ORIGINAL RESEARCH ARTICLE
pISSN09763325 | eISSN22296816
Open Access Article (CC BY-SA)
www.njcmindia.com
DOI: 10.55489/njcm.131120222415

Nutritional Status of Pre-School Children Attending Anganwadi Centres in Chittoor, Andhra Pradesh, India

C Sravana Deepthi[1], Erigela Mallikarjuna Reddy[2], Sirshendu Chaudhuri[3], Syed Rizwana[4]

[1]Apollo Institute of Medical Sciences and Research, Chittoor, India
[2]Apollo Institute of Medical Sciences and Research, Chittoor, India
[3]Indian Institute of Public Health, Hyderabad, India
[4]Apollo Institute of Medical Sciences and Research, Chittoor, India

ABSTRACT

Context/Background: Malnutrition among children is a major public health problem in India. The objective of the study is to assess the nutritional status of pre-school children and to identify the socio-demographic determinants of malnutrition.

Methodology: In this community-based cross-sectional study, 194 under-five children were recruited from rural and urban areas of Chittoor district, Andhra Pradesh. Anthropometric measurements were measured and age standardized weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ) were calculated. The proportion of under nutrition (WAZ <-2 standard deviation (SD)), stunting (HAZ <-2SD), and wasting (WHZ <-2SD) were calculated along with the determinants.

Results: The mean age of the participants was 40.5 months (SD- 9.1 months), 101 (52.1%) were from rural areas, and 96 (495%) females. The HAZ values were significantly low in- urban children (-0.81; 95%CI: -0.4, -1.21), among the non-Hindu children (-0.92; 95%CI: -0.35, -1.5). The overall prevalence of underweight, stunting, and wasting were- 13.4% (95%CI: 8.5%, 18.3%), 23.7% (95%CI: 17.6%, 29.8%), and 19.6% (95%CI: 11.9%, 25.3%) respectively. Urban residence (OR 6.75; 95% CI: 3.03 – 15.04) was a strong predictor of stunting.

Conclusion: Malnutrition remains to be a public health problem in this area. Strengthening of existing programs should be the key strategy in combating malnutrition.

Keywords: India, Malnutrition, Preschool child, Severe acute malnutrition, Stunting

INTRODUCTION

Undernutrition among children in has remained a major public health problem globally, but more marked in the low- and middle-income countries.[1,2] The condition directly affects child survival, morbidities, high infection rate, growth and development and future productivity in the life-cycle of the children.[3,4] The worst damages of malnutrition occur during the most crucial periods of pregnancy and early childhood i.e., from conception to two years, i.e., the first 1000 days. Children who are undernourished will have weaker immune systems thereby becoming more susceptible to infections and illnesses.[5] At the community level, this burden reduces productivity, including food production, and perpetuates the spiral of further malnutrition, infection, disease, poverty, and socioeconomic and political instability.[5–7] The World Health Assembly has reiterated the importance of reduction of undernutrition and suggested the approaches to combat the condition, but failed to gain much.[8,9]

The estimated reduction of undernutrition from the national level surveys is unsatisfactory in many parts of the world. In the last two decades, the reduction of stunting was higher in Asia (38.2% to 22.7%) when compared with the other regions like

How to cite this article: Deepthi CS, Reddy EM, Chaudhuri S, Syed R. Nutritional Status of Pre-School Children Attending Anganwadi Centres in Chittoor, Andhra Pradesh, India. Natl J Community Med 2022;13(11):828-834. DOI: 10.55489/njcm.131120222415

Financial Support: None declared | **Conflict of Interest:** None declared | **Date of Submission**: 06-09-2022 | **Date of Acceptance**: 07-11-2022 | **Date of Publication**: 30-11-2022

Correspondence: Sirshendu Chaudhuri (Email: sirshendusisu@gmail.com)

the Latin Americas (16.7% to 9.0%) and Africa (38.0 to 30%).[10] However, a high between country disparities is expected within a region because of socio-economic disparities.[11] According to WHO report on malnutrition, 156 million were affected by stunting (low height-for-age) and 50 million children were found to be affected by wasting (low weight-for-height). Poor nutrition caused nearly half of deaths in children of under- five age group.[12] In India, undernutrition continues to be a major public health challenge. Estimate in 2017 suggests that almost two-fifths of the children are suffering from stunting, one-sixth wasting, and one-third undernutrition.[13] The National Family Health Survey (NFHS-5) (2019-21) shows that prevalence of stunting (38.4%), wasting (19.5%), severe wasting (7.7%) and underweight (32.1%) is still critically high in the country and changed only marginally compared to the finding from NFHS-4 in 2015-16.[14] According to NFHS-4 data, 35.8% of under-five children were found to be underweight, 38.4% were stunted and 21.0% of the children had wasting.

Nutritional uplift in India can come with overall socio-economic development and hence the government of India initiated several supplementary feeding programs like Integrated Child Development Services (ICDS) Scheme aiming at overcoming specific nutritional deficiency diseases through various ministries of Government to combat malnutrition. Hence, pre-school children in India require special attention and care with respect to their health and nutritional status. In this regard, the Anganwadi centers plays a key role in implementing the programs in the community level. In India, Anganwadi centers provide a unique platform to screen the pre-school children for undernutrition. However, it is uncertain whether the screening results into appropriate management of the children or not. Also, this screening does not provide the further details like the determinants of undernutrition and thereby provision of targeted approach to combat the condition efficiently. In this background, the present study was conducted to assess the nutritional status of pre-school children (24 to 60 months) by anthropometric measurements in urban and rural areas of Chittoor, and to identify the socio-demographic determinants of malnutrition.

METHODS

Study design: This was a community-based cross-sectional study.

Study settings: The study was carried in Urban and Rural areas in Chittoor district. The urban area which was under Urban Health Centre of Apollo Institute of Medical Sciences (AIMSR), Chittoor. The rural area of study was the villages under Aragonda sub-centre in Chittoor district which is approximately 20 kilometres away from Chittoor.

Study duration: Data collection was done from May 2018 to August 2018

Study Participants: The Under- five children between 24 and 60 months of age attending the Anganwadi centres in Urban and rural field practice area of department of community medicine. The inclusion criteria were- age between 24 – 60 months, permanent resident of the area (at least 6 months) and attending anganwadi centres. The exclusion criteria were- any acute or chronic medical condition where it is difficult to perform anthropometric measurements, and unwilling to participate

Sample size: In a study done in same district,[15] prevalence of underweight was 57%, stunting was 38% and wasting was 36%. In the present study, we assume a prevalence of 40%, with 8% of relative precision, our required sample size was found to be 150. After getting the list of all the pre – school children enrolled in Anganwadi centre, we found the number to be 206 and we enrolled all the children into our study.

Tools and data collection process: The list of the children attending Anganwadi centre was obtained, and their address taken. The principal investigator (PI) visited the house of the child and took the informed consent from the parent / guardian. After obtaining the informed consent, the PI carried out an interview of the mother or the primary care giver of the child through a pre-tested, semi-structured questionnaire. The questionnaire had two parts. In the first part, socio-demographic profile was asked; followed by the second part which had anthropometric measurements of the child- height, weight and mid-upper arm circumference (MUAC) through calibrated instruments.

Definition of the outcome variables: Three anthropometric measures were examined in this study-underweight, stunting, and wasting. Underweight was defined as z-scores of age standardized weight for age (WAZ) <-2 standard deviation (SD); stunting was defined as z-scores of age standardized height for age (HAZ) <-2SD while wasting was defined as z-scores of either age standardized weight for height (WHZ) <- 2SD.

Data entry and analysis: Data was entered in Microsoft excel. Anthropometric analysis was done by WHO Anthro software. Final data was analyzed by SPSS version 20.0. (IBM Corp., Armonk, New York, 2010) Categorical variables were expressed as proportion with appropriate 95% confidence interval (CI). For the continuous variables, mean with standard deviation (SD) or median with inter-quartile range (IQR) was estimated depending on the distribution of the variables. To check the association between two variables, we conducted univariate analysis with Chi-square test for the categorical variables. To check the mean difference of an outcome between two variables, we conducted unpaired t-test. For all

statistical analyses, a p-value <0.05 was considered significant.

Human subject protection: We obtained the institutional ethics committee clearance. In addition, we obtained written informed consent from all the parents of the children.

RESULTS

In this study, we recruited 194 participants out of 206 eligible participants. Twelve (6%) mothers did not give consent. Out of 194 participants, 93 (47.9%) were from urban areas and 102 (52.1%) from rural areas. (Table 1) The mean age of the participants was 40.5 months (SD- 9.1 months) and 96 (495%) females. Most of the participants belonged to Hindu (n=165, 85.1%) nuclear families (n=120, 61.9%) and poor socio- economic section (n=123, 64.1%). Most of the mothers have studied at least higher secondary level (n=150, 77.3%), and home maker (n=161, 83%).

Nutritional status of the participants

The median z-scores (IQR) for WAZ (Median: -1.22, IQR: -1.74 to -0.73), HAZ (Median: -0.98, IQR: -2.82 to -0.21) and WHZ (Median: -0.78, IQR: -1.53 to -0.15) were skewed substantially from the WHO reference median of zero. (Figure 1) The skewness is even more prominent for the height-for-age in the urban children. The HAZ values were significantly low in-urban children compared to the rural children (-0.81; 95% CI: -0.4, -1.21), among the non-Hindu children compared to the Hindu children (-0.92; 95% CI: -0.35, -1.5) and among the children whose mothers are homemaker than the children of working (outside) mothers (0.8; 95% CI: 0.25, 1.35). (Table 2) However, we noticed a reverse relationship in the distribution of the WHZ. The WHZ values were significantly low in- rural children compared to the urban children (-0.58; 95% CI: -0.23, -0.91), among the Hindu children compared to the non-Hindu children (-0.50; 95% CI: -0.02, -0.98) and among the children whose mothers are working (outside) mothers than the children of homemakers (-0.72; 95% CI: -0.27, -0.17). (Table 2)

The overall prevalence of underweight, stunting, and wasting were- 13.4% (95% CI: 8.5%, 18.3%), 23.7% (95% CI: 17.6%, 29.8%), and 19.6% (95% CI: 11.9%, 25.3%) respectively. There were a total 16 (8.3%, 95% CI: 5.6%, 11.0%) severely malnourished children. While the proportion of underweight and wasting was significantly high in the rural areas, the proportion of stunting was substantially high (OR 6.75; 95% CI: 3.03 – 15.04) among the urban children. (Supplementary table 1-3) The distribution of underweight was similar in both urban and rural area (Figure 1). Severe wasting (WHZ <-3SD) was strongly associated with children whose mothers are working outside (OR 6.0; 95% CI: 2.1, 17.8)

Table 1: Socio demographic variables of the study subjects (N=194)

Variable	Children (%)
Age (in months)	
24 – 36	68 (35.1)
>36 – 48	74 (38.1)
>48 – 60	52 (26.8)
Gender	
Female	96 (49.5)
Male	98 (50.5)
Birth order	
One	102 (52.6)
Two	80 (41.2)
Three	12 (6.2)
Religion	
Hindu	165 (85.1)
Muslim	24 (12.4)
Christian	5 (2.6)
Type of family	
Nuclear	120 (61.9)
Joint family	5 (2.6)
Three generation	69 (35.6)
BG Prasad SocioEconomic status for August 2018 (INR)	
Class I (>= 6871)	2 (1)
Class II (3435- 6870)	7 (3.6)
Class III (2061-3434)	9 (4.7)
Class IV (1031- 2060)	51 (26.6)
Class V (<= 1030)	123 (64.1)
Education of Mother	
Illiterate	6 (3.1)
Primary	5 (2.6)
Middle	33 (17.0)
Higher secondary	100 (51.5)
Intermediate	32 (16.5)
Graduation & above	18 (9.3)
Occupation of Mother	
Home Maker	161(83.0)
Working Gainfully	33 (17.0)

DISCUSSION

In this study, we have estimated the prevalence of different types of undernutrition among the under-five pre-school children and examined the association of these outcomes with the socio- demographic determinants. We found that prevalence of stunting is high compared to the other two malnutrition types. Prevalence of stunting is remarkably high in urban areas compared to rural area. All the three forms of malnutrition are equally distributed in respect to the socio-demographic variables. Women working outside home is a strong predictor severe acute malnutrition.

While prevalence of underweight and stunting in our study falls on 'medium prevalence' in cut-off values for public health significance, according to World Health Organization (Nutrition Landscape Information System- Country Profile indicators); the prevalence of wasting falls on serious level prevalence' in cut-off values for public health significance.

The prevalence of malnutrition in our study is low when compared with the finding from the other parts of the country.

A study done in Goa, the overall prevalence of underweight, wasting and stunting was found to be 33.4%, 24% and 31.5%.[16] A study conducted in Assam, the North-East part of the country, found that the overall prevalence of underweight, stunting and wasting was found to be 29%, 30.4% and 21.6% respectively.[17] Whereas study conducted in the northern part of the country in Bareilly, UP showed the prevalence of underweight, stunting and wasting as 53.86, 43.22% and 60.67% respectively.[18]

Lower prevalence of malnutrition in the present study may be due to improved effectiveness in the implementation in the program or local factors. A remarkable higher burden of stunting in urban area in the present study could be contributed by other factors like availability of food, exposure to poor environmental factors.

Importantly, we found that the proportion of malnutrition is equally distributed in respect to the socio-demographic factors. Other studies conducted in the similar region, found that age group, urban residence, gender, and lower socioeconomic status to be the common socio-demographic predictors of undernutrition.

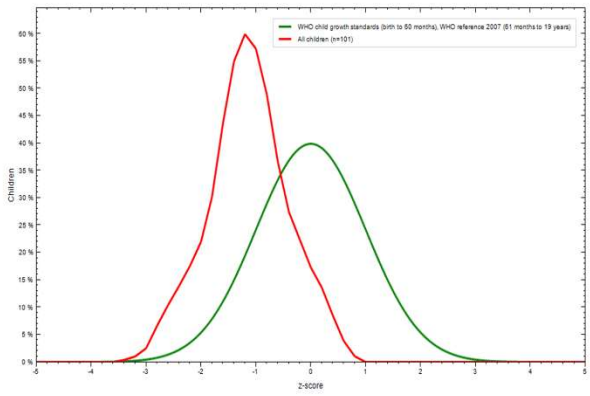

Figure 1A: WAZ distribution, rural children (n=101)

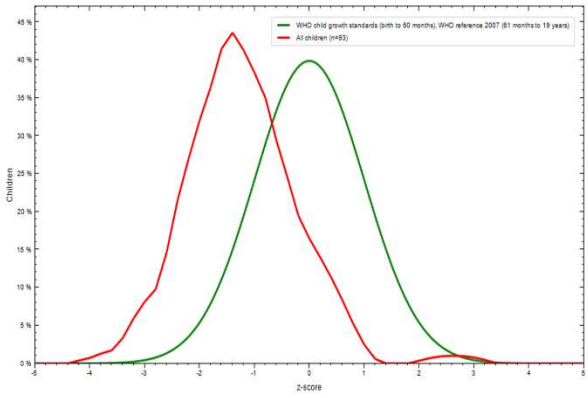

Figure 1B: WAZ distribution, urban children (n=93)

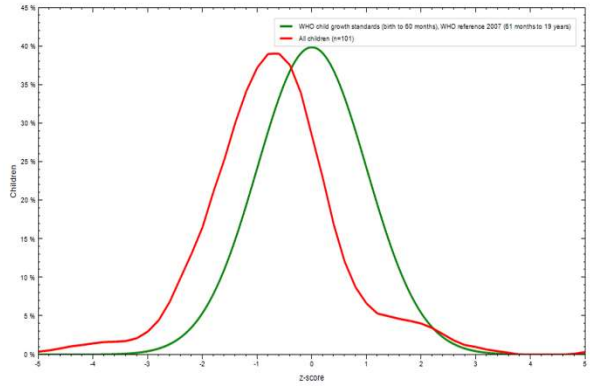

Figure 1C: HAZ distribution, rural children (n=101)

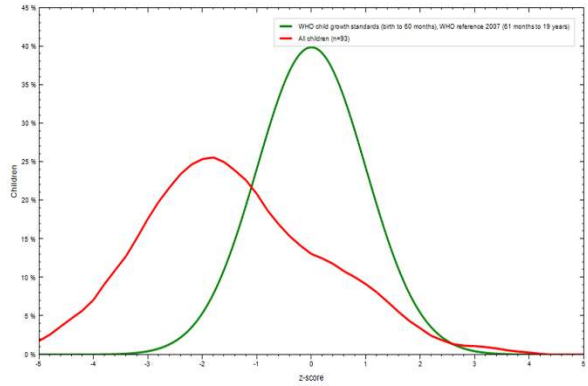

Figure 1D: HAZ distribution, urban children (n=93)

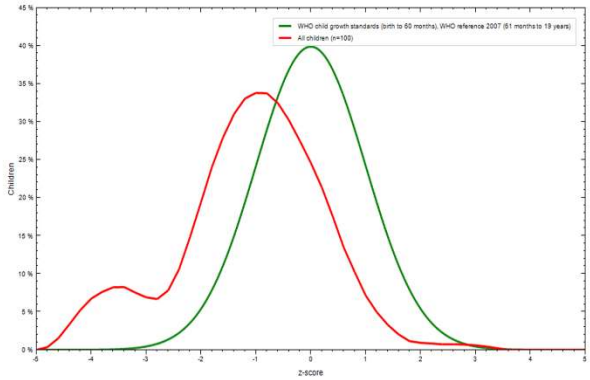

Figure 1E: WHZ distribution, rural children (n=100*)
*One outlier (WHZ -5.79) excluded

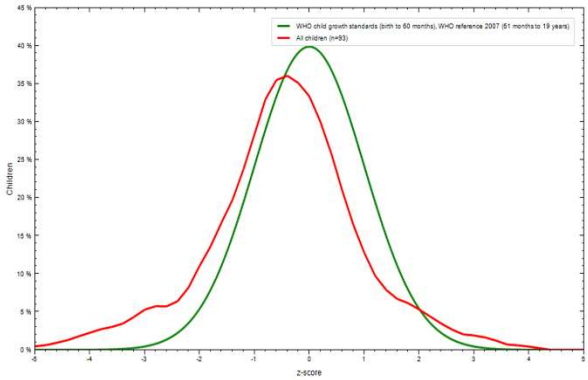

Figure 1F: WHZ distribution, urban children (n=93)

Figure 1A-F: Distribution of anthropometric indices in relation to rural/urban residence, Chittoor, India, 2018

Table 2: Distribution of anthropometric z-scores in different socio-economic groups

Variables	Anthropometric indices								
	WAZ			HAZ			WHZ		
	Mean value	Difference (95% CI)	P value	Mean value	Difference (95% CI)	P value	Mean value	Difference (95% CI)	P value
Gender									
Male	-1.2	-0.04	0.69	-0.96	0.11	0.6	-0.99	0.2	0.12
Female	-1.16	(-0.19, 0.28)		-1.07	(-0.31, 0.54)		-0.78	(-0.13, 0.55)	
Area of residence									
Rural	-1.13	0.1	0.4	-0.63	-0.81	<0.001	-1.16	-0.58	<0.001*
Urban	-1.23	(-0.13, 0.34)		-1.44	(-0.4, -1.21)		-0.58	(-0.23, -0.91)	
Family type									
Nuclear	-1.16	0.04	0.62	-1.08	-0.16	0.47	-0.81	0.19	0.28
Third generation	-1.2	(-0.21, 0.28)		-0.92	(-0.59, 0.28)		-1	(-0.17, 0.54)	
Religion									
Hindu	-1.14	0.24	0.14	-0.88	0.92	0.001*	-0.95	-0.5	0.04*
Non-Hindu	-1.38	(-0.08, 0.57)		-1.8	(0.35, 1.5)		-0.45	(-0.02, -0.98)	
Birth order									
One	-1.16	0.03	0.82	-1.01	0	0.98	-0.88	0.02	0.45
>One	-1.2	(-0.21, 0.26)		-1.01	(-0.41, 0.43)		-0.9	(-0.33, 0.38)	
Mother's education									
<=8th standard	-1.27	-0.12	0.4	-1.14	-0.16	0.54	-0.87	0.02	0.46
>8th standard	-1.15	(-0.40, 0.16)		-0.98	(-0.66, 0.34)		-0.89	(-0.39, 0.43)	
Mothers' occupation									
Homemaker	-1.22	-0.05	0.9	-0.36	0.8	0.004*	-1.48	-0.72	<0.001
Working gainfully	-1.17	(-0.37, 0.27)		-1.15	(0.25, 1.35)		-0.76	(-0.27, -0.17)	
Fathers' education									
<=8th standard	-1.31	-0.16	0.28	-1.23	-0.25	0.26	-0.87	0	0.98
>8th standard	-1.15	(-0.45, 0.12)		-0.98	(-0.75, 0.26)		-0.87	(-0.42, 0.41)	
SES									
Low SES#	-0.93	0.28	0.17	-0.9	0.15	0.33	-0.9	0.26	0.39
High SES$	-1.21	(-0.12, 0.69)		-1.05	(-0.57, 0.87)		-0.63	(-0.33, 0.85)	

*Statistically significant; # BG Prasad class Socio-economic IV/V, $ BG Prasad Socio-economic class I/II/III

(15,16,19–21) In a study conducted in Tirupati, Andhra Pradesh showed the prevalence of underweight as 42% and 46% in urban and rural areas respectively.[15] In our study the prevalence of underweight, stunting and wasting in males and females were 13.3%, 24.5%, 13.6% and 15.6%, 22.9%, 14.6% respectively. Though not significant, females had a relatively higher proportion of underweight and wasting. Similar observation is found in a study done in rural children in Goa, and among the tribal children in West Bengal.[16,21] Even a large multicentric study in eight countries, found that proportion of stunting is almost equal in males and females.[20] However, a few studies from similar settings reported that boys have a marginally higher prevalence than the girls.[19,22] Studies from other parts of the country mostly found that the socioeconomic is an important association with malnutrition. In majority, higher prevalence of undernutrition is seen in the poor socio-economic groups.[16,17,23] However, in the present study we found that the distribution is only marginally high in the higher socioeconomic classes. Strikingly, we found that the working mothers is a strong predictor of SAM- could be due to lack of childcare in absence of the mother. Although maternal education didn't show any significant finding in our study, larger multi-centric study from similar settings has reported that maternal education is a crucial factor in determining a child's nutritional status.[20]

LIMITATIONS

The study participants were recruited through the anganwadi centers and we expect to miss a few children to recruit in the study. However, we have earlier intimated the local village health workers to recruit the maximum number of participants. We also expect a few misclassifications in the outcome variables. However, we have used calibrated instruments and uniform anthropometry examination process to reduce the measurement bias and thereby misclassification.

CONCLUSION

Malnutrition remains to be a public health problem in this area. All forms of malnutrition are prevailed among the children under five years of age irrespective of any among all socio-demographic groups, more likely among the urban children and the working mothers. The existing system to identify the children with malnutrition through anganwadi system should be strengthened. We strongly recommend for continuous monitoring of the children through simple nutritional assessment by village

level health workers through the existing national level programs like ICDS. Besides, supportive supervision of the village-level healthcare workers, and linking referral services from the anganwadi center to the nutritional rehabilitation center for the SAM children can identify the conditions and initiate treatment at an early stage. High prevalence of chronic malnutrition suggests long term effect of various factors which are unnoticed and may need further exploration.

REFERENCES

1. Black RE, Allen LH, Bhutta ZA, Caulfield LE, de Onis M, Ezzati M, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2008 Jan 19;371(9608):243–60.
2. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013 Aug 3;382(9890):427–51.
3. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet. 2013 Aug 3;382(9890):452–77.
4. Morris SS, Cogill B, Uauy R, Maternal and Child Undernutrition Study Group. Effective international action against undernutrition: why has it proven so difficult and what can be done to accelerate progress? Lancet. 2008 Feb 16;371(9612):608–21.
5. Katona P, Katona-Apte J. The Interaction between Nutrition and Infection. Clinical Infectious Diseases [Internet]. 2008 May 15 [cited 2022 Jul 3];46(10):1582–8. Available from: https://doi.org/10.1086/587658
6. Martins VJB, Toledo Florêncio TMM, Grillo LP, Franco M do CP, Martins PA, Clemente APG, et al. Long-Lasting Effects of Undernutrition. Int J Environ Res Public Health [Internet]. 2011 Jun [cited 2022 Jul 3];8(6):1817–46. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3137999/
7. Abu-Fatima O, Abbas AAG, Racalbuto V, Smith L, Pizzol D. Child Undernutrition in Sudan: The Social and Economic Impact and Future Perspectives. Am J Trop Med Hyg [Internet]. 2021 Mar [cited 2022 Jul 3];104(3):1149–52. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7941838/
8. World Health Organization. Global nutrition targets 2025: policy brief series [Internet]. [cited 2022 Jul 3]. Available from: https://www.who.int/publications-detail-redirect/WHO-NMH-NHD-14.2
9. Victora CG, Christian P, Vidaletti LP, Gatica-Domínguez G, Menon P, Black RE. Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. The Lancet [Internet]. 2021 Apr 10 [cited 2022 Jul 3];397(10282):1388–99. Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00394-9/fulltext
10. UNICEF, WHO, World Bank Group. Levels and trends in child malnutrition: Key findings of the 2019 edition [Internet]. [cited 2022 Jul 3]. Available from: https://www.unicef.org/media/60626/file/Joint-malnutrition-estimates-2019.pdf
11. da Silva ICM, França GV, Barros AJD, Amouzou A, Krasevec J, Victora CG. Socioeconomic Inequalities Persist Despite Declining Stunting Prevalence in Low- and Middle-Income Countries. J Nutr. 2018 Feb 1;148(2):254–8.
12. World Health Organization. WHO | Double burden of malnutrition [Internet]. WHO. World Health Organization; [cited 2022 Jul 3]. Available from: http://www.who.int/nutrition/double-burden-malnutrition/en/
13. Swaminathan S, Hemalatha R, Pandey A, Kassebaum NJ, Laxmaiah A, Longvah T, et al. The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. The Lancet Child & Adolescent Health [Internet]. 2019 Dec 1 [cited 2022 Jul 3];3(12):855–70. Available from: https://www.thelancet.com/journals/lanchi/article/PIIS2352-4642(19)30273-1/fulltext
14. Ministry of Health and Family Welfare. India Fact Sheet National Family Health Survey- 5 [Internet]. International Institute of Population Sciences; [cited 2022 Jul 3]. Available from: http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf
15. Mamatha IV, Reddy DNK. Nutritional Status of Pre-School Children Attending Anganwadi Centres in Tirupati, Andhra Pradesh, India. :5.
16. Silva VGP, Silva SGP. Nutritional Status of Anganwadi Children under the Integrated Child Development Services Scheme in a Rural Area in Goa. INTERNATIONAL JOURNAL OF SCIENTIFIC STUDY [Internet]. 2015 [cited 2022 Jul 3];3(7):217–21. Available from: https://galaxyjeevandhara.com/index.php/ijss/article/view/3277
17. Islam S, Mahanta TG, Sarma R, Hiranya S. Nutritional Status of under 5 Children belonging to Tribal Population Living in Riverine (Char) Areas of Dibrugarh District, Assam. Indian J Community Med. 2014 Jul;39(3):169–74.
18. Singh J, Gupta S, Shrotriya V, Singh P. Study of Nutritional Status Among Under Five Children Attending Out Patient Department at A Primary Care Rural Hospital, Bareilly(UP). undefined [Internet]. 2013 [cited 2022 Jul 3]; Available from: https://www.semanticscholar.org/paper/Study-of-Nutritional-Status-Among-Under-Five-Out-at-Singh-Gupta/9b22b7bfcefb602c66fd300a086dcda1f3cdefc1
19. Ray SK, Biswas AB, Gupta SD, Mukherjee D, Kumar S, Biswas B, et al. RAPID ASSESSMENT OF NUTRITIONAL STATUS AND DIETARY PATTERN IN A MUNICIPAL AREA. Indian Journal of Community Medicine [Internet]. 2000 Mar [cited 2022 Jul 3];25(1):14–8. Available from: https://journals.lww.com/ijcm/Abstract/2000/25010/RAPID_ASSESSMENT_OF_NUTRITIONAL_STATUS_AND_DIETARY.3.aspx
20. Psaki S, Bhutta ZA, Ahmed T, Ahmed S, Bessong P, Islam M, et al. Household food access and child malnutrition: results from the eight-country MAL-ED study. Popul Health Metr. 2012 Dec 13;10(1):24.
21. Banerjee B, Mandal ON. An Intervention Study in Malnutrition Among Infants in a Tribal Community of West Bengal. Indian Journal of Community Medicine [Internet]. 2005 Mar [cited 2022 Jul 3];30(1):27. Available from: https://journals.lww.com/ijcm/Abstract/2005/30010/An_Intervention_Study_in_Malnutrition_Among.10.aspx
22. Devi PY, Geervani P. Determinants of Nutrition Status of Rural Preschool Children in Andhra Pradesh, India. Food Nutr Bull [Internet]. 1994 Dec 1 [cited 2022 Jul 3];15(4):1–8. Available from: https://doi.org/10.1177/156482659401500402
23. Dhakal M, Rai A, Singh CM, Mohapatra S. Health impact assessment: A futuristic approach in under-five care. India J Prev Soc Med [Internet]. 2005 [cited 2022 Jul 3];36(3):114–20.

Supplementary Table 1: Association of Socio-demographic variables with underweight based on the WHO child growth std

Variables	Frequency in nutritional status group		OR (95% CI)	p value
	Underweight (%)	Normal (%)		
Age (months)				
24-35	10 (14.7)	58 (85.3)	Ref. category	
36-47	7 (9.5)	67 (90.5)	1.7 (0.6, 4.6)	0.33
48-60	9 (17.3)	43 (82.7)	0.8 (0.3, 2.2)	0.7
Gender				
Male	12 (12.2)	86 (87.8)	0.8 (0.4, 1.9)	0.64
Female	14 (14.6)	82 (85.4)		
Birth order				
One	13 (12.8)	89 (87.2)	Ref. category	
Two	12 (15.0)	68 (85.0)	0.8 (0.4, 1.9)	0.54
Three	1 (8.3)	11 (91.7)	1.6 (0.2, 13.5)	0.55
Socio-economic status (BG Prasad – August 2018)				
Poor (class IV, V)	25 (14.4)	149 (85.6)	2.9 (0.4 – 25.0)	0.31
High (class I, II, III)	1 (5.6)	17 (94.4)		
Education of mother				
Up to middle level	6 (13.6)	38 (86.4)	1.02 (0.4 – 2.7)	0.95
Above middle level	20 (13.3)	130 (86.7)		
Residence				
Urban	16 (17.2)	77 (82.8)	1.89 (0.8 – 4.4)	0.14
Rural	10 (9.9)	91 (90.1)		

Supplementary Table 2: Association of Socio-demographic variables with Stunting based on the WHO child growth standards

Variables	Frequency in nutritional status group		OR (95% CI)	p value
	Stunting (%)	Normal (%)		
Age (months)				
48-60	15 (28.8)	37 (71.2)	Ref. category	
36-48	13 (17.6)	61 (82.4)	0.53 (0.34 – 1.99)	0.14
24-36	18 (26.5)	50 (73.5)	0.89 (0.22 – 1.23)	0.77
Gender				
Female	22 (22.9)	74 (77.1)	0.91 (0.47 – 1.77)	0.79
Male	24 (24.5)	74 (75.5)		
Birth order				
3	3 (25)	9 (75)	Ref. category	
2	21 (26.3)	59 (73.8)	1.07 (0.20 – 3.31)	0.93
1	22 (21.6)	80 (78.4)	0.82 (0.26 – 4.32)	0.78
Socio-economic status (BG Prasad – August 2018)				
Poor (class IV, V)	43 (41.7)	131 (75.3)	1.64 (0.45 – 5.92)	0.45
High (class I, II, III)	3 (16.7)	15 (13.7)		
Education of mother				
Up to middle level	12 (27.3)	32 (72.7)	1.28 (0.59 – 2.71)	0.53
Above middle level	34 (22.7)	116 (77.3)		
Residence				
Urban	37 (39.8)	56 (60.2)	6.75 (3.03 – 15.04)	<0.001*
Rural	9 (8.9)	92 (91.1)		

*Statistically significant

Supplementary Table 3: Association of Socio-demographic variables with Wasting based on the WHO child growth standards

Variables	Frequency in nutritional status group		OR (95% CI)	p value
	Wasting (%)	Normal (%)		
Age (months)				
48-60	9 (17.3)	43 (82.7)	**Ref. category**	
36-48	10 (13.5)	64 (86.5)	0.75 (0.28, 1.99)	0.56
24-36	8 (11.8)	60 (88.2)	0.64 (0.23, 1.78)	0.34
Gender				
Female	14 (14.6)	82 (85.4)	1.11 (0.49, 2.52)	0.79
Male	13 (13.6)	85 (86.7)		
Birth order				
Three	1 (8.3)	11 (91.7)	Ref. category	
Two	9 (11.3)	71 (88.8)	1.39 (0.16, 12.10)	0.76
One	17 (16.7)	85 (83.3)	2.20 (0.27, 18.19)	0.46
Socio-economic status (BG Prasad – August 2018)				
Poor (class IV, V)	24 (13.8)	150 (86.2)	1.28 (0.28, 5.92)	0.75
High (class I, II, III)	2 (11.1)	16 (88.9)		
Education of mother				
Up to middle level	6 (13.6)	38 (86.4)	0.97 (0.36, 2.57)	0.95
Above middle level	21 (14)	129 (86)		
Residence				
Urban	9 (9.7)	84 (90.3)	0.49 (0.21, 1.16)	0.10
Rural	18 (17.8)	83 (82.2)		