Risk factors associated with severe acute malnutrition relapse: a case-control study of children from 30 outpatient treatment facilities in Sudan

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BACKGROUND AND OBJECTIVE

Relapse occurs when a child's health and nutritional state deteriorates back to severe acute malnutrition (SAM) after a period of recovery. Repeated episodes of SAM not only heighten children's risk of death and longer-term developmental problems, but also contribute to persistently high rates of malnutrition across the world. Relapse can also undermine the effectiveness of community-based management of acute malnutrition (CMAM) treatment programs and can also be a drain on limited resources when programs treat the same child multiple times. Little is known about the factors that contribute to relapse since data on relapse are rarely collected or reported. A recent literature review focusing on relapse following treatment of wasting found very little data in this area, as well as considerable variation in both the definition of relapse and in the approach to measuring it across research and programs. Schaefer et al, developed a theoretical framework on the potential contributing factors associated with relapse and regression of SAM to guide discussions, risk factor analyses, and development and evaluations of interventions.

International Medical Corps and the University of Khartoum conducted an unmatched case-control study in Sudan between May 2022 and September 2022. The objective of the study was to investigate multi-sectoral risk factors associated with relapse to inform the design of follow-up interventions to prevent relapse cases among SAM children discharged from outpatient therapeutic program (OTP) sites in Sudan

METHODS

The study was carried out at 31 OTP sites operated by IMC in 4 Sudanese states (Central and South Darfur, Blue Nile and South Kordofan). The study population consisted of children 6-59 months with SAM without medical complications who were discharged as cured as per the national CMAM protocol of Sudan from 30 IMC-supported OTP sites. Figure 1 illustrates the eligible period for both cases and controls.

All caregivers of eligible relapse cases were approached for participation in the study. Caregivers of eligible controls were selected from line lists using simple random sampling. Purposive sampling of replacement controls was carried out where households could not be located by enumerators. Questionnaires were administered to consenting caregivers to assess the presence of hypothesized risk factors related to general household demographic, socio-economic, WASH, health, nutrition and food security variables.

The quantitative data were summarized using descriptive statistics, and risk factors were evaluated using chi-square statistical tests and multivariable logistic regression. Furthermore, focus group discussions and key informant interviews had been conducted in each state to investigate contextual issues and experiences of caregivers and services providers that supported interpretation of the quantitative data.

FINDINGS

From the total 1209 children 6-59 months on the line list that were eligible for inclusion in the study, a total of 502 respondents (89 cases and 414 controls) of 31 OTPs in four Sudanese States were enrolled in the study as can be seen in figure 2.
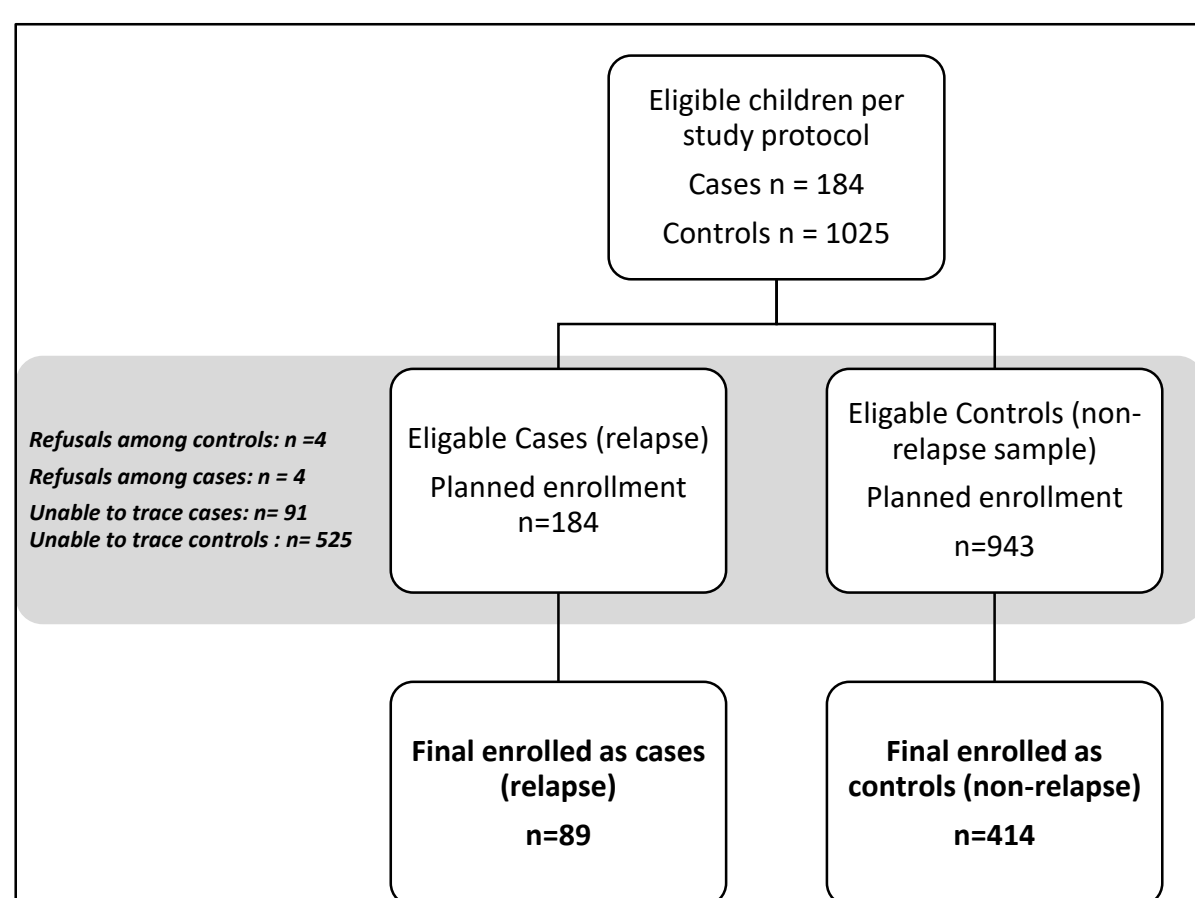
The majority of the study population (53%) was from Central Darfur State whereas South Kordofan, Blue Nile and South Darfur accounted for 16%, 18% and 12% respectively. More females were enrolled in the study (58%, n=291) than male children (42%, n=211). The majority of caregivers interviewed were mothers (51%), while fathers represented 39% and stepmothers 7.5%. Relapse cases were more likely to live in host communities compared to controls (62% versus 47% p=0.035).

In adjusted analysis, we identified primarily IYCF and WASH practices and information to be associated with relapse. Infant and young child feeding (IYCF) practices, in particular if the child was ever breastfed, was significant (p=<0.001) where 77% of controls versus 57% of cases were ever breastfed. Furthermore, caregivers of controls were more likely to have received individual IYCF counselling compared to caregivers of relapse cases (21% versus 8.7%, p= 0.020). However, caregivers of relapse cases were more likely to have participated in care groups than caregivers of non-relapse cases (56% versus 43%, p= 0.039). Minimum dietary diversity or meal frequency were not significantly associated with relapse status. Unlike expected, caregivers of relapse cases knew significantly more ways of preventing malnutrition than caregivers of non-relapse controls (49% versus 31%, p=0.002) although this might be explained by the fact that they received more counselling on prevention of malnutrition the second time the child was admitted in the OTP program as indicated by the fact that caregivers are significantly more likely to have received nutrition from CMAM services than those caregivers of controls (50% versus 34%, p=0.035)

Although food security status, as calculated by the household food insecurity access scale (HFIAS) was not significant, a trend was noticed in which relapse cases were more likely to live in households with either moderate (9.4% versus 8%) or severe food insecurity (78% versus 68%). Immunization status was not a significant risk factor for relapse among our sample. In relation to water, sanitation and hygiene (WASH), insufficient drinking water at any time last month was shown to be significant (63% among cases, 42% among controls, p= 0.002) where controls had more access to an improved water source compared to cases (58% versus 46%, p=0.043). The knowledge about the appropriate handwashing times was however significantly better among caregivers of relapse cases than their peers of controls (61% versus 42%, p=0.001) which might be an indication that knowledge alone is not sufficient to prevent relapse but access to improved water source and drinking water is more important.

To quantify the effect size of preliminary risk factors, crude odds ratios (Table xxx) were calculated using bivariable logistic regression for variables in which chi-square tests showed a statistical difference between cases and controls at the cut-off p<0.05. A multivariable model is under development to present adjusted risk factors and maximize predictive power. Based on unadjusted odds ratios. The preliminary risk factors for relapse found in this study includes therefore displacement status where internally displaced children had a decreased odds of relapse (OR=0.56, CI: 0.35-0.90). The most significant risk factor was if a child has ever been breastfed where children we were ever breastfed had a decreased odds of relapse (OR 0.39, CI: 0.24-0.65). The strongest odds for a child to relapse was the provision of unprescribed medication to a malnourished child (OR: 2.21, CI:1.18-4.02) followed by caregivers who have received nutrition information at a CMAM site (OR: 1.99, CI:1.07-3.75).

Characteristic		N	OR	95% CI	p-value
Family is Internally displaced		493	0.56	0.35, 0.90	0.020
Gender of child enrolled in study					
	Female		—	—	
	Male	502	0.98	0.61, 1.55	0.92
Nutritional factors					
Breastfed status		447	0.39	0.24, 0.65	< 0.001
Giving the malnutrition child medicines purchased on the market, in pharmacies without a prescription		482	2.21	1.18, 4.02	0.014
Prioritization of meal preparation?		478			0.010
	Variety		1.55	0.88, 2.79	
	Location of market away from home		1.57	0.41, 4.91	
	Low cost of food		0.55	0.27, 1.09	
Received information on IYCF at CMAM services		282	1.99	1.07, 3.74	0.031
Received information on IYCF through individual counselling		282	0.25	0.04, 0.86	0.025
Respondent views about prevention of child from becoming malnourished (Knows less than 2 ways)		483	0.47	0.29, 0.75	0.002
WASH factors					
Do not know about proper handwashing times/methods		502	0.46	0.29, 0.74	0.001
Lack of Improved water source		466	1.63	1.01, 2.64	0.044

CONCLUSIONS AND RECOMMENDATIONS

In unadjusted analysis, the risk for relapse among children discharged as cured from OTP in Sudan as identified in this study are mainly related to IYCF and WASH practices. The crude odds ratio for relapse among breastfed children is 0.39. Families who did not receive information on IYCF at CMAM services have an odds ratio of 1.99 for relapse among children aged 6-59 months. This highlights the importance of providing families with accurate, up-to-date information about proper nutrition in order to ensure long term health outcomes for their children

It is essential that CMAM services provide IYCF education and support to families in order to prevent further cases of severe acute malnutrition relapse among recovered children 6-59 months. The unadjusted analysis also suggests lack of access to improved water is a risk factor for relapse and this should be addressed in a thoughtful manner. Unsafe water supply may have perilous implications, both in terms of health outcomes and economic costs, as it affects the most vulnerable population who are at risk of becoming malnourished.

FUNDING INFORMATION