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Determinants of nutritional recovery status and survival time among children from 0 to 14 years old with acute malnutrition admitted to a therapeutic feeding center in Oromia, Southern Ethiopia: A retrospective cohort study

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ABSTRACT

Some studies have been conducted in Ethiopia to analyze the predictive factors associated with recovery or mortality in children with acute malnutrition, but no recent studies carried out in Oromia have analyze nutritional recovery status in this children. we studied the factors affecting nutritional recovery for survival in acutely malnourished children Southern Ethiopia. cohort study that included the children admitted to the (*blinded for review)* hospital (Oromia, Ethiopia) for acute malnutrition from January 2015 to December 2016 (*n* = 440). Kaplan–Meier tests and log-rank tests were used to describe the survival. Chi-squared tests and Spearman and Mann–Whitney U correlation tests were also employed. The mean survival time was shorter in children with severe versus moderate malnutrition at admission (49 days vs. 101 days; log-rank p = 0.042). The survival time was shorter in children with severe acute malnutrition at the time of admission. Survival time of children with moderate acute malnutrition was shorter in children who came from rural areas compared to urban areas. Severe acute malnutrition was associated with hospital stays, death rates, or transfer to another hospital. Practical implications: the results of this study may improve the care of children with malnutrition.

Contribution/Originality: We have analyzed nutritional recovery status in hospitalized children with malnutrition.

1. INTRODUCTION

Malnutrition, defined as the lack of sufficient or adequate food, is a threat to human health and survival. Among pediatric populations malnutrition is classified as acute (severe or moderate) or chronic [1]. At the time of this study, the protocol used in Ethiopia to manage malnutrition defined severe acute malnutrition (SAM) as a weight/height ratio lower than 70% of the anthropometric median standards, a low mid-upper arm circumference (MUAC), or the presence of edema. Cases were considered as moderate acute malnutrition (MAM) when the weight/height ratio was 70% to 80% of the standard medians [2]. The World Health Organization (WHO) also uses weight/height ratio and MUAC parameters to diagnose acute malnutrition, although it defines SAM as a weight/height ratio lower than 3 standard deviations (*SD*s) of the WHO median growth standards, a MUAC < 115 cm, or bilateral edema, with MAM corresponding to a weight/height ratio of ≤ 2 to ≥ 3 *SD*s of the WHO median growth standards and/or a MUAC of 115–125 mm [3].

Among children, acute malnutrition is the most severe form and requires immediate medical attention because it corresponds to a high risk of mortality [1]. According to the latest WHO data [4] malnutrition is the underlying cause of death in 45% of children aged under 5 years. The prevalence of acute malnutrition in this age group in developing countries is 18%, and Ethiopia is among the top 10 countries worldwide with the highest rates of malnutrition [1].

Ethiopia suffers cyclical droughts and famines which cause 12% of the population to be acutely malnourished [1]. For example, in the Oromia region in Southern Ethiopia, the latest data from the Ethiopia Demographic and Health Survey [5] reported that 10.6% of children aged under 5 years weighed less than 2 *SD*s of the WHO Child Growth Standards for their corresponding height.

Apart from the direct causes of child malnutrition (insufficient quantity and/or quality of food, lack of adequate care, and infectious diseases), other underlying causes including a lack of access to food or health care, unhealthy sanitation, or poor feeding practices (all of which are associated with poverty and inequality) can also contribute to this problem [1].

Nutritional deficiencies also have short-term effects such as diarrhea, dehydration, hydroelectrolytic abnormalities, immunosuppression, infections, weight loss, or hematological, cardiorespiratory, or renal disorders as well as long term outcomes including stunting and reduced intelligence quotient [6].

In response to the problem of malnutrition, the Ethiopian Government developed a national nutritional strategy [5] and a protocol for the management of SAM in children [2] with treatments including the use of therapeutic milk formulas or ready-to-use therapeutic foods.

This nutrition program can be implemented in hospitals and health centers (in-patient treatment), or from health posts or assessment sites (out-patient treatment) which must be fully intercommunicated with the referral hospital or health center [2]. An updated version of the guideline has been developed [7]. Because the situation is critical in Ethiopia, several studies have been conducted in this environment to analyze the determinants associated with acute malnutrition in children [8, 9] treatment outcomes at therapeutic feeding centers [10] or after hospitalization [11] and predictive factors associated with recovery [12-14] or mortality [15, 16].

To the best of our knowledge, no recent studies carried out in Oromia have investigated the main objective of this present work: to analyze nutritional recovery status in hospitalized children. As a secondary objective, we set also set out to describe the nutritional profiles of children in Oromia hospitalized with SAM and to study the relationship between their level of malnutrition at admission and their sociodemographic and clinical variables with their nutritional recovery status and survival. The results of this study will help to know the state of this problem, which may affect health practice, or be useful for developing improvement interventions.

2. METHODS

2.1. Study Setting

This study was conducted in Oromia in Southern Ethiopia—a region with a total population of 33,692,000 [17] with approximately 10,680,521 children aged under 9 years and 5,142,679 aged 10 to 14 years [18]. The (*blinded for review*) center, which is located 245 km southeast of the country's capital, Addis Ababa, is the only hospital in the district of *(blinded for review)* in Oromia and serves a reference population of more than 450,000 people. The *(blinded for review)* hospital has had a Re-nutrition Therapeutic Unit and an external follow-up program [19].

2.2. Study Design and Participants

This study was a retrospective cohort analysis and this report complies with the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines [20]. Because this was a retrospective historical cohort study, we did not record the follow-up of the participants. The study sampling was non-probabilistic and consecutive because only the hospital in the district of (*blinded for review)* (one of the 180 districts in Oromia) was included. The samples comprised data extracted from all the clinical records of children aged 0 to 14 years admitted for acute pediatric malnutrition (both MAM and SAM) to the (*blinded for review)* hospital (Oromia region, Ethiopia) from January 2015 to December 2016 (n = 440). Records in which the main variable of nutritional recovery status was missing were excluded.

Due to the orographic environment where the study was carried out, there was a difficult access to health services and to the external follow-up program. Therefore, most of the children with SAM and MAM were admitted to the hospital because the only external treatment that families could administer at home was ready-to-use therapeutic food, and not therapeutic milk formula.

During admission, treatment for MAM and SAM was divided into three stages. In the Phase I, the child received treatment for infections and non-critical care, their electrolyte balance was restored, and they were fed with F75 therapeutic milk formula (containing 75 Kcal per 100 ml). In the transition phase, F100 therapeutic milk (100 Kcal per 100 ml) or ready-to-use therapeutic foods were gradually introduced. Finally, in the Phase 2, when the children had a good appetite and no serious complications, they were fed only F100 therapeutic milk or therapeutic ready-to-eat foods [2].

2.3. Variables

The primary outcome was nutritional recovery which was considered a home discharge; for this variable, any children that died or who were transferred to another hospital were considered as 'not recovered'. Survival time was considered as the time elapsed from admission until their death. Other clinical variables were: admission weight (kg); discharge weight (kg); weight gain during hospitalization (discharge weight minus admission weight, in kg); length of stay (days); medical symptoms or comorbidities (edema, parasitic, viral, bacterial, or fungal infection, tuberculosis, or others; hereon in, we have used the global term 'infections' when referring to all these infection types grouped together); and malnutrition level: SAM is defined as a weight less than 70% of the appropriate level for the child's height and sex, while MAM was considered as 70–80% of the proper weight for the patient's corresponding height and sex [2]. The sociodemographic variables were: sex; age (measured quantitatively and qualitatively as the following age groups: newborn (0–28 days), infant (1–24 months), preschooler (2–6 years), school-age (6–12 years), and teenage (12–14 years) [21] and residence type (rural or urban).

2.4. Data Collection, Management, and Analysis

Data were collected in person in November 2017 from the in-patient registration book by one researcher of this paper during field work at the hospital. To ensure the quality of the data collection, this investigator was provided support by a supervisor at the hospital. Any information that could identify the patients was anonymized.

2.5. Data Processing and Analysis

We carried out an inferential and descriptive statistical analysis using IBM SPSS software v.24 (IBM Corp., Armonk, NY) for data entry and analysis. Kaplan–Meier curves were calculated to describe the survival time after a child's admission to the hospital unit, and log-rank tests were used to compare the survival time between MAM or SAM groups. Afterwards, Kaplan–Meier survival analyses was also analyzed in relation to sociodemographic and clinical variables in SAM group and MAM group separately. Principal component analysis was analyzed for quantitative variables. Chi-squared tests were employed to analyze the relationship between qualitative variables with a normal distribution. The relationship between quantitative variables without a normal distribution was analyzed using Spearman rank correlations and the difference between the medians was analyzed with Mann–Whitney U tests. The frequencies, means, medians, *SD*s, and minimum and maximum values were used in the descriptive statistical analysis. All the analyzes were performed using a 95% confidence interval and p-values < 0.05 were considered significant for the Kaplan–Meier tests, Spearman correlations, and Mann–Whitney U tests, while p < 0.025 was considered bilaterally significant for the Chi-squared tests.

2.6. Ethical Considerations

The study was approved by the Ethics Committee at the Gambo hospital who also gave their consent to the communication of this data (Supplementary file 1). In addition, this research complied with the WHO general code of ethics and did not present any conflicts of interest. All the data collected during this work was treated confidentially in accordance with current regulations on the protection of personal data.

3. RESULTS

3.1. Socio-Demographic and Admission Characteristics of the Participants

Of the 653 children enrolled in the admissions and discharges registration book for hospitalizations of children with acute malnutrition, 213 were excluded because the information recorded about their progress was incomplete. Therefore, a final sample of 440 patients was used in this study (Figure 1): 53.2% were girls and 46.8% were boys. The mean age was 16 months, and the range was 2 days to 10 years. According to the age groups, 2 children (0.5% of the sample total) were newborns, 324 (73.6%) were infants, 97 (22%) were preschoolers, and 17 (3.9%) were school age. Most of the children were from urban populations (307; 69.8%) and the rest were from rural areas (133; 30.2%).

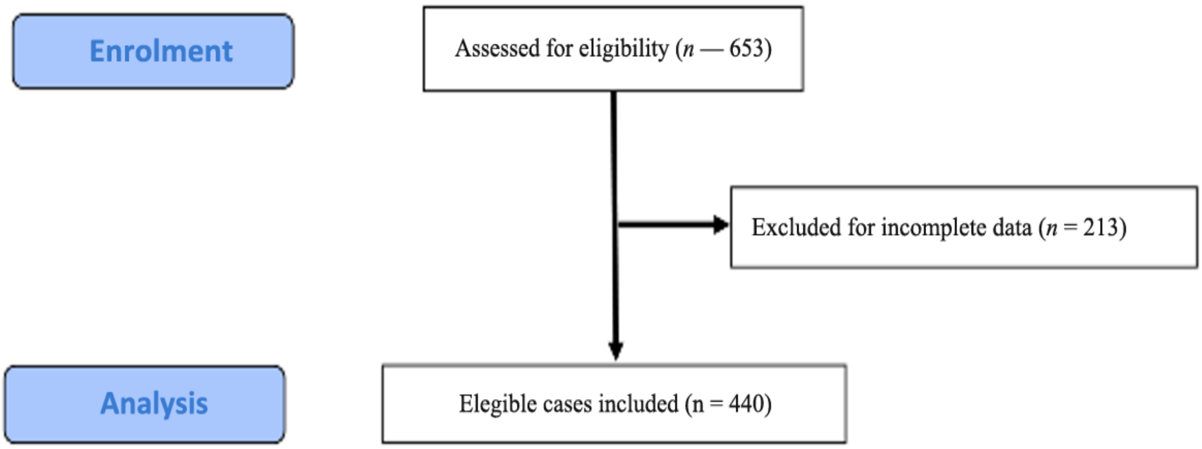

Figure 1. Flow diagram of participants.

3.2. Comorbidities, Nutritional Profile, and Recovery Status

The rate of MAM (229; 52%) was similar to that of SAM (206; 46.8%), and this data was not recorded in 5 cases. The most common medical symptoms or comorbidities were viral, bacterial, or fungal infection (153; 34.8%), parasitic infection (137; 31.1%), edema (72; 16.4%), and tuberculosis (21; 4.8%); 13% of the children had other comorbidities. The average admission weight was 6.83 kg, and this ranged from 1.2 kg to 17.7 kg; the median patient discharge weight was 7.7 kg, with a range of 2.63 to 23 kg. The median weight gain during hospitalization was 0.8 kg, with a minimum value of −2.8 kg in one child whose weight decreased, and a maximum value of 7.83 kg. The median length of stay was 18 days with a range from 0 to 122 days. Most of the children (304; 69.1%) recovered, 82 (18.6%) were transferred to more specialized hospitals, and 54 (12.3%) died during their hospital admission.

3.3. Relationship Between Malnutrition Level at Admission, Nutritional Recovery, and Sociodemographic and Clinical Variables

There was a significant relationship between the malnutrition level of the children at the time of admission, and qualitative sociodemographic and clinical variables for comorbidities, symptoms, and nutritional recovery. Regarding the latter, the results were significantly poorer in the SAM group compared to the MAM group, both for death (15.5% vs. 8.3%, respectively; $p = 0.000$) and transfers to another hospital (23.3% vs. 14.4%, respectively; $p = 0.000$). However, even though there was a significant difference between age and malnutrition level ($p = 0.000$), the Spearman's Rho value (−0.206) indicated that there was no correlation between them. Similarly, there was a weak negative correlation between the admission weight and malnutrition level (Spearman's Rho = −0.477; $p = 0.000$). There was also a significant difference in the average length of stay, discharge weight, and weight gain such that the discharge weight was higher for children with MAM while the weight gain and length of stay were higher for patients with SAM ($p < 0.05$; Table 1).

Table 1. Relationship between malnutrition level and sociodemographic and clinical variables.

Variables	Malnutrition level		P-value
	MAM	SAM	
Sex[a]	(*n* = 229)	(*n* = 206)	
Female	120 (51.3%)	111 (47.4%)	0.909
Male	109 (52.9%)	95 (46.1%)	
Age[b]	Correlation coefficient (−0.206)		0.000
Age group[a]	(*n* = 229)	(*n* = 206)	
Newborn	0 (0%)	2 (100%)	0.037
Infant	158 (48.9%)	161 (49.8%)	
Preschooler	59 (60.2%)	39 (39.8%)	
School-age	12 (70.6%)	4 (23.5%)	
Residence[a]	(*n* = 229)	(*n* = 206)	
Rural	64 (48.1%)	67 (50.4%)	0.520
Urban	165 (53.7%)	139 (45.3%)	
Medical symptoms or comorbidities[a]	(*n* = 229)	(*n* = 206)	
Edema	67 (93.1%)	5 (6.9%)	0.000
Viral, bacterial, or fungal infection	79 (51.6%)	73 (47.7%)	
Parasitic infection	55 (40.1%)	79 (57.7%)	
Tuberculosis	7 (33.3%)	14 (66.7%)	
Others	21 (36.8%)	35 (61.4%)	
Admission weight[b]	Correlation coefficient (−0.477)		0.000
Discharge weight[c]	233.10	154.75	0.000
Weight gain during hospitalization (Kg)[c]	0.154	0.250	0.000
Length of stay (days)[c]	200.64	236.17	0.003
Nutritional recovery[a]	(*n* = 229)	(*n* = 206)	
Recovery	177 (77.3%)	126 (61.2%)	0.000
Transfer to another hospital	33 (14.4%)	48 (23.3%)	
Death	19 (8.3%)	32 (15.5%)	

Note: MAM: Moderate acute malnutrition; SAM: severe acute malnutrition.
a: Chi-squared test, significant if $p < 0.025$.
b: Spearman correlation test, significant if $p < 0.05$.
c: Mann–Whitney U median difference test, significant if $p < 0.05$.

3.4. Determinants that Affect Survival of Children

Survival time differed according to the malnutrition level (log-rank $p < 0.05$). Survival was higher in children who had MAM at admission (101.9 ± 9.68 days; 95% CI: [82.9, 120.9]) compared to those with SAM (48.9 ± 1.9 days; 95% CI: [45.2, 52.6]); p=0.42. Figure 2.

In SAM group, the recovery analysis was not associated with sex or residence type. The Kaplan-Meier analysis in relation with age group and medical symptoms or comorbidities was not possible to calculate because all cases were censored. Table 2.

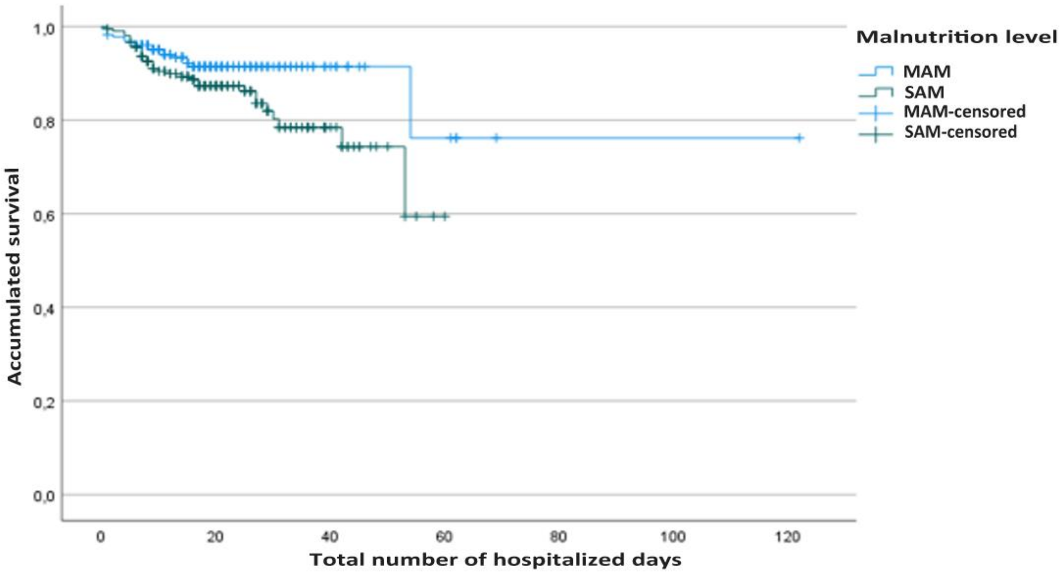

Figure 2. Survival time differed according to the malnutrition level.

Table 2. Kaplan–Meier survival analysis in relation to sociodemographic and clinical variables for SAM children.

Variables	95% Confidence interval				Log rank	
	Mean	SE	Lower limit	Upper limit	χ^2 value	p-value[a]
Sex	(n=206)					
Female	50.05	2.38	45.57	54.52	0.109	0.741
Male	46.92	2.62	41.79	52.06		
Residence	(n=206)					
Rural	42.05	2.61	36.94	47.17	2.448	0.118
Urban	50.24	2.20	45.93	54.55		

Note: SE: standard error.
a: Kaplan–Meier test. Chi-squared test, significant if $p < 0.05$.

Table 3. Kaplan–Meier survival analysis in relation to sociodemographic and clinical variables in MAM children.

Variables	Mean	SE	95% Confidence interval		Log rank	
			Lower limit	Upper limit	χ^2 value	p-value[a]
Sex	(n=229)					
Female	60.00	3.35	53.44	66.57	0.335	0.551
Male	113.11	3.30	106.65	119.57		
Age group	(n=229)					
Newborn	-	-	-	-	1.897	0.387
Infant	58.47	3.94	50.75	66.18		
Preschooler	117.62	3.05	111.65	123.59		
School-age	39.75	3.11	33.65	45.85		
Residence	(n=229)					
Rural	39.91	1.88	36.22	43.60	5.880	0.015
Urban	104.81	9.96	85.29	124.33		

Note: SE: standard error.
a: Kaplan–Meier test. Chi-squared test, significant if $p < 0.05$.

In MAM group, the recovery analysis was only associated with residence type: the mean survival time of children who came from urban areas was 104.81 days (95% CI: [85.29, 124.33]) compared to 39.91 days (95% CI:

[36.22, 43.60]) in children from rural areas (log-rank p = 0.015). The Kaplan-Meier analysis in relation with medical symptoms or comorbidities was not possible to calculate because all cases were censored. Table 3.

4. DISCUSSION

To the best of our knowledge, this is the only recent study that has analyzed the determinants of nutritional recovery status and survival among hospitalized children with acute malnutrition in Oromia, Ethiopia. And this is the first Oromia study carried out in a rural hospital.

In this study, 52% of the sample had SAM. Our findings imply that acute malnutrition more strongly affects infants (73%), meaning that age is a key factor in the development of this pathology. Although these results and the SAM rate described in this study were worrying, according to the meta-analysis by Yazew, et al. [22] the prevalence of this problem is also high in other regions of Ethiopia, with differences between the studies included perhaps being attributable to the sample cohorts or methodology applied. These authors [22] also described different factors that can affect the recovery of children with SAM, including their socioeconomic level, quality of care received, and accessibility to medication and nutrition therapies. Indeed, the large differences in the rates of MAM (92.9%) and SAM (7.1%) described in a study carried out in Niger can also be understood in this vein [23].

In addition, Seid, et al. [8] found an association between malnutrition and child age and residence, which correlated with the work by Atnafe, et al. [14] in which malnourished children from rural areas took longer to recover than those from urban areas. In other work, Mekuria, et al. [13] found an association between recovery time from SAM and access to health services. Similarly, others have argued that the scarcity of resources and difficulty in early access to healthcare may be factors that directly impact the differences between rural and urban environments [24, 25]. Along these lines, the study conducted in India by Degefie, et al. [26] showed that many patients in their cohort belonged to marginal population groups, which in turn, was related to poor knowledge about nutrition. However, Gebremichael [12] found no relationship between nutritional recovery time and the residence, sex, or age of the child cohort they analyzed.

Some studies have also shown the relationship between breastfeeding and malnutrition in children, especially in countries like Ethiopia [24]. This may be because of cultural factors related to feeding children, such as the pre-lacteal foods mothers give to their children before breastfeeding, the use of bottles, or discarding breast milk because it is not considered beneficial [27, 28]. Of note, in Ethiopia, only 58% of children aged under 6 months are exclusively breastfed [5]. In our study, most children that had suffered acute malnutrition were infants, and shorter breastfeeding periods, absence of milk in mothers, and use of supplements or hygienic practices during breastfeeding were associated with lower patient weight. In agreement, Girma, et al. [24] found that children who were breastfed for fewer than 24 months were 2.6 times more malnourished than those who were breastfed for longer. Moreover, medical symptoms and comorbidities can become even more acute depending on the patients' residence, and children from rural settings had the lowest survival times, a finding which agrees with other studies. For example, Tsegaye, et al. [25] found that mothers living in urban settings in Ethiopia were 7-fold more likely to exclusively breastfeed than those living in rural settings, which would correspond to the most malnourished children in this current study—those of breastfeeding age from rural settings.

Thus, despite macroeconomic growth in Ethiopia and the Ethiopian government's plan to reduce child malnutrition, there was no concomitant improvement in children's nutritional levels [29]. The same authors indicated that, rather than economic growth per se, increasing mothers' education about breastfeeding and feeding children could do more to improve this situation. This idea is supported by the United Nations Children's Fund (UNICEF) [1] which is committed to promoting the position of women in society because they strongly influence dietary choices at a populational level. Similarly, Tsegaye, et al. [25] found that Ethiopian mothers' lack of knowledge about exclusive breastfeeding, and traditional beliefs, myths, and misconceptions about breastfeeding were barriers that hindered the reduction of child malnutrition.

We found lower rates of discharges to home in our study (69.1%) compared to Jarso, et al. [16] (77.8%) and Gebremichael [12] (82.4%). In addition, compared to the 12.3% we found in this present study, disparate death rates were reported elsewhere in the scientific literature: 42% by Kerac, et al. [30] 9.3% by Gebremichael [12] and Jarso, et al. [16] 4.4% by Mena, et al. [11] and 4.4% by Teferi, et al. [10]. This difference may be because of dissimilarities in the participant inclusion criteria and the severity of the cases, treatment protocols, management team, and medical supplies considered in these studies. For example, the very high figures reported by Kerac, et al. [30] could be explained by the presence of Human Immunodeficiency Virus-positive participants with an unknown serological status, while the low rates indicated by Teferi, et al. [10] may be because these authors analyzed 6 different areas of southern Ethiopia, some of which had a recovery rate of 92%. Focusing on our work, it is worth noting that the death rates of acutely malnourished children from the district of *(blinded for review)* admitted to *(blinded for review)* hospital have substantially decreased in recent years to 1.22% in 2018 and 0.96% in 2019. However, more children had also been referred to other centers during our study period compared with later years (31% and 39.1% in 2018 and 2019, respectively). Therefore, the nutritional program implemented there seems to have had a positive effect [19].

Some authors [12] have indicated that for a therapy to be considered effective, the death rates in centers implementing therapeutic feeding, like the one from our work, should be less than 5%. They also noted that high mortality rates might be related to other factors such as comorbidities or poor adherence to the WHO therapeutic guidelines. Thus, the implementation of activities such as a community program to prevent acute malnutrition, or the availability of more training courses, could help improve mortality rates [19]. Importantly, factors associated with the death rate (such as infections) may hinder the improvement of malnutrition levels in children in Ethiopia. Similarly, several authors [23, 31, 32] have described how malnutrition is associated with immunosuppression, thereby contributing to the development of comorbidities such as diarrhea, malaria, or pneumonia which, in turn, favor continued malnutrition [31, 33]. This situation is aggravated in breastfeeding infants because nutritional status is the main factor that determines immune competence at this age and it plays a fundamental role in the evolution of infectious comorbidities [27].

The results shown in this study may improve the care of children with acute malnutrition. In MAM children, the worst survival times have been described in rural areas. In this sense, it is necessary to improve the conditions of this environment, for example through the use of adequate water and sanitation systems and improving access to health care. In that way, UNICEF [1] indicates that these mentioned factors are one of the causes of child malnutrition. In fact, in Ethiopia, only 57% of rural houses have access to improved drinking water and only 7% have soap and water, which are essential for hand washing [5]. In addition, health professionals should work in promotion health activities and early detection of malnutrition in this population group.

Finally, this study had some limitations. Firstly, because it was retrospective, it was subject to information, selection bias, and measurement errors. We tried to minimize information bias by following a standardized data collection protocol for the entire cohort. Measurement errors were minimized when the original data was recorded by using a standardized analysis protocol. Secondly, the data presented here must be considered as a representative sample of the district of *(blinded for review)*; therefore, because we used convenience sampling, these data cannot be generalized to the child population as a whole in Oromia. Thirdly, the absence of patient follow-ups means that we do not know how the children referred to other hospitals evolved, and so this participant data remains unknown.

5. CONCLUSIONS

Most children with acute malnutrition in Oromia were infants with infections who lived in urban areas. The recovery rate and survival time was shorter in children with SAM at the time of admission compared with MAM. In MAM children, survival time was shorter in children who came from rural areas compared to urban areas. A diagnosis of SAM upon admission was associated with the presence of infections or tuberculosis, as well as with longer hospital stays, higher death rates, or transfer to another hospital.

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Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study.

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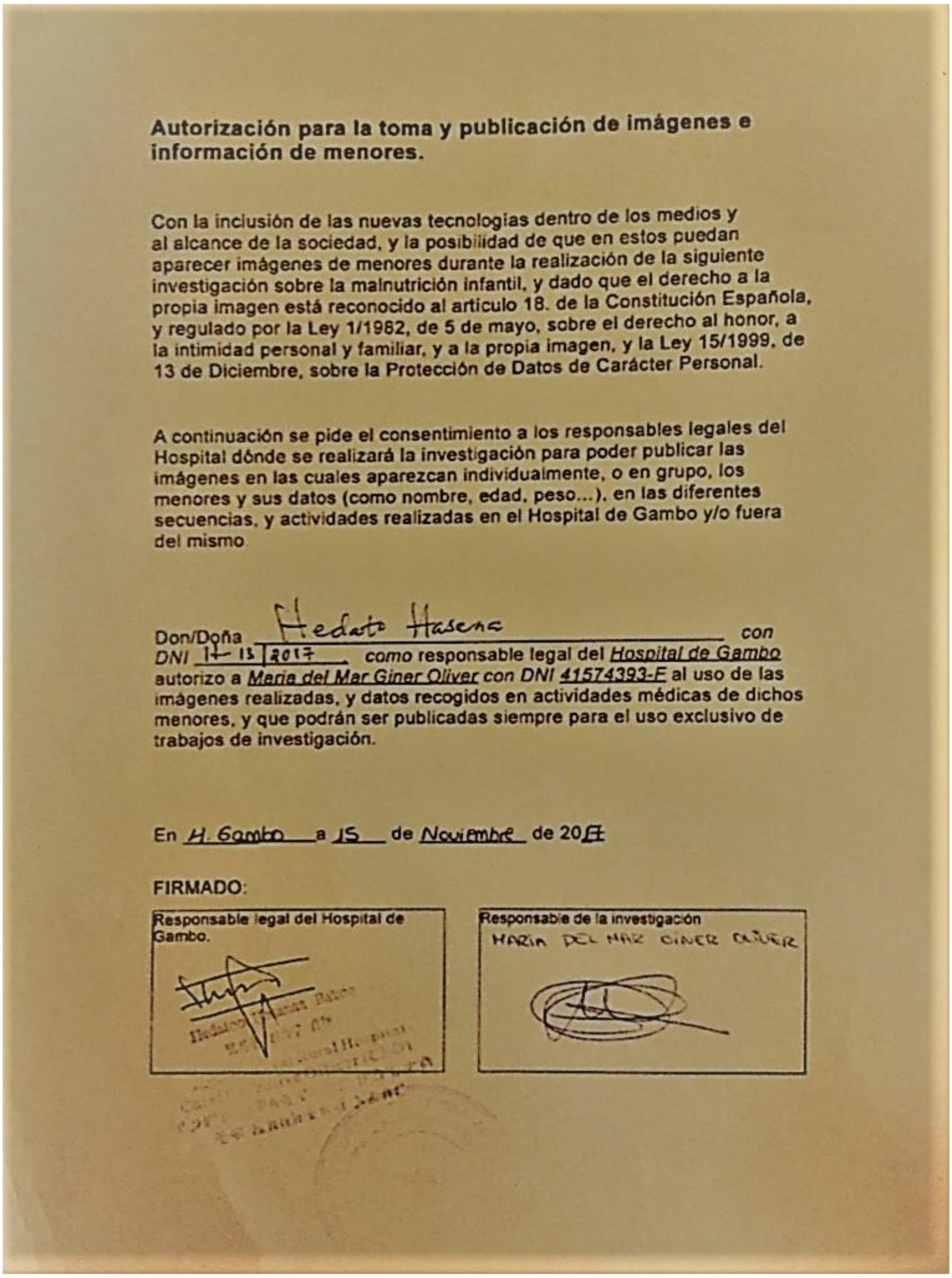

Autorización para la toma y publicación de imágenes e información de menores.

Con la inclusión de las nuevas tecnologías dentro de los medios y al alcance de la sociedad, y la posibilidad de que en estos puedan aparecer imágenes de menores durante la realización de la siguiente investigación sobre la malnutrición infantil, y dado que el derecho a la propia imagen está reconocido al artículo 18. de la Constitución Española, y regulado por la Ley 1/1982, de 5 de mayo, sobre el derecho al honor, a la intimidad personal y familiar, y a la propia imagen, y la Ley 15/1999, de 13 de Diciembre, sobre la Protección de Datos de Carácter Personal.

A continuación se pide el consentimiento a los responsables legales del Hospital dónde se realizará la investigación para poder publicar las imágenes en las cuales aparezcan individualmente, o en grupo, los menores y sus datos (como nombre, edad, peso...), en las diferentes secuencias, y actividades realizadas en el Hospital de Gambo y/o fuera del mismo.

Don/Doña Hedato Hasena con *DNI* 11-15/2017 *como* responsable legal del *Hospital de Gambo* autorizo a *Maria del Mar Giner Oliver con DNI 41574393-F* al uso de las imágenes realizadas, y datos recogidos en actividades médicas de dichos menores, y que podrán ser publicadas siempre para el uso exclusivo de trabajos de investigación.

En H. Gambo a 15 de Noviembre de 2017

FIRMADO:

Responsable legal del Hospital de Gambo.	Responsable de la investigación
	MARIA DEL MAR GINER OLIVER

Appendix: Supplementary file 1. Presents the consent of the Gambo hospital to the communication of the data of the study.