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Evaluation of the Nutritional Status of Khasi Children under ICDS Programme in Mawsynram Block of East Khasi Hills, Meghalaya

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Abstract

The present study is concerned with the evaluation of the nutritional status of Khasi children under the ICDS Programme in East Khasi Hills District of Meghalaya. A cross-sectional method of anthropometric study was carried out in 2018-19 for evaluating the nutritional status of 549 children aged 2-6 years, using weight-for-age, height-for-age, and weight-for-height Z-scores relative to the WHO growth references. The findings were compared with those of the monitoring study carried out in 2008-09 by the Government of Meghalaya in collaboration with the Department of Anthropology, North-Eastern Hill University. It was found that the overall mean Z-scores for weight-for-age, height-for-age, and weight-for-height were significantly higher among boys and girls in 2018-19 compared with their coevals in 2008-09. The prevalence of underweight has decreased from 42% in 2008-09 to 22% in 2018-19; whereas the prevalence of stunting has declined from 52% in 2008-09 to 33% in 2018-19. The prevalence of wasting has also declined from 12% in 2008-09 to 7% in 2018-19, but about 4% of the children were overweight. The decline in the prevalence of undernutrition may be associated with the overall socioeconomic development in the state during the last decade or so, and the impact of the ICDS Programme cannot also be ruled out. While interventions are still necessary to reduce child underweight and stunting; simultaneous preventive measures to control child overweight and obesity may also be initiated in the state.

Keywords: Nutritional status; Anthropometric indices; Underweight; Stunting; Wasting

Introduction

Malnutrition remains a major health problem in the world, especially in Southern Asia [1]. The joint report by the FAO, IFAD, UNICEF, WFP and WHO [2] shows that there is not much progress to reach the WHO nutrition targets set for 2025, adopted by the World Health Assembly in 2012, and the United Nations Sustainable Development Goals set for 2030. In Asia, despite the rapid economic growth and nutrition transition during the last decade or so, Southern Asia has the highest prevalence of under nutrition (about 15 percent or 278.5 million people) followed by Western Asia (over 12 percent or 38 million people). It is also reported that the prevalence of child stunting in the world has declined significantly over the past 20 years, but overweight and obesity along with co-morbidities are emerging rapidly.

In India, under nutrition continues to be a major health problem among children under five years of age. According to the National Family Health Survey 2015-16 (NFHS-4), about 38 percent of children below five years of age were stunted or too short for their age, 36 percent of them were underweight, and 21 percent of them were wasted or too thin for their respective height [3]. Although stunting and underweight have declined since 2005, which may be associated with the positive economic growth in the country, the prevalence of stunting in many states is more than 30 percent, and it is highest in Bihar (48%) followed by Uttar Pradesh (46%) and

Jharkhand (45%).

In Northeast India, NFHS-4 data show that Meghalaya has the highest prevalence of stunting (44%) followed by Assam (36%), Arunachal Pradesh (29%), Manipur (29%), Nagaland (29%), and Tripura (24%) [3]. The prevalence of stunting in Meghalaya has, however, decreased from 55 percent in 2005-06 to 44 percent in 2015-16, and the prevalence of underweight has declined from 49 percent in 2005-06 to 29 percent in 2015-16 [3-4]. The prevalence of wasting has also declined from 31 percent in 2005-06 to 15 percent in 2015-16, thereby suggesting that the overall nutritional status of children under age-five years has improved substantially during the last decade or so. However, it is not clear whether this trend of improvement in the nutritional status of children in Meghalaya is consistent across communities in the state. It is also unclear about the impact of the Supplementary Nutrition Programme (SNP) under the Integrated Child Development Services (ICDS) Scheme during the last ten years or so. Therefore, the purpose of this paper is to evaluate the nutritional status of Khasi children under the ICDS Programme in Mawsynram Block of East Khasi Hills, Meghalaya.

Materials and Methods

The present study was conducted in the Mawsynram Community Rural Development Block (CRDB) of the East Khasi Hills district of Meghalaya during 2018-19. Mawsynram CRDB is predominantly inhabited by the two Khasi subgroups, namely Khynriam and War Khasis. A cross-sectional method of anthropometric study was carried out during 2018-19 for evaluating the growth and nutritional status of 549 children aged 2-6 years. Two anthropometric measurements, namely height and weight were taken on the target groups of children from all the selected Anganwadi Centres, following standard techniques [5-6].

The study was part of the monitoring study carried out by the Department of Social Welfare, Government of Meghalaya, in collaboration with the Department of Anthropology, North-Eastern Hill University [7]. Applying a multi-stage random sampling method, two CRDBs (where ICDS Centres also located) were selected from each of the seven districts in the state during 2008-09. Consequently, Mawsynram and Mylliem CRDBs were selected from East the Khasi Hills district. Therefore, Mawsynram CRDB was selected purposely in the present study for two reasons: (i) In order to make our data more comparable with those collected in 2008-09, and (ii) for understanding the impact of SNP on the nutritional status of children under the ICDS Scheme in the proposed study area. The same villages covered under the above study were also included in the present study. The study included five villages, *viz*., Langsymphut, Phlangwanbroi, Kynrang, Mawtapiew and Tyngnger. All these villages are located in the War area of the Block.

In the present study, three anthropometric indices, such as weight-for-age, height-for-age, and weight-for-height were used as indicators of the nutritional status of children [8]. These indices are expressed as a Z-score of a child's measurement to the median weight of the WHO reference population [9], using the Lambda-mu-sigma (LMS) method [10]. The formula for obtaining the Z-score for a given measurement relative to the WHO growth reference is given as:

$$Z = \frac{\left(\frac{X}{M}\right)^{L} - 1}{L \times S}$$

where, X is the anthropometric measurement (weight or height) and L (power in the Box-Cox transformation), M (median) and S (standard deviation) are the reference values corresponding to a given sex and age in months.

The Z-score of–2 was used as the cut-off point for screening the children who were likely to be undernourished. Children with the Z-score below – 3 were arbitrarily categorized as having moderate to severe undernutrition. The cut-off point of > 2 was also used to categorise children as overweight.

The Z-score, as calculated above, is a measure of the distance between the child's measurement and the median of the growth reference. It depends to a great extent on the growth reference. The choice of appropriate growth reference is therefore very crucial for getting comparable and reliable information on growth and nutritional status. The justification for the use of international growth reference is that the effect of ethnic/genetic differences in growth of young children, especially below 5 years of age, is not large enough when compared with the effects of environmental factors including poverty and inadequate nutrition [11]. In India, several studies have supported such a contention [12,13]. In other words, growth retardation among under-five children is generally considered an indicator of poor nutritional status, or a failure in the expression of the "genetic potential" for growth.

All data were managed and analyzed using SPSS/PC Software (Version 22). The differences between two means were tested by using the student's t-test. The Pearson chi-square (χ^2) test was used to test the differences between proportions or percentages.

Results

Weight-for-Age

Table 1 gives the means and standard deviations of weight-for-age Z-score for boys according to two periods of study conducted in 2008-09 and 2018-19. It shows that the overall mean Z-score for weight-for-age in 2018-19 was significantly higher than that studied in 2008-09 ($t = 4.57$, $p < 0.001$). It is also observed that boys in 2018-19 had higher weight-for-age Z-scores than those in 2008-09 across age groups. It is found that the mean Z-score was above the cut-off point of −2.0 across age groups. The differences between the two studies are statistically significant at 36, 60 and 72 months of age. The weight-for-age Z-scores for girls also show a similar trend (Table 2). The overall mean Z-score for weight-for-age was significantly higher among girls in 2018-19 compared with their counterparts in 2008-09 ($t = 5.18$, $p < 0.001$). The differences between the two periods of study are more pronounced in girls than in boys, although the differences between the sexes are not significant at all age groups (results not shown). It is seen from Table 2 that the mean Z-scores for weight-for-age in girls are statistically significant at 24, 36, 60, 66 and 72 months of age ($p < 0.05$), suggesting that the weight-for-age Z-score has increased significantly during the last ten years or so. It also holds true for boys.

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	−0.88	1.54	114	−1.30	1.41	1.19
30	27	−1.55	1.43	159	−1.62	1.3	0.25
36	46	−1.18	1.21	156	−1.81	1.19	3.14**
42	23	−1.34	1.05	160	−1.49	1	0.67
48	49	−1.37	0.97	149	−1.63	1.06	1.52
54	24	−1.41	0.98	104	−1.70	0.99	1.3
60	39	−1.33	0.95	139	−1.73	0.95	2.32*
66	13	−1.48	0.8	102	−1.95	1.18	1.39
72	46	−1.71	1.13	190	−2.16	0.95	2.77*
Total	286	−1.38	1.13	1273	−1.72	1.14	4.57**

Table 1: Mean weight-for-age Z-scores for boys.
*p < 0.05; **p < 0.001.

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	−0.64	0.88	121	−1.38	1.27	2.45*
30	33	−1.32	1.27	146	−1.53	1.25	0.87
36	41	−1.27	1.23	162	−1.78	1.17	2.47*
42	18	−1.45	0.86	125	−1.72	1.26	0.88
48	47	−1.24	1.17	161	−1.62	1.3	1.8
54	28	−1.82	0.79	94	−1.80	0.91	0.11
60	31	−1.39	0.69	162	−1.95	1.07	2.80*
66	16	−1.44	0.48	111	−2.00	1.1	2.00*
72	30	−1.68	0.96	185	−2.07	0.85	2.29*
Total	263	−1.37	1.04	1267	−1.77	1.16	5.18**

Table 2: Mean weight-for-age Z-scores for girls.
*p < 0.05; **p < 0.001.

Height-for-Age

Height-for-age is considered as one of the best indicators of stunting or short stature relative to age mainly due to chronic undernutrition for children below 6 years of age. The means and standard deviations of height-for-age Z-score for boys and girls are given in Tables 3 and 4, respectively. It is found that the mean Z-score for height-for-age has decreased significantly from −2.25 for boys in 2008-09 to −1.89 for boys in 2018-19 ($t = 4.09$, $p < 0.001$). A similar trend is observed in the height-for-age Z-score for girls, which has declined significantly from −2.22 in 2008-09 to −1.91 in 2018-19 ($t = 3.35$, $p < 0.02$). The student's t- test for the differences between the two studies indicate that the mean Z-score has reduced significantly at ages 36, 48 and 72 months for boys ($p < 0.05$). As for girls, significant differences are found at ages 42, 60 and 66 months ($p < 0.05$). This indicates that the prevalence of stunting has decreased substantially during the last decade for both boys and girls. However, the mean Z-score for height-for-age indicates that stunting is still a major nutritional problem in both boys and girls of the present study. It is seen that the mean Z-score is slightly below the cut-off level of −2.00 at several age groups for both the sexes, and it is still around the cut-off level of −2.00, especially at ages 30 and 60 months for boys (Table 3) and 36, 48 and 54 months for girls (Table 4).

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	−1.79	1.68	114	−1.58	1.81	0.47
30	27	−2.15	1.5	159	−2.34	1.64	0.56
36	46	−1.77	1.26	156	−2.64	1.3	4.01**
42	23	−1.94	1.07	160	−2.19	1.19	0.95
48	49	−1.69	1.2	149	−2.27	1.37	2.65*
54	24	−1.96	1.13	104	−2.28	1.31	1.1
60	39	−2.10	1.16	139	−2.23	1.2	0.6
66	13	−1.81	1.16	102	−2.27	1.29	1.22
72	46	−1.92	1.04	190	−2.27	1.02	2.08*
Total	286	−1.89	1.22	1273	−2.25	1.37	4.09**

Table 3: Mean height-for-age Z-score for boys.
*p < 0.05; **p < 0.001.

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	−1.75	1.15	121	−1.74	1.66	0.03
30	33	−1.97	1.46	146	−2.04	1.5	0.24
36	41	−2.02	1.4	162	−2.49	1.41	1.91
42	18	−1.74	0.87	125	−2.38	1.25	2.10*
48	47	−2.08	3.19	161	−2.08	1.2	0
54	28	−2.34	1.11	94	−2.47	1.01	0.58
60	31	−1.55	1.07	162	−2.33	1.13	3.55**
66	16	−1.35	0.85	111	−2.18	1.04	3.05**
72	30	−1.88	1.06	185	−2.26	1	1.91
Total	263	−1.91	1.72	1267	−2.22	1.28	3.35**

Table 4: Mean height-for-age Z-score for girls.
*p < 0.05; **p < 0.001.

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	0.05	1.96	114	−0.76	1.56	2.02*
30	27	−0.57	1.89	159	−0.48	1.47	0.28
36	46	−0.27	1.44	156	−0.49	1.66	0.81
42	23	−0.33	1.29	160	−0.32	1.44	0.03
48	49	−0.52	1.44	149	−0.41	1.42	0.47
54	24	−0.31	1.28	104	−0.47	1.1	0.62
60	39	−0.02	1.34	139	−0.54	1.05	2.56**
66	13	−0.39	0.53	102	−0.67	1.15	0.86
72	46	−0.58	1.23	190	−0.90	0.94	1.95*
Total	286	−0.35	1.43	1273	−0.56	1.34	2.37*

Table 5: Weight-for-height for boys.
*p < 0.05; **p < 0.001.

Age in months	2018-19			2008-09			t-value (2-tailed)
	N	Mean	SD	N	Mean	SD	
24	19	0.41	0.81	121	−0.68	1.45	3.19**
30	33	−0.24	1.3	146	−0.51	1.22	1.13
36	41	−0.10	1.48	162	−0.40	1.5	1.15
42	18	−0.57	1.17	125	−0.36	1.22	0.69
48	47	−0.31	1.33	161	−0.49	1.49	0.75
54	28	−0.51	1.24	94	−0.37	1.02	0.61
60	31	−0.62	0.95	162	−0.70	1.25	0.34
66	16	−0.85	0.89	111	−0.77	1.16	0.26
72	30	−0.65	1.1	185	−0.79	0.88	0.78
Total	263	−1.91	1.72	1267	−2.22	1.28	2.45*

Table 6: Weight-for-height for girls.
*p < 0.05; **p < 0.001.

Weight-for-Height

Weight-for-height is generally considered a good indicator of body fat mass, or wasting and thinness relative to height to due to chronic energy deficiency. It is similar to body mass index. The means and standard deviations of the Z-scores for this index in relation to the WHO growth references are given in Tables 5 and 6 for boys and girls, respectively. It is observed that the weight-for-height Z-scores are greater than those for weight-for-age and height-for-age in both boys and girls. As in the case of weight-for-age and height-for-age, the weight-for-height Z-scores are significantly higher among boys and girls in 2018-19 compared to their coevals in 2008-09 ($p < 0.05$). Table 6 shows that the differences between the two studies in girls are mainly due to the difference at 24 months of age ($t = 3.19$, $p < 0.01$). As for boys, the differences are significant at 24, 60 and 72 months of age (Table 5). Nevertheless, the present study indicates that the weight-for-height Z-scores do not deviate much from the WHO growth references compared to weight-for-age and height-for-age.

Characteristics	2018-19		2008-09		χ2 - value
Girls (N = 263)					
Weight-for-age	50	19.01	548	43.25	44.95, p < 0.001
Height-for-age	82	31.18	650	51.3	28.34, p < 0.001
Weight-for-height	20	7.6	141	11.13	3.33, p > 0.05
Boys (N = 286)					
Weight-for-age	68	23.78	523	41.08	19.64, p < 0.001
Height-for-age	98	34.27	673	53.1	18.01, p < 0.001
Weight-for-height	16	5.59	169	13.28	11.21, p < 0.05
Total (N = 549)					
Weight-for-age	118	21.49	1071	42.17	81.48, p < 0.001
Height-for-age	180	32.79	1323	52.09	67.31, p < 0.001
Weight-for-height	36	6.56	310	12.2	14.47, p < 0.001

Table 7: Prevalence of undernutrition.

Sex	Weight-for-age		Weight-for-height	
	N	> 2 z-score (%)	N	> 2 z-score (%)
Boys (N = 286)	3	1.05	17	5.94
Girls (N = 263)	2	0.76	5	1.9
Total (N = 549)	3	0.91	22	4.01

Table 8: Prevalence of overweight.

Nutritional Status

The nutritional status was assessed in terms of three anthropometric indices, namely weight-for-age, height-for-age and weight-for-height relative to the WHO growth references [9]. Table 7 shows the prevalence of underweight as indicated by <– 2 Z-score of weight-for-age was significantly higher in children measured in 2008-09 (42 percent) than in those measured in 2018-19 (22 percent) ($\chi^2 = 81.48$, $p < 0.0001$). Similarly, the prevalence of stunting as indicated by <– 2 Z-score of height-for-age has significantly declined from 52 percent in 2008-09 to 33 percent in 2018-19 ($\chi^2 = 67.31$, $p < 0.0001$); whereas the prevalence of wasting has decreased from 12 percent in 2008-09 to 7 percent in 2018-19 ($\chi^2 = 14.47$, $p < 0.001$). Thus, it is evident from the present study that the overall prevalence of undernutrition in children aged 2-6 years has declined significantly during the last 10 years or so.

Table 7 also shows the prevalence of underweight, stunting, and wasting by sex. It is found that the prevalence of underweight in 2018-19 was lower in girls (19%) than in boys (23%), despite the absence of statistical difference ($\chi^2 = 1.84$, $p > 0.05$). The prevalence of underweight in 2008-09 was, however, higher in girls (43%) than in boys (41%). Nevertheless, these sex differences in the prevalence of underweight are not statistically significant for both the periods of study. It also holds true for the prevalence of wasting and stunting, thereby supporting the observation that gender preferences with respect to dietary provision were by and large miniscule in some tribal populations of Northeast India [14].

As for the prevalence of overweight, Table 8 shows the prevalence of overweight as indicated by > 2 Z-score of weight-for-age and weight-for-height. The prevalence of overweight according to weight-for-age is negligible, but it is about 4 percent according to weigh-for-height. It may be noted that the prevalence of overweight was imperceptible in 2008-09. This indicates that the decline in underweight and stunting during the last decade is also associated with the emerging trend of overweight among the children in the present study.

Discussion

The present study indicates that mean Z-scores for the three anthropometric indices, namely weight-for-age, height-for-age and weight-for-height have increased significantly from 2008-09 to 2018-19. The prevalence of undernutrition according to these three indices has also declined during the last decade. Prior to 2009, about 55 percent of under-five children in Meghalaya were stunted, or too short for their age, and about 49 percent were underweight [3]. According to the NFHS-3 [4], the nutritional status of children in Meghalaya had not improved from 1998-99 to 2005-06. Instead, the prevalence of underweight had increased from 38 percent during 1998-99 to 49 percent in 2005-06, and the prevalence of stunting had increased from 45 to 55 percent. The NFHS-3 data showed that Meghalaya had the highest prevalence of undernutrition in Northeast India, and it was among the worst in India where underweight in particular was among the highest in the world. As a result, the major concern was about the impact of SNP under the ICDS Scheme, which has been implemented by the State Government for more than four decades. In Meghalaya, the first ICDS project was launched in 1975 as an experimental basis at the Songsak Community and Rural Development Block, East Garo Hills District. Since then the scheme had been expanded in 32 Community and Rural Development Blocks with 39 ICDS Projects and 3179 Aganwadi Centres in 2008 when this evaluation study started.

The present study indicates that the prevalence of underweight has decreased from 42 percent in 2008-09 to 22 percent in 2018-19, and the prevalence of stunting has reduced from 52 percent in 2008-09 to 33 percent in 2018-19. The present findings seem to be in line with the NFHS-4 Report [3] that the prevalence of underweight and stunting has declined considerably from 2005-06 to 2015-16. Although it may be associated with the overall economic development in the country during the last decade or so, the impact of supplementary nutrition under the ICDS Programme in the state cannot be ruled out. It may be noted that the ICDS provides a number of integrated services like supplementary nutrition, immunization, health check-ups and referral services at Anganwadi centres to children, pregnant women and lactating mothers. The increasing coverage and improvement in services under the ICDS Programme during the last ten years may have contributed to the overall improvement in the nutritional status of children under the present study. It is, however, evident that undernutrition in terms of underweight (22%) and stunting (33%) continues to be a major nutritional problem in the state. According to the NFHS-4 [3], Meghalaya has still the highest prevalence of stunting in Northeast India, and is one of the four states in India with a large number of under-five children who are too short for their age. Therefore, efforts to maintain and strengthen the implementation of the ICDS Programme in the state are still needed to achieve the Global Nutrition Targets 2025 [15].

The present study also indicates that there is an emerging trend of overweight among children in addition to the problem of underweight and stunting. About 4 percent of children in the present study are found to have a Z-score of more than 2 with respect to weight-for-height. Although undernutrition remains a major nutritional problem, it is likely that the prevalence of overweight and obesity is also emerging in the state. It is generally reported that the decline in child underweight and stunting due to socioeconomic development in a population is also associated with increasing overweight and obesity [16,17]. This nutritional situation is known as the double burden of malnutrition, which is characterized by the coexistence of undernutrition along with overnutrition in terms of overweight, obesity or diet-related morbidities [15]. The double burden of malnutrition may exist at household, population, regional and national levels, depending on a variety of nutritional and socioeconomic factors [15-19]. Thus, while interventions are still necessary to reduce child underweight and stunting; simultaneous preventive measures to control child overweight and obesity in terms of public health and education programmes may also be initiated in the state.

Conclusion

The present study indicates that the prevalence of underweight and stunting has declined during the last decade, although undernutrition especially stunting continues to be a major nutritional problem. Despite the limitations of the present study in terms of sample size and lack of socioeconomic data, it is evident that the nutritional status of Khasi children has substantially improved during the last decade or so. This improvement in the nutritional status of children may be associated with the overall socioeconomic development in the state during the last ten years or so, but the impact of the supplementary nutrition under the ICDS Programme, which has been implemented in the state since 1975, cannot also be ruled out. Therefore, the implementation of the ICDS Programme in the state should be maintained and strengthened with a view to achieving the Global Nutrition Targets 2025.

There is also evidence of the prevalence of overweight children, suggesting that there is an emerging trend of the double burden of malnutrition. While interventions are still necessary to reduce child undernutrition especially stunting; public health and education programmes to control overweight and obesity may also be implemented in the state.

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