The present study showed that hypolipidemia and erythroid hyperplasia was present in all groups of Beta-thalassemia patients. The extent of hypolipidemia and erythroid hyperplasia were most pronounced in E-Beta thalassemia patients and the abovementioned correlation was unrelated to hemoglobin levels and S.G.P.T(as a marker of liver injury).Future studies are required to compare the cardiovascular morbidity and mortality among different groups of Beta- thalassemia patients and to interpret the effect of hypolipidemia in them.

Keywords: E- β Thalassemia ,Hypolipidemia ,Erythroid hyperplasia

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I. Introduction

[1] The thalassemias are a group of congenital anemias that have in common deficient synthesis of one or more globin subunits of the normal human hemoglobin. [2]Approximately 3% of the World's population (150 million people) carry beta thalassemia genes. [2]In Indians frequencies between 3.5% and 14.9% have been reported.

[3-6]Lipid abnormalities including low levels of all fractions of serum lipids have been repeatedly reported in all phenotypes of beta thalassemia- the concentration of all fractions of serum lipids were found below normal in thalassemia major.

[7]Data of the study published on Int Jnl Lab Hem 2007shows that plasma lipids and lipoprotein pattern of thalassemia intermedia patients are not influenced by age, gender etc.

In our present study, we are going to document the low lipid profile of various groups of beta thalassemia patients(of which E beta thalassemia patients are the commonest) and will try to find out the correlation with the erythroid bone marrow activity.

II. Materials And Methods

The study was conducted in the department of General Medicine, Calcutta National Medical College And Hospital (CNMCH), Kolkata, India.

Duration of study: 1 year

Sample Size: 100 thalassemia patients

Selection of the subject: The patients were taken from the Hematology Clinic and the General Medicine ward, according to the inclusion and exclusion criteria and after obtaining proper consent through a consent certificate.

Inclusion and exclusion criteria for entry of subjects in the study:

- a) **Inclusion Criteria:** Patients > 12 years of age, diagnosed patients of HbE-beta thalassemia, Thalassemia intermedia(TI), beta thalassemia major(BTM) and beta thalassemia trait(BTT) were selected to participate in this study .
- b) **Exclusion criteria:** Patients < 12 years of age, alpha thalassemia and other compound heterozygotes, patients having family history of dyslipidemia were excluded to take part in the study.

Parameters studied-

- 1. Lipid profile
 - a. LDL
 - b. HDL
 - c. VLDL
 - d. Triglyceride (TG)
 - e. Total cholesterol (TC)
- 2. Myeloid-erythroid ratio (MER)
- 3. Body mass index (BMI)
- 4. Hemoglobin (Hb)
- 5. Liver function test (LFT)
- 6. Marrow iron (MI)

III. Statistical Analysis

Statistical analysis was done by the following methods:

- a) **For continuous variable-**
T-test, ANOVA and Multiple Regression Analysis
- b) **For nominal variable-**
Chi square test(where applicable) and Fischer’s test
- c) **For simple descriptive data-**
Mean, standard deviation and frequency

The study was a cross sectional one (without controls)

A correlation was detected between lipid profile and erythroid bone marrow activity (by MER) and its relationship with age, sex, Hb levels, LFT, MI etc.

IV. Results And Analysis

In the present study conducted with 100 patients of thalassemia diagnosed by Hb electrophoresis, 52 patients were male , 72 had normal Marrow Iron(MI).

The patients were divided into four groups:

- a) group A had 25 β-thalassemia major patients,
- b) group B had 61 patients of Hb-E beta thalassemia while
- c) group C consisted of 7 patients of Thalassemia intermedia and
- d) group D - 7 patients of β-Thalassemia trait.

Among 4 groups of 100 thalassemia patients:

- a) group A had a minimum MER of 1.10(1.1:1) and maximum MER was 1.40(1.4:1),
- b) group B had a minimum MER of 0.10(0.1:1) and maximum MER was 1.40(1.4:1),
- c) group C had a minimum and maximum MER of 0.33(0.33:1) and 1.40(1.4:1) respectively.
- d) group D had minimum MER was 1.20(1.2:1) and maximum was 1.40(1.4:1).

TABLE 1 ANOVA

		Sum of squares	df	Mean square	F	Level of Sig.
MERATIO (x)	Between Groups	24.453	3	8.151	1025.113	p≤0.05
	Within Groups	.732	92	.008		
	Total	25.185	95			
BILTOT	Between Groups	65.445	3	21.815	2.834	p≤0.05
	Within Groups	738.950	96	7.697		
	Total	804.396	99			
BILCONJ	Between Groups	16.106	3	5.369	1.447	NS
	Within Groups	356.167	96	3.710		
	Total	372.273	99			

Lipid Profile In Thalassemia Patients Common In Eastern India And Its Correlation With Erythroid

SGPT	Between Groups Within Groups Total	145936.06 233991.65 379927.71	3 96 99	48645.352 2437.413	19.958	p≤0.05
SGOT	Between Groups Within Groups Total	55664.626 157138.93 212803.56	3 96 99	18554.875 1636.864	11.336	p≤0.05
ALB	Between Groups Within Groups Total	.015 11.490 11.505	3 96 99	.005 .120	.042	NS
GLOB	Between Groups Within Groups Total	2.030 15.983 18.012	3 96 99	.677 .166	4.063	p≤0.05
ALKPHOS	Between Groups Within Groups Total	28789.212 148211.38 177000.59	3 96 99	9596.404 1543.869	6.216	p≤0.05
AGE	Between Groups Within Groups Total	946.193 2453.597 3399.790	3 96 99	315.398 25.558	12.340	p≤0.05
BMI	Between Groups Within Groups Total	131.133 26.314 157.448	3 96 99	43.711 .274	159.466	p≤0.05
LDL	Between Groups Within Groups Total	17687.972 7599.588 25287.560	3 96 99	5895.991 79.162	74.480	p≤0.05
HDL	Between Groups Within Groups Total	387.594 1539.646 1927.240	3 96 99	129.198 16.038	8.056	p≤0.05
VLDL	Between Groups Within Groups Total	1491.490 1646.300 3137.790	3 96 99	497.163 17.149	28.991	p≤0.05
TG	Between Groups Within Groups Total	48950.941 38874.059 87825.000	3 96 99	16316.980 404.938	40.295	p≤0.05
TC	Between Groups Within Groups Total	33185.283 8617.157 41802.440	3 96 99	11061.761 89.762	123.234	p≤0.05
Hb	Between Groups Within Groups Total	67.149 30.132 97.280	3 96 99	22.383 .314	71.312	p≤0.05

Significant = $p \leq 0.05$, Nonsignificant (NS) = $p > 0.05$, MERATIO – Myeloid erythroid ratio, BILTOT- Total Bilirubin, BILCONJ- Conjugated Bilirubin, SGOT – Serum Glutamic oxaloacetic transaminase, SGPT – Serum Glutamic pyruvic transaminase, ALB –Albumin, GLOB- Globulin, ALKPHOS- Alkaline phosphatase, BMI- Basal Metabolic Index, LDL- Low density lipid, HDL – High Density Lipid, VLDL- Very low density lipid, TG- triglyceride, TC – Total count, HB – Haemoglobin.

From the above table it can be concluded that the total bilirubin, SGPT, SGOT, globulin, Alkaline phosphatase, Age, BMI, total count, haemoglobin levels and most importantly the myeloid erythroid ratio, LDL, HDL, VLDL and Triglyceride levels are all statistically significant among the different groups of Thalassemia as well as within the groups unlike Albumin and conjugated bilirubin which are not significant.

TABLE 2 Coefficients^b

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
1	(Constant)	1.945	.840		
	BMI	.202	.038	-.495	2.316
	LDL	.014	0.002	.432	-5.366
	HDL	.017	.006	.148	5.881
	VLDL	.030	.005	.323	5.757
	TG	.001	.001	0.062	.855
	HB	.052	.039	.101	1.325
	SGPT	.001	.001	-.082	-1.260
	THALTYPE	.319	.074	.482	4.305

Dependent Variable MERATIO (x), THALTYPE – Type of thalassaemia, $p \leq 0.05$ = Significant, $p > 0.05$ = Nonsignificant(NS)

From the above correlation table we conclude BMI as well as the lipid levels – LDL, HDL and VLDL all has significant correlation with Myeloid erythroid ratio i.e. more is the extent of erythroid hyperplasia the more is the extent of hypolipidaemia in these patients which is in concordance with the previous studies furthermore this correlation between ME ratio and lipid profile is not influenced by triglyceride and haemoglobin levels as well as SGPT (as a marker of liver function)

TABLE 3

Table showing patients and their average lipid profile values (LDL,HDL,VLDL,TG)

Type	Number of patients	LDL (mg/dl)	HDL (mg/dl)	VLDL (mg/dl)	TG (mg/dl)
β -thalassemia major	25	75.04	27.84	26.72	139.76
HbE β -thalassemia	61	43.66	26.00	17.70	87.48
Thalassemia intermedia	7	57.00	32.29	22.14	95.71
β -thalassemia trait	7	57.14	31.14	22.57	107.14

As seen in Table 1: Hypolipidemia though present in all groups of thalassemia was most marked in E- β thalassaemia followed by intermedia and trait and least in those patients of β thalassemia.

Thus Hypolipidemia(TC<150mg) was present in all the patients of thalassemia along with erythroid hyperplasia.The hypolipidemia present in E beta thalassemia patients was of marked degree along with marked erythroid hyperplasia proving a direct relationship between the 2 parameters(hypolipidemia and erythroid hyperplasia).

V. Discussion

Hypolipidemia was present in all the patients of thalassemia studied(TC<150mg/dl).The extent of hypolipidemia was most pronounced in the Hb-E beta thalassemia patients(TC<100mg/dl) with hypolipidemia being present in also the other groups(BTM-TC<150mg/dl, TI and BTT patients had TC<120mg/dl).

Marrow erythroid hyperplasia was present in all the patients of thalassemia studied, with marked erythroid hyperplasia being present in Hb E beta thalassemia patients. The hypolipidemia present in these patients was also of marked degree which proves the hypothesis-[7,8]“The higher erythroid bone marrow activity with the enhanced cholesterol consumption could be the dominant mechanism indicated in the lipid abnormalities of thalassemia patients”(Normal MER-8:1-2:1).

The abovementioned correlation was not influenced by Hb levels, SGPT(marker of liver injury)levels. BMI had a significant correlation with MER, but inspite of that lipid levels (LDL,HDL,VLDL) had maintained significant correlation with MER. Among lipids, LDL, HDL, VLDL had significant correlation with MER, the more is the extent of erythroid hyperplasia, the more is the extent of hypolipidemia (LDL,HDL,VLDL).

Furthermore, [9] low levels of TC with or without hypertriglyceridemia have been frequently described in variety of hematologic disorders in which anemia is a prominent feature.

Our study did not show any abnormality of significance with respect to TG levels.

[10] In the study of “lipid profile in Jordonian children withBeta thalassemia major”, it was found that majority of the participants had low TC ,HDL and LDL levels which is in concordance to our study. [11]Papanastasiou et. al have showed that TC, HDL &LDL were significantly decreased, while TG levels were significantly increased in the thalassemia patients compared to the control subjects.

However, [12] a recent report showed that adolescent with beta thalassemia minor have significantly low TC levels than patients with beta thalassemia major. Our study also showed that BTI &BTT patients had lipid levels lower than that of BTM patients. [13] The investigations suggested that this has been related to their disorder and not influenced by age, gender, Hb or ferritin levels. Our study also demonstrated that this was not influenced by Hb and SGPT levels. The LDL lowering effect of thalassemia trait is evident even in patients of familial hypercholesterolemia.

VI. Summary And Conclusion

Thus our present study illustrated that hypolipidemia was present in all the patients of thalassemia studied of which marked degree of hypolipidemia was found in E beta thalassemia patients (commonest variety of thalassemia found in Eastern India). [14]The erythroid hyperplasia was also of marked degree in E-beta thalassemia patients, thus indicating a direct relationship between hypolipidemia and erythroid hyperplasia and proving the hypothesis”. “The erythroid bone marrow activity with the enhanced cholesterol consumption could be the dominant mechanism indicated in the lipid abnormalities of thalassemia patients.” This direct relationship was not related to Hb levels and liver injury.

[15] Importance of the study lies in the fact that a partially improved cardiovascular risk profile has been observed with respect to a low packed cell volume and low density lipoprotein cholesterol in carriers of beta thalassemia. However, further studies are required to document the clear survival benefit of these group of patients with low lipid profile, in comparison to the general population. Studies are also required to compare the cardiovascular morbidity and mortality among different categories of beta thalassemia patients and to interpret the effect of hypolipidemia in them.

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