Absorption of Zinc from Mixed Diets Containing Conventional or Zinc-Biofortified Bangladeshi Rice Among Young Children in a Peri-Urban Community

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INTRODUCTION

In Bangladesh, 43% of under-five children have low height-for-age (Z-score <-2 compared with WHO standards) (BDHS, 2007), suggesting an elevated risk of zinc (Zn) deficiency. Community-based studies indicate that dietary Zn intakes are inadequate among children and women (median Zn intakes 2.5 mg d^{-1} (2.1, 2.9) and 5.4 mg d^{-1} (4.8, 6.1) in children and women, respectively) (Arsenault *et al.,* 2010); and several investigators have reported a high prevalence of low serum Zn concentration among both infants and children.

Biofortification is an emerging strategy for controlling deficiencies of several micronutrients in lower income countries; and cultivars of rice with relatively high Zn content are now being produced in Bangladesh. Dietary studies in northern Bangladesh found that rice provided ~58% of energy intake among children 2-3 years of age and 84% of energy intake among women. Simulations of the potential impact of 70% population coverage with Zn-biofortified rice containing an assumed additional 0.8 mg Zn $100g^{-1}$ dry weight indicate that this Zn-biofortified rice could reduce the prevalence of inadequate Zn intake from 22% to 9% in children and from 73% to 20% in women (Arsenault *et al.,* 2010). The ultimate nutritional impact of rice Zn-biofortification depends on the amount of Zn absorbed from high-Zn cultivars.

METHODS

We completed stable isotope tracer studies using the triple isotope ratio method to assess Zn absorption from conventional rice (CR: BR-28) and Zn-biofortified rice (ZnBfR: IR-68144). We compared total dietary Zn intakes (TDZ), fractional Zn absorption (FZA) and total absorbed Zn (TAZ) from mixed diets containing one of each of the two forms of rice on successive days.

RESULTS

TDZ measured from all sources (rice, other foods, and Zn tracers) was 3.83 and 4.83 mg d^{-1} when the children were fed the CR- and ZnBfR-containing diets, respectively. The mean FZA (% of intake) was 25.1 ± 4.1% and 20.2 ± 3.7% from the respective diets ($p < 0.001$), and the mean TAZ was 0.96 ± 0.16 and 0.97 ± 0.18 mg d^{-1} ($p = 0.99$).

CONCLUSIONS

We conclude that Zn-biofortified rice has potential for improving Zn intake in rice-consuming populations, but the amount of additional Zn present in the ZnBfR we tested was insufficient to induce greater TAZ in young children. Thus, it appears that rice cultivars with higher Zn and/or lower phytate content will need to be developed to increase TAZ by young children.

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