# Anthropometric predictors of relapse from severe acute malnutrition: towards evidence-based discharge criteria

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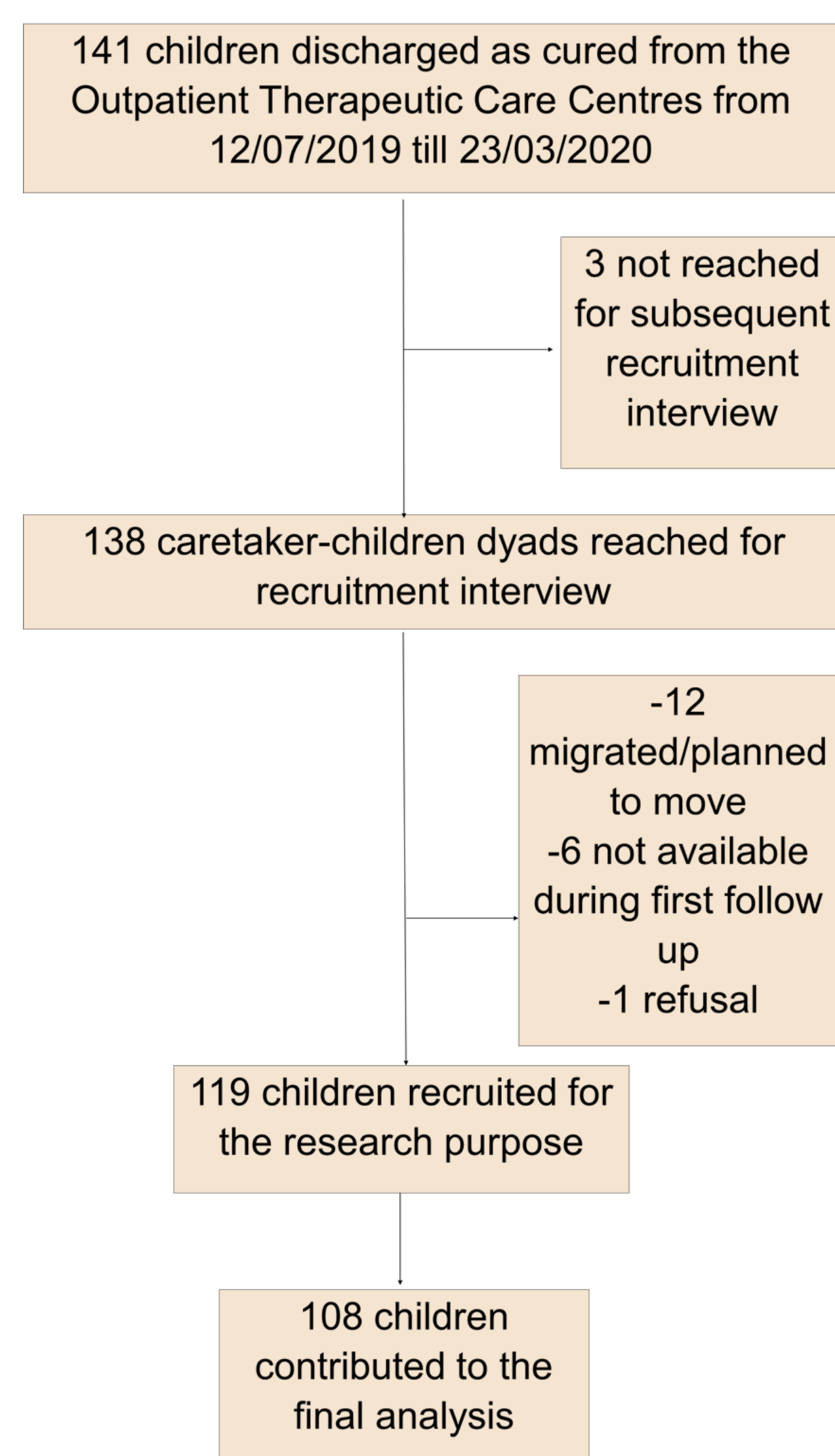
## Background

There is a dearth of evidence on what should be the optimal criteria for discharging children from severe acute malnutrition (SAM) treatment. Post-treatment outcomes follow-up in children discharged as cured with variable levels of anthropometric deficits is instrumental to fill current evidence gaps about the adequacy of current international recommendation and the extent to which different types of anthropometric deficits at discharge, including Weight-for-Height (WHZ) deficits, influence the risk of relapse. In Nepal, SAM children are managed and treated as per the national guideline on Integrated Management of Acute Malnutrition (IMAM). According to this guidance, all internationally agreed-upon case definitions of SAM (low Mid Upper Arm Circumference (MUAC) or low WHZ or nutritional Oedema) are eligible for treatment, yet discharge criteria are less stringent than WHO standards: they mainly consist in the observation of a MUAC > 115 mm after a minimum treatment duration of 6 weeks. Many children may thus be discharged from SAM treatment while still presenting anthropometric deficits. The resulting risks have never been assessed. In particular it is unknown if (or to what extent) this may predispose to relapse or if instead, the child recovery process would continue after treatment cessation.

## Aim

- describe the relapse rates among the severely acutely malnourished children discharged as cured from the IMAM programme.
- quantify the strength of the association between failure to reach WHO-recommended discharge criteria and risk of relapse, and
- identify the respective contributions of the different types of anthropometric deficits

## Methodology

A prospective observational study of a cohort of SAM children discharged as cured from the IMAM programme was conducted. SAM children aged 6 to 59 months at their admission to treatment, and who were discharged as cured as per national recommendations from the 14 health facilities implementing outpatient treatment in the district were the target population. The recruitment period started in July 2019, for a period of one year. The IMAM programme registers of the health facilities were screened each week in order to identify children newly discharged as cured as per national protocol: a minimum length of 6 weeks AND MUAC >115 mm AND no Oedema for two consecutive visits AND weight gain for last two consecutive visits AND clinically well and alert. Families were then promptly reached using either direct phone contact or indirect contact through the community health workers in charge of the area. Children eligible for the study were all new children discharged as cured (1) for whom a home visit could be planned for a formal recruitment interview with the caretaker at a date close to two weeks after discharge; and (2) for whom the caretaker did not report any plan to leave the district in the next 6 months.

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141 children discharged as cured from the Outpatient Therapeutic Care Centres from 12/07/2019 till 23/03/2020

3 not reached for subsequent recruitment interview

138 caretaker-children dyads reached for recruitment interview

-12 migrated/planned to move
-6 not available during first follow up
-1 refusal

119 children recruited for the research purpose

108 children contributed to the final analysis

*Patient's flow chart*

### Result

The results suggest that children who are apparently successfully treated for SAM as per current national guidance in Nepal have a high risk of relapse as SAM within 6 months after end of treatment. This risk of relapse appears to be primarily explained by the fact that the current guidance allows discharging children as cured before they reach the WHO-recommended discharge criteria. Among the anthropometric deficits at discharge contributing to the risk of relapse as SAM, it is shown that WHZ deficits plays a unique role.
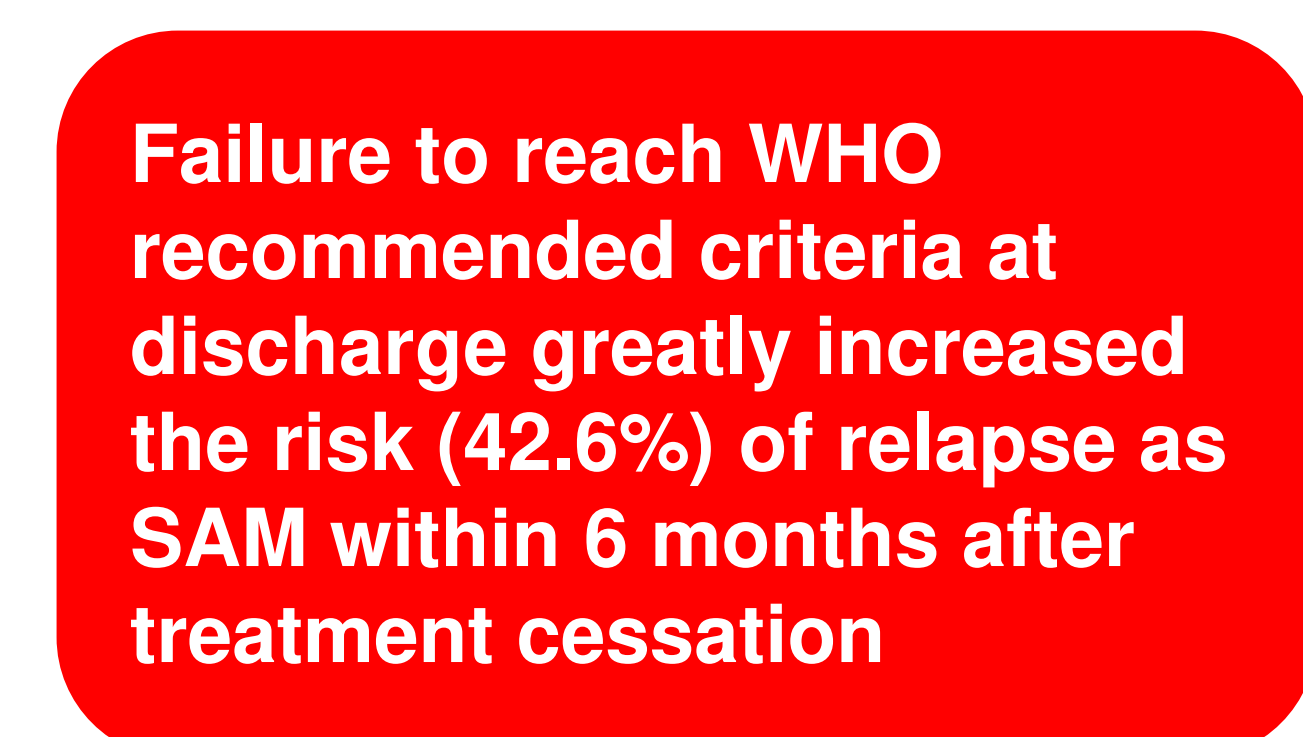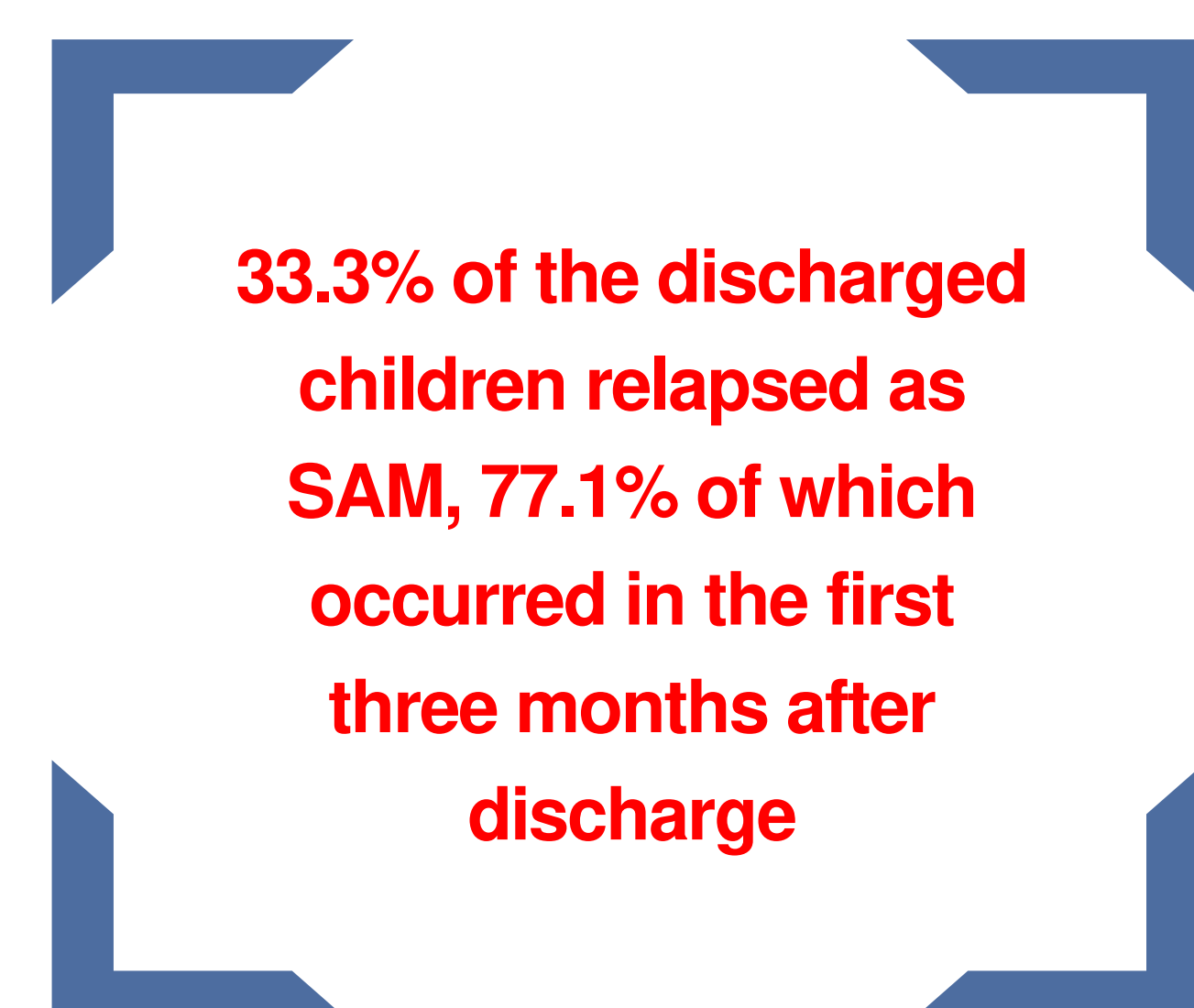
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Table: Cox proportional-hazards analysis of the association between anthropometric deficits at discharge and risk of relapse

| Exposure variables | | Proportion of relapse (%) | Univariate models | | Multivariate models | |
|---|---|---|---|---|---|---|
| | | | Hazard Ratio | p | Hazard Ratio | p |
| **Models with binary exposure variables** | | | | | | |
| WHZ at discharge | WHZ<-2 WHZ>=-2 | 45.3 (24/53) 20.0 (11/55) | 3.2 Ref. | 0.003 | 2.8 Ref. | 0.01 |
| MUAC at discharge | MUAC<125mm MUAC>=125mm | 41.7 (15/36) 27.8 (20/72) | 1.5 Ref. | 0.26 | 1.4 Ref. | 0.32 |
| HAZ at discharge | HAZ<-2 HAZ>=-2 | 32.8 (20/61) 31.9 (15/47) | 1.1 Ref. | 0.75 | NA | NA |
| Duration of treatment | <10 weeks >=10 weeks | 22.8 (13/57) 43.1 (22/51) | 0.5 Ref | 0.051 | 0.7 Ref. | 0.27 |
| Age at discharge | <24 months >=24 months | 32.8 (21/64) 31.8 (14/44) | 0.9 Ref. | 0.74 | NA | NA |
| Sex | Male Female | 40.0 (20/50) 25.9 (15/58) | 1.7 Ref. | 0.14 | 1.6 Ref. | 0.23 |
| **Models with continuous exposure variables** | | | | | | |
| WHZ at discharge | | NA | 0.19 | <0.001 | 0.2 | 0.001 |
| MUAC at discharge in mm | | NA | 0.94 | 0.046 | 1.0 | 0.10 |
| HAZ at discharge | | NA | 0.81 | 0.24 | NA | NA |
| Duration of treatment in days | | NA | 1.0 | 0.10 | 1.0 | 0.86 |
| Age at discharge in months | | NA | 1.0 | 0.94 | NA | NA |
| Sex | Male Female | 40.0 (20/50) 25.9 (15/58) | 1.7 Ref. | 0.14 | 1.7 Ref. | 0.19 |

*WHZ: weight-for-height Z-score; MUAC: Mid-upper arm circumference; HAZ: height-for-age Z-score*

Table: Incidence rates of relapse as SAM (by 100 child-months)

| period | Over the 6 months follow-up | | Over the first 3 months | | Over the last 3 months | |
|---|---|---|---|---|---|---|
| | Incidence Rate | 95% CI | Incidence Rate | 95% CI | Incidence Rate | 95% CI |
| Relapse as SAM | 7.2 | 5.1-10.1 | 10.9 | 7.5-15.9 | 2.5 | 1.0-6.0 |

**The only anthropometric parameter at discharge significantly associated with relapse as SAM was WHZ.**

**Still being MAM at discharge multiplied the risk of relapse as SAM by almost 3.**

**33.3% of the discharged children relapsed as SAM, 77.1% of which occurred in the first three months after discharge**

**Failure to reach WHO recommended criteria at discharge greatly increased the risk (42.6%) of relapse as SAM within 6 months after treatment cessation**

## Conclusion

The results suggest that priority should be given to ensure that the children enrolled in SAM management programmes reach a high level of WHZ at discharge, at least above or equal to the WHO-recommended cut-off, and that the correction of MUAC deficits should not be considered as a sufficient discharge criterion. Besides, the validity of using a single MUAC cut-off such as 125 mm as a criterion to end treatment in all age groups should be further ascertained. Robust investigations of relapse providing a complete assessment of nutritional status at discharge, and using all possible case definitions of SAM to define relapse as SAM, should be performed in a variety of contexts, including in the context of MUAC-only protocols. This is required to assess the current burden of relapse across programmes and to build the evidence base for setting discharge criteria that secure sustained recovery and healthy growth in most of the children. In the meanwhile, it is believed that current international and national guidance encouraging the practice of leaving SAM children's WHZ status unassessed, at admission to and discharge from treatment, and the use of restricted MUAC-only definitions of relapse, should be promptly revised in the light of the research findings.