e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(10); 755-758

Case Series

Combined Iron and Vitamin B12 Deficiency in Children with Growth Retardation & Psychomotor Retardation

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Received: 16-08-2023 / Revised: 28-09-2023 / Accepted: 05-10-2023
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Conflict of interest: Nil

Abstract:

Anemia is an important health problem because of its negative effects on children's mental and physical development. We identified combined iron and Vitamin B12 deficiency in 5 children who were brought to our hospital for various reasons. All children were around 1 year of age. They had severe pallor, features of malnutrition and significant development delay. 3 children had skin hyperpigmentation most prominent over the knuckles. Complete blood count, Peripheral smear, Iron studies, Vitamin B12 levels, Folate levels, Maternal Vitamin B12 levels were done in these patients. All children had Iron and Vitamin B12 deficiency. Folate levels were normal. We could do Vitamin B12 levels only in 3 mothers and all of them had Vitamin B12 deficiency. All children were successfully treated with Iron and Vitamin B12 supplements. This case series emphasises the importance of early recognition and treatment of Vitamin B12 deficiency which can be present along with iron deficiency.

Keywords: Iron Deficiency, Vitamin B12 Deficiency, Malnutrition, Development Delay.

Introduction

Anemia is a major health problem in the world, with variable etiologies. It is defined as a drop in hemoglobin level two standard deviations of normal range for both age and gender. The most common cause of anemia worldwide and in India is iron deficiency, which results in microcytic hypochromic anemia. Sometimes, there is a concurrent presence of different types of anemia, which result in masking the clinical findings of one of them. One such condition is coexistent Vitamin B12 deficiency which causes macrocytic anemia. [1-3]

Iron deficiency anemia is a result of reduction of red blood cell production due to low iron stores in the body. Iron deficiency anemia can occur due to inadequate iron intake, decreased iron absorption & increased iron demand. In many low-, and middle-income countries the prevalence of IDA among children ranges from approximately 35 to 90%. Vitamin B12 is produced by microorganisms and it is only found in clams, liver, fish, crab, cheese, eggs, low-fat beef and low-fat dairy. [4] This vitamin is involved in protein, DNA and myelin synthesis. Vitamin B12 deficiency causes megalloblastic anemia characterized with formation of big and immature erythrocytes and neurological manifestations. Vitamin B12 deficiency is more frequent in population with a poor or inadequate intake of foods containing vitamin B12, in patients with intestinal parasitosis or helicobacter pylori infections and in older adults with atrophic gastritis (due to lack of intrinsic factor production). Strict vegetarian diets may be associated with vitamin B12 deficiency. [5-8

Studies about combined deficiency of Iron & Vitamin B12 are very limited. We present 5 children with severe anemia, growth retardation & psychomotor retardation whose investigation proved coexistent Iron & Vitamin B12 deficiency. [9]

Methods:

We did a cases series in the department of Paediatrics, Government medical College, Palakkad over a period of 2 years. The study participants included children admitted with severe anemia and peripheral smear showing dimorphic anemia. Most of them were having protein energy malnutrition, stunting and global development delay. Aim of the study is to increase awareness on the coexistent deficiency of Iron & Vitamin B12, its varied clinical manifestations and treatment.

Case 1:

1 year old boy was evaluated for lethargy and recurrent vomiting. On examination he was alert but not very active, he had severe pallor and system examination was within normal limits. He was found have grade 2 PEM, 2nd degree stunting, global development delay. He was investigated and found to have haemoglobin of 5.1 gm% with MCV of 97. Peripheral smear showed dimorphic anemia. Vitamin B12 level was 89 pg/ml which is low and iron studies proved concurrent iron deficiency. Maternal vitamin B12 levels was also done which showed deficiency. Folate levels done was within normal limits. Child was managed with PRBC transfusion, B12 injections, iron supplements and other dietary measures. Child improved dramatically. Now he has normal haemoglobin values, has good weight gain and has achieved age appropriate mile stones.

Case 2:

1 year and 4 month old boy was brought to hospital with recurrent respiratory tract infections. He was found to have severe pallor, grade 2 PEM and global development delay. Initial investigations showed Hb 4.4gm%, MCV of 95 & thrombocytopenia. Peripheral smear showed dimorphic anemia. Child was evaluated for concomitant iron and B12deficiency. He was found to have S.Ferritin of 9 ng/ml and vit B12 levels of <50pg/ml which confirmed our diagnosis. He was given PRBC transfusion , B12 injections, iron supplements and dietary therapy. He is showing consistent improvement in Hb levels, weight gain and development.

Case 3:

1 year old tribe boy was brought to casualty with complaints of generalized edema. He also had global development delay, severe pallor, grade 2 PEM. He was irritable, not interested in surroundings, generalised pigmentation of skin most prominent over knuckles. A provisional diagnosis of kwashiorkor with nutritional anemia was made. Investigations showed Hb of 2.3 gm%, MCV of 68, S.Albumin 2gm%. Further investigations showed dimorphic anemia. We proceeded to check Iron studies and vitamin B12 levels which proved combined B12 and Iron Deficiency.

Case 4:

1 year 2 month old boy admitted to Paediatric ICU of our hospital with recurrent pneumonia was evaluated for the same. On examination he had grade 2 PEM, 2nd degree stunting, pallor & predominantly motor development delay. On evaluation his haemoglobin was 7 gm%, MCV was 91, S.Ferritin was 15ng/ml & Vitamin B12 level was 83pg/ml. He was treated with antibiotics, nebulisations, Vitamin B12 injections and iron supplementations. He has improved, showing consistent improvement in Hb, weight & development. Now he has less respiratory infections.

Case 5:

11 months old girl admitted in paediatric ward with respiratory tract infection. She had severe pallor, no PEM or Stunting, but she had severe global development delay. She was apathetic, not interested in surroundings & not interacting with mother. Her Hb was 6.5gm%, MCV 102, S Ferritin was , and Vitamin B12 level was <50pg/ml. She was also treated with weekly B12 injections followed by monthly injections. Iron therapy was started later. She improved dramatically. Now she is a happy child, able to stand alone and her social interactions are also good.

The table below shows the clinical characteristics of the cases we studied (Table 1)

Table 1: Clinical Characteristics

Case No	Age	Sex M/ F	IAP Grade of PEM	Waterlow De-gree of Stunting	Development	Skin hyper pigmentation	Recurrent infections
Case1	1 year	M	Grade 2	2nd degree	Global devel-opment delay	yes	no
Case2	1 year 4 months	M	Grade2	1st degree	Global devel-opment delay	no	yes
Case3	1 year	M	Grade2	1st degree	Global devel-opment delay	yes	no
Case4	1 year 2 months	M	Grade2	2nd degree	Motor devel-opment delay	Yes	yes
Case5	11 months	F	NIL	NIL	Global devel-opment delay	yes	yes

The table below (Table2) depicts the haematological parameters of the cases.

Table 2: Haematological parameters

Case No	Hb	MCV	PS	S Iron (mcg/dl)	S Ferritin (ng/ml)	TIBC	S B12 (pg/ml)	Folic Acid (ng/ml)	Maternal Vit B12 (pg/ml)
Case1	5.1	97	DA	72	17	523	89	14.54	147
Case2	4.4	95	DA with thrombocytopenia	21.8	9.3	409	<50	11	99
Case3	2.3	68	DA with thrombocytopenia	16	8	525	<50	Not done	Not done
Case4	7	91	DA	36	15	394	83	8	Not done
Case5	6.5	102	DA	36	13	450	<50	Not done	120

Reference ranges:

S. Iron : 33-193 microgram/dl

S. Ferritin in males : 30-400 nanogram/ml

S. Ferritin in females : 13-150 nanogram/ml

TIBC : 255-450 microgram/dl

Vit B12 levels : 191-663 picogram/ml

S. Folate : 2.7- 17 nanogram/ml

Discussion

Nutritional anemia is an important health problem because of the negative effects on children's mental and physical development. The vast majority of nutritional anemias are iron deficiency (IDA) and vitamin B12 deficiency anemias. Dimorphic Anemia is not a rare condition in India, but there is a paucity of literature regarding this entity especially in south India. This anemia should be recognized early since the treatment may be ineffective if not diagnosed accurately. [10]

A study was done by Ashok Bhardwaj et al [(1)] on the coexistence of Iron and vitamin B12 deficiency in adolescent children in North India. Serum ferritin, folic acid, and vitamin B12 were estimated among randomly selected 100 male and 100 female adolescents. Strikingly, it was found that most of the adolescents were deficient in vitamin B12 and none of the adolescents was observed to be deficient in folic acid. [11] It was concluded that among both male and female adolescents, iron deficiency anemia with coexistent vitamin B12 deficiency was observed to be a significant public health problem. [12]

In our study we diagnosed coexistent Iron and vitamin B12 deficiency in infants & toddlers. All the children were around 1 year of age and 4 out of 5 patients were boys. All children were breast feeding and they were also receiving food from the family pot. The main clinical features of these children were pallor, reduced activity, Malnutrition and developmental delay. 4 children had hyperpigmentation of skin mainly at knuckles and knees. Since all the children were breastfeeding we did maternal levels of Vitamin B12 in 3 cases & they were found to be vitamin B12 deficient. We could not check maternal B12 levels in 2 cases due to financial constraints. All mothers were mainly on vegetarian diet and this was identified to be the cause of Vitamin B12 deficiency. [13]

Garg et al [2] did a study on the clinico-hematological Profile of Dimorphic Anemia and concluded that it is one of the common anemia in developing countries like India and its neighboring countries but an undermined entity. In low-resource settings, clinical and hematological parameters such as complete hemogram and peripheral smear are the important clues for diagnosis and are of paramount importance in guiding further management. In our study too, clue to the coexistence of Vitamin B12 deficiency were high MCV and Peripheral smear showing dimorphic anemia.

All the children in our case series were appropriately treated with PRBC transfusions, Vitamin B12 injections & treatment of complications like lower respiratory infection. Iron therapy was started later after stabilization. Development therapy was also given from the DEIC (District Early Intervention Centre) of our institute since all children had significant development delay. All children improved dramatically and are currently under follow up. [14,15]

Conclusion

It is important to suspect and recognize coexistence of Vitamin B12 deficiency and Iron deficiency anemias. We have to check Vitamin B12 levels whenever there are some atypicality in clinical features like skin hyperpigmentation or significant development delay in children with anemia. Early treatment with Iron & B12 supplementation improves the outcome of these children dramatically.

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