

Maternal Knowledge on Health, Sanitation, And Micronutrients and Its Impact on Nutritional Outcomes Among Children Aged 0-5 Years at Nutrition Rehabilitation Centre (NRC), Capital Hospital, Bhubaneswar

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Abstract—Maternal and child health and welfare are determined by nutrition and health status, especially when looking at at-risk populations who live in poor environments. In India, Severe Acute Malnutrition (SAM) is still a major Public Health issue that causes children under-five years of age to suffer from increased hospitalization and deaths. The current study was conducted to assess health and sanitation behaviours, mothers' knowledge of nutrition and micronutrients, and the nutrition status of children admitted with SAM at the Nutrition Rehabilitation Centre (NRC), Capital Hospital, Bhubaneswar. A descriptive observational cross-sectional design was undertaken, involving 100 children under 5 years old who had been diagnosed with SAM and their caregivers. Mixed methods including pre-tested, structured questionnaires; anthropometric measures; medical record reviews; and interviews were used to collect data. Anthropometric methods used to describe the nutrition status of children included weight, height/length, body mass index, and mid-upper arm circumference. Descriptive and inferential statistical analyses were conducted to describe quantitative data; and thematic content analyses were used for qualitative data. Improvements in anthropometric indicators are seen during institutionalized care and indicate that NRC-based nutritional rehabilitation intervention is effective. However, the study revealed gaps in maternal understanding concerning appropriate feeding techniques, micronutrient supplementation, and aftercare following discharge. There were also some notes on poor sanitation and hygiene practices contributing to repeated episodes of infections and nutritional deficiencies. Strengthening health care provider education, community-based follow-up, and

integrated health and nutrition interventions will be needed to create sustained improvements in child nutrition outcomes.

Index Terms—Severe Acute Malnutrition, Nutrition Rehabilitation Centre, Anthropometric Measurements, Maternal Knowledge, Sanitation Practices, Child Nutrition

I. INTRODUCTION

Individual wellbeing is determined by health and nutrition as their main drivers. Women of reproductive age and their families represent particularly vulnerable populations; thus, both health and nutrition must be understood as major influencing factors on health and well-being. In many developing regions (UNICEF, 2019), Health and nutrition remain to be the major determinants of health outcomes. Conditions that are preventable remain, due to poor sanitation, health education, and limited access to adequate nutrition (WHO & UNICEF, 2021). These factors are mutually related and therefore many factors that influence maternal and child health will be interrelated. Understanding health behaviors of the patient, maternal knowledge of nutrition, and nutritional status is a major contributor in developing public health interventions, and improving quality of life.

Healthy practices related to both sanitation and health is essential to preventing the transmission of communicable diseases through encouraging one's

overall health status. For example, poor personal hygiene practices, drinking unsafe water, improperly disposing of wastes, and having limited access to basic sanitation facilities can greatly increase the opportunity for individuals to become infected with gastrointestinal infections such as diarrhea or parasites to develop other health problems due to the physical environment, i.e., environmental health (WHO, 2019). Hygiene behaviors exhibited in patients can give an indication of their awareness of how to maintain a healthy lifestyle as well as their access to basic infrastructure that enables them to practice healthy hygiene. Observing these healthy hygiene behaviors in patients will provide health professionals with insight as to what barriers exist to access to safe and healthy practices including environmental health and healthcare, which can further create opportunities for morbidity to develop among these patients, especially those individuals living in low-resource countries.

Mothers have a major influence on the food that is consumed in their households. They are responsible for the types of foods that are available for their families to eat (i.e., food availability), how they will prepare these foods (i.e., food preparation), feeding their children (i.e., child-feeding practices), and where they will access health care services for their family. Educating mothers about the importance of healthy eating through a balanced diet, as well as the importance of micronutrients and how to use them properly during pregnancy and breastfeeding, could help to reduce the occurrence of malnutrition. Micronutrients such as iron, iodine, vitamin A, folic acid and zinc are also important for the physical growth, immune system function and cognitive development of children (WHO, 2017). The lack of these micronutrients could lead to serious health complications throughout an individual's lifespan, such as anemia and developmental delays of the child, as well as increasing the risk of infection (Black *et al.*, 2013). By evaluating mothers' knowledge about the micronutrients, we will identify areas of low maternal knowledge that can be addressed through the development of appropriate education programs.

There is a relationship between sanitation behaviors, nutrition knowledge of mothers, and the nutritional condition of mothers. Given that poor sanitation can worsen the nutritional deficiencies of mothers due to higher infection rates due to an increased opportunity for infection transmission from the environment, and

because a mother's lack of knowledge of nutrition may cause her to practice poor nutrition even when food is available these two areas of concern create a cycle that adversely affects the overall health of the mother (WHO & UNICEF, 2021). Therefore, a holistic approach to assessing the health of mothers or patients will provide a complete and integrated assessment of the health of mothers, patients, and population as a whole.

This study will augment the body of evidence currently available to guide the work of health programs and health systems by providing empirical data to determine the health behaviors and sanitation practices of mothers of children aged 1-5 years, mothers' nutrition knowledge with respect to the health of the child and the mother's nutrition knowledge with respect to micronutrients and to determine the nutritional status of mothers and children using anthropometric measurements. This data is important to health care providers, policy-makers and public health practitioners and will provide support for the development of community-based nutrition and health programs in order to empirically identify areas of need and identify strategies to improve the health of mothers through sustainable efforts to provide informed choices to improve their overall health and that of their child (UNICEF, 2019).

OBJECTIVES OF THE STUDY

1. To observe the health and sanitation practices of the patients.
2. To observe maternal knowledge concerning health and the importance of micronutrients.
3. To learn about the nutritional status of patients using anthropometric measurements.

II. SIGNIFICANCE OF THE STUDY

This study's value is in the broad range it covers in assessing the health of patients. It assesses hygiene, maternal knowledge about health and micronutrients, and evaluates nutritional status using anthropometric measurements. The study identifies the areas where there are gaps in hygiene behaviours, nutrition awareness and physical indicators of health and can provide evidence-based information to support the early detection of health risks and malnutrition. The results can assist healthcare providers in developing specific health education and nutrition intervention

programmes, improve prevention strategies related to health, and provide policy-makers with information to facilitate their efforts associated with improving the health of mothers and their children. This study enhances the community's understanding of health-related issues, decreases the incidence of health problems associated with nutrition, and raises the level of awareness about sustainable health and sanitation practices.

III. REVIEW OF LITERATURE

Sharma and Verma (2022) studied that caregiver knowledge and practices directly influence the outcomes of nutritional rehabilitation. The analysis indicated an improved rate of weight gain and a reduced relapse rate among children whose caretakers got strict counseling while they were in the NRC. The data suggest that many caretakers were not aware of the following: how often to feed their child; how diverse to make the diet, and appropriate hygiene procedures. These factors lead to negative longer-term nutritive outcomes.

Das and Mohanty (2021) found recurrent infections to be an important factor in nutritional status deterioration in infants and children. Frequent occurrence of diarrhoea and respiratory infections were found to have a significant correlation with both wasting and underweight. It was found that compromised immunity among undernourished children created a vicious cycle of infection and malnutrition.

Menon et al. (2020) studied that there are many factors (both socioeconomic and environmental) likely to significantly influence the nutrition status of children. Poverty, food insecurity, poor water supply and/or poor sanitation have been identified as the three primary risk factors for under-nutrition among children in India.

Kumar et al. (2020) estimated that there is a high prevalence of micronutrient deficiencies among severely malnourished children in tertiary hospitals. About 13% of the sample population of children was identified as having iron deficiency, while both vitamin A and Zinc deficiencies were common among those who were malnourished, but to differing

degrees, with iron being the most common. Micronutrient supplementation as part of NRC care effectively raised hemoglobin levels and reduced the incidence of infection in malnourished children. Deficiency observed among the sample population of children; followed by vitamin A and Zinc deficiencies. Micronutrient supplementation as part of NRC care improved hemoglobin levels and decreased the incidence of infections in undernourished children.

Prasad et al. (2018) observed that 6% of children showed improved anthropometric deficits after 4-6 months of community rehabilitation, with significant positive changes in weight-for-height Z-scores in an observational study to evaluate nutritional outcomes in severely acute malnourished children in tribal blocks of Central and Eastern India. The importance of interventions at the village level in improving recovery rates of SAM children in tribal areas was highlighted in the study, although it also accepted that some children continued to remain in the SAM category.

Saxena et al. (2018) estimated that nutritional interventions in 500 SAM children admitted to multiple Nutrition Rehabilitation Centers (NRCs) in Bhopal, Madhya Pradesh, showed significant improvements in weight and mid-upper arm circumference from admission to six months of follow-up and average weight gain of approximately 8.95 g/kg/day during NRC care. The findings emphasized that nutritional rehabilitation of SAM children in NRCs was effective in improving anthropometric recovery, but the authors emphasized that parental knowledge and participation post-discharge are essential for long-term maintenance of benefits.

IV. RESEARCH METHODOLOGY

This study used a descriptive observational study design with a cross-sectional method to identify the causes, complications and treatment of children suffering from Severe Acute Malnutrition (SAM) who were admitted into the Nutrition Rehabilitation Centre (NRC) at Capital Hospital, Bhubaneswar. Data were collected using a questionnaire which included assessment of the socio-demographic characteristics of participants, nutritional status and knowledge and care practices of caregivers.

The research was carried out in the NRC facility in Bhubaneswar, which is a tertiary hospital and a referral center for people from urban and rural communities in Odisha. The population of interest is comprised of children aged between 1 and 5 who have been diagnosed with SAM who have also been admitted at the hospital. Their caregivers were also included in evaluating and collecting data for qualitative analysis. A purposive sampling method was developed to recruit and select these 100 infants based on an average number of NRC admissions from last year.

Data for the research were then collected using both quantitative methods and qualitative methods to assess the nutritional status of the children, as well as how they seek out healthcare or how they maintain hygiene or what types of foods/feeding practices are utilized. Quantitative data was assessed through the collection of structured questionnaires, anthropometric measures (weight, length/height, and MUAC), and the review of medical records in order to assess the nutritional status of children and determine medical complications and treatment results.

Qualitative data collection happened through the completion of structured caregiver interviews that were focused on feeding practices, hygiene behaviors, and seeking out healthcare. Data collection was done through the use of pre-tested structured questionnaires and interview schedules. The instruments were refined through a pilot test with ten caregivers who were not included in the final sample for inclusion in the study. The data was coded and then analyzed using both descriptive and inferential statistics, while qualitative data were analyzed using thematic analysis to identify common themes/patterns. Ethical clearance was obtained prior to the start of the study and all participants provided their informed consent and received complete confidentiality during the course of the study.

V. RESULTS AND DISCUSSION

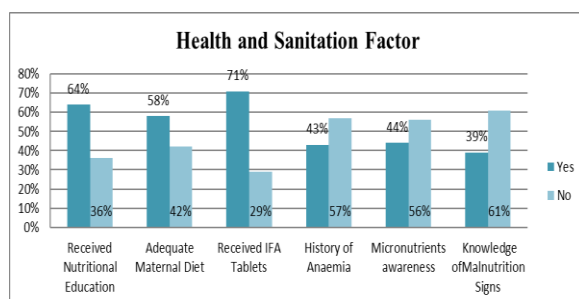
The results and discussion chapter is based on statistical analysis and tabulation data

Total no. of sample (N):100

Section A: Health and Sanitation Factors

Table 1: Health and Sanitation Factors

Sl No.	Variable	Observation	Frequency	Percentage
1	Frequent Illness (Diarrhea, Cough, Fever)	Yes	64	64%
		No	36	36%
2	Fully Immunized	Yes	58	58%
		No	42	42%
3	History of Malnutrition Diagnosis	Yes	71	71%
		no	29	29%
4	Source of Drinking Water • Tap / Borehole - Yes • Open Source (Well/River)- No	Yes	43	43%
		No	57	57%
5	Toilet Access	Yes	44	44%
		No	56	56%
6	Regular Handwashing	Yes	39	39%
		No	61	61%



Graph no.1

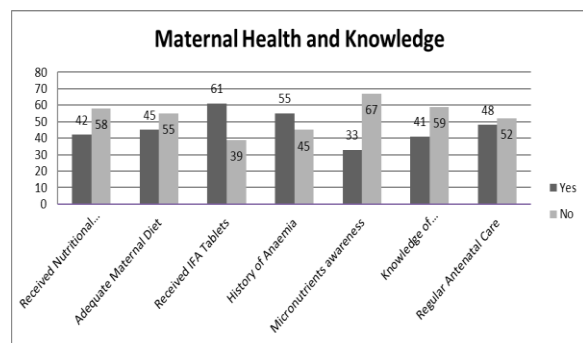
The table no.1 and graph no.1 show health and sanitation factors where it is found that 64% of children suffered frequent illnesses, such as diarrhea, cough and fever, which may exacerbate nutritional deficiencies. Fifty-eight percent of children had been fully immunized, but there were still a large number of unimmunized children remaining. Seventy-one percent of children have been diagnosed with malnutrition prior to this study. The poor sanitary environment is clearly documented as being

detrimental to health through limited access to safe drinking water (43%), access to toilets (44%), and limited access to regular hand washing (39%). All of these environmental factors result in an increased risk of infection and malnutrition.

Section B: Maternal Health and Knowledge

Table 2: Maternal Health and Knowledge during pregnancy

Sl N o.	Variable	Observat ion	Freque ncy	Percent age
1	Received Nutritional Education	Yes	42	42%
		No	58	58%
2	Adequate Maternal Diet	Yes	45	45%
		No	55	55%
3	Received Iron-Folic Acid Tablets	Yes	61	61%
		No	39	39%
4	History of Anaemia	Yes	55	55%
		No	45	45%
5	Awareness of Micronutri ents	Yes	33	33%
		No	67	67%
6	Knowledg e of Malnutritio n Signs	Yes	41	41%
		No	59	59%
7	Regular Antenatal Care	Yes	48	48%
		No	52	52%



Graph no.2

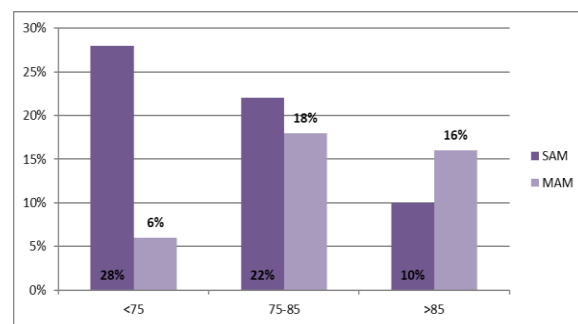
In table no.2 and Graph no.2, the findings of this study indicate that there is a lack of maternal health education and practice. There were only 42% of mothers who had been provided nutritional education during their pregnancy, and less than 50% of mothers said that they had an adequate dietary intake. Although sixty-one percent of mothers were provided with Iron and Folic Acid supplementation during pregnancy, over half of these mothers (55%) reported having a history of anaemia. Within this study, a low number of women were aware of the importance of micronutrients (33%) and the signs of malnutrition (41%). Just 48% of mothers received timely antenatal care during their pregnancy. This lack of maternal knowledge and care will significantly contribute to the malnutrition of children.

Section C: Anthropometric Measurements of Patients

1. Distribution of Children According to Height (in cm)

Table 3: Distribution of Children According to Height (in cm)

Height (in cm)	SAM (Severe Acute Malnutrition) child	MAM (Moderate Acute Malnutrition) child	Total children (% n)
<75	28%	6%	34%
75-85	22%	18%	40%
>85	10%	16%	26%



Graph no.3

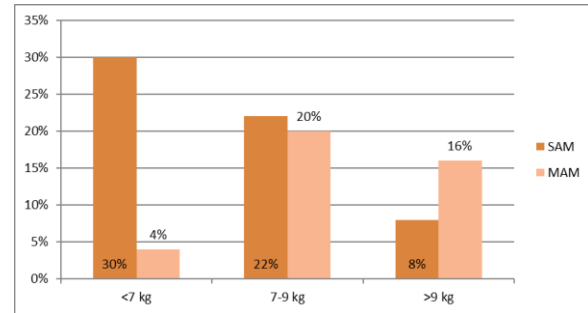
In table no.3 and Graph no.3, the height distribution demonstrates that there are 34% of children who fall below the 75 cm height mark, with a larger number being categorized as SAM children. The 75 to 85 cm range accounts for the largest number of children and

represents 40% of the total number of children, whereas 26% of the children fall into the greater than 85 cm range. There is therefore a significant level of stunting amongst severely malnourished children.

2. Distribution of Children According to Weight (in kg)

Table 4: Distribution of Children According to Weight (in kg)

Weight (in kg)	SAM (Severe Acute Malnutrition) child	MAM (Moderate Acute Malnutrition) child	Total children (% n)
<7	30%	4%	34%
7-9	22%	20%	40%
>9	8%	16%	26%



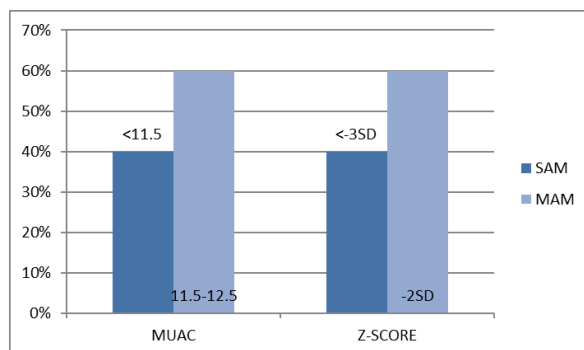
Graph no.4

In table no.4 and Graph no.4, an analysis of weight shows 34% of Children are < 7kg and consist mainly of wasting (SAM), 40% were in the 7-9 kg category, and only 26% were > 9kg, indicating that there are many children underweight, which is indicative of acute malnutrition.

3. Distribution of Children According to MUAC and Z-SCORE

Table 5: Distribution of Children According to MUAC and Z-SCORE

Sl no.	Variable	Observation	SAM (Severe Acute Malnutrition) child	MAM (Moderate Acute Malnutrition) child	Total children (n%)
26	MUAC	<11.5	40%	0%	40%
		11.5-12.5	0%	60%	60%
27	Z-Score	<-3SD	40%	0%	40%
		-2SD	0%	60%	60%



Graph no.5

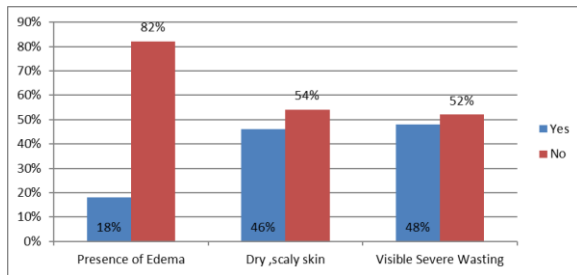
In table no.5 and Graph no.5, The MUAC and Z-scores shows that 40% of Children fall into the severe malnourished categories (MUAC<11.5cm, <-3 SD) and 60% were classified as moderately malnourished. These measures confirm that a high percentage of the population suffers from acute malnutrition, and that the data collected through anthropometry is valid.

Section F: Clinical Signs and Symptoms of the Patients

Table 4: Clinical Signs and Symptoms of the Patients

Sl No.	Variable	Observation	Frequency	Percentage
1	Presence of edema	Yes	18	18%
		No	82	82%
2	Dry and scaly skin	Yes	46	46%
		No	54	54%
3	Visible Severe Wasting	Yes	48	48%
		No	52	52%

In table no.6 and Graph no.6, Clinical examinations indicated that 18% of children had edema, which may indicate serious malnutrition complications. Almost half of the children had dry, scaly skin (46%) and visible signs of severe wasting (48%).



Graph no.6

These are typical clinical manifestations of protein-energy malnutrition, which add to the evidence for a high degree of severe and moderate acute malnutrition among the children in this study.

VI. CONCLUSION

Health and sanitation conditions were found to be poor and closely linked with nutritional outcomes. Frequent episodes of illness, including diarrhea, cough, and fever, were reported in 64% of children. Such recurrent infections increase nutrient losses, suppress appetite, and impair nutrient absorption. Immunization coverage was incomplete, with only 58% of children being fully immunized. Environmental sanitation indicators were concerning, as only 43% of households had access to safe drinking water and 44% had access to toilet facilities. Regular handwashing practices were followed by just 39% of families. Additionally, 71% of children had a previous history of malnutrition, indicating chronic or recurrent undernutrition. These findings highlight the strong interrelationship between poor sanitation, frequent illness, and nutritional deterioration.

Maternal health and nutrition-related knowledge were also found to be inadequate. Only 42% of mothers reported receiving nutritional education during pregnancy, and 45% consumed an adequate diet. Although 61% of mothers received iron and folic acid supplementation, 55% reported a history of anemia, suggesting poor dietary quality or insufficient utilization of supplements. Awareness regarding the importance of micronutrients was low, with only 33% of mothers demonstrating adequate knowledge. Knowledge of malnutrition signs was reported by 41% of mothers, limiting early detection and timely intervention. Regular antenatal care was accessed by only 48% of mothers, reducing opportunities for health education and nutritional counseling.

Anthropometric assessment revealed a high burden of acute malnutrition among the children admitted to the NRC. Height measurements indicated that 34% of children were below 75 cm, with a higher proportion classified as severely malnourished. Weight assessment showed that 34% of children weighed less than 7 kg, 40% weighed between 7–9 kg, and only 26% weighed more than 9 kg, reflecting significant levels of underweight and wasting. MUAC and Z-score analysis further confirmed the severity of malnutrition, with 60% of children categorized as severely acutely malnourished and 40% as moderately acutely malnourished. Clinical examination supported these findings, with 18% of children presenting with edema, an indicator of severe protein-energy malnutrition. Dry and scaly skin was observed in 46% of children, while 48% exhibited visible severe wasting. These clinical features indicate prolonged nutritional deprivation and delayed access to effective intervention, emphasizing the seriousness of the condition among children admitted to the NRC.

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