An Empirical Study of the Nutritional Status of Severe Acute Malnourished (SAM) Children between Pre and Post Admission in Nutrition Rehabilitation Center (NRC)

Priyanka Tripathi[1], Hari Shankar[2], Sunil Kumar Rao[3]

ABSTRACT

The aim and objective of this research study was to compare the nutritional status of Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC). The exploratory as well as descriptive research design was used. The nutritional status was checked by four test variables as Weight-kg, Height-cm, MUAC (Mid-Upper Arm Circumference). The sample size of this study was 211. The normality test was performed using One-Sample Kolmogorov-Smirnov Test. Since the data of four test variable was not normal, hence non-parametric test (Wilcoxon Signed Ranks Test) was used for the comparative study between pre and post condition. The findings concluded that there was a difference of the weight, height, MUAC, of the children in pre and post medical treatment in the NRC for the SAM children.

Keywords: Nutritional Status; Severe Acute Malnourished (SAM); Nutrition Rehabilitation Center (NRC); One-Sample Kolmogorov-Smirnov Test; Wilcoxon Signed Ranks Test, Sign Test

Introduction

One of the most significant dangers to the health of children all around the world is malnutrition. Globally, there were 156 million children under the age of five who were stunted in 2015, along with 50 million children who were underweight and 42 million children who were overweight. Countries in Africa and Asia with lower per capita incomes have a higher incidence of malnutrition. It is estimated that 38 percent of children under the age of five in Ethiopia are short for their age, 24 percent of those children are underweight, and 10 percent of those children are wasted. The illness manifests itself in many children while they are still in the fetal stage. Inadequate nutrition during pregnancy and the early years of a child's life can have a wide variety of negative effects, including delayed physical growth, impaired motor and cognitive development, leading to a lower IQ; increased behavioral problems and poor social skills at school; decreased attention, learning, and educational achievement; and so on. However, such harmful repercussions do exist. According to research conducted in a variety of countries, acute malnutrition is a rather prevalent occurrence among children who are confined to hospitals; nevertheless, the definition of malnutrition varies from one study to the next. There is a possibility that as many as 31.8% of newborns and children who are battling several disorders have acute malnutrition.

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1. **Research Scholar (Home Science),** Department of Community Medicine, Institute of Medical Science, Banaras Hindu University, Varanasi, **Email:** tripathipriyanka137@gmail.com
2. **Professor,** Department of Community Medicine Institute of Medical Science, Banaras Hindu University, Varanasi., **Email:** hshankar.cmims@bhu.ac.in
3. **Professor,** Department of Pediatrics, Institute of Medical Science, Banaras Hindu University, Varanasi. **Email:** drsunilrao21@gmail.com

Corresponding Author: Priyanka Tripathi, Research Scholar (Home Science), Department of Community Medicine, Institute of Medical Science, Banaras Hindu University, Varanasi, **Email:** tripathipriyanka137@gmail.com

Severe Acute Malnutrition (SAM): SAM is defined by very low weight-for-height/length (Z- score below -3SD of the median WHO child growth standards), a mid-upper arm circumference <115 mm, or by the presence of nutritional oedema SAM increases significantly the risk of death in children under five years of age. It can be an indirect cause of child death by increasing the case fatality rate in children suffering from common illnesses such as diarrhea and pneumonia. Children who are severely wasted are 9 times more likely to die than well-nourished children. Using the new WHO Child Growth Standards in developing country situations results in a 2–4 times increase in the number of infants and children falling below -3 SD weight for height/length compared to using the former NCHS reference. Using the new standards increase the levels of malnourished children; however, it also leads to earlier detection of malnutrition and in a less severe state; thereby providing an opportunity for faster recovery and lower-case fatality rates (Operational Guidelines on the facility based management of children with severe acute malnutrition, 2011)

Objectives: The objectives of this study are as follows-

- To compare the weight-kg of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).
- To compare the height-cm of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).
- To compare the MUAC (Mid-Upper Arm Circumference) of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).

The hypotheses of this study are as follows:

- $H0_1$: There is no significant difference of the weight-kg of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).
- $H0_2$: There is no significant difference of the height-cm of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).
- $H0_3$: There is no significant difference of the the MUAC (Mid-Upper Arm Circumference) of the Severe Acute Malnourished (SAM) Children between Pre and Post admission in Nutrition Rehabilitation Center (NRC).

Literature review

The previous researchers had worked on malnutrition and it has been identified as one of the main health issues in Bangladesh and other developing nations, according to numerous surveys. When food intake is minimal, children might not be able to maintain their energy balance. Furthermore, minerals including zinc and vitamin A are lost in diarrheal stools. Micronutrient deficiency is linked to weakened immunity, which may in turn contribute to an increase in morbidity and a subsequent decline in nutritional status.[1] Recent findings from community intervention trials show that this is both real and has the potential to reduce the under nutrition of children.[2] Children classified as being at risk of malnutrition at admission got only 66.9 % of the required calorie intake. However, for malnourished children, management was acceptable, with energy intake average 92.5% of required intake.[3]An intermediate plan is required to successfully treat these severely wasted youngsters on an outpatient basis while the government of Bangladesh waits for the full-scale development of a local RUTF. The establishment of MAM and SAM treatment service delivery requires the provision of preventive nutrition services.[4] Hypoleptinemia may potentially lessen viability by preventing the immune system from responding to parasite and viral diseases. This is because leptin affects numerous elements of innate and acquired immunity and encourages T cell growth, proliferation, and function.[5] The nation should keep analysing how to guarantee the community-level health information system and chain supply chain, as well as how these CHWs need to be

paid and motivated in order for their job to be a sustainable intervention.[6] Regardless of the RUTF dose, complementary foods greatly increase the amount of energy and nutrients consumed by children with SAM. These findings imply that children with SAM receiving RUTF treatment continue to eat meals with their families. Therefore, it could be advisable to re-evaluate the advice to only consume RUTF throughout treatment.[7] The large percentage of HIV positive cases may be to blame for the disparity. 43 percent of people in South Africa have HIV, which increases mortality because treatment is difficult and opportunistic infections are common. Similar results were obtained from studies done at Sekota Hospital and Zewditu Hospital in Ethiopia.[8]

Methodologies

1. **Data gathering process:** The primary data was collected from the District Hospital Balrampur, Lucknow, Uttar Pradesh. 211 SAM children were examined in this study.

2. **Measures:** Four test variables as Weight-kg, Height-cm, MUAC, and Edema were used in this study. The groping variable was pre and post admission in NRC.

3. **Analysis Models:** In this research study, we have to compare the nutritional status of SAM children in the pre and post admission in NRC, hence we have to apply the Paired t test or Wilcoxon Signed Ranks Test, depend upon the normality checking of the test parameters as Weight-kg, Height-cm, MUAC, and Edema. The normality test was performed using One-Sample Kolmogorov-Smirnov Test. If the sig value for the particular test parameter was more than 0.05, then the data will be normally distributed, we can apply parametric test as paired t test for the comparison between pre and post condition. But, if the significance value is less than 0.05 for a particular test statics, then we will use the non-parametric test (Wilcoxon Signed Ranks Test).

Results

According to the descriptive statistics, it is clear that the mean weight in kg is 5.6247, the mean height in cm is 68.725 cm, the mean MUAC score is 11.265, and the mean edema score is 1.8777 in pre data collection stage (Table-1).

Table-1: Descriptive Statistics- Pre-Study- (Weight-kg, Height-cm, MUAC, and Edema)

	Mean $\pm$ SD	Minimum	Maximum
Weight-kg (Pre)	5.625± 2.059	1.57	12.40
Height-cm (Pre)	68.725± 11.446	46.7	105.0
MUAC (Pre)	11.27± 1.379	3	14
Edema (Pre)	1.88± 0.329	1	2

According to the One-Sample Kolmogorov-Smirnov Test table, all the sig value (p = 0.008, 0.000,0.000, 0.000 0 is less than 0.05, hence the data for Weight-kg (Pre), Height-cm (Pre), MUAC (Pre), Edema (Pre) were not normal, therefore we can only apply non parametric test like Wilcoxon Signed Ranks Test (Table-2).

Table- 2: One-Sample Kolmogorov-Smirnov Test for pre data

		Weight-kg (Pre)	Height-cm (Pre)	MUAC (Pre)	Edema (Pre)
Normal Parameters[a,b]	Mean ± SD	5.62±2.059	68.73±11.446	11.27±1.379	1.88±0.329
Most Extreme Differences	Absolute	0.072	0.089	0.167	0.523
	Positive	0.072	0.070	0.091	0.355
	Negative	-0.063	-0.089	-0.167	-0.523
Test Statistic		0.072	0.089	0.167	0.523
Asymp. Sig. (2-tailed)		0.008[c]	0.000[c]	0.000[c]	0.000[c]
a. Test distribution is Normal.					
b. Calculated from data.					
c. Lilliefors Significance Correction.					

According to the Descriptive Statistics table and bar chart, it is clear that the mean weight in kg is 6.3588, the mean height in cm is 68.635 cm, the mean MUAC score is 11.794, and the mean edema score is 2.000 in post data collection stage (Table-3).

Table- 3: Descriptive Statistics- Post-Study- (Weight-kg, Height-cm, MUAC, and Edema)

	Mean ± SD	Minimum	Maximum
Weight-kg (Post)	6.359 ± 2.209	2.122	13.28
Height-cm (Post)	68.635 ± 12.758	5.05	105.40
MUAC (Post)	11.79 ± 1.158	8	14
Edema (Post)	2.00 ± 0.000	2	2

According to the One-Sample Kolmogorov-Smirnov Test table, all the significance value (p = 0.65) is less than 0.05, hence the data for Height-cm (Post), MUAC (Post), Edema (Post) were not normal except Weight-kg (Post), because the sig value is 0.065 more than 0.05, therefore we can only apply non parametric test like Wilcoxon Signed Ranks Test (Table-4).

Table- 4: One-Sample Kolmogorov-Smirnov Test for post data

		Weight-kg (Pre)	Height-cm (Pre)	MUAC (Pre)	Edema (Pre)
Normal Parameters[a,b]	Mean ± SD	6.359 ± 2.209	68.635 ±12.758	11.79±1.158	2.00±00.000[d]
Most Extreme Differences	Absolute	0.059	0.094	0.152	
	Positive	0.059	0.087	0.096	
	Negative	-0.051	-0.094	-0.152	
Test Statistic		0.059	0.094	0.152	
Asymp. Sig. (2-tailed)		0.065[c]	0.000[c]	0.000[c]	
a. Test distribution is Normal.					
b. Calculated from data.					
c. Lilliefors Significance Correction.					
d. The distribution has no variance for this variable. One-Sample Kolmogorov-Smirnov Test cannot be performed.					

Pre and post- Weight Study

The descriptive statistics table and bar chart make it abundantly evident that the mean weight of all the children at the time of hospitalization was 5.695 kg, however at the time of discharge, it had climbed to 6.347 kg. This information is presented in a clear and concise manner. As a result, one might draw the conclusion that SAM children were released after experiencing weight increase in the medical treatment in the NRC (Table-5).

Table 5: Descriptive Statistics- Pre and post Study- Weight

	Mean ± SD	Minimum	Maximum
Weight-kg (Pre)	5.649 ± 2.064	1.572	12.400
Weight-kg (Post)	6.347 ± 2.216	2.122	13.280

According to the Wilcoxon Signed Ranks Test, it is clear that out of 211 cases, maximum 204 cases have the Weight-kg (Post) > Weight-kg (Pre), hence one might draw the conclusion that SAM children were released after weight increase in the medical treatment in the NRC. Only 7 cases reported as Weight-kg (Post) < Weight-kg (Pre) which is very low and negligible (Table-6).

Table -6: Ranks- Pre and post Study- Weight

		N	Mean Rank	Sum of Ranks
Weight-kg (Post) - Weight-kg (Pre)	Negative Ranks	7[a]	86.64	606.50
	Positive Ranks	204[b]	106.66	21759.50
	Ties	0[c]		
	Total	211		
a. Weight-kg (Post) < Weight-kg (Pre)				
b. Weight-kg (Post) > Weight-kg (Pre)				
c. Weight-kg (Post) = Weight-kg (Pre)				

According to the Test Statistics[a] of Wilcoxon Signed Ranks Test, the significance value (0.000) is less than 0.05, hence it was safe to reject first null hypothesis, therefore it can be concluded that there was a difference of the weight of the children in pre and post medical treatment in the NRC for the SAM children (Table-7).

Table- 7: Test Statistics[a]- Pre and post Study- Weight

	Weight-kg (Post) - Weight-kg (Pre)	Hypothesis Result
Z	-11.912[b]	H0[1] Rejected
Asymp. Sig. (2-tailed)	0.000	
a. Wilcoxon Signed Ranks Test		
b. Based on negative ranks.		

Sign Test-Pre and post Study- Weight

According to the Sign frequency Test, it is clear that the out of 211 cases, maximum 204 cases have the Weight-kg (Post) > Weight-kg (Pre), hence one might draw the conclusion that SAM children were released after weight increase in the medical treatment in the NRC. Only 7 cases reported as Weight-kg (Post) <Weight-kg (Pre) which is very low and negligible (Table-8).

Table- 8: Frequencies- Pre and post Study- Weight

		N
Weight-kg (Post)- Weight-kg (Pre)	Negative Differences[a]	7
	Positive Differences[b]	204
	Ties[c]	0
	Total	211
a. Weight-kg (Post) < Weight-kg (Pre)		
b. Weight-kg (Post) > Weight-kg (Pre)		
c. Weight-kg (Post) = Weight-kg (Pre)		

According to the Test Statistics[a] of Sign Test, the significance value (0.000) is less than 0.05, hence it can be concluded that there was a difference of the weight of the children in pre and post medical treatment in the NRC for the SAM children. Therefore, both the Wilcoxon Signed Ranks Test and Sign Test proved that there was a difference of the weight of the children in pre and post medical treatment in the NRC for the SAM children (Table-9).

Table- 9: Test Statistics[a]-Pre and post Study- Weight

	Weight-kg (Post) - Weight-kg (Pre)
Z	-13.493
Asymp. Sig. (2-tailed)	0.000
a. Sign Test	

Pre and post-Height Study

The descriptive statistics table and bar chart make it abundantly evident that the mean height of all the children at the time of hospitalization was 68.832 cm, however at the time of discharge, it had to 68.608 cm. As a result, one might draw the conclusion that SAM children were experiencing no height increase in the medical treatment in the NRC (Table-10).

Table- 10: Descriptive Statistics- Pre and post-Height Study

	Mean ± SD	Minimum	Maximum
Height-cm (Pre)	68.832 ± 11.469	46.7	105.0
Height-cm (Post)	68.608 ± 12.782	5.05	105.4

Wilcoxon Signed Ranks Test-Height Study

According to the Wilcoxon Signed Ranks Test, it is clear that out of 212 cases, maximum 142 cases have the Height-cm (Post) = Height-cm (Pre), hence one might draw the conclusion that SAM children were released after experiencing no height increase in the medical treatment in the NRC. Only 19 cases reported as Height-cm (Post) <Height-cm (Pre) which is very low and negligible and 51 cases reported as Height-cm (Post) > Height-cm (Pre) in the medical treatment in the NRC (Table-11).

Table -11: Ranks-Pre and post-Height Study

		N	Mean Rank	Sum of Ranks
Height-cm (Post) – Height - cm (Pre)	Negative Ranks	19[a]	47.47	902.00
	Positive Ranks	51[b]	31.04	1583.00
	Ties	142[c]		
	Total	212		
a. Height-cm (Post) < Height-cm (Pre)				
b. Height-cm (Post) > Height-cm (Pre)				
c. Height-cm (Post) = Height-cm (Pre)				

According to the Test Statistics[a] of Wilcoxon Signed Ranks Test, the significance value (0.046) is less than 0.05, hence it is safe to reject the second null hypothesis, therefore it can be concluded that there was a difference of the height of the children in pre and post medical treatment in the NRC for the SAM children (Table-12)

Table- 12:Test Statistics[a]-Pre and post-Height Study

	Height-cm (Post) - Height-cm (Pre)	Hypothesis Result
Z	-1.998[b]	H0[2] Rejected
Asymp. Sig. (2-tailed)	0.046	
a. Wilcoxon Signed Ranks Test		
b. Based on negative ranks.		

Sign Test- Pre and post-Height Study

According to the Sign frequency Test, it is clear that the out of 212 cases, maximum 142 cases have the ties as Height-cm (Post) = Height-cm (Pre), hence one might draw the conclusion that SAM children were released after experiencing no height increase in the medical treatment in the NRC. Only 19 cases reported as Height-cm (Post) < Height-cm (Pre) which is very low and negligible and 51 cases reported as Height-cm (Post) > Height-cm (Pre) (Table-13).

Table -13: Frequencies- Pre and post-Height Study

		N
Height-cm (Post) - Height-cm (Pre)	Negative Differences[a]	19
	Positive Differences[b]	51
	Ties[c]	142
	Total	212
a. Height-cm (Post) < Height-cm (Pre)		
b. Height-cm (Post) > Height-cm (Pre)		
c. Height-cm (Post) = Height-cm (Pre)		

According to the Test Statistics[a] of Sign Test, the significance value (0.000) is less than 0.05, hence it can be concluded that there is a difference of the height of the children in pre and post medical treatment in the NRC for the SAM children. Therefore, both the Wilcoxon Signed Ranks Test and Sign Test proved that there was a difference of the height of the children in pre and post medical treatment in the NRC for the SAM children (Table-14).

Table -14:Test Statistics[a]-Pre and post-Height Study

	Height-cm (Post) - Height-cm (Pre)
Z	-3.705
Asymp. Sig. (2-tailed)	0.000
a. Sign Test	

MUAC- Pre and Post Study

The descriptive statistics table and bar chart make it abundantly evident that the mean MUAC of all the children at the time of hospitalization was 11.311, however at the time of discharge, it had to 11.774. As a result, one might draw the conclusion that SAM children were experiencing slight MUAC increase in the medical treatment in the NRC (Table-15).

Table-15: Descriptive Statistics- MUAC- Pre and Post Study

	Mean ± SD	Minimum	Maximum
MUAC (Pre)	11.31 ± 1.351	3	14
MUAC (Post)	11.77 ± 1.174	8	14

Wilcoxon Signed Ranks Test-MUAC- Pre and Post Study

According to the Wilcoxon Signed Ranks Test, it is clear that out of 164 cases, maximum 142 cases have the MUAC (Post) > MUAC (Pre), hence one might draw the conclusion that SAM children were released after experiencing slight MUAC increase in the medical treatment in the NRC. Only 2 cases reported as MUAC (Post) < MUAC (Pre) which is very low and negligible and 20 cases reported as MUAC (Post) = MUAC (Pre) in the medical treatment in the NRC (Table-16).

Table- 16: Ranks- MUAC- Pre and Post Study

		N	Mean Rank	Sum of Ranks
MUAC (Post) - MUAC (Pre)	Negative Ranks	2[a]	69.75	139.50
	Positive Ranks	142[b]	72.54	10300.50
	Ties	20[c]		
	Total	164		
a. MUAC (Post) < MUAC (Pre)				
b. MUAC (Post) > MUAC (Pre)				
c. MUAC (Post) = MUAC (Pre)				

According to the Test Statistics[a] of Wilcoxon Signed Ranks Test, the significance value (0.000) is less than 0.05, hence it is safe to reject third null hypothesis, therefore it can be concluded that there was a difference of the MUAC of the children in pre and post medical treatment in the NRC for the SAM children (Table-17).

Table-17: Test Statisticsa- MUAC- Pre and Post Study

	MUAC (Post) - MUAC (Pre)	Hypothesis
Z	-10.152[b]	H0$_3$ Rejected
Asymp. Sig. (2-tailed)	0.000	
a. Wilcoxon Signed Ranks Test		
b. Based on negative ranks.		

Sign Test-MUAC- Pre and Post Study

According to the Sign frequency Test, it is clear that the out of 164 cases, maximum 142 cases have the ties as MUAC (Post) > MUAC (Pre), hence one might draw the conclusion that SAM children were released after experiencing MUAC increase in the medical treatment in the NRC. Only 2 cases reported as MUAC (Post) < MUAC (Pre) which is very low and negligible and 20 cases reported as MUAC (Post) = MUAC (Pre) (Table-18).

Table- 17: Frequencies- MUAC- Pre and Post Study

		N
MUAC (Post) - MUAC (Pre)	Negative Differences[a]	2
	Positive Differences[b]	142
	Ties[c]	20
	Total	164
a. MUAC (Post) < MUAC (Pre)		
b. MUAC (Post) > MUAC (Pre)		
c. MUAC (Post) = MUAC (Pre)		

According to the Test Statistics[a] of Sign Test, the significance value (0.000) is less than 0.05, hence it can be concluded that there is a difference of the MUAC of the children in pre and post medical treatment in the NRC for the SAM children. Therefore, both the Wilcoxon Signed Ranks Test and Sign Test proved that there was a difference of the MUAC of the children in pre and post medical treatment in the NRC for the SAM children (Table-19).

Table- 19 :Test Statistics[a]- MUAC- Pre and Post Study

	MUAC (Post) - MUAC (Pre)
Z	-11.583
Asymp. Sig. (2-tailed)	0.000

a. Sign Test

Conclusion

It was finally concluded that SAM children were released after weight increase in the medical treatment in the NRC. Only 7 cases reported as Weight-kg (Post) < Weight-kg (Pre) which is very low and negligible. SAM children were released after experiencing no height increase in the medical treatment in the NRC. Only 19 cases reported as Height-cm (Post) <Height-cm (Pre) which is very low and negligible and 51 cases reported as Height-cm (Post) > Height-cm (Pre)in the medical treatment in the NRC.SAM children were released after experiencing slight MUAC increase in the medical treatment in the NRC. Only 2 cases reported as MUAC (Post) < MUAC (Pre) which is very low and negligible and 20 cases reported as MUAC (Post) = MUAC (Pre) in the medical treatment in the NRC.

References

1. Islam, M., Roy, S. K., Begum, M., & Chisti, MJ. Dietary intake and clinical response of hospitalized patients with acute diarrhea. 29 (1), 25–31, 2008.

2. Imdad A & Bhutta ZA. Global micronutrient deficiencies in childhood and impact on growth and survival: challenges and opportunities. Nestlé Nutrition Institute Workshop Series, 70, 1–10, 2012. https://doi.org/ 10. 1159/000337384

3. Groleau V, Thibault M, Doyon M, Brochu EE, Roy CC & Babakissa C. Malnutrition in hospitalized children: Prevalence, impact, and management. Canadian Journal of Dietetic Practice and Research, 75(1), 29–34, 2014. https://doi.org/10.3148/75.1.2014.29

4. Choudhury N, Ahmed T, Hossain I, Mandal BN, Mothabbir G, Rahman M, Islam MM, Husain MM, Nargis M, & Rahman E. Community-based management of acute malnutrition in Bangladesh : Feasibility and constraints. Food and Nutrition Bulletin, 35(2), 277–285, 2014.

5. Freemark M. Metabolomics in nutrition research: Biomarkers predicting mortality in children with severe acute malnutrition. Food and Nutrition Bulletin, 36(1), S88–S92., 2015 https://doi.org/10.1177/15648265150361S114

6. Charle-Cuéllar,P, López-Ejeda N, Traore M, Coulibaly AB, Landouré A, Diawara F, Bunkembo M, Vargas A, Gil R & Briend A. Impact of different levels of supervision on the recovery of severely malnourished children treated by community health workers in mali. Nutrients, 13(367), 1–14., 2021. https://doi.org/ 10.3390/ nu13020367.

7. Nikièma V, Kangas ST, Salpéteur C, Ouédraogo A, Lachat C, Bassolé NHI & Fogny NF. Adequacy of Nutrient Intakes of Severely and Acutely Malnourished Children Treated with Different Doses of Ready-To-Use Therapeutic Food in Burkina Faso. Journal of Nutrition, 151(4), 1008–1017, 2021. https://doi.org/10.1093/ jn/nxaa393.

8.   Kassaw A, Amare D, Birhanu M, Tesfaw A, Zeleke S, Arage G & Kefale D. Survival and predictors of mortality among severe acute malnourished under-five children admitted at Felege-Hiwot comprehensive specialized hospital, northwest, Ethiopia: a retrospective cohort study. BMC Pediatrics, 21(1), 1–10, 2021. https:// doi.org/ 10.1186/s12887-021-02651-x

9.   India M. of H. F. W. G. 'Operational Guidelines on the facility based management of children with severe acute malnutrition', Ministry of Healthand Family Welfare Government of India, pp. 1–84, 2011.