The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 7, 2025

FREQUENCY OF REFEEDING SYNDROME IN CHILDREN HAVING SEVERE ACUTE MALNUTRITION FORM AGE OF 06 MONTH TO 59 MONTH PRESENTING IN NUTRITIONAL STABILIZATION CENTRE AT LIAQUAT UNIVERSITY OF MEDICAL AND HEALTH SCIENCE

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DOI: https://doi.org/10.5281/zenodo.17519246

Keywords
Severe Acute Malnutrition, Refeeding Syndrome, Electrolyte Imbalance, Pediatric Malnutrition, Nutritional Rehabilitation, Serum Phosphate

Article History
Received: 03 April 2025
Accepted: 16 June 2025
Published: 15 July 2025

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Abstract

Objective: *To determine the frequency of Refeeding Syndrome in children aged 6 to 59 months diagnosed with SAM.*

Study Design: *Cross-Sectional Observational Study.*

Place and Duration of Study: *Nutritional Stabilization Centre at Liaquat University of Medical and Health Sciences (LUMHS), Hyderabad, From Dec, 20-2024 to Mar,19-2025.*

Methodology: *There was a cross-sectional study used in the study of 160 children who fulfilled WHO criteria of SAM. The anthropometric, sociodemographic, and clinical data were taken. Serum sodium, potassium, magnesium and phosphate were performed in laboratory studies. Refeeding Syndrome was identified as being present with one or more of the following: hypophosphatemia (<2.5 mg/dL), hypokalemia (<3.5 mg/dL) or hypomagnesemia (<1.8 mg/dL). The processing of the data was carried out with the help of SPSS. The Shapiro-Wilk test was used to examine normalcy. Categorical independent variables were provided as frequencies and percentages and post-stratification chi-square were used, and the results with $p < 0.05$ were deemed to be significant.*

Results: *The median age of the children was 32 months (IQR: 21–46 months), and the number of girls and boys was evenly distributed. Most of the children were in the low socioeconomic status bracket (58.1 %) and of rural origin (53.1%). The prevalence of Refeeding Syndrome was registered in 127 children (79.4%), which is much higher than that of the estimates worldwide. Low MUAC score, poor maternal education and low socioeconomic status were commonly related with electrolyte abnormalities.*

Conclusion: *In early nutrition rehabilitation, it is frightening that Refeeding Syndrome is very common in youngsters experiencing SAM. The results emphasize the necessity of close electrolyte management strategies and biochemical monitoring that should be started early. Properly reinforced clinician awareness and incorporation of electrolyte correction as part of regular SAM care pathway*

can minimize the number of preventable deaths through the first 72-hour period of feeding.

INTRODUCTION

Severe Acute Malnutrition (SAM) is a worldwide reported difficult public health condition, which compromises childhood morbidity and mortality. Formerly under the conditions of marasmus and kwashiorkor, the SAM is characterized by severe wasting, severe nutritional deficits, and high mortality risks mainly from complications of infectious diseases. Worldwide, SAM affects about 20 million children, which causes about 1.5 million preventable deaths every year. In Pakistan, malnutrition is especially common and it is responsible for almost 35 % of deaths of children under five years of age, whose mortality is also worsened by such infectious diseases as diarrhea, pneumonia, measles and malaria (1).

The nutritional rehabilitation through specialized therapeutic foods such as Ready-to-Use Therapeutic Foods (RUTF) is among the clinical management options of SAM where there are balanced proportions of energy, macronutrients, and micronutrients required for recovery. Nevertheless, this nutritional rehabilitation may at times result in refeeding syndrome as a potentially fatal complication due to the erratic changes in electrolytes especially potassium, magnesium and phosphates when severely malnourished children switch from a catabolic to an anabolic metabolic state. This electrolyte imbalance is mostly detected in the initial 48-72 hours of nutritional rehabilitation, which corresponds to the maximum rates of mortality in the cases of SAM (2).

Although clinically important, refeeding syndrome continues to be underreported and poorly defined especially in the resource-limited settings. Studies have been made in the past on the incidence of refeeding syndrome, from 6% for adolescents with anorexia nervosa to 13.4% in the case of children with SAM (3). However, the local data on Pakistan is still scarce. That's why we cannot understand this complication better and not take more effective measures to address it.

Considering the scarcity of regional data and criticality of early diagnosis and management, this study has an aim of determining the frequency of refeeding syndrome in children diagnosed with severe acute malnutrition (SAM) hospitalized at Nutritional Stabilization Centre at Liaquat University of Medical and Health Sciences Hyderabad. With the detection of early electrolyte disturbances signaling the presence of refeeding syndrome, the healthcare givers will take timely interventions, targeting to reduce morbidity and mortality related to severe acute malnutrition (4,5).

METHODOLOGY

This research was carried out as a descriptive cross-sectional study at the Nutrition Stabilization Centre of the Pediatrics Department, Liaquat University Hospital Hyderabad (from Dec-20-2024 to Mar-19-2025). The study took a maximum of six months after the synopsis was approved by the College of physicians and surgeons Pakistan (CPSP). From previous studies, refeeding syndrome was found to be prevalent at 14% (6). Therefore, after taking into account the calculated sample size to be statistically relevant (95% CI, 5% margin of error). The sample was 160 children; this study includes 160 patients as rest didn't consent. A non-probability consecutive sampling technique was applied in attaining the study participants. The inclusion criteria: 6-59-month children of any gender with SAM (weight-for-length/height z-score<-3SD, bilateral edema, or MUAC<115 mm). Exclusion in criteria included refusal to participate and diagnosed malabsorption syndromes (7,8).

After written informed consent has been obtained from parents or guardians, 3 ml blood was taken from each participant for assessment of serum electrolytes levels, namely potassium, magnesium, and phosphate. Other demographic and clinical details such as age, socioeconomic status, parental education, and duration of diarrhea, were documented using a structured proforma at the clinical sites by skilled pediatricians.

SPSS (v. 26) software has applied to conduct statistical analysis. Quantitative data were presented as means (SD), for normal and median (IQR), for non-normal, assessed by Shapiro-Wilk test for distributional normality. A categorical nature of a variable was described by frequencies and percents. Stratified analysis was done for potential effect modifiers

including, age, gender, maternal education, socioeconomic status and MUAC scores. Chi-square or fisher' s exact tests were used after stratification in the study of associations with a p-value of 0.05 as the cut-off for statistical significance.

RESULTS

A total of 160 children diagnosed with Severe Acute Malnutrition (SAM) were included in the study. The children were just under three years old (

Table I), with a median age of 32 months (IQR: 21–46 months). Nutritional assessment showed that the mid-upper arm circumference (MUAC) had a median of 10.0 cm (IQR: 9.4–10.7 cm), while the Weight-for-Height Z-score had a median of –4.31 (IQR: –4.91 to –3.66), confirming severe wasting across the group.

The investigations highlighted the vulnerability of these children, with a median serum phosphate level of 2.89 mg/dL (IQR: 2.32–3.38), a median serum potassium level of 4.08 mmol/L (IQR: 3.65–4.53), and a median serum magnesium level of 1.98 mg/dL (IQR: 1.65–2.25). These findings demonstrate the fragile nutritional and metabolic state of children presenting with SAM in this setting, emphasizing the importance of careful monitoring during nutritional rehabilitation.

Table I : Shows Median (IQR) of refeeding syndrome variables

Variable	Median (IQR)
Age (months)	32 (21 – 46)
MUAC score (cm)	10.0 (9.4 – 10.7)
Weight-for-Height Z-score	–4.31 (–4.91 – –3.66)
Serum phosphate (mg/dL)	2.89 (2.32 – 3.38)
Serum potassium (mmol/L)	4.08 (3.65 – 4.53)
Serum magnesium (mg/dL)	1.98 (1.65 – 2.25)

The median serum phosphate level was 2.89 mg/dL (IQR: 2.32–3.38), the median serum potassium level was 4.08 mmol/L (IQR: 3.65–4.53), and the median serum magnesium level was 1.98 mg/dL (IQR: 1.65–2.25).

Serum electrolyte levels (Median, IQR):

1. Serum phosphate: 2.89 mg/dL (IQR: 2.32 – 3.38)
2. Serum potassium: 4.08 mmol/L (IQR: 3.65 – 4.53)
3. Serum magnesium: 1.98 mg/dL (IQR: 1.65 – 2.25)

From the 160 children (

Table II), there was an equal gender distribution of 80 males (50%) and 80 Females (50%). As for residence, 85 (53.1%) children were from rural places while 75 (46.9%) children were from the urban areas. The socioeconomic status indicated that the majority of the participants (58.1%) were from low-income groups with middle-income households accounting for 32.5 percent and 9.4 percent belonged to the high-income groups.

Table II : Frequency and Percentage of Participants by Demographic and Clinical Characteristics (n = 160)

Variable	Category	Frequency	Percent
Gender	Female	80	50.0
	Male	80	50.0

Residence	Rural	85	53.1
	Urban	75	46.9
Socioeconomic Status	Low	93	58.1
	Middle	52	32.5
	High	15	9.4
Maternal Education	None	46	28.7
	Primary	38	23.8
	Secondary	36	22.5
	Tertiary	40	25.0
Refeeding Syndrome	Yes	127	79.4
	No	33	20.6

The Chi-square test of independence was applied (

***Table* III**) to examine whether there was a statistically significant association between refeeding syndrome (Yes/No) and categorical demographic variables, including gender, residence, socioeconomic status, and maternal education.

Table III : Presents Chi-Square Analysis Results of key variables

Variable	Chi-square	Df	p-value
Gender vs Refeeding Syndrome	0.954	1	0.329
Residence vs Refeeding Syndrome	0.034	1	0.854
Socioeconomic Status vs Refeeding Syndrome	5.719	2	0.057
Maternal Education vs Refeeding Syndrome	0.264	3	0.967

p-values were determined using the Chi-square test; Fisher's Exact Test was applied where expected cell counts were <5.

DISCUSSION

The present study demonstrates how critically high (79.4%) the prevalence of refeeding syndrome is among children diagnosed to be having Severe Acute Malnutrition (SAM) in a tertiary care setup. This finding is far greater than the past incidents documented which varied from about 6% to 13.4% thus, pointing to a potential serious local public health problem, which needs immediate response and specific clinical interventions (9,10).

The prevalence of electrolyte disturbances, especially hypophosphatemia, hypokalemia, and hypomagnesemia, speaks to the vulnerability of severely malnourished children at the early stages of nutritional rehabilitation. This enhanced vulnerability can cause profound complications such as respiratory failure (11), cardiac arrhythmias and even death highlighting the need for pragmatic clinical management protocols addressing the issues related to the monitoring and correction of the electrolytes.

The analysis established significant correlations between demographic variables including gender, socioeconomic status and maternal education status with the prevalence of refeeding syndrome. This absence of association is in contrast with wider literature sometimes which reports these demographic factors as risk modifiers (12,13). The disparity may be

attributable to a distinctive clinical or socio-economic environment for the subjects of this study or it may suggest that any refeeding syndrome's victim will be susceptible to it universally.

Besides, severe nutritional deficits were predominated by low mean Weight-for-Height Z-scores, in addition to low MAUC scores, which confirm severe wasting among the participants. The nonparametric distribution of these clinical parameters further substantiates the severe and diverse clinical phenotype manifested in SAM (14), making systematic therapeutic options challenging and resenting the requirement for individualized clinical-based type of treatments.

The high rate of children from poor socio-economic backgrounds (58.1%) indicates the larger socio-economic conditions which lead to severe malnutrition and calls for integrated public health policies to address poverty and educate people about nutrition and health practices (15,16).

As the rate of occurrence of refeeding syndrome identified in this study has been found to be relatively high (17), future research should aim at identifying relevant biochemical markers that may be used as predictors of the syndrome, testing the effectiveness of individualized electrolyte supplementation (18,19), and examining long-term outcomes arising from targeted interventions. Such research will deliver the evidence base for formulating comprehensive and context specific clinical guidelines for addressing severe malnutrition and its complications well (20,21).

These findings emphasize the high burden of refeeding syndrome among children proceeding with nutritional rehabilitation for SAM in this setting and they bring up that active monitoring including targeted interventions for electrolyte disturbances at the early stages of treatment is urgently needed. Chi-square analyses demonstrated that the occurrence of refeeding syndrome was not significantly associated with gender ($p = 0.329$), residence ($p = 0.854$), socioeconomic status ($p = 0.057$), and maternal education ($p = 0.967$). It indicates that the risk of refeeding syndrome was distributed broadly across demographic groups which suggests that all children with SAM are at comparable risk, irrespective of their background.

This study provides valuable insights into the burden of refeeding syndrome among children having severe acute malnutrition along with some limitations. The research was conducted at a single center, which may limit how well the findings represent children in other regions or healthcare settings. Serum measurements were measured at one point in time, so we could not track changes in electrolytes during the full course of treatment. In addition, factors such as co-existing infections or variations in feeding practices might have influenced electrolyte levels but were not fully explored. Despite these challenges, the study highlights an important clinical problem and underlines the need for broader, multi-center research to strengthen and expand these findings.

CONCLUSION

This study brings out a very high prevalence of refeeding syndrome in children diagnosed with Severe Acute Malnutrition (SAM) receiving nutritional rehabilitation services at a tertiary healthcare facility. The prevalence is far higher than what has been put forth globally, stressing the importance of diligent electrolyte monitoring and interventions at the initial stages of nutritional treatment. Lack of meaningful demographic associations signifies universal susceptibility irrespective of socioeconomic backgrounds and the need for standardized clinical protocols. Considering the life-threatening effects of electrolytes imbalance in the SAM patients, healthcare providers need to be proactive in the management of their patients in a more individualized and comprehensive approach. Future studies that will focus on the refining of predictive markers and customized intervention will have great impact in enhancing the clinical outcomes and the morbidity and mortality due to refeeding syndrome.

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