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Original Article

Prevalence and Determinants of Undernutrition among Children Aged 6–59 Months in Northeast India: A Hospital-based Cross-sectional Study

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Abstract

Background and Objectives: Undernutrition (UN) is one of the leading causes of morbidity and mortality in children under 5 years of age in developing countries. The prevalence of UN is high and its causes are multifactorial. To estimate the prevalence of UN and identify its determinants among children aged 6–59 months attending pediatric outpatient department at a tertiary care institute.

Methods: A cross-sectional study was conducted from June 2020 to May 2021 on 360 children. All children were examined clinically, including anthropometric measurements. Multiple logistic regression analysis was carried out to identify the determinants of different categories of UN.

Results: The mean age of presentation was 25.3 months ± 14.86 standard deviations, with males comprising 52.3%. The prevalence of stunting was highest (26.39%), followed by underweight (25.28%) and wasting (15.83%). The important determinants of being underweight were exclusively breastfeeding <6 months, nuclear family, and incomplete immunization. Younger age, unprotected water, and comorbidities with anemia, diarrhea, and acute respiratory tract infection were the main predictors for stunting. The major determinants for wasting were lower mother's education and improper hand hygiene in addition to nuclear family and incomplete immunization.

Conclusion: Identifying determinants of the UN will help in addressing the policymakers to improve maternal literacy, promote breastfeeding and nutrition programs, provide infection control, and better sanitation and water facilities at the community level. Strengthening the screening for the nutritional status of children under 5 years should be performed in every childcare/facility base center.

Key words: Analysis, Children, Determinants, Prevalence, Undernutrition

INTRODUCTION

Nutritional status is one of the best indicators for the health and well-being of children. Undernutrition (UN) is a condition in which there is inadequate consumption, poor absorption, or excessive loss of nutrients. Bain *et al.* reported that the potential causes of malnutrition are food insecurity, poverty, parental education, climate change, government policies, and socioeconomic inequalities in sub-Saharan African countries.[1] UN among children under 5 years is prevalent globally, particularly in developing countries, including India.[2] Overall, both girls and boys have a similar prevalence of UN. UN is one of the leading causes of morbidity and mortality in children under five in developing countries. An estimated 35% of all deaths among children under five are caused by childhood UN.[3] Children with UN are more susceptible to infections. Strong evidence exists on the synergism between UN and child mortality due to common childhood illnesses. Previous studies found that factors such as the presence of diarrhea or acute respiratory tract infections were important contributors to childhood malnutrition.[4] Malnutrition

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in the form of UN, namely underweight, stunting, and wasting has been coined as the "silent emergency" by the United Nations Children's Fund (UNICEF).[5]

Underweight is often used as a basic indicator of the status of a population's health as weight is easy to measure. An underweight child has a weight-age-z-score that is at least two standard deviations (−2SD) below the median for the World Health Organization (WHO) child growth standard. Stunting represents failure to achieve expected height/length as compared to healthy, well-nourished children of the same age and it indicates failure to receive adequate nutrition over a long period or recurrent infections. Stunting often results in delayed psycho-social and cognitive development as well as poor school performance. This, in turn, affects economic productivity at the national level. Wasting represents a recent failure to receive adequate nutrition and may be affected by recent episodes of diarrhea and other acute illnesses. A wasted child has a weight-for-height z-score that is at least −2SD below the median for the WHO child growth standards.[6]

The reported prevalence of UN in pediatric patients seeking care or being hospitalized varies considerably, ranging from 2.5% to 51%. The absence of systematic nutritional screening in the hospital environment may lead to an underestimation of varied malnutrition.

To combat child UN with the right set of interventions, policymakers need to have a better understanding of its economic, social, and policy determinants.[7,8] Studies that focus on hospital attending children <5 years of age for assessment of UN are scarce in Northeast India. The objective of the present study was to estimate the prevalence and ascertain the determinants of UN among children aged 6–59 months seeking care in a tertiary-level hospital in Northeast India.

MATERIALS AND METHODS

An institution-based cross-sectional observational study was carried out at the pediatric outpatient department (OPD) of Jawaharlal Nehru Institute of Medical Sciences, Manipur, Northeast India during June 2020–May 2021. The study was conducted after getting approval from the Institutional Ethics Committee. Written informed consent was obtained from the mother/caregiver of each child. Only those parents/caregivers willing to participate are enrolled in the study by simple random sampling. Considering the national prevalence of underweight (35.7%) as per the National Family Health Survey (NFHS-4) 2015–2016 sample size of 352 was calculated with a 95% confidence interval (CI) and allowable difference of 5% of prevalence but we had included 360 children which is an adequate sample size.

Inclusion Criteria

Children aged 6–59 months attending pediatric OPD.

Exclusion Criteria

Children with malignancy, HIV, and congenital birth defects, children admitted in the Pediatric ward.

A questionnaire was formulated in English and local language considering the important factors that may cause UN. Data were collected by the residents under the supervision of the faculty. Detailed case history of the child including clinical examination was done. The data were also collected regarding the mother's education, family type, family income, water sources, sanitation, hygiene practices, and other relevant information. The exact age in months was recorded as told by the respondents. The socioeconomic status was determined using a modified B.G. Prasad's scale.[9] For anthropometric measurement equipment, global standards were used. A digital weighing scale was used for measuring the weight of the child. A stadiometer was used for measuring the standing height of children aged 2 years and above whereas length in lying down position using an infantometer was measured for children aged <2 years or children who cannot stand. Mid-upper arm circumference (MUAC) was measured using tri-color (red, yellow, and green zones) mid-upper arm insertion tapes on the left arm of the children. The weighing scale, stadiometer, and infantometer were calibrated each week before the start of the data collection. Standard methods were followed for all the measurements as recommended by WHO. The nutritional status of the children was assessed by weight for age, height for age, and weight for height/length on WHO 2006 standards growth charts using z-scores.[10,11] All the children were clinically examined to find out the comorbidities as per guidelines of integrated management of neonatal and childhood illnesses.[12] Home treatment was advised to all the children as per their clinical outcomes.

Statistical Analysis

Data collected were entered into the Microsoft Excel software (version 10) and statistical analysis was performed using SPSS version 22. Descriptive analysis was done to calculate mean, ratio, standard deviation, frequency, and percentage. Multivariate logistic regression analysis was carried out to identify the determinants of child UN (underweight, stunting, and wasting). Independent variables such as gender, maternal education, family type, family income, birth order, exclusive breastfeeding till 6 months, water source, hand hygiene, anemia, diarrhea, and acute respiratory infections (ARI) were taken into consideration.

Results were reported by 95% CI with 5% level of significance. Using Chi-square 2-tailed test $P < 0.05$ was considered statistically significant.

RESULTS

In the present study, a total of 360 children in the age group between 6 and 59 months were studied. There were 189 (52.3%) boys and 171 (47.5%) girls with a ratio of 1.1:1. Children residing in urban (57%) were more than the rural area (42.78%). The mean age of the children was 25.3 months ± 14.86 SD. The majority of the children belong to the age group between 12 and 23 months (37.78%). Table 1 in our study, the prevalence of underweight (weight for age z-score < −2SD), stunting (height for age z-score < −2SD), and wasting (weight for height z-score < −2SD) were 25.28%, 26.39%, and 15.83% respectively among children aged 6–59 months. Figure 1 stunting was the most common category of UN observed. In all the categories of UN, the number of boys is more than the girls. Figure 2 shows that maximum number (20.16 %) of boys had stunting followed by underweight (19.75%) and only 9.17% had wasting. The majority of the underweight (37.74%) children were among the age group between 24 and 35 months Table 2.

In the present study, the severely underweight, severely stunted, and severely wasted were found to be 96.39%, 9.44%, and 6.11%, respectively. 57 (15.83%) children had MUAC <125 mm and only 14 (3.89%) children had MUAC <115 mm.

In the computation of adjusted odds ratio [AOR], the variables considered were age in months, gender, birth order, residence, mother's education, exclusive breastfeeding till 6 months, type of family, family income, unprotected water source, common childhood diseases (diarrhea and ARI), anemia, complete immunization, available toilet facility, and hand hygiene. As shown in Table 3, it was observed that the odds of stunting were significantly lower among children aged below 24 months (AOR = −0.44, $P < 0.001$) than underweight and wasting. The important factors associated with stunting among children aged 6–59 months were lower per capita family income (AOR = 0.71, $P < 0.001$), unprotected water source (AOR = 0.73, $P < 0.001$), anemia (AOR = 0.70, $P < 0.001$), diarrhea (AOR = 0.67, $P < 0.001$), and acute respiratory tract infection (AOR = 1.71, $P < 0.05$). Exclusive breastfeeding (AOR = 0.38, $P < 0.001$, type of family (AOR = 0.66, $P < 0.05$), and immunization not completed (AOR = 0.53, $P < 0.001$) are the determinants of underweight among children aged 6–59 months. The determinants for wasting include mother's education (AOR = 0.30, $P < 0.001$), nuclear family

Table 1: Age-wise gender distribution among children aged 6–59 months

Age in months	Male frequency	Female frequency	Total number (percentage)
6–11	25	32	57 (15.83)
12–23	76	60	136 (37.78)
24–35	33	28	62 (17.22)
36–47	29	20	49 (13.61)
48–59	26	30	56 (15.56)
Total	189	171	360

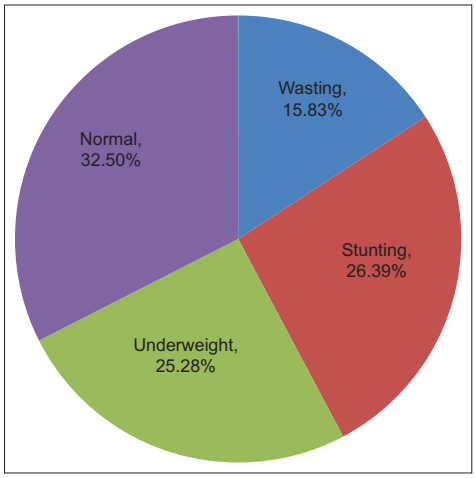

Figure 1: Prevalence of undernutrition among children aged 6–59 months (*n* = 360)

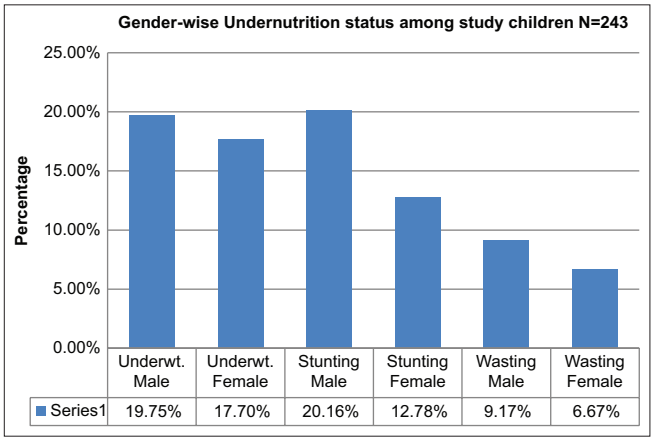

Figure 2: Gender-wise distribution of undernutrition among children aged 6–59 months

(AOR = 0.47, $P < 0.001$), family income (AOR = 0.66, $P < 0.05$), immunization not completed (AOR = 0.57, $P < 0.001$), and lack of hand hygiene (AOR = 0.68. $P < 0.05$).

Overall, the multivariate logistic regression analysis confirmed the determinants of UN among the enrolled children as younger age group, lower mother's education, not exclusively breastfeeding till 6 months, nuclear type of family, low family (per capita) income, unprotected water

Table 2: Age-wise prevalence of UN in different categories

Age in months (No. of UN)	WAZ		HAZ		WHZ	
	<−3SD (%)	<−2SD (%)	<−3SD (%)	<−2SD (%)	<−3SD (%)	<−2SD (%)
6–11 (26)	2 (7.69)	4 (15.38)	7 (26.92)	5 (19.23)	3 (11.54)	5 (19.23)
12–23 (87)	10 (11.49)	23 (26.44)	11 (12.64)	22 (25.29)	9 (10.34)	12 (13.79)
24–35 (53)	3 (5.66)	20 (37.74)	10 (18.87)	11 (20.75)	3 (5.66)	6 (11.32)
36–47 (35)	2 (5.71)	12 (34.29)	2 (5.71)	11 (31.43)	3 (8.57)	5 (14.29)
48–59 (42)	6 (14.29)	9 (21.43)	4 (9.52)	12 (28.57)	4 (9.52)	7 (16.67)
243	23	68	34	61	22	35

UN: Undernutrition, WAZ: Weight for age z-score (underweight), HAZ: Height for age z-score (stunting), WHZ: Weight for height z-score (wasting)

Table 3: Determinants of UN among children aged 6–59 months

Determinant variables	Underweight		Stunting		Wasting	
	AOR (95%CI)	*P*-value	AOR (95%CI)	*P*-value	AOR (95%CI)	*P*-value
Age in months						
<24	0.89	0.287	0.44	0.000	1.04	0.937
≥24	(0.72–1.09)		(0.32–0.62)		(0.69–1.58)	
Gender						
Male	1.01	0.993	0.95	0.832	1.12	0.563
Female	(0.72–1.41)		(0.68–1.32)		(0.89–1.55)	
Birth order						
<2	0.88	0.517	1.029	0.932	1.07	0.669
≥2	(0.6 3–1.23)		(0.73–1.43)		(0.80–1.43)	
Residence						
Urban	0.87	0.170	1.029	0.984	1.14	0.342
Rural	(0.72–1.05)		(0.73–1.43)		(0.88–1.47)	
Mothers education						
<8 standard	1.25	0.259	0.88	0.340	0.30	0.000
≥8 standard	(0.87–1.80)		(0.69–1.12)		(0.17–0.55)	
EBF till 6 months						
No	0.39	0.000	0.91	0.373	0.94	0.626
Yes	(0.27–0.56)		(0.74–1.11)		(0.74–1.17)	
Types of family						
Nuclear	0.66	0.026	1.15	0.471	0.47	0.000
Joint	(0.46–0.93)		(0.82–1.60)		(0.32–0.70)	
Family income (Per capita)						
<Rs. 900	1.34	0.111	0.71	0.000	0.66	0.015
≥Rs. 900	(0.95–1.88)		(0.58–0.86)		(0.48–0.91)	
Water source						
Unprotected	0.86	0.100	0.73	0.000	0.95	0.627
Protected	(0.72–1.02)		(0.61–0.88)		(0.77–1.15)	
Anemia						
Yes	1.22	0.450	0.70	0.000	0.67	0.136
No	(0.77–1.93)		(0.59–0.83)		(0.41–1.09)	
Diarrhea						
Yes	0.87	0.326	0.67	0.000	0.77	0.207
No	(0.67–1.12)		(0.57–0.79)		(0.52–1.15)	
ARI						
Yes	0.98	0.965	1.71	0.002	0.93	0.713
No	(0.78–1.24)		(1.21–2.40)		(0.67–1.28)	
Completed immunization						
No	0.53	0.000	1.28	0.08	0.57	0.000
Yes	(0.37–0.77)		(0.97–1.69)		(0.43–0.76)	
Use toilet						
Yes	0.87	0.658	1.16	0.260	0.85	0.253
No	(0.53–1.41)		(0.90–1.50)		(0.64–1.11)	
Hand washing before food						
No	0.72	0.066	1.05	0.670	0.68	0.004
Yes	(0.51–1.00)		(0.84–1.32)		(0.512–0.89)	

UN: Undernutrition, AOR: Adjusted odds ratio, CI: Confidence interval

sources, anemic children, childhood illnesses (diarrhea and acute respiratory tract infection), incomplete immunization, and lack of hand hygiene. However, gender, birth order, and residence were not significantly associated with UN when the model was adjusted for confounders.

DISCUSSION

UN in children under 5 years of age is a global health issue. Despite the fast economic growth and development in India childhood UN remains the important reason for child ill-health and mortality. In the present study, we have enrolled 360 children aged 6–59 months to estimate the prevalence and identify determinants of UN. According to NFHS-4 (2015–2016), the trends in the nutritional status of children under 5 years show that 38% were stunted which is a sign of chronic UN, 21% of children are wasted, indicating acute malnutrition, whereas 36% of children were underweight.[13] In the present study, the overall prevalence of underweight, stunting, and wasting are shown in Figure 1. Stunting is found to have the highest prevalence (26.38%) among the three categories of UN which shows a similar trend with NFHS-4 survey. A cross-sectional study done by Doğan *et al*. in a Turkish hospital reveals an elevated rate of moderate-to-severe UN based either on WFA (36.6%), WFH (27.7%), or body mass index (BMI) <−2SD (43.4%) and indicate that stunting is more affected than underweight.[14] In our study, children with age under 24 months are significantly associated with stunting. NFHS-4 (2015–2016) the survey also shows that the prevalence of stunting increases in children 18–23 months of age and decreases slightly thereafter. According to the HUNGaMA survey in Kanchipuram District, Tamil Nadu, the prevalence of underweight was 28%.[15] In our study, the prevalence of being underweight is 25.28% which is nearly similar with the previous study.

The NFHS from time to time shows the prevalence of wasting is increasing trend especially severe wasting from 6.7% to 7.9%.[16] In the present study, the prevalence of severe wasting was found to be 6.11% which shows similar findings with NFHS survey done earlier and the prevalence of severely underweight was 6.39% with 9.44% severely stunting. These findings are nearly similar with a study jointly conducted by UNICEF and the Ministry of Women and Child Development, Government of India 2013–2014 documenting the prevalence of severe wasting, severe underweight, and severe stunting as 4.6%, 9.4%, and 17.3%, respectively.[17]

In the present study, the prevalence of stunting is higher among boys than girls. Qadri and Shashank in their study found that the prevalence of stunting was higher among male children as compared to female children and the reason could be due to male children are more affected by environmental stress.[18] However in NFHS-4 (2015–2016) survey, the prevalence of UN is almost the same among boys and girls. In a study conducted in a rural area of West Bengal, there was no gender difference in the prevalence of UN.[19]

Children of mothers who completed higher secondary school and above were better nourished than other children. In our study, mothers who are educated below class 8 standard were a predictor for the wasting category of UN. Studies in different parts of India showed a strong association between maternal education and poor nutrition among children.[20] Educated mothers are more aware of the health services available and the acceptance to utilize it is better among them. The wealth index reflects the socioeconomic status of households which could be a potential contribution to childhood UN.[21] In the present study, lower family (per capita) income was a determinant for both the stunting and wasting categories of UN. This association between nutritional status of children and socioeconomic status was similar to the findings of previous studies.[22,23]

In the present study, gender, birth order and residence of the children were not associated factors for UN and were statistically not significant which might be due to chance. The role of family type is also important for the child-rearing and the overall development of the child. In our study, children reared in a nuclear family and not immunized completely were associated with wasting and underweight categories of UN. In a study done by Sujata *et al*., it is seen that a joint family gives protection against stunting to under 5 years children in urban slums.[24] Nutrition experts advise exclusive breastfeeding for the first 6 months of life.[25] It enhances the immunity of the child and acts as a complete food for the child.

Breastfeeding also protects against diseases in children. In the present study, not exclusively breastfeeding till 6 months emerged as the major determinant of underweight. Infection and malnutrition are known to be always interrelated together.[26] Infections such as diarrhea and acute respiratory tract infections are common childhood diseases and cause malnutrition among children under 5 years. In developing countries, repeated infection leads to hampering growth and development among children under 5 years of age. In the present study, both diarrhea and acute respiratory tract infection are predictors for a stunting category of UN which are statistically significant. This finding could be due to long-term complications following frequent episodes of diarrhea and acute respiratory tract infection.

In our study, among the children with UN 77.78% were anemic and it is significantly associated with a stunting category. In a study done by Rao *et al*., they found that anemia was one of the most common (86.7%) comorbidities among children with UN.[27] Children are more vulnerable to the infection possibly due to their living environment such as the source of drinking water and household sanitation. In the present study, the unprotected water source is the associated risk factor for stunting, and lack of hand washing with soap before eating is the determinant for wasting categories of UN. In an Ethiopian study done by Poda *et al*., the risk factors for malnutrition include age, child morbidity, mother's education, and household index in addition to gender and mother's BMI.[28] The present study also shows that younger age groups of children, lower mother's education, not exclusively breastfeeding till 6 months, nuclear family, lower family income, unprotected water source, incomplete immunization, comorbidity (anemia, diarrhea, and ARI) and lack of hand hygiene were the important determinants of UN among children aged 6–59 months.

Limitation of the Study

This is a hospital-based study and the findings might be different from the prevalence of community-based study. Our study did not include birth weight, detailed dietary intake, or maternal BMI to assess the nutrition status of children under 5 years, which could be considered in the future study.

CONCLUSION

Childhood UN is a public health problem. It is very important to improve economic conditions, encourage exclusive breastfeeding till 6 months, and provide better sanitation facilities along with protected water to the community. Infection control measures to be strengthened and promote effective nutrition programs. Improving maternal education or literacy could be one of the strategies to bring down the child UN. There is a need for systematic screening of children under 5 years of age for nutritional status in all the health facilities, especially in the hospital set up for effective management of child ill-health and prevent UN.

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REFERENCES

1. Bain LE, Awah PK, Geraldine N, Kindong NP, Sigal Y, Bernard N, *et al*. Malnutrition in Sub-Saharan Africa: burden, causes and prospects. Pan Afr Med J 2013;15:120.
2. The United Nations Children's Fund. Malnutrition: Current Status and Progress. Available from: https://data.unicef.org/nutrition/malnutrition.html [Last accessed on 2019 Feb 06].
3. Vinod KP, Rakesh L, Anuja A. Nutrition, undernutrition. In: Vinod KP, Arvind B, editors. Ghai Essential Pediatrics. 8th ed. New Delhi: CBS; 2013. p. 88-100.
4. Rodríguez L, Cervantes E, Ortiz R. Malnutrition and gastrointestinal and respiratory infections in children: A public health problem. Int J Environ Res Public Health 2011;8:1174-205.
5. Yadav SS, Yadav ST, Mishra P, Mittal A, Kumar R, Singh J. An epidemiological study of malnutrition among under five children of rural and Urban Haryana. J Clin Diagn Res 2016;10:C07-10.
6. Ministry of Health and Family Welfare Government of India. Participant Manual-Facility Based Care of Severe Acute Malnutrition; National Rural Health Mission. India: Ministry of Health and Family Welfare Government of India; 2013. p. 3-4
7. Menon P, Raabe K, Bhaskar A. Biological, programmatic and sociopolitical dimensions of child undernutrition in three states in India. IDS Bull 2009;40:60-9.
8. Keino S.Plasqui G, Borne BV. Household food insecurity occurs: A predictor of overweight and underweight among Kenyan women. Agri Food Secur 2014; 3:2
9. WHO Multicentre Growth Reference Study Group: WHO Child Growth Standards: Length/Height-for-Age, Weight-for-age, weight-for-Length, Weight-for-Height and Body Mass Index-for-Age: Methods and Development Geneva: World Health Organization; 2006. Available from: https://wwwwho.int/childgrowth/standards/technical_report/en/index.html [Last accessed on 2015 Jul 12].
10. WHO Child Growth Standards and the Identification of Severe Acute Malnutrition in Infants and Children: Joint Statement by the World Health Organisation and the United Nations Children's Fund; 2009. Available from: https://apps.who.int>9789241598163_eng pdf [Last accessed on 2018 Jul 02].
11. Nandy S, Irving M, Gordon D, Subramanian SV, Smith GD. Poverty, child undernutrition and morbidity: New evidence from India. Bull World Health Organ 2005;83:210-6.
12. Sharma R. Revision of Prasad's social classification and provision of an online tool for real-time updating. South Asian J Cancer 2013;2:224.
13. National Family Health survey (NFHS-4) 2015-16. Indian Report. Nutrition and Anemia. p. 291. Available from: https://dhs program.com>pubs>pdf [Last accessed on 2019 Mar 14].
14. Doğan Y, Erkan T, Yalvaç S, Altay S, Cokuğraş FC, Aydin A, *et al*. Nutritional status of patients hospitalized in pediatric clinic. Turk J Gastroenterol 2005;16:212-6.
15. Basit A, Nair S, Chakraborthy K, Darshan B, Kamath A. Risk factors for under-nutrition among children aged one to five years in Udupi taluk of Karnataka, India: A case control study. Australas Med J 2012;5:163-7.
16. Chatterjee P. Child malnutrition rises in India despite economic boom. Lancet 2007;369:1417-8.
17. India Fact Sheet, The Rapid Survey on Children (RSOC) 2013-14, UNICEF and Ministry of Women and Child Development, Government of India. Available from: https://wcd.nic.in>acts>rapid-survey-children-rsoc 2013-14 [Last accessed on 2018 Dec 19].
18. Qadri HA, Shashank KS. Under-nutrition more in male children: A new study. Int J Res Md Sci 2015;3:3363-6.
19. Ahmad E, Khalil S, Khan Z. Nutritional status in children (1-5 yrs)-a rural study. Indian J Community Health 2011;23:84-6.
20. Gupta R, Chakrabarti S, Chatterjee SG. A study to evaluate the effect of various maternal factors on the nutritional status of under-five children. Indian J Nutr 2016;3:149.
21. Hadley C, Tessema F, Muluneh AT. Household food insecurity and caregiver distress: equal threats to child nutritional status? Am J Hum Biol 2012;24:149-57.
22. Sutanu DC, Tarun C, Tusharkanti G. Prevalence of undernutrition in santal

children of Puruliya District, West Bengal. Indian Pediatrics 2008;43:43-6.
23. Stalin P, Joy B, Dinesh D, Zile S, Senthilvel V, Sathyanarayanan S. Prevalence of underweight and its risk factors among under five children in a rural area of Kancheepurum district in Tamil Nadu, India. IOSR J Dent Med Sci 2013;3:71-4.
24. Sujata M, Jayashree G, Prakash D, Prasad P, Sanjay L, Girish D, *et al.* Prevalence and determinants of undernutrition among under-five children residing in urban slums and rural area, Maharastra, India: A community based cross-sectional study. BMC Public Health 2020;20:1559:1-9.
25. WHO. Exclusive Breast Feeding. Available from: https://www.who.int/nutrition/topics/exclusive_breastfeeding/en [Last accessed on 2019 Jul 03].
26. Katona P, Katona-Apte J. The interaction between nutrition and infection. Clin Infect Dis 2008;46:1582-8.
27. Rao VG, Yadav R, Dolla CK, Kumar S, Bhondeley MK, Ukey M. Undernutrition and childhood morbidities among tribal preschool children. Indian J Med Res 2005;122:43-47.
28. Poda GG, Hsu CY, Chao JC. Factors associated with malnutrition among children <5 years old in Burkina Faso: Evidence from the demographic and health surveys IV 2010. Int J Q Health Care 2017;29:901-8.

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