Conflict of Interest

The authors have declared no conflict of Interest.

Longitudinal follow-up of children aged 6-59 months with Moderate Acute Malnutrition (MAM) in India: a prospective observational study

Raman Mahajan, Tansy Edwards, Chandra N. Shandilya, Vivek Kashyap, Elisa Marino, Alan de Lima Pereira, Montse Escruela, Nuria Salse, Amit Harshana, Rajib Dasgupta, Sakib Burza

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

जवाहरलाल नेहरू विश्वविद्यालय
Jawaharlal Nehru University

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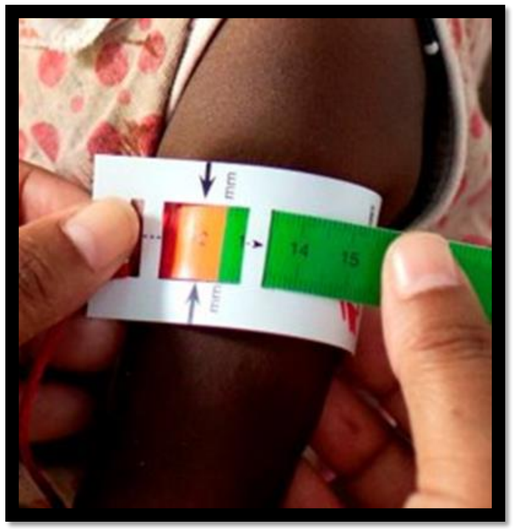
BACKGROUND

- Globally, more than 33 million children are affected by moderate acute malnutrition (MAM).
- No standardized approach to the management of MAM in India
- Definitions of MAM and severe acute malnutrition (SAM) (WHO 2012)



MAM: WHZ between −2 and −3 and/or MUAC 115-124 mm

SAM: WHZ < -3 and/or MUAC <115 mm and/or bilateral pitting oedema

Malnutrition Scenario in India

- Approximately 1 in every 3 children are either wasted, stunted and/or underweight in India
- 7.5% Severely wasted (SAM), 13.5% Moderately wasted (MAM). (Source: NFHS-4 -15-16)

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METHODS

Objective:

- To investigate the evolution of nutritional status in children aged 6-59 months presenting with MUAC of 115-124mm, for up to **6 months** post enrollment

Study Design:

- Longitudinal observational study, conducted in parallel to RCT on alternate discharge MUACs in SAM
- Study area: 46 sites in West Singhbhoom District , Jharkhand India
- Inclusion criteria: Children aged 6-59 months with MUAC 115 to 124 mm

Primary Endpoint:

- Deterioration to SAM (defined as MUAC<115mm and/or bilateral oedema) or death occurring within 6 months

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This study was approved by the MSF Ethics Review Board and by the Ethical Review Boards of the Rajendra Institute of Medical Sciences, Ranchi and Jawaharlal Nehru University, New Delhi, India, and London School of Hygiene & Tropical Medicine, UK. Clinical Trials Registry – India number, CTRI/2017/12/010743

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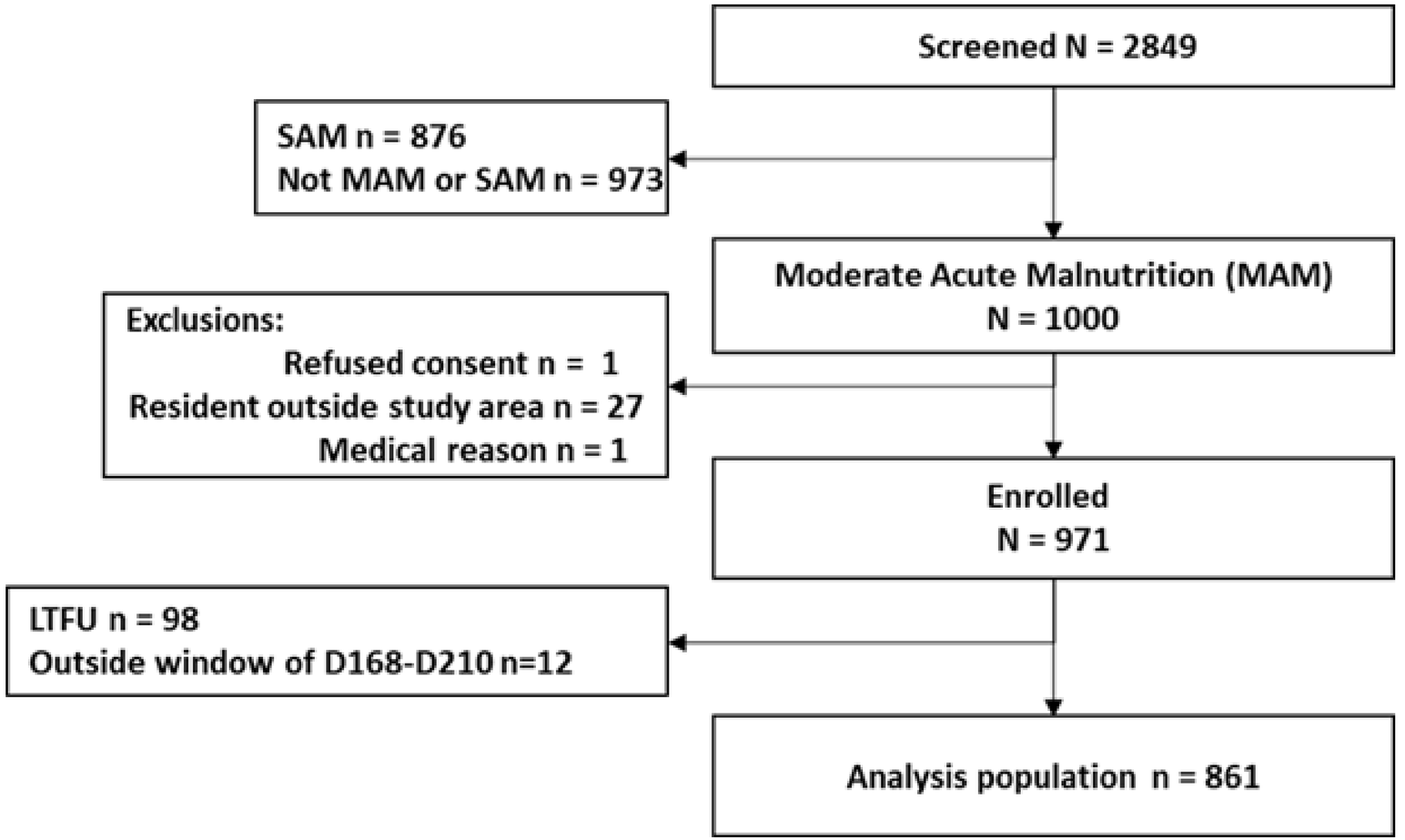
RESULTS (SCREEENING, ENROLMENT AND ANALYSIS)



- % 6-11 months 40%
- % with MUAC between 115-119 mm 34%
- % of children with WHZ <-3 44%

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3 AND 6 MONTH OUTCOMES

Eligible analysis population (non-missing outcome):	861
Died within 3 months, n (%, 95% CI)	1 (**0.1%**, 0.0 - 0.6)
Deteriorated to SAM within 3 months, n (%, 95% CI)	97 (**11.3%**, 9.2 - 13.6)
Deteriorated to SAM or died within 3 months, n (%, 95% CI)	98 (**11.4%**, 9.3 - 13.7)
Died within 6 months*, n (%, 95% CI)	4 (**0.5%**, 0.1 - 1.2)
Deteriorated to SAM within 6 months*, n (%, 95% CI)	129 (**15.0%**, 12.7 - 17.5)
Deteriorated to SAM or died within 6 months*, n (%, 95% CI)	133 (**15.4%**, 13.1 - 18.0)

*** Includes 3 months outcomes**

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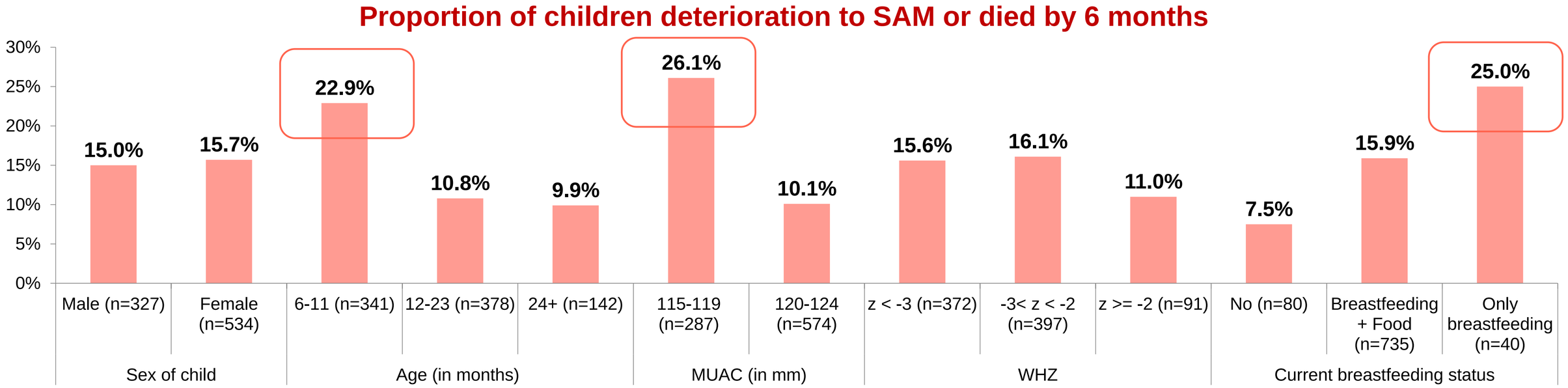
Univariable associations with SAM or death



Multivariable step-wise logistic regression analysis:

- **Association of breastfeeding status with outcome disappears after adjustment for age**
- **Negligible difference by sex and WHZ categories**
- **Final model included MUAC category and age group with an interaction between them (next slide)**

No evidence of association with outcome: Sex, WHZ, WAZ, HAZ, socio economic status, mother education, mother age, household size, seasonality, Use of aanganwadi services and immunization status

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MULTIVARIABLE ANALYSIS - INTERACTION

Characteristic		Adjusted odds ratio (95% CI)	Wald p-value
Age 6-11 months	**MUAC 115-119 vs 120-124mm**	**3.08 (1.83 – 5.19)**	**<0.001**
Age 12-23 months	**MUAC 115-119 vs 120-124mm**	**2.64 (1.37 – 5.10)**	**0.004**
Age 24+ months	**MUAC 115-119 vs 120-124mm**	**4.00 (1.29 – 12.4)**	**0.016**
MUAC 115-119mm	Age 6-11 vs 24+ months	2.22 (0.94 – 5.21)	0.068
	Age 12-23 vs 24+ months	0.88 (0.36 – 2.12)	0.790
MUAC 120-124mm	**Age 6-11 vs 24+ months**	**3.96 (1.28 – 12.3)**	**0.017**
	Age 12-23 vs 24+ months	1.32 (0.52 – 3.40)	0.559

- Deterioration seen across all ages in children with MUAC 115-119
- Amongst children with MUAC 120-124mm at enrolment; some evidence that under 1 year olds have higher odds of deterioration compared to children 24-59 months

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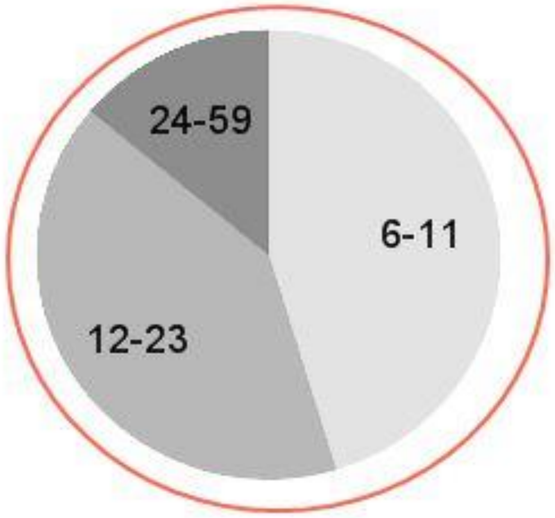
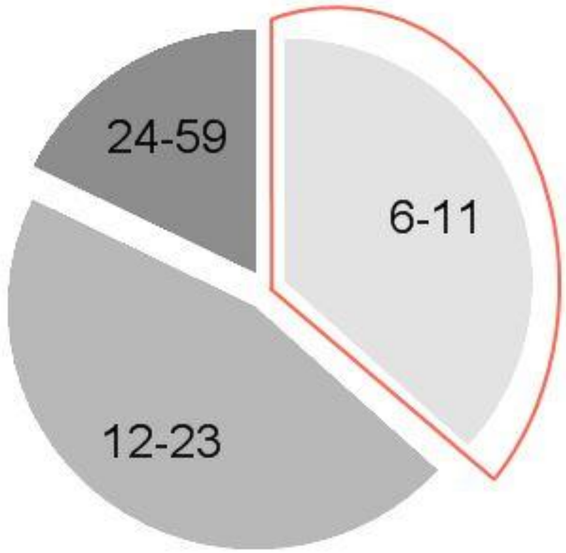
Increased odds of deterioration to SAM or death:

MUAC 115-119mm at enrolment (33% of cohort)



25% of MUAC 115-119mm deteriorated

MUAC 120-124mm at enrolment (67% of cohort)



- **MUAC 120-124mm & aged 6-11 months (1/4 of cohort)**
- **15% of MUAC 120-124mm & 6-11 months deteriorated**

15% of children deteriorated overall
57% of children have MUAC 115-119mm or MUAC 120-124 + 6-11 months

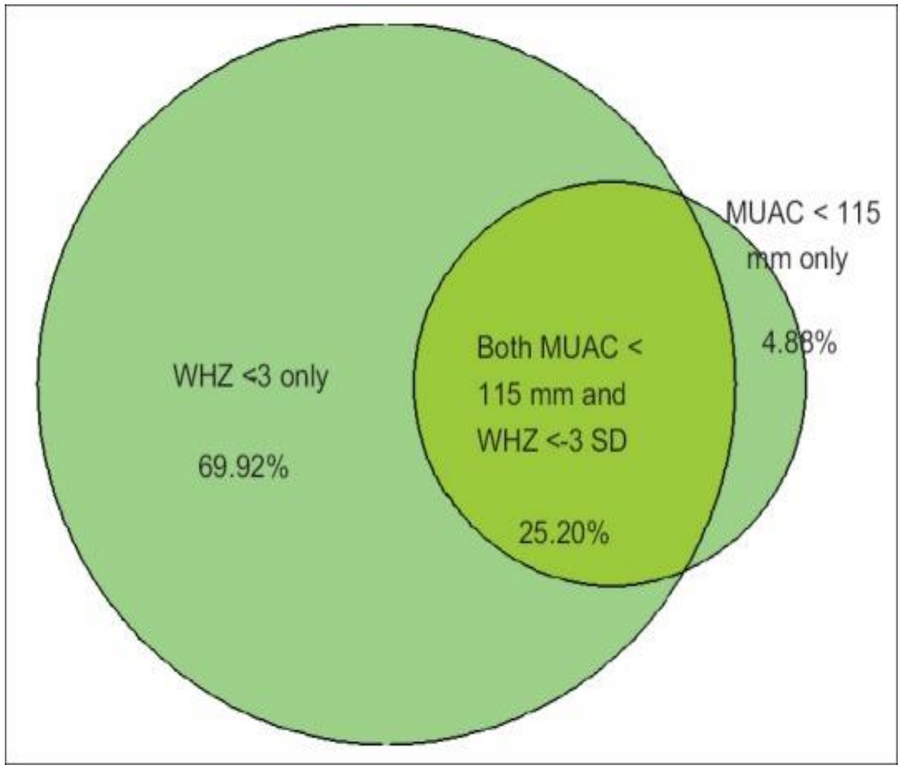
-

CHILDREN WITH WHZ<-3 BUT MUAC ≥115 MM?

- WHZ <-3 are SAM
- Those not also MUAC <115 typically excluded from solely MUAC based SAM therapeutic feeding programmes
- Represents up to 70% of children screened with both MUAC and WHZ

- ❖ Are the majority of 'remaining' WHZ <–3 covered by MUAC 115-125mm?
- ❖ 43% of MAM children in this study had WHZ<-3

No association of WHZ<-3 as an independent variable with deterioration in this cohort (p=0.9)



Source : Kumar et al. Comparison between Weight-for-Height Z-Score and Mid Upper Arm Circumference to Diagnose Children with Acute Malnutrition in five Districts in India.

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CONCLUSIONS

- Considerable number of children **(n=129 , 15%)** of MAM-by-MUAC children deteriorated to SAM-by-MUAC within 6 months.
- Majority **(n=97, 11.3%)** did so within the first 3 months
- A third of MAM-by-MUAC children have MUAC 115-119mm; 25% of whom deteriorated
- A quarter had MUAC 120-124mm and were aged 6-11 months; 15% of whom deteriorated
- Mortality rate was globally low (n=4 , 0.5%)
- Those with WHZ <-3 were **not** associated with deterioration to SAM-by-MUAC
- **Suggests current MUAC based SAM program standards would not increase risk of children with WHZ<-3 but MUAC >115 deteriorating**

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RECOMMENDATIONS

- Considering the high burden of MAM children in India, additional nutritional interventions focused on MAM children should be considered.
- Younger children (<1yrs) and children with MUAC between 115-119mm should be closely monitored up to 3 months if no supplemental feeding programme is available.
- Is increasing admission cut-offs for SAM therapeutic feeding programmes the answer? More evidence needed.
- Limitation: Children with MUAC>124 mm not included in the study.
  - Would these results hold for children WHZ<-3 BUT MUAC >125?

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THANK YOU