

Title: Longitudinal Analysis of the Gut Microbiota in Children with and without Stunting in India

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Abstract:

Alterations in the gut microbiome have been implicated in the pathogenesis of childhood malnutrition. Recently, the gut microbiome was shown to be causally associated with severe acute malnutrition. However, there have been no reported studies on the role of the gut microbiome in chronic malnutrition or stunting. Stunting (low height for age) affects around 170 million children in the resource-limited world and is thought to account for 20 to 30% of childhood mortality globally. Low birth weight is a major risk factor for stunting. In a pilot study of children in the urban slum of Vellore, India, we compared the composition and diversity of the microbiota every 3 months from three to 24 months of age in 10 children with normal birth weight and 10 children with low birth weight using the V4 region of the 16S rRNA on the Illumina MiSeq platform. An average of 37,050 sequences and 379 operational taxonomic units (OTUs) were examined per sample (total of 160 samples). We found a significant increase in alpha and beta diversity metrics with increasing age as well as in the relative abundance of Bacteroidetes and a significant decrease in that of Actinobacteria and Proteobacteria. There was a significant difference in beta diversity but not alpha diversity in stunted compared to non-stunted children. Additional analysis also revealed significant enrichment of specific taxa in the Proteobacteria phylum, including taxa such as *Desulfovibrio*, (associated with inflammatory bowel disease and malnutrition) in stunted compared to non-stunted children. Stunted children were also depleted in the probiotic anti-inflammatory species *Bifidobacterium longum*. Future studies are directed at analysis of the gut microbiota from larger numbers of children and at metagenomics approaches to characterize the microbiome in these children. The long term goal is to develop targeted interventions to prevent or reverse stunting in young children.