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Microbiota is immature in moderate and severe acute malnutrition

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Globally 19 million under-five children suffer from severe acute malnutrition (SAM) while 51.5 million children have moderate acute malnutrition (MAM). These two conditions, together known as acute malnutrition, are responsible for 14.6% of all under-five deaths. Case fatality rate can be reduced with treatment of SAM, which however, is not readily available everywhere. Even with effective treatment, recovery can be slow and relapse not uncommon. Lack of nutrients is one of the causes of acute malnutrition but other factors including infections, inter- and intra-generational factors are also believed to play important roles in the etiology. The gut microbiota is another factor; however its relationship with nutritional interventions and therapeutic response is poorly understood. We studied the gut microbiota of children suffering from severe and moderate acute malnutrition in Bangladesh. Children with SAM were studied during the acute phase, nutritional rehabilitation and follow up in icddr,b Hospital, Dhaka. During the nutritional rehabilitation phase, the children were randomized to either RUTF or a combination of local diets (khichuri and halwa). Children with MAM were randomly selected from a birth cohort in a slum settlement and so were healthy controls. Gut microbiota were identified using 16S rRNA datasets generated from monthly fecal samples obtained from the healthy control children. 'Relative microbiota maturity index' and 'microbiota-for-age Z-score' were computed from a model developed from the age-discriminatory bacterial species identified in the healthy and acutely malnourished children. The index and the Z-score compare maturation of an acutely malnourished child's fecal microbiota relative to healthy children of similar chronological age. Our results indicate that SAM is associated with relative immaturity of the gut microbiota. Moreover, treatment with either RUTF or the local diets is associated with incomplete recovery of the gut microbiota. Similarly, MAM is also associated with immaturity of the gut microbiota, the degree of immaturity correlating with the severity of malnutrition. The immaturity of the gut microbiota in acute malnutrition may have an important role in metabolic and immunologic perturbations that result in suboptimal response to therapeutic measures.