Vitamin B12 Deficiency in 8 Month-Old Infant Born to a Rural Mother Who is a Pure Vegan

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Case Report

Abstract: **Background:** In infants, vitamin B12 deficiency may be due to dietary deficiency born to mothers who are pure vegans. **Case presentation:** 8 month old male baby, single child born out of non consanguineous marriage with birth history, immunization history and developmental history being normal. Baby was exclusively breast fed till 6months of age, now on complementary feeds and mother is continuing breast feeding. Both mother and father are pure vegans. On examination, severe pallor was noted. Anthropometry was within normal range. Hyper pigmentation was noted in the knuckles and nail beds of fingers and toes. Hb %- 7.8g, PCV- 21, RBC count-2.1 million/cmm, total count- 6200cells/cmm, neutrophil count-17%, lymphocytes-72%, eosinophils- 11%. platelet count- 3.44Lakh cells/cmm, MCV- 97fl, MCH-35pg, MCHC- 36%, reticulocyte count- 0.3%,peripheral smear- RBCs were reduced in number with severe degree of anisocytosis, macrocytic normochromic cells, macroovalocytes, few polychromatophilic cells and ovalocytes were seen admixed with normocytic and normochromic cells. WBCs were normal in number, with lymphocytic predominance, few hypersegmented nutrophils were present. Platelets were adequate in number with normal morphology. Iron profile showed, S. iron- 35.8µg/dl, TIBC- 305 µg/dl, ferritin- 76.9ng/mL. Serum folic acid- > 24ng/ml (normal- >5.38ng/ml), serum cyanocobalamine; vitamin B12- 101pg/ml (normal 211-911pg/ml). Stool for occult blood negative. Since parents are pure vegans, mother's serum B12 level was done. Serum B12 level was reduced. The child was diagnosed as having vitamin B12 deficiency due to nutritional inadequacy and was treated with intramuscular vitamin B12 injections, and folic acid supplementation. A few days after the start of therapy, his hemoglobin levels and other hematological parameters rapidly improved, and a clinical improvement was observed within few weeks. **Conclusion:** In this case infant was suspected of vitamin B12 deficiency with anemia, hyperpigmentation of fingers and toes and history of mother being pure vegan. This underlines the importance of adequately controlling maternal vitamin B12 intake during pregnancy by means of supplementation which, in the case of vegan mothers, should be significantly greater than that usually given. Moreover, the supplementation should be continued during lactation in order to avoid the development of signs of deficiency that may be associated with persistent neurological problems in infants.

Keywords: Anemia; Vegans; Vitamin B12 deficiency.

Background

Vitamin B12 is synthesized exclusively by certain microorganisms. Animal protein is the major source of vitamin B 12 in nonvegetarians. Vitamin B 12 serves as a cofactor in 2 essential metabolic reactions, namely methylation of homocysteine to methionine[1] and conversion of methylmalonyl coenzyme A (CoA) to succinyl CoA. It is necessary for the production of tetrahydrofolate, which is important in DNA synthesis. In contrast to the situation with folate stores, older children and adults have sufficient vitamin B 12 stores to last 3-5 yr. However, in young infants born to mothers with low vitamin B 12 stores, clinical signs of cobalamin deficiency can become apparent in the first 6-18 mo of life. Children with cobalamin deficiency often present with nonspecific manifestations such as weakness, fatigue, failure to thrive, and irritability.

Other common findings include pallor, glossitis, vomiting, diarrhea, and icterus. Neurologic symptoms also occur and can include paresthesias, sensory deficits, hypotonia, seizures, developmental delay, developmental regression, and neuropsychiatric changes[2]. Neurologic problems from vitamin B 12 deficiency can occur in the absence of any hematologic abnormalities. The hematologic manifestations of folate and cobalamin deficiency are identical. The anemia resulting from cobalamin deficiency is macrocytic, with prominent macro-ovalocytosis of the RBCs. The neutrophils may be large and hypersegmented. In advanced cases, neutropenia and thrombocytopenia can occur, simulating aplastic anemia or leukemia. Serum vitamin B 12 levels are low, and the serum concentrations of methylmalonic acid and homocysteine usually are elevated. Concentrations of serum iron and serum folic acid are normal or elevated. Serum LDH activity is markedly increased a reflection of the ineffective erythropoiesis. Moderate elevations of serum bilirubin levels (2-3

mg/dL) also may be found. Excessive excretion of methylmalonic acid in the urine (normal, 0-3.5 mg/24 hr) is a reliable and sensitive index of vitamin B 12 deficiency. Vitamin B 12 deficiency can result from inadequate dietary intake of cobalamin (Cbl), lack of IF, impaired intestinal absorption of IF-Cbl, or absence of vitamin B 12 transport protein. Daily pediatric requirements range from 0.4 to 2.4 µg. Because vitamin B 12 is present in many foods, dietary deficiency is rare. However, it does occur in cases of extreme restriction (e.g., strict vegetarians or vegans) wherein no animal products or vitamin B 12 supplements are consumed. In children, megaloblastic anemia from inadequate vitamin B 12 intake can appear in the 1st year of life when infants are breast-fed by mothers who are vegan, have pernicious anemia, or have short gut syndrome or previous gastric bypass surgery. In very young children in whom dietary insufficiency may be a factor, evaluation of the mother for anemia and serum vitamin B 12 often is rewarding. Most infants with B12 deficiency are born to women with low vitamin B12 levels and have been exclusively breastfed. Vitamin B12 is only found in animal products such as meat, egg, fish and milk [3]. Consequently, the breast milk of mothers who do not consume such products is frequently poor in vitamin B12, and their newborn infants have low vitamin stores. The physiologic requirement for vitamin B 12 is about 1-3 µg/day. Hematologic responses have been observed with small doses, indicating that administration of a minidose may be used as a therapeutic test when the diagnosis of vitamin B 12 deficiency is in doubt or in circumstances where the anemia is severe and higher initial doses might result in severe metabolic disturbances.

Case presentation

8 month old male baby admitted to our hospital on 13/11/2013, with upper respiratory symptoms. On examination there was anemia, knuckle pigmentation and nail bed pigmentation both in fingers and toes. Baby was given hematinics 3 months back by a local doctor when approached for cough and cold. There is no history of previous blood transfusion. He is a single child born out of non consanguineous marriage with birth history, immunization history, and developmental history being normal. Baby was exclusively breast fed till 6months of age, now on complementary feeds and mother is continuing breast feeding. Both mother and father are pure vegans. They belong to lower socioeconomic status according to modified B.G. Prasad classification. On examination, baby was conscious and active. Severe pallor was noted. Anthropometry was within normal range. Hyper pigmentation was noted in the knuckles and nail beds of fingers and toes. Heart rate 130/min, respiratory rate 44/min, temperature 98^0 F. Liver was palpable 2 cm below right costal margin with span of 7cm. Spleen was not palpable. Respiratory system examination showed bilateral conducted sounds. Other systems were normal. Baby was evaluated for anemia. Hb % 7.8g, PCV- 21, RBC count-2.1 million/cmm, total count- 6200cells/cmm, neutrophil count-17%, lymphocytes-72%, eosinophils- 11%. platelet count-3.44Lakh cells/cmm, MCV- 97fl, MCH-35pg, MCHC-36%, reticulocyte count- 0.3%, peripheral smear- RBCs were reduced in number with severe degree of anisocytosis, macrocytic normochromic cells, macroovalocytes, few polychromatophilic cells and ovalocytes were seen admixed with normocytic and normochromic cells. WBCs were normal in number, with lymphocytic predominance. Few hypersegmented nutrophils were present. Platelets were adequate in number with normal morphology. Iron profile showed, S. iron- 35.8 µg/dl, TIBC- 305 µg/dl, ferritin- 76.9ng/mL. Serum folic acid- > 24ng/ml (normal- >5.38ng/ml), serum cyanocobalamine; vitamin B12- 101pg/ml (normal 211-911pg/ml). Stool for occult blood negative. Since parents are pure vegans mother's serum B12 level was done, which was low(109pg/ml).

Conclusion

The child was diagnosed as having vitamin B12 deficiency due to nutritional inadequacy and was treated with intramuscular vitamin B12 injections, and folic acid supplementation. A few days after the start of therapy, his hemoglobin levels and other hematological parameters rapidly improved, and a clinical improvement was observed within few weeks. Repeat Hb% was 9.4, PCV-28, MCV- 92fl, reticulocyte count- 1.3%, peripheral smear- few anisocytic changes, few macro ovalocytes, with predominant normocytic normochromic RBC's. Occasional hyper segmented neutrophils seen. A recent review of 134 cases of childhood vitamin B12 deficiency published over the last 20 years found that 69 were due to maternal B12 deficiency, and that more than 50% of these were directly related to an inadequate consumption of meat and other animal products such as that usually characterizing strict vegetarians [4]. The children of women with low vitamin B12 levels during pregnancy and lactation may have smaller stores of the vitamin at birth [5], and its concentration in breast milk is likely to be low [6]. Such children tend to develop signs of vitamin B12 deficiency generally not before the fourth month of life, although neonatal cases have also been reported [7]. In India, where people tend to be vegetarians, vitamin B12 deficiency during pregnancy is common [8], and the infants of deficient mothers are affected by a syndrome including mild developmental regression and alterations in skin pigmentation [9]. Vitamin B12 supplementation in pregnant and lactating women, and the greater use of

complementary vitamin B12-rich foods in infants aged >6 months are frequently suggested strategies for reducing the risk of major clinical signs of deficiency [10,11]. There is a lack of information concerning the optimal formulation of micronutrient supplements for pregnant women, and the need to continue their administration after delivery is not recognized in many situations in which maternal and infant health might benefit.[12]

Consent

The patient's parents gave their written consent to the publication of this case report.

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