Exclusive cow's milk intake and asymptomatic anaemia

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ABSTRACT

It is a strong tradition to introduce cow's milk (CM) early in infancy. There are reports of various deleterious health effects of CM in infancy. We describe an asymptomatic, well-thriving infant who was exclusively fed with CM and had severe iron deficiency anemia. An eleven-months-old infant during the consultation for fever was found to have severe pallor. Except for systolic murmur, she had a normal systemic examination. Hemoglobin was 2.2 gm/dl, her RBC count, volume and hemoglobin concentration were low. Iron studies done showed a severe iron deficiency state. She was given packed cell transfusions; iron supplements were initiated. Introduction of complementary foods rich in iron is imperative as iron stores begin to deplete at four to six months of age. Initiation of CM early in infant feeding can lead to very severe anemia which can be mitigated by CM fortification, iron supplementation in infants.

Keywords: *Cow's milk fortification, Exclusive cow's milk, Iron deficiency.*

The use of animal milk as an alternative to breast milk existed as early as 2000 BC. The type of animal was based on the local availability [1]. Cow's milk (CM) owing to its easy availability is commonly used and it is an integral part of infant nutrition during the transition from breast milk.

There are many ill-effects associated with early introduction of the whole CM [2]. Occult blood loss from the gastrointestinal tract occurs in both infants and toddlersand also leads to iron-deficiency anemia if iron-rich supplemental foods are not introduced in the second six months of life [3,4]. Whole CM is also deficient in zinc, niacin, vitamin C and vitamin E [5]. Exposure to CM proteins early makes the infant vulnerable to develop allergy and thus lead to varied manifestations [5]. Association between early introduction of CM and development of type I diabetes mellitus which is an immune-mediated reaction in genetically susceptible individuals has been reported [6]. Infants and toddlers are at an increased risk of iron-deficiency as their natural diet is low in iron and also there is an increasing requirement of iron during the rapid growth phase [7]. Not only does CM have low iron content but has poor bioavailability and the occurrence of intestinal microhemorrhages leads to iron deficiency anemia in this vulnerable population [8,9]. With reference to this, we report the case of an eleven-months-old infant who presented to us with very severe anemia and was on exclusive CM feeding.

CASE REPORT

An 11-months-old infant was brought to the outpatient department with a complaint of febrile illness. She was first born of third-degree consanguineous parents by Lower Segment Cesarian Section (LSCS) at term with a birth weight of 2985 grams. She was normal on examination at birth and had an uneventful neonatal period. Her developmental milestones were age appropriate and she was immunized upto date as per the national guidelines at the primary health centre. She did not suffer from any significant illness untill the presentation to our outpatient department. Her mother had anemia in the antenatal period, needed a blood transfusion for the correction of anemia. There was no other significant history in the mother. There was no hematological disorder in the family. She was fed with CM from birth as her mother had lactation failure. Initially, she needed a few milliliters of feeds but later the quantity increased upto two litres of CM per day. Weaning foods were initiated but was refused by the baby on repeated attempts. Hence, she was exclusively CM fed at presentation. She was not on any iron supplements since birth. The baby had gained good weight and was active, parents were happy.

Her physical examination showed a temperature of 100.2º Fand was severe pallor. She had a grade three ejection systolic murmur and no lymphadenopathy. She did not have any features of congestive cardiac failure or features of hemolytic anemia such as splenomegaly, icterus and evidence of extra-medullary hematopoiesis. Rest of her systemic examination was unremarkable. Her length was 69 cms, weight was 7900grams (both just below the 25 centiles on the Indian Academy of Pediatrics growth chart) and normal head circumference.

Dietary history revealed that the baby was fed with 1500 to 2000ml /day of exclusive CM which supplied 1180 calories/day which is 135% of the Recommended Dietary Allowance(RDA). Owing to the high protein content of CM, she received five times the required amount (60 grams against 11gm/day). On the

Table 1: Infants nutrient requirements vs intake

Nutrients	RDA per day	Cow's milk per Litre	Infant
Energy (cals)	885	590	1180
Protein (grams)	11	31	62
Iron (mg)	11	0.2- 0.5	1

contrary, the iron intake was only 1mg/day which is 9.09% of the RDA [10] (Table 1).

Blood investigations showed very low hemoglobin of 2.2 gm/dl. Red blood cell count was 1.49 million/ml, Mean Corpuscular Volume - 50.8 fl, Mean Corpuscular Hemoglobin -14.8 pg, Red cell distribution with was high 24.3%. The low RBC count with severe loss of volume of RBC was suggestive of iron deficiency state. Reticulocyte count was normal 4%, peripheral smear did not have features of hemolysis. Stool tested negative for occult blood.

As the clinical history and RBC indices were in favor of iron deficiency,serum iron done was 5ng/dl (37-145), ferritin was 14.4 ng/ml (13-150), Iron binding capacity was very high at 656 mcg/dl (240-450) and transferrin saturation was low at 0.3% (12-45). She was transfused with packed cells and was started on iron supplements. Caretakers were educated about infant nutrition and iron rich diet preparation from locally available ingredients. Her fever settled, she improved clinically and was discharged. On follow-up, she was clinically well and had an improved nutritional status and hemoglobin had increased to 8.3 gm/dl.

DISCUSSION

In Term infants, iron stores depletion begins at four to six months of age. They become entirely dependent on external sources of iron during the phase when nutritional needs are absolutely critical for their growth and development [8]. The iron content of CM and human milk are similar at about 0.2- 0.5mg/L, but the iron in the latter is lactoferrin bound which being proteolysis resistant, enhances uptake from the intestine through specific lactoferrin receptors [11]. Only 10% of the iron in CM is absorbed as opposed to 50% in breast milk.Calcium, phosphorus, caesin in high amounts also inhibit the absorption of iron in CM. Higher calcium has a luminal effect on iron absorption in addition to inhibition during transfer into circulation. CM contains lower levels of vitamin C which facilitates the conversion of insoluble ferric form to more absorbable ferrous iron [12].

Feeding with CM also results in intestinal blood loss in the form on asymptomatic intestinal micro hemorrhages. Wilson et al., in his cohort of infants fed with CM found the blood loss was on an average 1.7ml/day as compared to 0.3ml/day with soy/milk-based formula. The equivalent iron loss is 0.53mg/day [8]. The lower level of iron content in CM, the presence of inhibitors coupled with intestinal blood loss predisposes infants to iron deficiency anemia.CM is a rich source of protein and minerals and plays a very prominent role in the infant and toddler nutrition [3]. The negative impact of CM on iron metabolism can be offset by the fortification of CM with iron. Countries with the program of distributing iron fortified CM e.g. Mexico have demonstrated a reduction in the prevalence of anemia and iron deficiency in children [13]. According to a report published by Ministry of statistics and program implementation, Government of India, about 58% of children had some degree of anemia [14].

Eventhough this infant had very severe anemia, she remained asymptomatic which could have contributed to the delay in diagnosis. Maternal anemia was a risk factor for iron deficiency in this infant, which was aggravated by large quantities of CM intake and absence of iron supplements. CM feeding has numerous deleterious health effects in infants.

CONCLUSION

Unmodified cow's milk has numerous adverse effects on the health of infants. The use of the same should be discouraged in infants and be used in modest quantities in toddlers. Iron-fortified cow's milk can be made available in our country in special situations.

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