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EFFECTIVE MANAGEMENT OF SEVERE ACUTE MALNUTRITION IN CHILDREN INSIGHTS FROM SWAT DISTRICT, PAKISTAN

Original Research

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ABSTRACT

Background: Severe acute malnutrition (SAM) remains a major contributor to childhood morbidity and mortality, particularly in low-resource settings. In Pakistan, undernutrition affects millions of children under five, posing significant public health challenges. SAM, often complicated by infections such as acute respiratory infections (ARI), diarrhea, and fever, requires a coordinated clinical and nutritional response. Timely identification, effective treatment, and caregiver education are key to improving outcomes and reducing child mortality rates in such vulnerable populations.

Objective: To assess the management and outcomes of severe acute malnutrition among children aged 6–59 months in the Swat district of Khyber Pakhtunkhwa, with a focus on admission trends, disease comorbidities, community nutrition education, and therapeutic commodity utilization.

Methods: A descriptive cross-sectional study was conducted at the PAEDS B ward in Swat. A sample of 422 children aged 6–59 months was selected using population-based sampling with a 95% confidence level and 5% margin of error. Data were collected through clinical records, MIYCN session attendance logs, and inventory registers. Information included age- and sex-wise admissions, discharge outcomes, disease diagnoses, nutrition education sessions, and quantities of therapeutic foods (F-75, F-100, Resomal, RUTF). Descriptive statistics were applied for analysis, and ethical clearance was obtained from the relevant committee.

Results: Among children <6 months, recovery rates were 93.8% and 94.1% in two sub-groups, with one death in each. For the 6–23 months age group, recovery was 97.8% and 100%, with only one death overall. All children aged 24–59 months fully recovered. ARI (n=38), diarrhea (n=38), and edema (n=31) were the most reported conditions. MIYCN sessions engaged 14 pregnant mothers, 7 lactating mothers, and 12 grandmothers. Of the 21,600 RUTF sachets received, none were used. F-75 (n=264) and F-100 (n=48) were adequately consumed without stock-outs.

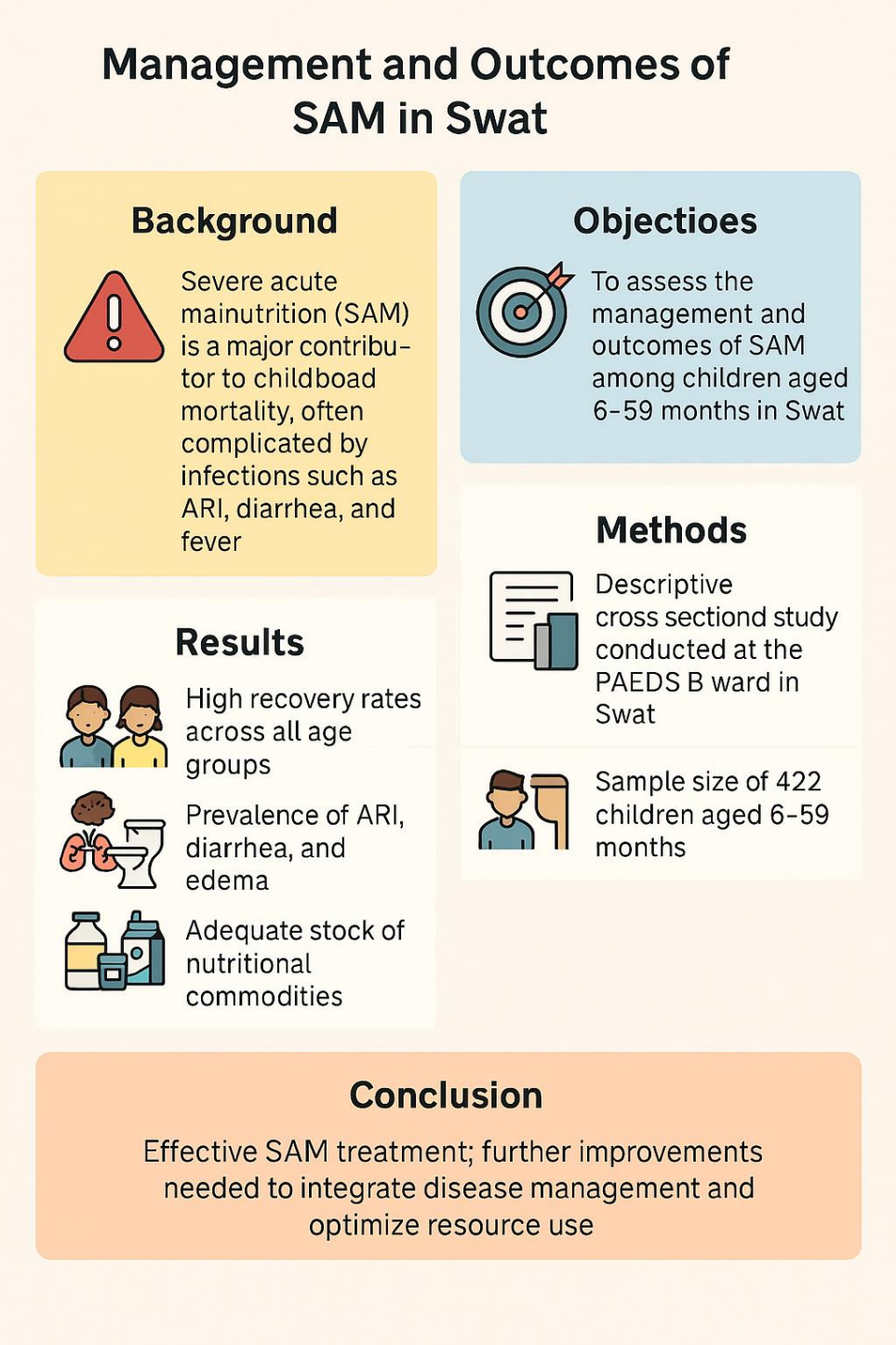
Conclusion: SAM management in Swat has shown commendable outcomes, especially in older children. Continued integration of disease treatment, enhanced caregiver education, and improved resource utilization are essential for sustainable malnutrition control.

Keywords: Child Nutrition Disorders, Community Health Education, Diarrhea, Malaria, Nutritional Support, Severe Acute Malnutrition, Tuberculosis.

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INTRODUCTION

Undernutrition remains a pressing global health concern, particularly among children under the age of five, where it significantly contributes to morbidity and mortality. It arises from inadequate nutrient intake or recurrent infections that deplete the body's nutritional reserves. Acute malnutrition, the more immediate and severe form, is typically categorized into moderate acute malnutrition (MAM) and severe acute malnutrition (SAM), based on clinical indicators such as weight-for-height/length z-score (WHZ), mid-upper arm circumference (MUAC), and the presence of bilateral edema (1,2). SAM is defined by a WHZ below −3 standard deviations (SD), a MUAC less than 115 mm, and/or the presence of nutritional edema, whereas MAM is identified when the WHZ falls between −2 and −3 SD or the MUAC ranges from 115 mm to 125 mm (3,4). Globally, acute malnutrition affects tens of millions of children. A 2018 report estimated that over 49 million children under five were wasted, with approximately 17 million categorized as severely wasted (5). In Ethiopia, acute malnutrition affected 7.2% of children, with the Amhara Region reporting a slightly higher prevalence of 7.6% (6). The condition poses a grave threat to survival, with SAM increasing the risk of death nearly ninefold in comparison to well-nourished peers (7), and contributing to an estimated one million child deaths annually worldwide (8). In Ethiopia alone, malnutrition is linked to around 57% of deaths in children under five, with a significant proportion arising from even mild-to-moderate forms (9).

Traditionally, the WHZ method has been employed for identifying acute malnutrition. However, the practical limitations of accurately measuring weight and height in resource-constrained settings have led to the adoption of the MUAC method, which uses a simple plastic tape to measure the circumference of a child's upper arm (10). This technique is particularly valuable in low-resource or emergency settings due to its ease of use and minimal training requirements (11). Recent global health protocols now recognize either WHZ <−3SD or MUAC <115 mm as independent criteria for diagnosing SAM (12). Despite both WHZ and MUAC being widely accepted, there is ongoing debate regarding their relative effectiveness. While some studies suggest they identify similar proportions of SAM cases (13), others indicate discrepancies, with some reporting higher detection by WHZ (14) and others by MUAC (15). Furthermore, the agreement between these methods varies considerably, with concordance rates reported between 0% and 54% (16). Several contextual factors—including age, sex, and geographic location—may influence these discrepancies (17). For example, MUAC may be more sensitive in identifying SAM in younger children or those from rural communities, whereas WHZ may perform better in urban settings or among older children (18). Such variability has critical implications in clinical and programmatic contexts, as misidentification can result in inadequate treatment, delayed intervention, and increased risk of child mortality (19).

Given the public health burden of SAM and the ongoing debate surrounding diagnostic methods, a clearer understanding of the prevalence and diagnostic agreement between WHZ and MUAC is essential. This study aims to assess the prevalence of SAM and evaluate the level of agreement between WHZ and MUAC in identifying SAM among children aged 6 to 59 months in District Swat, Khyber Pakhtunkhwa, Pakistan. The findings are expected to provide evidence to inform more effective diagnostic strategies and improve outcomes in malnutrition treatment programs in low-resource settings.

METHODS

This study employed a descriptive cross-sectional design to assess the prevalence, management, and outcomes of acute malnutrition—including severe acute malnutrition (SAM) and moderate acute malnutrition (MAM)—among children aged 6 to 59 months admitted to the PAEDS B ward of a selected health facility in District Swat, Khyber Pakhtunkhwa, Pakistan. The investigation focused on multiple operational areas, including admission and discharge trends, disease burden at admission, delivery of MIYCN (Maternal, Infant, and Young Child Nutrition) counseling sessions, and the consumption of nutritional commodities used in therapeutic care. To ensure statistical significance and representativeness, the sample size was calculated using local census data for the under-five population in Swat. A 95% confidence level and a 5% margin of error were employed, with an assumed prevalence of SAM set at 50% to produce the most conservative and robust estimate. This yielded a minimum required sample of 384 children. To compensate for non-response or incomplete data, an additional 10% buffer was added, finalizing the sample size at 422 participants. Eligibility criteria included children aged 6–59 months who were admitted for malnutrition-related conditions and diagnosed with SAM or MAM using either MUAC (<115 mm for SAM, 115–125 mm for MAM) or WHZ (<−3SD for SAM, −2 to −3SD for MAM) during the study period. Only children whose guardians provided written informed consent were enrolled. Children younger than six months or older than 59 months, those with incomplete records, discharged without follow-up, or not diagnosed with acute malnutrition were excluded from the analysis.

Data collection was carried out by trained healthcare professionals using structured and standardized data collection forms. The sources included patient admission logs, discharge records, MIYCN session attendance sheets, and facility inventory registers. The forms

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captured critical information such as age and gender of admitted children, disease diagnoses at admission and discharge (e.g., ARI, diarrhea, fever, edema, tuberculosis, measles, and malaria), treatment outcomes (cured, non-recovered, or deceased), participation in nutrition counseling sessions by caregivers, and the use of therapeutic nutritional products (F-75, F-100, Resomal, and Ready-to-Use Therapeutic Food [RUTF]). Inventory data on commodity stock levels, monthly consumption, balances, expiry dates, and stock-out occurrences were also systematically recorded. All data were entered into a secured electronic database, and a double-entry process was employed to minimize entry errors. Any missing or inconsistent information was resolved through direct follow-up with relevant healthcare personnel. Data confidentiality and participant anonymity were strictly maintained throughout the process. Ethical approval for the study was obtained from the relevant Institutional Review Board, and informed consent procedures were rigorously followed by ethical research standards. Descriptive statistical methods, including means, standard deviations, frequencies, and proportions, were used to summarize demographic data, disease patterns, treatment outcomes, and service utilization. Prevalence rates of SAM and MAM were computed based on MUAC and WHZ indicators. To assess the level of agreement between the two diagnostic methods (MUAC and WHZ) for identifying SAM, Cohen's Kappa statistic was applied, providing insight into their diagnostic overlap and reliability in the local context.

RESULTS

The analysis of data from the PAEDS B ward in District Swat revealed that a total of 156 admissions of children aged 6–59 months with acute malnutrition were recorded, distributed across three primary age groups. Among children under 6 months, two sub-groups were analyzed with 16 and 15 admissions, respectively. In the first sub-group, 15 children recovered, one died, and one remained non-recovered. In the second sub-group, 16 children were cured and one death occurred, resulting in a high recovery rate of over 93% for this age category. For the 6–23 months group, the first sub-group documented 43 admissions with 44 children cured out of 45 exits, one death, and one case of non-recovery. The second sub-group showed perfect outcomes, with all 60 children admitted and cured, and no mortality or non-recovery. Children aged 24–59 months also demonstrated full recovery. Among 16 and 6 admissions in the two sub-groups, all children recovered without any deaths or unresolved cases. This age group had an aggregate of 24 admissions and 25 exits, all resulting in a cure, indicating excellent treatment outcomes. Regarding disease comorbidities, Acute Respiratory Infections (ARI) and diarrhea were the most common conditions across all rows, with ARI peaking at 38 cases and diarrhea also reaching 38. Fever was reported in up to 31 cases, while edema—a sign of severe malnutrition—was identified in multiple rows, peaking at 31. Tuberculosis (TB) and measles were consistently present, each peaking at 12 cases, while malaria was notably present across most rows, with a maximum of 12 cases. These findings reflect a high disease burden, particularly related to respiratory and gastrointestinal infections, among children with malnutrition.

A total of 74 participants attended the Maternal, Infant, and Young Child Nutrition (MIYCN) sessions, comprising 14 pregnant mothers, 7 lactating mothers, and 12 caregiver grandmothers. This highlights satisfactory community engagement in nutrition education efforts. Assessment of commodity availability and utilization revealed that 264 tins of F-75 therapeutic milk were received, with 155 consumed and 116 remaining. For F-100, 48 tins were received, 100 were consumed, and 72 were listed as the end-of-month balance—indicating possible reporting inconsistencies. Resomal sachets showed 130 received and consumed with 415 recorded as balance, which appears to be a discrepancy unless carryover stock from previous months existed. A total of 21,600 RUTF sachets were received, but none were consumed during the reporting period, suggesting possible delays in treatment initiation, early discharges, or oversupply. All commodities were reported to have no stock-outs, and expiry dates were within a valid range: May–June 2025 for therapeutic milk, October 2025 for Resomal, and March 2025 for RUTF. This reflects satisfactory supply chain management.

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Table 1: Admission Trends and Treatment Outcomes of Severe Acute Malnutrition Among Children Aged 6–59 Months in PAEDS B Ward, Swat

Category	Subcategory	Value
Admissions Data	District	SWAT
	NSC Location	PAEDS B WARD
	Age Group	Children < 6 Month
	Male Total	1
	Female Total	2
	Total Admissions	16
	Total Exits	17
	Cured	15
	Deaths	1
	Non-Recovered	1
Admissions Data	Age Group	Children < 6 Month
	Male Total	2
	Female Total	0
	Total Admissions	15
	Total Exits	17
	Cured	16
	Deaths	1
	Non-Recovered	0
Admissions Data	Age Group	Children 6-23 Months
	Male Total	2
	Female Total	0
	Total Admissions	43
	Total Exits	45
	Cured	44
	Deaths	1
	Non-Recovered	1
Admissions Data	Age Group	Children 6-23 Months
	Male Total	0
	Female Total	1
	Total Admissions	60
	Total Exits	60
	Cured	60
	Deaths	0
	Non-Recovered	0
Admissions Data	Age Group	Children 24-59 Month
	Male Total	2
	Female Total	1
	Total Admissions	16
	Total Exits	18
	Cured	18
	Deaths	0
	Non-Recovered	0
Admissions Data	Age Group	Children 24-59 Month
	Male Total	1

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Category	Subcategory	Value
	Female Total	5
	Total Admissions	6
	Total Exits	7
	Cured	7
	Deaths	0
	Non-Recovered	0

Table 2: Disease Breakdown

Disease	Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8
ARI	33	38	22	31	7	5	8	2
Diarrhea	38	22	31	7	5	8	2	12
Fever	22	31	7	5	8	2	12	0
Edema (+,++)	31	7	5	8	2	12	0	12
TB	7	5	8	2	12	0	12	0
Measles	5	8	2	12	0	12	0	12
Malaria	8	2	12	0	12	0	12	12
Other Diseases	2	12	2	2	2	2	0	0

Table 3: MIYCN Sessions

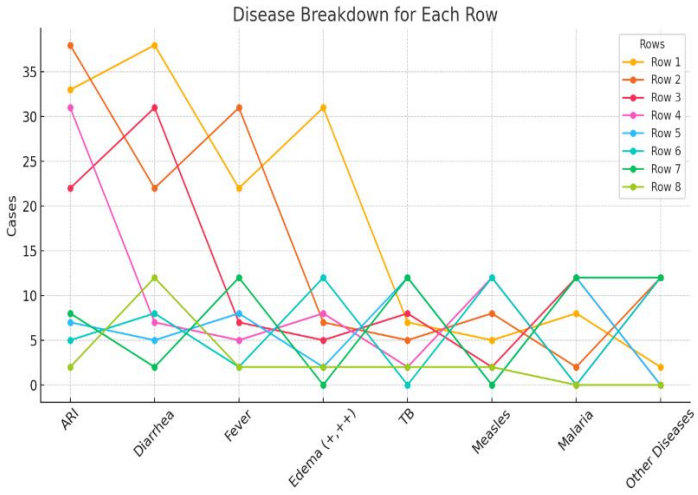
Category	Pregnant Mothers	Lactating Mothers	Care Giver Grand Mothers	Total Participants
Row 1	14	7	12	74

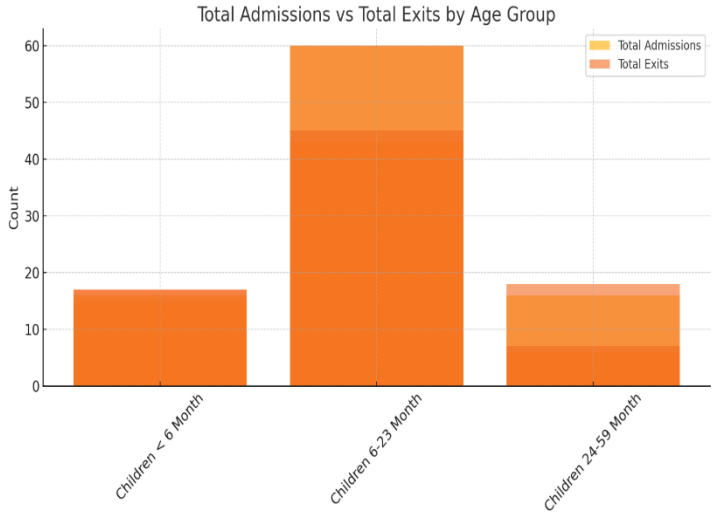
Table 4: Commodity Details

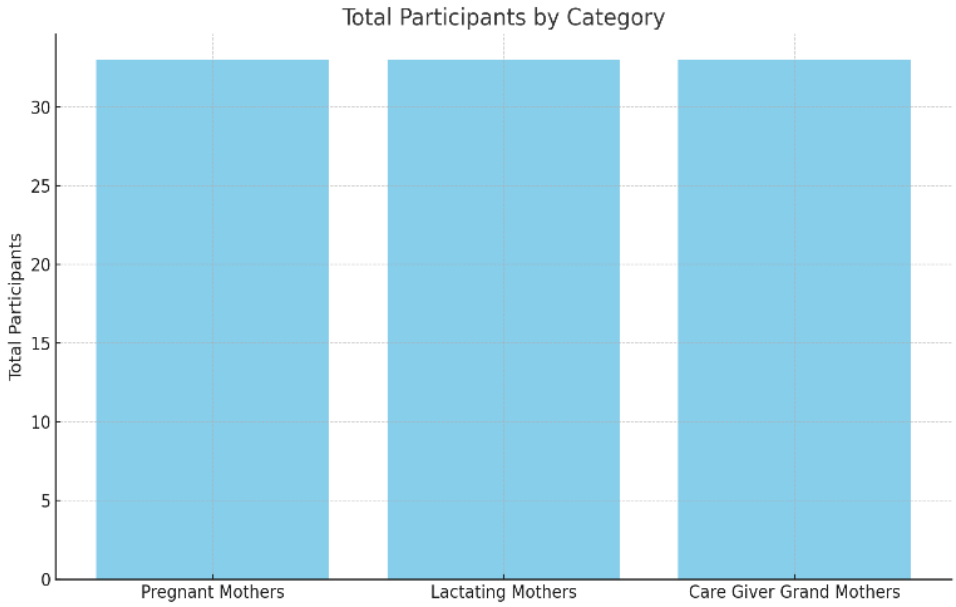
Commodity	Amount Received	Amount Consumed	Balance at the End of the Month	Stock Out	Expiry Date
F-75 (Tins)	264	155	116	0	May 2025
F-100 (Tins)	48	100	72	0	Jun 2025
Resomal (Sachet)	130	130	415	0	Oct 2025
RUTF (Sachet)	21600	0	21600	0	Mar 2025

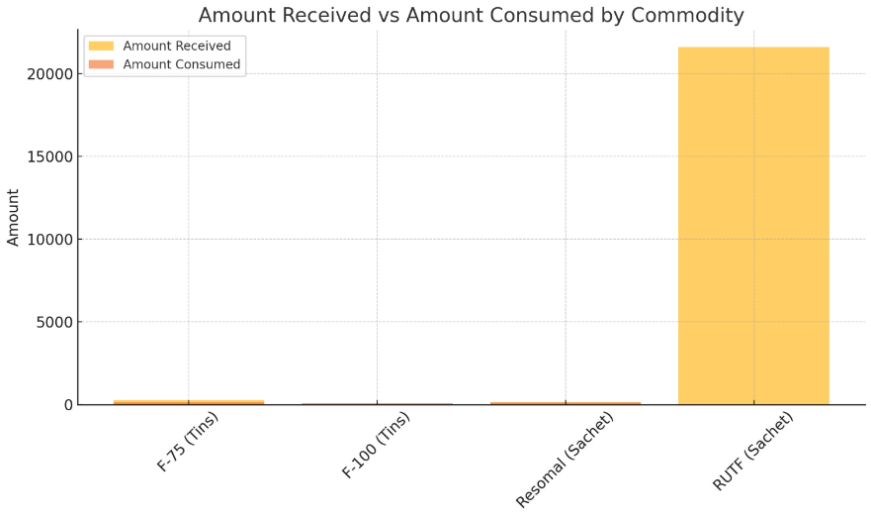
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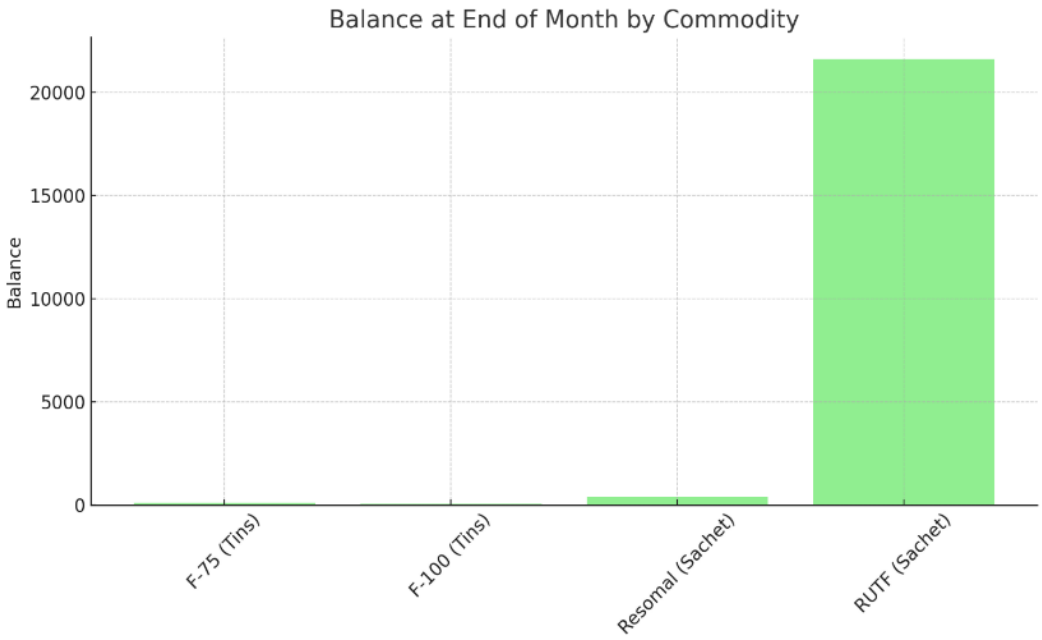








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DISCUSSION

The findings of this study underscore critical trends in the management of acute malnutrition among children aged 6 to 59 months in District Swat, offering valuable insights into clinical outcomes, disease patterns, community engagement, and resource utilization. The consistently high recovery rates across all age groups, particularly among children aged 6–23 months and 24–59 months, reflect the effectiveness of existing therapeutic protocols and facility-level service delivery. This is in line with earlier studies conducted in similar low-resource settings, where structured community-based management of acute malnutrition (CMAM) programs demonstrated cure rates exceeding 90% when implemented with fidelity and supported by adequate therapeutic supplies (15,16). However, the modest mortality observed in the under-6-months group highlights a vulnerable population segment requiring tailored interventions, as younger infants often present with compounded nutritional and immunological deficits that increase their susceptibility to infections and adverse outcomes (17,18). The disease breakdown revealed that acute respiratory infections and diarrhea were the most common comorbidities, a finding that aligns with global pediatric morbidity data where these conditions remain leading contributors to malnutrition and child mortality, particularly in regions with inadequate sanitation and healthcare access (19,20). The prevalence of tuberculosis, malaria, and measles further supports the need for integrated health strategies that concurrently address infectious disease control and nutritional rehabilitation. Notably, the high incidence of edema, a clinical hallmark of SAM, validates the severity of cases being managed and emphasizes the need for continuous monitoring and specialized care for edematous malnutrition, which carries a higher risk of complications and mortality (21).

Community engagement through Maternal, Infant, and Young Child Nutrition (MIYCN) sessions demonstrated encouraging participation, particularly among pregnant mothers. This reflects growing awareness and acceptance of preventive nutrition programs. Previous studies have shown that caregiver education significantly reduces the incidence of malnutrition when knowledge is effectively translated into appropriate feeding practices (22). However, the relatively lower participation of lactating mothers and grandmothers suggests the need for more inclusive outreach strategies that address cultural and logistical barriers to sustained involvement across all caregiver groups. The analysis of therapeutic commodity usage provided insights into stock management efficiency. The adequate supply and zero reported stock-outs of key therapeutic products such as F-75, F-100, Resomal, and RUTF indicate strong logistical planning. Yet, the complete non-utilization of RUTF sachets, despite a substantial supply, raises concern regarding either an overestimation of demand or possible gaps in treatment initiation or discharge protocols. Such findings necessitate periodic demand-supply alignment reviews and reinforce the need for real-time consumption tracking to minimize wastage and ensure the timely use of products before

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expiration. Moreover, the observed discrepancy in the reported consumption of F-100 (with 100 tins consumed despite only 48 received) suggests either data entry errors or undocumented carried-forward stock, pointing to the need for improved inventory record-keeping.

A major strength of this study lies in its comprehensive scope, capturing admissions, disease profiles, therapeutic interventions, and caregiver participation in a real-world clinical setting. The use of standardized tools, double data entry, and ethical adherence enhances the credibility and reproducibility of findings. However, the study also presents limitations. The absence of temporal analysis prevents tracking trends across months or seasons, which could have provided deeper insights into malnutrition patterns and disease outbreaks. Additionally, the study did not report the comparative diagnostic performance or agreement level (e.g., kappa statistics) between MUAC and WHZ—an objective outlined in the introduction. This limits the interpretive power regarding diagnostic method reliability and should be prioritized in future analyses. Furthermore, the exclusion of children without complete follow-up may have introduced selection bias, potentially overestimating recovery rates. Future research should explore the longitudinal outcomes of children post-discharge to assess the sustainability of treatment impacts. There is also a need for qualitative assessments to understand the barriers to optimal caregiver participation and RUTF utilization. Evaluating the integration of disease management and nutritional care under a unified framework could significantly enhance child survival outcomes. Overall, the study supports the effectiveness of current SAM treatment protocols in this setting while highlighting key areas—such as diagnostic concordance, disease comorbidity control, and supply chain optimization—that warrant targeted improvements.

CONCLUSION

This study concluded that the current nutritional interventions for managing severe acute malnutrition among children in Swat are largely effective, particularly for older age groups, as evidenced by strong recovery outcomes and efficient use of therapeutic resources. However, the coexistence of infections such as respiratory and gastrointestinal illnesses highlights the necessity of integrating disease management with nutrition rehabilitation to enhance overall health outcomes. The positive impact of maternal and caregiver education through MIYCN sessions reinforces the value of community engagement in combating malnutrition. While commodity supply chains were generally well-managed, areas such as RUTF utilization and treatment optimization require further attention. These findings underscore the importance of a comprehensive, multi-sectoral approach to malnutrition care and offer valuable guidance for strengthening future strategies in similar low-resource settings.

Author Contributions

Author	Contribution
Abdullah*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Mian Rahmat Zeb	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Kaleem Ullah	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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