East African Journal of Health and Science, Volume 9, Issue 1, 2026
Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

East African Journal of Health and Science
eajhs.eanso.org
Volume 9 Issue 1, 2026
Print ISSN: 2707-3912 | Online ISSN: 2707-3920
Title DOI: https://doi.org/10.37284/2707-3920

EANSO
EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design

Mustafe Abdi Ali[1], Najmo Abdirizak Jama[1], Shamso Abdirahman Ahmed[2], Mohyadin Abdullahi Ahmed[1] & Asia Mohamed Ahmed[1]*

[1] East Africa University, Gardo, Somalia.
[2] Gardo General Hospital, Gardo, Somalia.
*Author for Correspondence ORCID ID; https://orcid.org/0009-0001-5626-4211; Email: mu.awaare@gmail.com

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

Date Published:
13 February 2026

Keywords:
Severe acute malnutrition, Time to recovery, Children aged 6-59 months, Somalia.

ABSTRACT

Background: Severe Acute Malnutrition (SAM), characterised by an extremely low weight-for-height or length, represents a significant health challenge in Somalia, where complex crises contribute to elevated mortality rates among children under five years of age. **Objective:** To estimate the median recovery time and assess treatment outcomes for children aged 6-59 months with SAM admitted to Gardo General Hospital in Gardo, Puntland, Somalia. **Methods:** An institutional-based retrospective cohort study was conducted from July 2023 to July 2025. The study employed data collected from the children's inquiry data form of a systematically random selected sample of 250 children. Data entry was performed using the KOBO Toolbox and subsequently exported to R Programming version 4.4.0 for analysis. Descriptive statistics were utilised to examine demographic and care-related characteristics, anthropometric and complication-related characteristics. Survival curves, such as Kaplan-Meier curves, were generated to estimate the median recovery time from Severe Acute Malnutrition (SAM). **Results:** The findings of this study indicated that 239(95.6%) children achieved successful treatment outcomes, 4(1.6%) children were transferred out, 4(1.6%) defaulted on their treatment, and 2 children (0.8%) remained in the program during the study period. Unfortunately, there was one recorded fatality, accounting for 1(0.4%) of the cases. **Conclusion:** This study found a median recovery time of 9 days and a 95.6% recovery rate for children aged 6 to 59 months with Severe Acute Malnutrition (SAM) at Gardo General Hospital.

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

APA CITATION

Ali, M. A., Jama, N. A., Ahmed, S. A., Ahmed, M. A. & Ahmed, A. S. (2026). Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design. *East African Journal of Health and Science*, *9*(1), 286-298. https://doi.org/10.37284/eajhs.9.1.4505

CHICAGO CITATION

Ali, Mustafe Abdi, Najmo Abdirizak Jama, Shamso Abdirahman Ahmed, Mohyadin Abdullahi Ahmed and Asia Mohamed Ahmed. 2026. "Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design". *East African Journal of Health and Science* 9 (1), 286-298. https://doi.org/10.37284/eajhs.9.1.4505

HARVARD CITATION

Ali, M. A., Jama, N. A., Ahmed, S. A., Ahmed, M. A. & Ahmed, A. S. (2026). "Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design", *East African Journal of Health and Science*, 9(1), pp. 286-298. doi: 10.37284/eajhs.9.1.4505

IEEE CITATION

M. A., Ali, N. A., Jama, S. A., Ahmed, M. A., Ahmed & A. S., Ahmed "Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design", *EAJHS*, vol. 9, no. 1, pp. 286-298, Feb. 2026.

MLA CITATION

Ali, Mustafe Abdi, Najmo Abdirizak Jama, Shamso Abdirahman Ahmed, Mohyadin Abdullahi Ahmed & Asia Mohamed Ahmed. "Recovery Time and Treatment Outcomes Among Children Aged 6-59 Months with Severe Acute Malnutrition Admitted to Gardo General Hospital, Puntland, Somalia: A Retrospective Cohort Study Design". *East African Journal of Health and Science*, Vol. 9, no. 1, Feb. 2025, pp. 286-298, doi:10.37284/eajhs.9.1.4505.

INTRODUCTION

Severe Acute Malnutrition (SAM) is defined as an extremely low weight-for-height or length, specifically falling below −3 z-scores of the median as per the World Health Organization (WHO) growth standards, or less than 70% of the median according to the National Centre for Health Statistics reference, in conjunction with the presence of nutritional oedema [1, 2]. In children between the ages of 6 and 59 months, a middle-upper arm circumference (MUAC) measuring less than 11.5 cm signifies severe acute malnutrition (SAM) [3]. Malnutrition can be either acute or chronic, with acute malnutrition further divided into severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) [4].

SAM is the most prominent form of malnutrition. Children with SAM exhibit extreme wasting and weight-for-height z-scores of less than 110 mm and may also show signs of nutritional oedema, which is identified by swelling in the face, feet, and limbs. Oedema is a critical condition that demands immediate medical attention [1]. Children afflicted with severe acute malnutrition (SAM) exhibit compromised immune systems, rendering them susceptible to infections [2]. These infections contribute to diminished appetite and impede the body's capacity to effectively absorb nutrients, thereby exacerbating malnutrition and further impairing growth [3]. This condition also increases the risk of mortality, particularly in cases of severe wasting. The mortality risk of children with SAM is nine times higher than that of their healthy counterparts. Most fatalities among children with acute malnutrition are associated with infections such as malaria, diarrhoea, pneumonia, tuberculosis (TB), and HIV/AIDS [5].

Severe Acute Malnutrition (SAM) accounts for 21% of disability-adjusted life-years (DALYs) in children under the age of five [6]. Beyond its immediate nutritional impact, SAM leads to long-term consequences, such as reduced intelligence quotient (IQ) and impaired growth [7]. Malnutrition significantly weakens the immune system, making children more susceptible to various illnesses. Malnourished children face a heightened risk of

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

mortality when afflicted with conditions such as diarrhoea, pneumonia, measles, and malaria [6].

While Severe Acute Malnutrition (SAM) typically affects all parts of a population, infants and young children are particularly at risk because of their increased nutritional needs for growth and development [8]. It is among the top causes of illness and death in infants and young children worldwide, with a higher prevalence in sub-Saharan Africa and South Asia [9]. The most common age for SAM is between 6 and 18 months, a period characterised by rapid growth and brain development. However, it is becoming more common for SAM to occur in infants younger than six months, especially in deprived communities, as they begin introducing semi-solid and solid foods to children as early as two months old [10].

Annually, over ten million children globally succumb to severe acute malnutrition (SAM) before the age of five. A substantial proportion of severely malnourished children die at home without receiving hospital care, and even when medical attention is provided, the mortality rates remain alarmingly high [11]. In developing countries, children under five years of age who are severely malnourished and hospitalised experience an unacceptably high case fatality rate of 30–50% [12]. Furthermore, of the estimated 555 million children worldwide under the age of five, approximately 19 million suffer from severe wasting. Over 90% of these children reside in developing nations, particularly in sub-Saharan Africa and Southeast Asia [6].

In developing countries, severe acute malnutrition (SAM) is the primary cause of pediatric hospital admission and is associated with elevated morbidity and mortality rates. It accounts for over half of the ten to 11 million annual deaths of children under five years of preventable causes [13, 14]. In Africa, for example, 14.1 million children under the age of five are affected by wasting, with 4.3 million experiencing severe wasting. Sub-Saharan Africa (SSA) accounts for 13.2 million children suffering from acute malnutrition, ranking second only to South Asia, with a population of 27.8 million [15]. Within sub-Saharan Africa itself, there are 137 million children under five, and 12.3 million of them waste [16]. Despite its global significance, child recovery initiatives have not sufficiently prioritised facility-based management of SAM [13].

In Somalia, the post-Deyr 2016 seasonal assessment by the Food Security and Nutrition Analysis Unit (FSNAU) identified 944,000 cases of acute malnutrition among children under five years of age, with 185,000 classified as severe [17]. Internally displaced persons (IDPs) are among the most severely affected groups facing a critical situation nationwide [17, 18]. Although the data show that boys have higher malnutrition rates than girls, the reasons for this disparity remain unclear [17]. The incidence of severe acute malnutrition (SAM) is worsened by a compromised social and health environment, further aggravated by underlying issues such as poverty, natural and human-made disasters such as famine or war, insufficient food quantity and quality, and outbreaks of infection and disease [19]. Over the years, the country has faced infectious disease outbreaks, high food insecurity, and a continuous cycle of complex crises, stemming from intricate social and political dynamics [20]. Consequently, malnutrition accounts for approximately 45% of mortality among children under five in Somalia, with manifestations varying across different regions. In Puntland, a region within Somalia, 11% of children under five suffer from wasting, a condition marked by low weight relative to height, which is indicative of acute malnutrition [21].

Although numerous studies have examined the prevalence and determinants of severe acute malnutrition in Somalia [22-25], there is a significant lack of research on the recovery time and treatment outcomes for children aged 6-59 months with this condition. This gap underscores the need for targeted studies to enhance our understanding of recovery dynamics. Therefore, this study aimed to

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

estimate the median recovery time and examine treatment outcomes among children aged 6-59 months with severe acute malnutrition admitted to the Gardo General Hospital in Puntland, Somalia. By identifying treatment outcomes and estimating recovery durations, stakeholders can develop more effective treatment protocols and allocate resources more efficiently to support malnourished children in the region.

MATERIALS AND METHODS

Study Area

This study was conducted at Gardo General Hospital in Gardo, Puntland, Somalia, a vital healthcare facility that addresses the diverse medical needs of the community. The hospital offers a comprehensive range of services, including emergency care, inpatient and outpatient services, maternal and child health care, nutritional support, immunisation, laboratory diagnostics, and pharmacy services. It plays a critical role in the management of severe acute malnutrition, admitting approximately 300–400 children annually for treatment. The facility serves an estimated 2000–2500 patients per month.

Study Period

Data were collected from July 8, 2025, to July 18, 2025, at Gardo General Hospital.

Study Design

An institution-based retrospective cohort study was conducted.

Source Population

All children aged 6–59 months with severe acute malnutrition who were admitted to Gardo General Hospital from July 8, 2023, to July 8, 2025. This cohort is of considerable significance due to their need for adequate nutrition to support both physical and cognitive development. Severe acute malnutrition (SAM) can result in long-lasting effects on their health and future opportunities. By focusing on this specific group admitted to Gardo General Hospital during the designated period, the researchers aim to assess treatment outcomes and recovery times in a context where malnutrition is prevalent.

Study Population

All selected children with severe acute malnutrition who were admitted to Gardo General Hospital from July 8, 2023, to July 8, 2025.

Inclusion and Exclusion Criteria

The study included children between the ages of 6 and 59 months who were diagnosed with severe acute malnutrition and admitted to Gardo General Hospital from July 8, 2023, to July 8, 2025, with complete medical records. Children who fell outside this age range, were not admitted during the specified timeframe, or had incomplete data were excluded.

Sample Size Determination

In this study, the sample size was calculated using a single population proportion formula. This calculation was based on an estimated recovery of p = 0.796, as indicated by previous findings [26], with a 95% confidence level and a 5% margin of error. The calculation resulted in a total sample size of approximately 250 participants.

$$n = \frac{z^2 p(1-p)}{e^2} \Rightarrow n = 250$$

Sampling Technique

A systematic random sampling technique was employed to select participants from a total population of N=429. A systematic random sample is defined by the selection of every kth item, where k is determined by dividing the total number of items in the sampling frame by the desired sample size. The procedure commences with the random selection of an initial starting point, followed by the selection of every k^{th} item on the list. This sampling method presents several advantages, including moderate usage and cost, as well as high internal and external validity. Furthermore, it is

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

straightforward to implement and easy to verify. However, a significant limitation is that only the selection of the first subject is genuinely probabilistic, as subsequent selections result in certain subjects having no chance of being chosen [27]. With a required sample size of n=250, the sampling interval was calculated by dividing the total population by the desired sample size (N/n), resulting in an interval of approximately 2. Consequently, every second individual was included in the sample.

Data Collection Methods

All data were extracted from the children's inquiry data form using standardised tools. The checklist was adapted and modified based on various related studies and then organised to align with the study's objectives. Two data collectors from East Africa University, specifically from the Clinical Officer and Nursing departments, were recruited. A supervisor was assigned to oversee the data collection process.

Data Quality Control and Management

To ensure data quality, suitable data abstraction tools were developed. A pre-test was conducted on 5% of the sample size to facilitate necessary modifications. Data collectors received two days of training on the data abstraction checklist. During the data collection phase, rigorous supervision and monitoring were implemented daily. Ultimately, the completeness and consistency of all collected data were verified during the data cleaning process.

Data Processing and Analysis

The completeness of the data was rigorously verified and coded appropriately. Any errors identified were promptly corrected following a review of the original data. Data were collected using the KOBO Toolbox and subsequently exported to R Programming version 4.4.0 for analysis. The analysis began with descriptive statistics, examining demographic and care-related characteristics, anthropometric and complication-related characteristics, and comparing complications at admission with treatment outcomes for children. Survival curves, such as Kaplan-Meier curves, were generated to estimate the median recovery time from Severe Acute Malnutrition (SAM).

Ethical Considerations

In this research, secondary data obtained from Gardo General Hospital was utilised. To protect the confidentiality of participants, all data were anonymised, ensuring that no identifiable information could be linked to individual cases. The study was carried out with a strong adherence to ethical standards, and the researchers involved reported no conflicts of interest. This approach protected the rights and well-being of children suffering from Severe Acute Malnutrition (SAM), thereby fostering trust among participants and stakeholders.

RESULTS AND DISCUSSION

Socio-Demographic and Care-Related Characteristics

Table 1 demonstrates the socio-demographic and care-related characteristics of children diagnosed with Severe Acute Malnutrition (SAM). The data indicate a slight male predominance, with 130 (52.0%) males compared to 120 (48.0%) females. Notably, recovery rates are high for both sexes, with males exhibiting a recovery rate of 94.6% and females at 96.7%. The age distribution reveals that the majority of children are between 6-12 months old, accounting for 118 (47.2%), followed by those aged 13-24 months at 99 (39.6%), while older age groups (25-36 months and ≥37 months) constitute a smaller proportion. Recovery rates are commendable across all age groups, with the highest recovery rate of 100% in the ≥37 months group, suggesting that older children may experience better outcomes. Seasonal admission patterns demonstrate that the highest number of admissions occurred in summer, with 82 (32.8%),

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

followed by winter at 61 (24.4%), spring at 55 (22.0%), and autumn at 52 (20.8%).

Most admissions were new cases, totalling 242 (96.8%), with a minor fraction being readmissions at 2 (0.8%) or returns after defaulting at 6 (2.4%). In terms of residence, urban children accounted for 155 (62.0%) of the admissions, internally displaced persons (IDPs) comprised 84 (33.6%), and only 11 (4.4%) were from rural areas. Recovery rates were highest among rural children at 100%, suggesting better outcomes for those from rural backgrounds. Regarding vaccination status, a significant proportion of children were not vaccinated, totalling 142 (56.8%), with 62 (24.8%) partially vaccinated and only 14 (5.6%) fully vaccinated. However, recovery rates remained high across all vaccination statuses, with fully vaccinated children showing a recovery rate of 92.9%. Finally, breastfeeding practices were nearly evenly divided, with 120 (48.0%) children reported as breastfed and 130 (52.0%) children not breastfed; interestingly, both groups exhibited high recovery rates.

Table 1: Socio-Demographic and Care-Related Characteristics of Children with SAM Admitted to Gardo General Hospital, Somalia, 2025.

			Status of children	
Variable	**Labels**	**Total**	**Recovered**	**Censored**
Sex	Male	130(52.0)	123(94.6)	7(5.4)
	Female	120(48.0)	116(96.7)	4(3.3)
Age in months	6-12	118 (47.2)	113(95.8)	5(4.2)
	13-24	99(39.6)	94(94.9)	5(5.1)
	25-36	22(8.8)	21(95.5)	1(4.5)
	≥37	11(4.4)	11(100.0)	0(0.0)
Season at admission	Autumn	52(20.8)	51(98.1)	1(1.9)
	Spring	55(22.0)	52(94.5)	3(5.5)
	Summer	82(32.8)	79(96.3)	3(3.7)
	Winter	61(24.4)	57(93.4)	4(6.6)
Admission status	New	242 (96.8)	231(95.5)	11(4.5)
	Re-admission	2(0.8)	2(100.0)	0(0.0)
	Return after default	6(2.4)	6(100.0)	0(0.0)
Residence	Urban	155(62.0)	146(94.2)	9(5.8)
	Rural	11(4.4)	11(100.0)	0(0.0)
	IDP	84(33.6)	82(97.6)	2(2.4)
Vaccination status	Fully vaccinated	14(5.6)	13(92.9)	1(7.1)
	Partially vaccinated	62(24.8)	60(96.8)	2(3.2)
	Not vaccinated			
	Not documented	142(56.8)	134(94.4)	8(5.6)
		32(12.8)	32(100.0)	0(0.0)
Breast feeding	Yes	120(48.0)	114(95.0)	6(5.0)
	No	130(52.0)	125(96.2)	5(3.8)

Anthropometric and Complication-Related Characteristics

Table 2 presents the anthropometric and complication-related characteristics of children diagnosed with Severe Acute Malnutrition (SAM) admitted to Gardo General Hospital. The data reveal that a substantial proportion, 199 (79.6%), of the children had a Mid-Upper Arm Circumference (MUAC) below 11.5 cm, indicative of severe malnutrition, while 51 (20.4%) met the required threshold. Among those with a MUAC below 11.5 cm, the recovery rate was notably high at 96.0%,

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

whereas those with a MUAC equal to or above 11.5 cm exhibited a recovery rate of 94.1%. Nutritional status, assessed using Z-scores, indicates that 125 (50.0%) children scored below -3. Recovery rates were 100% for those scoring below -2, 96.8% for those below -3, and 93.3% for those below -4. Regarding oedema, 241 (96.4%) children exhibited a grade of 0, indicating no visible swelling, with a recovery rate of 95.4%. Children exhibiting grades 1 to 3 demonstrated a 100% recovery rate for each grade. Complication rates are concerning, with 166 (66.4%) children experiencing diarrhoea and a high recovery rate of 98.2%. Among those with a high fever, 51 (20.4%) showed a recovery rate of 94.1%. Vomiting was reported in 148 cases, with a recovery rate of 94.6%, while 155 (62.0%) children experienced a cough, demonstrating a recovery rate of 96.8%. Lastly, 79 (31.6%) children faced other complications, with a recovery rate of 94.9%.

Table 2: Anthropometric and Complication-Related Characteristics of Children Admitted to Gardo General Hospital, Somalia, 2025.

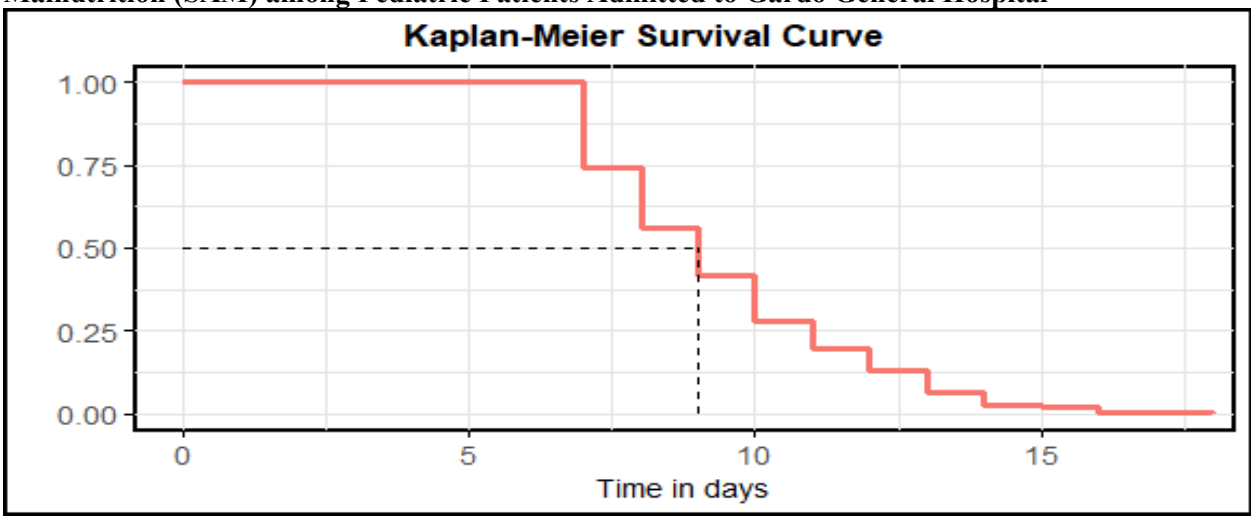
		Status of children		
Variable	**Labels**	**Total**	**Recovered**	**Censored**
MUAC	Equal to 11.5 cm	51(20.4)	48(94.1)	3(5.9)
	Less than 11.5 cm	199(79.6)	191(96.0)	8(4.0)
Z score	< -2	20(8.0)	20(100)	0(0.0)
	< -3	125(50.0)	121(96.8)	4(3.2)
	< -4	105(42.0)	98(93.3)	7(6.7)
Oedema grade	0	241(96.4)	230(95.4)	11(4.6)
	1	1(0.4)	1(100.0)	0(0.0)
	2	5(2.0)	5(100.0)	0(0.0)
	3	3(1.2)	3(100.0)	0(0.0)
Diarrhea	Yes	166(66.4)	163(98.2)	3(1.8)
	No	84(33.6)	76(90.5)	8(9.5)
High fever	Yes	51(20.4)	48(94.1)	3(5.9)
	No	199(79.6)	191(96.0)	8(4.0)
Vomiting	Yes	148(59.2)	140(94.6)	8(5.4)
	No	102(40.8)	99(97.1)	3(2.9)
Cough	Yes	155(62.0)	150(96.8)	5(3.2)
	No	95(38.0)	89(93.7)	6(6.3)
Other complications	Yes	79(31.6)	75(94.9)	4(5.1)
	No	171(68.4)	164(95.9)	7(4.1)

Duration of Recovery among Children Aged 6-59 Months with Severe Acute Malnutrition

The Kaplan-Meier (KM) method was employed to estimate the distribution of survival time for children's recovery periods. As shown in Figure 1 below, the horizontal axis represents the time until recovery, while the vertical axis illustrates the survival probability S(t) = P($T > t$). Initially, the survival curve starts at S(0) = 1, indicating that none of the children had recovered at the outset. The curve rises gradually until around the 6-day mark, suggesting a higher likelihood of children remaining unrecovered in the early stages. Beyond 6 days, the curve begins to decline, with the median recovery time being 9 days. This downward trend signifies a reduction in survival probability over time, demonstrating that more children recovered as time progressed.

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

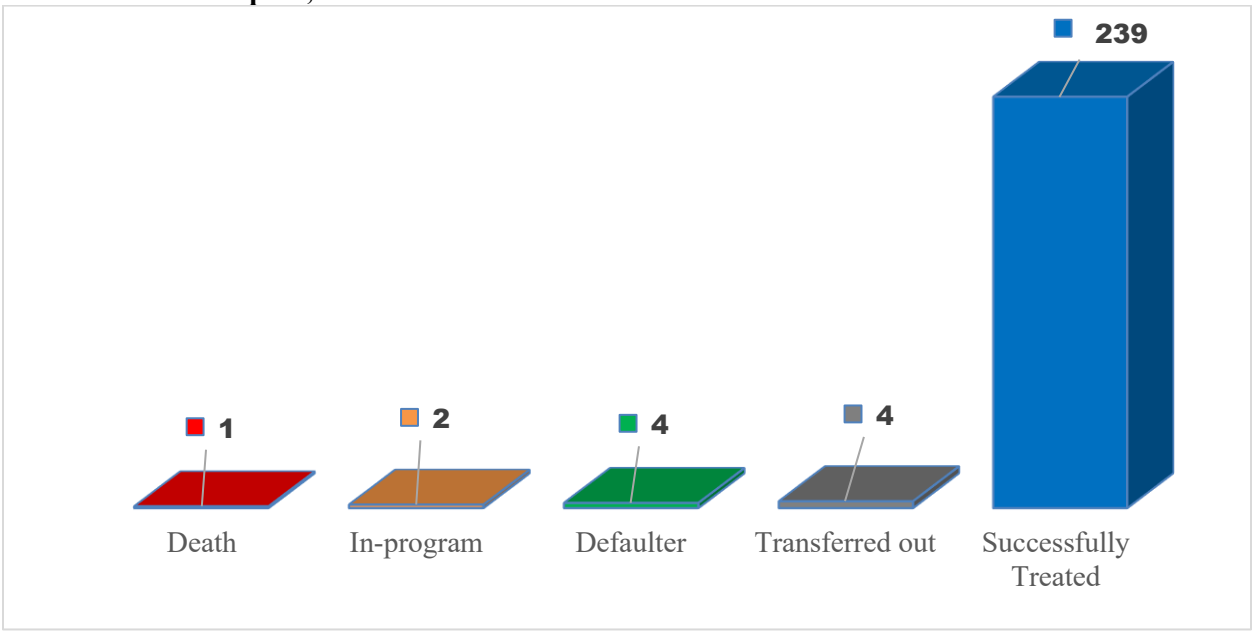
Figure 1: Kaplan-Meier Curve Illustrating the Duration Until Recovery from Severe Acute Malnutrition (SAM) among Pediatric Patients Admitted to Gardo General Hospital



Treatment Outcomes

The treatment outcomes for children with Severe Acute Malnutrition (SAM) reveal that 239 (95.6%) children were successfully treated. Furthermore, 4(1.6%) children were transferred out, 4(1.6%) children discontinued their treatment, and 2 children (0.8%) remained enrolled in the program during the study period. Unfortunately, there was one recorded fatality, accounting for 1(0.4%) of the cases.

Figure 2: Treatment Outcomes for Children with Severe Acute Malnutrition (SAM) Admitted to Gardo General Hospital, 2025



Complications at Admission with the Treatment Outcomes

As illustrated in Table 3, an analysis was conducted on the complications at admission and the treatment outcomes for children aged 6-59 months with Severe Acute Malnutrition (SAM) admitted to Gardo General Hospital. The findings demonstrate a definitive association between specific complications at admission and their subsequent

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

treatment outcomes. Among the pediatric patients presenting with diarrhoea, there were 166 cases; notably, there were no fatalities and only one defaulter. Furthermore, a significant association was observed between diarrhoea and treatment outcomes, as indicated by a chi-square p-value of 0.04. In contrast, children without diarrhoea exhibited a high success rate, with 76 out of 84 cases resulting in successful treatment. A similar trend is observed with vomiting, where its presence correlated with increased complications, as evidenced by 148 total cases, including one death and three defaults. In cases of high fever, although only 51 children were affected, the outcomes were concerning, with one death recorded among those without high fever. Cough was another prevalent complication, with 155 cases, but the treatment outcomes varied, including two transfers out. Interestingly, the "other complications" category indicated that children with additional issues accounted for 79 cases, with one death and 75 successful treatments.

Table 3: Complications at Admission and the Treatment Outcomes for Children Aged 6-59 Months with Severe Acute Malnutrition (SAM) Admitted to Gardo General Hospital.

Variable		Treatment outcome						
		Death	Defaulter	In-program	Transferred out	Successfully treated	Total	P-value
Diarrhea	Yes	0	1	0	2	163	166	
	No	1	3	2	2	76	84	0.04
Vomiting	Yes	1	3	2	2	140	148	
	No	0	1	0	2	99	102	0.62
High fever	Yes	0	2	0	1	48	51	
	No	1	2	2	3	191	199	0.56
Cough	Yes	0	1	2	2	150	155	
	No	1	3	0	2	89	95	0.24
Other complications	Yes	1	0	1	2	75	79	0.29
	No	0	4	1	2	164	171	

DISCUSSION

This study aimed to examine the median recovery time and treatment outcomes for children aged 6-59 months diagnosed with severe acute malnutrition admitted to Gardo General Hospital in Gardo, Puntland, Somalia. The findings indicated that the median recovery time was approximately 9 days, suggesting that 50% of the malnourished children achieved recovery within this period, while the remaining half required a longer duration. This result aligns with a previous study conducted in Zambia [28]. However, it is a longer time compared to studies conducted in Ethiopia [29-32].

The prolonged recovery period identified in this study can be attributed to several factors. Foremost among these are the variations in medical treatment protocols, which may differ based on local resources, the training level of healthcare personnel, and the availability of therapeutic foods. Similar to many healthcare facilities in resource-constrained regions, Gardo General Hospital may face challenges in consistently providing specialised nutritional interventions, which can directly impact recovery durations. Additionally, the socio-economic conditions in Puntland influence caregiving practices and health-seeking behaviours. Families with limited financial resources may delay seeking immediate medical care, exacerbating malnutrition issues. Cultural beliefs regarding healthcare and nutrition can also affect the promptness with which families respond to malnutrition symptoms. Consequently, enhancing community awareness and outreach programs may

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

be essential for ensuring timely treatment for children at risk of SAM.

The study revealed that 239 (95.6%) children achieved successful treatment outcomes, while 4 (1.6%) children were transferred out, 4 (1.6%) defaulted on their treatment, and 2 children (0.8%) remained in the program during the study period. Regrettably, there was one recorded fatality, accounting for 1 (0.4%) of the cases. This result contrasts with a study conducted in Ethiopia, which targeted 341 children aged 6-59 months with severe acute malnutrition admitted to East Amhara hospitals, finding that 74.49% recovered, 9.68% were transferred out, 8.8% defaulted, and 5.28% died [33]. This disparity could be attributed to differences in medical treatment protocols, caregiving practices, healthcare settings, sample sizes, education and awareness, access to follow-up care, and various socio-economic and environmental factors.

The findings of this study demonstrate a significant association between the occurrence of diarrhoea and treatment outcomes, as indicated by a chi-square p-value of 0.04. This result suggests that the presence of diarrhoea at the time of admission is correlated with the efficacy of the treatment. The low p-value signifies statistical significance, emphasising the necessity for immediate and appropriate medical intervention. Diarrhoea is a common complication in children with severe acute malnutrition (SAM), as it can exacerbate dehydration and nutrient loss, thereby complicating the recovery process. This highlights the critical importance of promptly addressing gastrointestinal issues in the treatment of malnourished children. Effective management of diarrhoea not only improves treatment outcomes for SAM but also plays a crucial role in overall patient care.

In contrast, other complications such as vomiting (p=0.62), high fever (p=0.56), cough (p=0.24), and additional complications (p=0.29) were found to be statistically insignificant, as their p-values exceeded 0.05, indicating no significant association between these symptoms at admission and treatment outcomes. This suggests that while these symptoms may impact the patients' general health, they do not have the same immediate effect on the efficacy of SAM treatment as diarrhoea does.

These findings underscore the essential need for timely interventions and tailored treatment plans in managing severe acute malnutrition. Future research should explore the factors influencing recovery times and consider strategies to enhance treatment protocols, caregiver training, and access to follow-up care in similar contexts. Improving community education, healthcare access, and integrating management for related health issues may further enhance outcomes for vulnerable children in Puntland.

Limitations of the Study

Due to the reliance on retrospective data, this study did not include certain potentially significant variables, such as dietary diversity and the educational and economic status of caregivers. Furthermore, as the research was conducted at a single centre, the findings cannot be generalised to a broader population.

CONCLUSION

The findings indicated a median recovery duration of 9 days. A substantial proportion of children, 239(95.6%), diagnosed with Severe Acute Malnutrition (SAM) were successfully treated. There was one recorded fatality, representing 1(0.4%) of the cases. The presence of diarrhoea at the time of admission was associated with the treatment outcomes, underscoring the significance of timely and appropriate medical intervention.

RECOMMENDATIONS

Based on the findings of this research, the study recommends:

- To implement specific protocols for managing common complications, such as diarrhoea,

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

vomiting and high fever, in order to enhance treatment outcomes.

- To initiate educational campaigns aimed at informing communities about the indicators of malnutrition and the critical importance of timely medical intervention, particularly for children under the age of five.
- To develop efforts to increase vaccination coverage among children, particularly those admitted with severe acute malnutrition (SAM), to mitigate the risk of infections that may complicate their recovery.
- Advocate for breastfeeding through community-based initiatives and support networks, emphasising its critical role in improving recovery outcomes for children experiencing malnutrition.

Declarations

Authors Contribution

All authors made substantial contributions to the conceptualisation, research design, data collection, analysis, and interpretation of the results. They also participated in drafting the manuscript, conducting critical evaluations, and selecting an appropriate journal for submission. Each author reviewed and approved the final version of the paper, assuming full responsibility for its content.

Acknowledgement

The authors extend their gratitude to all individuals who contributed to the development of this original article at any stage.

Conflict of Interest

The authors have declared that there are no conflicts of interest concerning the research, authorship, or publication of this paper.

Funding Statement

The authors did not receive any financial support for this study.

Data Availability

Requests that are deemed appropriate may be directed to the corresponding author to obtain access to the data that support the findings of this study.

REFERENCES

1. WHO. Guideline: updates on the management of severe acute malnutrition in infants and children. Guideline: updates on the management of severe acute malnutrition in infants and children2013.
2. D'Innocenzo S, Biagi C, Lanari M. Obesity and the Mediterranean diet: a review of evidence of the role and sustainability of the Mediterranean diet. Nutrients. 2019;11(6):1306.
3. Case PC. Evaluation of Community Management of Acute Malnutrition (CMAM). Citeseer; 2012.
4. Acute malnutrition: an everyday emergency: A 10-point plan for tackling acute malnutrition in under-fives; 2014 08/08/2014 10:00:00.
5. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? The Lancet. 2013;382(9890):452-77.
6. Black RE, Allen LH, Bhutta ZA, Caulfield LE, De Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. The Lancet. 2008;371(9608):243-60.
7. Demographic E. Health survey: Addis Ababa. Ethiopia and Calverton, Maryland, USA: central statistics agency and ORC macro. 2011;2011.
8. Gerensea H, Berhe T, Siyum H. Trend of malnutrition in Tigray region from 2011/12-2014/15. Anesthesia & Clinical Research. 2017;8(5):1-4.

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

9. WHO. Management of severe malnutrition: a manual for physicians and other senior health workers. 2000.

10. Williams P, Berkley JA. Severe acute malnutrition update: Current Whoguidelines and the Whoessential medicine list for children. World Health Organization, Geneva, Switzerland. 2016.

11. Ababa A. Federal democratic republic of Ethiopia ministry of health. Ethiopia: Postnatal Care. 2003.

12. Ashworth A. Guidelines for the inpatient treatment of severely malnourished children: World Health Organization; 2003.

13. Collins S, Dent N, Binns P, Bahwere P, Sadler K, Hallam A. Management of severe acute malnutrition in children. The Lancet. 2006;368(9551):1992-2000.

14. Trehan I, Manary MJ. Management of severe acute malnutrition in low-income and middle-income countries. Archives of disease in childhood. 2015;100(3):283-7.

15. Sphere P. The Sphere Project: Humanitarian charter and minimum standards in humanitarian response. The Sphere Project. 2011.

16. Organization WH, Fund UNCs. Levels and trends in child malnutrition: key findings of the 2020 edition. UNICEF/WHO/World Bank Group joint child malnutrition estimates: World Health Organization; 2020.

17. FSNAU. FSNAU, "Nutrition Update for Somalia - Preliminary findings from 2016 Gu season nutrition surveys among Internally Displaced Persons (IDPs) in Somalia," FAO, 2016.; 2016.

18. UNICEF. UNICEF, "Situation Analysis of Children in Somalia," 2016.; 2016.

19. Levitt EJ, Pelletier DL, Pell AN. Revisiting the UNICEF malnutrition framework to foster agriculture and health sector collaboration to reduce malnutrition: a comparison of stakeholder priorities for action in Afghanistan. Food Policy. 2009;34(2):156-65.

20. Mohamed LA. The United Nations Civilian Initiatives in Stabilising Somalia between 2007 and 2022. 2024.

21. WHO. Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates: key findings of the 2023 edition. 2023.

22. Ali AM, Dahir MAA, Said MM. Determinants of Undernutrition among Children under Age 5 in the Puntland State of Somalia.

23. Ali YD, Gisemba B, Oirere N. Factors Associated with Malnutrition among Under Five in Bosaso, Puntland Somalia. International Journal of Professional Practice. 2023;11(4):89-104.

24. Abdiwali Mahamed A, Gebremichael MB. PREVALENCE OF WASTING AND ASSOCIATED FACTORS AMONG CHILDREN AGED 6-23 MONTHS IN GAROWE, PUNTLAND, SOMALIA: Haramaya University; 2021.

25. Abdiwali A, Gebremichael B, Gebretsadik S. Prevalence of wasting and associated factors among children aged 6-23 months in Garowe, Puntland, Somalia. 2022.

26. Teshome G, Bosha T, Gebremedhin S. Time-to-recovery from severe acute malnutrition in children 6–59 months of age enrolled in the outpatient treatment program in Shebedino, Southern Ethiopia: a prospective cohort study. BMC pediatrics. 2019;19(1):33.

27. Acharya AS, Prakash A, Saxena P, Nigam A. Sampling: Why and how of it. Indian journal of medical specialties. 2013;4(2):330-3.

Article DOI: https://doi.org/10.37284/eajhs.9.1.4505

28. Irena AH, Mwambazi M, Mulenga V. Diarrhea is a major killer of children with severe acute malnutrition admitted to inpatient set-up in Lusaka, Zambia. Nutrition Journal. 2011;10(1):110.

29. Mekuria G, Derese T, Hailu G. Treatment outcome and associated factors of severe acute malnutrition among 6–59 months old children in Debre Markos and Finote Selam hospitals, Northwest Ethiopia: a retrospective cohort study. BMC Nutrition. 2017;3(1):42.

30. Hassen SL, Astatkie A, Mekonnen TC, Bogale GG. Survival Status and Its Determinants among Under-Five Children with Severe Acute Malnutrition Admitted to Inpatient Therapeutic Feeding Centers in South Wollo Zone, Amhara Region, Ethiopia. Journal of nutrition and metabolism. 2019;2019(1):2643531.

31. Wagnew F, Tesgera D, Mekonnen M, Abajobir AA. Predictors of mortality among under-five children with severe acute malnutrition, Northwest Ethiopia: an institution based retrospective cohort study. Archives of Public Health. 2018;76(1):64.

32. Asres DT, Prasad RP, Ayele TA. Recovery time and associated factors of severe acute malnutrition among children in Bahir Dar city, Northwest Ethiopia: an institution based retrospective cohort study. BMC Nutrition. 2018;4(1):17.

33. Simachew Y, Zerfu T, Alemu W. Treatment outcomes and predictors of recovery from severe acute malnutrition among children aged 6–59 months attending an outpatient therapeutic program in Wenago District, Southern Ethiopia. Nutrition and Dietary Supplements. 2020:189-200.

