Tracking child acute malnutrition in the 2017-8 flood response programme in Saptari plains Nepal

Naomi M. Saville[1,2] , Manisha Katwal [3] , Anjana Rai [1], Sujay Nepali Bhattacharya [3]

[1] UN World Food Programme, Nepal , [2] Institute for Global Health, University College London, UK. [3] Action Against Hunger | Action Contre La Faim Nepal (ACF). *Funded by DFID / Australian Aid.*

Introduction

Floods caused large scale destruction in Nepal in Aug 2017. In response the Government of Nepal with support from the UN World Food Programme and UNICEF implemented a nutrition response programme as follows:

1. Used Nepal Food Security Monitoring System (NeKSAP) Integrated Food Security Phase Classification (IPC) to assess post-flood vulnerability and select target areas.
2. In selected Phase 3 and Phase 4 target areas :

- Distributed 3kg of fortified blended food (Super Cereal) to all children aged 6-59 months (BSFP) at health facilities and mass screened them using mid-upper arm circumference (MUAC) to identify wasting;
- Treated moderate & severe acute malnutrition (MAM/SAM) using Targeted Supplementary Feeding (TSF) with ready-to-use supplementary or therapeutic foods (RUSF/RUTF);
- Female Community Health Volunteers (FCHVs) screened MUAC in the community and referred new cases for TSF.

No studies have assessed the appropriateness of wasting treatment in response to flooding. Wasting screening data fail to disaggregate new, relapsed, defaulted and repeat-screened cases. Whilst HMIS records provide total numbers cured, defaulted, referred and died, individual recovery and relapse trajectories are unavailable. Tracking of individuals in and out of treatment is needed to improve effectiveness.

Aims

We hypothesized that areas more affected by flooding would have higher wasting prevalence and would recover more slowly. So, in children aged 6-59 months in four flood-affected VDC clusters of Saptari we aimed to:

1. Assess the feasibility of tracking wasting in the community using mobile phones and QR-coded unique identifiers.
2. Assess wasting prevalence in 6-59 months children before and after targeted supplementary feeding (TSF).
3. Compare how a Mid-Upper Arm Circumference (MUAC) cut-off of 125 mm and a weight-for-height z score (WHZ) cut-off of <-2 SD differ in diagnosis of wasting in Nepal .
4. Explore associations between Phase classification and pre-treatment flood exposure, wasting prevalence, food security and endline child diet.
5. Estimate recovery rates amongst children treated for wasting and compare them by Phase classification.

Methods

In this prospective cohort study, we exhaustively sampled all 6-59 months children in 4 flood-affected clusters of Saptari district. At baseline (Dec 2017) and endline (May-June 2018) we collected child anthropometry (MUAC, weight, length / height) and food security. Baseline flood exposure and humanitarian assistance and endline programme exposure, dietary diversity, mother's/ household information and rice yields were collected. Between base- & endline MUAC was screened during BSFP and twice by FCHVs in communities.

We collected data using CommCare on android smart mobile phones to scan each child's unique QR code identifier and record their SAM/MAM category. We entered data from 20 health facility MAM/SAM registers at endline.

Results

Aim 1: Screening children for wasting using mobile phones proved feasible. MUAC measures were available for 2567, 2354, 2781,1793 and 2427 children at baseline, BSFP, FCHV screening 1 and 2, and endline respectively. Tracking individual children through treatment was challenging due to loss/damage of beneficiary ID cards and some difficulty in use of smart phones by non-literate FCHVs.

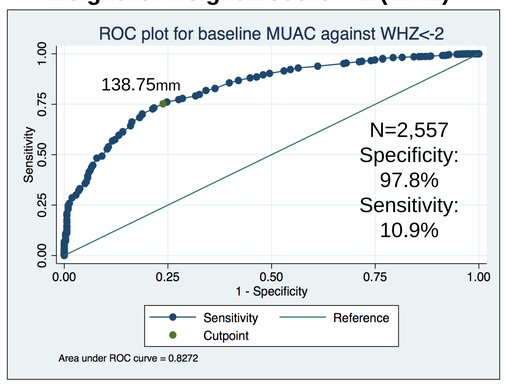
Aim 2: In 1916 children sampled both at baseline and endline, MUAC increased and MAM / SAM prevalence by MUAC decreased after the treatment programme. However using weight-for-height z- score (WHZ) to estimate wasting, MAM and SAM prevalence increased and mean WHZ decreased between December 2017 & June 2018 (Table 1).

Aim 3: Compared to the WHZ <-2 SD diagnostic criterion, the sensitivity of MUAC cut-off of 125 mm for detecting global acute malnutrition (GAM) was only 10.9%. Most children that were wasted by WHZ were not detected as wasted using MUAC and therefore were not enrolled in treatment (Fig 1).

Table 1. Wasting prevalence at baseline and endline before and after the treatment programme (TSF)

N=1916	Mid-upper Arm Circumference (MUAC)				Weight-for-height z score (WHZ)			
	Baseline		Endline		Baseline		Endline	
Mean [SD]	**143.5**	[11.2]	**144.8**	[10.9]	**-0.98**	[0.94]	**-1.21**	[0.89]
Category	n	%	n	%	n	%	n	%
Normal	1,839	*96.0*	1,875	*97.9*	1,676	*87.5*	1,559	*81.4*
MAM	69	***3.6***	36	***1.9***	213	***11.1***	317	***16.5***
SAM	8	*0.4*	5	*0.3*	27	*1.4*	40	*2.1*

Figure 1. ROC plot for MUAC <125mm against Weight for Height z score <-2 (WHZ)



Aim 4: At baseline compared with Phase 3, those residing in Phase 4 had higher flood exposure, lower child weight-for-height (WHZ) and weight-for-age (WAZ) z scores and lower mid-upper arm circumference (MUAC) but height-for-age (HAZ) z score did not differ. Phase 4 areas had a larger loss of rice yield compared with 2016, poorer child dietary diversity and lower minimum acceptable diet but meal frequency and household food insecurity were not significantly different between Phase 3 and Phase 4 (Table 2). Households reported very high (possibly inflated?) levels of food insecurity which may account for the lack of difference by Phase.

Table 2. Associations between Phase Classification and child's WHZ, WAZ,HAZ, MUAC, diet, household food security and flood exposure

Variable	Phase 3 (ref)		Phase 4		Coefficient
	Mean [SD]	N	Mean [SD]	N	[95% CI]
WHZ	-0.8 [0.9]	1276	-1.1 [0.9]	1280	**-0.23** [-0.30, -0.15]
WAZ	-1.4 [1.0]	1277	-1.6 [1.0]	1284	**-0.21** [-0.36, -0.06]
HAZ	-1.4 [1.4]	1275	-1.5 [1.4]	1275	-0.08 [-.35, 0.20]
MUAC	144.9 [11.1]	1278	143.4 [11.0]	1289	**-1.5** [-2.3, -.63]
Flood index	6.5 [1.8]	1199	7.0 [1.8]	1255	**0.52** [0.09, 0.95]
Loss in rice yield*	-1.77 [1.5]	654	-2.08 [1.6]	784	**-0.31**[-0.47, -0.15]
Food in-security**	7.1 [6.2]	1480	8.2 [5.4]	1359	0.95 [-0.04, 1.95]
Dietary diversity#	4.0 [1.0]	1236	3.6 [1.1]	1124	**-0.41** [-0.49, -0.32]
Meal freq.	3.8 [1.2]	1260	3.6 [1.3]	1157	-0.14 [-0.35, 0.08]
MAD ##	%	N	%	N	OR [95% CI]
	65.4%	818	46.2%	536	**-0.79** [-0.95, -0.62]

*Loss in metric tonnes relative to 2016, **Household Food Insecurity Access Scale, # 7-food group Child Dietary Diversity Score, ## MAD= Minimum Acceptable Diet in all children. Bold coefficients/ Odds Ratio indicate p<0.05

Aim 5: Figure 2 shows the recovery trajectories of 2345 MAM cases and 113 SAM cases recorded in registers from 20 health facilities in Saptari district between Dec 2017 and Jun 2018. A significant increase in MUAC after consumption of RUSF by MAM children and of RUTF by SAM children was found over the first 4 to 5 visits, after which there was little further improvement. Many children did not return for follow-up.

Figure 2. Recovery trajectories of children treated for MAM / SAM with RUSF / RUTF

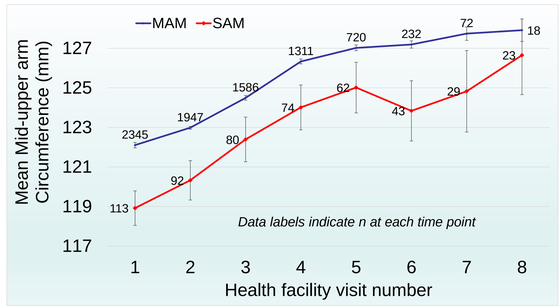
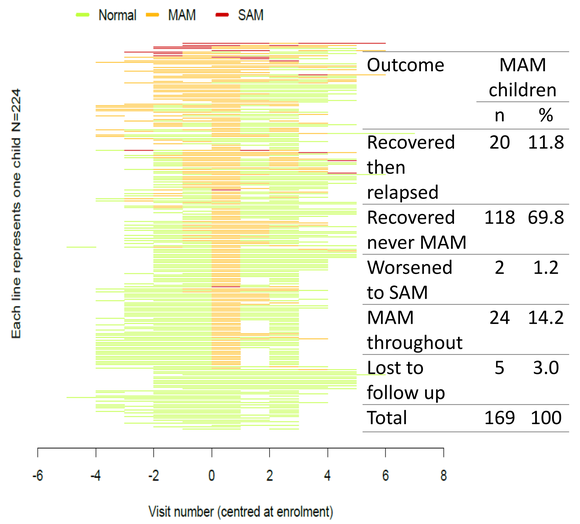


Figure 3 shows MUAC category over time for 224 children matched between health facility register data and the study cohort and a recovery trajectory summary for 169 that were MAM on enrolment. Each line represents one child's MUAC category at different time points. Negative visit numbers are measures prior to-, and positive visit numbers are measures after-, enrolment (visit number 0).

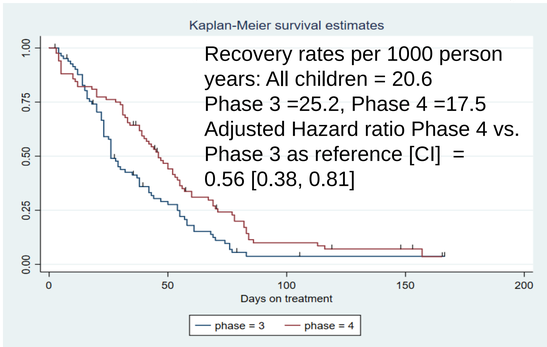
Of children that started treatment as MAM, 70% became normal and stayed normal, 12% relapsed to MAM, 14% did not recover and 1.2% developed SAM. Children in Phase 4 areas recovered significantly slower that those in Phase 3 (Fig 4.)

Figure 3. Mid-upper Arm Circumference (MUAC) category before, during and after treatment and outcome summary of treated MAM children



Outcome	MAM children	
	n	%
Recovered then relapsed	20	11.8
Recovered never MAM	118	69.8
Worsened to SAM	2	1.2
MAM throughout	24	14.2
Lost to follow up	5	3.0
Total	169	100

Figure 4. Kaplan Meier Curves showing rates of recovery under treatment of wasting comparing Phase 3 and 4 (less vs. more flood affected)



Conclusions

- Tracking wasting using mobile phones in the community is feasible but users need support and universal unique identifier cards are needed in the health system.
- NeKSAP Integrated Phase Classification done during the 2017 flood emergency effectively predicted flood exposure, crop losses, poor dietary diversity and wasting in children.
- Wasting prevalence was higher in Phase 4 than 3 and Phase 4 children recovered slower under treatment
- Treatment led to short-term recovery from wasting but use of the 125mm MUAC cut-off missed most wasted children and about 12% relapsed after treatment.
- Adoption of a higher MUAC cut-off (138mm) and wider use of WHZ for screening are needed.
- Wasting prevention should be integrated with treatment.

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Contact: Naomi Saville **n.saville@ucl.ac.uk**