

DETERMINING THE UNDERLYING FACTORS CONTRIBUTING TO SEVERE ACUTE MALNUTRITION AND IMPACT OF NUTRITIONAL REHABILITATION CENTRE-A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Background: Severe Acute Malnutrition is a clinical syndrome caused by an imbalance between the supply and demand for proteins, micronutrients, and energy content, along with the intricate interplay of numerous pathological mechanisms. The objective is to determine the etiological factors responsible for severe acute malnutrition in District Teaching Hospital, Koppal institute of medical sciences (KIMS), Koppal and the impact of Nutritional Rehabilitation Centre. **Materials and Methods:** It is a hospital based prospective observational study conducted on children admitted to Nutritional Rehabilitation Centre at District Teaching Hospital, Koppal. **Result:** The study included 50 children with severe acute malnutrition (SAM), pre-dominantly aged 12–23 months (36.0%), with a near-equal gender distribution (52% fe-male, 48% male) and a majority from rural areas (84.0%). Common symptoms included fe-ver (58.0%), poor appetite (50.0%), diarrhea (42.0%), and weight loss (42.0%). Anemia was diagnosed in 46.0% of children, and 60.0% had abnormal serum protein levels. Calo-rie deficiency >50% was observed in 46.0% of children, and protein deficiency (21–45%) was noted in 32.0%. No children had normal weight for age, though 42.0% had normal height for age. Most mothers were married young (58.0% ≤20 years), and 72.0% of chil-dren were exclusively breastfed for 6 months. Faulty feeding practices were noted in 30.0% of cases. All 50 children (100.0%) recovered at the Nutritional Rehabilitation Cen-tre (NRC) with an average weight gain of 8 g/kg/day and an average stay of 12 days. No mortality was reported, with no defaulters. **Conclusion:** Severe acute malnutrition (SAM) is most prevalent in rural children aged 6–35 months. Low parental education, poverty, and unskilled labor contribute signifi-cantly to malnutrition. Faulty feeding practices and delayed breastfeeding initiation worsen nutritional status. Infections (fever, diarrhea) are major comorbidities in malnour-ished children.

INTRODUCTION

According to who definition of malnutrition refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients.^[1]

Undernutrition is one of the most concerning health and development issues in India as in other parts of the world. Undernutrition encompasses stunting (chronic malnutrition), wasting (acute malnutrition) and deficiencies of micronutrients (essential vitamins and minerals).^[2]

The high mortality and disease burden resulting from undernutrition call for urgent imple-mentation

of interventions to reduce their occurrence and consequences and this would include determined action on the social determinants of undernutrition.^[2]

In 2022, an estimated 148 million children under 5 years of age globally were affected by stunting (too short for age) and 45 million were affected by wasting (too thin for height), revealing the vast extent of undernutrition among the youngest population.^[3]

The global prevalence of stunting is 22.3% in 2022, and the prevalence of wasting is 6.8 %. The prevalence of wasting continued to be the highest

across all who regions despite having declined from 17.1% in 1990 to 14.7% in 2022.^[3]

Malnutrition is the leading cause of immunodeficiency across the globe. In India, weight-for-age measurements tend to be lower compared to international benchmarks, reflecting widespread nutritional concerns. This trend highlights the prevalence of undernutrition, which can lead to issues like stunting, wasting, and underweight conditions, significantly impacting overall health and development.^[4]

A significant number of children affected by undernutrition experience mild to moderate forms that often go unnoticed. Early childhood is particularly vulnerable, and malnutrition at this stage can lead to irreversible effects on growth and development.^[5]

In the present study an attempt will be made to determine the underlying factors contributing to severe acute malnutrition and impact of nutritional rehabilitation centre.

MATERIALS AND METHODS

This Hospital based prospective observational study was conducted among Children admitted to Nutritional Rehabilitation Centre at District Teaching Hospital, Koppal.

Inclusion Criteria:

Children aged 6 months - 5 years with presence of any of the following

- Weight for length/height < -3 standard deviation (SD) [World Health Organisation (WHO) median height].
- Bilateral pedal edema.
- Grossly visible severe wasting.
- Mid upper arm circumference

Exclusion criteria:

Children with non-nutritional causes of Severe acute malnutrition:

- Cleft lip, cleft palate, gastro-esophageal reflux disease (GERD), other surgical conditions,
- Preterm babies,
- Chronic renal failure,
- Congenital heart diseases,
- Liver disorders,
- Congenital lung malformations
- Mental retardation,
- Cerebral palsy,
- Suspected case of Inborn error of metabolism and
- Children less than 6 months of age and more than 5 years of age were excluded from the study.

Methodology: Approval was obtained from the Institutional Scientific and Ethical Committee of Koppal Institute of Medical Sciences, Koppal. Children admitted to Nutritional Rehabilitation Centre at District Teaching Hospital, Koppal. Those

meeting the criteria will be enrolled in the study following the acquisition of informed consent.

- Etiological factors were gathered through the use of history. An extensive history was taken, along with a clinical and systemic examination.
- Anthropometric data (weight, height/length, mid upper arm circumference, weight for height, edema) taken at admission were used to determine the nutritional status.
- The children's weight was determined using electronic weighing devices. The participant's height was measured using a stadiometer. An infantometer was used to measure recumbent length in children under 24 months old, and a mid upper arm circumference tape was used to measure mid upper arm circumference.
- Babies received therapeutic feeding for a minimum of 14 days. Additional daily meals that a child could eat were provided. Mothers received advice on nutrition, hygiene, and health.
- Weight was kept track of daily. Children who gained weight were discharged after 14 days. If there is no weight gain, they must stay at NRC for a total of 21 days.

Sample Size:

The sample size was calculated using the formula:

$$n = z^2 \times p \times q / l^2 \text{ Where:}$$

Sample size = 50

Statistical Analysis: Data were analyzed using SPSS Statistics software version 23.0. Descriptive statistics, including frequency analysis, were conducted to describe the data. Categorical variables were analyzed using percentage analysis, while continuous variables were assessed using mean and standard deviation.

RESULTS

The majority of children (36.0%) were between the ages of 12 and 23 months. Following closely behind, 30.0% of children fell within the age range of 24 to 35 months, while 28.0% were aged 6 to 11 months. Only 6.0% of patients were in the 36 to 59 month age group. The youngest child was 8 months old, while the oldest was 52 months. The average age of patients was 19.64 years.

Majority of patients were male children, accounting for 24 individuals (48.0%), while 26 patients (52.0%) were female. The male to female ratio was calculated as 1:1.08.

Majority of children included in the study were from rural areas, accounting for 42 children (84.0%) with acute malnutrition. In contrast, only 8 children (16.0%) were from urban areas. This data highlights the prevalence of acute malnutrition among rural children compared to their urban counterparts.

Table 1: Distribution of acute malnutrition children according to duration of stay in to Nutritional Rehabilitation Centre (NRC)

Duration of stay in NRC	Number of children	Percentage
9—10 days	11	22.0
11—12 days	24	48.0
13—14 days	15	30.0
Total	50	100.0
Mean ± SD	12.00 ± 1.10	

24 children (48.0%) stayed at the NRC for 11-12 days, followed by 15 children (30.0%) who stayed for 13-14 days, and 11 children (22.0%) who stayed for 9-10 days. On average, children stayed at the NRC for 12.0 days.

Majority of children's fathers and mothers had an educational level of illiteracy, with 20 (40.0%) and 18 (36.0%) respectively. This was followed by 14 (28.0%) fathers and 17 (34.0%) mothers who had completed higher secondary education

Majority of fathers (40.0%) held occupations as unskilled workers, followed by 32.0% who were involved in farming, and 20.0% who were skilled workers. It is evident that a significant portion of fathers in the study were employed in manual labor or agricultural roles.

Majority of mothers, 37 (74.0%), were housewives. This was followed by 6 (12.0%) mothers who were daily wage workers, and 4 (8.0%) mothers who were involved in

Majority of children from lower-class families make up 64.0% of the sample. Additionally, 28.0% of children come from lower-middle-class families, while 8.0% belong to the middle class. Interestingly, no children from upper-class or upper-middle-class families were included in the study. This distribution highlights the socio-economic diversity within the sample population.

Most prevalent complaints reported by participants. Fever was the most common complaint, with 25

individuals (50.0%) experiencing this symptom. Loose stools followed closely behind, with 21 individuals (42.0%) reporting this issue. Vomiting was reported by 11 individuals (22.0%), while cold and cough were experienced by 10 individuals (20.0%). Poor weight gain was the least common complaint, with only 5 individuals (10.0%) reporting this symptom.

Poor appetite was re-reported in 25 individuals, representing 50.0% of the sample, while 1 child, accounting for 2.0%, exhibited no appetite. Vomiting was noted in 12 children, equating to 24.0% of the group, and diarrhea was present in 21 children, making up 42.0% of the total. Additionally, 5 children (10.0%) displayed edema, 22 (44.0%) had a cough, and 29 (58.0%) experienced fever. Shortness of breath was reported in 4 children (8.0%), skin changes in 1 child (2.0%), and hair changes in 3 children (6.0%). Furthermore, 21 children (42.0%) exhibited hair changes, 21 (42.0%) experienced weight loss, and 6 (12.0%) showed visible wasting.

30 children (60.0%) had no significant history or similar complaints, while 20 children (40.0%) had a past history that showed similar complaints. This data highlights the importance of understanding the medical history of children when assessing their health.

Table 2: Maternal and neonatal history wise distribution

Maternal history	Categories	Number of children	Percentage
Maternal age	≤ 20 years	17	34.0
	>20 years	33	66.0
Age at marriage	≤ 20 years	29	58.0
	>20 years	21	42.0
Birth order	1—2	34	68.0
	≥ 3	16	32.0
Birth weight	Normal	50	100.0
NICU Admission	No	50	100.0
Breastfed	< 1 hour of life	31	62.0
	> 1 hour of life	19	38.0
Prelacteal feeds given	Yes	9	18.0
	No	41	82.0
Faulty feeding	Cow milk	14	28.0
	Goat milk	1	2.0
	No	35	70.0
Exclusively breast-fed for 6 months	Yes	36	72.0
	No	14	28.0
Immunization	Immunized	44	88.0
	Partially Immunized	6	12.0
Developmental history	Developmentally normal child	50	100.0

It was observed that 17 out of 50 mothers (34.0%) were aged 20 years or younger, 29 out of 50 mothers (58.0%) were married at the age of 20 or younger,

and 34 out of 50 babies (68.0%) were first or second in birth order.

All 50 children (100.0%) had a normal birth weight, and none of them were admitted to the Neonatal

Intensive Care Unit (NICU). Additionally, 31 babies (62.0%) were breastfed within the first hour of life, while only 9 babies (18.0%) received prelacteal feeds. Furthermore, 15 babies (30.0%) were observed to have faulty feeding practices.

A majority of the babies, 36 out of 50 (72.0%), were exclusively breastfed for the first 6 months of life. Moreover, 44 children (88.0%) were fully immunized, while 6 children (12.0%) were only partially immunized. All 50 children (100.0%) were found to be developing normally.

Table 3: Calorie and protein deficiency wise distribution

Deficiency	Categories	Number of chil-dren	Percentage
Calorie deficit	20—30%	4	8.0
	30—40 %	9	18.0
	40—50%	14	28.0
	>50%	23	46.0
	Total	50	100.0
Protein deficit	≤ 10%	17	34.0
	11—20%	17	34.0
	21—45%	16	32.0
	Total	50	100.0

23 children, accounting for 46.0%, were found to have a calorie deficiency of over 50%. The highest calorie deficiency observed was 70%, while the low-est was 20%. Additionally, 17 children, representing 34.0%, were identified as having

protein deficiencies of 20-30% and 30-40% respectively. A protein deficiency of 21-45% was noted in 16 children, making up 32.0% of the total. The minimum protein deficiency recorded was 5%, while the maximum was 45%.

Table 4: Height and weight for age wise distribution

Variables	Categories	Number of chil-dren	Percentage
Height for age	Normal	21	42.0
	<-1SD	1	2.0
	<-2SD	15	30.0
	<-3SD	13	26.0
	Total	50	100.0
Weight for age	Normal	0	0.0
	<-1SD	1	2.0
	<-2SD	0	0.0
	<-3SD	46	92.0
	<-4SD	3	6.0
	Total	50	100.0

21 children (42.0%) were observed to have normal height for their age, while none were found to have normal weight for their age. The re-maining children were below the normal range for both height and weight

19 out of 50 children (38.0%) had mid upper arm circumferences of less than 11.5 cm. All 50 children (100.0%) had normal head circumferences.

During the general examination, pallor was observed in 21 children (42.0%) and edema was seen in 2 children (4.0%). Hair changes were absent in 40% of the children, while 7 children (14.0%) exhibited a calorie deficiency of over 50%, with the maximum defi-ciency being 70% and the minimum being 20%. Additionally, 17 children (34.0%) had hypo pigmentation and 3 children (6.0%) had lusterless hair.

Skin changes were not observed in 46 children (92.0%), while 4 children (8.0%) had nu-tritional dermatoses. Furthermore, 45 children (90.0%) showed no signs of vitamin defi-ciency, 4 children (8.0%) had bony deformities, and 1 child (2.0%) had Cheilitis.

The cardiovascular system was deemed normal (NAD) in all 50 children, accounting for 100% of the participants. Additionally, the abdomen was

found to be within normal limits (NAD) in 100% of the children.

When examining the central nervous system, it was noted that 47 children (94.0%) were alert and conscious, while 2 children (4.0%) displayed signs of irritability. Furthermore, 1 child was observed to be lethargic. These results provide valuable insights into the overall health status of the pediatric population under study.

41 out of 50 children (82.0%) were diagnosed with anaemia. Additionally, abnormal total white blood cell count was observed in 12 children (24.0%), while 7 children (14.0%) had lower blood sugar levels and 43 children (94.0%) had normal blood sugar levels. Furthermore, 9 children (18.0%) had abnormal sodium levels, 6 children (12.0%) had abnormal potas-sium levels, and all children (100.0%) had normal chloride levels.

The majority of children, 30 out of 50 (60.0%), were found to have abnormal serum pro-tein levels (lower than normal). Additionally, 12 children (24.0%) had abnormal S. Albu-min levels, 9 (18.0%) had abnormal S. Globulin and 8 children (16.0%) had abnormal re-nal function test results (urea/creatinine).

All 50 (100.0%) children observed had normal liver function tests. In the analysis of chest X-rays, only 2 (4.0%) children were diagnosed with bronchopneumonia, while the remaining 48 (96.0%) showed normal results.

Furthermore, all 50 (100.0%) children tested negative for HIV, and the Montoux test re-sults were also negative for tuberculosis. However, in urine routine analysis, 5 (10.0%) children showed the

presence of pus cells. Urine culture results indicated that 49 (98.0%) children had negative cultures, while 1 (2.0%) child tested positive for E.coli.

Stool routine tests showed that all children had normal results, with 49 (98.0%) testing negative in stool cultures and 1 (2.0%) testing positive. These findings provide valuable insights into the health status of the children involved in the study

Table 5: Distribution of children according to study outcome

Study outcome	Number of children	Percentage
Recovery rate	50	100.0%
Death rate	0	0.0%
Average weight gain	8gm/kg/day	---
Defaulter rate	0	0.0%
Length of Stay	Average 12 days	Range (9–14 days)

The study revealed that all 50 children (100.0%) successfully recovered, resulting in a recovery rate of 100.0%. There were no reported cases of mortality, indicating a mortality rate of 0 (0.0%).

During the study, it was observed that the children experienced an average weight gain of 8 grams per kilogram per day. Additionally, there were no defaulters, indicating defaulter rate of 0(0.0%). The average length of stay for the children in the NRC was 12 days, with a range of 9 to 14 days (minimum of 9 days and maximum of 14 days).

DISCUSSION

In the present study, the majority of children (36.0%) were between the ages of 12 to 23 months. This was followed by 30.0% in the 24 to 35-month age group, while 28.0% were aged between 6 and 11 months. A smaller proportion, only 6.0%, were between 36 to 59 months.

These findings are consistent with the study conducted by Kumar et al,^[6] who observed that 40.2% of children with Severe Acute Malnutrition (SAM) were within the age range of 6–23 months, underscoring the heightened vulnerability during early childhood due to increased nutritional needs and transitional feeding practices.

Our study revealed that among the patients analysed, males accounted for 24 individuals (48.0%), while females constituted 26 individuals (52.0%). This results in a male-to-female ratio of 1:1.08. These findings are consistent with those reported by other researchers, although with slight variations. In one study, the male-to-female ratio was found to be 281:349 (1:1.24).^[7]

Residence Wise Distribution: Our study illustrates that the majority of children included were from rural areas, with 42 children (84.0%) affected by acute malnutrition, compared to only 8 children (16.0%) from urban areas.

In another study, it was reported that 49.3% of children with Severe Acute Malnutrition (SAM) resided in rural areas (comprising 47.8% males and 50.9% females), while 12% were from urban areas

(9.7% males and 14.3% females), and 38.7% lived in slum areas (42.5% males and 34.8% females). These findings underscore a significant burden of SAM among children living in rural and slum areas⁸.

Duration of stayed at the NRC: Our study illustrates that 24 children (48.0%) stayed at the Nutrition Rehabilitation Centre (NRC) for 11–12 days, followed by 15 children (30.0%) who stayed for 13–14 days, and 11 children (22.0%) who stayed for 9–10 days. On average, the duration of stay was 12.0 days. This indicates that the majority of children remained within a relatively narrow window of hospitalization.

According to Borkar P et al,^[9] 71.9% of participants stayed between 7 and 15 days at the NRC, while 25% required more than 15 days of care. In addition, 80.2% of the children were discharged for follow-up after stabilization. These findings are consistent with our study, where the majority of children also stayed between 7 and 15 days.^[10]

A study by Arya et al,^[11] similarly reported that the majority of children with Severe Acute Malnutrition (SAM) belonged to the upper lower (44%) and lower (23%) socio-economic classes, with only 1% from the upper class. Regarding maternal education, 66% of mothers were either illiterate (31%) or had received only primary education (35%), reflecting limited educational attainment. Most fathers were engaged in manual labour, including farming or unskilled work (63.5%), followed by those in service or business (29.5%), with a small proportion being skilled professionals (7%).

Presenting Complaint Wise Distribution: Our study illustrates that fever was the most commonly reported presenting complaint among children admitted to the Nutrition Rehabilitation Centre (NRC), with 25 individuals (50.0%) experiencing this symptom. Loose stools were the second most common complaint, reported by 21 individuals (42.0%). Vomiting was experienced by 11 children (22.0%), followed by cold and cough in 10 children (20.0%). Poor weight gain was the least frequently

reported complaint, noted in only 5 children (10.0%).

According to Verma DK et al,^[8] the most common presenting symptoms among children admitted to NRCs were fever and diarrhea, each affecting 46.0% of the sample. Fever was reported in 44.2% of girls and 43.7% of boys, while diarrhea was slightly more prevalent among girls (47.7%) than boys (40.1%). Anorexia was observed in 24.7% of children (25.6% of girls and 21.4% of boys), followed by respiratory symptoms in 12.6% and vomiting in 12.1%.

Maternal and Child Health Practices, Feeding Patterns, and Immunization Status: Our study observed that 34.0% of mothers (17 out of 50) were aged 20 years or younger, and 58.0% (29 out of 50) were married by the age of 20. Regarding birth order, 68.0% of babies (34 out of 50) were first or second in the birth order. All 50 children (100.0%) had a normal birth weight, and none required admission to the Neonatal Intensive Care Unit (NICU).

Breastfeeding practices were also evaluated: 62.0% of infants (31 out of 50) were breast-fed within the first hour of life, while 18.0% (9 out of 50) received prelacteal feeds.

Faulty feeding practices were noted in 30.0% (15 out of 50) of cases. A majority of infants (72.0%, or 36 out of 50) were exclusively breastfed for the first six months. Immunization rates were high, with 88.0% (44 out of 50) fully immunized and 12.0% (6 out of 50) partially immunized. All 50 children were found to be developing normally.

Assessment of Macronutrient Deficiencies and Nutritional Status in Children: Our study illustrates those 23 children, accounting for 46.0%, were found to have a calorie deficiency of over 50%. The highest calorie deficiency observed was 70%, while the lowest was 20%. Additionally, 17 children, representing 34.0%, were identified as having protein deficiencies of 20-30% and 30-40% respectively. A protein deficiency of 21-45% was noted in 16 children, making up 32.0% of the total. The minimum protein deficiency recorded was 5%, while the maximum was 45%.

An analysis of daily calorie intake among the study participants, as reported by Pathak GH et al,^[12] revealed that 79.68% had a calorie deficit exceeding 60% of their total daily requirement, 18.75% had a deficit between 20% and 60%, and only 1.5% had a deficit of less than 20%.

Laboratory and Clinical Profile of Malnourished Children: Our study findings revealed that 82.0% of children were diagnosed with anemia, 24.0% had abnormal total white blood cell counts, and 14.0% exhibited low blood sugar levels (hypoglycemia), while 86.0% had normal glucose levels. Electrolyte abnormalities were also observed: 18.0% had abnormal sodium levels and 12.0% had abnormal potassium levels; all children had normal chloride levels. Biochemical parameters showed that 60.0% of children had low serum protein levels, 24.0% had abnormal serum albumin/globulin ratios, and 16.0%

had impaired renal function. All children had normal liver function tests. Radiological evaluation showed that 4.0% had bronchopneumonia on chest X-ray, and all tested negative for HIV and tuberculosis. Urinalysis revealed pus cells in 10.0% of cases, and urine culture was positive for *E. coli* in 2.0%. Similarly, 2.0% of children had positive stool cultures despite having normal routine stool examinations.

Anemia was the most prevalent micronutrient deficiency associated with malnutrition in our study (82%), consistent with earlier reports by Kumar et al.^[6]

Treatment Outcomes and Recovery Rates in Children Admitted to Nutritional Rehabilitation Centres (NRCs)

Our study illustrates the outcomes of a cohort of 50 children with acute malnutrition who were admitted to the Nutritional Rehabilitation Centre (NRC). All 50 children (100.0%) successfully recovered, resulting in a recovery rate of 100.0% and a mortality rate of 0%. There were no defaulters, with defaulter rate. During their stay at the NRC, the children demonstrated an average weight gain of 8 g/kg/day, which meets the minimum acceptable standard. The average length of stay was 12 days, ranging from a minimum of 9 days to a maximum of 14 days.

In contrast, Bhat et al,^[13] reported lower recovery rates in their study of 61 children: 41 (67.2%) achieved full recovery, 15 (24.6%) had partial recovery, and 5 (8.2%) defaulted from treatment. Weight gain patterns were also more variable, with 58.20% gaining less than 5 g/kg/day, 57.38% gaining between 5–10 g/kg/day, 26.23% gaining between 10–15 g/kg/day, and only 4.92% gaining more than 15 g/kg/day; 23.28% of children experienced weight loss during their hospitalization. Regarding duration of stay, 14.75% of children stayed less than 7 days, 55.74% stayed between 7–14 days, and 29.51% remained hospitalized for more than 14 days.

CONCLUSION

Severe acute malnutrition (SAM) is most prevalent in rural children aged 6–35 months. Low parental education, poverty, and unskilled labor contribute significantly to malnutrition. Faulty feeding practices and delayed breastfeeding initiation worsen nutritional status. Infections (fever, diarrhea) are major comorbidities in malnourished children. NRCs are highly effective, with a 100% recovery rate and significant weight gain. Early intervention, proper feeding education and IYCF feeding practices can re-duce SAM cases.

REFERENCES

1. WHO guideline on the prevention and management of wasting and nutritional oedema in infants and children under 5 years, 2023.

2. Operational Guidelines on Facility Based Management of Children with Severe Acute Malnutrition, Ministry of Health and Family Welfare Government of India, 2011.
3. Levels and trends in child malnutrition: UNICEF/WHO/World Bank Group joint child malnutrition estimates: key findings of the 2023 edition. Geneva: World Health Organization, United Nations Children's Fund, International Bank for Re-construction and Development/The World Bank; 2023 (<https://iris.who.int/han-dle/10665/368038>). Licence: CC BY NC-SA 3.0 IGO.
4. National Family Health Survey(NFHS-5),India, 2019-2021. Ministry of Health And Family Welfare, Govt Of India, International Institute for Population Sci-ences Deonar, Mumbai
5. Naandi foundation,HUNGaMA fighting hunger and malnutrition:the HUNGaMA survey report-2012 Naandi foundation Hyderabad ;2012
6. Kumar R, Singh J, Joshi K, Singh HP, Bijesh S. Comorbidities in hospitalized children with severe acute malnutrition. *Indian Pediatr*. 2014 Feb;51(2):125-7.
7. Das S, Paul DK, Bhattacharya M, Basu S, Chatterjee A, Sen S and Bhakta S. Clinicoepidemiological Profile, Risk Factors and Outcome of Severe Acute Mal-nutrition Children at the Nutritional Rehabilitation Centre of a Tertiary Care Centre in Eastern India- A 4 Years Experience. *Adv Res Gastroentero Hepatol* 2017; 5(2): 555659.
8. Verma DK, Varghese A, Agarwal M, Singh VK, Chandrakanta. Outcome of Nutritional Rehabilitation Centre based care for children with Severe Acute Malnutrition in Uttar Pradesh, India: Cross sectional Study. *International Journal of Health and Allied Sciences*. 2022;11(1):22-26.
9. Borkar P, Sangam R, Rawat S, Kembali R. Socio demographic Profile of Severely Malnourished children admitted to a Nutritional Rehabilitation Centre in one of the Districts of Maharashtra: A Cross-sectional study. *Healthline*. 2024; 15 (4):305-311
10. Owor M, Tumwine JK, Kikafunda JK, "Socio-economic risk factors for severe protein energy malnutrition among children ", *East Africa Medical Journal* , Sep;(2009);77(9):471-5
11. Arun Kumar Arya, Pavika Lal, Pramod Kumar. Comorbidities in children with severe acute malnutrition - a tertiary care centre experience. *International Journal of Contemporary Medical Research* 2017;4 (5):1086-1088
12. Pathak GH, Chauhan AV, Beniwal SO. Determinants of severe acute malnutrition in children between six months to five year of age enrolled in nutritional re-habilitation centre at a tertiary care level. *Int J Contemp Pediatr* 2019;6:2489-92.
13. Bhat IB, Jan M, Bhat AS. Clinico-epidemiological profile and outcome of children with severe acute malnutrition. *Int J Contemp Pediatr* 2023;10:80-6.