

Evaluating Anthropometric Outcomes in Children Treated at NRCs: A Case Study in Gwalior District

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Abstract

Background: Severe Acute Malnutrition (SAM) remains a significant public health issue, particularly in low- and middle-income countries. This study evaluates the anthropometric outcomes of children treated at Nutritional Rehabilitation Centres (NRCs) in Gwalior District, Madhya Pradesh.

Methods: A cross-sectional study was conducted at five NRCs in Gwalior District over six months, involving 200 children aged 6 months to 5 years diagnosed with SAM. Data were collected through structured interviews and anthropometric measurements, including weight, height, and mid-upper arm circumference (MUAC), recorded at admission and discharge.

Results: The study observed significant improvements in anthropometric parameters post-treatment ($p < 0.001$). Weight increased by 1.7 kg, height by 3 cm, and MUAC by 1.3 cm. Socio-economic factors, including maternal education (40%) and household income (30%), strongly influenced recovery.

Conclusion: NRC interventions effectively improve the nutritional status of children with SAM. However, socio-economic factors significantly impact recovery, necessitating integrated approaches combining nutritional treatment with educational and economic support.

Keywords: Severe Acute Malnutrition, Nutritional Rehabilitation Centre, Anthropometric Outcomes, Child Nutrition.

Introduction

Severe Acute Malnutrition (SAM) continues to be a critical public health challenge worldwide, with its impact being most pronounced in low- and middle-income countries. Among vulnerable populations, children under the age of five are disproportionately affected, facing severe health risks, developmental delays, and increased mortality rates. India, in particular, experiences a high prevalence of childhood malnutrition, which remains a significant concern despite ongoing governmental and non-governmental interventions. Within India, the state of Madhya Pradesh stands out as one of the worst-affected regions,

with the Gwalior District exhibiting some of the most alarming rates of SAM. This heightened prevalence can be attributed to deeply rooted socio-economic disparities, including widespread poverty, food insecurity, inadequate healthcare access, and limited maternal education. These structural inequities not only contribute to the persistence of malnutrition but also hinder effective intervention strategies. Addressing SAM in such high-burden regions requires a multifaceted approach that integrates immediate nutritional rehabilitation with long-term socio-economic improvements (1,2). The National Family Health Survey (NFHS-5) indicates that these socio-economic challenges significantly contribute to the malnutrition crisis, highlighting the urgent need for effective interventions (2).

Nutritional Rehabilitation Centres (NRCs) play a pivotal role in addressing SAM by providing therapeutic diets, medical care, and health education to caregivers. These centers are designed to facilitate short-term nutritional recovery, focusing on improving anthropometric measures such as weight, height, and mid-upper arm circumference (MUAC) (3). However, the success of NRCs is not solely determined by the treatment provided; it is also influenced by socio-economic factors such as household income, maternal education, and cultural practices. Research indicates that children from households with higher maternal literacy and stable income levels demonstrate significantly better recovery rates post-treatment (4,5). This correlation underscores the importance of integrating educational initiatives alongside nutritional interventions to enhance recovery outcomes.

The current study aims to evaluate the anthropometric outcomes of children treated at NRCs in Gwalior District while also exploring the socio-economic determinants that affect recovery. With a sample size of 200 children aged 6 months to 5 years, the study emphasizes the dual role of direct nutritional intervention and the socio-economic environment in improving health outcomes. A robust methodology involving pre- and post-treatment anthropometric measurements and socio-economic data collection will be employed to address existing gaps in the literature regarding the effectiveness of NRCs in rural and semi-urban contexts (6,7).

Furthermore, the study gives critical insights regarding the duration of stay in NRCs, cultural perceptions of health and nutrition, and barriers to long-term recovery. Previous research has identified adherence to recommended stay durations and the need to address systemic issues such as poverty and education as pivotal factors in achieving sustained nutritional improvements (8,9). By combining quantitative measurements with socio-economic analysis, this case study aims to contribute to a nuanced understanding of the recovery processes associated with SAM in NRCs. It highlights the necessity of integrating health system improvements with socio-economic policies to comprehensively tackle malnutrition (10,11)

Objectives

1. Evaluate the variations in key anthropometric indicators, such as weight, height, and mid-upper arm circumference (MUAC), before and after receiving treatment at Nutritional Rehabilitation Centres (NRCs).
2. To analyze the socio-economic determinants of recovery.

Material and Methods

Study Design and Sample Size

A cross-sectional study was carried out at five Nutritional Rehabilitation Centres (NRCs) in Gwalior District over a duration of six months. The study included a total of 200 children, aged between 6 months and 5 years, who were diagnosed with Severe Acute Malnutrition (SAM). The sample size was determined based on prior research highlighting the prevalence of malnutrition in the region. Participants were selected using a systematic random sampling approach from the NRC records.

Data Collection

Data were collected through structured interviews and anthropometric measurements. The following parameters were assessed:

- Weight
- Height
- Mid-Upper Arm Circumference (MUAC)

Measurements were taken at admission and after the completion of the treatment protocol, which typically lasted around 14 days. Additionally, socio-economic data were collected, including household income, maternal education, and living conditions.

Statistical Analysis

The data were analyzed using SPSS software, with descriptive statistics calculated for all variables. Paired t-tests were performed to assess changes in anthropometric measurements before and after treatment. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

- Approval was obtained from the Institutional Ethics Committee of GRMC, Gwalior.
- Written informed consent was obtained from caregivers after explaining the study's objectives and procedures.
- Confidentiality of participant data was strictly maintained.

Results

The results showed significant improvements in anthropometric parameters among children treated at NRCs and highlighting key socio-economic influences on recovery.

1. Anthropometric Outcomes

The results of the paired t-test analysis indicated that all observed changes in anthropometric measurements were statistically significant, with a p-value < 0.001 . This finding confirms that the improvements in weight, height, and mid-upper arm circumference (MUAC) following treatment at the Nutritional Rehabilitation Centres (NRCs) were not due to random variation but rather a direct outcome of the nutritional interventions provided.

2. Socio-Demographic Insights

a. Gender and Age Distribution

- **Age:** The mean age of participants was **24 months**, with a range of **6 months to 5 years**.
- **Gender:** Females comprised **60%** of the participants, reflecting possible gender disparities in healthcare-seeking behaviour or malnutrition prevalence.

b. Socio-Economic Background

Maternal Education (40%): Strong correlation with improved adherence to dietary and health practices.

Household Income (30%): Limited income constrained access to resources, affecting recovery rates.

Cultural Practices (20%): Some traditional beliefs conflicted with NRC-provided guidance.

Access to Resources (10%): Availability of clean water and sanitation facilities played a smaller role but was still significant.

3. Duration of Stay and Its Impact

- **Mean Stay:** The average stay at the NRC was **9.88 days**, shorter than the recommended **14 days** for complete nutritional recovery.
- **Observation:** Shorter stays might limit the full impact of therapeutic interventions, highlighting the need for tailored treatment durations based on individual recovery rates.

Discussion

The results of the study indicate significant improvements in anthropometric parameters among children treated at Nutritional Rehabilitation Centers (NRCs), with notable socio-economic influences on recovery. The anthropometric outcomes, including weight, height, and mid-upper arm circumference (MUAC), demonstrated substantial increases post-treatment, indicating effective nutritional interventions. Specifically, the average weight increased by 1.7 kg, height improved by 3 cm, and MUAC showed a 1.3 cm enhancement, all statistically significant ($p < 0.001$). These findings align with previous research indicating that nutritional interventions can lead to marked improvements in children's growth metrics, as noted by Ghimire et al. (2020), who found that children from food-insecure households were more likely to experience malnutrition, highlighting the importance of addressing underlying socio-economic factors in treatment strategies (12).

The socio-demographic insights reveal critical patterns in gender and age distribution among the participants. The mean age of 24 months, with a predominance of female participants (60%), suggests potential gender disparities in healthcare access and nutritional status. This observation is consistent with findings by Obasohan et al. (2023), who reported that female children have considerably decreased odds of being poorly nourished compared to their male counterparts, indicating potential gender disparities in malnutrition (13).

Furthermore, maternal education emerged as a significant predictor of improved dietary practices, corroborating the findings of Kandala et al. (2011), who emphasized the role of socio-economic factors in influencing malnutrition risks among children (14).

The duration of stay at the NRC, averaging 9.88 days, was shorter than the recommended 14 days for optimal recovery. This raises concerns about the adequacy of treatment duration, as shorter stays may limit the effectiveness of therapeutic interventions. Similar observations were made by Trehan et al. (2013), who highlighted that insufficient treatment duration could adversely affect recovery outcomes in children suffering from severe acute malnutrition (3). The need for tailored treatment durations based on individual recovery rates is critical, as underscored by the findings of Mehta et al. (2013), who noted that environmental and behavioural factors significantly influence recovery trajectories in malnourished children (15).

Conclusion

This study highlights the effectiveness of Nutritional Rehabilitation Centres (NRCs) in improving the nutritional status of children diagnosed with Severe Acute Malnutrition (SAM) in the Gwalior District. The results demonstrate significant improvements in key anthropometric parameters—weight, height, and mid-upper arm circumference (MUAC)—post-treatment. These outcomes underscore the efficacy of NRC-provided therapeutic interventions. However, the findings also emphasize the critical influence of socio-economic factors such as maternal education, household income, and cultural practices on recovery. The study reveals that while NRC interventions are impactful, the shorter-than-recommended average duration of stay (9.88 days compared to 14 days) may limit the full realization of treatment benefits. Gender and age disparities, as well as socio-economic barriers, highlight the multifaceted nature of malnutrition and recovery, necessitating a holistic approach to addressing SAM.

Recommendations

1. Extend the duration of stay at NRCs to align with the recommended 14 days, ensuring children receive comprehensive care and recovery.
2. Develop robust caregiver education programs to improve maternal understanding of child nutrition and health practices.

Limitations

The study focused solely on short-term outcomes during the NRC treatment period, limiting insights into long-term recovery and sustained nutritional improvements.

The average stay of 9.88 days limited the ability to evaluate the full potential of the standard 14-day treatment protocol.

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Tables and Legends**Table 1. Anthropometric Outcomes**

Parameter	Admission (Mean $\pm$ SD*)	Discharge (Mean $\pm$ SD)	Change (Mean)	t-value	p-value
Weight (kg)	8.5 $\pm$ 1.2	10.2 $\pm$ 1.1	1.7	-15.34	< 0.001
Height (cm)	75 $\pm$ 3.5	78 $\pm$ 3.2	3.0	-10.12	< 0.001
MUAC [†] (cm)	11.5 $\pm$ 1.0	12.8 $\pm$ 1.1	1.3	-12.87	< 0.001

*Standard Deviation

[†]Mid Upper Arm Circumference

Table 1 shows:

- **Weight:** Increased significantly by an average of 1.7 kg after treatment.
- **Height:** Improved by 3 cm, highlighting growth recovery during the treatment period.
- **MUAC:** A 1.3 cm improvement indicates better nutritional status and reduced risk of malnutrition.

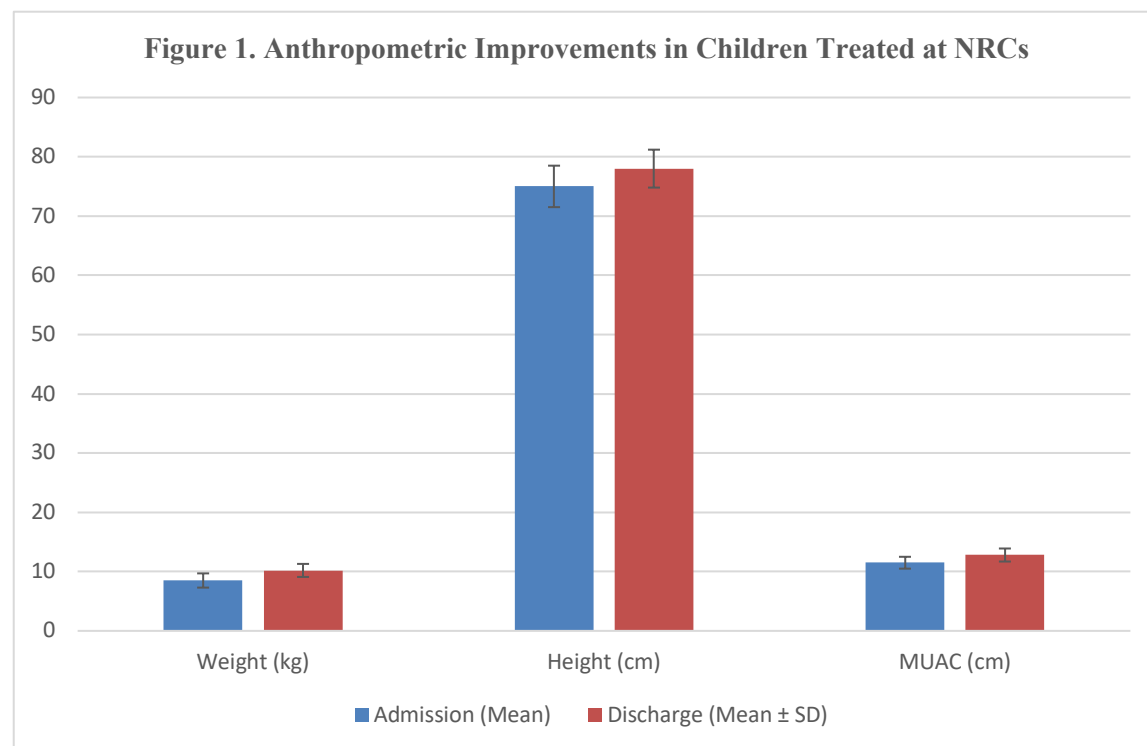


Figure 2. Socio-Economic Factors influencing recovery