Clinical Outcomes and Determinants of Recovery Rates of Pediatric Inpatients Treated for Severe Acute Malnutrition

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Abstract: *Background*: Though treatment of severe acute malnutrition cases in both the in-patient care and the out-patient care has been going on since 2011 at the Tamale Teaching Hospital, little is known about the clinical treatment outcomes and factors that may be associated with the recovery rate in the in-patient setting. This study investigated the clinical treatment outcomes and determinant factors likely to be associated with recovery rates at the Hospital.

Methods: We performed a retrospective chart review (RCR) of all pediatric patients aged (0-11 years of age) who were diagnosed of severe acute malnutrition between March 2011 and December 2013. Logistic regression modeling was used to determine the risk factors of severe malnutrition.

Results: Of the 630 cases that were reviewed, only 19.5 % recovered (having mid-upper-arm-circumference measure ≥125 mm, or oedema resolved, or gained 5g/kg/body weight for 2 consecutive days at the time of discharge), 1.7 % defaulted, and 65.2 % were referred to out-patient care units for continued treatment. The observed case fatality rate was 13.5 %. Marasmic cases had more chronic co-morbid conditions at admission compared to kwashiorkor patients (81.7% *vs.* 69.3%, p=0.01).

Conclusions: Case fatality rate in this population was quite high. Case referral to out-patient care unit was appropriately high. Malaria was the most common co-morbid condition diagnosed among the cases reviewed. Younger age, 15% or more increase in weight, and type of malnutrition were the main predictors of recovery from severe acute malnutrition in the in-patient care setting.

Keywords: In-patient care, severe acute malnutrition, under-five children, recovery rate, fatality rate, medical complications, Tamale Teaching Hospital, Northern Ghana.

INTRODUCTION

Acute malnutrition is a common indication for hospital admission among pediatric patients in sub-Saharan Africa. In one study from Ethiopia, severe acute malnutrition was the primary diagnosis in 20% of pediatric hospital admissions [1], while 41.4% of preschool-aged children were affected by malnutrition of any degree [2]. Additionally, acute malnutrition is frequently noted as a medical co-morbidity during hospitalization and is associated with poor outcome in a variety of conditions, including HIV infection [3, 4], pneumonia [5], and severe anemia [6].

Relatively little has been published on treatment outcomes in Northern Ghana. One study in rural Malawi demonstrated that, of children enrolled in an outpatient treatment program for moderate acute malnutrition, 80% recovered, 4% defaulted, and 0.4% died [7]. In the same setting, 30% of children who completed treatment for moderate acute malnutrition either relapsed or died within one year following treatment [8]. In northwest Ethiopia, patients hospitalized for severe malnutrition had a case fatality rate of 18%, and 9% abandoned treatment [9]. However, it is unknown how these results translate to other regions of Africa.

UNICEF supports the rehabilitation of SAM cases in Ghana with Plumpy'Nut which is a ready-to-use therapeutic food (RUTF). Plumpy'Nut is energy, mineral and vitamin enriched paste-food designed to treat SAM. A sachet has a serving size of 92 gm and gives energy of 2,100 kJ (500 kcal). Severely malnourished children are also provided with routine medications such as de-worming tabs, antibiotics, vitamin A, folic acid and measles vaccine.

The treatment of SAM cases in inpatient care (IPC) has been going on since 2011 in the Tamale Teaching

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Hospital (TTH), however little is known about the clinical treatment outcomes and factors that may be associated with the recovery rate in the in-patient setting. This study sought to describe the clinical outcomes from a pediatric nutrition clinic at the Tamale Teaching Hospital in Northern Ghana, including resolution of malnutrition, death, medical complications or clinic attrition. A secondary goal is to define the incidence of infection and hospital re-admission during treatment.

SUBJECTS AND METHODS

Study Site

All study patients were enrolled from the In-patient (IPC) site of the Tamale Teaching Hospital in Tamale, Ghana. This is a 452-bed academic hospital that serves as a major referral center for Northern Ghana, serving an estimated population of 2.1 million people.

Study Design

We performed a retrospective chart review (RCR) of patients enrolled in the In Patient Care (IPC) clinic March 2011-December 2013 at the Tamale Teaching Hospital.

Study Population and Sampling

All malnourished aged 0-59 months and those more than 59 months but with SAM who sought in-patient care between March 2011 and December 2013 were eligible for the study. Children less than 6 months did not have MUAC measurement available but were included using either presence of bilateral pitting oedema (n=3) or visible signs of wasting (n=82) in accordance with international practice [10]. Children who were also lost to follow up (n=11) or died (n=85) while on treatment did not have their anthropometric records available on discharge and so were excluded in variable related analysis. A total of 630 inpatient cases were reviewed.

Outcome Measures

The primary outcome measure was the status at discharge from the clinic, specifically resolution of malnutrition (cure rate), death rate, and average length of stay, average rate of weight gain, default rate and transfer rate. Secondary outcome measures were the co-morbid conditions among malnourished patients enrolled in the in-patient clinic. The effectiveness of the management of severe acute malnutrition with medical complications in the IPC was guided by the global SPHERE standards [11, 12].

Data Collection

The source of data for the study was individual IPC record documents including registers and patient Hospital folders. Data collected were date of admission, age, gender, indication for admission, co-morbid medical conditions, mid-upper arm circumference (MUAC) and weight measurements on admission and on discharge, status of patient at discharge (resolved malnutrition, deceased, lost to follow-up), and length of stay. Additionally, anthropometric data, including weight, presence of bilateral oedema and MUAC were collected at the time of enrollment, during treatment and at discharge. The average length of stay was calculated by adding the total number of days that each child discharged as cured stayed in the IPC and dividing this by the number of children cured for a specific month.

Data Analysis Plan

Data was checked for correctness and consistency and were analyzed using SPSS for Windows (version 18; SPSS Inc., Chicago, IL, USA). The data was analyzed initially using descriptive statistics. First, frequency tables were produced for different variables and cross tables were produced accordingly. Comparison between groups was done using chi square tests for proportions, and t-tests or ANOVA procedures for continuous variables. Logistic regression analysis was performed to identify independent outcome predictors. Other inferential statistical analysis was conducted as appropriate. A trend analysis was carried out to help assess if severe acute malnutrition cases are increasing or declining over time. Seasonal changes in severe acute malnutrition cases were also investigated.

Ethics Consideration

Ethical approval was obtained from the Tamale Teaching Hospital with reference number TTH/R&M/SR/13/91. There was minimal risk involved to participants in this study. All protected health information (PHI) was de-identified prior to data analysis and publication; subjects' identities were known only to the study staff.

PHI was de-identified prior to data analysis or study publication. Written informed consent was not obtained. However, permission to use the data was sought and

obtained from the hospital authorities. The risk of harm or discomfort that may occur as a result of taking part in this research study was not expected to be more than in daily life or from routine physical or psychological examinations or tests. The rights and welfare of study participants were protected through the use of measures to maintain the confidentiality of study information.

RESULTS

Sample Characteristics

The mean ± SD age of the children studied was 20.8±16.3 months, with the oldest child being 132 months. The majority of the children were between the ages of 24 to 59 months with children above 59 months being the least represented. There were more male children (54.6%) with severe acute malnutrition compared to female children. Children below the age of 24 months accounted for 57% of all the admissions. Overall, the majority (71.1%) of the SAM children were admitted on account of wasting (MUAC <115mm). The majority (66.2%) of the admissions occurred during the rainy season. The average length of stay in the facility before discharge was 9.6±7.0 days with the minimum and maximum being 0 and 47 days respectively. Greater than 80 % of cases admitted spent 0 to 14 days on admission before discharge (Table **1**).

Factors Influencing Admission

The type of malnutrition (marasmic or kwashiorkor) admitted into the IPC was associated with sex and age of child but did not show any significant relationship with the season of admission. Marasmic admissions

Table 1: Socio-Demographic Characteristics

Characteristics	N	%
Age		
<6 months	85	13.5
6-11 months	99	15.7
12-23 months	175	27.8
24-59 months	255	40.5
60+ months	16	2.5
Total	**630**	**100**
Sex		
Male	344	54.6
Female	286	45.4
Total	**630**	**100**
Admission Criteria		
Based on MUAC	448	71.1
Based on oedema	182	28.9
Total	**630**	**100**
Season of Admission		
Dry season	213	33.8
Rainy season	417	66.2
Total	**630**	**100**
Length of Stay Before Discharge		
0-14 days	513	81.4
15-28 days	102	16.2
29-42 days	10	1.6
42+ days	5	0.8
Total	**630**	**100**

Table 2: Factors Influencing Admission (Bivariate Analysis)

Variable	N	Admission Criteria		Chi-Square (χ^2)	p-Value
		Marasmus n(%)	Kwashiorkor n(%)		
Sex					
Male	344	260 (75.6)	84 (24.4)	7.3	0.007
Female	286	188 (65.7)	98 (34.3)		
Total	**630**	**448 (71.1)**	**182 (28.9)**		
Age					
<6 months	88	84(95.5)	4(4.5)	118.2	<0.001
6-11 months	99	91(91.9)	8(8.1)		
12-23 months	174	141(81.0)	33(19.0)		
24-59 months	255	124(48.6)	131(51.4)		
60+ months	14	9(64.3)	5(35.7)		
Total	**630**	**449(71.3)**	**181(28.7)**		
Season					
Dry season	213	158(74.2)	55(25.8)	1.4	0.2
Rainy season	417	290(69.5)	127(30.5)		
Total	**630**	**448(71.1)**	**182(28.9)**		
Type of co-morbidity					
Acute	537	372(69.3)	165(30.7)	5.978	0.014
Chronic	93	76(81.7)	17(18.3)		
Total	**630**	**448(71.1)**	**182(28.9)**		

were observed more frequently among male children (75.6% *vs.* 65.7%) while kwashiorkor admissions were observed more frequently among female children (34.3% *vs.* 24.4%, p=0.007).

The mean age of the kwashiorkor child was significantly higher than the marasmic child (28.6±15.7 *vs.* 17.4±15.4) months F (1, 629) = 67.27, P < 0.001.

Most (81.7% *vs.* 69.3%) of the patients admitted with marasmus suffer from chronic co-morbid condition while those admitted with kwashiorkor suffer from acute co-morbid conditions (30.7% *vs.* 18.3%, p = 0.01) (Table **2**).

Co-Morbid Conditions

Malaria, gastroenteritis, RTI/pneumonia, sepsis, anaemia, CHD and HIV infections/AIDS were the most common co-morbid conditions identified among malnourished children managed for severe acute malnutrition in the in-patient care. Not surprisingly malaria was the most common (32.5%) among the conditions diagnosed (Figure **1**).

Co-morbid conditions that cannot be treated completely by simple medications were considered chronic and the reverse for acute.

Trend of Admissions at the In-Patient

A trend analysis was carried out to help assess how cases have been trending over the three year period. Generally there has been an increasing trend of severe acute malnutrition cases recorded over the last three years studied. The peak months for admissions over the three year period were May and December with the highest number of admissions recorded in 2013. The least number of cases were admitted in March (Figure **2**).

Programme Effectiveness

The treatment outcomes of severely malnourished children during the period reviewed (2011 to 2013) at the IPC are shown in Table **3**. The main outcome indicators were cure rate, death rate, default rate and transfer rate. In all, a total of 630 children with SAM were admitted to the IPC of the Hospital during the period of study. Of these, 19.5 % recovered (defined as

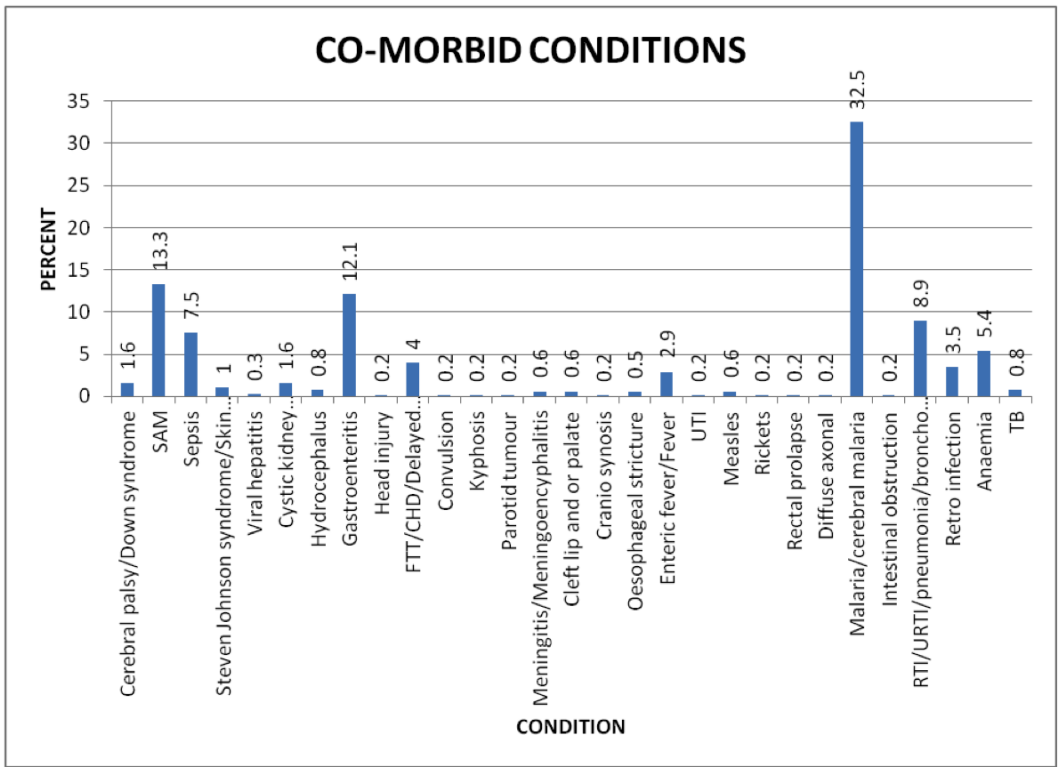

Figure 1: Co-morbid conditions.

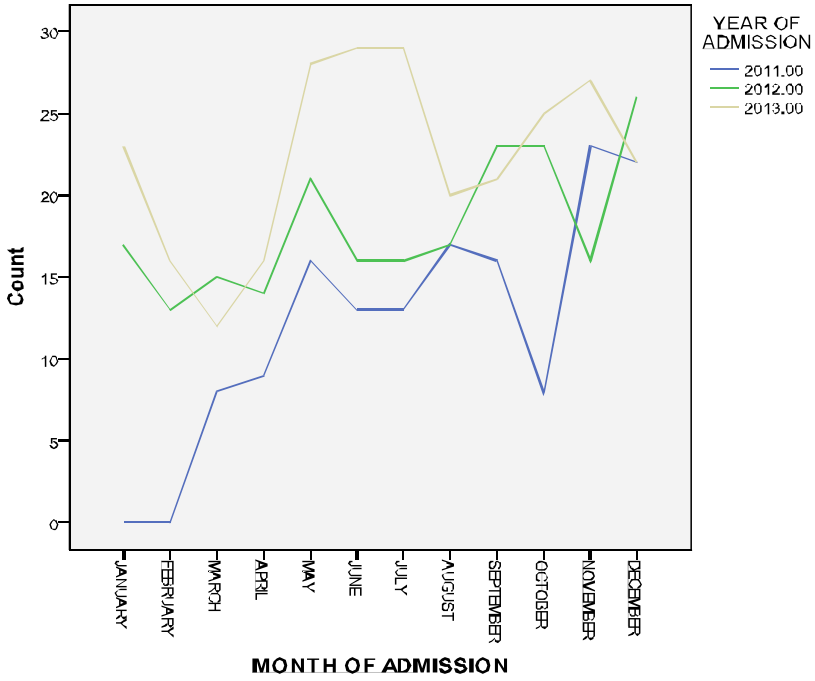

Figure 2: Trend of admissions at the In-patient.

resolution of oedema or improvement in weight or MUAC), 1.7 % defaulted, and 65.2 % stabilized and transferred to OPC treatment site either in the Hospital or another OPC sites to continue with treatment. The case fatality rate was 13.5 % for the period being reviewed. Among SAM cases that were cured, the average length of stay on admission was 1.4±6.4 weeks.

In an analysis of variance (ANOVA), we observed no significant difference in average length of stay

Table 3: Treatment Outcomes of Severely Malnourished Children at the IPC Compared with International Sphere Standards (N = 630)

Outcome Indicator	Reviewed Outcome	Sphere Standards	
	(%)	Acceptable	Alarming
Recovery rate	19.5	>75 %	< 50 %
Non-response rate	0.0	15	
Defaulter rate	1.7	< 15 %	>25 %
Case fatality rate (CFR)	13.5	< 10 %	>15 %
Average rate of weight gain (g/kg/day)	-	≥ 8	< 8
Average length of stay (weeks)	1.4	< 8 weeks	>6 weeks
Referred to OPC	65.2	-	-

among children cured from marasmus and kwashiorkor before discharge (9.6 *vs.* 9.2) days. Kwashiorkor patients on the average weighed more than marasmic patients on admission F (1,122) = 64.1, p < 0.001). However on discharge, the marasmic patients had appreciated in average weight by 1.32 kg while the kwashiorkor patients had decreased in average weight by 0.04 kg. Kwashiorkor patients were still heavier than the Marasmic patients on discharge (Table **4**).

Factors Associated with Recovery from Severe Acute Malnutrition

Bivariate and logistic regression analyses were performed to identify factors that independently predicted recovery from SAM in the in-patient care setting. In the bivariate analysis, age and weight increase by 15% or more were the factors significantly associated (p < 0.001) with recovery from SAM. Sex, co-morbid conditions at admission and type of malnutrition at admission were not significantly associated with recovery rate (Table **5**).

In binary logistic regression analysis age and 15% or more increase in weight were the main predictors of recovery from SAM in the IPC. Compared to children aged at least 24 months, children aged 0-5 months had a 9.8 times higher probability of recovery from SAM (AOR= 9.78, 95% CI = 5.42, 17.64, p <0.001). Patients who had a weight increase of at least 15% before discharge had 5.6 times higher probability of recovery from SAM as compared to those whose weight did not increase by 15% (AOR = 5.59, 95 % CI = 3.05, 10.27, p < 0.001). However, children age 12-23 were 53 % less likely of being cured (AOR = 0.47, 95 % CI = 0.25, 0.91, p = 0.024) (Table **6**). The two variables accounted for 37 % (Nagelkerke R Square = 0.366) of the variance in the cure of malnourished children.

DISCUSSION

We studied the clinical treatment outcomes of children aged 0–132 months who presented with wasting (mid-upper arm circumference (MUAC) less than 115 mm or visible signs of wasting for children

Table 4: Length of Stay and Weight of Cured Children Stratified by Type of Malnutrition on Admission

Variable /Type of Malnutrition		N	Mean	Std. Deviation	95% Confidence Interval for Mean		Test statistic
					Lower Bound	Upper Bound	
Length of stay before discharge in days	Marasmus	92	9.61	6.69	8.22	10.99	F (1,122) = 0.1, p=0.7).
	Kwashiorkwor	31	9.16	5.46	7.16	11.16	
	Total	123	9.50	6.39	8.36	10.64	
Weight on admission	Marasmus	92	4.60	2.59	4.06	5.13	(1,122) = 64.1, p < 0.001).
	Kwashiorkwor	31	9.11	3.05	7.99	10.23	
	Total	123	5.74	3.34	5.14	6.33	
Weight on discharge	Marasmus	46	5.9217	2.91	5.06	6.79	(1, 68) = 16.1, p < 0.001).
	Kwashiorkwor	23	9.0652	3.36	7.61	10.52	
	Total	69	6.9696	3.39	6.16	7.78	

Table 5: Factors Associated with Recovery from Severe Acute Malnutrition (Bivariate Analysis)

Variable	N	Recovery from SAM		Chi-Square (χ^2)	p-Value
		Yes n(%)	No n(%)		
Sex					
Male	344	69(20.1)	275(79.9)	0.138	0.711
Female	286	54(18.9)	232(81.1)		
Total	**630**	**123(19.5)**	**507(80.5)**		
Age					
<6 months	85	60(70.6)	25(29.4)	170.342	0.000
6-11 months	99	7(7.1)	92(92.9)		
12-23 months	175	15(8.6)	160(91.4)		
24-59 months	255	36(14.1)	219(85.9)		
60+ months	16	5(31.3)	11(68.8)		
Total	**630**	**123(19.5)**	**507(80.5)**		
Co-morbid condition					
Acute	537	101(18.8)	436(81.2)	1.186	0.276
Chronic	93	22(23.7)	71(76.3)		
Total	**630**	**123(19.5)**	**507(80.5)**		
Type of Malnutrition					
Marasmus	448	92(20.5)	356(79.5)	1.011	0.315
Kwashiorkor	182	31(17.0)	151(83.0)		
Total	**630**	**123(19.5)**	**507(80.5)**		
15% Weight Gain at Discharge					
<15% wt change	553	79(14.3)	474(85.7)	79.011	0.000
15%+ wt change	77	44(57.1)	33(42.9)		
Total	**630**	**123(19.5)**	**507(80.5)**		

Table 6: Factors Associated with Recovery from Severe Acute Malnutrition (Multivariate Analysis)

	Wald	Sig.	Exp(B)	95% C.I. for EXP(β)	
				Lower	Upper
Age of child (reference: 24^+) months	91.005	<0.001			
0-5	57.37	<0.001	9.78	5.42	17.64
6-11	3.62	0.057	0.44	0.19	1.03
12-23	5.11	0.024	0.47	0.25	0.91
15 % weight change	30.80	<0.001	5.59	3.05	10.27
Constant	113.55	0.000	0.14		

less 6 months) and/or the presence of bilateral oedema (swelling of the limbs). These children were admitted for the management of severe acute malnutrition at the Tamale Teaching Hospital. A MUAC of less than 115 mm and/or bipedal oedema of any grade with medical complication (co-morbid condition) are currently the only admission criteria for the programme for children 6-59 months. However, children less than 6 months with visible signs of wasting or oedema of any grade are also admitted into IPC for management. Mid upper

arm circumference measurement is not applicable to children less than 6 months. Children more than 59 months with either MUAC less than 115 mm or eodema of any grade or both with any medical complication are admitted into to the IPC programme for management.

Most of the children admitted in this study were between the ages of 24 and 59 months and the majority were male children. Most of the admissions were on the account of marasmus (MUAC<115 mm or visible signs of wasting for children less than 6 months). This conforms with what other studies have found; that marasmus is more prevalent in children than kwashiorkor in Northern Ghana [13].

UNICEF has proposed a conceptual framework in which malnutrition is triggered by external factors such as inadequate food intake (as a result of food insecurity or inadequate care for the child) and ill-health with a partial or complete resultant loss of appetite. The cause of severe wasting (marasmus) is linked to a situation where the child consumes much less food than required for his or her energy needs and so energy is mobilized from both body fat and muscle. Gluconeogenesis in the liver is enhanced, and there is loss of subcutaneous fat and wasting of muscles [14].

The type of malnutrition was found in this study to be associated with sex and age of children. Marasmic admissions were more observed among male children while kwashiorkor admissions were more observed among female children. Generally in other studies [14, 15], malnutrition is observed to be more common among male children than female children. This may be partially attributed to the physiology, cultural favor and attachment of female children to their mothers as culturally, society prefers the female child to be with the mother while the male child be with the father after the some few years of life. Mothers have been well documented to care more about the feeding intervals of children than their male counterparts and for that matter the female children could be enjoying some positive protection in terms of food consumption to meet daily needs than the male children. It could also be that families are more likely to seek medical attention for their male children, compared to the females.

More so, the observed increased frequency of SAM admissions amongst male children may relate to zinc. During early childhood, males have lower serum zinc concentrations than did females, but this reversed in late childhood (≈10 y of age) when the concentrations in males begin to exceed those of females [16]. Zinc is reported to promote growth of the human body [17-20] and is also necessary for the integrity and normal functioning of the immune system [21-23]. Depleted levels of zinc in male children may predispose to increased infections (such as diarrheal illness) due to compromised immunity which will have a direct negative impact on nutrition. We did not measure zinc levels directly in this study but we do empirically supplement with zinc during treatment for SAM in the form combined mineral vitamin (CMV) mix. This is added as an ingredient during the therapeutic formula preparation.

In this study, younger children were admitted on the account of marasmus into IPC and older children more frequently with kwashiorkor (oedema). We therefore observed marasmus to be more commonly associated with younger age (children less than 24 months) while kwashiorkor was observed to be more common among children older than 24 months ($p<0.001$). The reason for this relationship is unclear and more research is required to understand this interesting phenomenon.

Treatment Outcomes

The cure rate was quite low (19.5%) whereas the referral out to OPC (65%) was about three times higher than the cure rate. WHO guidelines and international practice anticipate that in-patient care would record fewer cured cases (recovered) from SAM and have a higher frequency of referral to OPC to complete treatment [24]. SAM cases in the in-patient setting are not expected to completely recover due to associated infections. After the co-morbid conditions that usually accompany SAM patients in IPC are resolved, the patient is usually referred to OPC to continue treatment until the patient completely recovers from the SAM condition. An exception is those who cannot or are too young (children less than 6 months) to eat the ready-to-use therapeutic food (RUTF) which is used in the OPC. In addition, patients who fail appetite test for the RUTF or are too young to eat (less than 6 months) because of exclusive breastfeeding are completely treated at the IPC. Defaulting is uncommon with IPC and analysis of this data showed very few patients defaulted from treatment (1.7%). (A defaulter is a patient that is absent for two consecutive weeks and it is confirmed that the patient is not dead). We observed a high case fatality rate (13.5%). The case fatality rate (CFR) and recovery rates of this study were observed to be outside the acceptable range of Global SPHERE standards. In northwest Ethiopia, similar high case fatality rate of 18

%, has also been reported [9]. The high case fatality observed could partly be due to late arrival of patients to IPC. It is very common to find patients reporting to hospital during the latent stage of SAM with a resultant high fatality rate. Malnutrition is largely perceived as a spiritual problem rather than a medical problem and because of this the patient's family will traditionally seek spiritual help before coming to the Hospital. This delay in seeking care results in advanced severe disease at the time of hospitalization for SAM and may explain the associated high fatality rate observed. This practice is common among the people of Northern Ghana [14].

It is expected that, if malnourished children access nutritional care early in the onset of their condition and comply with treatment until they have recovered, there would be improved medical and nutritional outcomes. Conversely, if patients access care late and/or they are deterred from staying in the programme for as long as necessary, then success rates will be low. To achieve a reduction in child mortality, the management of SAM with medical complications needs to be implemented properly [25]. The appropriate management of SAM will depend on the adoption and implementation of best practice guidelines. A first step will be effective ways of encouraging early identification and reporting of malnutrition to the health facilities which can be managed at the OPC level. Such a strategy will tend to reduce inpatient caseloads so as to decrease the risks of cross infection, reduce costs associated with treatment, encourage compliance by patients and increase the time available to staff to help the sickest children to prevent needless mortalities [26, 27].

We also noticed a significant difference in average length of stay among children admitted with marasmus and kwashiorkor before discharge. Kwashiorkor patients stayed longer in the in-patient before discharge compared to their marasmic counterparts. This finding is contrary to the findings of earlier studies [28, 29]. This could have been due to the fact that oedema in kwashiorkor patients would need to be resolved before rehabilitation would begin and hence the relative higher length of stay. The study found kwashiorkor patients to weigh more than marasmic patients on admission. However on discharge, appreciable weight gain was observed among marasmic patients while reduction in weight was observed among kwashiorkor patients. A weight gain of 10-15g/kg/day is considered satisfactory; and conversely if the weight gain is less than 5g/kg for three consecutive days, it shows that the child is not responding to the treatment. The discharge weight is usually seen as 90% of expected weight-for-age and most children reach this target weight within two to four weeks of therapy [24].

Co-Morbid Conditions

Malaria, gastroenteritis, RTI/pneumonia, sepsis, anaemia, CHD and HIV infections/AIDS were common co-morbid conditions identified among malnourished children managed for severe acute malnutrition in the in-patient care. This is similar to the findings of other studies [3-6]. Malaria was the most common co-morbid condition among the SAM patients managed. Usually, because of cultural practices and the nature of health seeking behaviors in this population in Northern Ghana, families do not present to a health facility with malnutrition when it first is apparent. Rather they present late when a co-morbid medical illness develops. This complicates the medical condition and makes treatment more complex and resource intensive in the in-patient care setting. It is observed from the data analyzed that patients admitted on the account of marasmus suffer more from chronic co-morbid condition while those admitted on the account of kwashiorkor suffer more from acute co-morbid conditions. Most often the patients with chronic co-morbid conditions are admitted to the ward because of the chronic condition, with or without malnutrition, and they develop malnutrition on admission. Their length of stay depends on the chronic condition which is usually managed palliatively. The long hospitalization, presence of co-morbid condition characterized by inadequate food intake could have led to fast depletion of nutrients and the possibly development of wasting. Hospitalized patients nutritional needs have to be recognized early and addressed before developing malnutrition which makes them more vulnerable and reduces rate and chances of recovery. The synergistic relationship between infection and malnutrition has been well documented more than four decades ago [30]. However, how specific infection relates to specific type of malnutrition is unclear and requires further research.

Patient Factors that Might have Contributed to Patient Outcome

Among SAM cases that were discharged, the average length of stay was 9.2±7 days. Younger children (< 6 months) were observed to recover faster than the older children. This could partly be due to the fact that young children less than 6 months per the

WHO guidelines are expected to get completely treated at IPC because they are not expected to eat anything apart from the milk-based therapeutic formula (F-100 diluted) and their mothers' breast milk. Patients who had gained at least 15% weight before discharge were considered to have recovered from SAM. Children with severe acute malnutrition should only be discharged from treatment when their weight-for-height/length is ≥–2 Z-score and they have had no oedema for at least 2 weeks, or mid-upper-arm circumference is ≥125 mm and they have had no oedema for at least 2 weeks [31].

CONCLUSION

This study revealed a high case fatality rate in the IPC, low recovery rates and high referrals to OPC in the management of SAM. Malaria, gastroenteritis, RTI/pneumonia, sepsis, anaemia, CHD and HIV infections were common co-morbid conditions with malaria being the leading co-morbid condition among SAM patients in the IPC. The mean length of stay (LOS) in the IPC was 1.4 weeks. The results are in concordance with the goals of the SPHERE standards and WHO criteria for IPC practice except that case fatality rate (CFR) was high. The high CFR is felt to be at least partially due to a tendency for patients to present late for care and have associated co-morbid medical conditions. The findings reinforce the need for social intervention programmes to educate families to present cases early for care. We recommend more public health education programmes to educate people on the causes of malnutrition.

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