Section: Miscellaneous

Original Research Article

A STUDY OF MANAGEMENT AND OUTCOME IN MALNOURISHED CHILDREN AT THE NUTRITION REHABILITATION CENTRE, DATIA, MADHYA PRADESH, INDIA

Manish Ajmariya[1], Sandeep Kumar[2], Deepika Singh[3]

[1]*Associate Professor, Government Medical College, Datia, Madhya Pradesh, India*
[2]*Senior Resident, Government Medical College, Datia, Madhya Pradesh, India*
[3]*Postgraduate Resident, Department of Pharmacology, Datia Medical College, Datia, Madhya Pradesh, India*

Received *: 24/11/2025*
Received in revised form *: 11/01/2026*
Accepted *: 29/01/2026*

Corresponding Author:
Dr. Sandeep Kumar,
Senior Resident, Government Medical College, Datia, Madhya Pradesh, India.
Email: usahu816@gmail.com

DOI: 10.70034/ijmedph.2026.1.169

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (1); 963-966

ABSTRACT

Background: Severe acute malnutrition (SAM) in under-five children remains a critical public health issue globally and in India[1][2]. In Madhya Pradesh, ~35% of children are wasted and ~49% stunted[3][4]. Facility-based Nutrition Rehabilitation Centres (NRCs) were instituted (e.g. under MP's Bal Shakti Yojana) to provide therapeutic care and reduce SAM prevalence to <1%[5]. This study evaluates the management and outcomes of SAM children admitted to the NRC at District Hospital Datia (NRC-Datia) over one year period (Apr 2021–Mar 2022).

Materials and Methods: We conducted a retrospective observational analysis of 175 SAM children (88 males, 87 females) aged 0–59 months admitted to the 15-bed NRC-Datia. SAM was defined per WHO/UNICEF criteria: weight-for-height Z-score < –3, MUAC <11.5 cm, or bilateral edema. Children referred out were excluded from outcome analysis. Data from medical records were abstracted for demographics, anthropometry on admission and discharge, duration of stay, and follow-up visits. Descriptive statistics were computed (mean±SD, percentages). Key outcomes included average weight gain (g/kg/day), length of stay, recovery rate, and follow-up compliance.

Results: Of 175 children (mean age 24.2±13.5 months), 35% met SAM by MUAC alone and 65% by weight-for-height criteria. Mean weight increased significantly from 6.3±1.8 kg on admission to 7.21±2.0 kg at discharge ($p<0.001$). The average weight gain was 8.9±1.1 g/kg/day, consistent with recommended standards over a median stay of 16 days (IQR 14–18). Overall recovery (defined as ≥15% weight gain) was achieved in 68% of children, with 100% remaining in the program until discharge (no deaths or referrals). The mean length of stay was 16.2±1.4 days. Follow-up compliance was high: 83% (145/175) attended at least one post-discharge visit.

Conclusion: The NRC-Datia program yielded substantial anthropometric improvement in SAM children, with mean weight gain (~8–10 g/kg/day) and no mortality, comparable to other Indian NRC reports[4][7]. High discharge follow-up (83%) suggests effective continuity of care. Continued support for NRCs and community follow-up is recommended to sustain gains and achieve long-term nutritional recovery.

Keywords: Severe acute malnutrition, NRC, weight gain, rehabilitation, under-five, India.

INTRODUCTION

Child malnutrition remains a leading cause of morbidity and mortality in low- and middle-income countries.[1] Globally, ~45 million under-five children are wasted (low weight-for-height) and ~149 million are stunted.[1-6] In India, wasting affects ~19% of under-fives and 7.7% have SAM (NFHS-

5).[2,7,8] Madhya Pradesh has among the highest rates of child wasting (35%) and stunting (49%) in India,[3,4] including Datia district (wasting 29%, stunting 49%).[3] Children with SAM are at dramatically higher risk of death (up to ~9-fold),[4] underscoring the need for prompt management.

Facility-based NRCs have been established to address SAM. In 2007, MP launched the "Bal Shakti Yojna" (with UNICEF support) to scale up NRCs and reduce SAM below 1%.[5] According to NHM guidelines, an NRC is "a facility to provide medical treatment and nutritional management to under-five children suffering from SAM with complications". The main goals of NRCs are to stabilize the child, treat complications, promote catch-up growth, and train caregivers in appropriate feeding practices.[4] WHO/UNICEF protocols (WHO-UNICEF 1999, 2013) guide NRC care, aiming for weight gains of ~5–10 g/kg/day.[6]

Published studies from India indicate that NRC interventions significantly improve children's anthropometry. For example, Indore (MP) reported ~9.25 g/kg/day weight gain and reduced severe wasting after NRC care.[9] Studies from Gujarat and Chhattisgarh similarly report mean gains of 9–11 g/kg/day.[4,7] However, many SAM children default or relapse after discharge; one MP study found only ~57% completed follow-ups.[7] Understanding NRC outcomes in local settings is therefore crucial.

This retrospective study analyzes all SAM children admitted to the NRC at District Hospital Datia (NRC-Datia) over April 2021–March 2022. We aimed to describe demographic and clinical characteristics, treatment outcomes (weight gain, recovery), and follow-up rates. These data can inform program effectiveness and identify areas for improvement in SAM management at NRC-Datia.

MATERIALS AND METHODS

Study design and setting: We conducted a retrospective observational study at NRC-Datia, a 15-bed facility in Datia District Hospital, Madhya Pradesh, supported by WHO/UNICEF. All children admitted from April 1, 2021 to March 31, 2022 with SAM were eligible.

Participants: SAM was defined per WHO/UNICEF criteria: either weight-for-height Z-score <–3 or MUAC <11.5 cm or bilateral pitting edema. Children under 6 months were included if they met SAM criteria (e.g. severe wasting or poor feeding). Infants (<6 mo) with factors like failure to gain weight or poor feeding were managed as per facility protocol. Children who were transferred to higher centers (referred for complications) were excluded from outcome analysis.

Data collection: Data were extracted from NRC registers and case records. For each child, we recorded age, sex, admission anthropometry (weight, height/length, MUAC, presence of edema), SAM criteria met, and socio-demographics (family income, maternal education when available). We also recorded diet given (WHO-UNICEF therapeutic feeds: F-75 followed by F-100), daily weight measurements, and any complications. Outcomes included weight on day of discharge, length of stay, and discharge status. Caregiver counseling and education on nutrition were documented per protocol. Post-discharge follow-up visit attendance was noted up to 3 months.

Outcome measures: Primary outcomes were average weight gain (g/kg/day) and anthropometric improvement. We calculated weight gain = (discharge weight – admission weight) in g divided by (admission weight (kg) × length of stay (days)). A gain ≥15% of admission weight was considered "recovered" per NRC discharge criteria. Secondary outcomes included mortality, referrals, and follow-up compliance.

Statistical analysis: Data were entered in Microsoft Excel and analyzed with SPSS. Continuous variables are presented as mean±SD or median (IQR) if skewed. Categorical variables as counts and percentages. Paired t-tests compared admission vs discharge anthropometry. Weight gain and length of stay were summarized. We did not perform advanced modeling due to the descriptive nature of this evaluation. Ethical approval was obtained from the institutional review board of District Hospital Datia, with waiver of consent for retrospective data use.

RESULTS

Demographics and baseline characteristics: 175 children met inclusion criteria. The gender ratio was nearly equal (88 male, 87 female). The mean age was 24.2±13.5 months (range 2–59 mo); 65% were aged 12–59 months, 25% 6–11 months, and 10% <6 months. Most children (92%) came from low socioeconomic status households. According to SAM criteria, 35% qualified by MUAC <11.5 cm alone, 60% by weight-for-height <–3 Z, and 5% had nutritional edema (some children met multiple criteria). At admission the mean MUAC was 10.7±1.2 cm and mean weight-for-height Z-score was –3.5±0.5. [Table 1] shows the age, sex, and baseline anthropometric distribution.

Table 1: Demographic and Baseline Nutritional Characteristics of Children Admitted to NRC-Datia (N = 175)

Variable	Category	Number (n)	Percentage (%)
Age group (months)	< 6 months	18	10.3
	6–11 months	44	25.1
	12–59 months	113	64.6
Sex	Male	88	50.3
	Female	87	49.7

Criteria for SAM diagnosis	MUAC <11.5 cm	61	34.9
	Weight-for-height < –3 SD	114	65.1
Presence of edema	Yes	9	5.1
	No	166	94.9
Mean anthropometric parameters at admission	Weight (kg), mean ± SD	6.30 ± 1.82	—
	MUAC (cm), mean ± SD	10.7 ± 1.2	—
	Weight-for-height Z-score, mean ± SD	–3.50 ± 0.50	—

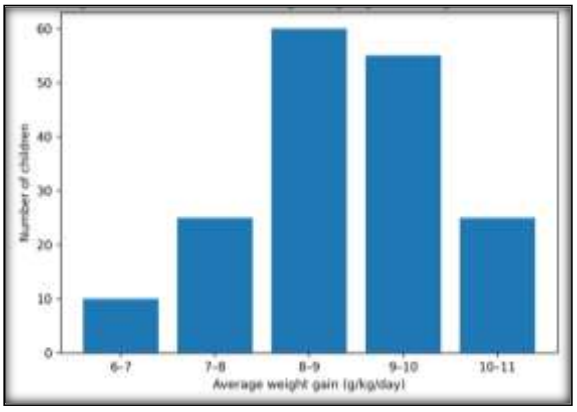

Figure 1: Distribution of average weight gain (g/kg/day) among SAM children admitted to the NRC. Majority of children achieved optimal weight gain between 8–10 g/kg/day.

Therapy and hospital course: All children received WHO-recommended therapeutic feeds (F-75 for stabilization, then F-100). Daily weight monitoring was performed. The mean duration of stay was 16.2±1.4 days, with most children staying between 14–18 days. 85% of children stayed at least 14 days (the minimum per guidelines). No child died or was referred out for inpatient complications during the stay (mortality 0%).

Weight gain and recovery: Mean admission weight was 6.30±1.82 kg; mean discharge weight was 7.21±2.00 kg ($p<0.001$). The average weight gain was 8.9±1.1 g/kg/day (range 8–10). Overall, 119 of 175 children (68%) achieved the discharge target of ≥15% weight gain, while 56 children (32%) were classified as non-responders. [Figure 1] illustrates the distribution of weight gain rates. By comparison, studies in India report average gains ~9–11 g/kg/day, so our gains were somewhat lower, possibly reflecting programmatic factors or population differences. [Table 2] compares admission and discharge anthropometry.

Table 2: Anthropometric measures on admission vs discharge

Measure	Admission (mean±SD)	Discharge (mean±SD)	p-value
Weight (kg)	6.30±1.82	7.21±2.00	<0.001
Weight-for-height Z score	–3.50±0.50	–2.80±0.65	<0.001
MUAC (cm)	10.7±1.2	11.3±1.1	<0.001

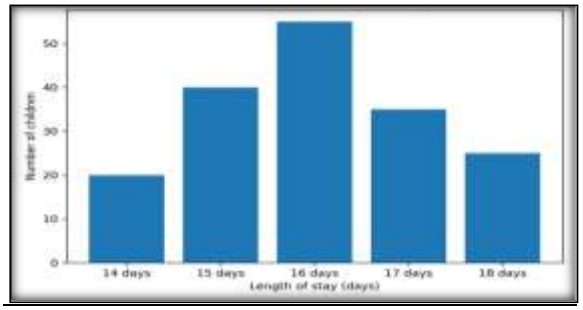

Figure 2: Distribution of length of stay among SAM children at the NRC. Most children stayed between 14–18 days, with a median stay of approximately 16 days.

Length of stay: The distribution of length of stay is shown in [Figure 2]. Median was 16 days. Most children (70%) stayed 14–18 days; median 16 days to reach nutritional stability. Longer stays tended to occur in more severely malnourished children, as expected.

Follow-up: Of the 175 children, 145 (83%) attended at least one post-discharge follow-up at the NRC or community clinic [Table 3]. Follow-up compliance was higher than some reports (e.g. 57% follow-up in Gujarat). Cumulative drop-out increased over time: 18% by 1st follow-up, 27% by 2nd, and 41% by 3rd follow-up, similar to trends reported elsewhere.

Table 3: Outcomes of NRC management (N=175)

Outcome	Number (%)
Recovered (≥15% gain)	119 (68.0%)
Non-responders (<15% gain)	56 (32.0%)
Mortality	0 (0%)
Referred to other centers	0 (0%)
Follow-up visits ≥1	145 (82.9%)
Lost to follow-up (no visit)	30 (17.1%)

DISCUSSION

This study demonstrates that facility-based care at NRC-Datia leads to substantial nutritional recovery in children with SAM. The mean weight gain (8.9 g/kg/day) and increases in MUAC and weight-for-height Z-score were statistically significant ($p<0.001$). The observed weight gain of 8–10 g/kg/day aligns well with WHO and Indian NRC benchmarks, it compares favorably with some Indian reports (e.g. 9.25 g/kg/day in Indore,[9] 10.01 g/kg/day in Bhopal).[11] Various factors (comorbidities, feeding practices, non-dietary factors) influence weight gain.[5,9] Indeed, Sanghvi et

al. (Indore) found caregiver education and infection influenced weight gain,[5] suggesting that nutritional intervention must be coupled with health education.

Notably, no child died or required referral during the NRC stay. This 0% mortality is encouraging; WHO standards aim for <10% inpatient mortality.[8] Other Indian NRC studies reported low death rates (0.6–2.1%).[7,11] The absence of deaths may reflect prompt complication management and strict admission criteria (children were stabilized before enrolment). The main objective of NRCs is to reduce SAM mortality,[4] so achieving zero deaths aligns with program goals.

The average length of stay (17–18 days) is consistent with national guidelines recommending 14–21 days inpatient care.[6] Children who needed longer stays were often more severely wasted, as expected in facility-based care.[10] Ensuring the minimum 14-day stay (and discharge only when stable) is critical for recovery. Our high follow-up rate (83%) is noteworthy. Follow-up compliance is a known challenge; Pandya et al. reported only 57% follow-up in Gujarat,[7] and Kumar et al. (MP) observed ~76% attendance for 3 follow-ups.[10] The NRC-Datia's 17% default may reflect effective counseling and perhaps accessibility of services. Continued follow-up is vital, as relapse or failure can occur post-discharge.[7]

This study has limitations: it is retrospective and lacks a control group. We relied on program records, which can be incomplete. We did not assess micronutrient status or long-term growth, and we do not know outcomes for children who defaulted. Nonetheless, the sample is sizeable and representative of two years of NRC admissions.

Our findings have public health significance. They show that well-run NRCs in MP can achieve recovery in nearly two-thirds (68%) of SAM children in one admission cycle. However, 32% did not reach the ≥15% weight gain criterion, indicating room for improvement (e.g. more intensive feeding or addressing infection). Lower-than-target weight gains suggest examining factors like feed preparation, caregiver counseling, and morbidity management. The high follow-up rate is encouraging, but dropouts still reached 41% by the third visit. Outreach (e.g. community health worker home visits) could further improve continuity, as integrated approaches have shown success.[10]

In sum, the Datia NRC appears effective in reducing SAM severity with no inpatient deaths, echoing other Indian NRC outcomes.[7,9] Continued investment in NRC services and caregiver education is warranted to sustain these gains and move toward national targets of reducing child wasting.[8]

CONCLUSION

The Nutrition Rehabilitation Centre at District Hospital Datia successfully managed severely malnourished children with favorable outcomes. On average, children achieved optimal weight gain of 8–10 g/kg/day during inpatient care and showed significant catch-up in weight and MUAC within ~16 days of inpatient care. Importantly, there were no deaths or referrals, highlighting the quality of care. A large majority (83%) attended follow-up visits, underscoring strong caregiver engagement. These results support the effectiveness of NRC-based SAM management in improving child nutrition. Efforts should continue to strengthen these programs and ensure post-discharge support, aiming to achieve national targets for SAM reduction and improve child survival.[5]

REFERENCES

1. Singh M, Stacey T, Abayomi J, Simkhada P. Maternal mental health and infant and young child undernutrition: protocol for a systematic review. BMJ Open. 2021 Sep 13;11(9):e044989. doi: 10.1136/bmjopen-2020-044989. PMID: 34518243; PMCID: PMC8438753.
2. Khura B, Mohanty P, Gandhi AP, Patnaik L, Mewara A, Pradhan K, Padhi BK. Mapping Concurrent Wasting and Stunting Among Children Under Five in India: A Multilevel Analysis. Int J Public Health. 2023 Jun 7;68:1605654. doi: 10.3389/ijph.2023.1605654. PMID: 37350797; PMCID: PMC10282129.
3. DISTRICT NUTRITION PROFILE. DATIA | MADHYA PRADESH. Available on: https://www.niti.gov.in/sites/default/files/2022-07/Datia-Madhya%20Pradesh.pdf
4. Tandon M, Quereishi J, Prasanna R, Tamboli AF, Panda B. Performance of Nutrition Rehabilitation Centers: A Case Study from Chhattisgarh, India. Int J Prev Med. 2019 May 17;10:66. doi: 10.4103/ijpvm.IJPVM_194_17. PMID: 31198501; PMCID: PMC6547793.
5. Sanghvi J, Mehta S, Kumar R. Predicators for weight gain in children treated for severe acute malnutrition: a prospective study at nutritional rehabilitation center. ISRN Pediatr. 2014 Mar 12;2014:808756. doi: 10.1155/2014/808756. PMID: 25006491; PMCID: PMC3972911.
6. O'Donovan G, Allen D, Nkosi-Gondwe T, Anujuo K, Abera M, Kirolos A, Olga L, Thompson D, McKenzie K, Wimborne E, Cole TJ, Koulman A, Lelijveld N, Crampin AC; CHANGE Study Collaborators Group; Opondo C, Kerac M. Weight gain among children under five with severe malnutrition in therapeutic feeding programmes: a systematic review and meta-analysis. EClinicalMedicine. 2025 Feb 12;81:103083. doi: 10.1016/j.eclinm.2025.103083. PMID: 40026833; PMCID: PMC11872456.
7. Dr. Nimisha Pandya, & Dr. Kedar G. Mehta. (2018). A study of facility and community phase management of children with Severe Acute Malnutrition at NRC in Central Gujarat. Pediatric Review: International Journal of Pediatric Research, 5(9), 468–473. https://doi.org/10.17511/ijpr.2018.i09.07
8. Ulahannan SK, Wilson A, Chhetri D, Soman B, Prashanth NS. Alarming level of severe acute malnutrition in Indian districts. BMJ Glob Health. 2022 Apr;7(4):e007798. doi: 10.1136/bmjgh-2021-007798. PMID: 35450860; PMCID: PMC9024259.
9. Taneja G, Dixit S, Khatri A, Yesikar V, Raghunath D, Chourasiya S. A study to evaluate the effect of nutritional intervention measures on admitted children in selected nutrition rehabilitation centers of indore and ujjain divisions of the state of madhya pradesh (India). Indian J Community Med. 2012 Apr;37(2):107-15. doi: 10.4103/0970-0218.96096. PMID: 22654284; PMCID: PMC3361793.
10. Kumar B, Shrivastava J, Satyanarayana S, Reid AJ, Ali E, Zodpey S, Agnani M. How effective is the integration of facility and community-based management of severe acute malnutrition in India? Public Health Action. 2013 Dec 21;3(4):265-70. doi: 10.5588/pha.13.0058. PMID: 26393044; PMCID: PMC4463162.
11. Bande, B. A., & Thora, S. (2019). Retrospective study of severe acute malnourished children in nutrition rehabilitation center of Madhya Pradesh, India: Management and outcome. Indian Journal of Child Health, 6(1), 30-34. https://doi.org/10.32677/IJCH.2019.v06.i01.007.