

Micronutrient Bioavailability in Preschoolers



Importance of nutrition in preschool children



Preschool children have high requirements for micronutrients for their growth and development.¹



Therefore, nutrient–nutrient interactions during digestion and absorption become essential.¹



Nutrients with chemical similarities can facilitate or hinder absorption by competing for:²

- ▶ Uptake mechanisms
- ▶ Chelating organic substances



The quantitative consequences of these interactions depend on nutrients’ relative concentrations.²

Micronutrients & early childhood

Important nutrient–nutrient interactions³

Vitamin A–vitamin D	Excess preformed vitamin A can antagonize vitamin D action
Iron–zinc	Mutual competitive interaction for sites of intestinal absorption
Calcium–iron	Calcium interferes with inorganic and heme iron absorption from the diet
Calcium–phosphorus	Inadequate and excessive phosphorus intake disturbs the homeostatic regulation of circulatory calcium

Factors affecting the absorption & bioavailability of micronutrients



Antinutritional constituents^{3,4}

- ▶ Substances that can reduce the absorption or utilization of essential nutrients.
- ▶ Present in varying amounts based on the food type, its mode of propagation, and chemicals used in the growing and storage of food substances.

Adverse effects of some antinutrients⁴

Antinutrient	Effects on child’s body
Phytates	Reduce calcium and iron absorption
Oxalates	Reduce calcium absorption, encourage kidney ailments in later life
Phenol compounds	Reduce bioavailability of minerals (especially zinc), may negatively affect the pH mechanism and reduce protein digestion

Gastrointestinal health^{3,5,8}

- ▶ Compromised secretory and absorptive integrity of the GI tract due to frequent diarrhea, *Helicobacter pylori*, and parasitosis affects absorption and bioavailability.
- ▶ Dietary patterns (refined carbohydrates, ultra-processed foods, sweetened beverages, snacks) can alter gut microbial composition which can impact health status.



Efficiency of metabolic retention³

- ▶ Excess wastage of nutrients following absorption due to improper intestinal and renal function, integumentary system intactness, and systemic immune responses.

How do prebiotics help in better absorption?



- ▶ Microbial fermentation of prebiotics leads to the production of SCFA and a decrease in pH.⁶
- ▶ This increases the bioavailability of minerals (calcium, magnesium, iron, and zinc) and vitamins (vitamin A, B, C, D, and E) in the colon.⁷

Key takeaways

- ✓ Micronutrients (vitamins and trace elements) are essential for the growth and development of preschoolers.
- ✓ Nutrient–nutrient interactions among micronutrients can affect absorption and hence the nutritional status of preschool children.
- ✓ Prebiotics like GOS and FOS help better absorb micronutrients and increase their bioavailability, supporting in growth and development of preschool children.



Abbreviations:
FOS: Fructo-oligosaccharides; GI: Gastrointestinal; GOS: Galacto-oligosaccharides; SCFA: Short-chain fatty acids

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