

# Intravenous and oral rehydration of children with severe malnutrition and gastroenteritis

<b>Submission date</b> 23/07/2018	<b>Recruitment status</b> No longer recruiting	<input checked="" type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
<b>Registration date</b> 08/08/2018	<b>Overall study status</b> Completed	<input checked="" type="checkbox"/> Statistical analysis plan <input checked="" type="checkbox"/> Results
<b>Last Edited</b> 16/06/2025	<b>Condition category</b> Nutritional, Metabolic, Endocrine	<input type="checkbox"/> Individual participant data

## Plain English summary of protocol

### Background and study aims

Severe acute malnutrition (SAM) is a severe problem for African children. It can lead to the development of gastroenteritis, diarrhoea and dehydration, which leads to hospitalisation. However, on the current treatment recommended by the World Health Organization (WHO), the outcome is poor, with 20% of children dying during hospital admission.

A standard treatment for gastroenteritis, which leads to dehydration, is rehydration therapy, given by either an IV drip, which is used for more severe cases, or oral salt solutions, which is used for less severe cases or as a follow-on treatment after using a drip. The WHO guidelines for children with dehydration as a result of diarrhoea (which can be a complication of SAM, but also a result of bacterial or viral infections) recommend using oral salt solutions, with restricted use of intravenous drip therapy; however, this is controversial, as these recommendations are not based on results from clinical trials.

The aim of this study is to compare the recommended treatments for the rehydration of children with SAM with the standard treatments for the rehydration of children without SAM, to determine if these can be safely used for and improve the outcome of children with SAM.

### Who can participate?

African children aged 6 months to 12 years who are hospitalised with SAM and have gastroenteritis leading to dehydration

### What does the study involve?

For children with severe dehydration, we will compare the effects of giving them fluid via a drip, either quickly or slowly, with giving them the WHO SAM recommended regime, which involves using oral rehydration salts (ORS) and only starting drip treatment if the child goes into shock. For children with less severe dehydration, we will compare the effects of using standard ORS treatment, which has a higher amount of sodium, with an ORS called ReSoMal (designed specifically for SAM), which has a lower sodium content.

### What are the possible benefits and risks of participating?

The benefit of participating is that the children will be closely monitored throughout, so that any clinical deterioration can be identified at the earliest opportunity and appropriate therapy initiated. The possible risks of participating are:

1. Drip insertion and taking blood for laboratory tests may lead to pain, swelling or infection at the site of the drip; however, this will be minimised by careful technique and regular inspection  
2. Liberal intravenous rehydration and salt-rich solution has the potential to cause malnourished hearts to go into pump failure or lead to harmful fluid accumulation  
To minimise these risks, the nurses and doctors will monitor children very closely to look for side effects and if detected the treatments may be stopped. The trial sites in Africa have considerable experience with management of very ill children and this will serve to minimise the risks to the patients in the trial

Where is the study run from?  
KEMRI Wellcome Trust Research Programme (Kenya)

When is the study starting and how long is it expected to run for?  
October 2018 to October 2024

Who is funding the study?  
Medical Research Council (UK)

Who is the main contact?  
Ayub Mpoya  
ampoya@kemri-wellcome.org

## Contact information

**Type(s)**  
Scientific

**Contact name**  
Prof Kathryn Maitland

**ORCID ID**  
<https://orcid.org/0000-0002-0007-0645>

**Contact details**  
Wellcome Centre for Clinical Tropical Medicine  
London  
United Kingdom  
W2 1PG  
+254733411022  
kathryn.maitland@gmail.com

**Type(s)**  
Public

**Contact name**  
Mr Emmanuel Oguda

**Contact details**  
KEMRI Wellcome Trust Research Programme  
Kilifi  
United Kingdom

-  
+254 735 229 037  
EOguda@kemri-wellcome.org

## **Additional identifiers**

### **Protocol serial number**

MRC Grant Reference: MR/R018502/1

## **Study information**

### **Scientific Title**

GASTROenteritis: Intravenous and oral rehydration of children with Severe Acute Malnutrition

### **Acronym**

GASTROSAM

### **Study objectives**

For children with severe acute malnutrition (SAM) with severe dehydration due to diarrhoea, we hypothesize that standard intravenous regime WHO Plan C (100 ml/kg over 3-5 hours) used for non-SAM gastroenteritis with severe dehydration will result in better outcomes than the current very conservative SAM rehydration recommendations.

In addition, we propose that the rate of rehydration may be critical and hypothesize that 100 ml /kg over 8 hours in SAM children will result in fewer fluid related adverse effects than rapid World Health Organization (WHO) Plan C guideline.

We also propose that standard oral rehydration solutions (ORS) may be equally as effective with fewer side effects than low salt ReSoMal ORS recommended by WHO.

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

Imperial College Research Ethics committee (ICREC), 20/03/2018, 18IC4427

Mbale Regional Referral Hospital Research Ethics Committee, submitted for approval 17/07/2018

### **Study design**

Interventional open multi-centre phase II randomised controlled trial with a factorial design

### **Primary study design**

Interventional

### **Study type(s)**

Treatment

### **Health condition(s) or problem(s) studied**

Severe acute malnutrition

### **Interventions**

Randomisation lists are generated and kept at the MRC CTU at UCL, London. The randomisation envelopes are prepared before the trial at the Clinical trials facility, KWTRP, Kilifi. These contain the actual allocation visible only once opened. The cards will be numbered consecutively and opened in numerical order.

The trial includes 2 strata:

Stratum A includes children with severe dehydration only. Children will be randomised in a 1:1:2 ratio to compare:

1. WHO Plan C arm: Rapid intravenous (IV) rehydration as per WHO Plan C (usually for non-SAM) children (100 ml/kg Ringers Lactate (RL) over 3-6 hours according to age including boluses (20 ml/kg) for those with shock (experimental))
2. Slow Rehydration arm: A slower IV rehydration regimen (100 ml/kg RL given over 8 hours and no boluses (experimental)).
3. WHO SAM arm: rehydration regime involves no intravenous rehydration and rehydration with ReSomMal Oral rehydration solution (ORS) with IV boluses of RL only for children with shock (standard of care)

Stratum B includes all children with some dehydration and all those with severe dehydration post IV rehydration, randomised in a 1:1 ratio to compare:

1. Standard WHO ORS given for non-SAM (experimental) versus
2. WHO SAM-recommended low-sodium ReSomMal

The trial will run for a total of 18 months for both strata.

## **Intervention Type**

Mixed

## **Primary outcome(s)**

Current primary outcome measures as of 07/08/2023:

1. For the intravenous rehydration strategy, mortality at 96 h after enrolment
2. For the oral rehydration strategy, change in plasma sodium levels, measured by standard laboratory clinical chemistry analyser from baseline (time of enrolment) to 24 h after enrolment

---

Previous primary outcome measures:

1. For intravenous rehydration, urine output (ml/kg/hour) will be assessed as a surrogate marker of rehydration efficacy 8 hours after treatment
2. Change in plasma sodium levels, measured by standard laboratory clinical chemistry analyser at the baseline (time of enrolment) and after 24 hours

## **Key secondary outcome(s)**

1. Evidence of pulmonary oedema or heart failure during period of hospital admission:
  - 1.1. Pulmonary oedema defined as developed of bilateral bi-basal crepitations of lungs on clinical examination
  - 1.2. Heart failure defined as development of signs of severe tachycardia, elevated jugular venous pressure and de novo or increasing hepatomegaly
2. Changes in sodium from post-IV levels for those in Stratum A, measured using standard laboratory clinical chemistry analyser at the baseline and after intravenous rehydration is completed
3. Perturbations of electrolyte abnormalities (severe hyponatraemia < 125 mmol/l or hypokalaemia < 2.5 mol/l), measured by standard laboratory clinical chemistry analyser at the baseline and at any time during admission
4. Mid-upper arm circumference (MUAC) change, measured using MUAC tape (supplied by

UNICEF) at the baseline and day 7

5. Survival at day 28 (child is confirmed to be alive at day 28)

**Completion date**

31/10/2024

## **Eligibility**

**Key inclusion criteria**

Severe dehydration - Stratum A:

1. Aged 60 days to 12 years
2. Severe malnutrition defined as any of the following: Mid-upper arm circumference (MUAC) <11.5 cm, weight for height Zscore (< -3SD), or signs of kwashiorkor
3. Gastroenteritis, defined as > 3 loose stools per day
4. Signs of severe dehydration, defined (as per WHO definition) as at least one of the following: unable to drink, Alert Voice Pain Unresponsive scale (AVPU) < A, sunken eyes, reduced skin pinch (>2 seconds) or inability to take or retain oral fluids, and/or shock (defined as patient with cold peripheries, weak and fast pulse and capillary refill time > 3 seconds)

Moderate/some dehydration - Stratum B:

1. Aged 60 days to 12 years
2. Severe acute malnutrition criteria, complicated by dehydrating diarrhoea (defined as > 3 loose stools per day)
3. Some to moderate dehydration or completing management of severe dehydration. Some to moderate dehydration defined as two of the following: restlessness, irritability, thirst, sunken eyes or skin pinch goes back slowly

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Child

**Lower age limit**

60 days

**Upper age limit**

12 years

**Sex**

All

**Total final enrolment**

272

**Key exclusion criteria**

1. Diarrhoea lasting more than 14 days
2. Known congenital or rheumatic heart disease
3. Refusal of consent

**Date of first enrolment**

02/09/2019

**Date of final enrolment**

30/08/2024

## **Locations**

**Countries of recruitment**

Kenya

Niger

Nigeria

Uganda

**Study participating centre**

**Mbale Regional Referral Hospital**

Pallisa Road Zone

P.O. Box 921

Mbale

Uganda

-

**Study participating centre**

**Soroti Regional Referral Hospital**

Department of Paediatrics

P.O. Box 289

Soroti

Uganda

-

**Study participating centre**

**Kilifi County Hospital**

Hospital Road

PO Box 230

Kilifi

Kenya

-

**Study participating centre**  
**Coast General Teaching Hospital**  
Madakara Road  
Mombasa  
Kenya  
-

**Study participating centre**  
**Nilefa Kiji MSF Hospital**  
Behind CBN Quarters  
Kushari  
Damboa Road  
Maiduguri  
Nigeria  
-

**Study participating centre**  
**Hôpital du district du Magaria**  
Région de Zinder  
Département de Magaria  
Magaria  
Niger  
-

**Study participating centre**  
**Hôpital de district de Madarounfa**  
Region de Maradi  
Département de Madarounfa  
Maradi  
Niger  
-

## **Sponsor information**

**Organisation**  
Imperial College, London

**ROR**  
<https://ror.org/041kmwe10>

# Funder(s)

**Funder type**  
Government

**Funder Name**  
Medical Research Council

**Alternative Name(s)**  
Medical Research Council (United Kingdom), UK Medical Research Council, MRC

**Funding Body Type**  
Government organisation

**Funding Body Subtype**  
National government

**Location**  
United Kingdom

## Results and Publications

**Individual participant data (IPD) sharing plan**  
The data sharing plans for the current study are unknown and will be made available at a later date

**IPD sharing plan summary**  
Data sharing statement to be made available at a later date

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Results article</a>		13/06/2025	16/06/2025	Yes	No
<a href="#">Participant information sheet</a>	version 3.0	21/10/2022	15/04/2024	No	Yes
<a href="#">Participant information sheet</a>	Participant information sheet	11/11/2025	11/11/2025	No	Yes
<a href="#">Protocol file</a>	version 3.0	19/10/2022	15/04/2024	No	No
<a href="#">Statistical Analysis Plan</a>	version 3.0	19/10/2022	15/04/2024	No	No
<a href="#">Statistical Analysis Plan</a>	version 4.0	17/12/2024	16/01/2025	No	No