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<th>Abstract ID</th>
<th>Author</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>124</td>
<td>Benedikte Grenov</td>
<td>Wasting, but not stunting, is associated with reduced fat-free mass index in Cambodian children aged 6 and 15 months</td>
<td>1</td>
</tr>
<tr>
<td>126</td>
<td>Pacifique Mwene-Batu</td>
<td>Malnutrition in childhood and chronic diseases in adulthood in the context of Eastern DR Congo: a longitudinal study protocol</td>
<td>2</td>
</tr>
<tr>
<td>287</td>
<td>Celine Bourdon, Presented by Natasha Lelijveld</td>
<td>Serum metabolomics analysis shows no longer-term metabolic consequences in children that survived severe acute malnutrition 7 years post-discharge: ChroSAM study</td>
<td>3</td>
</tr>
</tbody>
</table>
Wasting, but not stunting, is associated with changes in fat and fat-free mass indexes in Cambodian children aged 6 and 15 months

ID:124

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Background and objective

- Few data from low-income countries describe the association between nutritional status and body composition in early life. This period is particularly critical for long-term outcomes
- The main objective was to assess the association of stunting and wasting with body composition in young rural Cambodian children. We hypothesized that association of stunting and wasting with body composition change with age

Method

- The study was a longitudinal study nested in a randomized trial (WinFood, ISRCTN19918531 (1)). It was conducted from March 2011 to March 2012 in seven rural municipalities in the Prey Veng province, south-east of Phnom Penh
- Single born children were eligible if they were 6 months of age and did not have severe wasting, pitting oedema, vitamin A deficiency, anaemia or diarrhoea on the day of recruitment
- Body composition was measured by the deuterium dilution technique described by IAEA and anthropometry was conducted according to the WHO guidelines
- Children were assessed at 6 and 15 months of age
- Linear mixed-effects models were used to assess associations of stunting and wasting with fat mass (FM) and fat-free mass (FFM) and their corresponding height-adjusted indexes FMI and FFMI

Results and discussion

- The study enrolled 419 children. At 6 months of age, 98% were breastfed, 15% were stunted and 4% were wasted. At 15 months, 78% were breastfed, 24% were stunted and 11% were wasted (Table 1)
- Stunted children had lower FM at 6 months and lower FFM at 6 and 15 months of age compared to children with length-for-age z-score ≥0. These differences disappeared for height-adjusted indexes, FMI and FFMI (Figure 1A and 1B)
- Wasted children had lower FM, FMI and FFMI at 6 and 15 months compared to children with weight-for-length z-score (WLZ) ≥0. FFM and FFMI deficits generally increased with age, while FM and FMI deficits decreased (interactions between age and WLZ in the mixed-effects models) (Figure 1C and 1D)

Table 1: Breastfeeding, anthropometry and body composition of young, rural Cambodian children at 6 months and 15 months of age

<table>
<thead>
<tr>
<th></th>
<th>Boys (%)</th>
<th>Age, month</th>
<th>Breastfeeding</th>
<th>Weight, kg</th>
<th>Length, cm</th>
<th>MUAC</th>
<th>LAZ, %</th>
<th>WLZ, %</th>
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<td>6 months</td>
<td>n</td>
<td>n</td>
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<td></td>
<td>419</td>
<td>358</td>
<td>54%</td>
<td>419</td>
<td>358</td>
<td>15:0.6</td>
<td>417</td>
<td>357</td>
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<td>15 months</td>
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Conclusions

Malnourished children seem to preserve body fat for immediate survival at the expense of fat-free tissue accretion. This may have long-term consequences including reduced working capacity and higher risk of non-communicable diseases.

Malnutrition in childhood and chronic diseases in adulthood in the context of Eastern DR Congo: a longitudinal study protocol

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INTRODUCTION

Malnutrition is a public health problem in low- and middle-income countries. In particular, there is a rapid increase in obesity and chronic diseases among adults in sub-Saharan Africa, where under-nutrition still predominates largely in children. A number of studies suggested that malnutrition in the first 1000 days of life is associated with high risk of non-communicable diseases (NCD) later in adulthood. In Eastern DR Congo where up to 8% of children younger than 5 years are acutely malnourished and over 1 in every 2 children are stunted. The overall prevalence of diabetes is 3.5%, a combination of hypertension and diabetes is found in 59.6% of patients and the prevalence of obesity is estimated at 7.7%. Despite the increasing awareness of the lifelong deleterious effects of early life deprivations, there is scant information on link between undernutrition in infancy and the risk NCD in adulthood in DR Congo. Our study aims to estimate the association between both acute and chronic malnutrition during childhood and different NCD-related characteristics including high blood pressure, diabetes, obesity, dyslipidemia and body composition in later life in South-Kivu.

METHODS

We are conducting a cohort study on adults who were previously treated for severe acute malnutrition at age of 6-59 months between 1988-2003 at Lwiro pediatric hospital, South Kivu province. The exposed group consists of people aged 18 years and above, living in Miti-Murhesa and Katana health zones, with history of severe acute or chronic malnutrition before the age of 5 years. A control group will be recruited and consists of adults with no history of early childhood undernutrition, living in the same area as the participants in the exposed participants to whom they will be sex- and age-matched.

Up to 2011 medical files have been obtained and will constitute the baseline sample size for this study. Trained community health workers are working toward tracing the participants who are still living in Miti-Murhesa and Katana health zones. Structured and pre-tested questionnaires will then be administered to the participants by trained data collectors. The main study outcomes will include body composition parameters and cardiovascular risk factors like high blood pressure, obesity, diabetes and dyslipidemia. Data will be analyzed as cohort study.

PRELIMINARY RESULTS

Of the 2011 subjects recorded today, 708 are alive, 192 dead, 463 displaced and 648 lost to follow-up.

DISCUSSION/CONCLUSION

A follow-up study of this length in a setting where malnutrition is prevalent is rare. Our results will estimate the link between undernutrition in infancy and the risk NCD in adulthood. Our findings could inform future programs to minimize long-term adverse outcomes of malnutrition.
Background

- Through better management, more children are now surviving severe acute malnutrition (SAM) and this may be associated with a higher risk of long term cardiometabolic disorders\(^1,2\)
- To better understand the changes that lead to these disorders, we studied the metabolite profiles of children seven years post-treatment for SAM

Study Aims

To investigate whether SAM leads to detectable changes in metabolites seven years post-treatment for SAM. Specific aims were:

1. Characterize metabolic profiles of SAM survivors and compare them to community and sibling controls using targeted metabolomics
2. Associate metabolite profiles with a SAM phenotype (severe wasting vs. edematous SAM) and anthropometry, both current and at time of admission

Methods

Participants

A subset of Malawian children previously hospitalised for SAM (n=69), healthy sibling controls (SCs, n=44) and age and sex-matched community controls (CCs, n=37).

Measurements

Metabolites and other bioactive molecules were measured in fasting blood using:

1. Mass spectrometry (DI-MS) to quantify acylcarnitines, sphingolipids, glycerophospholipids, amino acids and biogenic amines
2. Nuclear magnetic resonance (NMR) spectroscopy to quantify sugars, amino acids and ketone bodies
3. Lumix® and ELISA assays to measure fibroblast growth factors, adipokines, hormones and vitamins A and D
4. Anthropometry at hospitalization and at 7-year follow up

Statistical Analysis

1. Univariate and sparse partial least squares discriminant analysis (sPLS-DA) were used to assess differences in metabolic profiles between groups while adjusting for age, sex, HIV status and wealth index.
2. Differences associated with edema status and anthropometry were also tested.

Results

Table 1 – Metabolite / protein concentrations of top-ranked variables that differentiate between SAM survivors and controls as selected by sPLS-DA with their associated results from linear regressions

- **IGF1** was associated with stunting (\(R^2=15\%\)) and SAM survival (\(R^2=3.2\%\)).

  - No metabolite was associated with edema status, duration of hospital stay or anthropometry measured during initial hospitalization.

Anthropometry and IGF1

- **IGF1** was associated with stunting (\(R^2=15\%\)) and SAM survival (\(R^2=3.2\%\)).
  - No metabolite was associated with edema status, duration of hospital stay or anthropometry measured during initial hospitalization.

Conclusions

- In this cohort, 7 years post-treatment for SAM, the metabolome did not differ between SAM survivors and controls.
- SAM phenotype, severity of SAM episode (wasting and stunting on admission) and post-treatment weight gain (change in WAZ-scores) were not associated with specific metabolite profiles.
- Stunting was associated with IGF1 concentrations and this relationship may be influenced by exposure to SAM.
- Risk markers linked to non-communicable diseases could be revealed in childhood if SAM survivors were to be metabolically challenged or seen later in adulthood after exposure to an obesogenic environment.

Funded by:

References