MANAGMENT OUTCOME OF SEVERE ACUTE MALNUTRITION FROM 6 MONTHS TO 5 YEARS OF AGE CHILDREN ADMITTED TO YEKATIT 12 HOSPITAL

SUBMITTED TO PARTIAL FULLFILMENT OF THE REQUIREMENT FOR

PEDIATRICS SPECIALITY CIRTIFICATE

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AUGUST 2014

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ACRONYMS

AAU: Addis Ababa University

AIDS: acquired immune deficiency syndrome

ART: anti-retroviral treatment

BMI: body mass index

CI: confidence interval

Cm: centimeter

EDHS: Ethiopian Demographic and Health Survey

G: gram

HAART: highly active anti-retroviral therapy

HIV: human immune deficiency virus

Kcal: kilocalorie

Kg: kilogram

MDGs: Millennium Development Goals

MUAC: mid upper arm circumference

NCHS: National Centre for Health Statistics

OR: odd ratio

PEM: protein-energy malnutrition

PMTCT: prevention of mother to child transmission

SAM: severe acute malnutrition

SD: standard deviation

TB: tuberculosis

UNICEF: United Nations International Children's Emergency Fund

WHO: World Health Organization

W/A: weight for age

W/Ht: weight for height

ACKNOWLEGEMENT

I wish to express my heartfelt gratitude to all individuals and groups of people too numerous to mention for their various support rendered to me throughout my research and the whole pediatrics study. The following deserve to be mentioned: Dr Damtie Shimeles my supervisor, for his support, guidance and encouragement during this critical stage of my study. I appreciate your commitment and assistance despite your tight schedules; and I sincerely thank you.

I should also thank Pediatrics and child health department giving me a chance to do this study. I am also grateful to yekatit 12 hospital staffs for giving support during data collection finally; I cannot forget to acknowledge my colleague for your support and encouragement throughout my studies.

ABSTRACT

Background: severe acute malnutrition is major health problem in sub Sahara Africa. WHO prepared a guideline to manage SAM and Ethiopia also prepared its own guideline by adapting WHO guideline to decrease mortality below five percent even in children with HIV/AIDS. Despite applying same guideline there were different case fatality rate reports. Studying adverse outcome of SAM and associations that may lead to improve the outcome is important.

Objective: the main objective of this study was assess the outcome of children admitted with SAM to yekatit 12 hospital

Method: retrospective descriptive study was conducted in children between 6 months and 5 years of age with severe acute malnutrition admitted to Yekatit 12 hospital from a period of September 2012- September2013. Data was collected from the patients' chart by using structured questionnaire.

Data processing and analysis: compiled and analysed using software Statistical package for social science (SPSS 20). The charts of 193 was retrieved and analysed. Both bivariate and multivariable analysis was performed to determine the outcome of the management of SAM. A p-value of less than 0.05 was taken as statistically significant.

Result: The average age of the study participants was 19.6 months, the majority being in the age group between 6months and 2 years of age. Male children accounted for 52.3 % of the study participants. The treatment outcome revealed that 75% of the patients improved while 12.4% died and the remaining 12.4% defaulted.

Conclusion: This study shows a high mortality rate of severe acute malnutrition despite treatment with the standard guideline. This findings show that the treatment s goal, which is to keep the mortality below 5 % is far from achievable. The finding of high death rate suggests an urgent need to revisit our practice in the management of severe acute malnutrition and warrants more prospective studies.

INTRODUCTION

The World Health Organization (WHO) describes nutrition as 'the intake of food, considered in relation to the body's dietary needs' and good nutrition is a key determinant of health.[1]When food intake is not in balance with the body's dietary needs, malnutrition occurs. The term malnutrition encompasses both under nutrition and over nutrition (obesity). Under nutrition makes major contribution to global disease burden and malnutrition, which is responsible, directly or indirectly, for 35% of deaths among children under five.[2]

Severe acute malnutrition (SAM) is defined as a weight-for-height (WFH) measurement of <70% of the median or >3 SD below the mean National Centre for Health Statistics (NCHS) reference values (termed "wasted") or the presence of bilateral pitting oedema of nutritional origin (termed "oedematous malnutrition") middle upper arm circumference (MUAC) less than 110 mm for a child between 1 and 5 years of age[3, 4, 5]

Worldwide around 19 million children age below 5 years are affected by SAM and associated with 1–2 million preventable child deaths each year.[6] Severe wasting (W/H z-score < −3), a defining feature of severe malnutrition, is thought to affect around 3.5% of the world's children.[6]The large majority of malnourished children live in South Asia, followed by West & Central Africa and East & Southern Africa. Approximately 2% of children living in developing countries suffer from SAM.[6]

Infants and children are most vulnerable to the effects of under nutrition during the period of their most rapid physical growth and development, which predominantly takes place during the first 2 years of life.[7] They are particularly vulnerable at this time because of the extra nutritional requirements for growth and development. In addition, infants and children have smaller bodily reserves than an adult so under nutrition has a more rapid effect. Infants and children are additionally vulnerable because they are dependent on others to provide and prepare foods, and even to be fed.[7, 8]

The mortality rate in a child with SAM is 5–20 times higher risk of death compared to well-nourished children. The mortality rate of children with complicated SAM that receive treatment in inpatient set ups has remained unacceptably high. Such high mortality in

inpatient units has been attributed to co-morbidities such as infections and micronutrient deficiencies.[9] Severe acute malnutrition can be a direct cause of child death, or it can act as an indirect cause by dramatically increasing the case fatality rate in children suffering from such common childhood illnesses as diarrhea and pneumonia.[2]

In Ethiopia, children younger than five years of age, according to the Ethiopian Demographic and Health Survey (EDHS) report, 44% were stunted with 21% severely stunted, 10% wasted, 3% severely wasted 29% underweight (below -2SD) and 16% severely underweight (below -3SD).[10] malnutrition as underlying cause account for 57% of under 5 mortality[11]. Forty-four percent of children age 6-59 months are anaemic, with 21 percent mildly anaemic, 20 percent moderately anaemic, and 3 percent severely anaemic[10].

A study done in Southern Nations Nationalities and Peoples Regional state attested that 45% of the children were stunted, 42% underweight and 12% wasted,[12] similarly in Jimma town the prevalence of underweight, wasting and stunting were 36%, 9% and 36% respectively.[13]

Marasmus is the most common form of PEM and is caused by inadequate intake of all nutrients, but especially dietary energy sources (total calories). Kwashiorkor is characterized by marked muscle atrophy with normal or increased body fat. Pure kwashiorkor is characterized by inadequate protein intake in the presence of fair to good energy intake.[14]

The underlying causes of SAM differ within different communities and from family to family but are generally family food shortages; inadequate care of children and women; unhealthy environment and poor health services; and too many children in a family to feed. The immediate causes associated with malnutrition include poor diet and disease.[6]

Although the median under-five case-fatality rate for severe acute malnutrition typically ranges from 30% to 50%, it can be reduced substantially when physiological and metabolic changes are taken into account. Management of severe acute malnutrition according to WHO guidelines can reduce the case-fatality rate by about 55% in hospital settings.[15]

To decrease mortality, WHO introduced guidance in 1999 that provided a 10-step ordered approach through three phases which have been further developed in subsequent WHO publications for the management and inpatient treatment of children with malnutrition.[15] Ethiopia has prepared a guideline for management of SAM with the aim of decreasing

mortality to less than 5 %. Treatment include first phase (phase I), transition phase and phase II. In phase I, health workers resuscitated patients, treated for infections, restored electrolyte balance, and prevented hypoglycemia and hypothermia on indication. F75 milk was used during phase I treatment; malnourished cases who responded on treatment by return of appetite, beginning of loss of edema and no intravenous line or nasogastric tubes were transferred to transition phase to receive F100. No additional feeding was given and to prepare the cases to phase II treatment. Phase I and transition phase usually took two to seven days and the quantity of F100 given is equal to the quantity of F75 given in phase I. A transition phase was introduced for in-patients because a sudden increase in the amounts of diet, before physiological function is restored can lead to electrolyte disequilibrium and prepares the cases for the next treatment phase.[16]

Afterwards, cases were transferred to phase II after they gained good appetite (finish 90% of F100 prescribed for transition phase) clear edema. In phase II treatment, F100 was used as much as the children could take and additional diet is recommended until they achieved a normal weight for height, 85% and above of the standard. Children who attained at least 85% of the standard weight for height were discharged with an appointment for regular follow up in the health facilities.[16]

STATEMENT OF THE PROBLEM

Globally under nutrition is a major contribution of global disease burden. It accounts 35% of direct or indirect death. As mentioned above malnutrition is also major problem in Ethiopia. A document released by Family Health Department of Federal Ministry of Health of Ethiopia, malnutrition is an underlying cause of 57% of childhood mortality. To decrease mortality WHO and Ministry of Health of Ethiopia prepared a guideline for the management of severe acute malnutrition. There were different researches done in many countries and in Ethiopia as well. But there is no research done at least recently published at my study pace, YEKATIT 12 hospital, where patient management is run by BLH pediatrics department according to the guideline.

The study was a retrospective study aiming at filling the gap on data on management of SAM at my study area. From our day to day practice at Yekatit 12 hospital there are many malnourished patients in the inpatient where many of them are complicated

LITERATURE REVIEW

From different studies done at different countries with retrospective and prospectively, most agreed that the commonest age for SAM is below two years of age. But there are different figures about the case fatality of severe acute malnutrition. Poor hospital care of severe acute malnutrition contributes to high mortality rates.[17]

The study done at Indian University hospital from August 2011 to July 2012 on 104 SAM children between six to sixty months of age admitted at nutrition rehabilitation ward, 59.6% of were in age group six to twelve months. Mean age of presentation was 14.29 months. Of this 104 children, 24.03% cases had severe visible wasting, 27% had bilateral pitting edema. Diarrhea was found to be the most common co morbid disease associated with SAM. 54% SAM children had diarrhea and 27.9% of children suffered acute respiratory tract infections. Tuberculosis and HIV were diagnosed in 22% and 2.88% of cases respectively.[18]

Other Indian study to evaluate on 1,1229 the effectiveness of facility-based care for children with SAM in Nutrition Rehabilitation Centers (NRCs), which was done on 2010 and 2011 54.6% were boys, 81.6% were in the age group 6-23 months old, and 42% had edema or medical complications. 14 (1.2%) children died 657 (47.2%) children defaulted, and 610 (51.7%) children were discharged.[19] This mortality rate was low compared to one study which was done at Uganda university hospital which was 24% of which 70% of death was occurred in the first week of admission.[20]

The average (SD) weight gain was 12.1 (7.3) g/kg body weight/day and the average (SD) length of stay was 13.2 (5.6) days. 206 (46.8%) children were discharged after recovery (weight gain ≥15%) while 324 (53.2%) were discharged, non-recovered (weight gain < 15%).[19]

A study done at Sudan from 3 hospitals age less than 5 yr with sample size of two hundred and ten participant and sex distribution was approximately same and age between one and two was more common which is 68.6%. In this study, cure rate is 89.5% and death rate is 19.5%. The average hospital stay and weight gain is similar for marasmus and kwashiorkor.

The most common associated disease at admission was diarrhea (68.4%) More than half of the children suffered diarrhea at admission and others developed diarrhea during therapy.[20]

From Gondar university hospital, Ethiopia retrospective study there was 52.2% males and 160 47.8% females with severe malnutrition. Children below the age of 24 months constituted for 60.3% of all the admissions. Marasmus was the most common type of malnutrition, present in 52.0% of the patients. Kwashiorkor and marasmic kwashiorkor were seen in 23.3% and 24.7% of the patients respectively. The overall case fatality rate was 18.4% while 9.1% abandoned treatment. 72.5% of the patients were discharged improved. The case fatality rates for the different types of malnutrition were 28.4% for marasmic kwashiorkor, 16.9% for kwashiorkor and 14.5% for marasmus.[21]

Other study at same study area done to assess the risk of SAM under age of five Inappropriate infant and young child feeding practices were commonly seen in children with severe acute malnutrition. The identified inappropriate feeding practices were supplementation with prelacteal feeds, lack of exclusive breastfeeding in the first six months of age, late initiation (at12 months of age or beyond) of complementary diet, and bottle-feeding. The risk for severe acute malnutrition was independently associated with lack of exclusive breastfeeding for the first six months of life.[22]

From study done zewditu hospital Addis Ababa Ethiopia shows the predominant age group suffered from marasmus was the infants (75.4%) while kwashiorkor was prevalent during the second and third year. The mean age for marasmus, kwashiorkor and marasmic-kwashiorkor incidence was 16.9, 25.9 and 27.3 months respectively. Death occurred in 21.3% of the cases. Presence of diarrhea, edema, stunting and short mean duration of hospital stay were predictors of death outcome.[23]

Study made on four hundred ninety three SAM patients at St. Luke Catholic Hospital in Wolisso, South West Shewa, Ethiopia, which was done at 2006 and the mortality rate was 7.1% and the recovery rate was 88.4%; the drop-out rate was 4.5%. From this study review 28.6% of the death was within 48 hr of admission.[24]

From prospective study done at Ethiopian 90 malnourished children on the clinical profile and pattern of infection, Over 80% of the patients were infected and the lungs were the

commonest sites. Bacterial pathogens, predominantly Gram negative enteric organisms, were isolated from 36% of blood and 37% of urine specimens. Septicaemia, gastroenteritis, pneumonia and disseminated tuberculosis accounted for an overall case fatality rate of 32%. Mortality was higher in children with total serum protein of 5gm% or less.[25]

The HIV pandemic has changed the epidemiology, pathophysiology and mortality of SAM in many parts of sub-Saharan Africa and other areas of the world.[26] During HIV infection, nutritional intake may be affected by anorexia, central nervous system disease, dysphagia, and odynophagia.[7] A study of 200 children presenting with malnutrition in a Zambian hospital found that 54% also had HIV infection.[27]

Seventeen studies systematic review and meta-analysis to evaluate HIV prevalence and mortality in children undergoing treatment for severe acute malnutrition (SAM) in sub-Saharan Africa, and 29.2% were HIV-infected. HIV-infected children were significantly more likely to die than HIV-uninfected children (30.4% vs. 8.4%; $P < 0.001$; relative risk = 2.81, 95% CI 2.04–3.87), [28] which is against the result of Ugandan study where there was no statically significant case fatality rate with HIV infection.[20]

Justification of the study:-This study targets those who had malnutrition children and the result generated from this study is believed to have impact in future outcome of these patients who will be admitted at study area. The result of the study will be used by Addis Ababa University pediatrics and child health department and Yekatit hospital pediatrics and child health department and expected to be used. This study is also can help as an income for future study in this area. Therefore, the significance of the study is cannot be overemphasized.

MAJOR OBJECTIVE

To assess the factors associated with the treatment outcome of severe acute malnutrition in children in the age group 6 month to 5 years of age

SPECIFIC OBJECTIVES

To assess the prevalence of the treatment outcomes of severe acute malnutrition (cured/died/defaulted)

To assess the factors associated with the treatment outcomes of severe acute malnutrition.

STUDY MATERIAL AND METHOD

Study area and period

This study was conducted in Yekatit 12 hospital and from the period of 2011-2012 G.C. Yekatit 12 Hospital is a teaching referral hospital owned by the Addis Ababa Health Council with well organized pediatrics outpatient and inpatient care. It is also one of the hospitals where nutrition therapy is given. The department of pediatrics is run by BLH pediatrics staff including interns, residences and pediatrics specialists. This study is a retrospective descriptive study. All children with SAM admitted from September 2011 –September 2012 GC at yekatit 12 hospital have been included in the study.

Children eligible for inclusion in this study were those age six months to 5 years age who are diagnosed having SAM by WHO criteria. Exclusion criteria was age < 6months and >5 years of age, and incomplete documentation

Data was collected from the patient chart of all pediatrics wards after ethical clearance from the responsible body. It was collected by the investigators using standardized survey tools after it is tested by pilot studies.

Data analysis and interpretation

Data obtained from the study was coded and entered in to SPSS version 20. Data was summarized using mean and standard deviation for quantitative variables, and percentage for qualitative variables. Data analysis involved calculation for indicators like cure, death and defaulter rate. Survival analysis was also done to survival data(death and cure). The association between the outcome and type of malnutrition, age of child, presence of diarrhea, complication, HIV status and serum level of albumin controlling cofounding factors for each was done by regression analysis. P-value of 0.05 was considered as a cut-off level for statistical significance.

OPERATIONAL DEFINITION

Diagnosis of SAM:

1, W/Ht< 70%

2, MUAC < 11 cm

3, bilateral pitting edema

4, W/A < 60%

Dropout: patient: discontinue treatment against

Cure: patient who fulfil WHO discharge criteria

RESULTS

A total of 193 patients with severe acute malnutrition were admitted over one year period of study. The mean age of study participant was 19.6 ±10.4months. Around 80% of them were below two years of age. Almost half of them (52.3%) were males. Of these 142 patients (73.6%) were from Addis Ababa and 42(21.8%) were from Oromya. The remaining 9(4.7%) patients were from other regions. table 1 shows age distribution of the study participants.

Table 1: age distribution of SAM

Age in months	Frequency	Percent	Valid Percent	Cumulative Percent
12or less	57	29.5	29.5	29.5
13 – 24	96	49.7	49.7	79.3
25 – 36	30	15.5	15.5	94.8
37 – 48	8	4.1	4.1	99.0
49 or above	2	1.0	1.0	100.0
Total	193	100.0	100.0	

Non edematous malnutrition account 53.4% and edematous malnutrition of 46.6%, with 33.6% was kwashiorkor 13% with marasmic-kwashiorkor. The mean age of non edematous malnutrition was younger than edematous malnutrition, 22.65 months for kwashiorkor, 22.12 months for marasmic-kwashiorkor and 16.8 months for marasmus. This showed that there is an association between age of the child and type of malnutrition (P. <0.05). Figure 1 shows the type of malnutrition.

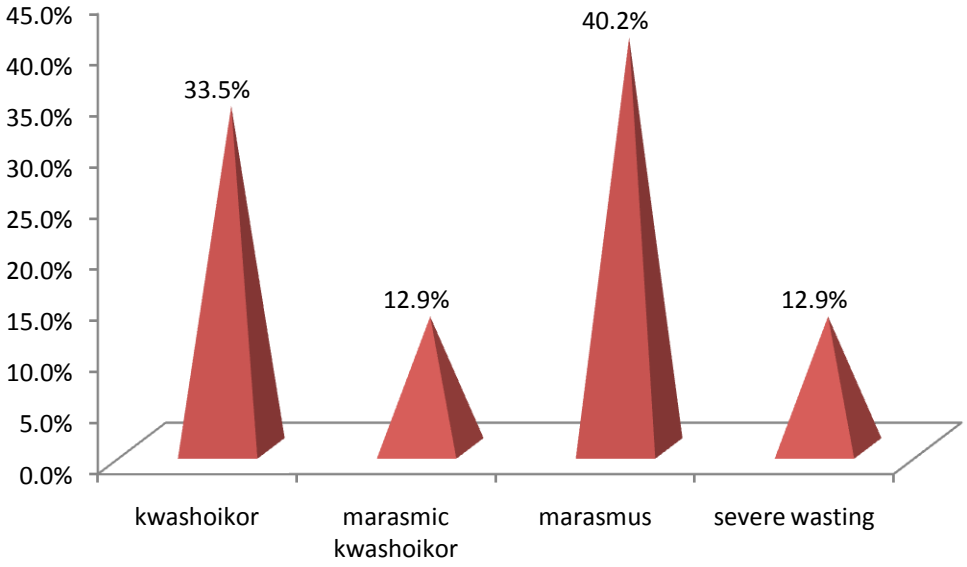

Fig.1 Frequency of SAM by type

From nutritional history, 60% children were exclusively breastfed (64% for non edematous and 54.4% for edematous) with 10 patients (5.2%) unknown history. The remaining 35% were not exclusively breastfed. 17% children were not breastfed at all or breastfed for less than one month. 35.5% children were breastfed for more than one year. The mean age of breast feeding was 11months. Figure 2 shows breast feeding distribution.

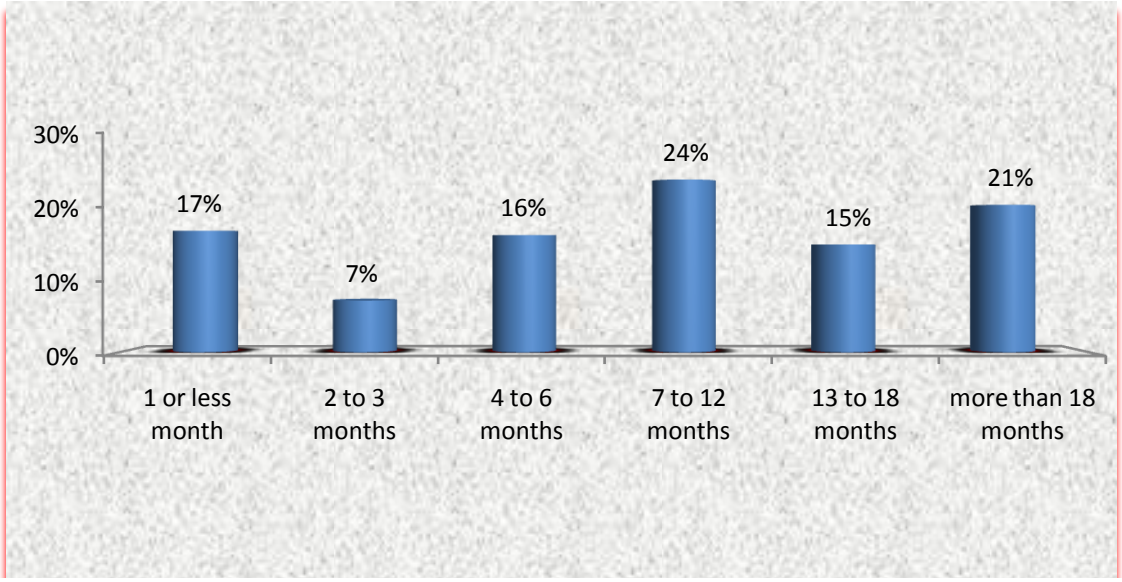

Fig.2 breastfeeding distribution

One hundred four patients (54%) were admitted with diarrhea. diarrhea was slightly less prevalent to non edematous malnutrition than edematous malnutrition (51.5 % Vs 56.7%) but not statistically significant. 14.6% of children who had no diarrhea have died as compared to 10.6% those who had diarrhea. This increase death difference was not statistically significant when the analysis was done after controlling other cofounding factors.

Of the total cases, 119 children (61.7%) had anemia which is hematocrit level less than 34% but only 4% had severe anemia of hematocrit <12%. In 90 children serum albumin level was determined and34.4% children had normal serum albumin level (>=3.5g/dl). Of those who had low serum albumin level, 23.3% had serum albumin between 2.5g/dl and 3.5 g/dl and the remaining had <2.5 g/dl.

When we see the HIV status, 141(73.1%) of the study subjects HIV status was documented and 52 (26.9%) were not. Of those known 127 (90%) were negative and 14 (10%) were positive (include infected and exposed). Positive HIV status was higher for those who died as compared to those who had improved (4.8% Vs 16.7%). The relationship between outcome and HIV status is shown at figure 3.

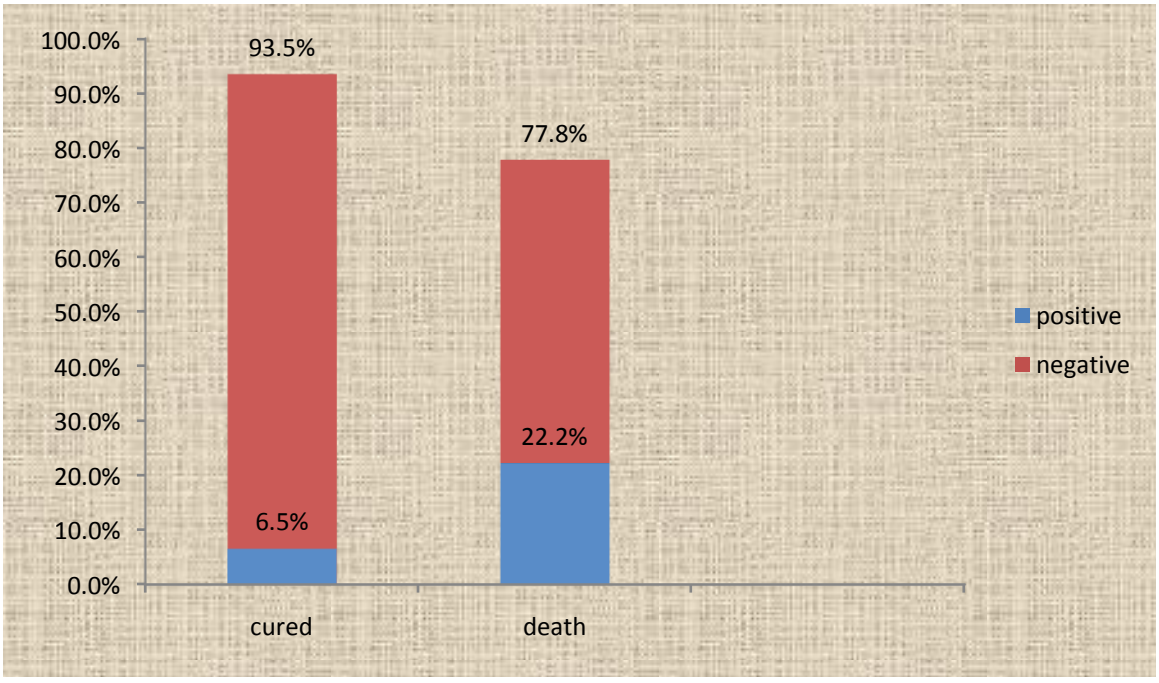

Fig.3 relation between outcome and HIV status

There was no significant association between HIV status and the presence of diarrhea or complications (56.7% for HIV negative Vs 57.1% for HIV positive had diarrhea and about complication, 50.4%Vs 50% had complication).

There was increase risk of having tuberculosis for those who are HIV positive (8.7% Vs 50%). HIV increase risk of tuberculosis by 10.5 times (95% CI is 3 to 35.5, P<0.05). Of all 193 children, 23 children (11.9%) were diagnosed to have tuberculosis.

When we see the presence of complication, 48.7% of those admitted children had complication. Pneumonia was the most common complication which occurred in 30% of all children, and contributes to 61.7% of all complications. For type of complication see fig. 4.

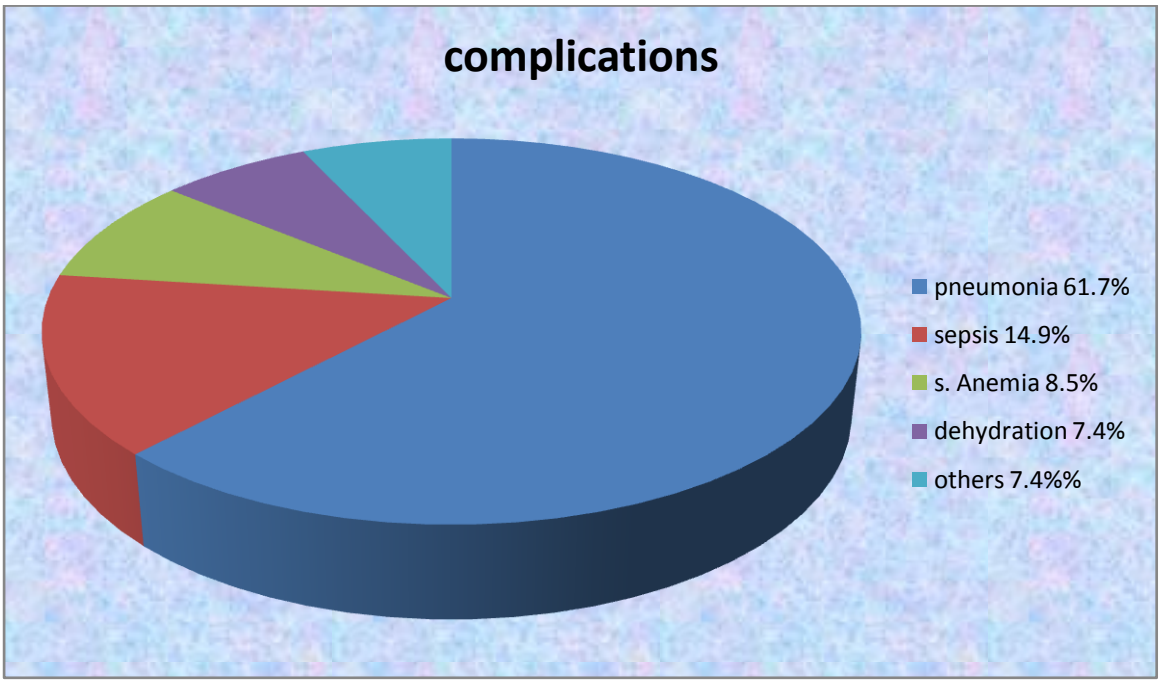

Fig. 4 types of complications

There was no significant difference on the presence of pneumonia between those who had improved and those who died (30% Vs 33%).

The outcome of these children was 74.4% had improved, 12.4% dead and the same 12.4% withdraw the treatment. There is no significant association between type of malnutrition, age of the child, serum albumin level and presence of complications with treatment

outcome after controlling for potential confounding factors. Fig.5, 6, and 7 show relation of type of malnutrition, age of child and complication with outcome respectively.

Characteristics of children who died see table 2

Table 2: characteristics of those children who died

characteristics		number	Percent
Age	<= 12 months	8	32
	13 to 24 months	11	44
	25 to 36 months	4	16
	>= 37 months	2	8
Type of malnutrition	Kwashiorkor	8	33.3
	Marasmic -kwash	2	8.3
	Marasmus	11	45.8
	Severe wasting	3	12.5
HIV status	Positive	4	16.7
	Negative	14	58.3
	Unknown	6	25
Presence of diarrhea	Yes	13	54.2
	No	11	45.8
Presence of complication	Yes	15	62.5
	No	9	37.5
Type of complication	Dehydration	1	6.7
	Pneumonia	8	53.3

	Sepsis	4	26.7
	Severe anemia	1	6.7
	Other	1	6.7
tubeculosis	Yes	5	20.8
	No	19	79.2
Presence of anemia	Yes	14	58.3
	No	10	41.7
Albumin level	Normal	1	4.2
	Low	4	16.7
	Unknown	19	79.2

Fig.5 relationship between type of malnutrition and outcome

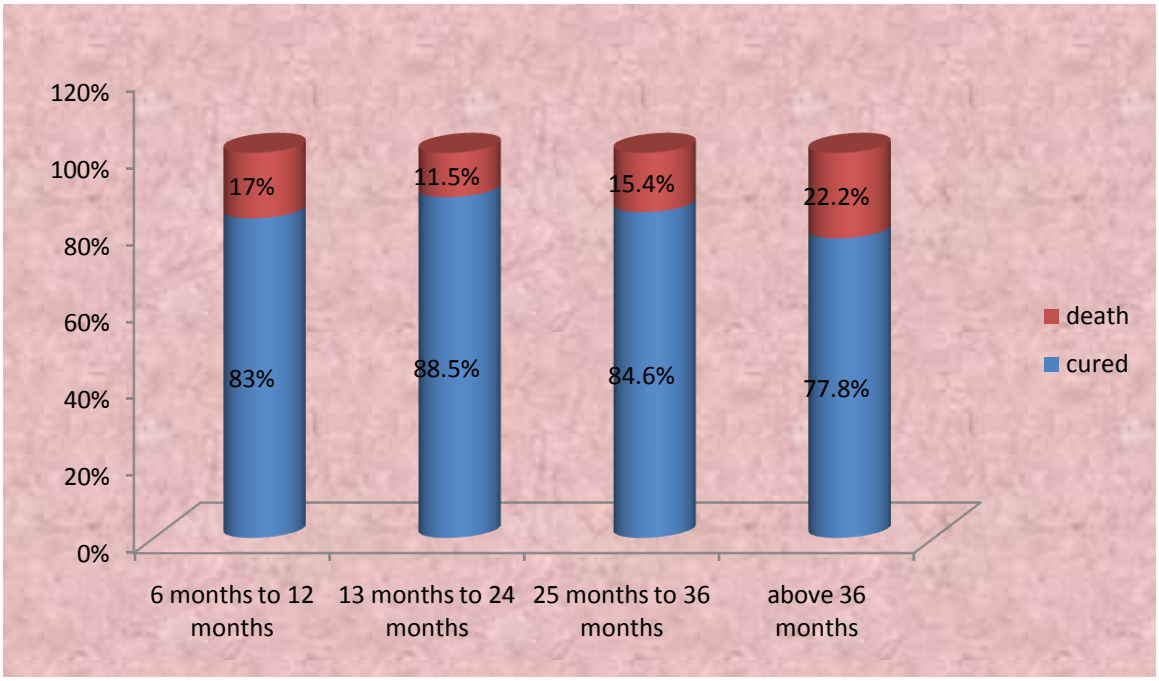

Fig.6 relationship between age of child and last outcome

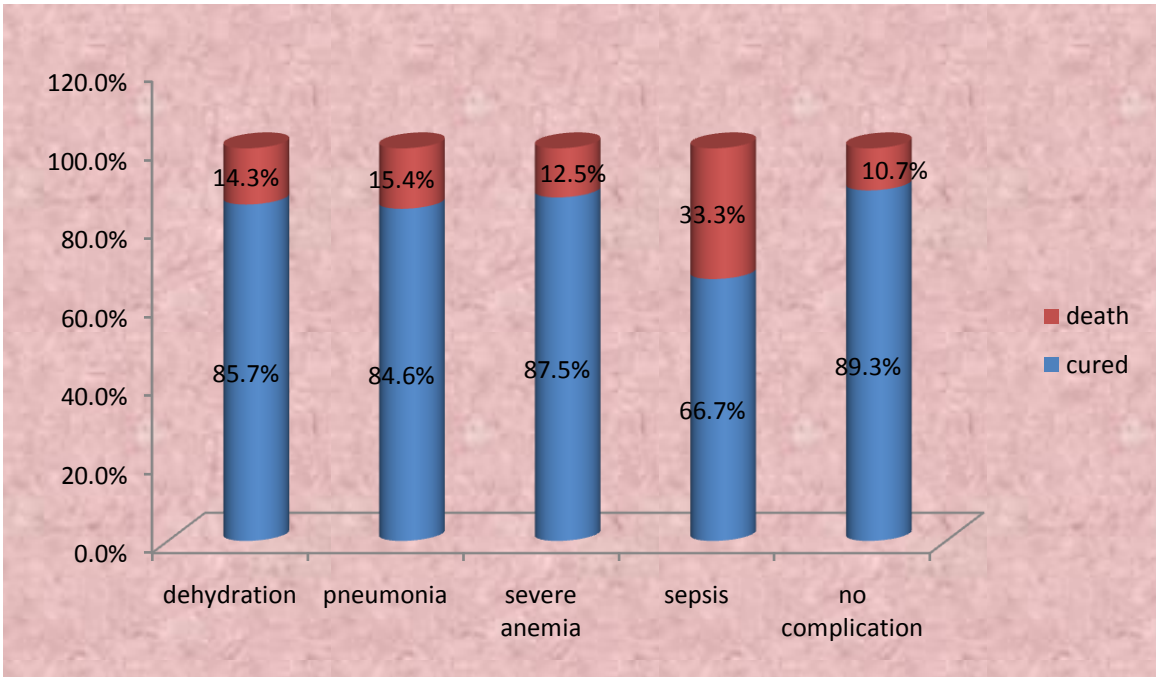

Fig.7 relationship between type of complication and outcome

The mean age of hospital stay was around 16 days (15 days for those dead Vs 16 for those improved). Fig. 8 below presents length of hospital stay. The risk of death in the first one week is high. Around one fourth admitted children dead in the first 8 days of admission as shown at fig.9.

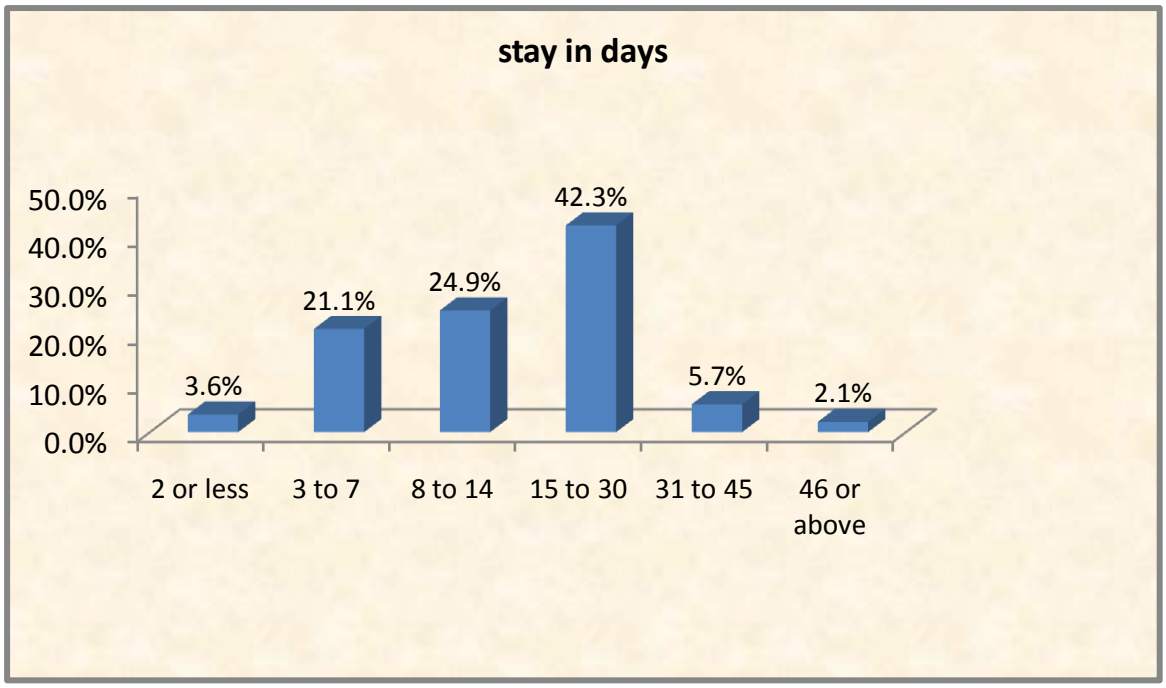

Fig. 8 length of hospital stay

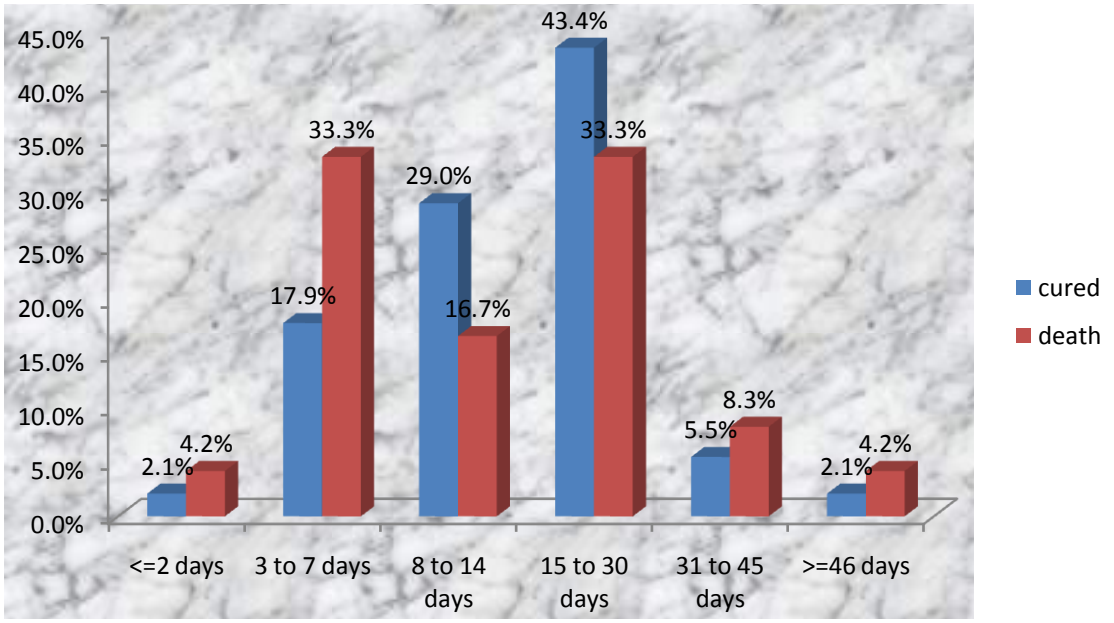

Fig. 9 relationship between hospital stay and last outcome

DISCUSSION

The result showed that there is no significant sex difference in those with severe acute malnutrition. This result agreed with study done at Gondar University hospital (52.2 % and 47.8 % from Gondar study Vs 52.3% and 47.7% from our study for male and female respectively.[21] Sudan study also support this finding.[20] Most of malnourished children are between 1 yr and 2 years which occupy half of the children. Gondar and Khartoum study also support the age with difference in percentage.[21,20] But this is different from Indian study in which commonest age is between 6 months and 1yr.[18]

Non edematous malnutrition was most common type of malnutrition 53%, followed by kwashiorkor and marasmic kwashiorkor 34% and 13% respectively. Gondar study agreed with non edematous malnutrition with difference in kwashiorkor and marasmic kwashiorkor which is 23.3% and 24.7% respectively. There is statistically significant relation between age of the child and type of malnutrition as same conclusion which was done at Zewditu hospital.[23]

The results from Zewditu and Gondar do not agree with our findings. In these studies the case fatality was high for edematous malnutrition while in our s study there was no relationship between type of malnutrition and outcome.[21, 23]

In Indian study, 54% of children had diarrhea. In other African studies diarrhea occurred in 68.4% at admission. Diarrhea is a major co morbid condition seen in this study and more than half of the studied children had diarrhea at admission.[18, 20] Diarrhea was not as such an important factor for increase in death rate in our study (14.6%Vs 10.6%)[22] which is against the finding at Zewditu Hospital.

We found that 30% of our study subjects had pneumonia which is comparable to Indian study which was 27.9%[18]. But had comparable outcome to those who had no pneumonia which is against the study done in 90 Ethiopian malnourished children where pneumonia increase risk of death.[25]

From those tested, 10% were HIV positive and this number is around 4 times higher compared to Rakesh Kumar et al result but it is very low to Zambian study where half of malnourished are HIV infected.[18, 27] This 10% is also low compared to seventeen studies

systematic review and meta-analysis to evaluate HIV prevalence and mortality in children undergoing treatment for severe acute malnutrition (SAM) in sub-Saharan Africa where they found 29.2% were HIV infected.[20]

Positive HIV status increased the risk of death (16.7 % Vs 4.8 %, OR=4.1, P<0.05) with same conclusion from Hanifa Bachou et al meta-analysis (30.4% vs. 8.4%; *P* < 0.001; relative risk = 2.81, 95% CI 2.04–3.87).[20] Prevalence of tuberculosis is half from the study on 104 Indian malnourished children.[18] HIV increase risk of tuberculosis by 10.5 times (95% CI is 3 to 35.5, P<0.05)

The mortality rate is high when compared to national guideline target (12.4% Vs <5%), and St. Luke Catholic Hospital which is 7.1%, is also very high to an Indian study but in the last study default was very high.[16, 24,19] When compared to two other Ethiopian studies (Zewditu hospital and Gondar university hospital) and Sudan study mortality rate is low (18.4% from Gondar, 21.3% from Zewditu and 19.5% from Sudan).[20, 21, 23] Risk of death is high in first few days of admission which is true for zewditu and St. Luke Catholic Hospital studies.

CONCLUSSIONS AND RECOMMENDATION

In conclusion, despite use of national guideline on management of severe acute malnutrition the mortality rate is high. Some of the deaths occurred early. Those who were sero-positive for HIV had higher chance of death than sero-negative. Most of children stayed some days before dying, so it could be possible to prevent some of the deaths by providing extra care.

We should also revise our management to improve the outcome. Supportive supervision to make sure whether the guideline is followed may be necessary.

I also recommend further study to come up with strategies that may help to improve outcome and it teaching staffs on severe acute malnutrition may also have an impact.

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Annex I : Survey tool:

1, Sociodemography

No	Question	Catagories	Skip
1.01	Age of child	months	
1.02	Gender	Male----------1	
		Female----------2	
1.03	Address	Addis Ababa------1	
		Amhara---------- 2	
		Oromya----------3	
		South----------4	
		Other----------5	
1.04	Date of admission	____/____/_____	
1.05	Date of discharge/withdrawal/death	____/____/_____	

2, nutritional history

2.01	Was the child breast fed"	Yes----------1	→go to 2.2
		No----------2	→go to 3
2.02	Was it exclusive for first 6 months?	Yes----------1	
		No----------2	
2.03	For how long breast fed?	months	

3	Clinical and anthropometry		
3.01	Admission criteria	W/Ht< 70 %----------1	
		W/A<60%(marasmus)------2	
		Edema(kwash)----------3	
		MUAC <11 CM----------4	
3.02	Did the child have diarrhea?	Yes----------1	
		No----------2	
3.03	Did the child have complication at admission?	Yes---------- 1-----	-→go to 3.4
		No----------2-----	-→3.5
3.04	What was the complication?		
3.05	Was he treated for hospital acquired infection?	Yes----------1	
		No----------2	
3.06	Was the child test for HIV?	Yes----------1------	-→go to 3.07
		No/not documented ------2------	-→go to 3.10
3.07	What was the result?	Reactive----------1-------	-→go to 3.08
		Non reactive----------2	
3.08	Was the child on ART?	Yes----------1-----	-→go to 3.09
		No----------2	

3.09 When was ART started? Before admission----------1

After admission----------2

3.10 Was the child diagnosed to have TB or anti TB? Yes----------1

No----------2

3.11 Any other chronic medical or surgical illness

3.12 What was the last outcome? Cured----------1

Withdrawal----------2

Death----------3

3.13 Mention cause of death

4,Investigation result

4.01 Hematocrit at admission %

4.02 Serum albumin level g/dl

4.03 Chest x ray reading

4.04 Was Blood culture done? Yes----------1----

No----------2---

4.05 If yes, what was grow? Gram –ve bacteria----------1---

Gram +ve bacteria----------2—

No growth----------3--

Annex 2: Hospital Consent Form

This is a study that will be conducted in yekatit 12 Hospitals. The main objective of this study is to evaluate treatment outcome of severe acute malnutrition. Such type of study expected to have good feedback for feature patient care. This study will not be done without cooperation of the hospital. Therefore, the hospital's participation and collaboration is very much helpful in generating the required information and will be very much appreciated.

In this study data will be collected from the patient chart record retrospectively. Information regarding any specific personal identifiers like the name of the clients will not be collected and information generated will be disclosed in totality. In addition, confidentiality of any personal information will be maintained throughout the study process and no unauthorized access to the information is allowed

The hospital has all the right to refuse to participate in this study and shall withdraw from the study at any time. if you would like to participate in this study, would you please confirm it by signing here.

Thank you very much

Participant: ---------- Principal investigator: ----------

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