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Research Article

Factors Influencing Recovery among Children with Moderate Acute Malnutrition Treated at Kirehe District Health Centers

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Abstract

Acute malnutrition affects nearly 52 million of under five years children globally, 75% of them live in low to middle income countries. The treatment of acute malnutrition using supplement foods could help children recover and could reduce the risk of sickness. The present study investigated the factors associated with recovery among children with moderate acute malnutrition (MAM) under a follow-up program at health facilities. A prospective study was conducted in 16 health centers of Kirehe District of Rwanda and included 200 children from 6 to 59 months. A semi-structured questionnaire was used for data collection. All children enrolled in the study spent three months in a nutrition program at health centers. The results show that after 3 months in the program 77.5% recovered from MAM. Children aged above 36 to 59 months recovered at 90% whereas children aged from 24-35 months recovered at 73.5%. Micronutrients and deworming provided at the health facility contributed to the recovery as children who received them recovered at 89.1% and for those who didn't, recovery was at 72.1%. The findings demonstrated that boys were 16 times more likely to recover from MAM in three months of intervention than girls (AOR=16.19, p<0.001, 95% CI: 5.39- 48.63). Children from moderate income families were 3 more likely to recover than those from very low income families (AOR=2.8, p=0.029, 95% CI: 1.11-7.51). Male gender, receiving micronutrients and deworming from health facilities and family income status were factors associated with MAM recovery status.

Keywords:
Malnutrition; recovery; moderate acute malnutrition; Kirehe District

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Background

Globally, wasting or acute malnutrition (moderate and severe) affects nearly 52 million of under five years and among these wasted children, 17 million are suffering Severe Acute Malnutrition (SAM). Seventy-five (75%) of all those children suffering from malnutrition live in low to middle income countries while only one percent (1%) live in high income countries. These statistics show that malnutrition is a public health problem in Africa. East Africa was among three UN Sub regions with the highest prevalence of MAM among all Nations Sub regions in 2011 and the second UN sub region with higher prevalence of stunting was South-Central Asia with 42% [1,2].

The 2015 survey on Comprehensive Food Security and Vulnerability Analysis and Nutrition Survey (CFSVA) conducted in Rwanda showed that 1.7% of under five years are wasted which shows an improvement compared to 3.6% in 2012. The CHSVA results show that 36.7% of under five children are stunted, down from 43% in 2012 and 8.1% of underweight compared to 12% in 2012 [3]. According to the Kirehe District Development Plan (2013-2018), chronic malnutrition is at 50.7% but the acute malnutrition is 1% [4].

The treatment of acute malnutrition using supplement foods could help malnourished children recover and could reduce the risk of becoming sick [5]. In Rwanda, all children with moderate acute malnutrition are receiving cow milk and Corn Soy Beans as treatment in health centers for a period of 3 months before being discharged from the nutrition program. The socio-workers in charge of nutrition and community health workers are following the use of those food supplements in malnourished families during this period of treatment of acute malnutrition especially in humanitarian emergencies [6].

The present study assessed factors influencing the recovery of children with MAM treated in health centers of Kirehe.

Material and Methods

Study Design, Setting and Population

A prospective study was conducted in 16 health centers of Kirehe District in Rwanda. A total of 200 children with Moderate Acute Malnutrition under the Nutrition program were followed-up for 3 months.

On the first day of admission all children from 6 to 59 months had anthropometric measurements taken (weight, height, weight for height in z-score) by the socio-worker in charge of nutrition and all children diagnosed as Moderate Acute Malnutrition (MAM) or weight for height in z-score between -3≤WHF<-2 were enrolled in the nutrition program for 3 months of treatment. The anthropometric measurements and the family socio-demographic characteristics were collected after every 2 weeks by hired nurses at

health facility. By the end of three months, children were classified as recovered and discharged from the nutrition program if found to have weight for height Z-score of over minus two.

Sample Size and Data Collection Tools

This study included 200 children aged 6 to 59 months under the nutrition program called Supplementary Feeding program (SFP) in health centers of Kirehe District from 1st January to 31st March 2019.

The primary caregivers of these children were interviewed as they brought their children for anthropometric measurement, physical exams, medical follow-up and treatment. Parents or caregivers were requested to sign a consent form and participation was voluntary.

Data on anthropometric measurement (weight, height, z-score) were captured from Supplementary Feeding Program (SFP) registers. Data of the first day of admission of the child to the program served as baseline information. Some variable data were collected considering three months of food supplement treatment as the assessment or end line information.

All the caregivers were asked for information regarding clinical signs and symptoms, diagnostics and medications received at admission, types of foods received and their duration in the program.

The intervention received was Corn Soy Beans (CSB), nurse consultation, laboratory examinations and treatment of infections if existing. Pre- and post-anthropometric measurements and weight for height in z score were collected from the health study centres and used to determine the children who had recovered from MAM.

Data Analysis

A database was constructed in Excel to serve as a platform for data entry. After cleaning, data were imported into STATA version 15.1. Descriptive statistics such as mean and standard deviations for continuous variables were computed. For categorical variables frequency and percentages were calculated. A chi square test was conducted to measure the association and p-value was set at 5%. Logistic regression was used to determine factors associated with recovery among the children with MAM and odds ratios with 95% CI were estimated to identify the factors associated with recovery.

Ethical Considerations

Permission to do a study was obtained from Mount Kenya University and Kirehe District Health Unit. Before beginning the study, a clear explanation was given to mothers/caregivers and received their written informed consent. They were also assured of their full right to leave the study at any time they wish to do so without any inconvenience. The parents/caregivers were also assured that their responses were kept confidential and used to serve the purpose of the study.

Results

Demographic Characteristics of Children who Enrolled in the Study by Recovery Status

A total of 200 children participated in the study and anthropometric data were collected on height and weight of the children. All children with -3≤WFH<-2 were enrolled in the nutrition program for three months.

(Table 1) shows the demographic characteristics of children who enrolled in the study by recovery status. In this study it shows that an overall proportion of recovery was 77.5% and only 22.5% were not of those did not recovery within three months under intervention program.

Within the age group, children aged above 36 to 59 months were recovered at 90% whereas children aged 24-35 months were recovered at 73.5%. Male participants were highly recovered that female at 95.7% and 61.3% respectively. Recovery rate among children whose caregivers are educated was high compare to not educate at 78.6% and 75.7% respectively. Micronutrients and deworming provided at the health facility contributed to the recovery as children who received them recovered at 89.1% and for those who didn't, recovery was at 72.1%. The family whose monthly income was varying above 5 thousand, their children were recovered from MAM at 88.7%.

Table 1. Demographic Characteristics of children who enrolled in the study by recovery status

Variable	Category	Recovery status	
		Recovered n=155 (77.5%)n(%)	Not recovery n=45(22.5%)n(%)
Age	Less than or equal to 23 months	112 (76.7)	34 (23.3)
	24-35 months	15 (73.5)	9 (26.5)
	Greater than 36	18 (90)	2 (10.0)
Gender	Female	65 (61.3)	41 (38.7)
	Male	90 (95.7)	4 (4.3)
Number of children	1-2 children	96 (77.42)	28 (22.6)
	3-4 children	30 (69.8)	13 (30.2)
	More than 4 children	29 (87.9)	4 (12.1)
Education level of	Not educated	56 (75.7)	18 (24.3)
parents or caregiver	Educated	99 (78.6)	227 (21.4)
Milk intake	Once a day	11 (78.6)	3 (21.4)
	Twice a day	124 (79)	33 (21)
	More than 2 times per day	20 (69)	9 (31)
Source of foods	Through income	41 (78.9)	11 (21.1)
	Working for foods	19 (65.5)	10 (34.5)
	Supports	95 (79.8)	24 (20.1)
Micronutrients and deworming	No	98 (72.1)	38 (27.9)
	Yes	57 (89.1)	7 (10.9)
Monthly income	Less than or equal 5k	100 (72.5)	38 (27.5)
	Greater than 5k	55 (88.7)	7 (11.3)
Alcohol abuse	No	77 (72.6)	29 (27.4)
	yes	78 (83)	16 (17)
Breastfeeding	Up to 6 months	2 (100)	0
	6 plus	153 (77.3)	45 (22.7)
Foods share	No	97 (77)	29 (23)
	Yes	58 (78.4)	16 (21.6)
Use of latrine	Community latrine	93 (80.2)	23 (19.8)
	Neighbor's latrine	2 (100)	0
	Private latrine	60 (73.2)	22 (26.5)

Dietary Pattern Among children with MAM Treated in Health Centers of Kirehe District

The respondents were asked the type of diet they had taken on the previous 24 hours prior to data collection. The result shows that the majority 81 (40.5%) reported that they ate cereal meals (corn flour porridge, cornmeal) in the last 24 hours (Table 2)

Table 2. Dietary pattern among children with MAM treated in health centers of Kirehe District

Type of foods	Frequency	Percentage
Cereal meals (corn flour porridge, cornmeal)	81	40.5
Animal protein source	9	4.5
Legumes	79	39.5
Porridge	2	1
Porridge and legumes	15	7.5
Porridge, legumes & fruits	6	3
Tubers	8	4

Of the total of 200 respondents, 79 (39.5%) said that they ate legumes while 15 (7.5%) reported that they had porridge and legumes. Only 8 (4%) respondents ate the tubers and 6 (3%) ate porridge, legumes and fruits. A small proportion of 9 (4.5%) reported that they had animal protein (milk, meat, eggs), on the day before data collection.

Factors Associated with Recovery Among Children with MAM

At 5% level of confidence, the chi-square test showed that gender, monthly income and micronutrients and deworming provided were significantly associated with children's recovery from MAM (p values were < 0.001, 0.007, and 0,011 respectively).

(Table 3) above presents an interesting factor to recover, where it shows that children who did not receive any treatment at health facility were significantly associated with recovery (x^2: 7.216, p: 0.007). This means that since children who do not experience any infections or other comorbidity lead to quick recovery from MAM. Bivariate analysis showed that there was a relationship between monthly income and under five children recovery. The percentage of recovery in under five years was higher among those whose income was greater than 5 thousands (x^2= 6.475, p=0.011).

Table 3. Bivariate analysis of factors associated with MAM recovery

Variable	Category	Frequency		X^2	P value
		Recovered n=155 (77.5%)	Not recovery n=55 (22.5%)		
Age	<= 23 months	112 (76.7)	34 (23.3)	2.152	0.34
	24-35months	25 (73.5)	9 (26.5)		
	Greater than 36	18 (90)	2 (10.0)		
Gender	Female	65 (61.3)	41 (38.7)	33.86	<0.001
	Male	90 (95.7)	4 (4.3)		
Parenting	Orphans	43 (81.13)	10 (18.9)	0.55	0.46
	Live parents	112 (76.19)	35 (23.81)		
Insurance	Yes	93 (75)	31 (25)	1.169	0.279

Table 3 (continued)

Variable	Category	Frequency		X^2	P value
		Recovered n=155 (77.5%)	Not recovery n=55 (22.5%)		
	No	62 (81.58)	14 (18.42)		
Household size	1-3 children1-3	96 (77.42)	28(22.58)	3.514	0.173
	3-4 children	30 (69.77)	13 (30.23)		
	More than 4 children	29 (87.88)	4 (12.12)		
Education level of parents or caregivers	Not educated	56 (75.7)	18 (24.3)	0.224	0.64
	Educated	99 (78.6)	27 (21.4)		
Daily intake	Once a day	11 (78.6)	3 (21.4)	1.42	0.492
	Twice a day	124 (79)	33 (21)		
	More than 2 times	20 (69)	9 (31)		
Source of foods	Through income	41 (78.9)	11 (21.1)	2.813	0.245
	Working for foods	19 (65.5)	10 (34.5)		
	Supports	95 (79.8)	24 (20.1)		
Micronutrient & deworming	No	98 (72.1)	38 (27.9)	7.216	0.007
	Yes	57(89.1)	7 (10.9)		
Monthly income	Less than or equal 5k	100 (72.5)	38 (27.5)	6.475	0.011
	Greater than 5k	55 (88.7)	7 (11.3)		
Alcohol abuse	No	77 (72.6	29 (27.4)	3.035	0.081
	Yes	78 (83)	16 (17)		
Breastfeeding	Up to 6 months	2 (100)	0	0.586	0.444
	6 plus	153 (77.3)	45 (22.7)		
Food share	No	97 (77)	29 (23)	0.052	0.820
	Yes	58 (78.4)	16 (21.6)		
Use of latrine	Community latrine	93 (80.2)	23 (19.8)	1.937	0.380
	Neighbor's latrine	2 (100)	0		
	Private latrine	60 (73.2)	22 (26.5)		

The variables with less than 5% in the bivariate analysis were considered for logistic regression. In the final multivariate analysis adjusted model, socio-demographic variables which are gender and family income were found to be associated with children's recovery.

Table 4. Multivariate analysis on factors associated with MAM recovery among children treated

Variable	Category	AOR	P-value	95% CI
Gender	Female	Reference		
	Male	16.19	<0.001	5.39- 48.63
Receiving Micronutrients & deworming from health facility	No	Reference		
	Yes	2.9	0.027	1.13 -7.58
Monthly income	<=RWF5000	Reference		
	> RWF 5000	2.8	0.029	1.11 -7.51

The Table 4 above shows that being male, other treatments provided at health facilities (micronutrients and deworming) and monthly income greater than RWF 5000 are the contributing factors of children's recovery from MAM. The findings demonstrated that boys were 16.19 more likely to recover from MAM in three months of intervention than their counterpart girls (AOR=16.19, p<0.001, 95% CI: 5.39 48.63). Regarding monthly income, family whose income is greater than five thousand were 2.8 more likely to recover than those whose income is less than or equal to five thousand (AOR=2.8, p=0.029, 95% CI: 1.11-7.51).

The present study also showed that another factor that was associated to the children's recovery was other treatments (micronutrients and deworming) provided at health facility. For other treatment, those who did not receive micronutrients and deworming were 2.9 more likely to recover and this may be due to effect comorbidities to plan interventions meaning that they did not present other medical problems during the course of treatment for MAM enhancing quick recovery (AOR=2.9, p=0.027, 95% CI: 1.13-7.58).

Discussion

By referring to weight for height (WFH) measurements, children who achieved nutrition recovered was 77.5%. By running the bivariate and multivariate analysis, it was documented that factors identified to influence MAM recovery were being male; earning monthly greater than RWF 5000 and micronutrients and deworming provided apart from food supplements at health facilities were associated with the recovery of children from MAM.

A recent study conducted in Malawi [8] showed that children who were moderately wasted had significantly higher recovery rates after only 8 weeks using Ready to Use Foods (RUF) treatment (80%) than did those receiving CSB (72%); this could be due to sharing practices more pronounced in CSB than RUF, which was a recent product with specific guides. If we compared those results with our findings in Kirehe District where the recovery rate was 77.5 using WFH, this higher recovery could be due to home visits conducted which were conducted on weekly basis by socio workers in charge of nutrition and community health workers based in each village went to see how food supplements were using at each family with malnutrition and advised them on better use. The percentage of recovery in this study met the required minimum nutrition standards (sphere goals) which recovered over 75% of recovery.

A controlled comparative trial done in Malawi among moderately wasted children established that 58% of children recovered when consuming Ready to Use Therapeutic Foods (RUTF), although only 22% recovered when using Corn Soy Beans (CSB) [9]. But another study conducted by Medecins Sans Frontieres (MSF) in Niger reported that of 59.698 had moderate acute malnutrition and were treated by RUTF, the recovery rate was 95% and it offered curative services for some complicated illnesses such as HIV, malaria, endemic illnesses, whereas the Malawi trial didn't do it [10]. These contrasts between the Malawi and Niger interventions give to the higher recovery rate in Niger. This result from the study conducted in Niger reinforces what we find in Kirehe District where treatment got at health facilities contributed in recovery rate at 89.1%.

A study conducted in Indonesia [11] and another conducted in Nigeria [12] shown that children whose mothers did not work had worse evolution when compared to those whose mothers worked. These studies had evidence that, quite often, mothers of malnourished children do not perform paid jobs. However, when women have jobs, they improve family income, which has a positive impact on nutritional status of under five children. The findings from these studies demonstrated an association between maternal unemployment and child recovery from malnutrition. This could due to lack of resources to take care of a child, before and after supplementation, suggested the effect of maternal unemployment adversely effects nutritional recovery. The results are similar to our research in Kirehe District where the monthly income of parents was associated with recovery of children with MAM at 77.5%. This might be explained by the transactional model where the lack of income lead to negative impact the development of child. Parents with less monthly income might not be able to provide a balanced diet to their children or buy health insurance for the family.

A study conducted by Christine in 2013 [13] in South of Asia documented the importance of gendered effects of siblings on child under nutrition. For wasted cases, the form of malnutrition most likely to result in higher order heightened risk, child mortality, higher birth where birth spacing low was protective, with no impact seen for number or sex of siblings.

The sex stratified analyses revealed that, though similar findings were retained for males, female wasting was more likely among girls with brothers. Such findings may be explained by preferential feeding or better hygiene of brothers as compared to their sisters, which may indicate low value placed on girls.

A recent published series on maternal and child nutrition by the Lancet medical journal hypothesizes that improving women's empowerment is an important point of intervention for improving nutrition. The series explains that women's empowerment is the mechanism through which increase in income and yield for agricultural inputs affect intra household resource allocation and children's nutrition [14,15,16]. Also transactional model stipulated that employment which is one of the means to empowerment and income brings to positive aspects in children's development.

Conclusion and Recommendation

The aim of the study was to assess factors that influence recovery among children under five years treated for MAM at Kirehe District health centers. The findings showed the proportion of 77.5% of recovery from MAM. It was revealed that a small proportion of respondents feed on animal protein source. Male gender (AOR=16.19, $p<0.001$, 95% CI: 5.39-48.63), provision of micronutrients (AOR=2.9, $p=0.027$, 95% CI=1.13-7.58) and monthly income greater than RWF 5000 (AOR=2.8, $p=0.029$, 95% CI=1.11-7.51) were found to be associated with MAM recovery. In order to monitor the growth status of malnourished children under nutrition feeding program, community health workers need to visit families with malnourished children more often. The government should continue to provide micronutrients and nutrient food package to the poor families with malnourished children. There is a need to increase direct and indirect support received by poor families in Rwanda.

Competing Interests

The authors have declared that no competing interests exist.

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