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Science commentary: What does zinc do?

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Adequate zinc intake is critical for health. Zinc deficiency affects cells of the immune system. It causes a reduction in the number B lymphocytes and T lymphocytes (CD4 lymphocytes in particular) through increased apoptosis and also reduces their functional capacity. The functions of the macrophage, another key immunological cell that engulfs and destroys bacteria, are also compromised. The production and potency of several cytokines, the central messengers of the immune system, are also perturbed by zinc deficiency. Many of these changes occur even in the early stages of deficiency.

Zinc plays a part in the maintenance of epithelial and tissue integrity through promoting cell growth and suppressing apoptosis and through its underappreciated role as an antioxidant, protecting against free radical damage during inflammatory responses. Thus, in the case of diarrhoea, multiple functions of zinc may help to maintain the integrity of the gut mucosa to reduce or prevent fluid loss. Notably, these responses can occur within 48 hours, much more rapidly than the direct effects of zinc on cellular development.

The recommended daily allowance is only 10 mg elemental zinc, but many people in both developing and industrialised countries do not have this in their diet.¹ Zinc deficiency is biochemically defined as a serum concentration of less than 9 µmol/l. However, serum zinc concentrations may not fully reflect the physiological zinc status in an individual, and individuals with apparently normal serum concentrations may benefit from daily zinc supplements.²

Benefits of supplementation

This is clearly illustrated in several randomised controlled trials of zinc supplementation. A meta-analysis indicated that daily zinc supplementation can reduce the incidence of pneumonia by 41% and

diarrhoea by 18%.³ A meta-analysis of trials of adjunctive zinc supplementation in children with diarrhoea reduced the duration of the illness by 24%.⁴ A trial of daily zinc supplementation in otherwise healthy children from New Guinea reduced the number of cases of malaria seen at a health clinic by 38%.⁵

There is also evidence that zinc supplementation could offer benefit to pregnant women and their babies.⁶ One study showed that prenatal zinc supplementation can increase birth weight,⁷ and another indicated reduced incidence of diarrhoea and other morbidities in the infants.⁸ Babies who are small for gestational age also seem to benefit from taking daily zinc supplementation. A trial in India found that babies who received zinc from 1 month onwards were 60% less likely to die during infancy.⁹ Lastly, several studies indicate a potential role for zinc and supplements that contain zinc in improving immune status¹⁰ and health in elderly people.¹¹ Zinc supplementation, therefore, seems to be particularly critical during periods of immune development or degeneration: early childhood, pregnancy, and later life.

Problems caused by too much zinc

Taking too much daily zinc could also be a problem because, although it is not toxic, high doses can impair copper absorption. This can lead to copper deficiency with immunosuppression and other subtle and apparent adverse effects, especially for the mother and fetus during pregnancy.¹² For this reason, doses more than twice the recommended daily allowance are not recommended and prenatal zinc supplements should contain copper,¹³ especially in populations with low mineral intakes.

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Cross sectional, community based study of care of newborn infants in Nepal

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Abstract

Objective To determine home based newborn care practices in rural Nepal in order to inform strategies to improve neonatal outcome.

Design Cross sectional, retrospective study using structured interviews.

Setting Makwanpur district, Nepal.

Participants 5411 married women aged 15 to 49 years who had given birth to a live baby in the past year.

Main outcome measures Attendance at delivery, hygiene, thermal care, and early feeding practices.

Results 4893 (90%) women gave birth at home. Attendance at delivery by skilled government health workers was low (334, 6%), as was attendance by traditional birth attendants (267, 5%). Only 461 (8%) women had used a clean home delivery kit, and about half of attendants had washed their hands. Only 3482 (64%) newborn infants had been wrapped within half an hour of birth, and 4992 (92%) had been bathed within the first hour. 99% (5362) of babies were breast fed, 91% (4939) within six hours of birth. Practices with respect to colostrum and prelacteals were not a cause for anxiety.

Conclusions Health promotion interventions most likely to improve newborn health in this setting include increasing attendance at delivery by skilled service providers, improving information for families about basic perinatal care, promotion of clean delivery practices, early cord cutting and wrapping of the baby, and avoidance of early bathing.

Introduction

Although infant mortality has fallen in many developing countries over the past two decades, the rate of fall may be slowing.¹ One reason is the resistant contribu-

tion of neonatal mortality, which has remained fairly steady over this period.^{2,3} For many mothers, health care during and after childbirth is virtually non-existent, and in 2000, an estimated 53 million women in developing countries gave birth without professional help.⁴

The World Health Organization guidelines for essential newborn care encompass cleanliness, thermal protection, initiation of breathing, early and exclusive breast feeding, eye care, immunisation, management of illness, and the care of low birthweight infants.⁵ For a mother and her family, this means preparing for birth, choosing a safe place for delivery, keeping the process clean, avoiding the cold, breast feeding early and exclusively, and understanding (and reacting to) potential danger signs. Our understanding of what happens at home and how to change behaviour is limited. The aim of the present study was to describe newborn care practices quantitatively in the cohort of women recruited to the trial.

Participants and methods

Setting

Nepal has a population of 23.4 million with more than 60 ethnic groups. The landscape tiers down from the Himalayas, through middle hills, to plains in the south.⁶ The population is poor, and there are limited communications and infrastructure. The gross national product per head is about \$220 (£145, €223),⁷ the human development index is 0.378,⁸ life expectancy is 58 years, about 60% of adults are illiterate,⁷ the total fertility rate is 4.8 in rural areas, and early marriage and adolescent pregnancy are common.⁹

Nepal's estimated neonatal mortality rate is 50/1000 live births and accounts for two thirds of the infant mortality rate (79/1000).⁹ Less than half of pregnant women attend for any antenatal care,⁹⁻¹³ and

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