

## Profile of Pediatric Patients with Severe Acute Malnutrition in a Tertiary Hospital in Southern Philippines

Elaera Faith S Medrano<sup>1</sup>, Ameleen B Bangayan<sup>1,2</sup>, Genevieve Dable-Tupas<sup>1,2,3,4</sup>, Genelynne J Beley<sup>1,2,3\*</sup>

<sup>1</sup>Department of Pediatrics, Southern Philippines Medical Center, Davao City, Philippines

<sup>2</sup>Department of Pediatrics, Davao Medical School Foundation, Davao City, Philippines

<sup>3</sup>Department of Biochemistry, Davao Medical School Foundation, Davao City, Philippines

<sup>4</sup>Department of Pharmacology, Davao Medical School Foundation, Davao City, Philippines

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**Citation:** Elaera Faith S Medrano, Ameleen B Bangayan, Genevieve Dable-Tupas, Genelynne J Beley. Profile of Pediatric Patients with Severe Acute Malnutrition in a Tertiary Hospital in Southern Philippines. *Int Clin Med Case Rep Jour*. 2023;2(9):1-10.

**Received Date:** 15 March, 2023; **Accepted Date:** 20 March, 2023; **Published Date:** 22 March, 2023

**\*Corresponding author:** Genelynne J Beley, Department of Pediatrics, Southern Philippines Medical Center, Davao City, Philippines

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### ABSTRACT

**Objective:** This study aimed to describe the demographic and clinical profile of patients with Severe Acute Malnutrition (SAM) in a tertiary hospital in Davao City from December 2017 to December 2019.

**Methodology:** A retrospective descriptive study design was utilized through review of medical charts conducted in a tertiary hospital in Davao City. A total of 123 patients were included. Data were analyzed with Excel and R Software using frequency and percentages for categorical variables, while, mean, standard deviation and median were used for continuous variables. Proportion tests with one sample and normal approximation were used for three or more categorical variables. The primary outcome measures included the demographic and clinical profile of SAM patients. Prevalence rate and relationships among variables were the secondary outcomes.

**Results:** The prevalence rate of SAM among pediatric patients in a tertiary hospital in Davao City is 0.94% (n=132). SAM was more evident among females, aged 13-24 months old, among those with unmarried parents with one or none of the parents were employed and belonged to a small family. Diarrhea was the most common presenting complaint and respiratory tract infection was the most common comorbidity. Among those with known illness, SAM was more prevalent among patients who have had previous hospital confinement than those who were managed as outpatient. Significant relationships were established between SAM and the demographic and clinical profile of patients; however, it was observed that SAM occurs regardless of gender.

**Conclusion:** SAM was more common among females, 13 to 24 months of age, with unmarried parents. Diarrhea was the most common presenting complaint while respiratory tract infection was the most common comorbidity. The findings of this study support that SAM is both a socio-demographic and a clinical problem.

**Research Article (ISSN: 2832-5788)**

Improved community prevention strategies and health education should focus on seeking early treatment and appropriate nutritional management.

**Keywords:** Severe acute malnutrition; Malnutrition; Edema; Diarrhea; Community

**INTRODUCTION**

Malnutrition refers to deficiencies, excesses or imbalances of a child's intake of nutrients and energy. Two broad groups of malnutrition are undernutrition and overnutrition, whereby the former includes stunting, wasting and underweight while the latter comprises overweight, obesity and diet-related non-communicable diseases. Malnutrition during childhood does not only lead to long-term health problems but also impacts on adolescent neurodevelopment, future educational challenges and limited work opportunities in the future as it significantly affects brain development.<sup>[1]</sup>

Severe acute malnutrition (SAM) is defined as visible severe wasting manifested by weight-for-height of 3 standard deviations (SD) or more below the mean National Center for Health Statistics reference values, mid-upper arm circumference of less than 11.5 centimeters in children 6-59 months and presence of bilateral pitting edema.<sup>[2,3]</sup> It is a result of one or a combination of the following factors: insufficient food intake, concurrent or repeated bouts of infection and inappropriate childcare practices. Children with SAM have nine times higher risk of dying than well-nourished children.<sup>[1]</sup>

The State of The World's Children: Children, Food and Nutrition revealed that one in three Filipino children under the age of five are stunted, therefore, they are considered to be shorter for their age, while approximately 7 percent of children are thin for their height and/or length. Many children who suffer inadequate nutrition from the time they were still in the mother's wombs to after being born, end up stunted or three SD or more below the height-for-age, which would irreversibly be affected with early death or a recurrent illness, development and cognitive problems.<sup>[4]</sup>

The Philippine Strategic Framework for Comprehensive Nutrition Implementation Plan 2014-2015, laid down integrated plans for nutrition with nutrition-specific programs and outlined multi-sector approach, launched by UNICEF with the Department of Health (DOH). Philippine Integrated Management of Acute Malnutrition (PIMAM) is one of the components that focuses on the management of moderate and severe acute malnutrition that relies on the community mobilization and participation in preventing and treating malnutrition.<sup>[1]</sup>

In 2014, Integrated Management of Acute Malnutrition (IMAM) was integrated and institutionalized in the local health system of Davao City as an Executive Order No.26. In 2015, there were 176 barangays that are already operational as out-patient therapeutic care (OTC) facilities throughout Davao City. It led the implementation of updated and scientifically proven protocols used by trained health providers to manage acute malnutrition cases among children age 6-59 months down to the barangay level.<sup>[1]</sup>

At any point in time, a number of Filipino children under five years are severely wasted and are dangerously undernourished to survive, grow and develop to their full potential. Relative to this, one of the tertiary hospitals in Davao City became the first fully functional in-patient therapeutic care (ITC) facility in 2017. The use of standardized protocol-based management is being set up for inpatient management of severely malnourished children based on the guidelines on the management of SAM by UNICEF, which include nutritional management and management of medical complications.

**Research Article (ISSN: 2832-5788)**

To date, no study has been done relative to the implementation of SAM program in an in-patient facility. As the first health care institution in the Philippines to fully implement the program, the clinical profile of SAM patients admitted in a tertiary hospital in Davao City remains to be unknown.

Therefore, this study will provide information on the profile of these patients, which may help assess and improve existing policies and programs to help eradicate malnutrition in our country.

**METHODOLOGY**

The study aimed to describe the profile of patients with severe acute malnutrition in a tertiary hospital in Davao City, Philippines at Southern Philippines Medical Center from December 2017 to December 2019. Demographic and clinical profile according to the patients' presenting complaint upon admission, presence or absence of bilateral pitting edema, presence or absence of a medical complication or comorbidity, presence or absence of a previous illness, managed whether as out-patient or in-patient and feeding history. The relationship between the prevalence of SAM with the demographic and clinical profile were also taken. This study utilized a retrospective descriptive study design which made use of patients' medical records to gather the data and analyze the results. It was carried out in a tertiary hospital in Davao City at Southern Philippines Medical Center. It included all patients who belong to ages 6-59 months, which were classified as Severe Acute Malnutrition upon hospital admission or discharge from December 2017 to December 2019 fulfilling any of the criteria for SAM adapted from UNICEF such as: a) severe wasting as evidenced by a mid-upper arm circumference (MUAC) of  $<11.5$  cm and weight-for-height  $< 3$  SD b) nutritional edema in the form of bilateral pitting edema of any grade and Kwashiorkor.

Data gathered were analyzed using Excel and R Software. The demographic and clinical profile was described using frequency and percentages for categorical variables and mean, standard deviation and median for continuous variables. Proportion test with one sample and normal approximation for three or more categorical variables was utilized in determining any relationship of SAM prevalence to participants' demographic and clinical profile.

**RESULTS**

From December 2017 to December 2019, the department of Pediatrics had a total admitted patients of 45,165 in all age groups, 14,007 of which are patients aged 6-59 months. Among this age group, 132 patients were identified with severe acute malnutrition, which resulted to a prevalence of 0.94%. However, only a total of 123 charts were successfully retrieved. Ninety eight (98) out of 123 (79.7%) of these patients were residents of Davao City.

Most of the admitted SAM patients were aged 13 to 24 months, female, and residents of Davao City (79.7%). Majority of the fathers were employed while most of the mothers were unemployed. Most of the parents were not married with small family size (Table 1).

From the study group, the most frequent presenting complaint was diarrhea (24.4%), followed by cough (22.8%) and fever (19.5%). All patients had medical complications with respiratory tract infection as the most common (49.6%). Majority (72.4%) did not present with bilateral edema. More than half (58.9%) of the patients did not

## Research Article (ISSN: 2832-5788)

have history of previous illnesses, however, only 35.8% affirmed to have been exclusively breastfed for at least 6 months, while more than half of the patients had no data available relative to their feeding history (Table 2).

The greatest proportion of SAM was evident among 13-24 months old (36.6%) and were Davao City residents (79.7%). There is no association between gender and the prevalence of SAM (p-value 0.528). Moreover, with regards to parents' occupations, results of the study showed that an employed father (p-value= 0.003) or unemployed mother (p-value <0.0001) were significantly associated with the prevalence of SAM. This could be associated with lesser financial capacity to provide quality food and seek health care. There was also a significant association between the prevalence of SAM and both the parent's marital status (p-value 0.0001) and the family size, where the proportion of SAM was greater among unmarried parents (70.4%) and more evident among small family in more than half (55.1%) of cases (Table 3).

The prevalence of SAM is significantly associated with the presenting complaints and concomitant medical conditions, whereby the greater proportion of SAM was found to be more evident among patients who presented with diarrhea (24.4%), closely followed by cough (22.8%) and similarly a greater proportion of SAM was found among patients with concomitant respiratory tract infection (49.6%), followed by gastrointestinal tract infection (41.5%). Also, the SAM prevalence, in contrast, was observed to be greater among patients with history of previous illness. There is not enough evidence to conclude that there is a significant association between feeding practices and SAM since more than 50% of the responses had no record on feeding practices. Out of the available data, feeding practices is not a reliable factor in predicting the prevalence of SAM (Table 4).

**Table 1:** Demographic Profile of SAM pediatric patients in a tertiary hospital, n = 123.

Demographic	Frequency (%)
<b>Age (in months)</b>	
6-12	26 (21.1%)
13-24	45 (36.6%)
25-36	21 (17.1%)
37-59	31 (25.2%)
<b>Sex</b>	
Male	58 (47.2%)
Female	65 (52.8%)
<b>Residence Address</b>	
Davao City	98 (79.7%)
Outside Davao City	25 (20.3%)
<b>Socio-economic Status</b>	
<b>Father's Occupation</b>	
Employed	47 (38.2%)
Unemployed	22 (17.9%)
Not Applicable	54 (43.9%)
<b>Mother's Occupation</b>	
Employed	20 (16.3%)
Unemployed	68 (55.3%)
Not Applicable	35 (28.5%)
<b>Marital Status</b>	
Married	27 (22.0%)
Unmarried	69 (56.1%)
Separated	2 (1.6%)
Not Applicable	25 (20.3%)
<b>Family size</b>	

Less than 5	54 (43.9%)
5 and more	39 (31.7%)
Not applicable	30 (24.4%)

**Table 2:** Clinical Profile of SAM pediatric patients in a tertiary hospital, n = 123.

Clinical Profile	Frequency (%)
<b>Presenting complaint</b>	
Diarrhea	30 (24.4%)
Cough	28 (22.8%)
Fever	24 (19.5%)
Vomiting	15 (12.2%)
Edema	7 (5.7%)
Loss of appetite	3 (2.4%)
Abdominal Distention	3 (2.4%)
Others	6 (4.9%)
<b>Bilateral Pitting Edema</b>	
Present	34 (27.6%)
Absent	89 (72.4%)
<b>Medical Complication</b>	
Gastrointestinal Tract Infection	51 (41.5%)
Respiratory Tract Infection	61 (49.6%)
Urinary Tract Infection	2 (1.6%)
Septicemia	9 (7.3%)
<b>Previous Illness</b>	
OPD	14 (11.4%)
Hospital Admission	37 (30.1%)
Absent	72 (58.5%)
<b>Exclusive breastfeeding</b>	
Yes	44 (35.8%)
No	17 (13.8%)
Not available	62 (50.4%)
<b>Mixed feeding</b>	
Yes	24 (19.5%)
No	17 (13.8%)
Not available	82 (66.7%)
<b>Milk formula</b>	
Yes	23 (18.7%)
No	0 (0.0%)
Not available	100 (81.3%)
<b>Complementary feeding</b>	
Yes	12 (9.8%)
No	0 (0.0%)
Not available	111 (90.2%)
<b>Table Food</b>	
Yes	6 (4.9%)
No	0 (0.0%)
Not available	117 (95.1%)

**Table 3:** Association between SAM and demographic profile of pediatric patients in a tertiary hospital.

Demographic	Severe Acute Malnutrition (%)	p-value
<b>Age (in months)</b>		0.015*
6-12	26 (21.1%)	
13-24	45 (36.6%)	
25-36	21 (17.1%)	
37-59	31 (25.2%)	
<b>Sex</b>		0.528
Male	58 (47.2%)	
Female	65 (52.8%)	
<b>Residence Address</b>		< 0.0001*
Davao City	98 (79.7%)	
Outside Davao City	25 (20.3%)	
<b>Socio-economic Status</b>		
Father's Occupation		
Employed	47 (68.1%)	0.003*
Unemployed	22 (31.9%)	
Mother's Occupation		
Employed	20 (22.7%)	< 0.0001*
Unemployed	68 (77.3%)	
<b>Marital Status</b>		< 0.0001*
Married	27 (27.6%)	
Unmarried	69 (70.4%)	
Separated	2 (2.0%)	
<b>Family size</b>		< 0.0001*
Less than 5	54 (55.1%)	
5 and more	39 (42.9%)	

\*Significant p-value &lt; 0.05 level.

**Table 4:** Association between SAM prevalence and clinical profile of pediatric patients in a tertiary hospital.

Clinical Profile	Severe Acute Malnutrition (%)	p-value
<b>Presenting complaint</b>		< 0.0001*
Diarrhea	30 (24.4%)	
Cough	28 (22.8%)	
Fever	24 (19.5%)	
Vomiting	15 (12.2%)	
Edema	7 (5.7%)	
Loss of appetite	3 (2.4%)	
Abdominal Distention	3 (2.4%)	
Others	6 (4.9%)	
<b>Bilateral Pitting Edema</b>		< 0.0001*
Present	34 (27.6%)	
Absent	89 (72.4%)	
<b>Medical Complication</b>		
Gastrointestinal Tract Infection	51 (41.5%)	

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Respiratory Tract Infection	61 (49.6%)	< 0.0001*
Urinary Tract Infection	2 (1.6%)	
Septicemia	9 (7.3%)	
<b>Previous Illness</b>		
OPD	14 (11.4%)	< 0.0001*
Hospital Admission	37 (30.1%)	
Absent	72 (58.5%)	
<b>Feeding History</b>		
Exclusive breastfeeding		
Yes	44 (35.8%)	-
No	17 (13.8%)	
Not available	62 (50.4%)	
Mixed feeding		-
Yes	24 (19.5%)	
No	17 (13.8%)	
Not available	82 (66.7%)	-
Milk formula		
Yes	23 (18.7%)	
No	0 (0.0%)	-
Not available	100 (81.3%)	
Complementary feeding		
Yes	12 (9.8%)	-
No	0 (0.0%)	
Not available	111 (90.2%)	
Table Food		
Yes	6 (4.9%)	-
No	0 (0.0%)	
Not available	117 (95.1%)	

## DISCUSSION

Severe acute malnutrition is often classified as complicated if the patient comes in with symptoms of infection, poor appetite or bilateral pitting edema. The result of the study shows that 79.7% of SAM patients admitted in the tertiary hospital are Davao City residents and is comparable to the local data from the National Nutrition Council Region XI (2016), where Davao City has the highest number of underweight children among the provinces in the region with 10.95% in 2015.<sup>[6]</sup>

The findings on the demographic profile of SAM patients admitted in the tertiary hospital are similarly observed in a prospective observational study done in India which revealed that the incidence of SAM is 3.28% with a mean age of  $14.92 \pm 7.48$  months and affecting female patients more than males, however, belonging to a large family with 5 or more family members.<sup>[7-9]</sup> This area of contradiction of can be contributed to the 24.4% of SAM patients with no record of family size.

In another multivariable study on the household-level risk factors among SAM patients, it was observed that the odds of SAM was higher among children who caretakers' marriage status is of that unmarried or living alone.<sup>8</sup> This is comparable to the results of this study where it also shows that SAM is more evident among unmarried parents (56.7%). Economic strain for food consumption were observed among families whose parents are unmarried or earning alone and among households with greater or equal to five family members.<sup>[10]</sup> In another community-based study conducted in Northern Ethiopia, it was observed that the odds of stunting for children born to mothers who were never married are 56% higher compared to those who are currently in union.<sup>[11,12]</sup>



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This study, however, does not explore whether or not unmarried parents cohabit and financially support each other.

The most common presenting complaint of the patients was diarrhea (24.4%), followed by cough (22.8%), fever (19.5%), vomiting (12.2%), edema (5.7%), loss of appetite (2.4%) and abdominal distention (2.4%). Also, the most common identified medical complication were respiratory tract infection (49.6%), followed by gastrointestinal tract infection (41.5%), septicemia (7.3%) and urinary tract infection (1.6%). These results seem to contradict the findings of a prospective observational study done in India<sup>9</sup>, where the most common presenting complaint was fever (70.7%), followed by vomiting (51%), diarrhea (46.7%), cough (46.7%), loss of appetite (30.7%), edema (14.75) and abdominal distention (6.7%). Additionally, it identified that the most common comorbidities were gastrointestinal tract infection (52%) and respiratory tract infection (52%), followed by urinary tract infection (4%) and septicemia (1.3%).<sup>[9]</sup>

Most of the patients admitted in this institution were found to be non-edematous (72.4%). In contrast to a cross-sectional study by Kumar, D. et al (2020), 53.27% of patients included in the study were edematous. In addition, their study found that mortality was significantly higher in edematous malnutrition than non-edematous malnutrition (66.6% vs 33.3%).<sup>15</sup> In this study, we have low incidence of edematous malnutrition.

A study conducted in Ghana showed that the odds of being malnourished were 1.7 times higher in children with mixed breastfeeding in less than 6 months compared to children who were exclusively breastfed for first six months and that malnourished children were found more among those who were introduced with complementary food at less than 6 months old.<sup>[11-15]</sup> It is noteworthy that this study was limited only to chart review, whereby additional information such as the nutrition status of the caregiver, as well as the duration and frequency of breastfeeding are not explored. Missing or incomplete data may have affected the representation of SAM patients in this study, therefore, with only the available data, it is inconclusive that feeding history is associated with the prevalence of SAM.

**Diagnosis**

The new WHO growth standards observed that the effect of ethnic differences on the growth of infants and children in populations is small compared with the effects of the environment. Studies have also shown that there may be some ethnic differences among groups, just as there are genetic differences among individuals, but for practical purposes they are not considered large enough to invalidate the general use of the WHO growth standards population as standard in all populations. The diagnosis of SAM as recommended by WHO (2005), is defined as weight-for-height below -3 SD, a mid-upper arm circumference of 115 and/or the presence of edema.<sup>[1]</sup>

The rationale of utilizing these cut-offs is relative to the relationship of weight-for-height and risk of dying reassessed in several existing epidemiological studies, showing that a weight-for-height below -3 SD based on WHO growth standards have a more than 9-fold risk of death than that of children with weight-for-height above -1 SD. Similar analysis using MUAC showed that the risk of dying is increased below 115mm. Moreover, statistical theory shows that in a well-nourished population, only 0.13% of children have a weight-for-height less than -3 SD, yielding a specificity of greater than 99% for this cut-off.<sup>[1]</sup>

**Complication**



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Malnutrition at the early stages of life can increase the risk of infection, morbidity and mortalities that subsequently decrease mental and cognitive development. When there is an insufficient food intake to meet the body's daily needs, physiologic and metabolic changes take place in an orderly progression to conserve energy and prolong life. Some of the important consequences are hypoglycemia due to less readily available glucose, less heat production making the child more vulnerable to hypothermia, increasing risk for fluid overload and cardiac failure, impaired immune function and undiagnosed infections.<sup>[5]</sup>

**Management**

The management of severe acute malnutrition is gradual. It follows the principle of stabilization and rehabilitation. The goal of stabilization phase is to repair cellular function, correct fluid and electrolyte imbalance, restore hypoglycemia, hypothermia, and infection, while in rehabilitation phase, the goal is to restore wasted tissues. It is essential that the interventions proceed in an orderly progression to avoid potentially fatal complications.<sup>[5]</sup>

In emergency setting, patients who are severely malnourished usually come to the emergency room with manifestations of shock. They may present with dehydration, poor feeding and body weakness. In-patient care for children with SAM aged 6 to 59 months therefore focuses primarily on both the nutritional needs and medical stabilization of the patient. Generally, with reductive adaptation, the usual signs of infection in a SAM patient are not apparent, thus, nearly all children with SAM are assumed to have bacterial infection and routine medications are given among SAM patients

**CONCLUSION**

The Department of Pediatrics in a tertiary hospital in Davao City recorded 123 patients aged 6-59 months diagnosed with severe acute malnutrition (SAM), with a prevalence rate of 0.94% since December 2017 to December 2019. SAM was more common among females, 13 to 24 months of age, with unmarried parents. Diarrhea was the most common presenting complaint while respiratory tract infection was the most common comorbidity. The findings of this study support that SAM is both a socio-demographic and a clinical problem. Improved community prevention strategies and health education should focus on seeking early treatment and appropriate nutritional management.

**ABBREVIATIONS**

SAM	Severe Acute Malnutrition
DOH	Department of Health
IMAM	Integrated Management of Acute Malnutrition
PIMAM	Philippine Integrated Management of Acute Malnutrition
SD	Standard deviations
OTC	Out-patient therapeutic care

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