

Relapsing Time to Severe Acute Malnutrition and Hazards Among Children Treated in the Health Posts.

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Research

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Abstract

Background: Malnutrition has many unpleasant results on child health during illness and after discharge. However, in Ethiopia there is lack of study that address either time to relapse or post discharge status

Objective: To identify time of relapse and associated factors among children discharged after undergoing treatment for SAM in South, Ethiopia

Methods: An institution Retrospective cohort study was done among children admitted to health posts for treatment of SAM from 2014/2015-2019/2020 under-five children after discharge. After checking all the assumptions finally multivariable Cox regression has been used. All tests were two sided and P values <0.05 were used to declare statistical significance.

Results: The mean time for relapse of severe acute malnutrition among under five children was determined as 22 at 95% CI, (20.69-24.82) week from discharge to relapse time.

On multivariable negative binomial regression model, after adjusting for background variables time for relapse of severe acute undernutrition was significantly associated with edema during admission (AHR, 2.02, 95% CI: 1.17-3.50), age group of 6-11 months (AHR 5.2, 95% CI: 1.95-13.87), less discharge MUAC for first admission increase hazard of relapse (AHR 12, 95% CI: 7.90-19.52).

Conclusion: The mean time was 22 week and edema, Age and MUAC was associated time to relapse.

Introduction

Malnutrition is a significant global public health burden with greater concern among children under five years in Sub-Saharan Africa (1).

In Ethiopia every month over 25,000 children with severe acute malnutrition are admitted to hospitals across Ethiopia and the survivors are more likely to perform poorly in school and, once grown up, girls are more likely to suffer from complications during childbirth(2). Severe acute malnutrition (SAM) is a life-threatening condition among the children with SAM and children with SAM were 11 times more likely to die than a non-malnourished child(3).

Malnutrition has many unpleasant results on child health during illness and after discharge. Many children younger than 5 years in developing countries are exposed to multiple risks, including poverty, malnutrition, poor health, and unstimulating home environments, which detrimentally affect their cognitive, motor, and social emotional development(4). Nearly half of all deaths in children under 5 are attributable to undernutrition; undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and delays recovery(5).

On another hand relapse after treatment is another challenge for SAM cases in some study suggests that after cure relapse rates at 4 months or 16 weeks post-discharge(6,7). And close follow-up of SAM

following discharge is crucial for successful management, since complications, i.e., relapse, development of complications and mortalities, can happen during this period. Weekly follow-up for at least two months is recommended, as these patients have a tendency to relapse. A quarter of these children fail to follow up in six months due to migration, social, political and logistic reasons(8).

However, in Ethiopia there is lack of study that address either time to relapse or post discharge status. As we have seen above after treatment of SAM and discharge under five children may face multiple health challenge so, this study is paramount important for government focus on post discharge status of SAM children.

Methods

Study area and design

An institution retrospective cohort study was conducted among the cohort of 2014/2015-August 30/2020 under-five children's who are admitted and discharged for SAM case in 20 selected health posts in Hadiya zone, SNNPR, Ethiopia from August 1 – 30 /2020.

Population

All records of under-five children who were admitted to the health posts of Southern people, Hadiya Zone among three weredas from November, 2014/2015-August 30/2020 were the source population of this study

Sample size determination and sampling procedure

Sample size is determined from the study conducted in North Gondar zone, Northwest Ethiopia (9). Then it is calculated by medcalc@version 119.1.1.3 survival analysis (logranktest) at <http://www.medcal.org> (18). And diarrhea on admission as the main exposure cured=51, censored=17, outcome 75%, AHR=0.81 and Log rank=19 total event needed 484 as we have moving from zones to weredas and from wereda to Kebeles multiplying factor for design effect is considered as 1.5. and final sample size is $484 \times 1.5 = 726$ were chosen,

Data collection procedure

A data extraction tool was prepared from the national treatment protocol for the management of SAM (5). SAM registration booklet, health management information system (HMIS) register. The data extraction format used consisted of socio-demographic data (age, sex), anthropometric measurements (height, weight, MUAC, edema), four data collectors (MPH) and one supervisor were recruited based on their experience in data collection. Data collectors received one day training on the collection tool and were deployed to collect data once the principal investigator was convinced of their competency.

Operational definition

Relapse rate/repeated relapse episodes; The proportion of children who re-enrolled after they recovery and discharged(10).

Wasting is defined; as low weight-for-height. It often indicates recent and severe weight loss, although it can also persist for a long time(11).

Severe acute malnutrition; It is diagnosed by weight for- height below -3 SD of the WHO standards, by a MUAC 11.5 cm and by Clinical sign like bilateral edema (21-23).

Criteria for discharging children from treatment; weight-for-height/length is ≥ -2 Z-scores 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(12).

Data processing and analysis

Data was coded, entered, Ep-data software version 4.2 and exported to SPSS version 25 software for analysis. The presence of missing values, possible outliers, and multicollinearity were checked through exploratory analysis.

Both bi-variable and multivariable Cox regression analyses were performed. Kaplan Meier survival curve with the log-rank test was fitted to identify the presence of a difference in recovery rate among the categorical variables. And Mantel-Cox and Generalized Wilcoxon test of equality of survival distributions is significant and one minus survival function line is also parallel for those candidate variables of multivariable Cox regression. Fig1

In this study, person-time was reported in child-week. Child-week are total follow up times of each child from admission to the occurrence of the events (relapse or censored)

Those variables with $p \leq 0.25$ in the bi-variable with parallel line in Kaplan Meier survival curve analysis were selected to Cox-regression were selected for the multivariable Cox-regression analysis. All statistical tests were considered significant at 95% confidence interval the final significant value is determined at p-values of 0.05.

Ethical Considerations: Before starting the data collection process, ethical clearance was be secured by Jimma University Health Research Ethics Review Committee (IHRERC). An official letter was written from Jimma University to the Hadiya Zone health office.

Informed written consent was obtained from all health extension workers of selected health posts and woreda health office, confidentiality of the study documents was' information was also ensured according to the Helsinki declaration of ethical code for human subjects.

Results

Sociodemographic Characteristics and Anthropometric

In this study 726 SAM cases seen from registration book for Severe acute malnutrition among 20 health posts. From the total admission 640(88.2%) were new admission and 86(11.8%) were relapsed or readmitted with severe acute malnutrition in the last five years and of the total 374(51. were female and 352 (48.5%) were male children, when we see age distribution 176(24.2%) of SAM cases were at the age of 6-11 months,147(20.2%) age of 12-23 months,136(18.7%),24-35 months,172(23.7%)36-47 months and 95(13.1%) 48-60 months.

When we see admission condition of the under five children for the first admission of SAM 242(33.3%) of children has edema during first admission and the rest 484(66.7%) has no edema and the mean weight of children during admission is determined as 7.94 at (95%, CI: 7.769-8.11) in similar way the mean MUAC of children during admission was 10.60 at (95%, CI: 10.50-10.60)

Treatment outcomes

The outcome of SAM treatment for the first admission was a majority of children cured for SAM during first admission or 667(91.9%) cured and the rest 6(0.8%) died, 20(2.8%),11(1.5%),6(0.8%) and 16(2.2%) defaulter, unknown status or not recorded, non-response during treatment and transfer out from the program and mean time for recovery from severe acute malnutrition is 10 weeks with 95%, CI (10.4-10.9) week for the first admission. The mean discharge weight was 11.13 Kg at 95%, CI:(10.98-11.29) and mean discharge MUAC was 11.57 cm at 95%, CI (11.51-11.64), when we see the admission condition there were 640(88.2%) at (95%, CI: 85.8-90.2) new admission and 86(11.8%) at (95%,CI:9.8-14.2) relapsed cases for severe acute malnutrition.

Time to relapse of children with SAM

From the total cases seen 86(11.8%) were relapsed or readmitted with severe acute malnutrition in last five years. The mean time for relapse of severe acute malnutrition among under five children was determined as 22 at 95% CI, (20.69-24.82) week from discharge and minimum relapse time was determined as 9 weeks after treatment and maximum time of relapse was 67 weeks after discharge.

The mean time of relapse with different variables when we see sex of children and relapse time among male children 21 (95%, CI: 19.02-23.94) week and 23 (95%, CI: 21.04-27.40) week among female children. And among edematous children the mean relapse time was 22 (95%, CI:18.79-26.29) week, the mean time of relapse among different age, at the age of 6-11 months 21 (95%, CI: 18.71-24.47) weeks, age 12-23 months 25 (95%, CI: 20.27-30.10) week, age 24-35 months 26 (95%, CI: 19.84-35.29) week, age 36-47 months 21 (95%, CI:18.47-25.32) week and age 48-60 months 15 (95%, CI: 12.61-17.76) week and the mean time of relapse after cure was 23(95%, CI:20.26-26.81) and 21(95%, CI:19.75-23.93). Tabel;1

Factors affecting time to relapse

In Cox Regression the following variables were associated with hazard to time to event. In this study early age of 6-11 months increase the hazard of relapse to time by 5.2 with (95%, CI:1.95-13.87) higher than that age of 48–60-month, edema for the first admission increase the risk of hazard to time relapse by

2.02 with (95%, CI: 1.17-3.50) compared to non-edematous children and outcome for the first treatment or not cured for first admission increase hazard of relapse to time by 12 with (95%, CI: 7.90-19.52) compared to cured one. Tabel;2

Discussion

In this study mean time for relapse of severe acute malnutrition among under five children was determined us 22 week and there is sex difference in time of relapse among male relapse will occur earlier than female 21 week for male and 23 weeks for female and when we see type of admission condition there were 640(88.2%) new admission and 86(11.8%) at relapsed cases for severe acute malnutrition.

And when we come to the variables that were linked with hazard of relapse among severe acute malnourished children. Age of 6-11 months increase the hazard of relapse to time by 5.2 with compered with the age of 48–60-month, edema for the first admission increase the risk of hazard to time relapse by 2.02 to the non-edematous children and children who were not cured for first admission has hazard of relapse was 12 compared to cured one.

In this study frequency of relapse is 86(11.8%) for severe acute malnutrition when we compare with other international studies. Finding from this study is similar with study conducted in Burkina Faso (13). This may show that the communalities of the problem and lack of other similar studies for comparison also indicates that the post discharge status of severe acute malnutrition especially relapse lacks both governmental and researchers' attentions.

The mean time of relapse in this study was 22 weeks when we compare with other studies this study has long relapse time compared to that conducted in Nigeria (14). This may be because of study design difference as study conducted in Nigeria is prospective cohort studies for only six months, however this study is for five years and retrospective cohort and sample size by itself may result in different result.

This study identified that age of the child increases the hazard of time relapse higher among the age of 6-24 month and finding from this study in line with other cross-sectional study conducted in Ethiopia Afar region(15).This may be at this age children were mostly dependent on maternal source of energy and physiological it includes the age highest demand in energy kg/day and it also may be the chance of readmission for SAM at this age is high because as we know that screening and admission .

As nutritional oedema resulted with endothelial glycocalyx that is key to control of fluid movement from and into the capillaries calls for complete revision, the factors so far known to affect the function of the glycocalyx are depend upon sulphated proteoglycans and other glycosaminoglycans and fundamentally related to a defect in Sulphur metabolism which can explain all the clinical features of the condition, including the formation of oedema (16).

Practical implication; In this study as we have seen that severe acute malnourished children who have edema and age younger and fail to cure for first admission were associated with the hazard of time for relapse.

Conclusion

The finding showed that children discharged from severe acute malnutrition are likely to have relapse in three weeks' time given the prevailing situation of the home environment.

Limitation; As this study is retrospective cohort and study design itself and it is better to support this study with prospective cohort to know time interval.

Declarations

Ethical approval; ethical letter from Jimma university received and given to respective body

Consent for publication; All authors in this work agreed to publish on this journal.

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Authors' contributions;

AL; Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Visualization, Writing and original draft.

DT; Conceptualization, Data curation, Formal analysis, Writing and review & editing.

TB; Conceptualization, Data curation, Formal analysis, Methodology, Resources, Software, Software, Supervision, review & editing.

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Tables

Table;1 Mean time of relapse among children with severe acute malnutrition (SAM) in Sothern Region Hadiya zone Ethiopia.

Variable	Mean time of relapse in week	95%, CI
Sex		
Male	21	19.02-23.94
Female	23	21.04-27.40
Age in months		
6-11	21	18.71-24.47
12-23	25	20.27-30.10
24-35	26	19.84-35.29
36-47	21	18.47-25.32
48-60	15	12.61-17.76
Edema during first admission		
Yes	22	18.79-26.29
No	22	20.55-25.19
Outcome of treatment		
Cured	23	20.26-26.81
Not cured	21	19.75-23.93

Table;2 Predictors of time to relapse among children with severe acute malnutrition (SAM) in Sothern Region Hadiya zone Ethiopia.

	B	p-value	AHR	95.0% CI for AHR
Sex				
Male	-	-	-	-
Female	-0.32	0.16	0.72	0.46-1.14
Admission edema				
Yes	0.70	0.01	2.02	1.17-3.50
No	-	-	-	-
Admission MAC	-0.10	0.53	0.90	0.65-1.25
Age of the child in month				
6-11	1.65	0.001	5.200	1.95-13.87
12-23	0.79	0.151	2.194	0.75-6.41
24-35	0.80	0.131	2.230	0.79-6.31
36-47	0.86	0.090	2.369	0.87-6.42
48-60	-	-	-	-
Outcome during discharge				
Cured	-	-	-	-
Not cured	2.519	0.001	12.42	7.90-19.52

Figures

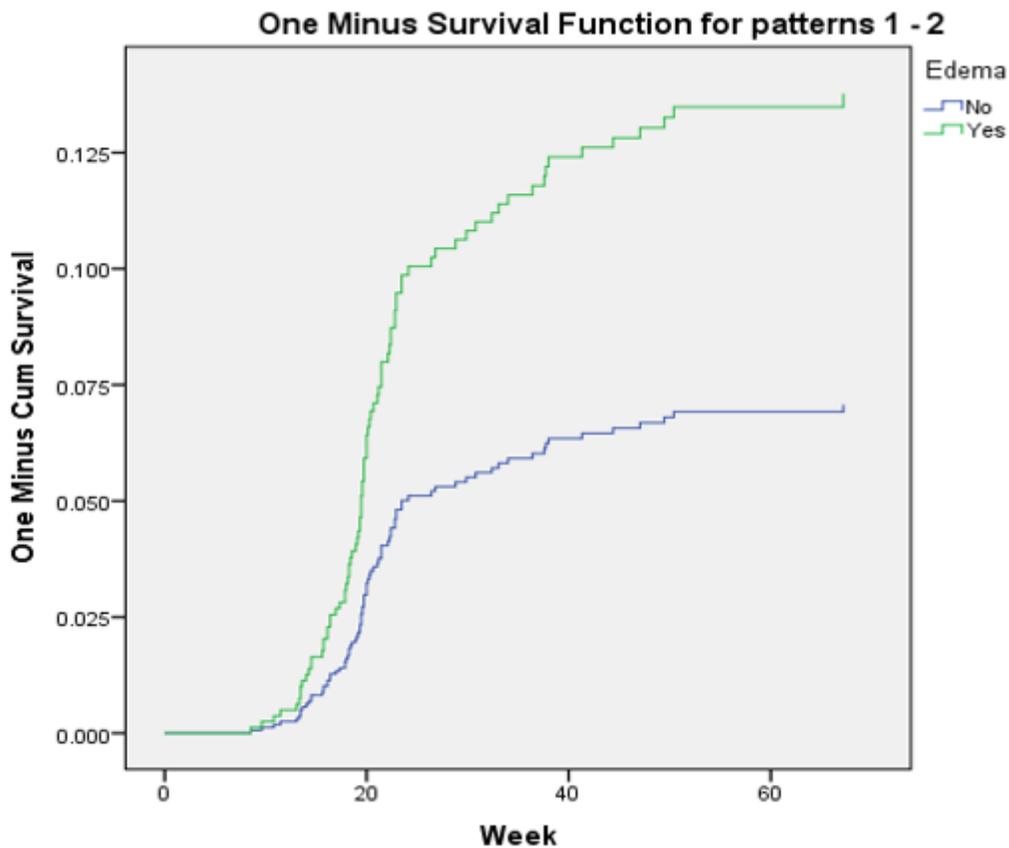


Figure 1

one minus survival function test for edematous children.

Supplementary Files

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- [SurvivalandRelpse19.sav](#)