

Zinc deficiency in a preterm breastfed infant

Zinc is an essential trace element that plays a role in cell division, cell growth, wound healing and normal immune function. A rare case of zinc deficiency in an ex-premature infant is described to illustrate the importance of zinc in rapidly growing preterm infants and highlight the clinical investigations and management. The infant presented with skin lesions around the mouth and anus. Oral zinc was commenced and the child's growth and skin rapidly improved.

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The case study

An ex-premature female infant presented at 19 weeks of age and was admitted to the paediatric ward for assessment of skin breakdown around the mouth and anus. The infant had been born prematurely at 25⁺² weeks gestation with a birth weight of 720g; she had previously spent 15 weeks on the neonatal unit. Due to bronchopulmonary dysplasia (BPD) she had been discharged home on oxygen.

Prior to presentation the baby's GP and her paediatric team had treated her skin with various creams and antibiotics. As the skin lesions were not getting better the neonatal community liaison team was contacted for a review by the neonatal team.

Upon examination the infant was found to have an acrodermatitis enteropathica-like skin eruption¹ in keeping with that seen in zinc deficiency (**FIGURE 1**). She had red and inflamed patches of dry and scaly skin around the mouth and perianal area. On the face, the inflamed patches evolved into crusted, blistered, pus-filled lesions. Around the anus, there was a sharp demarcation between the affected area and the normal skin.

Blood tests revealed an extremely low plasma zinc level of 1.3mol/L. The normal range is 10-18mol/L; less than 5mol/L is diagnostic of zinc deficiency. Other routine blood tests suggested an inflammatory response and hypoalbuminaemia associated with low plasma zinc levels.

The infant was prescribed oral zinc supplementation (zinc sulphate 3mg once per day) and her skin condition rapidly improved (**FIGURE 2**). She continued to receive standard preterm vitamin



FIGURE 1 Skin eruptions around the mouth and perianal area. A) Crusted, blistered and pus-filled lesions on the face. B) Red and inflamed patches of skin around the anus with a sharp demarcation between the affected area and the normal skin.

supplementation as per the Wishaw General Hospital preterm vitamin guidelines, which are based on the 2010 European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) guidelines.²

Dietary history and vitamin intake

The infant had received breast milk as her sole source of nutrition. In the neonatal

Keywords

zinc; preterm infant; acrodermatitis enteropathica; breastfeeding; growth

Key points

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1. Zinc deficiency can be confused with other skin conditions. An early diagnosis can prevent severe consequences of skin lesions and faltering growth.
2. Commencement of oral zinc supplements can lead to rapid improvement in the patient's skin and growth.
3. The number of zinc deficiency cases may be expected to increase as more premature infants survive.

unit she first commenced on expressed breast milk via a nasogastric tube and then transitioned to breastfeeding.

At presentation, she was receiving full oral feeds via breastfeeding, Abidec multivitamin supplementation (0.6mL od) and sodium feredetate (Sytron, 0.5mL bd).

The mother was following a vegan diet, which is naturally low in zinc – the main sources of dietary zinc are red meat, shellfish and unrefined flour. She took Pregnacare Breastfeeding supplements, which provide 15mg/day of zinc. Adult females require 4–7mg/day of zinc and toxicity is reported at levels of 40mg/day. Breastfeeding mothers are said to require 12mg/day. Usually about 30% of dietary zinc is absorbed, although less is absorbed from diets abundant in zinc inhibitors such as fibre or phytates, found in plant-rich diets.

The infant's birth weight was on the 25th centile but at the time of presentation her weight had faltered to below the 0.4th centile. Within 10 weeks of zinc supplementation her weight increased back to the 9th centile and within four months her weight had increased to the 50th centile (FIGURE 3). In the same four-month period her occipito-frontal circumference increased from the 25th centile to the 50th and her length increased from the 0.4th to the 9th centile. The baby remained on breast milk throughout this time.

The mother and baby receive ongoing dietetic care centred on improving nutritional status, promoting growth and monitoring dietary progress.

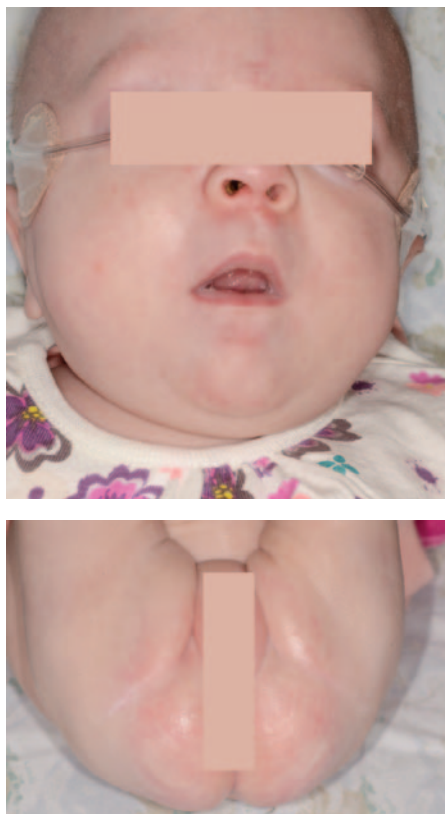


FIGURE 2 Rapid improvement following oral zinc supplementation.

Discussion

Zinc is an essential trace element that has a critical role in growth, development and immune function. Zinc deficiency is reported to contribute to more than half a million deaths worldwide per year in infants and children less than five years of age.³ Identification of zinc deficiency, or

risk of zinc deficiency, is outlined by the World Health Organization in three indicators: identification of low dietary zinc intake, stunting, low serum/plasma zinc.⁴

Zinc deficiency has been highlighted in preterm breastfed infants who are small for gestational age (SGA). The most at-risk babies are older solely-breastfed infants who were premature and SGA. Such infants may have low body stores of zinc due to:

- low maternal zinc levels during pregnancy
- prematurity; a fetus normally accumulates zinc *in utero* during the third trimester, which is 'missing' when an infant is born preterm
- a smaller liver, which could prevent zinc storage
- zinc deficiency in the nursing mother or inability to effectively pass zinc from serum to breast milk
- low zinc uptake in the preterm infant – zinc is absorbed in the small intestine and excreted via the kidneys therefore any gastrointestinal dysfunction following birth or increased kidney losses would also lead to low zinc uptake alongside potential poor intake.⁵

In this case, the mother's zinc levels were not measured but it was recommended that she should monitor her zinc levels in any subsequent pregnancies.

It is well documented that the level of zinc in breast milk decreases from around 3mg/L in colostrum to 1mg/L by six months.⁶ This sharp decline does not correlate to maternal intake or stores. This is at a time where a preterm baby may not yet be taking weaning foods and therefore zinc is not available from other sources.

When zinc supplementation is commenced, catch-up growth is documented as occurring, as was seen in this case.⁷

Conclusion

This case highlights the importance of zinc and its role in growth. Preterm infants who are solely breastfed may require further supplementation especially those of vegan/vegetarian mothers due to the risk of maternal zinc deficiency. Appropriate dietary and vitamin management of preterm infants is essential to promote healthy growth; zinc supplementation should be considered for the larger numbers of smaller, preterm babies successfully transitioning to breastfeeding.

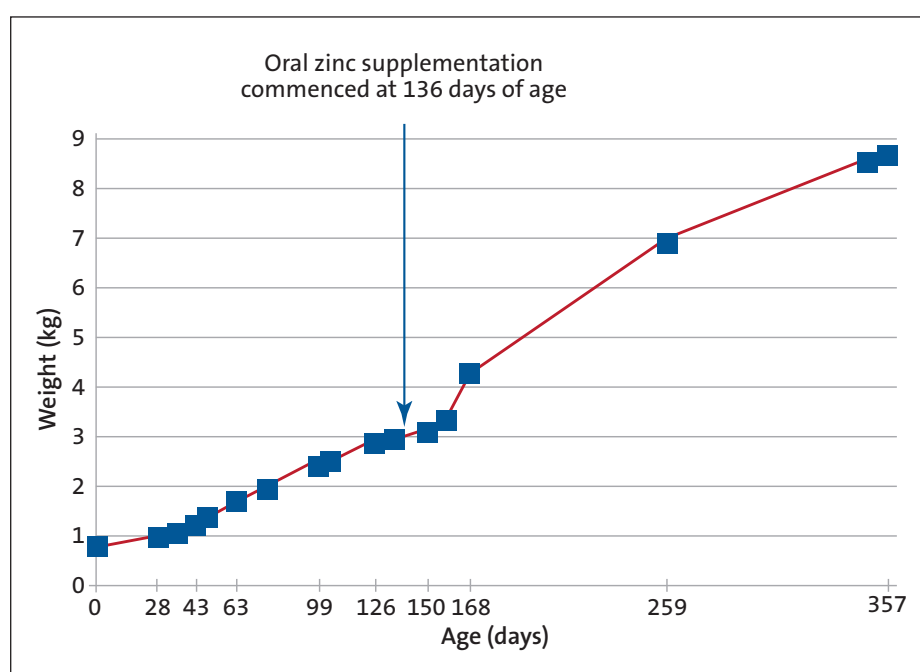


FIGURE 3 Weight gain before and after zinc supplementation.

Patient consent

The authors received written consent to publish this report from the patient's mother.

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