

## ORIGINAL ARTICLE

# Determinants of nutritional outcome among beneficiaries of Nutrition Rehabilitation Centre

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### ARTICLE CYCLE

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### ABSTRACT

**Background:** Under Mission Balam Sukham, children of 6 months to 5 years having severe acute malnutrition (SAM) along with complications are managed at Nutrition Rehabilitation Centre (NRC). They are admitted for 14 days with the provision of a nutritional diet and medicines. **Objectives:** To explore determinants of nutritional outcome of SAM children admitted at NRC **Methods:** A prospective cohort study was conducted comprising 63 children aged 6 months to 5 years having SAM along with complications admitted at NRC of New Civil Hospital, Surat (NCHS) for 10 months. **Results:** The majority of participants were boys (54%), 12-23 months of age (50.8%), and Grade III socioeconomic class (39.6%). The duration of stay ranged from 2-36 days. The average duration of stay was  $12.78 \pm 6.49$  days;  $14.26 \pm 5.99$  days for boys and  $11.10 \pm 6.73$  for girls. 18.8% stayed at NRC for 14 days. The average weight gain was 5.46 g/kg/day. A significant improvement in weight was seen in boys ( $t=2.20$ ,  $p<0.05$ ), working mothers ( $t=2.44$ ,  $p<0.01$ ), exclusively breastfed children ( $t=3.62$ ,  $p<0.01$ ) of 6-11 months, full-term children of 12-23 months ( $t=4.0$ ,  $p<0.05$ ). The children of 12-23 months ( $t=2.90$ ,  $p<0.01$ ) and boys ( $t=2.15$ ,  $p<0.05$ ) showed significant improvement in underweight (WAZ). Wasting improved significantly in age below 36 months ( $p<0.05$ ). 20.6% could achieve the target weight. **Conclusion:** NRC is an effective life-saving modality for malnutrition but its outcome is associated with factors like boys, exclusive breastfeeding, and full-term.

### KEYWORDS

Nutrition Rehabilitation Centre, Evaluation, Nutritional Outcome, Severe Acute Malnutrition

### INTRODUCTION

Malnutrition is a major public health concern in developing countries like India, as well as

globally. (1–6) Globally, 11 million deaths of children under 5 years of age occur annually. (6)

Approximately 15.95 million which is around 3.62% are both stunted and wasted. (6,7 ) A child suffering from wasting and stunting is at 12 times higher risk of dying. (6) India is a roof to 50% of the world’s undernourished children. Though there has been a significant decrease in stunting, India still holds the first position in loss of human potential because of stunting. (8)

So, to manage severe acute malnutrition (SAM) in children through preventive and curative aspects, there is one component under a three-tier approach of Mission Balam Sukham called Nutrition Rehabilitation Centre (NRC) at tertiary care level. (9) Here, the SAM children with complications are provided with medical and therapeutic care along with special attention on appropriate and adequate feeding habits timely for a period of a

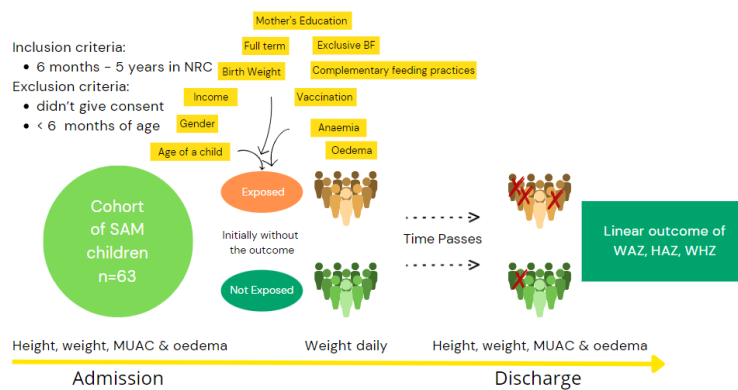
minimum of 14 days along with the incentives which they lose as daily wages.

The objective of the study is specifically to explore determinants of nutritional outcome in children admitted to NRC of NCH, Surat.

**MATERIAL & METHODS**

A prospective cohort study was conducted on all the 63 children aged 6 months to 5 years with SAM along with complications admitted in NRC at New Civil Hospital of Surat during the study period of 10 months between October 2020 to September 2021 [Figure 1]. The written consent was obtained from parents before enrolling. The children below 6 months and the children between 6 months to 5 years of age whose caretakers did not give consent were excluded from the study.

**Figure 1: Methodology**



**Ethical Concerns** Ethical approval was obtained from the Human Research and Ethical Committee, Government Medical College, Surat (No. GMCS/STU/ETHICS/Approval/31405/19) dated 09/12/2019 before the initiation of the study.

**Sample size calculation** The number of participants to be enrolled was 120 consecutively. The sample size was calculated using G power 3.1.9.2 version (10) through priori SS using F-test for multiple regression using 10 predictors from the literature cited, effect size  $f^2=0.281$ ,  $\alpha = 0.05$ ,  $1 - \beta = 0.95$  and 10 predictors and was estimated to be 97. A final sample size of 120 arrived at considering a 20% loss to follow-up. But due to COVID 19 pandemic, all the samples that were admitted

during 10 months of data collection were considered for analysis which was 63.

After obtaining consent, the participants' mothers (preferred) or caregivers (if the mother wasn't available) were interviewed using a predesigned and pretested questionnaire through ODK application on an android device. (11) ODK (Open Data Kit) is an open-source mobile data collection platform, primarily used for paperless data collection in field research or humanitarian aid and global development projects. A unique ID was given to each participant. The data collected was available only to researchers to maintain confidentiality.

Anthropometric measurements like length/ height, weight, mid-arm circumference and the status of oedema had been recorded at the time of

admission and discharge, except weight which was monitored daily.

**Outcome** Child is considered as improved if the child has achieved target weight as 15% increase of initial weight on admission as per NRC guidelines.

**Statistics** The collected data were analyzed using Statistical Package for Social Sciences (SPSS) version 25 and MS Excel. All normally distributed data were presented as mean standard deviation (SD). Categorical data were analyzed as proportions. To apply the analytical approach to the study cohort we use the mother's education, term at delivery, status of exclusive breastfeeding, birthweight, income, gender, vaccination, and age, to classify them among exposed and non-exposed for the internal comparison. The significance of differences in the outcome of the mean weight was analysed using student t test. The Chi-square ( $\chi^2$ ) test was applied to see improvement in weight with different factors like gender, full term, children with working mothers and exclusively breastfed. Weight and height of infants was calculated for nutritional indicators; [weight-for-height (WFH), weight-for-age (WFA) and height-for-age (HFA) z-scores were calculated using WHO Anthro (version 3.2.2). Children were classified as normal (z-score: -2.0 to 2.0), wasted (WFH z-score: < -2.0) and stunted (HFA z-score: < -2.0).

It was a hospital-based study, we enrolled all the participants to avoid selection bias, but the hospital admission rate was changed due to the COVID-19 pandemic. In the analysis part, we applied logistic regression to check the effect of confounders.

**RESULTS**

A total of 63 children were included in the analysis. Half of the children were from the age group of 12-23 months (50.8%) followed by 6-11 months (25.4%). Boys were more in the study group (54.0%). Half of the mothers were illiterate (52.5%) followed by 40.7 % and 6.8% who had primary education and secondary education and above respectively. Only 18.6% of the mothers were working while 81.4% were housewives. 39.6% of families belonged to socioeconomic class III, followed by class IV

(26.9%) and class V (23.8%) according to modified BG Prasad's classification. In the clinical profile of the patients, 27% exhibited oedema and 86.8% patients had anaemia. The severity of anaemia varied 20.6% having mild, 50.7% having moderate and 14.2% having severe anaemia. 84.1% were fully immunized and 15.9% were partially immunized. 81.5% were low birth weight which included 9.2% with very low birth weight.

**Analysis based on weight & duration of stay**

The average weight gain during the stay at the NRC was 5.46 g/kg/day. Table 1 shows the average weight gain according to age. It also outlines the age and gender wise distribution of study participants according to the duration of stay. The average duration of stay was 12.78 ± 6.49 days; 14.26 ± 5.99 days for boys and 11.10 ± 6.73 days for girls which are statistically significant. The median duration of stay at the NRCs was 13 days, (boys-14 and girls- 12.50 days). Only 18.8% of the children in the study group had stayed at the NRC for at least 14 days. Statistically, a significant difference was observed in the duration of stay at the centre according to gender (t=1.31, p<0.05).

**Table 1: Average weight gain & gender wise age distribution of study participants**

Age (months)	Average weight gain (g/kg/day)	Duration of stay n (Range)	
		Boys'	Girls'
6-11	10.74	10 (5-36)	6 (5-13)
12-23	4.62	18 (3-20)	14 (2-14)
24-35	1.22	4 (4-22)	4 (12-16)
36-47	4.72	2 (5-18)	4 (3-33)
48-59	-0.96	0	1 (7)

A significant improvement of weight was seen in 6-11 months of age particularly in boys (t=2.20, p<0.05), working mother (t=2.44, p<0.01), exclusively breastfed children (t=3.62, p<0.05) of 6-11 months age at discharge. Full-term children of 12-23 months showed significant improvement (t=4.0, p<0.05). The characteristics in children of more than 24 months do not show significant association [Table 2]. The children of 12-23 months (t=2.90, p<0.01) and boys (t=2.15, p<0.05) showed significant improvement in underweight (WAZ) [Table 4].

**Table 2: Age wise distribution of mean weight on admission and discharge according to various characteristics**

Characteristics	Category	Mean weight (kg)									
		6-11 months		12-23 months		24-35 months		36-47 months		48-59 months	
		Admission	Discharge	Admission	Discharge	Admission	Discharge	Admission	Discharge	Admission	Discharge
<b>Gender</b>	Boy	5.37	*5.78	6.88	7.21	7.63	7.60	7.75	7.82	-	-
	Girl	4.45	4.75	6.52	6.73	6.87	7.26	7.12	7.28	7.40	7.35
<b>Working mother</b>	Yes	5.25	*7.10	6.63	7.08	7.67	8.25	8.95	8.95	-	-
	No	5.19	5.46	6.81	7.05	7.18	7.20	7.31	7.15	7.40	7.35
<b>Full term child</b>	Yes	5.02	5.36	*6.85	7.12	7.25	7.43	7.33	7.46	7.40	7.35
	No	5.10	5.80	5.70	6.10	-	-	-	-	-	-
<b>Exclusive Breastfeeding</b>	Yes	*5.19	*5.57	6.75	7.04	7.32	7.50	7.38	7.55	7.40	7.35
	No	2.50	2.75	7.50	7.60	6.80	6.95	7.10	7.05	-	-
<b>Anaemia</b>	Present	5.11	5.44	6.89	7.09	7.40	7.60	7.33	7.46	7.40	7.35
	Absent	4.65	5.18	5.79	6.51	6.20	6.25	-	-	-	-
<b>Birth weight</b>	Low	*4.63	4.82	6.68	6.99	7.41	7.72	7.38	7.55	-	-
	Normal	*5.53	6.12	6.85	7.16	7.40	7.43	7.10	7.05	7.40	7.35
<b>Oedema</b>	Present	5.18	5.47	*7.12	*7.18	7.02	7.47	*7.15	7.12	-	-
	Absent	4.97	5.36	6.54	6.91	7.33	7.41	7.42	7.63	7.40	7.35

Note: \* statistically significant

The Chi-square ( $\chi^2$ ) test was applied to see improvement in weight with different factors. Table 3 outlines the association of children's individual characteristics with the improvement of weight. Though the severe malnourished children improved 20.6% following the stay at NRCs, statistically

significant improvement in weight can be seen in full-term children only but not in other factors ( $\chi^2 = 7.63$ ,  $p < 0.01$ ). Full-term children show 70-90% effective improvement of weight. It might be because of the small sample size.

**Table 3: Association of children's characteristics on achievement of target weight (15%)**

Factors	Group	Weight Improved n (%)	Weight Not improved n (%)	$\chi^2$ value	p-value	RR (95% CI)
<b>Gender</b>	Boy	9 (26.5)	25 (73.5)	1.53	0.21	1.92 (0.62-8.27)
	Girl	4 (13.8)	25 (86.2)			
<b>Full term child</b>	Yes	11 (18.6)	48 (81.4)	7.63	0.00	0.19 (0.11-0.32)
	No	2 (100.0)	0			
<b>Working mother</b>	Yes	1 (9.1)	10 (90.9)	1.17	0.28	0.38 (0.05-2.64)
	No	11 (23.9)	35 (76.1)			
<b>Place of delivery</b>	Hospital	11 (22.4)	38 (77.6)	0.19	0.66	1.35 (0.34-5.29)
	Home	2 (16.7)	10 (83.3)			
<b>Birthweight</b>	Low	8 (24.2)	25 (75.7)	0.14	0.70	1.28 (0.36-4.52)
	Normal	5 (20.0)	20 (80.0)			
<b>Anaemia</b>	Present	10 (18.5)	44 (81.4)	1.03	0.30	0.45 (0.97-2.13)
	Absent	3 (33.3)	6 (66.6)			
<b>Oedema</b>	Present	5 (27.7)	13 (72.2)	0.78	0.37	1.77 (0.49-6.42)
	Absent	8 (17.7)	37 (82.2)			

Almost all age groups show improvement in weight but the significance is seen in the age group of 12-23 months of age. Boys show significant improvement in weight. The overall underweight (WAZ) and wasting (WHZ) were

improved [Tables 4]. Wasting improved significantly in age below 36 months ( $p < 0.05$ ), while there is no change in stunting (HAZ). 20.63% could achieve the target weight.

**Table 4: WAZ (Underweight), WHZ (Wasting) and HAZ (Stunting) according to age and gender**

			On admission	On discharge	t value	p-value
WAZ (Underweight)	Age group in months	6-11	-4.35 + 0.75	-3.86 + 0.96	1.60	0.11
		12-23	-3.98 + 0.81	-3.31 + 1.05	2.90	0.00
		24-35	-4.59 + 0.84	-4.34 + 1.03	0.53	0.60
		36-47	-4.69 + 0.9	-4.67 + 0.65	0.04	0.96
		48-59	-5.42	-5.45	only 1 participant	
Gender	Boy	-4.16 + 0.83	-3.63 + 1.17	2.15	0.03	
	Girl	-4.36 + 0.85	-3.93 + 0.96	1.80	0.07	
WHZ (Wasting)	Age group in months	6-11	-3.69 + 0.85	-2.40 + 1.54	2.93	0.00
		12-23	-3.33 + 0.7	-2.69 + 1.19	2.62	0.01
		24-35	-4.02 + 0.34	-2.81 + 1.29	2.56	0.02
		36-47	-3.68 + 0.45	-3.96 + 0.7	0.82	0.42
		48-59	-3.78	-3.85	only 1 participant	
Gender	Boy	-3.46 + 0.75	-3.08 + 1.44	1.36	0.17	
	Girl	-3.70 + 0.65	-3.30 + 1.08	1.70	0.09	
HAZ (Stunting)	Age group in months	6-11	-2.8 + 1.45	-2.77 + 1.45	0.05	0.95
		12-23	-2.65 + 1.56	-2.57 + 1.58	0.20	0.83
		24-35	-2.68 + 0.77	-2.68 + 0.77	0.00	>0.99
		36-47	-4.2 + 0.86	-4.16 + 0.95	0.07	0.94
		48-59	-5.28	-5.28	only 1 participant	
Gender	Boy	-2.93 + 1.53	-2.88 + 1.54	0.11	0.91	
	Girl	-2.84 + 1.43	-2.79 + 1.46	0.13	0.89	

**Figure 2: Boys & Girls weight- for - length/height**

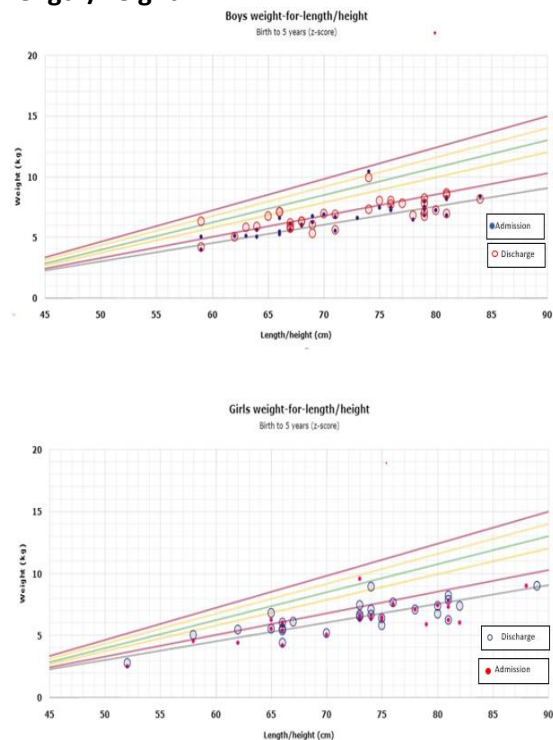


Figure 2 show z score distribution on admission and discharge which represents the majority of children in all the indices below 3SD. There is an improvement in weight for height but it is below the standard reference line as per WHO. Therefore, there might be chances of growth

faltering again or they may remain malnourished. Underweight (WAZ) shows improvement on discharge compared to weight on admission.

**DISCUSSION**

Children between 12-23 months of age are more likely to develop diseases and need more care, and the rate of underweight in this age group might be due to faulty feeding practices. The majority of study participants were boys which is also seen in a study by Meenakshi, et al. (12) This could be coincidental or may be due to more care given to the boys than girls because of societal tendency and attitude toward the male child. Converse results were found in studies where more girls were majority of study participants which estimates to be 59.6% in a study Patel D et al., 52% in a study by Jyoti Sanghvi et al and 55.5% in a study by Katole, et al. ( 5,13)

There is a strong evidence that SAM is prevalent in many poor socioeconomic classes. A key contributing factor to this issue is food insecurity, caused largely by poverty. Additionally, a lack of maternal knowledge on feeding exacerbates the problem of child malnutrition in this study area. (14–16) In our study too, the results were 50.79% of families

belonged to socioeconomic class III, IV and V (poor) according to modified BG Prasad's classification. 97.4% belonged to class III, IV and V lower socioeconomic class. (17) Lower socio-economic classes often struggle with food insecurity, which leads to insufficient intake of essential nutrients. This lack of adequate nutrition can lead to undernutrition. Inadequate healthcare services, lack of education, poor sanitation and hygiene can lead to frequent infections and diseases which contribute to malnutrition. (18–21) This study shows 27% were presented with oedema. A study by Panda M *et al* presented similar results of oedema. (4) Half (50.7%) of the study participants presented with moderate anaemia. 14.2% presented with severe anaemia, 20.6% presented with mild anemia. Hence 85.5% were anaemic in our study and only 14.2% were normal. It is comparable with 79.7% anemic children in 6-59 months of age in NFHS 5 data of the Gujarat state. (22)

**Mean weight gain:** Weight has been considered as the potential anthropometric measure as its improvement in SAM children has the most substantial effect in reducing the mortality among them. The average weight gain during the stay at the centres was 5.46 g/kg/day which is less according to the guidelines of NRC is >8 g/kg/day. (23) This could be because the majority of the patients were not willing to stay for the prescribed days of 14 days and more, and stayed for the major diseases and the stay of the patients for surgical intervention. The median duration of stay at the NRCs was 13 days, for boys it was 14 days and for girls, it was 12.50 days. The average duration of stay at the NRCs was 12.78 ± 6.49 days, for boys it was 14.26 ± 5.99 days and for girls, it was 11.10 ± 6.73 days. 18.8% of the children in the study group had stayed at the NRC at the centres for at least 14 days. Rinki H. Shah represented weight gain of 5-10 g/kg/day in 40% of study participants. (24) The average weight gain for 6-11 months was 10.74 g/kg/day (appropriate according NRC's guidelines) (24); 12-23 months was 4.62 g/kg/day, 24-35 months was 1.22 g/kg/day and 36-47 months was 4.72 g/kg/day. A significant weight gain of 9.25 ± 5.89 g/kg/day is also observed in study by G. Taneja *et al* and

Colecraft *et al*. (1,14) R. Rawat *et al* showed an average weight gain of 3.2 ± 2.3 g/kg/day (23) which is lesser compared to the overall average weight gain but is found more in the age group of 36-47 months in our study. A study in Gulbarga by Hashmi G *et al* observed 7.9 ± 1.6 g/kg/day. (15)

Only 20.63% were able to achieve the target weight at discharge in the present study. 51.2% could achieve target weight gain in a study by Katole, *et al*. (25) The results were comparable to improvement in WAZ scores that have been exhibited in Forney *et al* and Joshi *et al*. (6,26) The mean weight gain was 6.56 + 3.57g/kg/day. The mean weight at admission was 6.42 ± 1.21kg and at discharge was 7.28 ± 1.40kg. (6) The mean difference in weight was 1.08 ± 1.37kg in Forney *et al*. (23) The main reason behind it was the short stay at NRC in our study. The short stay at NRC was due to major diseases only. As soon as the symptoms subsided, the patient takes discharge against medical advice. Also, the catchment area of NRC is primarily urban slums and the beneficiaries are mostly daily wage earners. As soon as they perceive their child to be well and recovered, they tend to leave. Additionally, many are many were not eligible for incentives due to lack of local aadhar card as the incentives are provided through direct bank transfer system. There were 3.1% patients discharged before 7 days, 21.3% were discharged between 7-15 days and 75.6% patients discharged after 15 days in a study by Katole, *et al*. (25)

**Duration of stay at the NRCs:** Our study shows a mean duration of stay of 12.78 ± 6.49 days which is appropriate according to NRC guidelines (10-15 days) and more than a study by Mulla S *et al* observed (8.04 ± 6.70 days) and Hashmi G *et al* (7.17 ± 1.6 days). (2,15,27) In our study, the duration of stay is comparatively lesser in girls. In Guatemala and Haiti, the predictor of increase in weight-for-age percentile during NRC participation was effective stay. (1) The duration of stay needs to be stabilized between the possibility of cross exposure to infection and the preparedness of the mothers to cope with their children at home which is also seen in a study. (14)

**Wasting and underweight** were significantly improved on discharge as observed in other studies too. (14) **Stunting** wasn't improved significantly on discharge. (26) In most of the malnourished West Indian children, catch-up growth in height didn't occur until at least 85% recovery in their weight-for-length. (1) 20.63% could achieve the target weight which is quite similar to 18.4% in a study by Aguyo *et al.* and better than 14% of children in a study by Hashmi G *et al.* (15,28)

This study indicates that by following NRC guidelines, it has become easier to manage SAM in hospital settings with an optimum possible stay at the hospital. The stay at NRC is only due to illness which once cured (likely to be for 5-7 days), the patients take discharge against medical advice.

#### CONCLUSION

NRC is effective in improving children's weight gain and decreasing the prevalence of wasting but not effective at achieving gains in height. The study concludes the need for adherence to NRC guidelines and the importance of managing SAM in hospital settings. It also emphasizes the need for further research to improve weight gain and height catch-up in malnourished children. Regrettably, the COVID-19 pandemic led to a significant increase in COVID workload and the implementation of lockdown measures and the in-patient bed capacity was reduced from 10 to 5. So, the intended sample size couldn't be achieved. The future study can be planned with a large sample size and sufficient follow-up and qualitative components like in-depth interviews and FGD to determine factors responsible for the growth default.

#### AUTHORS CONTRIBUTION

All authors have contributed equally.

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Nil

#### CONFLICT OF INTEREST

There are no conflicts of interest.

#### REFERENCES

1. Colecraft EK, Marquis GS, Bartolucci AA, Pulley L, Owusu WB, Maetz HM. A longitudinal assessment of the diet and growth of malnourished children participating in nutrition rehabilitation centres in Accra, Ghana. *Public Health Nutr.* 2003;7(4):487–94.
2. National Rural Health Mission Department of Health & Family Welfare Government of Gujarat. Guidelines for Management of Severe Acute Malnutrition (SAM) Children at Nutrition Rehabilitation Center. 2012.
3. Gupta R, Sharma B. Role of nutrition rehabilitation center and dietary practices of mother associated with malnutrition and anemia among children. *Int J Med Sci Res Pract.* 2015;2(2):94–8.
4. Neeraj Pal Singh, Ajit Singh Solanki PBK. EVALUATION OF THE EFFECTS OF MEASURES TAKEN FOR NUTRITION ON CHILDREN ADMITTED TO NUTRITION REHABILITATION CENTRE. *Amity J Manag.* 2020;VIII(1):29–33.
5. Patel D, Upadhyay N. Evaluation of anthropometric indicators in malnourished children at Nutritional Rehabilitation Center, Gujarat, India. *Int J Contemp Pediatr.* 2019;6(4):1410–3.
6. Joshi P, Yadav JN, Gautam R. Impact of Indigenously Prepared Therapeutic Food for Children with Acute Malnutrition at Nutritional Rehabilitation Center. *Birat J Heal Sci.* 2020;5(1):891–6.
7. Kalaiselvi Selvaraj, Tovia Stephen<sup>1</sup>, S. Princy Priyadarshini<sup>2</sup>, Nikita Radhakrishnan<sup>2</sup>, Mohamed Ashic<sup>2</sup> R team. Exploration of Dietary Diversity and its Associated Factors among Infant and Young Children in Rural Tamil Nadu – A Mixed-Method Study. *Indian J Public Health.* 2021;65:218–25.
8. Istiyahq Ahmad, Najam Khaliq<sup>2</sup>, Salman Khalil, Urfi MM. Dietary diversity and stunting among infants and young children: A cross-sectional study in Aligarh. *Indian J Community Med [Internet].* 2018;43:34–6.
9. National Health Mission, State Health Society, Health & Family Welfare Department G of G. Mission Balam Sukham [Internet]. [cited 2023 Dec 12]. Available from: <https://nhm.gujarat.gov.in/mission-balam-sukham.htm>
10. Faul F, Erdfelder E, Lang AG, Buchner A. G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods.* 2007;39(2):175–91
11. Open Data Kit. ODK,2023, <https://opendatakit.org/>. Accessed 25 Dec. 2023
12. Meenakshi, Pradhan S K, Prasuna J G. A cross-sectional study of the association of postnatal growth and psychosocial development of the infants in an urban slum of Delhi. *Indian J Community Med* 2007;32:46-8
13. Sanghvi J, Mehta S, Kumar R. Predictors for Weight Gain in Children Treated for Severe Acute Malnutrition: A Prospective Study at Nutritional Rehabilitation Center. *ISRN Pediatr.* 2014;2014:1–5.
14. Taneja G, Dixit S, Khatri A, Raghunath D, Yesikar V, 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.* 2014;37(2):107-15.
15. Hashmi G, Kumar S. Evaluation of the effects of nutrition intervention measures on admitted children in nutritional rehabilitation center, Gulbarga, India. *Int J Community Med Public Heal.* 2016;3(9):2550-4.
  16. Udoh EE, Amodu OK. Complementary feeding practices among mothers and nutritional status of infants in Akpabuyo Area , Cross River State Nigeria. Springerplus. 2016;
  17. Chandwani H, Prajapati A, Rana B, Sonaliya K. Assessment of infant and young child feeding practices with special emphasis on IYCF indicators in a field practice area of Rural Health Training Centre at Dabhoda, Gujarat, India. *Int J Med Sci Public Health.* 2015; 4(10): 1414-1419
  18. Govender I, Rangiah S, Kaswa R, Nzaumvila D. Malnutrition in children under the age of 5 years in a primary health care setting. *South African Fam Pract.* 2021;63(1):1-6.
  19. Siddiqui F, Salam RA, Lassi ZS, Das JK. The Intertwined Relationship Between Malnutrition and Poverty. *Front Public Heal.* 2020;8(August):1-5.
  20. Tette EMA, Sifah EK, Nartey ET. Factors affecting malnutrition in children and the uptake of interventions to prevent the condition. *BMC Pediatr [Internet].* 2015;15(1):1-11.
  21. McKay FH, Sims A, van der Pligt P. Measuring Food Insecurity in India: A Systematic Review of the Current Evidence. *Curr Nutr Rep [Internet].* 2023;12(2):358-67.
  22. Indian Institute of Population Sciences. National Family Health Survey - 5 State Fact Sheet Gujarat. 2020;
  23. Rawat R, Marskole P. a Study To Evaluate the Effect of Nutritional Intervention Measures on Children With Severe Acute Malnutrition Admitted in Nutrition Rehabilitation Center At Civil Hospital Bairagarh, Bhopal, Madhya Pradesh. *J Evol Med Dent Sci.* 2015;4(17):2937-42.
  24. Shah RH, Javdekar BB, Rh S, Contemp IJ, May P. Management of children with severe acute malnutrition : experience of nutrition rehabilitation centre at Baroda , Gujarat. 2014;1(1):3-6.
  25. Ashwini Katole GN, , Anubhuti Kujur1 MK. Performance Appraisal of Nutritional Rehabilitation Centers in Central India: A Retrospective Facility-Based Descriptive Study. *Indian J Community Med.* 2022;47(2):272-6.
  26. Forney KM, Polansky LS, Rebolledo PA, Huamani KF, Mues KE, Ramakrishnan U, et al. Evaluation of a residential nutrition rehabilitation center in rural Bolivia: Short-term effectiveness and follow-up results. *Food Nutr Bull.* 2014;35(2):211-20.
  27. Mulla S, Gupta PK. An experience of facility based management at one of the malnutrition treatment centre in district Baran of Rajasthan, India. *Int J Community Med Public Heal.* 2017;4(6):2162-66.
  28. Aguayo VM, Jacob S, Badgaiyan N, Chandra P, Kumar A, Singh K. Providing care for children with severe acute malnutrition in India: new evidence from Jharkhand. *Public Health Nutr.* 2014;17(1):206-11.