

### **The Role of Micro-Biota in Early Childhood Malnutrition and its long-term Health Consequences in Mathare, Nairobi – Kenya**

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#### **Abstract**

This study examined the role of gut microbiota in early childhood malnutrition and its long-term health consequences among children in the Mathare informal settlement of Nairobi, Kenya. Early childhood malnutrition continues to be a major public health issue in Kenya, with lasting impacts on child development, growth, and future health, especially in informal settlements like Mathare where it remains highly prevalent. A prospective cohort of 300 children aged 6-24 months from Mathare was followed. Fecal samples were collected at baseline, then every 6 months for 2 years to analyze gut microbiota diversity and composition using 16S rRNA gene sequencing. Anthropometric, dietary intake, and socioeconomic data were also collected during this period. A subgroup of 100 participants received follow-up until age 8 to assess immune function, growth, and long-term health outcomes. Compared to well-nourished children, those suffering from early childhood malnutrition (stunting, wasting, or underweight) exhibited significant alterations in their gut microbiota composition. Malnourished children had markedly reduced levels of beneficial bacteria like *Bifidobacterium* and *Lactobacillus* species, and increased levels of potentially pathogenic *Enterobacteriaceae*. These dysbiotic gut microbiota profiles were associated with impaired nutrient absorption, heightened gut inflammation, and disrupted metabolic pathways. At age 8, children who had experienced early childhood malnutrition and persistent gut dysbiosis showed poorer development of the immune system, growth impairment, and diminished cognitive abilities compared to those who recovered from malnutrition with restoration of a more balanced, diverse gut microbiome. The findings shed light on the critical role gut microbiota play in early childhood malnutrition and its long-term deleterious health effects in this vulnerable population. Targeted interventions like probiotics, prebiotics and fecal microbiota transplantation aimed at reestablishing a healthy gut microbial profile may represent promising strategies to address malnutrition and mitigate its lasting developmental and health impacts.

**Keywords:** Early Childhood Malnutrition, Long-Term Health Effects, Gut Microbiota, Immune System