

Impact of consuming zinc-biofortified wheat flour on the growth and morbidity status of adolescent girls: a cluster randomised, double blind, controlled trial

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Despite the known detrimental consequences of zinc deficiency and recognized benefits of supplementation in reducing morbidity and improving growth⁽¹⁾, programmatic zinc supplementation is not feasible⁽²⁾ thus other sustainable methods such as biofortification of staple crops to increase zinc intakes on a population scale needs to be explored. The aim of this study was to determine the effectiveness of consuming zinc-biofortified wheat flour (Zincol-2016) on zinc-related morbidity and growth among adolescent girls, living in a rural, marginalized community in northwest Pakistan where the prevalence of zinc deficiency is high. Households (N = 486) with at least one adolescent girl aged 10–16 years (N = 517) near Peshawar, Pakistan were recruited to a double blind, cluster randomized controlled trial (BiZiFED2 RCT). During phase 1 of the trial (November 2019 to September 2020), households were provided with locally procured flour from standard wheat varieties (control) to establish a baseline. During phase 2 (September 2020 to March 2021), households received either zinc-biofortified flour or control flour. Anthropometric measurements and 24-hour dietary recalls were collected at the beginning, middle and end of the trial⁽³⁾. Data pertaining to incidence and duration of respiratory tract infection (RTI) in the preceding two weeks were collected fortnightly. Analysis was performed using linear mixed models for continuous variables and Pearson's chi-square test for categorical variables. Consumption of biofortified flour contributed to a moderate increase in estimated zinc (1.5 mg/day) and iron (1.2 mg per/day) intake. No significant effect of the intervention was observed on linear growth (height: control 150.6 ± 8.5 cms vs intervention 148.7 ± 8.5 cms; height for age Z scores: control -0.73 ± 1.1 vs intervention -0.92 ± 1.0) and weight (control 45.5 ± 9.7 kgs vs intervention 43.4 ± 10.1 kgs). Self-reported incidence of RTIs were not significantly different for the two study arms between the baseline and midpoint, but towards the end of the trial a lower incidence of RTIs was reported in the intervention arm compared to the control arm (week 22: control 19.3% vs. intervention 11.5%, p = 0.037; week 26: control 14.5% vs. intervention 6.1%, p = 0.014). However, when the longitudinal prevalence of RTI (cumulative days of sickness as a percentage of total days of observations) was considered with baseline adjustments, no treatment effects were observed (mid-point: control 10.6% [95% CI: 8.6, 12.7] vs intervention 6.3% [95% CI: 4.9, 7.7]; endline: control 8.1% [95% CI: 6.4, 9.8] vs intervention 9.9% [95% CI: 8.0, 11.9]). A moderate (21%) increase in dietary zinc through the consumption of zinc-biofortified flour for 25 weeks did not have a significant effect on growth or morbidity status of adolescent girls. Longer term interventions are warranted to monitor changes in functional outcomes in response to the ongoing national scale-up of the release of zinc- biofortified wheat varieties.

Acknowledgments

This work is supported by BBSRC Global Challenges Research Fund, Grant Number BB/S013989/1. The authors sincerely thank all the study participants and the farmers involved in grain production for the project. We are grateful to the nutritionists, research assistants and community health workers for their concerted efforts. We thank Mohamad Javaid, Tariq Aziz and Rashid Medhi for leading the field team, overseeing data entry, managing flour distribution, respectively. We extend our thanks to the Abaseen Foundation Pakistan for providing facilities and enabling access to the community. We acknowledge the efforts of Helen Bingley, Abaseen Foundation UK, for meticulous financial management.

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