

SERUM CALCIUM, PHOSPHORUS AND PARATHORMONE LEVEL IN CHILDREN WITH THALASSEMIA

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ABSTRACT

BACKGROUND

Thalassemia is commonest cause of chronic haemolytic anaemia. Individuals with thalassemia usually present within the first two years of life with severe anaemia, requiring regular RCC transfusions. Present transfusion regimens protocols have increased the life expectancy with thalassemia, but caused a progressive iron overload. As a result of iron overload, those patients develop endocrine abnormalities.

AIM OF STUDY

To study the serum calcium, phosphorus and parathormone levels in children with thalassemia.

SETTING

Thalassemia Day Care Centre in Chacha Nehru Balchiktsalaya, Indore.

DESIGN

Cross-sectional study.

PARTICIPANTS

Patients attending Thalassemia Day Care Centre in Chacha Nehru Balchiktsalaya, Indore.

METHOD

Fifty children with thalassemia from 4 years to 14 years, those who are requiring frequent blood transfusion and attending Outpatient and In-Patient Department were selected for study. Blood investigation for serum calcium, phosphorus and Parathormone was taken, and analyzed by appropriate test.

RESULT

Total 50 patients enrolled in this study. Out of 50 cases 6(12% cases) had low serum parathormone level which suggest hypoparathyroidism. In these 6 cases, all had low calcium level and 4 had high phosphorus level. Patients in 11-14 years age group had significant low calcium, high phosphorus and low parathormone as compared to 4-10 years of age group. In our study, there are no statistically significant correlation between APCRR and hypoparathyroidism significant.

STATISTICAL ANALYSIS

For statistical analysis independent, t-test and Pearson correlation test was used.

CONCLUSION

Incidence of hypoparathyroidism is more in thalassemia patients. In our study, 12% cases had low parathormone level. Children with thalassemia belong to group 11-14 years (Out of 15 cases, 6 had low serum parathormone level), have significantly high incidence of hypoparathyroidism as compared to 4-10 years of age group. So, it is very important to actively investigate for hypoparathyroidism after 10 years of age.

KEYWORDS

Hypoparathyroidism, Thalassemia, APCRR.

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INTRODUCTION

Thalassemia is one of the most common genetic disorder globally. It represents the commonest cause of chronic haemolytic anaemia. Thalassemia is a haemolytic state of an inherited defect in alpha and beta-globin chain synthesis. In thalassemia, impaired biosynthesis of the alpha and beta globin leads to accumulation of unpaired beta and alpha-globin chain respectively, shortened red cell life span and iron overload cause functional and physiological abnormalities in various organ system.¹⁻³

Individuals with thalassemia usually present within the first two years of life with severe anaemia, requiring regular Red Blood Cells (RBCs) transfusions. Thalassemia is associated with characteristic bone deformities that are considered the result of continuous massive ineffective erythropoiesis. These abnormalities resolve with regular transfusions starting early in life.⁴

Present transfusion regimens protocols have increased the life expectancy with thalassemia, but caused a progressive iron overload. As a result of iron overload those patients develop liver, heart, endocrine abnormalities. Iron deposition in the parathyroid gland, which in turn may cause hypoparathyroidism. Hormones of parathyroid gland especially parathormone and calcitonin hormones regulate normal levels of calcium and phosphorus in blood.

Hypoparathyroidism is reported to affect 3% to 7% of patients and is attributed to iron deposition in the parathyroid.⁵⁻⁶

Extreme hypocalcaemia is a frequent late event. Early detection requires periodic estimation of calcium homostasis. Serum calcium levels below 7mg/dl, phosphorus above 7mg/dl and low parathormone <12pg/dl is suggestive of hypoparathyroidism.⁷ Symptoms are usually mild and include paraesthesia, muscle pain and when severe tetany and even convulsions.⁸ A decrease of parathyroid hormone levels in the absence of symptoms has been reported in over 12% of the patients.⁹

METHODOLOGY

- Type of study-Prospective Cross-Sectional Study.
- Place of study-This study was carried over for one year in Thalassemia Centre in Chacha Nehru Balchikitsalaya, Indore.
- Sample size 50 cases.
- Source of data. The study includes children with thalassemia from 4 years to 14 years that requiring frequent blood transfusion and attending Outpatient and In-Patient Department.
- Method: Patient undergo blood investigation for serum calcium, phosphorus and parathormone. A 4ml venous blood was collected in a plain vial aseptically. Serum parathormone was estimated antibody radio-immunoassay.
- Results were interpreted using independent t-test by using computerized SPSS system.

INCLUSION CRITERIA

Thalassemia patients included in the study are:

- Aged from 4-14 years who requiring regular packed red blood cells transfusion.

EXCLUSION CRITERIA

- Having some renal disease.
- Malabsorption syndrome.
- On long term anticonvulsant therapy.
- Taking vitamin D and calcium supplementation.

RESULT

Maximum no. of patients 35(70%) belong to 4-10 years of age group I. Only 15(30% of cases) were belonging to 11-14 years of age group II.

In group I mean calcium level is 8.4571±0.685 and group II 7.36±0.75, which is significantly (p value <0.001) low in

group II. Mean phosphorus level 5.1457±0.65 and 6.2±0.91 in group I and group II respectively, which shows significant (p value <0.001) high level in group II. Mean parathormone level is 35.055±19.9 and 16.06±9.82 in group I and II respectively, which suggest that low parathormone level in group II significantly (p value <0.001).

By using Pearson Correlation, no correlation found between APCRR and serum calcium, phosphorus and parathormone level in thalassemia patients.

DISCUSSION

β-thalassemia is the commonest single-gene disorder in the Indian population.¹⁰ A 10% of the total world thalasseemics are born in India every year.¹¹ Certain communities in India like Sindhi, Gujarati, Punjabi and Bengali are more commonly affected with betathalassemia. The incidence varying from 1% to 17%.¹² (Gupta et al., 2003). It has been estimated that the prevalence of pathological hemoglobinopathies in India is 1.2/1,000 live births.¹³ and with approximately 27 million births per year.¹⁴ This would suggest the annual birth of 32,400 babies with a serious hemoglobin disorder.

In total 50 cases mean calcium level is 8.1280±0.86, mean phosphorus level is 5.46±0.875 and mean parathormone level 29.7±19.59 in all 50 cases. Out of 50 cases, 6 (12% cases) had low serum parathormone level which suggest hypoparathyroidism. In these 6 cases, all had low calcium level and 4 had high phosphorus level. In study done by Cao A, Galanello R, Rosatelli MC, et al. in 1996 suggests that asymptomatic hypoparathyroidism is reported in 3%-7% of patients.⁵⁻⁶ In our study, we found 12% cases had asymptomatic cases.

In our study it demonstrates that significantly reduced level of serum calcium, serum parathormone and high phosphorus level in children with thalassemia belong to age group 11-14 years as compared to 4-10 years of age group which suggest that risk of hypothyroidism increasing with age.

In our study there are 6 cases diagnosed as hypoparathyroidism, from them 3 cases received 120cc/kg/year, 1 received 180cc/kg/year and 2 cases received 240cc/kg/year packed red blood cell transfusion. So, in our study it was observed that there is no clear relationship between hypoparathyroidism and APCRR (Annual Packed Cell Requirement Rate) by using Pearson Correlation Test. The cause of hypoparathyroidism in thalassemia is assumed to be iron deposition in parathyroid glands, but the reason why some patients develop hypoparathyroidism and others do not is not exactly known.¹⁵ A number of possible mechanisms have been described to be responsible for glandular damage through iron overload.¹⁶ These include free radical formation and lipid peroxidation resulting in mitochondrial, lysosomal and sarcolemmal membrane damage and a number of surface transferrin receptors in the cell and the ability of the cell to protect itself against inorganic iron.

LIMITATIONS

It is a small and one time study. We had not got serum ferritin level >1500ng/ml, so we could not interpret relationship between serum ferritin level and parathormone level.

CONCLUSION

Incidence of hypoparathyroidism is more in thalassemia patients. In our study, 12% cases had low parathormone level.

Children with thalassemia belong to group 11-14years (Out of 15 cases 6 had low serum parathormone level) have

significantly high incidence of hypoparathyroidism as compared to 4-10 years of age group. So, it is very important to actively investigate for hypoparathyroidism, after 10 years of age, so that the treatment can be initiated without delay.

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OBSERVATION TABLES

Age	No. of Cases	Percentage
4-10	35	70
11-14	15	30

Table 1: Age Distribution of Cases

Frequency	No. of Cases	Percentage
1 unit/month	35	70
1.5 unit/month	5	10
2 unit/month	8	16
> 2 unit/month	0	0

Table 2: Frequency of Blood Transfusion

APCRR	NO. OF CASES	PERCENTAGE
120	35	70
180	5	10
240	8	16

Table 3: Annual Packed Cell Requirement Rate

Serum Ferritin Level	No. of Cases	Percentage
<1000 ng/ml	5	10
1000-1500 ng/ml	11	22
>1500 ng/ml	34	68

Table 4: Serum Ferritin Level in Thalassemia

Serum Calcium Level	No. of Patients	Percentage
≤ 6 mg/dl	0	0
6.1-7 mg/dl	7	14
7.1-8 mg/dl	14	28
8.1-9 mg/dl	23	46
>9 mg/dl	6	12

Table 5: Serum Calcium Level in Thalassemia Patients

Serum Phosphorus Level	No. of Patients	Percentage
< 5 mg/dl	21	42
5-5.9 mg/dl	13	26
6-6.9 mg/dl	12	24
≥ 7mg/dl	4	8

Table 6: Serum Phosphorus Level in Thalassemia

Level of Parathormone	No. of Patients	Percentage
<12 pg/ml	6	12
12-65 pg/ml	43	86
>65 pg/ml	1	2

Table 7: Serum Parathormone Level in Thalassemia Patients

Parameter	Total mean value (n=50)	Group I (n=35)	Group II (n=15)	P value (<0.001)
Calcium	8.1280±0.86	8.4571±0.685	7.36±0.75	Significant
Phosphorus	5.46±0.875	5.1457±0.65	6.2±0.91	Significant
Parathormone	29.7±19.59	35.055±19.9	16.06±9.82	Significant

Table 8: Comparison between Group I and Group II in relation with Serum Calcium, Phosphorus and Parathormone Level