

Theresia Jumanne Jumbe

## Association of Fatty Acids with Growth and Cognition of Tanzanian Children

### Abstract

**Background:** There is an increasing interest in the effects of n-3 and n-6 fatty acids in human health. Evidence from experimental and epidemiological studies has shown that essential fatty acids are important for growth and cognitive development of children. In most developing countries the availability of fats in food supply is generally low, most times lower than the minimum recommended levels. Among children in Tanzania, 42% below five years of age are stunted, 6% are wasted, and 21% are underweight. This, therefore, sets high risks of developing essential fatty acid deficiency to all the vulnerable groups and most importantly children. Research and interventions in Tanzanian children child growth and cognition in Tanzania has mostly focused on protein-energy deficiency in growth and the role of iron deficiency in cognition. No studies have assessed the FA status of Tanzanian children, nor have the relationships between fatty acid status and growth and cognition been measured. Therefore, the objective of this research was to measure whole blood levels of FA in these children and to establish the association of their FA levels with their growth and cognitive abilities.

**Methods:** The study was conducted in Rudewa Mbuyuni village, Kilosa, Tanzania. A total of 335 two-to-six year old children participated in this study. A drop of whole blood was collected on an antioxidant treated card and the resulting dried blood spot was analyzed for FA composition using gas chromatography. Weight and height were measured. These values, along with age, were used in calculations of weight-for-height, length-for-age, body mass index-for-age and weight-for-length z-scores with the World Health Organization Anthro software suite. Seeds, nuts and oil samples were collected from the study area. Fats were extracted from these foods by acidified methanol. FA composition of the extracts was measured using a DSQII quadruple GC/MS. Dimensional change card sort (DCCS) task was used to assess the executive function.

**Results:** Whole blood FA levels were measured and the results indicated that a significant proportion of these children had low levels of essential FA. Approximately 23% of these children were EFA deficient as defined by a T/T ratio  $>0.02$ . Whole blood levels of linoleic acid were positively associated with height-for-age z score in this population. Thus, those children with lower levels of linoleic acid (an EFA) were also stunted. We found that LA had a strong positive association with executive function. DHA was positively associated with executive functions. Although these results are just associations, they suggest a possible role of n-6 FA in cognition. The results also showed that the locally available and crude sunflower oil and pumpkin seeds were high in the n-6 FA, particularly linoleic acid.

**Conclusion:** This dissertation shows the strong association between whole blood essential fatty acids and both growth and cognitive function. It affirmed the importance of n-6 FA in growth as shown by others [1] and highlights the association of n-6 FA in cognitive functions, which has been mainly overshadowed by the emphasis on n-3 FAs. Promoting adequate total dietary intake may increase the amount of essential fatty acid consumed which will eventually provide the long chain fatty acid known to play a critical role in both growth and cognition. These findings provide a foundation for further research on the importance of fatty acids in eradicating malnutrition in developing countries.