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Cause Analysis and Evaluation of Patient Care of Severe Acute Malnourished (SAM) Children at Nutritional Rehabilitation Center, District General Hospital, Amravati, Maharashtra

			
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ABSTRACT

Objectives: This study was proposed to explore different etiological factors leading to malnourishment and to evaluate the performance of Nutritional Rehabilitation Centre (NRC) of District General Hospital (DGH), Amravati. **Method:** Observational prospective study was conducted at NRC, Amravati for the duration of 10 months. Total 137 children between the ages 0 to 60 months fulfilling the criteria for severe acute malnutrition (SAM) were enrolled in the study and observed for weight gain during their stay at NRC as well as during follow up. **Results:** Out of 137 study participants, 65 (47.44%) and 72 (52.55%) were female and male children respectively. 19 (13.86%) were <6 months, 29 (21.26%) 6-12 months, 52 (37.95%) 12 to 24 months and 37 (27%) were >24 months upto 60 months. The recovery rate of NRC was 68% recovery rate remaining 32% was defaulter rate. Mean weight gain during their stay at NRC was 10.53g/kg/day and mean duration of stay was 13.84 days. Weight gain of the children was statistically significant ($p < 0.0001$) showing remarkable improvement. **Conclusion:** Patient care at NRC is very much promising which can be seen from observations given above. Average weight gain is good during their stay at NRC but follow up rate is non-satisfactory so sustainability of weight gain cannot be assured.

INTRODUCTION:

According to World Health Organization (WHO), malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and nutrients. According to National Family Health Survey (NFHS-4) conducted in 2015-16, 35.7 % children under five years of age were underweight in India while it was 36% in the state of Maharashtra. Under five year mortality rate in India was 50% while in Maharashtra it was 29% and among them, 50% deaths were attributed to malnutrition.¹

For complete eradication of malnutrition, it is essential to be focused on prevention of it; rather than treatment. Inaccessibility of healthcare facility, insecurity of food, illiterate parents, unhealthy mother, and late introduction of complementary feed to the diet, frequent illness of children, large and unstable families, and money spending habit of parents are some of the causes of malnutrition. Ignorance about child health is most important cause of malnutrition.²

Nutritional rehabilitation centres were established in the year 2005, under National Health Mission (NHM) launched by Ministry of health and family Welfare (MoHFW), Government of India and till March 2016, 966 NRCs are functional all over the country. In Maharashtra, 35 NRCs have been established at district level. Among these, two are functional at Amravati district, one at Amravati city itself in collaboration with DGH, Amravati and other at sub-district hospital, Dharani in Melghat region.³

NRC has been developed as health facility where children with severe acute malnutrition are admitted and managed.¹ NRC at DGH, Amravati was established in July 2016. Since then it is working for the management of SAM patients between the ages 0- 60 months. For the identification of children with severe acute malnutrition, weight for height (W/H) or weight for length (W/L) standard deviation (SD/ Z-score), mid upper arm circumference (MUAC) and clinical signs like pitting oedema or wasting are used as per WHO guideline. According to these criteria, malnourished children are admitted and managed both medically and nutritionally at NRC. Dietary therapy starts with starter diet formula 75 (F-75) which contains 75 kcal and 0.9 g protein per 100 ml. It is more easily digested by the child as it is low in protein and sodium while high in carbohydrates. Then catch up diet formula 100 (F-100) containing 100 kcal and 2.9 g protein per 100 ml, is started to rebuild wasted tissues. Local

therapeutic food (LTF) which is high in proteins is given thereafter. Along with this, caretakers of children are counseled about post hospitalization nutritional care of children.¹

This study was undertaken to analyze causes behind malnutrition and to evaluate performance of NRC in reversing the problem of malnutrition.

MATERIALS AND METHODS:

Study site: Nutritional Rehabilitation Centre (NRC), District General Hospital, Amravati.

Study Design: Observational, Non-interventional, prospective study.

Duration: Ten months (November 2016 to August 2017)

Population: As per guidelines of WHO, below mentioned criteria was used for enrolling patients into the study-

Inclusion criteria-

Malnourished children due to nutritional causes fulfilling below criteria were included in the study.

1. Age 0-6 months with problems of breastfeeding like inability of infant to suck and/ or the mother has no enough milk and/ or infant having bilateral pitting edema over legs or visible severe wasting and/or W/H or W/L less than -3 SD.
2. Age 6-59 months with W/H or W/L less than -3 SD. MUAC less than 11.5cm and/or presence of bilateral edema over legs or visible severe wasting.¹

Exclusion Criteria-

Patients with Severe Acute Malnutrition due to medical complications like chronic kidney disease (CKD), congenital heart disease (CHD), cerebral palsy, Mental Retardation, and developmental delay were excluded from study.

Sample Size: 137

Material Used:

- 1) Patient's data collection form.
- 2) For anthropometric measurement –
 - Infantometer
 - Stadiometer.
 - Digital weighing balance.
 - MUAC (Mid upper arm circumference) tape.
- 3) WHO growth reference charts.

Dually signed informed consent form was collected from the caretaker of each study subject at the time of enrollment. Data was collected by using a structured data collection form including socio-demographic details, dietary history, family history, complaints of study subject, data of physical examination, daily medication data, daily feeding record and anthropometric measurement on daily basis from admission to discharge and at each (four) follow-up visits after discharge by interviewing the caretaker and examining the study subject. During study subject's stay at NRC, caretakers were counseled for health and hygiene, immunization, feeding practice, care of child, proper ways of cooking etc. by nurses and dietician.

RESULTS-

Demographics details:

Out of all study subjects, 65 (47%) & 72 (53%) were female and male children respectively. Among them, 19 (14%) study subjects belong to the < 6 months of age category, 29 (21%) to 6-12 months, 52 (38%) to 12-24 months and 37 (27%) to 24-60 months of age categories. Majority of the children 109 (80%) belong to rural, whereas 28 (20%) to urban locality. Community wise distribution shows that, majority of the study subject (111) 82% belong to socially backward class. Among 137 study subjects, 89 (65%) children belong to those families with 4 to 8 members followed by 34 (25%) and 14 (10%) belonging to ≤ 4 and > 8 members respectively.

Cause Analysis-

Among 137 study subjects admitted at NRC 106 (77%), were referred from in-patient department (IPD), 14 (10%) were brought to NRC by Accredited Social Health Activist (ASHA), 12 (9%) by Rashtriya Bal Suraksha Karyakram (RBSK), 3% (2) were referred from primary health center (PHC) and 3 (1%) children were admitted by parents. In 74 (54%) cases, birth gap was < 3 years which is less than recommended. McKinsey global institute classification for annual income was used to determine economic status of families of study subjects. It was found that annual income of 125 (91%) families was less than 90,000 that is they belong to deprived class, followed by 8 (6%) and 4 (3%) families belong to Aspirers and seekers class respectively. To classify the study subjects on the basis of their birthweight, WHO birthweight classification was used. In this study, it was found that weight of 85 % study subjects at the time of birth was below normal birth weight (2.5 kg to 4.2 kg). Among which 90 (66%) subjects belong to low birth weight category (< 2.5 kg) followed by 22 (16%) and 4 (3%) belong to very low birth weight (< 1.5kg) and extremely low birth weight category (< 1kg) respectively. (Table-1) Among 137 study subjects, in 49 (36%) complementary feeding started at 6-9 months of age, followed by 40 (29%), 23 (17%) and 6 (4%), at 9-12 months, 12-24 months and at birth respectively.

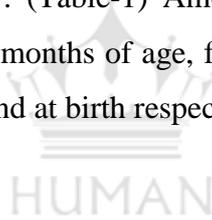


Table - 1: Demographic details of patient

Variables	Distribution
Gender	
Male	72 (53%)
Female	65 (47%)
Referred By-	
IPD	106 (77%)
RBSK	12 (9%)
PHC	2 (2%)
Self	3 (1%)
ASHA	14(10%)
Birth spacing	
<3 Years	74 (54%)
>3 Years	20 (15%)
NA	43 (31%)
Annual Income of parents-	
Deprived	125 (91%)
Aspirers	8 (6%)
Seekers	4 (3%)
Strivers	0 (0%)
Global	0 (0%)
Birth Weight-	
Normal	21 (15%)
LBW	90 (66%)
VLBW	22 (16%)
ELBW	4 (3%)

To find out an impact of age of parents at the time of marriage and childbirth; education and occupation of parents of study subjects, the data was collected and it is depicted in (Table-2).

Table - 2: Parents related factors.

Variable	Category	Distribution	
		Mother(M)	Father(F)
Age at the time Of marriage	≤ 18[M]/ ≤ 21[F]	74 (53%)	55 (38%)
	> 18[M]/>21[F]	62 (46%)	81 (61%)
	Unmarried	1 (1%)	1 (1%)
Age at the time Of child's birth	15 to 20 years	53 (37%)	34 (25%)
	21 to 25 years	71 (52%)	86 (63%)
	> 26 years	13 (9%)	17 (12%)
Education	Illiterate	25 (18%)	32 (23%)
	Primary (1-5)	21 (15%)	19 (14%)
	Upper primary stage (6-8)	26 (19%)	35 (26%)
	Secondary Stage (9, 10)	42 (31%)	36 (27%)
	Senior Secondary (11, 12)	19 (14%)	13 (9%)
	Undergraduate	4 (3%)	2 (1%)
	Post-Graduate	0 (0%)	0 (0%)
Occupations	Farm Worker	38 (28%)	29 (21%)
	Farmer	21 (15%)	43 (31%)
	House Wife	39 (29%)	0 (0%)
	Labor	24 (18%)	23 (17%)
	Construction Worker	0 (0%)	19 (19%)
	Other	16 (12%)	23 (17%)

Anthropometric indicators of linear growth retardation and cumulative growth deficits in children are stunting, wasting and underweight (Figure-1).

Performance of NRC-

The Performance of NRC is assessed based on quantitative indicators such as recovery rate and defaulter rates. Recovery rate means number of study subject that have gained 15% weight that of admission weight till discharge, whereas defaulter rate indicates, the study subject has not attended the NRC for 3 consecutive days.¹ Performance of NRC found in the present study is depicted in (figure-2). The mean weight gain was found to be 10.53 gm/kg/day, whereas average length of stay was 13.84 days.

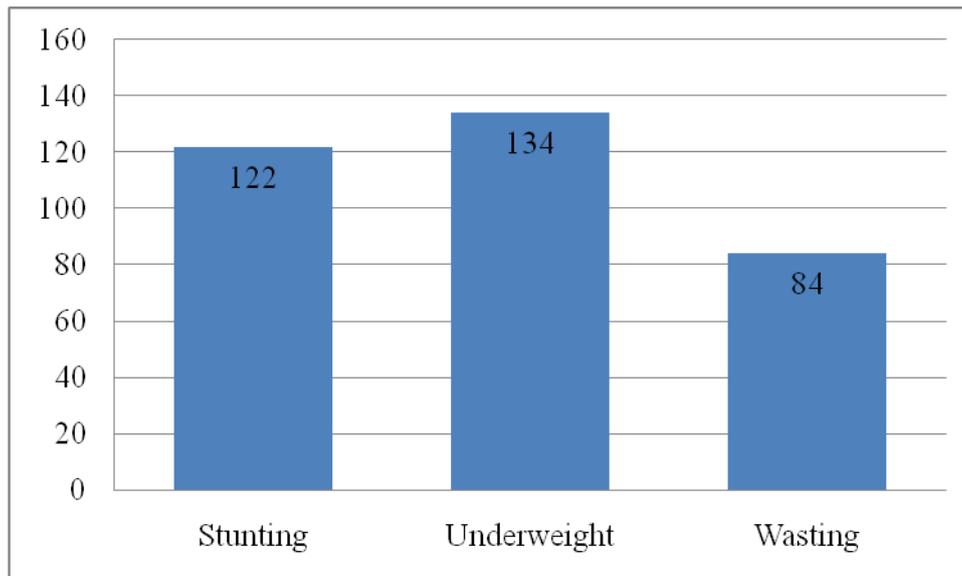


Figure-1: Anthropometric Indicators

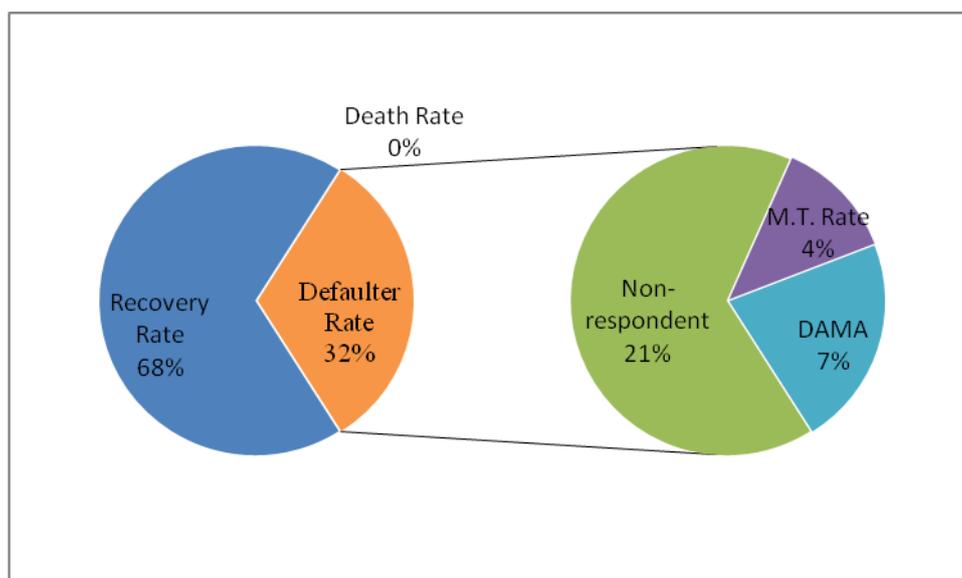


Figure-2: Performance of NRC

DAMA- Discharge against medical advice, M.T.- Medical Transfer Rate

Weight gain:

Majority of the SAM children 89(65%) achieved target weight in 2-3 weeks, whereas 44(32%) children failed to achieve target weight (Table-3).

Table – 3: Days required for achieving target weight.

Variable	Categories	Distribution
Days required to achieve target weight	≤ 5 days	4, (3%)
	6 – 10 days	24 (18%)
	11-15 days	48 (35%)
	≥16 days	17 (12%)
	Not Achieved	44 (32%)

Whereas average days required for achieving target weight were 12.28 days. Daily weight gain of 82(60%) & 47(35%) SAM children was Good (> 10 gm/kg/day) and Moderate (5-10 gm/kg/day) respectively, whereas only 8 (6%) had Poor (< 5 gm/kg/day) weight gain. Percent weight gain as compare to admission weight till discharge is given in (Figure-3).

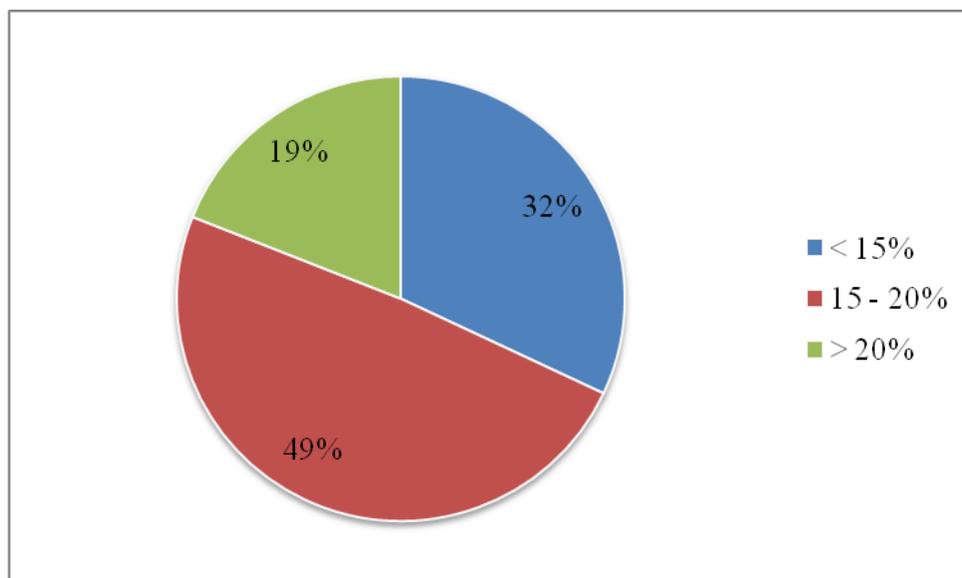


Figure-3: Percent weight gain till discharge

Statistical analysis of weight gain of the children revealed that there was significant ($p < 0.0001$) improvement. Length of stay at NRC and total weight gain was correlated by using Pearson correlation. The r value was found to be 0.3021 (95% CI: 0.1416 to 0.4472) with P value 0.0002 and 0.0003 by one tailed and two tailed respectively indicating weak positive correlation between length of stay at NRC and weight gain.

Physical Examination:-

We examined the study subjects for pallor, skin changes, hair changes, vitamin-A deficiency and complaints of subjects were also recorded. The findings are as shown in (Figure- 4 and 5).

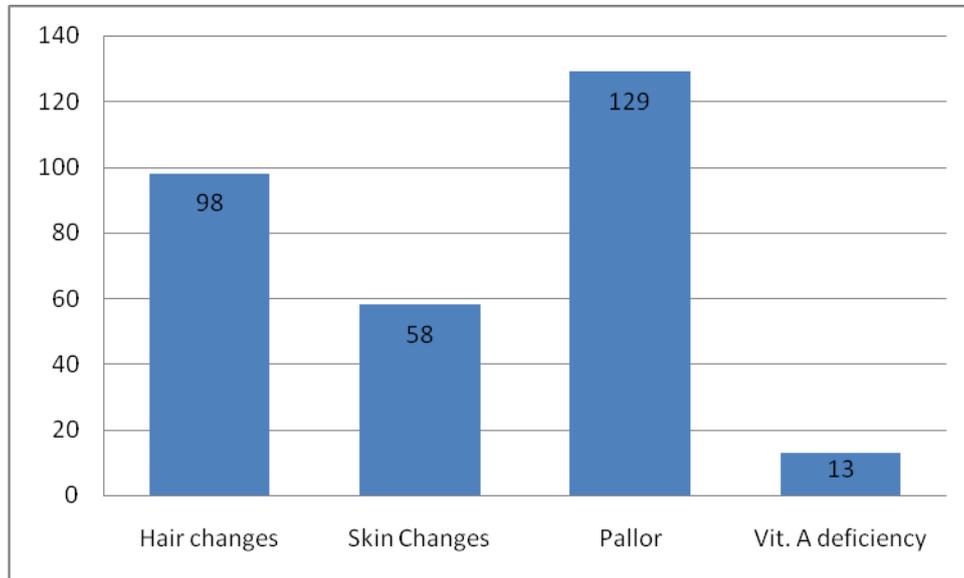


Figure-4: Findings of physical examination

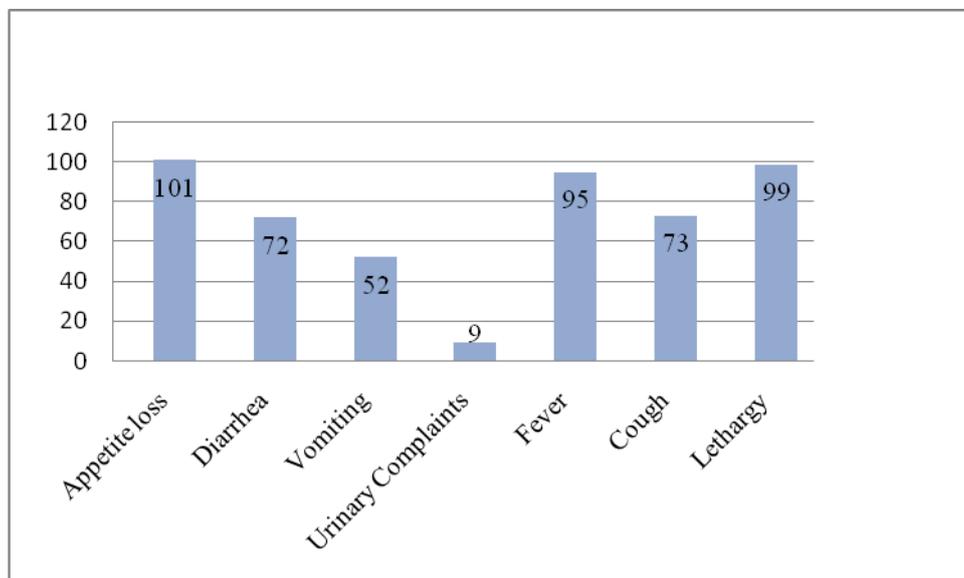


Figure-5: Complaints of patients

Associated diseases with malnutrition are depicted in (Table-4). Anemia (94%) was found to be the most common associated disease with malnutrition which was consistent with the findings of NFHS-III indicating dietary deficiency of essential vitamins and minerals.⁵ According to WHO technical report series-1997 anaemia is categorised on the basis of haemoglobin level as Mild (10-10.9gm/dl), Moderate (7-9.9 gm/dl), severe (<7 gm/dl). Such distribution of Anemia is depicted in (Figure-6).

Table-4: Burden of diseases associated with malnutrition.

Disease	Percentage
Anaemia	94% (129)
Acute Febrile Illness	24% (33)
Lower Respiratory tract Infection	21% (29)
Acute Gastro-enteritis	21% (29)
Dehydration	4% (6)

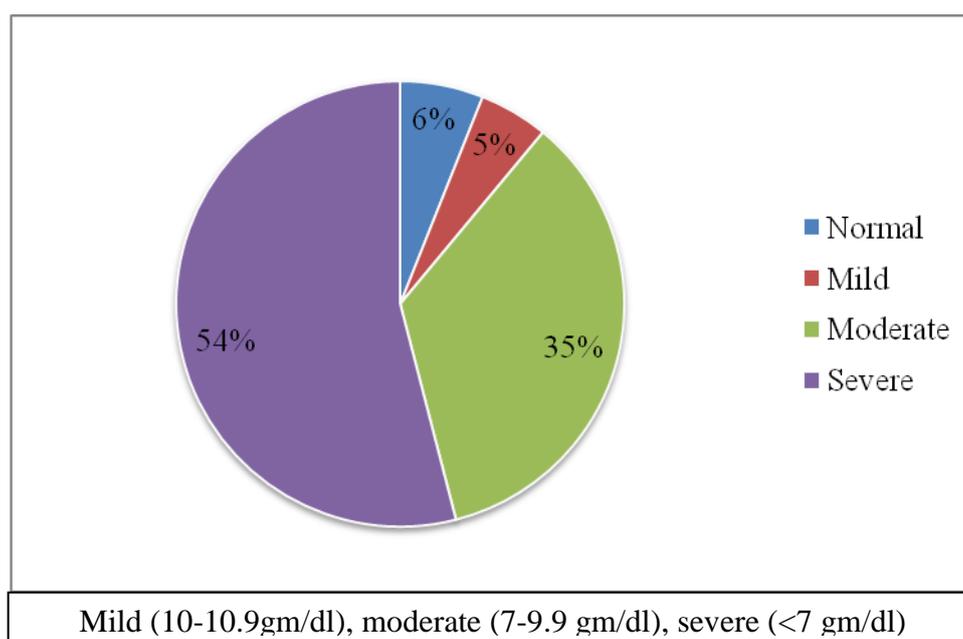


Figure-6: Burden of Anemia

Follow-up:

The extent of follow up of SAM children discharged from NRC shown consistent drop-out rate 82(61%) to 13% from 1st to 4th Follow-up (Figure-7).

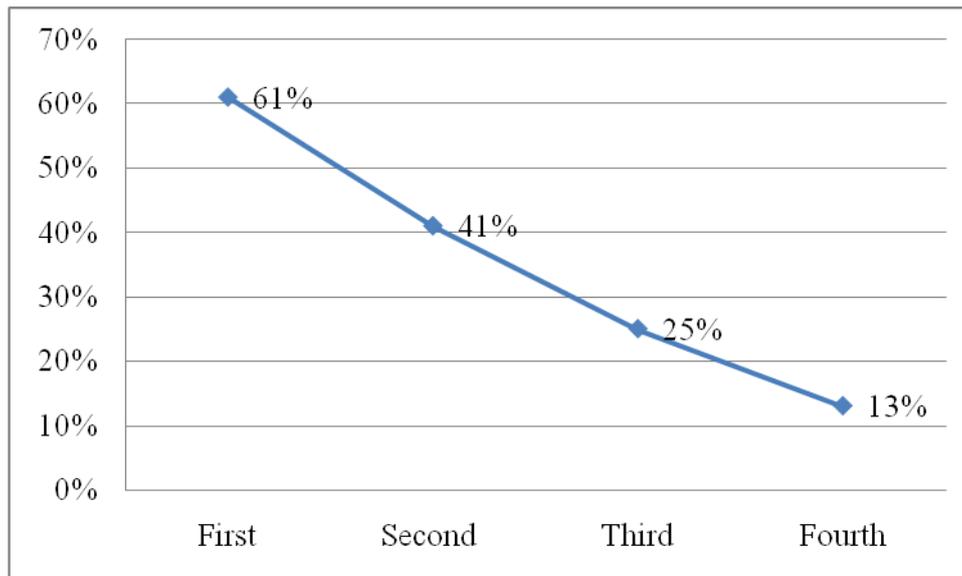


Figure-7: Decreasing Trend of Follow-up.

Weight of subject was monitored at the time of follow-up. Gradual decrease in weight gain and gradual increase in weight loss during 1st to 4th follow up as depicted in (Table-5).

Table-5: Weight gain and loss at follow up (Calculated during follow-up visits.)

Follow-up	Average daily Weight gain	Average daily Weight loss
First	5.28 gm/kg/day (52)	7gm/day (30)
Second	2.42gm/kg/day (29)	9.44 gm /day (27)
Third	2.10 gm/kg/day (14)	10.02 gm/day (20)
Fourth	0.54 gm/kg/day (5)	13.66 gm/day (13)

Weight for height standard deviation on Admission and Discharge-

The (Figure-8) shows the shift of W/H of study subjects from < -4SD (39), -4SD (21), <-3SD (54), -3SD (20), <-2SD (2) and -2SD (1) to -4SD (3), <-3SD (12), -3SD (18), <-2SD (38), -2SD (17), <-1SD(29), -1 SD(16) and median(4) indicating weight gain achieved at NRC, excluding study subjects who were medical transferred and was discharged against medical Advice.

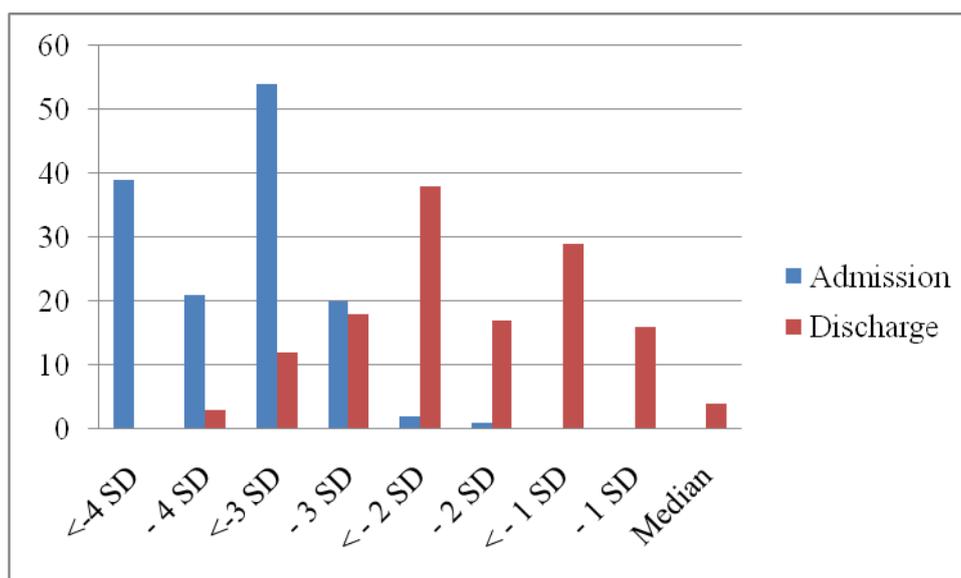


Figure-8: Shift of W/H SD on admission and discharge.

DISCUSSION:

Government of India is running various schemes for the economically backward category of people, but those schemes target only hunger of individual and not the nutrition. Therefore, the problem of undernutrition among 0-60 months of age still exists.² In the present study, out of 137 study subjects, majority that is 80 % belong to rural area and about 82 % belong to socially backward classes. Annual income of 91% families was less than 90,000; which indicate the poor economic status. These findings are consistent with the study conducted by Gupta P, et al. and NFHS-III.^{5,6} Unawareness about proper breastfeeding and complementary feeding techniques found to be the major risk factor leading to under-nutrition. In only 36% study subjects, complimentary feed was started at the age of 6-9 months, which is recommended age for starting complimentary feed.⁷

Our study also highlights some factors associated with malnutrition like less birth spacing - <3 years (54%)⁸, young age of parents during marriage and childbirth⁹, large families¹⁰. Unavailability of basic household facilities like latrine, concrete home, storage facility for vegetables (refrigerator) might be the cause of undernutrition as we observed in this study.¹¹ Majority of subject's parents were found to be engaged in low income and seasonal occupation like labours at farm and construction sites etc indicates the insecurity of both income and food. Majority of parents (86%) particularly fathers were addicted to one of the

habit among smoking, tobacco chewing and alcohol consumption which affect the harmony of family, health of individual and economy as well.

Field health workers like ASHA, RBSK can play very crucial role in early detection of malnourished children, prevention of malnutrition by properly guiding parents of children regarding diet, immunization and various government schemes. But, in the present study, we found that only 19 % study subjects were referred to NRC by ASHA and RBSK. These findings are contradictory with the study conducted by Pankaj Kumar Gupta, et al. Anemia (94%) was found to be the most common associated disease with malnutrition which was consistent with the findings of NFHS-III.⁵

Average length of stay was found to be 13.84 days and average daily weight gain was found to be 10.53 gm/kg/day which were surprisingly more than study of Radhakrishnan, et al. and Mitulkumar B. Kalathia, et al.^{12,13} The recovery rate of NRC, Amravati was good that is 68% which was against the other studies where it was 33.6% in Mahama Saaka, et al. and 81% in Dhanalakshmi K, et al. while it is consistent with the findings of Maurya M., et al.^{14, 15, 16} But, this result is not according to NRC protocol (recovery rate- >75%).

At the time of discharge, we found that 89% parents were satisfied with the work of NRC. But at follow-up, only 61% parents brought their children to NRC for first follow-up and this follow-up rate was found to be declined in further follow-up visits. Similar findings were also observed by Taneja G, et al. in his study.¹⁷

CONCLUSIONS AND RECOMMENDATIONS:

1) From the results, it can be concluded that children from rural area, those with illiterate or less literate parents, belonging to large families, with lower socioeconomic status and having less (<3 years) birth spacing are more prone to under-nutrition. So, awareness about education, health, family planning measures to control family sizes is needed to be spread among society. As well as to develop socio-economic status of individual, there is need to develop skills so that they could earn good income themselves rather than providing them readymade food through public distribution system (PDS).

2) Improper breastfeeding techniques and late introduction of complementary feed into the diet of child are found to be one of the most important etiologies behind malnutrition. So, caregivers should be properly and continuously counseled about the diet of children, proper

positions of breastfeeding and time to feed child and also about the diet of mother during and after pregnancy by healthcare professionals.

- 3) Involvement of field health workers i.e. ASHA, RBSK is needed to be improved to reach up to ground level and to eradicate malnutrition. So, these workers should be trained properly for identification of SAM as well as motivated by providing compensation according to their work.
- 4) For the prevention and early detection of malnutrition, regular health check-up should be done to monitor growth and nutritional status for early detection of malnutrition. Efficient follow-up system should be established to ensure sustainability of weight gain.

LIMITATIONS:

- 1) Sample size studied was less.
- 2) All patients were not followed up for duration of 2 months.
- 3) Mother's low BMI may be the cause for child's malnutrition, but it was not studied.
- 4) Complete Immunization history was not taken.

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Author's Contribution:

All authors contributed equally.

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