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Survival Status and Determinants of Mortality among Severely Malnourished Children Aged 0-59 Months Admitted to Jinka Hospital, South Omo Zone, Ethiopia

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Abstract

Background: despite, the availability of standard treatment protocols for severe acute malnutrition in stabilization centers in Ethiopia, children under-five admitted were unsatisfactorily high mortality. Therefore little is known about the survival status and determinants of mortality for study setting.

Objective: toassess the survival status and determinants of mortality among severely malnourished children aged 0-59 months admitted to Jinka Hospital.

Methods:the hospital-based retrospective cohort study was conducted from March 20-30, 2019. Simple random sampling was used to select 588 medical records.The proportional hazard assumption was checked by global test.Bivariable and multivariable Cox regression hazard ratio was used to see the association between each independent variables and the outcome variable. Level of statistical significance was declared at p value less than 0.05.

Result: during follow up, 62 (10.54%) children had died (95% CI: 8.05, 13.03). The overall mean survival time was 38 days (CI: 6.3, 39.7). Urban residence (Adjusted hazard ratio(AHR)=2.24, CI: 1.17, 4.30), having dehydration (AHR =3.94, CI: 1.89, 8.22), having shock (AHR=4.15, CI: 2.01, 8.55), altered body temperature (AHR= 2.01, CI: 1.01, 3.91), failure to take F100 (AHR= 4.87, CI: 2.75, 8.63) and failure to take oral antibiotics (AHR=3.57, CI: 1.88, 6.77) were independent determinants of mortality.

Conclusion: the study found that mortality rate for severely malnourished children was higher than global sphere standard and national protocol.

Keywords: Survival status, children, mortality, under-five

Introduction

Sever acute malnutrition (SAM) remains a major public health problem contributing to morbidity and mortality among children aged 0-59 months throughout the developing world. It is estimated that more than 52 million children worldwide are affected by acute malnutrition, of which 17 million are suffering from SAM (WHO et al, 2017) and the majority of these affected children are living in South Asia and sub-Saharan Africa (SSA). Nearly 3·1 million children under five years from these settings die every year due to under nutrition which contributes to 45 % of the total child deaths of which 4.4% of deaths specifically is attributed to its severe form, and 15, 652, 300 total global disability adjusted life years (DALYs) (Troeger C *et al.*, 2018; WHO, 2013; Black RE et al., 2013).

The SSA accounts for 14.0 million wasted children aged under-five years of which 4.1 million are severely wasted (WHO et al., 2017) with the prevalence ranging from 10% to 20 % (Hobbs B and Bush A, 2014). In Ethiopia, 38%, 24% and 10% of children under five years are stunted, underweight and wasted respectively (CSA, 2016) and over half of the deaths among these children is related to under-nutrition (FMOH, 2015). SAM accounts for 19.5 % pediatric hospital admissions and 3-29% inpatient case fatality rate among under-five children (Desta KS, 2015; Gordon DM et al., 2013; Wagnew F et al., 2017).

The complicated form of SAM is the commonest reason for pediatric hospital admission and death, those who are severely malnourished had nine-fold-increased risk of death than their well-nourished (Black RE et al., 2008). However, only 10% of children under five affected by SAM have access to treatment worldwide (Hobbs B and Bush A, 2014). Hence, poor adherence to inpatient treatment protocol causes high mortality contributing to 25 % to 30% of children with SAM to die during hospital admissions (WHO et al., 2007).

Although the case fatality rates for inpatient treatment of SAM using the world health organization (WHO) protocol ranged from 8 % to 16 % (Hossain M et al) still most of the cases admitted to stabilization centers (SCs) suffer from a number of fatal co-morbidities and infections that cause mortality which include diarrhea, pneumonia, sepsis and tuberculosis (Hobbs B and Bush A, 2014; De Maayer T and Saloojee H, 2011). Similarly, altered general conditions like shock, dehydration, impaired consciousness, and altered body temperature cause most children's death at admission among others (Jarso Het al., 2015 ; Munthali T et al., 2015; Muzigaba Met al., 2018) . In Ethiopia, in particular, the high risk of mortality is associated with low coverage rates of SAM management, late diagnosis of undernourished cases, poor adherence to treatment protocol (Park SE et al., 2012) , and high defaulter rates (Oumer A et al., 2016).

Even-though, the Ethiopian Federal Ministry of Health (FMOH) currently adopted WHO guidelines for the management of SAM, which are widely promoted as standard to treat SAM cases (FMOH, 2007; Schub C, 2010). It is indicated that the management of severe cases according to this guideline could reduce the case fatality rate by 10% in inpatient settings. The mortality could be reduced to less than 5 % with strict adherence to these guidelines (Ashworth A *et al.*, 2003). However, improved reduction in case fatality rates was not always sustained over time, despite consistent implementation of the WHO's guidelines (Muzigaba M *et al.*, 2018)where the mortality rate among admitted under five children is high (Desta KS, 2015). Therefore, this study was aimed at assessing the survival status and determinants of mortality among severely undernourished children aged 0-59 months admitted to SC in Jinka general hospital, South Omo Zone, South Ethiopia.

Methodology

Study settings, period, and design

The hospital-based retrospective cohort study was used in Jinka General Hospital SC, South Omo Zone, Southern Nation Nationalities and Peoples Regional state (SNNPR), South Ethiopia from March 20-30, 2019. Jinka, the administrative capital of South Omo Zone, is located at 750 km to the South of Addis Ababa, the capital City of Ethiopia, 399 km from Hawassa (capital of SNNPR).

Study participants and sample selection

All randomly selected records of children aged 0-59 months admitted with SAM in Jinka General Hospital SC from September 1, 2014 to August 30, 2018, which fulfilled treatment and management protocol guidelines developed by Ethiopian FMOH for admission of children with SAM such as weight for height below -3 z scores of the median or the presence of nutritional (bilateral pedal) edema or middle upper arm circumference (MUAC) less than 11.5 cm (FMOH, 2013), were included in the study.

The required Sample size was computed using Epi Info version 7 computer software. Double population proportion formula was used to calculate the sample size with the following assumptions: 95% confidence level, 5% margin of error, power 80%, unexposed to exposed ratio of 2:1, risk of having an outcome among unexposed to be 7.9%, and 15.9% among exposed with risk ratio of 2 (Jarso H et al., 2015). The main exposure variable was superimposed comorbidity. The estimated sample size was 602 with additional 10% for non-response. Simple random sampling technique was used to select the records of the admitted children from SAM registries. However, records of 14 cases of SAM were excluded due to incomplete recorded of treatment outcome and the final sample size of 588 was used for this study.

Data collection and quality control

All required data were collected using structured data retrieval format, which was adapted from standard treatment protocol guidelines and registration book for the management of SAM, monitoring multi chart, and related available literature. Five clinical nurses and one BSc nurse who had previous exposure to data collection and training on SAM management were deployed to collect the data and supervise the data collection process, respectively. The inpatient SAM treatment registration book was primarily used to find their unique SAM numbers and medical record numbers. Then, registry clerks retrieved the patient card from card room using their medical record numbers. Based on pretested structured data extraction format, the required data from SAM registers, SAM monitoring multi charts, and individual patient cards were collected. Pre-test was done on randomly selected 30 medical records. The research team checked all collected data for completeness, consistency and accuracy, and corrections were made accordingly. Data consistency and accuracy were checked before data entry. Two data clerks were trained on how to enter data onto EpiData version 3.1. Computer software. Data were double entered and validated for consistency

Study variables and measurements

Survival status of children admitted with SAM, death and time to event from admission until death, was understood as an outcome variable in this study. The outcome variable was coded as "1" if died and "0" if censored (other treatment outcomes cured, defaulter, nutritional transfer, none-recovered, and medical transfer). Children were labeled as cured if they have fulfilled the discharge criteria with nutritional improvement, died if passed away while in the SC program, and defaulter if they were absent for 2 consecutive weighing sessions for 2 days (FMOH, 2013) . Moreover , children were known to have hyperthermia if body axillary temperature was above 38.5°C and hypothermic if body axillary temperature was below 35°C (FMOH, 2013). Children who did not fulfill the discharge criteria after 40 days were said to be non-recovered and transfer out if transferred from in-patient care to outpatient program (OTP) but those children who were referred to higher health facilities for medical reasons did not continue the nutritional treatment (FMOH, 2013) .

The independent variables of this study included age of the child, type of SAM, residence, presence of malaria, dehydration, shock, diarrhea, and hypoglycemia, body temperature, use of F100 and oral antibiotics, level of consciousness, Naso-gastric tube feeding, and blood transfusion.

Data processing and analysis

Data were cleaned, coded and entered onto EpiData version 3.1 and exported to STATA version 13 for analysis. Exploratory data analysis was performed to check the levels of missing values and presence of influential outliers. The effect of Multicollinearity among independent variables was checked using variance inflation factor (VIF).Cox regression model's fitness to the survival data and proportional Hazard assumptions were checked with Schoenfeld residuals test. Descriptive statistics such as mean, median, interquartile range was used to summarize the data. The Kaplan-Meier non-parametric estimator was used to estimate the mean survival time and Log-rank significance test was used to compare survival between categorical groups. Bivariable Cox proportional hazard regression model was used to see the association between each independent variable and the outcome variable. Variables with p value less than 0.2 during Bivariable cox regression analyses were entered into final multivariable cox regression model using enter procedure to control for all possible confounders and identify determinant of mortality. The final model fitness was checked by global test using Schoenfeld residuals. Cox regression hazard ratio along with 95% CI was estimated to measure the strength of the association. Level of statistical significance was declared at p value less than 0.05.

Ethical clearance

Ethical clearance was secured from Haramaya University College of Health and Medical Sciences Institutional Health Research Ethical Review Committee (IHRERC). However, since the study has used data from existing admission and patients' records of SC, there was no direct contact with children/caregivers. All the necessary privacy and confidentiality was assured by collecting data secretly using medical record number of each patient. No patient card was lost during data collection period.

Results

Socio-demographic and admission characteristics SAM cases

Cohorts of 588 severely malnourished children were followed retrospectively for 60 months with median (±IQR) time of follow up to be 12 (±8) days. About 340 (57.8%) of those enrolled into the study were males. The common of admitted children 490(83.3%) were from rural areas. The mean (±SD) age of children was 22.05 (±15.31) months. The majority 534 (90.8%) of the cases were newly admitted of which 330 (56.1%) had clinically evident edematous malnutrition, 227(38.6%) clinically identified as kwashiorkor while 103(17.5%) were marasmus-Kwashiorkor.(Table 1).

Table 1: Socio-demographic and admission characteristics among severely malnourished children age 0-59 months admitted in Jinka General Hospital, South Omo Zone, Ethiopia, 2019 (N=588).

Variables		Survival status		Total, n (%)
		Died, n (%)	Censored, n (%)	
Sex	Male	38(6.5)	302(51.4)	340(57.8)
	Female	24(4.1)	224(38.1)	248(42.2)
Age	< 6 months	5(0.9)	54(9.2)	59(10.0)
	6-23 months	35(6.0)	233(39.6)	268(45.6)
	24-59 months	22(3.7)	239(40.6)	261(44.4)
Place of residence	Urban	15(2.6)	83(14.1)	98(16.7)
	Rural	47(8.0)	443(75.3)	490(83.3)
Breast feeding status	Yes	25(4.3)	199(33.8)	224(38.1)
	No	37(6.3)	327(55.6)	364(61.9)
Type of admission	New	57(9.7)	477(81.1)	534(90.8)
	Readmission	5(0.9)	49(8.3)	54(9.2)
Type of SAM	Marasmus	31(5.3)	227(38.6)	258(43.9)
	Kwashiorkor	17(2.9)	210(35.7)	227(38.6)
	Marasmus-kwashiorkor	14(2.4)	89(15.1)	103(17.5)
Nutritional edema	Yes	31(5.3)	299(50.9)	330(56.1)
	No	31(5.3)	227(38.6)	258(43.9)
WFH %	< 70%	29(4.9)	135(23.0)	164(27.9)
	≥70%	33(5.6)	391(66.5)	424(72.1)

Clinical profile and comorbidity patterns at admission

About 103(17.5%) and 41(7%) of children developed pneumonia and tuberculosis at admission, respectively. Similarly, 44(7.5%) of children were infected with malaria and 21(3.6%) of children were HIV Sero-positive. Almost, 382(65.0%) of children had developed anemia, 216(36.7%) of children had vomiting, 146 (24.8%) of children suffered from dehydration, 48(8.2%) of them had altered level of consciousness. (Table2)

Table 2: Clinical conditions and comorbidity patterns among severely malnourished children admitted in Jinka General Hospital, South Omo Zone, Ethiopia, 2019 (n=588).

Variables		Survival status		Total, n (%)
		Died, n (%)	Censored, n (%)	
Pneumonia	Yes	9(1.5)	94(16)	103(17.5)
	No	53(9)	432(73.5)	485(82.5)
Malaria	Yes	8(1.4)	36(6.1)	44(7.5)
	No	54(9.2)	490(83.3)	544(92.5)
HIV Sero-status	Sero positive	3(0.5)	18(3.1)	21(3.6)
	Sero negative	32(5.4)	295(50.2)	327(55.6)
	Not known	27(4.6)	213(36.2)	240(40.8)
Diarrhea	Yes	43(7.3)	228(38.8)	271(46.1)
	No	19(3.2)	298(50.7)	317(53.9)

Tuberculosis	Yes	6(1.0)	35(6.0)	41(7.0)
	No	44(7.5)	375(63.8)	419(71.3)
	Not known	12(2.0)	116(19.7)	128(21.8)
Vomiting	Yes	27(4.6)	189(32.1)	216(36.7)
	No	35(6.0)	337(57.3)	371(63.3)
Level of	Altered	25(4.3)	23(3.9)	48(8.2)
Consciousness	Normal	37(6.3)	503(85.5)	540(91.8)
Shock	Yes	20(3.4)	19(3.2)	39(6.6)
	No	42(7.1)	507(86.2)	549(93.4)
Dehydration	Yes	42(7.1)	104(17.7)	146(24.8)
	No	20(3.4)	422(71.8)	442(75.2)
Hypoglycemia	Yes	11(1.9)	26(4.4)	37(6.3)
	No	51(8.7)	500(85.0)	551(93.7)
Anemia	(Hgb<11 g/dl)	44(7.5)	338(57.5)	382(65.0)
	(Hgb>11 g/dl)	18(3.0)	188(32.0)	206(35.0)
Body	Altered	19(3.2)	33(5.6)	52(8.8)
temperature	Normal	43(7.3)	493(7.3)	536(91.2)
Appetite test	Passed	7(1.2)	41(7.0)	48(8.2)
RUTF	Failed	55(9.2)	485(82.5)	540(91.8)
Cough	Yes	25(4.3)	191(32.5)	216(36.7)
	No	37(6.3)	335(57.0)	372(63.3)
Skin lesion	Yes	7(1.2)	57(9.7)	64(10.9)
	No	55(9.4)	469(79.8)	524(89.1)

Therapeutic feeding, routine and special medication provision

According to the national treatment protocol, the most commonly delivered therapeutic food was F-75, 528(89.8%) and F-100 452(76.6%) formula milk, respectively. Around, 366(62.24%) SAM children were treated with intravenous antibiotic medication. Likewise, 276(46.9%) of children admitted were supplemented with folic acid.(Table 3).

Table 3: Therapeutic feeding, routine and special medication provision among severely malnourished children age 0-59 months admitted in Jinka General Hospital, South Omo Zone, Ethiopia, 2019 (n=588).

Variables		Survival status		Total, n (%)
		Death, n (%)	Censored, n (%)	
Vitamin A supplementation	Yes	25(4.3)	210(35.7)	235(40.0)
	No	37(6.3)	316(53.7)	353(60.0)
Folic acid supplementation	Yes	25(4.3)	251(42.7)	276(46.9)
	No	37(6.3)	275(46.8)	312(53.1)
Dewormed by anti-helmets	Yes	34(5.8)	255(43.4)	289(49.1)
	No	28(4.8)	271(46.1)	299(50.9)
Oral Antibiotics	Yes	14(2.4)	291(49.5)	305(51.9)
	No	48(8.2)	235(40.0)	283(48.1)
F75 intake	Yes	56(9.5)	472(80.3)	528(89.8)
	No	6(1.0)	54(9.2)	60(10.2)
F100 intake	Yes	27(4.6)	425(72.3)	452(76.9)
	No	35(6.0)	101(17.2)	136(23.1)

IV Fluid infusion	Yes	34(5.8)	240(40.8)	274(46.6)
	No	28(4.8)	286(48.6)	314(53.4)
NG tube feeding	Yes	35(6.0)	141(24.0)	176(29.9)
	No	27(4.6)	385(65.5)	412(70.1)
Treated with IV antibiotics	Yes	42(7.1)	324(55.1)	366(62.2)
	No	20(3.4)	202(34.4)	222(37.8)
Blood transfusion	Yes	17(2.9)	36(6.1)	53(9.0)
	No	45(7.7)	490(83.3)	534(90.0)

Survival status and treatment outcome of children admitted with SAM

From 588 cohort of children, 402 (68.37%, 95%CI :(64.48%, 72.01%) children were cured and discharged, 62 (10.54%, 95% CI: (8.30%, 13.30 %) were died during treatment, 41 (6.97%, 95% CI: (5.17%, 9.34%) were defaulted and left the TFU before completing their treatment (Figure 1).

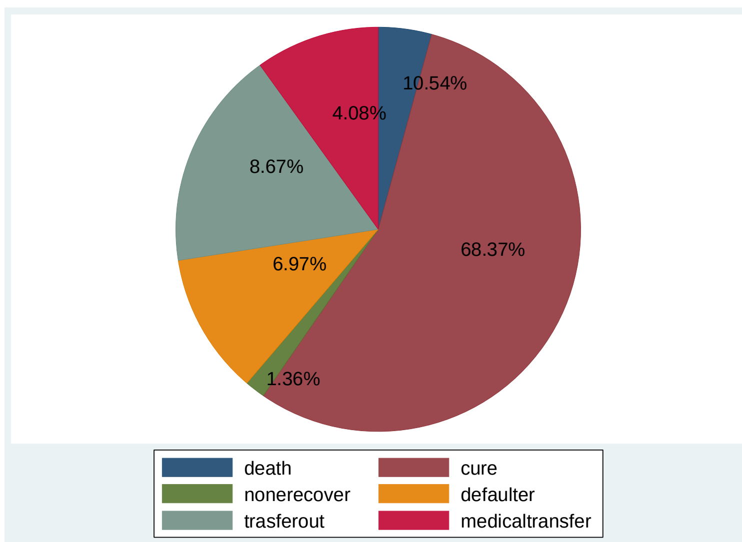

Figure 1: Treatment outcome among severely malnourished children aged 0-59 months admitted in Jinka hospital, south Ethiopia, 2019.

The overall mean survival time was 38 days, 95%CI: (36.3, 39.73) and the cumulative survival rates at the end of 1st, 2nd and 3rd weeks were 93.5%, 95% CI :(91.16%, 95.26%), 90.7 %, 95%CI: (87.81%, 92.89%), and 85.4 %, 95%CI: (80.9%, 88.89%) respectively. The majority of the children 37(59.68%) were died with in first week of admission while 12(19.35%) were died during second week of admission.

Determinants of mortality among children admitted with sever acute malnutrition

Children born to mothers from urban residence were two times [AHR= 2.24, 95%CI : (1.17, 4.30)] more likely to die compared with their counterparts .Children who had dehydration were nearly 4 times [AHR=3.94, 95%CI: (1.89, 8.22)] more likely die compared with children who did not have signs of dehydration .The hazard of death was two times[AHR= 2.02, 95%CI :(1.01, 3.91) higher among children who had altered body temperature compared with those with normal body temperature .Children who undergone shock were four times [AHR= 4.15, 95%CI : (2.01, 8.55)] more likely to die compared with their counterparts. The hazard of death was also nearly five times [AHR= 4.87, 95%CI: (2.75, 8.63)] higher among children who failed to feed on F-100 formula than those who used to fed on it .Moreover, children who did not get antibiotic upon admission were nearly four times [AHR=3.57, 95%cI : (1.88, 6.77)] more likely to die compared with their counterparts (Table 5).

Table 5: Result of multivariable cox proportional hazard regression analysis for determinant of mortality among severely malnourished children aged 0-59 months admitted in Jinka General Hospital, South Omo Zone, Ethiopia, 2019 (N=588).

Variables		Survival status		CHR (95%CI)	
		Died	Censored		AHR (95%CI)
Age	< 6 months	5	54	1.16(0.44, 3.07)	0.45(0.14, 1.37)
	6-23 months	35	233	1.59(0.93, 2.70)	0.57(0.30, 1.10)
	24-59 months	22	239	1	1
Type of SAM	Marasmus	31	227	1.09(0.54, 1.9)	0.64(0.32, 1.31)
	Kwashiorkor	17	210	0.58(0.28, 1.17)	0.53(0.25, 1.13)
	Marasmus - Kwashiorkor	14	89	1	1
Place of residence	Urban	15	83	1.49(0.83, 2.67)	2.24(1.17, 4.30) *
	Rural	47	443	1	1
WFH %	< 70%	29	135	2.3(1.38, 3.75)	1.56(0.83, 2.92)
	≥70%	33	391	1	1
Presence of malaria	Yes	8	36	1.73(0.82, 3.63)	1.90(0.79, 4.87)
	No	54	490	1	1
Presence of dehydration	Yes	42	104	6.78(3.98, 11.56)	3.94(1.89, 8.22) **
	No	20	422	1	1
Presence of shock	Yes	20	19	8.89(5.21, 15.17)	4.15(2.01, 8.55) **
	No	42	507	1	1
Body temperature	Altered	19	33	5.14(2.99, 8.84)	2.02(1.01, 3.91) *
	Normal	43	493	1	1
F100 intake	Yes	27	425	1	1
	No	35	101	5.49(3.32, 9.09)	4.87(2.75, 8.63) **
Oral antibiotics Intake	Yes	14	291	1	1
	No	48	235	4.06(2.24, 7.37)	3.57(1.88, 6.77) **
Level of consciousness	Altered	25	23	10.68(6.39, 17.86)	1.97(0.99, 3.94)
	Normal	37	503	1	1
Presence of hypoglycemia	Yes	11	26	3.57(1.86, 6.86)	1.01(0.45, 2.29)
	No	51	500	1	1
Presence of diarrhea	Yes	43	228	2.90(1.69, 4.98)	1.69(0.90, 3.17)
	No	19	298	1	1
	No	19	298	1	1
NG tube feeding	Yes	35	141	3.0(1.85, 5.0)	1.10(0.59, 2.06)
	No	27	385	1	1
Blood transfusion	Yes	17	36	3.99(2.28, 6.99)	1.61(0.76, 3.41)
	No	45	490	1	1

*=P<0.05, **= P<0.001

Discussion

This study revealed that the survival time for SAM children was 38 days in the follow up of 7920 days of observation. It is lower than studies conducted in different parts of Ethiopia Tigray which reported, 41.93 days (Guesh G et al., 2018), in Gondar University hospital ,69 days (Wagnew F et al., 2018).However, it is higher than studies conducted in Lusaka, Zambia, 13 days(Munthali T et al., 2015), in Sekota, north Ethiopia, 10 days (Desta KS, 2015). This might be due to differences, in hospital facilities,skills of professionals, in adherence to management protocol, severity of cases and comorbidity attribute these variations.

In this study, 10.54% of children had died during follow up, of which 59.68% had died with in first week of admission. This is in line with some studies conducted in Ethiopia, Gondar, 12.5% (Wagnew F et al., 208) and Wolaita, (2.4% (Admasu A et al., 2017). But it is higher than other studies conducted in India, 3.5% (Bharath S et al., 2016), in Woldia (6%) (Chane T etal., 2014) And Gedeo Zone (9.3%) (Girum T et al., 2017). Moreover, this result is also higher than acceptable levels of international standards and national protocol set for management of SAM, which describes that it should be less than 10 % (FMOH, 2013; SPHERE, 2011). However, the result obtained in this study is lower than studies conducted in Zambia Lusaka 40% (MunthaliTet al., 2015) and in Sekota hospital (28.67 %), north Ethiopia (Desta KS, 2015). This variation might be attributed to difference in: delay case presentation of mothers /caregivers to treatment centers and patterns of high comorbidities, inadequately trained health staff, poor compliance with WHO treatment guidelines (Barungi NN et al., 2018)

The finding of this study revealed that children who were lived in urban area were 2.24 times more likely to die at any given time compared with rural; this is congruent with study done (Guesh G et al., 2018). However, this finding contradicts with finding from a previous study (Massa D et al., 2016). This might be due to disparity in soio-economic characteristics.

In this study, children who had shock were 4.15 times more likely to die at any given time than their counterparts. This finding was comparable with previousconducted studies (Wagnew F et al., 2018; Girum T et al., 20117; AdmasuAet al., 2017).This might be due to hypovolemic shock designates the presence of severe dehydration, fluid and electrolyte imbalance, and low blood circulation in the body contributes to death (FMOH, 2013).

It was also observed that dehydrated children were found to be 4 times more likely to die earlier than those children who were not dehydrated. This result is consistent with other studies (ChiabiAet al., 2017; (Jarso H et al., 2015). were repored. However, it contradicts with other studies, (Wagnew F et al., 2018; Barungi NN et al., 2018). This might be due to depleted circulation and electrolyte imbalance with fluid overload, which may be attributed to secondary complication, infection and cardiac failure (FMOH, 2013).

The hazards of death were 2 times higher among children with altered body temperature (hypothermia or hyperthermia) when compared with their counterparts. This is supported by studies done in different parts of Ethiopia where the hazards of death due to altered body temperature were higher among children with altered body temperature (Kabeta A and Bekele G, 2017; Jarso H et al 2015; Adal TG, 2016; Girum T et al., 20117; AdmasuAet al., 2017). This might be attributed to the effects of hypothermia and hyperthermia, which may affect the biochemical reactions of the body and indicators of altered metabolism suggesting the presence of sepsis and serious infections. (FMOH, 2013).

In this study, children who failed to take F100 formula milk according to SAM treatment protocol had nearly 5 times hazards of death than their counterparts. This finding was in agreement with results of other studies (Wagnew F et al 218; Oumer A et al., 2016). However, it contradicts with other studies in Ethiopia (Admasu A et al., 2017) and Uganda (Barungi NN et al., 2018), which reported had no an association. This might be attributed to appropriate use the formula as it contains high calories and protein that hasten recovery, rapid weight gain and growth by rebuilding wasted tissues of the severely malnourished children (WHO, 2013; FMOH, 2013).

Moreover, the hazards of death were nearly 4 times higher among children who did not take oral antibiotics compared with their counterparts. This finding was consistent with studies conducted among admitted children (Ahmed AU et al., 2013; Wagnew F et al 218; Desta KS, 2015). This might be explained by the rationale behind antibiotic treatment for children with SAM lies in observation that malnourished children may not show sign of clinical infection. Therefore, treatment of infection and small intestine bacterial over growth, prevention of colonizing pathogens, and minimization of nutrient diversion are of paramount importance in increasing recovery rate (Barungi NN et al., 2018).

This study could have the following limitations: Firstly, as it was based on record reviews, the chance of capturing all-important risk factors of mortality could be low unlike prospectively capturing the data. Secondly, difference in health professionals' skill in the management of SAM could have influenced appropriate treatment of cases and record keeping.

Conclusion

The overall survival time for severely malnourished children aged 0-59 months was 38 days in the follow up of 7920 days observation. The mortality rate for severely malnourished children was higher than acceptable levels for global SPHERE standard and national protocol. Being urban residence, having shock, presence of dehydration, altered body temperature; failure to take F100 formula milk and failure to take oral antibiotics were independent determinant of mortality for sever acute malnutrition.

Therefore, further interventions to reduce deaths among the eligible should focus on altered clinical conditions and comorbidities/infections.

The implication of the study

This study was retrospective hospital-based and cannot be generalized to the community. Moreover, it may not influence national-level policy meanwhile; it was a small scale study. Though, it can be exploited as an input, with other similar studies, to produce pooled national or international estimates for policy decision-making. Besides, it can be useful as baseline information for further epidemiological and nutritional studies in similar settings. Furthermore, the results of this study can help clinicians' and health workers in decision making regarding sever acute malnutrition treatment management in stabilization centers (SC).

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Conflict of interest

The authors declare that there is no conflict of interest.

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