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Treatment Outcome and Associated Factors for Severely Malnourished Children at Jinja Regional Referral Hospital in Eastern Uganda

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ABSTRACT

Malnutrition is a prevalent issue affecting children globally, particularly in developing countries like Uganda, where it contributes significantly to under-five mortality rates. This retrospective record-based study conducted at Jinja Regional Referral Hospital aimed to determine the treatment outcomes and associated factors for severely malnourished children aged less than five years. Data from 317 children admitted between January 1, 2020, and December 31, 2020, were analyzed using statistical methods. Results showed a high case fatality rate (17.4%) among the study participants, with children aged less than 24 months, not fully immunized, HIV-positive, and those presenting with shock at admission being significantly more likely to die. The study underscores the importance of comprehensive management for severely malnourished children, particularly those with HIV, shock, and inadequate immunization, to improve treatment outcomes.

Keywords: Malnutrition, HIV-positive, Immunization, Children, Hospitalization.

INTRODUCTION

Severe malnutrition is defined by severe wasting (weight-for-height less than -3 Z-scores) and/orpresence of nutritional oedema [1-5]. According to the world health organization (WHO), malnutrition remains one of the most common causes of morbidity and mortality among children throughout the World [6]. Despite the global consensus on a comprehensive framework to achieve the 3rd Sustainable Development Goal of ensuring healthy lives and promote well-being for all at all ages, the World continues to struggle with the double burden of malnutrition [6]. The global population of under 5 children in 2014 was 667 million; of these 159 million were stunted, 41 million were overweight and 50 million were wasted [7]. Severe acute malnutrition (SAM) affects nearly 20 million children under five and contributes to one million child deaths yearly [8]. In 2014, almost all wasted children under 5 lived in Asia (68%) and Africa (28%). similarly, morethan half of all stunted children under 5 lived in Asia and more than a third lived in Africa [7]. Of the 165 million children under five that were stunted globally in 2011, 56 million were from Africa. In the same year, out of the 34countries that accounted for 90 percent of the global burden of malnutrition, 22 were from Africa. Of the 52 million wasted children, 13.4 million were from Africa [9]. Nationally, 33 percent of children under age 5 are stunted, and 14 percent of children are severely stunted. Overall, 5 percent of Ugandan children are wasted, and 2 percent are severely wasted. Nationally, 14 percent of children under age 5 are underweight (have low weight-forage), and 3 percent are severely underweight [10]. SAM in children is the consequence of a range of factors that are often related to poor food quality, insufficient food intake, and severe and repeated infectious diseases like malaria, diarrhea, and HIV [11-15]. Malnutrition causes growth retardation, impairs psychosocial and cognitive development, increases the risk of disease and death [16-21]. Worldwide, nearly 24 million children under five years of experience SAM, with 79.2% living in developing countries. It is more common in sub-Saharan Africa, with approximately 3% of childrenunder five affected at any one time [22]. In Uganda 6% suffer from SAM. SAM causes growth retardation, impairs psychosocial and cognitive development, increases the risk of disease and death accounting for >1/3-0.5 of all deaths in children under 5yrs andapproximately 54% deaths in developing countries [23]. A study done in Gulu showed a mortality rate of 11.9%. In hospitals, length of stay is a priority but it may be prolongedby SAM. The minimum international standard set for management of severe acute malnutrition is a cure rate of at least 75 % and death rate of less than 10 %, yet the outcome of severely malnourished children treated in most hospitals in developing countries remain poor [24]. In a study involving malnourished children admitted to Therapeutic Feeding Centers in Ethiopia showed an improved treatment outcome with 87% (11,191) cured, 3.6% (468) had died out of 11,335 cases admitted and the average length of stay was

25 and 21 days for children with severe wasting and edematous malnutrition, respectively [25]. However, a retrospective study to determine the treatment outcome of severely malnourished children in St. Mary's hospital Labor, Northern Uganda, treatment cure rate of 66.9 % [24]. Despite various studies that have been undertaken to determine treatment outcome for severely malnourished children, there is limited information on length of stay in hospital as a measure of treatment outcome. Thus, this study will be carried out with the aim of reducing the knowledge gap, and to also enable hospital management adjust policies to enable optimal care for these patients during hospital stay so as to achieve a more favorable treatment outcome.

METHODOLOGY

Study design

This was a hospital record-based retrospective observational study conducted in the nutritional unitat Jinja regional referral hospital to determine the treatment outcome and associated factors for severely malnourished children aged less than five years.

Area of Study

The study was conducted at Jinja regional referral hospital located in southeastern Uganda, nearly87 kilometers east of Kampala, the capital of Uganda. Jinja RRH serves the population of Bugiri, Kamuli, Iganga, Mayuge, Namutumba, Kaliro, Buyende, Buikwe, Luuka, Namiyongo, Busia, andJinja districts. The hospital trains medical graduate interns and is also manned by general practitioners and consultants in medicine and surgery. It is also a training center for KIU undergraduate and postgraduate students pursuing courses in human medicine. The nutritional unitis in the pediatric ward, approximately 1 km from the main hospital. It has 32 beds, and is mannedby 5 trained nurses who work in 8-hour shifts, intern doctors on rotational basis, a nutritionist, and specialist in Pediatrics assigned for the ward. Patients with severe acute malnutrition are categorized into edematous and non-edematous malnutrition, with a minimum of 80 admissions per month.

Target population

Severely malnourished children who were admitted at Jinja Regional Referral Hospital.

Accessible population

Severely malnourished children aged 6 to 59 months previously admitted in Jinja Regional ReferralHospital.

Study population

Severely malnourished children from 6 to 59 months previously admitted to Jinja Regional ReferralHospital who met the selection criteria.

Inclusion criteria

Severely malnourished children aged 6 to 59 months previously admitted to Jinja RegionalReferral Hospital between January 1, 2020 to December 31, 2020.

Exclusion criteria

Severely malnourished children ages 6 to 59 months previously admitted to Jinja Regional ReferralHospital that defaulted on treatment, and those with incomplete hospital records on anthropometricmeasurements (weight, height, MUAC), demographics were excluded from the study. Similarly, children with documented secondary under-nutrition due to other pathological disorders except HIV e.g., cerebral palsy and those with other causes of edema unrelated to malnutrition were excluded from the study as this could have distorted the outcome.

Sample size estimation

The sample size was estimated using the Keish Leslie formula [26]

$N= (Z^2 PQ)/D^2$

Where N- minimum sample size,

Z- 1.96(confidence interval of 95%),

P: an average cure rate in admitted under-five children with SAM is 75% [24].

Q= 1-P,

D= Maximum error (0.05)

Therefore, N=288. Assuming 10% documents cannot be found, sample size will be = 288 +29 =317.

Sampling procedure

For the quantitative data, simple random sampling was used to obtain the study participants. All cases were selected from Therapeutic Feeding Center (TFC) register book and patients' cards enrolled from January 1, 2020 to December 31, 2020 which constituted the accessible population on which the selection criteria (inclusion and exclusion) were applied to arrive at the study population. The patient cards from the study population were assigned random numbers with the sample size arrived at by selecting the numbers randomly without replacement. The papers containing the numbers were properly folded to ensure a random selection of the sample size. The necessary information of the study participants was then

recorded in a checklist format.

Independent variables

Sociodemographic characteristics (age, sex, place of residence), type of SAM, HIV status, TB,malaria, immunization status, complications of SAM, and treatment.

Dependent variable

Discharge status, length of stay.

Data collection procedure

Data was collected using a pre-designed checklist. All the necessary data were abstracted from theTFC patient monitoring card and registry. Patients whose weight for length or height was less than -3 standard deviation according to the World Health Organization Z-scores, or had a MUAC ofless than 11.5 centimeters were considered to have SAM.

Data management

Data in soft copy was stored in a password protected computer, with the keywords of the passwordsknown to the principal investigator. Checklists were packed in waterproof bags and stored under locks, only accessible to the principal investigator and supervisor.

Data analysis

Data was coded, entered, cleaned, stored and analyzed using Statistical Package for SocialScientists (SPSS) version 25.0. Categorical variables were summarized as frequencies and proportions, whereas continuous variables as means, median and standard deviations (SD). The bivariate analysis, 95 % confidence interval (CI), and chi-square test were used to measure the strength of association between the factors considered and the dependent variable. Factors with a p-value less than 0.2 at bivariate analysis were transferred to multivariate analysis. Multivariate logistic regression analysis was used to determine the factors that are significantly associated with treatment outcome. P-value less than 0.05 was considered statistically significant. Results were summarized as text, tables, and bar graphs.

Data quality control

Completeness of data entry in the checklists was ensured. Double data entry was performed.

Ethical considerations

The ethical approval to carry out the study was obtained from the Research Ethics Committee (REC) of Kampala International University – Western Campus, with the letter presented to the Hospital director of Jinja Regional Referral Hospital. Being a retrospective study, consent was notrequired. In addition, checklists did not contain any potential participant identifiers, as codes were used.

RESULTS

Study participants

This was a retrospective study of 317 participants treated for severe acute malnutrition in the nutritional unit at Jinja regional referral hospital from January 1, 2020, to December 31, 2020. Themedian age of study participants was 14 months (interquartile range: 10 to 19 months). Among thestudy participants, 17.4% (95% CI: 14.5-21.3) died during hospitalization.

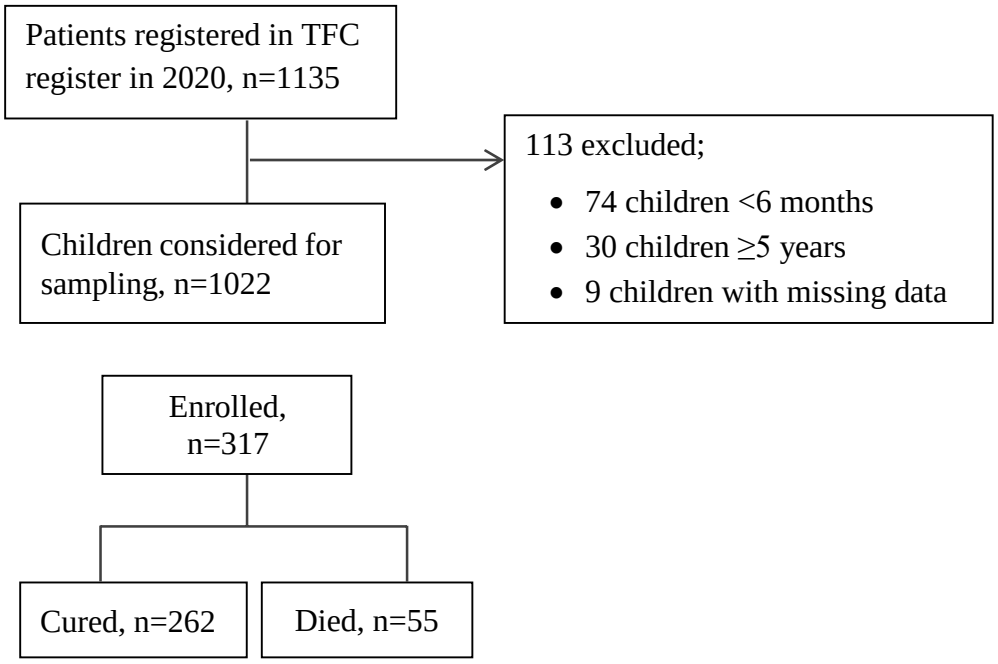


Figure 1: Study profile

Baseline socio-demographic characteristics of study participants

Table 1 show the participants' sociodemographic characteristics. Males comprised of 53.3% of study participants, while females accounted for 47.7%. Almost two-thirds of participants were agedless than 24 months (61.8%), and resided in rural areas (66.2%).

Table 1: Baseline sociodemographic characteristics of the study population

Variable	Frequency (n=317)	Percentage
Sex		
Male	169	53.3
Female	148	47.7
Age of child		
<24 months	196	61.8
24-59 months	121	38.2
Residence		
Rural	210	66.2
Urban	107	33.8

Baseline clinical characteristics of study participants

In this study, 172 (54.3%), and 145 (45.7%) of study participants were treated for oedematous and non-oedematous malnutrition respectively. Majority (90.5%) of participants were HIV negative, and 13.3% were diagnosed with tuberculosis. Other clinical characteristics are summarized in Table 2 below.

Table 2: Baseline clinical characteristics of the study population

Variable	Frequency (n=317)	Percentage
Type of SAM		
Oedematous	172	54.3
Non-oedematous	145	45.7
Immunization status		
Uptodate	261	82.3
Not up-to-date	56	17.7
HIV status		
Negative	287	90.5
Positive	30	9.5
Tuberculosis		
No	275	86.8
Yes	42	13.2
Hypothermia		
No	298	94.0
Yes	19	6.0
Hypoglycaemia		
No	314	99.1
Yes	3	0.9
Pneumonia		
No	306	96.5
Yes	11	3.5
Dehydration		
No	261	82.3
Yes	56	17.7
Severe anaemia		
No	269	84.9
Yes	48	15.1
Shock		
No	305	96.2
Yes	12	3.8
Bacteraemia		
No	273	86.1
Yes	44	13.9
Malaria		
No	264	83.3

Yes	53	16.7
Intravenous fluids		
No	303	95.6
Yes	14	4.4
Blood transfusion		
No	266	83.9
Yes	51	16.1

Figure 2 shows the comorbidities and medical complications among children admitted with SAM.The most common conditions were dehydration (18%), malaria (17%), bacteria (14%), tuberculosis (13%), and HIV (9%).

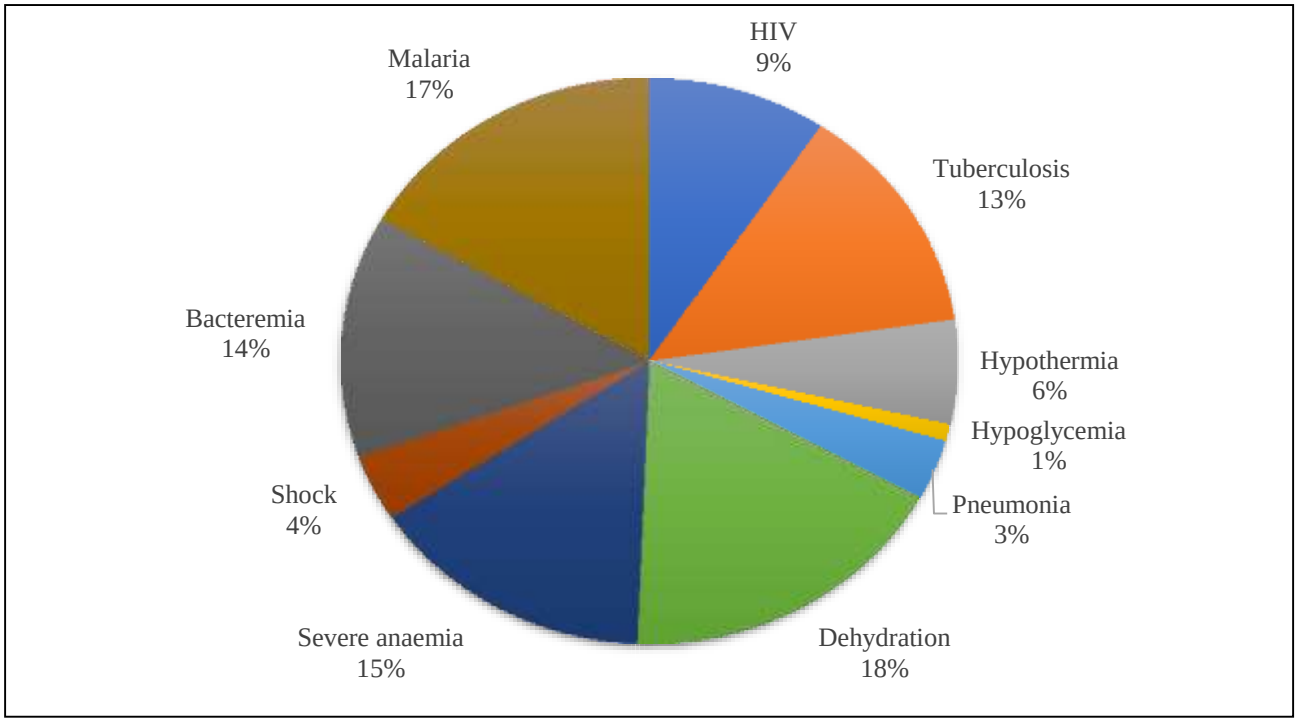
Figure 2: Comorbidities and medical complications among children with SAM

Length of hospital stay

The average length of hospital stay was 15 days (standard deviation, ±3.3 days), whereas the lengthof hospitalization was 13±5 days for children with non-oedematous SAM, and 17±3 days for children with oedematous SAM.

Bivariate analysis of sociodemographic and medical factors associated with mortality ofchildren with SAM

Results for bivariate analysis of factors associated with mortality of children (6 to 59 months) admitted with SAM at JRRH (Table 3) show that children aged less than 24 months have a 2.3 (95% CI: 1.15-4.33, p=0.020) times higher likelihood of mortality compared to those aged 24-59 months. Similarly, children whose immunization status was not up-to-date were 5.3 (95% CI: 2.35-9.80, p=0.004) times more likely to die when compared to those with up-to-date immunization status.In Addition, HIV positive children had a 6.9 (3.36-11.15, p<0.001) times higher likelihood of death compared to their HIV negative counterparts. Children who were treated for severe anaemia and shock had a 2.7 (95% CI: 1.02-4.26, p=0.03) times and 10.2 (95% CI: 4.45-16.93, P<0.001) times higher odds of mortality when compared to



those without severe anaemia and shock respectively.Intravenous fluid administration was associated with 4.9 (95% CI: 2.21-7.45, p=0.032) times higher likelihood of mortality.

Table 3: Bivariate analysis for factors associated with mortality of children with SAM at JinjaRegional Referral Hospital (January 1, to December 31, 2020)

Variable	Treatment outcome		COR (95% CI)	P-value
	Cured, n (%)	Died, n (%)		
Sex				
Male	139 (82.2)	30 (17.8)	1.1 (0.95-1.43)	0.370
Female	123 (83.1)	25 (14.9)	1.0	
Age of child				
<24 months	150 (76.5)	46 (23.5)	2.3 (1.15-4.33)	0.020
24-59 months	112 (92.6)	9 (7.4)	1.0	
Residence				
Rural	182 (86.7)	28 (13.3)	0.87 (0.32-1.04)	0.210
Urban	80 (74.8)	27 (25.2)	1.0	
Type of SAM				
Oedematous	141 (82.0)	31 (18.0)	1.0	0.573
Non-oedematous	121 (83.4)	24 (16.6)	0.7 (0.44-1.12)	
Immunization status				
Up-to-date	244 (93.5)	17 (6.5%)	1.0	0.004
Not update	18 (32.1)	38 (67.9)	5.3 (2.35-9.80)	
HIV status				
Negative	254 (88.5%)	33 (11.5)	1.0	<0.001
Positive	8 (26.7)	22 (73.3)	6.9 (3.36-11.15)	
Tuberculosis				
No	227 (82.5)	48 (17.5)	1.0	0.802
Yes	35 (83.3)	7 (16.7)	0.6 (0.4-1.13)	
Hypothermia				
No	248 (83.2)	50 (16.8)	1.0	0.370
Yes	14 (73.7)	5 (26.3)	1.1 (0.98-2.17)	

Hypoglycaemia				
No	260 (82.8)	54 (17.2)	1.0	0.422
Yes	2 (66.7)	1 (33.3)	4.7 (1.20-28.92)	
Pneumonia				
No	258 (84.3)	48 (15.7)	1.0	0.32
Yes	4 (36.4)	7 (63.6)	6.1 (2.27-10.15)	
Dehydration				
No	224 (85.8)	37 (14.2)	1.0	0.197
Yes	38 (67.9)	18 (32.1)	1.6 (1.11-3.45)	
Severe anaemia				
No	233 (86.7)	36 (13.3)	1.0	0.03
Yes	29 (60.4)	19 (39.6)	2.7 (1.02-4.26)	
Shock				
No	261 (85.6)	44 (14.4)	1.0	<0.001
Yes	1 (8.3)	11 (91.7)	10.2 (4.45-16.93)	
Bacteraemia				
No	235 (86.1)	38 (13.9)	1.0	0.890
Yes	27 (61.4)	17 (38.6)	1.4 (0.97-3.96)	
Malaria				
No	228 (86.4)	36 (13.6)	1.0	0.409
Yes	34 (64.2)	19 (35.8)	1.6 (1.01-2.34)	
Intravenous fluids				
No	242 (91.7)	22 (8.3)	1.0	0.032
Yes	20 (37.7)	33 (62.3)	4.9 (2.21-7.45)	
Blood transfusion				
No	235 (88.3)	31 (11.7)	1.0	0.341
Yes	27 (52.9)	24 (47.1)	2.6 (1.23-9.77)	

COR: Crude odds ratio; CI: Confidence interval; SAM: Severe acute malnutrition

Multivariate analysis for factors associated with mortality of children with SAM at Jinja Regional Referral Hospital

Table 4 summarizes the results of factors that were independently associated with outcomes of children with SAM. Children younger than 24 months were 1.5 (95% CI: 1.13-2.32, p=0.03) timesmore likely to die, compared to those aged 24-59 months. Those whose immunization status was not up-to-date were 4.4 (95% CI: 1.7-6.65, p<0.001) times more likely to die during hospitalization,

compared to fully vaccinated children. In addition, HIV-positive status was associated with 2.3 (95% CI: 1.2-3.66, p=0.04) times higher odds of mortality compared to HIV-negative status. Children who were treated for shock had a 5.4 (95% CI: 2.23-9.11, p<0.001) times higher likelihood of death compared to those without shock.

Table 4: Multivariate analysis for factors associated with mortality of children with SAM at Jinja Regional Referral Hospital (January 1, to December 31, 2020)

Variable	AOR (95% CI)	P-value
Age of child		
<24 months	1.5 (1.13-2.32)	0.03
24-59 months	1.0	
Immunization status		
Update	1.0	<0.001
Not update	4.4 (1.7-6.65)	
HIV status		
Negative	1.0	0.04
Positive	2.3 (1.2-3.66)	
Dehydration		
No	1.0	0.09
Yes	3.4 (1.22-7.54)	
Severe anaemia		
No	1.0	0.38
Yes	9.9 (3.82-15.92)	
Shock		
No	1.0	
Yes	5.4 (2.23-9.11)	<0.001
Intravenous fluids		
No	1.0	
Yes	2.2 (1.15-14.76)	0.06

AOR: Adjusted odds ratio; CI: Confidence interval; HIV: Human immune deficiency virus

DISCUSSION

Mortality of children with SAM

In the current study, 17.4% (95% CI: 14.5-21.3%) of children with SAM died. This is similar to the findings of prospective cohort studies conducted at Mulago National Referral hospital [27] and Jinja Regional Referral Hospital [28], which respectively determined that 20.7% (95% CI: 15.9–25.6%) and 14.5% of children with SAM die during hospitalization. On the other hand, Kambale *et al.* [29] reported an in-hospital mortality of 9.2% among hospitalized children with SAM in the EasternDemocratic Republic of Congo (DRC). This variation in mortality may be explained by differences in the study population. The latter studies enrolled children aged less than6 months, and more than 5 years.

Length of hospital stay for children with SAM

In this study, the average length of hospital stay was 15 days. Length of hospitalization was shorter(13±5 days) for children with non-oedematous SAM, and longer (17±3 days) for children with oedematous SAM. This finding is similar to 15 days and 17 days as reported by Muwanguzi *et al.* [30] and Kambale *et al.* [29], in Northern Uganda and Eastern DRC respectively.

Factors associated with mortality of children with SAM

Our data revealed a significant association between lower age (<24 months) and mortality due to SAM. A cohort study in Egypt determined that children aged 6-24 months account for the majority (92.3%) of deaths attributable to SAM [31]. Children whose immunization status was not up-to-date had 4.4 times higher odds of mortality compared to those with up-to-date immunization. This could be because unimmunized Children are more likely to have severe infections, due to a low level of immunity. However, a cohort study by Banga and associates [28] did not establish an association between immunization status and mortality among children admitted to the

nutritional unit at Jinja Regional Referral Hospital. This difference could be linked to the current coronavirus pandemic, which may have led to a substantial decrease in immunization coverage [32]. In addition, the study design used by Banga *et al.* [28] was prospective, and likely to have less documentationerror, compared to the current retrospective study. Although malnourished children may not develop a good protective response to select vaccines compared to well-children, they may still benefit from vaccination [33]. This study found that HIV-positive children with SAM are 2.3 times more likely to die compared to those without HIV. This is comparable to the findings of a systematic review and meta-analysis[34] and a five-year multicentre study in South Africa [35]. According to a cross-sectional study conducted at St Mary's Hospital Lacor (Northern Uganda), Nyeko and colleagues [24] determined that children with SAM and HIV have 3 times higher odds of mortality compared to their HIV-negative counterparts. This is in concordance with the findings of Nalwanga *et al.* [27] and Banga *et al.* [28] in the nutritional units of Mulago National Referral Hospital and Jinja Regional Referral Hospital, who reported that HIV-positive severely malnourished children are 2.2 times (95% CI: 1.2–4.2) and 4.8 times (95% CI: 1.42-16.30)more likely to die respectively. Similar results have been reported by other researchers [30]. Delayed diagnosis of HIV and subsequent initiation of antiretroviral therapy (ART) may worsen the prognosis of children who develop SAM. In the current study, severely malnourished children admitted in shock were 5.4 times more likelyto die compared to those without shock. This is in keeping with the results of cohort studies conducted in Uganda [28]. These children usuallyreceive intravenous fluids, and sometimes, blood transfusion, which have also been linked to increased odds of mortality in this fragile population [24]. This high likelihood of death among participants with shock may be explained by their poor physiological response to medical interventions or inadequate clinical monitoring of these patients whose metabolism had completely changed due to reductive adaptation [28].

CONCLUSION

The study highlights the critical need for improved management strategies for severely malnourished children at Jinja Regional Referral Hospital in Eastern Uganda. Addressing factors such as age, immunization status, HIV status, and shock at admission is crucial for reducing mortality rates among this vulnerable population. Health professionals should prioritize comprehensive care for these children, while community awareness about childhood immunization and prevention of mother-to-child transmission of HIV should be strengthened to mitigate the burden of malnutrition-related deaths.

RECOMMENDATIONS

Health professionals should comprehensively manage severely malnourished children with HIV, and pay more attention to children with shock, those aged less than 24 months, and whose immunization status is not up to date. Communities should be sensitized about the benefits of childhood immunization, and elimination of mother-to-child transmission of HIV.

REFERENCES

1. Eze, E. D., Barasa, A., Adams, M. D., Rabiu, K. M., Ayikobua, E. T., Ezekiel, I., ... & Okpanachi, A. O. Assessing factors contributing to the prevalence of protein–energy malnutrition among children under five years of age attending Kigoma District Hospital, Tanzania. *Journal of Food and Nutrition Sciences*, 2018; 6(5): 123-128.
2. Obeagu, E. I., Obeagu, G. U., Odo, E. O., Igwe, M. C., Ugwu, O. P. C., Alum, E. U. and Okwaja, P. R. Nutritional Approaches for Enhancing Immune Competence in HIV-Positive Individuals: A Comprehensive Review. *IDOSR JOURNAL OF APPLIED SCIENCES*. 2024; 9(1)40-50. https://doi.org/10.59298/IDOSRJAS/2024/1.7.8.295
3. Alum, E. U. and Ugwu, O. P. C. Nutritional Strategies for Rheumatoid Arthritis: Exploring Pathways to Better Management. *INOSR Scientific Research.* 2023; 10(1):18-26. https://doi.org/10.59298/INOSRSR/2023/3.2.47322
4. Alum, E. U., Ugwu, O. P. C., Obeagu, E. I., Aja, P. M., Ugwu, C. N., Uti, D. E., Samson, A. O., and Akinloye, D. I. Nutritional Requirements During Pregnancy: A Comprehensive Overview. *International Journal of Innovative and Applied Research.* 2023; 11(12):26-34. Article DOI: 10.58538/IJIAR/2058 DOI URL: http://dx.doi.org/10.58538/IJIAR/2058.
5. Mada, S. B., Bawa, K. D., Saliu, M. A., Garba, A., Abarshi, M. M., Muhammad, A., and Garba, I. Evidence of Malnutrition and its Associated Factors among Under-five Children in Danko-Wasagu Kebbi State, North-western Nigeria. *Nigerian Journal of Basic and Applied Sciences*, 2020; 28(1): 56-65.
6. WHO. Reducing child mortality, 2016.
7. UNICEF. Levels and trends in child malnutrition. UNICEF – WHO – World Bank Groupjoint child malnutrition estimates, 2015.

8. Saaka, M., S. Mohammed., Osman., A. Amponsem., Ziem, B. J., A. Abdu. l, P. Akanbong., E. Yirkyio, E. Yakubu, S. Ervin. Treatment outcome of severe acute malnutrition casesat the Tamale Teaching Hospital. Journal of Nutrition and Metabolism. 2015; (2015): 1-8.
9. Onis, D. Mercedes. The burden of malnutrition in Africa. Geneva: WHO. 2012.
10. Uganda Bureau of Statistics, ICF International, Inc. Uganda demographic and health survey2016. Kampala, Uganda; Calverton, Maryland: Uganda Bureau of Statistics; ICF International, Inc; 2017. Available from: www.health.go.ug/download/file/fid/1325.

11. Alum, E. U., Uti, D. E., Agah, V. M., Orji, O. U., Ezeani, N. N., Ugwu, O. P., Bawa, I., Omang, W. A. and Itodo, M. O. Physico-chemical and Bacteriological Analysis of Water used for Drinking and other Domestic Purposes in Amaozara Ozizza, Afikpo North, Ebonyi State, Nigeria. *Nigerian Journal of Biochemistry and Molecular Biology*, 2023; 37(1), 1-8. https://doi.org/10.2659/njbmb.2023.151.
12. Egwu, C. O., Aloke, C., Chukwu, J., Agwu, A., Alum, E., Tsamesidis, I, Aja, P. M., Offor, C. E. and Obasi, N. A. A world free of malaria: It is time for Africa to actively champion and take leadership of elimination and eradication strategies. *Afri Health Sci.* 2022;22(4). 627-640. doi: 10.4314/ahs.v22i4.68. PMID: 37092107.
13. Alum, E. U., Obeagu, E. I., Ugwu, O. P. C., Samson, A. O., Adepoju, A. O., Amusa, M. O. Inclusion of nutritional counseling and mental health services in HIV/AIDS management: A paradigm shift. *Medicine.* 2023;102:41(e35673). http://dx.doi.org/10.1097/MD.0000000000035673. PMID: 37832059; PMCID: PMC10578718.
14. Alum, E. U., Ugwu, O. P. C., Obeagu, E. I., Aja, P. M., Okon, M. B., Uti, D. E. Reducing HIV Infection Rate in Women: A Catalyst to reducing HIV Infection pervasiveness in Africa. International Journal of Innovative and Applied Research. 2023; 11(10):01-06. DOI: 10.58538/IJIAR/2048. http://dx.doi.org/10.58538/IJIAR/2048
15. Obeagu, E. I., Nimo, O. M., Bunu, U. M., Ugwu, O. P.C. and Alum, E.U. Anaemia in children under five years: African perspectives. *Int. J. Curr. Res. Biol. Med.* 2023; (1): 1-7. DOI: http://dx.doi.org/10.22192/ijcrbm.2023.08.01.001.
16. Alum, E. U., Ugwu, O. P. C., Obeagu, E. I., Aja, P. M., Ugwu, C. N., Okon, M.B. Nutritional Care in Diabetes Mellitus: A Comprehensive Guide**.** *International Journal of Innovative and Applied Research.* 2023; 11(12):16-25. Article DOI: 10.58538/IJIAR/2057 DOI URL: http://dx.doi.org/10.58538/IJIAR/2057.
17. Obeagu, E. I., Bot, Y. S., Obeagu, G. U., Alum, E. U. and Ugwu, O. P. C. Anaemia and risk factors in lactating mothers: a concern in Africa. *International Journal of Innovative and Applied Research.* 2023; **11**(02): 15-17. Article DOI: 10.58538/IJIAR/2012 DOI URL: http://dx.doi.org/10.58538/IJIAR/2012.
18. Alum, E. U., Ugwu, O. P. C., Obeagu, E. I., Orji, O. U., Edwin, N., Okon, M.B. Religious Leaders as Advocates for Promoting Exclusive Breastfeeding in East Africa**.** *International Journal of Innovative and Applied Research.* 2023; 11(12):10-15.
Article DOI: 10.58538/IJIAR/2056 DOI URL**:** *http://dx.doi.org/10.58538/IJIAR/2056*
19. Odwee, A., Kasozi, K. I., Acup, C. A., Kyamanywa, P., Ssebuufu, R., Obura, R., ... & Bamaiyi, P. H. Malnutrition amongst HIV adult patients in selected hospitals of Bushenyi district in southwestern Uganda. *African health sciences*, 2020; 20(1): 122-131.
20. Alum, E. U., Oyika, M. T., Ugwu, O. P. C., Aja, P. M., Obeagu, E. I., Egwu, C. O. and Okon, M. B. Comparative analysis of mineral constituents of ethanol leaf and seed extracts of *Datura stramonium. IDOSR JOURNAL OF APPLIED SCIENCES*, 2023; **8**(1):143-151. https://doi.org/10.59298/IDOSR/2023/12.1.7906.
21. Alum, E.U., Aja, W., Ugwu, O.P.C., Obeagu, E.I., Okon, M.B.: Assessment of Vitamin Composition of Ethanol Leaf and Seed Extracts of *Datura Stramonium. Avicenna J Med Biochem.* 2023; 11(1): 92–97. https://doi.org/10.34172/ajmb.2023.2421.
22. Chane, T., Oljira, L., Atomesa, G. E., Agedew, E. Treatment outcome and associated factors among those under five with severe acute malnutrition admitted to the therapeutic feeding unitin Woldia Hospital, North Ethiopia. *Journal of Nutrition and Food Sciences.* 2014;4:329.
23. Bain, L. E., Awah, P. K., Geraldine, N., Kindond, N. P., Sidal, Y., Bernard, N., Tanjeko, A. T. malnutrition in sub-Saharan Africa: Burden, causes and prospects. *The Pan AfricanMedical Journal.* 2013; 15:120.
24. Nyeko. R, Valeria. C, Boniface. O. S, Ayot. G. F. Treatment outcome among children under 5years hospitalised with severe acute malnutrition in Lacor Hospital. Biomed Central Nutrition. 2016; 2:19.
25. Teferi, E., Meskele. L., Sahle. S., Zerihum. B., Dakito, D.G., Yassin, M. A. Treatment outcome of children

with severe acute malnutrition admitted to therapeutic feeding centres in the Southern region of Ethiopia. *Ethiopian Journal of Health Development*. 2010;24(3):234-38.

26. Wiegand, H.: Kish, L.: Survey Sampling. John Wiley & Sons, Inc., New York, London 1965, IX + 643 S., 31 Abb., 56 Tab., Preis 83 s. Biometrische Zeitschrift. 10, 88–89 (1968). https://doi.org/10.1002/bimj.19680100122
27. Nalwanga, D., Musiime, V., Kizito, S., Kiggundu, J. B., Batte, A., Musoke, P., & Tumwine, J. K. Mortality among children under five years admitted for routine care of severe acute malnutrition: a prospective cohort study from Kampala, Uganda. BMC Pediatrics. 2020; 20, 182. https://doi.org/10.1186/s12887-020-02094-w.
28. Banga, D., Baren, M., Ssonko, N. V., Sikakulya, F. K., Tibamwenda, Y., Banga, C., & Ssebuufu, R. Comorbidities and factors associated with mortality among children under fiveyears admitted with severe acute malnutrition in the nutritional unit of Jinja Regional Referral Hospital, Eastern Uganda. International Journal of Pediatrics. 2020; 1–9. https://doi.org/10.1155/2020/7809412.
29. Kambale, R. M., Ngaboyeka, G. A., Ntagazibwa, J. N., Bisimwa, M.-H. I., Kasole, L. Y., Habiyambere, V., Kubuya, V. B., & Linden, D. Van Der. Severe acute malnutritionin children admitted in an Intensive Therapeutic and Feeding Centre of South Kivu, EasternDemocratic Republic of Congo: Why do our patients die? PLoS ONE. 2020; 15(7), e0236022. https://doi.org/10.1371/journal.pone.0236022.
30. Muwanguzi, E., Oboi, J. E., Nabbamba, A., & Wanyama, R. Treatment outcome and associated factors for severely malnourished children (1–5 years) admitted to Lacor Hospital and Gulu Regional Referral Hospital in Uganda. Journal of Nutritional Science. 2021;10(33), 1–7. https://doi.org/10.1017/jns.2021.11.
31. Ghazawy, E. R., Bebars, G. M., Eshak, E. S. Survival status and mortality predictors among severely malnourished under 5 years of age children admitted to Minia University maternity and children hospital. BMC Pediatr. 2020 May 19;20(1):233. doi: 10.1186/s12887-020-02146-1.
32. Mansour, Z., Arab, J., Said, R., Rady, A., Hamadeh, R., Gerbaka, B., & Bizri, A. R. Impact of COVID-19 pandemic on the utilization of routine immunization services in Lebanon. PLoS ONE. 2021; 16(2), e0246951. https://doi.org/10.1371/journal.pone.0246951.
33. Prendergast, A. J. Malnutrition and vaccination in developing countries. PhilosophicalTransactions of the Royal Society B Biological Science. 2015; 370(1671), 20140141. https://doi.org/10.1098/rstb.2014.0141.
34. Karunaratne, R., Sturgeon, J. P., Patel, R., & Prendergast, A. J. Predictors of inpatient mortality among children hospitalized for severe acute malnutrition: a systematic review andmeta-analysis. Am J Clin Nutr. 2020; 112, 1069–1079.
35. Gavhi, F., Kuonza, L., Musekiwa, A., & Motaze, N. V. Factors associated with mortalityin children under five years old hospitalized for Severe Acute Malnutrition in Limpopo province, South Africa, 2014-2018: A cross-sectional analytic study. PLoS ONE. 2020; 15(5), e0232838. https://doi.org/10.1371/journal.pone.0232838.

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