Research Article   **Open Access**

Factors Associated with Treatment Outcomes of Under-five Children with Severe Acute Malnutrition Admitted to Therapeutic Feeding Unit of Yirgalem Hospital

Alemneh Kabeta[*] and **Gezahegn Bekele**

School of Nursing and Midwifery, Hawassa University, Hawassa, Ethiopia

[*]**Corresponding author:** Alemneh Kabeta, School of Nursing and Midwifery, Hawassa University, Hawassa, Ethiopia, Tel: +251-910-10-19-82; E-mail: alemneh33@gmail.com

Abstract

Background: Worldwide severe acute malnutrition (SAM) affects more than 19 million children and Africa pointed as a region where the problem is highly prevalent. Because of the high chance of death, as compared to well-nourished one, child with severe acute malnutrition needs hospitalization or strict follow up for clinical management. However, protocol is available for the clinical management of SAM cases, monitoring and evaluation of treatment center performance is important for the betterment of outcomes. Thus, this study aimed to assess treatment outcome and associated factors among under-five children with severe acute malnutrition admitted to therapeutic feeding unit of Yirgalem Hospital.

Methods: Hospital based retrospective study was done. A total of 196 under-five children were selected using systematic random sampling technique. Questionnaire was used to collect data. Frequency distribution of treatment outcomes were calculated using descriptive statistics. Pearson chi-square, significance level p<0.05, was used to identify factors associated with treatment outcomes.

Results: Among the admitted children (n=191) 78% were cured, 16% were dead, 3.1% transferred out and 2.6% were defaulted. The average weight gain was found 9.5 g/Kg/day with 2.6 weeks (18.16 days) mean length of stay. Presence of Dermatosis (X^2=5.13 & P-value=0.024), Admission Body Temperature (X^2=8.12 & P-value=0.04), Tuberculosis co-infection (X^2=4.15 & P-value=0.04) and Multi-chart Completeness (X^2=5.42 & p-value=0.02) were found associated with treatment outcome of SAM clinical management.

Conclusion: Cure and default percentages are acceptable. The death percentage is alarming. The mean length of stay and average weight gain were found to be positively far from the national cut-offs. Presence of Dermatosis, Tuberculosis co-infection, admission body temperature, and completeness of multi-chart are associated with treatment outcome.

Introduction

Adequate nutrition is the means by which people thrive, maintain growth, resist and recover from diseases and perform their daily tasks. When nutrition is unhealthy, vulnerable populations' subgroups are likely to become malnourished. Worldwide more than 19 million children are affected by sever acute malnutrition and Africa pointed as a region where the problem is highly prevalent [1]. Ethiopia is a country with a long history of food insecurity and malnutrition exacerbated by population growth, land degradation, and frequent droughts affecting larger proportion of population in the country [2-4]. Reports on world's nutrition situation discussed significance of household food insecurity (25-34.9%) and malnutrition in Ethiopia [5,6]. Evidences of long years back communicated high child mortality rate in Ethiopia [7] and malnutrition claimed to contribute for more than half of child deaths worldwide [8,9]. About 10% of Ethiopian under-five children are wasted. The prevalence of wasting is higher in the rural (10%) than the urban (6%). Protein energy malnutrition, vitamin A, iron and iodine deficiency are commonly listed nutritional deficiencies in the country [10]. Because of the high chance of death, up to ten folds [11], as compared to well nourished, children with SAM and medical complication or appetite loss must managed at health facility. With the deep interest to standardize and improve SAM case management outcome guidelines, protocols and training materials were developed and continuously being updated [12-15]. When these guidelines are followed, it has been possible to reduce case fatality rate considerably [16,17]. Despite hospitalization and development of standardized guidelines, recent review indicated that the case fatality rate for inpatient treatment of SAM ranges from 3.4 to 35 percent [18].

Though case fatality rate of SAM is with wide statistical range, no study reported SAM management performance of Yirgalem hospital, South Ethiopia. Therefore, this retrospective longitudinal study assessed treatment outcomes of already managed severely malnourished children at Yirgalem hospital.

Methods and Materials

Study setting, design and sampling

The study was conducted at Yirgalem Hospital: located about 30 kms away from Hawassa (the capital city of the regional state) and 300

kms away from Addis Ababa (the capital of Ethiopia). A hospital based longitudinal study was conducted on a total of 196 medical records of already managed under-five children SAM cases selected through systematic random sampling technique. Sample was selected from 658 SAM cases admitted and managed at Yirgalem Hospital from January 2013 to January 2015.

Data collection and analysis

Data was collected from medical records using semi-structured data collection format, developed in consideration of literature review and case management multi-chart, SAM clinical management follow up format. Collected data was entered to and cleaned using SPSS version 20. Descriptive statistics was done to describe the participants and come up with treatment outcome distribution figures. Dermatosis diagnosed and graded clinically. Bivariate analysis using Pearson chi-square test was calculated to identify variable crudely associated with treatment outcome, statistical significance level of $p<0.05$.

Limitations of the study

The study was done retrospectively using data from a single treatment center. The statistical test is short to show direction of association. It would have been good if all cases managed in a defined period were included in the study to measure outcomes more precisely.

Ethical consideration

Hawassa University Institution Review Board reviewed the proposal and provided letter of ethical clearance.

Characteristics		Frequency	Percentage
Sex of the Child	Male	117	61.3
	Female	74	38.7
Age of the Child	<6 months	24	12.6
	6-11 Months	71	37.2
	12-23 Months	65	34
	>24 Months	31	16.2
Residence of the Child	Urban	4	2.1
	Rural	187	97.9
On Admission Breast Feeding Status of the Child	Yes	151	79.1
	No	40	20.9
Type of Admission	New	185	96.9
	Readmission	6	3.1

Table 1: Socio-demographic Characteristics, Breastfeeding Status and Admission Category of Children admitted for SAM case Management at Yirgalem Hospital, Yirgalem, Ethiopia, 2016.

Results

A total of 196 severe acute malnutrition cases clinical management medical records were reviewed. Out of the reviewed medical records, five records were excluded from the analysis because of significant data incompleteness that makes the response rate 97.4%.

Characteristics		Frequency	Percentage
Presence of Edema on Admission	Yes	33	17.8
	No	153	80.1
	Not Documented	5	2.1
Grade of Edema	Grade I (+)	6	17.6
	Grade II (++)	17	50
	Grade III (+++)	10	32.4
Presence of Diarrhea on Admission	Yes	123	64.4
	No	68	35.6
Pneumonia on Admission	Yes	82	43
	No	109	57
Dermatosis on Admission	Yes	9	4.7
	No	182	95.3
Grade of Dematosis	Grade I (+)	2	
	Grade II (++)	4	
	Grade III (+++)	3	
TB Co-infection	Yes	27	14.1
	No	164	85.9
Malaria Co-infection	Yes	2	1
	No	189	99
Presence of Anemia	Yes	26	13.6
	No	165	86.4
Body Temperature on Admission	<35°C	4	2.1
	35-38°C	120	62.8
	>38°C	7	3.7
	Not Documented	60	31.4

Table 2: Clinical conditions of Children with SAM Admitted to Therapeutic Feeding Unit of Yirgalem Hospital, Yirgalem, Ethiopia, 2016.

Socio-demographic, breast feeding status, admission category and type of sever acute malnutrition

Majority of the children were from rural (97.9%) parts. The median age of the children was 12+8.5 months. Almost all (96.9%) of the admissions were new. More than one third (79.1%) of the admitted children were on breast feed during admission (Table 1).

Based on the clinical features that it shows severe acute malnutrition is three in type: marasmus, kwashiorkor and marasmickwash. Most (n=158, 82.7%) of the children admitted to the nutrition stabilization unit of Yirgalem hospital were because of marasmus type of severe acute malnutrition as shown in the Figures 1 and 2.
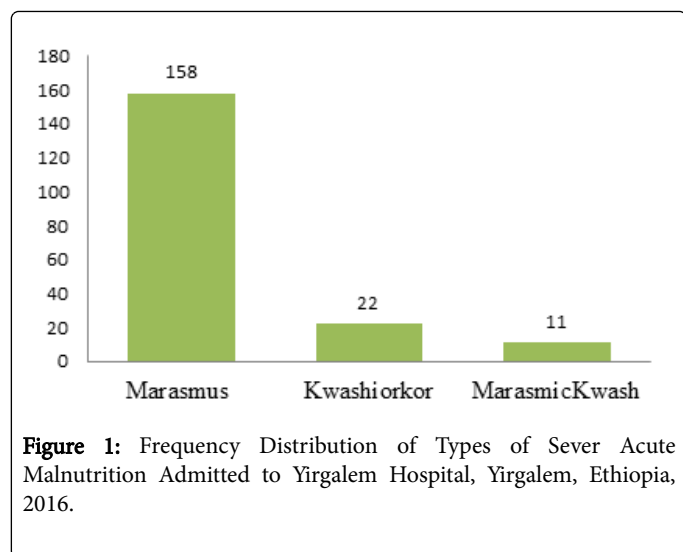
Figure 1: Frequency Distribution of Types of Sever Acute Malnutrition Admitted to Yirgalem Hospital, Yirgalem, Ethiopia, 2016.

Other common clinical conditions of children with severe acute malnutrition

On admission, more than three fourth of children were free of edema (80.1%). Higher than half (64.4%) of children were with diarrhea. Pneumonia was the common (43%) respiratory infection among children admitted because of severe acute malnutrition (Table 2).

Treatment outcomes of severe acute malnutrition

Ampcillin (documented for N=167) and Gentamycin (documented for N=169) are the common antibiotics used for treatment and prevention of bacterial infection among the admitted severely acutely malnourished children. Mebendazole and Albendazole deworming medicines were documented for 137 and 31 children respectively. Regarding the treatment outcome of children admitted for severe acute malnutrition clinical management 78% were cure and 16.2% were dead.
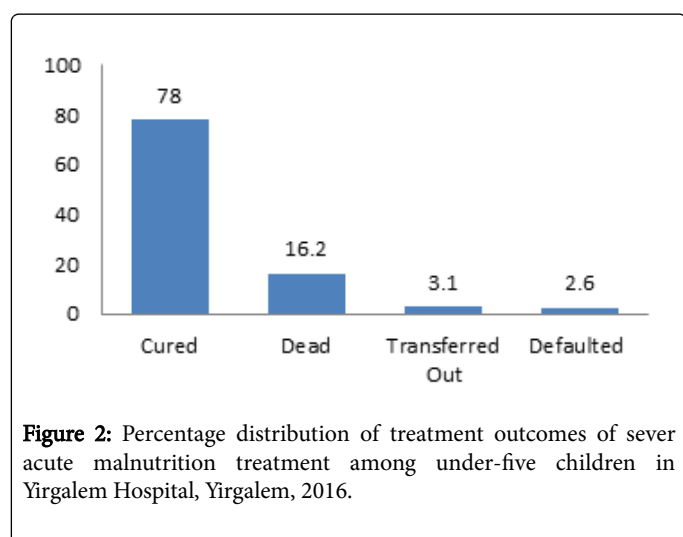

Figure 2: Percentage distribution of treatment outcomes of sever acute malnutrition treatment among under-five children in Yirgalem Hospital, Yirgalem, 2016.

Out of the total (191) selected and analysis included medical records discharge or minimum weight of around forty (40) was not documented and the average weight gain was computed using minimum and discharge weight of only 151 children. The average weight gain was found to be 9.5 g/Kg/day.

Characteristics		Treatment Outcome		X^2, P-Value
		Cured	Dead, Defaulted and Transferred	
Sex	Male	89	28	0.66, 0.42
	Female	60	14	
Age	<6 Months	20	4	1.92, 0.59
	6-11 Months	54	17	
	12-23 Months	53	12	
	>24months	22	9	
Breast Feeding Status	Yes	119	32	0.27, 0.61
	No	30	10	
Type of Admission	New	145	40	0.46, 0.49
	Readmission	4	2	
Type of SAM	Marasmus	125	33	0.37, 0.83
	Kwashorkor	18	4	
	MarasmicKwash	8	3	
Edema on Admission	Yes	25	8	1.18, 0.56
	No	119	34	
	Not Documented	5	-	
Diarrhea on Admission	Yes	94	29	0.51, 0.48
	No	55	13	
Dermatosis on Admission	Yes	3	4	5.13, 0.024*
	No	144	38	
Anemia on Admission	Yes	18	8	1.35, 0.26
	No	131	34	
Admission Body Temperature	<35°C	4	-	8.12, 0.04*
	35-38°C	100	20	
	>38°C	4	3	
	Not Documented	41	19	
Was Multi-chart complete	Yes	97	19	5.42, 0.02*
	No	52	23	
TB Co-infection	Yes	17	10	4.15, 0.04*
	No	132	32	
*Statistically Significantly Associated at P<0.05				

Table 3: Factors Associated with Treatment Outcomes of Management of SAM Cases Admitted at Yirgalem Hospital, Yirgalem, Ethiopia, 2016.

Average length of stay of severely acutely malnourished children in therapeutic feeding program/unit is also the other overall crude program performance indicator. Shorter average length of stay shows acceptable performance of the program/unit and team in the treatment and care process. About 35 (18.3%) children stayed for one week, 153 (53.9%) children stayed 2-3 weeks, 40 (20.9) children stayed 4-5 weeks and 13 (6.8%) children stayed more than 5 weeks in severe acute malnutrition treatment unit. Cured children stayed in the therapeutic feeding unit for days ranging from 3-40 with 2.6 weeks (18.16 days) mean length of stay.

Factors associated with treatment outcomes of severe acute malnutrition

The former four treatment outcome categories (Cured, Transferred, Defaulted and Dead) were dichotomized into desirable and undesirable outcomes: Cured as desirable and dead, defaulted and transferred as undesirable outcome (Table 3). Presence of Dermatosis (X^2=5.13 & P-value=0.024), Admission Body Temperature (X^2=8.12 & P-value=0.04), Tuberculosis co-infection (X^2=4.15 & P-value=0.04) and Multi-chart Completeness (X^2=5.42 & p-value=0.02) were found associated with treatment outcome of SAM clinical management.

Discussion

Severe acute malnutrition is common form of under nutrition forcing under five children seek clinical care. It significantly contributes to under five mortality. In line with World Health Organization recommendation and treatment guideline in Ethiopian children with the problem are being managed both as an inpatient (patients admitted to health care setting and treated with feeding with strict follow-up) and out-patient (patients visit health care setting with regular schedule for feeding refill and follow-up) [14,19].

By this study, we tried to assess treatment outcome and identify factors associated with treatment outcome of clinical management of severely acutely malnourished children. We also assessed other common clinical conditions in order to come-up with co-existing problems probably predicting treatment outcome.

The finding of this study showed that 78% of children treated for severe acute malnutrition were cured and 16.2% were dead. The cure and death percentage of this study finding were respectively lower and higher than regional report analysis [17]. In contrary to study done in teaching hospital from Ghana [20] and hospital from Uganda [21] the percent cured was by far higher and percent defaulted is lower. Study done in Woldia [22] reported lower cure and higher death percentage as compared to findings of the current study. Default percentage was found to be too lower than findings from southwest [23] and North Ethiopia [24]. In comparison to national cutoffs, this study's percent cured was in the acceptable range, percent dead was in alarming range and percent defaulted was in acceptable range [14,15].

Different from Ethiopian [17,22] and abroad studies [20] presence of dermatosis, admission body temperature, TB co-infection and completeness of multi-chart were found associated with treatment outcome.

Conclusion

Sever acute malnutrition is common form of under-nutrition affecting huge population of under-five children throughout the world subjecting them to clinical admission, other childhood illnesses, reduced childhood growth and development, lower adulthood productivity potential and early childhood death. As the clinical form of the undernourishment managed clinically with therapeutic feedings and other medicines both in health care setups and in the community, this study focused on assessment of inpatient treatment outcome and identifying associated factors.

The hospital found to be with acceptable cure and default percentage and alarming death percentage. The mean length of stay and average weight gain of severely acutely malnourished children treated in the hospital were found to be positively far from the cut-offs in the national protocol. Presence of dermatosis, tuberculosis co-infection, admission body temperature, and completeness of multi-chart (specific follow-up chart for the management of SAM) are found to be associated with treatment outcome of SAM management as in patient in the stabilization center.

In collaboration with stakeholders like researchers, governmental and nongovernmental organizations the hospital shall identify health worker, patient relative, and health care setting related factors to sustain and improve the acceptable cure percent and to down percent of death.

SAM stabilization center working team better give focus to severely acutely malnourished children with skin problem, Tuberculosis co-infection and on admission unhealthy body temperature. It is important to document day-to-day progress of clinical condition of the patient during hospitalization.

As the finding of this research subjected to the must drawbacks of secondary data source, prospective study shall be considered with better number of participants in a given period. In addition to changing direction of follow-up operational research also be considered to positively affect both the death and cure percent.

Acknowledgements

References

1. UNICEF-WHO-The World Bank Joint Child Malnutrition Estimates.

2. IFPRI (2007) The World Food Situation: New Driving Forces and Required Actions. Bi-Annual Overview of the World Food Situation presented to the CGIAR Annual General Meeting, Beijing December 3, 2007.

3. World Food Program (2010) Levels and Trends in Child Malnutrition: "Ethiopia-Overview".

4. Food and Agriculture Organization of the United Nations and World Food Program of the United Nations (2010) The State of Food Insecurity in the World: Addressing food insecurity in protracted crises, FAO, RomeUN, 2010.

5. International Food Policy Research Institute. 2014. Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition. Washington, DC.

6. World Food Program (2015) Hunger map.

7. Black RE, Morris SS, Jennifer B (2003) Where and why are 10 million children dying every year? The Lancet 361: 2226-2234.

8. Yebyo HG, Kendall C, Nigusse D, Lemma W (2013) Outpatient therapeutic feeding program outcomes and determinants in treatment of severe acute malnutrition in tigray, Northern Ethiopia: a retrospective cohort study. PLoS One 8: e65840.

9. UNICEF (2010) The state of the world's children: child rights.

10. Central Statistical Agency [Ethiopia] and ICF International (2012) Ethiopia Demographic and Health Survey 2011. Addis Ababa, Ethiopia and Calverton,Maryland, USA: Central Statistical Agency and ICF International.

11. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, et al. (2008) Maternal and Child Undernutrition: Global and Regional Exposures and Health Consequences. Lancet, 371, 243-260.

12. World Health Organization (1999) Management of Severe Malnutrition: A Manual for Physicians and Other Health Workers. World Health Organization, Geneva.

13. World Health Organization (2013) Guideline Update: Technical Aspects of the Management of Severe Acute Malnutrition in Infants and children. Geneva: World Health Organization; 2013.

14. Federal Ministry of Health-Ethiopia (2007).Protocol for the Management of Severe Acute Malnutrition. Ethiopia-Federal Ministry of Health, Addis Ababa.

15. Federal Ministry of Health-Ethiopia (2013). Training course on the management of sever acute malnutrition, 2nd ed. Ethiopia-Federal ministry of Health, Addis Ababa.

16. Ashworth A, Chopra M, McCoy D, Sanders D, Jackson D, et al. (2004) WHO Guidelines for Management of Severe Malnutrition in Rural South African Hospitals: Effect on Case Fatality and the Influence of Operational Factors. Lancet 363: 1110-1115.

17. Efrem T, Meskele L, Sahle S, Zerihun B, Daniel G, et al. (2010) Treatment outcome of children with severe acute malnutrition admitted to therapeutic feeding centers in Southern Region of Ethiopia. Ethiop J Health Dev 24: 234-238.

18. Lenters LM, Wazny K, Webb P, Ahmed T, Bhutta ZA (2013) Treatment of Severe and Moderate Acute Malnutrition in Low- and Middle-Income Settings: A Systematic Review, Meta-Analysis and Delphi Process. BMC Public Health 13: 23.

19. World Health Organization (2007) Joint statement on the community-based management of severe acute malnutrition.

20. Mahama S, Shaibu MO, Anthony A, Juventus BZ, Alhassan A, et al. (2015) Treatment Outcome of Severe Acute Malnutrition Cases at the Tamale Teaching Hospital. J Nutr Metab 3: 641784.

21. Richard N, Valeria C, Boniface OS, Grace FA (2016) Treatment outcome among children under-five years hospitalized with severe acute malnutrition in St. Mary's hospital Lacor, Northern Uganda. BMC Nutrition 2: 19.

22. Chane T, Oljira L, Atomesa GE, Agedew E (2014) Treatment Outcome and Associated Factors among Under-Five Children with Severe Acute Malnutrition Admitted to Therapeutic Feeding Unit in Woldia Hospital, North Ethiopia. J Nutr Food Sci 4: 329.

23. Habtemu J, Abdulhalik W, Fessahaye A (2015) Survival status and predictors of mortality in severely malnourished children admitted to Jimma University Specialized Hospital from 2010 to 2012, Jimma, Ethiopia: a retrospective longitudinal study. BMC Pediatrics 15: 76.

24. Desalegn M, Kifle W, Birtukan T, Amanuel T (2016) Treatment outcome of severe acute malnutrition and determinants of survival in Northern Ethiopia: A prospective cohort study. Int J Nutri Metab 8: 12-23.