

**EFFECT OF SUPPLEMENTATION WITH ZINC, ZINC PLUS VITAMIN A
AND IRON ON NUTRITIONAL STATUS OF SCHOOL CHILDREN (6-10
YEARS) IN UGANDA: a randomized controlled study**

ASIIMWE CHARLES

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BSC FST (Hons) MUK, Dip Educ (ITEK)

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ABSTRACT

Background: The nutritional status for the school-aged child is largely unknown. Unlike for children under five years of age, few studies have been conducted the age group of 6-10 years. Hence there is a paucity of information regarding this age group in many developing countries except Latin America where work shows that stunting is common in school age children. However, it is important to note that children under five years of age who are malnourished grow up into under nourished school aged children, adolescents and mothers, forming the vicious cycle of malnutrition. There is limited research on zinc nutrition among school children in developing countries. However a few studies have been conducted in Sub-Saharan Africa and other developing countries to assess the effect of zinc supplementation on children's health and development. These trials have produced variable results, depending on the specific outcomes considered and the initial characteristics of the children who were enrolled.

Objective: The objective of the study was to determine the effect of supplementation with zinc alone or zinc in combination with vitamin A and iron on serum zinc and nutritional status of children (6-10 years) living in a semi-urban setting of Wakiso District in central Uganda.

Methodology: Children (aged 6-10 years) selected from three day primary schools in Wakiso District were randomly allocated to three treatment groups in a randomized longitudinal controlled experimental design. Serum zinc, weight, height and MUAC were measured at baseline and after four school terms of supplementation. The study subjects received daily for four school terms 300mls of juice containing Zinc alone (group 1), Zinc plus Vitamin A and Iron (group 2) or fresh juice without any supplement added (control). Serum zinc was measured by AAS method (Smith *et al.*, 1979). Nutritional status of children before and after supplementation was classified as per WHO growth standards (WHO, 2006).

Results: Average height was 122.64 ± 8.70 cm, weight was 23.57 ± 4.23 kg, mid upper arm circumference (MUAC) was 17.26 ± 1.57 cm, Z-score for height for age (HAZ) was -0.67 ± 1.23 and weight for age (WAZ) was -0.53 ± 0.86 . Eight percent of the children were stunted, 5% underweight and 2% wasted at baseline. There was a significant difference in weight (2.50 ± 1.13 kg, $P= 0.03$), MUAC (0.90 ± 0.41 cm, $P= 0.03$) and BMI (0.79 ± 0.37 kg/m², $P = 0.03$) among zinc supplemented subjects compared to control at the end. Changes in HAZ, WAZ and BMIAZ among the zinc and control groups were not significantly different. Supplementation with zinc plus vitamin A and iron did not significantly change nutritional status of the children given a supplement compared to control. Supplementation with zinc alone or zinc plus vitamin A and iron did not improve the nutritional status of children (6-10 years).

The mean serum zinc concentration at baseline was 94.96 ± 26.70 $\mu\text{g/dL}$. The level of zinc deficiency was 7% among primary school children in this study at baseline. There was a slight increase of about 2 $\mu\text{g/dL}$ in serum zinc concentration for primary school children who were supplemented with zinc alone. There was no significant difference between the mean serum zinc in zinc group compared to control ($P=0.22$). There was a slight decrease of about 2 $\mu\text{g/dL}$ in serum zinc concentration for primary school children who were supplemented with zinc plus vitamin A and iron. Supplementation with zinc alone or zinc plus vitamin A and iron did not result into improved serum zinc status of primary school children in the current study.

Conclusion: Supplementation with zinc alone results in a significant improvement on weight, BMI and MUAC of primary school children. Supplementation with zinc alone did not improve serum zinc and nutritional status of primary school children in the study area. Supplementation with zinc plus vitamin A and iron did not improve serum zinc and nutritional status of primary school children in the current study.

Recommendations: A national assessment needs to be undertaken by the ministry of education and health jointly to ascertain the true picture of zinc deficiency and nutritional status of primary school children in Uganda. A great deal of research is still needed regarding the effect of supplementation with zinc alone or zinc plus vitamin A and iron on school aged children's nutritional status and longer-term outcomes whether in school or not, urban or rural based.