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ORIGINAL ARTICLE

Iron Deficiency Anemia in Predominantly Breastfed Young Children

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Background: Due to the increase of breastfeeding in infants, iron deficiency anemia (IDA) related to prolonged, predominant breastfeeding should be of concern. Mostly, the manifestation of IDA is indistinguishable and the enthusiastic advocacy of breastfeeding without concomitant education of complementary food may lead to ignorance of breast milk-related IDA, which may result in impaired psychomotor development of the baby. This retrospective study was conducted to re-emphasize this easily ignored but still prevalent illness.
Methods: This retrospective study involved 15 breastfeeding babies who were diagnosed with IDA between January 2007 and December 2010 at age 6—18 months. The clinical presentation, age at diagnosis, initial hemoglobin level and mean corpuscular volume, growth percentile, and duration of treatment were recorded and analyzed.
Results: None of the babies was suspected to have anemia by caregivers. Pallor was noticed by physicians in nine patients; one patient had seizure, one patient had pica, and, for the remaining four patients, IDA was diagnosed incidentally due to other medical events. Oral iron supplementation for an average of 3.6 months improved both hemoglobin level (from 8.0 g/dL to 11.5 g/dL) and mean corpuscular volume (from 57.5 fL to 73.9 fL). Most babies had appropriate growth and normal neurological development; two babies had both IDA and thalassemia.
Conclusion: Although the association of IDA with prolonged, predominant breastfeeding is well known, its presentation is so subtle that its detection relies mainly on alert medical personnel.

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1. Introduction

Iron deficiency is the most common micronutrient deficiency and the most common cause of anemia in childhood.[1] Iron is important for both growth and development of the infants. Ferropenic anemia caused by severe iron deficiency in infancy is associated with impaired health and serious neurological impairment, such as mental, motor, social, emotional, neurophysiological, and neurocognitive dysfunction.[2] In general, infants born at term with adequate birth weight have sufficient iron stores for the first 4–6 months of life, the recommended period of exclusive breastfeeding by the World Health Organization (WHO).[3] Breast feeding in this period reduces infant mortality that is caused by common childhood illnesses such as diarrhea and pneumonia,[4] and it also hastens children's recovery from illness. After age 6 months, as the children grow with concomitant expansion of blood volume, the body iron stores are depleted while body iron demand is increased; thus breast milk becomes insufficient for iron supply. Therefore, infants who are predominantly breastfed beyond age 6 months are potentially prone to have iron deficiency anemia (IDA)[5]; the addition of sufficient complementary foods is essential for infant growth at this time.

Due to the enthusiastic advocacy of breastfeeding in our society, the population of breastfed infants is increasing. Therefore, IDA related to prolonged predominant breastfeeding should be of concern in infant care. The manifestation of IDA is always indistinguishable; therefore, its detection relies mostly on the alertness of physicians. In this retrospective study, 15 cases of IDA are collected; the manifestations, diagnostic process, and treatment responses are presented.

2. Methods

This is a retrospective chart review study. From January 2007 to December 2010, fifteen babies were analyzed at the age of 6–18 months; 10 were male and five female. The enrollment criteria was as follows: predominant breastfeeding beyond 6 months of age; presence of microcytic anemia [hemoglobin (Hb) $<$11 g/dL and mean corpuscular volume (MCV) $<$70 fL]; and confirmation of IDA through laboratory test or presence of adequate response to iron therapy. The laboratory criteria are ferritin $<$15 ng/mL, and adequate response to iron therapy is defined as increase in Hb level by 1 g/dL after 1 month of appropriate iron-replacement therapy.[6] Three were full-term babies, whose mean birth body weight was 3126 $\pm$ 692 g; and 12 were preterm babies (gestational age $<$37 weeks) including one pair of twins and a single twin, whose mean birth body weight was 1858 $\pm$ 417 g. Predominant breastfeeding was defined as scanty addition of complimentary food. None of the babies had gross bloody stools, hematuria, or other bleeding events.

The clinical presentation, age at diagnosis, initial Hb levels and MCV, growth percentile, and duration of treatment were recorded and analyzed.

3. Results

Table 1 shows the baseline characteristics and laboratory data of all patients. In nine cases, anemia was suspected by pediatricians owing to pallor; in four patients, anemia was detected on routine blood tests for other diseases such as fever, urinary tract infection, and respiratory tract infection. One patient had seizure, and pallor was noticed by the physician; another had pica, which was manifested as eating paper.

Confirmation of IDA through complete laboratory checks such as ferritin/iron levels and total iron-binding capacity (TIBC) were available in eight cases only. The mean values in these patients were as follows: ferritin 9.2 ng/mL (range, 0.4–53.0 ng/mL; normal, $<$15 ng/mL); iron 15.6 μg/dL (range, 7–27 μg/dL; normal, 40–100 μg/dL); and TIBC 462 μg/dL (range, 378–606 μg/dL; normal, 100–400 μg/dL). The only patient with normal ferritin level (53.0 ng/mL) at diagnosis was a case of pneumonia. Her initial iron level was low (14 μg/dL) and TIBC was borderline (378 μg/dL). She had normalization of both hemoglobin and MCV after iron therapy for 2 months; therefore, this case was enrolled. Excluding these extreme data, which might be a response to infection, the mean value of ferritin in this group was 2.97 ng/mL (range 0.4–6.34 ng/mL). In the remaining seven patients, IDA was confirmed through therapeutic response. After iron therapy for an average duration of 4 months (range, 2–6 months), their Hb increased from 8.15 g/dL to 11.6 g/dL; and their MCV increased from 58 fL to 75 fL. The therapeutic iron trial remains the most cost-effective strategy for the diagnosis of IDA in patients with mild microcytic anemia.[7]

Hb electrophoresis and staining for Hb H inclusion bodies were performed to exclude thalassemia in eight patients who had positive family history; one patient had α-thalassemia, and another had β-thalassemia. For the case with α-thalassemia, the initial laboratory data were Hb 9.7 g/dL, MCV 69 fL, and Hb H stain positive; after 2 months of iron therapy, the Hb level was 12.1 g/dL, and MCV was 80 fL. Possibly, the baby had α-thalassemia trait, which is caused by the deletion of two α genes; MCV reduction in such cases may be borderline. The initial laboratory data in the patient with β-thalassemia were as follows: ferritin, 0.77 ng/mL; iron, 27 μg/dL; TIBC, 399 μg/dL; Hb A, 87.4%; Hb A2, 6%; and Hb F, 6.6%. After 2 months of iron therapy with poor compliance, no definite response was elicited, and the patient was lost to follow-up.

The mean postnatal age at IDA diagnosis was 10.5 months: 9.0 months in the full-term babies, and 10.8 months in the preterm babies. The average initial Hb level was 8.0 g/dL (full-term group, 8.6 g/dL; preterm group, 7.9 g/dL), and the average initial MCV was 57.5 fL (full-term group, 62.0 fL; preterm group, 56.4 fL). All babies received oral iron supplements (Ferrum Hausmann drops 50 mg/mL) at a dose of 4–6 mg/kg/day. The average duration of treatment was 3.6 months (range 2–6 months). After treatment, the average Hb level was 11.5 g/dL, and the average MCV was 73.9 fL (Table 1). All the babies, except for the case with β-thalassemia who was lost to follow-up, were free from neurological sequelae. Most of