

Nutritional Status of Primary School Children in Eastern Sri Lanka

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Abstract: A descriptive cross-sectional study was carried out among grade one to grade five school children in an educational division in the eastern part of Sri Lanka to describe the nutritional status of primary school students in the region. The height and weight were measured, and the Body Mass Index (BMI) was calculated for each child. The age and sex specific BMI charts developed by the National Center for Health statistics 2000 were used as standards. Data were analyzed using SPSS (Vs.20) and WHO Anthro Plus software. In this study Population, 32% (95%CI;24.3%,39.7%) were stunted having a height- for-age Z score of below -2SD, 32% (95%CI;24.3%,39.7%) were underweighted and 44.4% (95%CI;36.9%,52. 0%) were had a BMI-for-age Z score less than -2SD.The relationship of malnutrition with gender, family type, number of siblings, mother's occupation, monthly income, worm treatment, food allergy and dental caries were considered as factors influencing nutritional status for analysis of this study. Gender, number of siblings and worm treatment were statistically significant with malnutrition with a p-value of less than 0.05. Nutritional status of students showed higher prevalence of undernutrition in this region. It is evident that a substantial population does not consume a varied and balanced diet and the Sri Lankan dietary guideline have emphasized the importance of a balanced and varied diet. This will lead to improvement in the quality of diet.

Keywords: stunting, wasting, underweight, Body Mass Index, Undernutrition.

I. INTRODUCTION

A. Background

Food has always been a critical need for the survival of the human species (Ake-Tano et al., 2011). Good nutrition helps to improve child survival, to promote healthy growth and development, to contribute to better cognitive and economic development. It also reduces morbidity and mortality rate, and the risk of chronic diseases such as cardiovascular disease, diabetes, kwashiorkor, marasmus, hypertension, even in adulthood (OMS, 2010). Although food is essential, it has often been lacking, in the qualitative and quantitative point of view resulting in the occurrence of malnutrition. Indeed, malnutrition (undernutrition, overnutrition) is a public health problem of significant importance in developing countries (Asres and Eidelman, 2011).

Malnutrition remaining as a serious problem in Sri Lanka. The 2009 National Food Security Survey (NFSS) indicates that only 36.4 percent of households in the poorest quintile reported having had adequate food supply for every day in the past 12 months compared to 91.4 percent of the richest quintile. Unicef Sri Lanka stated that the stunting rates (13%) are lower than other countries in the region, including Afghanistan and Pakistan, higher than other middle-income Asian countries such as China, Thailand and Malaysia. Critically, both wasting and underweight have increased since 2009 and trends indicate that wasting is serious (more than 15 per cent) in 24 out of 25 districts [4]. In Sri Lanka, even the children of the relatively rich suffer from high rates of malnutrition which goes up to 11.9%. This supports the perception that while inadequate food access is critical, poor infant and child feeding practices (e.g. too early or too late introduction of complementary feeding and inappropriate complementary food) and poor public health also play a significant role [5].

According to the Demographic and Health Survey 2006/2007, the highest prevalence of underweight in children under five is observed in Badulla district, where it is more than 30 percent. The prevalence of underweight in Kandy, Nuwara Eliya, Batticaloa, Trincomalee, Polonnaruwa and Monaragala districts is between 25 and 30 percent. The prevalence of wasting in Kandy, Matara, Batticaloa, Ampara, Polonnaruwa, Badulla, Monaragala and Kegalle districts is between 15

percent and 20 percent [6]. School age children are insufficient of general knowledge on their own health and nutrition and are not aware of the importance of health, and thus select foods on the basis of preference without proper judgment to aggravate unbalanced diets [7] thus this study aim to assess the nutritional status among primary school students aged 5 to 10 years, in Batticaloa west education zone. There are several remote areas in the educational zone and the zone was severely affected by the Sri Lankan civil war. I could not access any previously conducted study in the particular education zone, thus we wish to conduct a baseline nutritional survey among primary school students in Batticaloa west educational zone.

II. METHODOLOGY

A. Study design

It was a Cross Sectional Descriptive Study carried out in selected schools Batticaloa West Education Zone, in the eastern part of Sri Lanka. As the researchers were able to get the permission from the Zonal Director of Education and the principals of respective schools, the data was collected from those schools after getting informed consent from the students and parents.

B. Participants

Study population was the Students who were studying from grade-1 to grade-5 in selected schools in Batticaloa West Education Zone. Multi stage sampling was employed and the sample size was estimated as per the Solvens' formula: $n = N / (1 + N e^2)$ in which $N =$ Total student population of the educational zone (Grade1 to Grade 5 = 5827). So, the sample size 'n' was calculated as 375. All the grade-1 to grade-5 students aged 5 to 10 years studying in the selected schools in Batticaloa West Education Zone was included. The student(s) who are absent or won't provide consent to the study on the day of visit was excluded. Study period of the research was one-year duration.

C. Procedures

Ethics Review Committee of the Faculty of Health-Care Sciences of Eastern University Sri Lanka granted ethical clearance to this study and The Zonal Director Education of Batticaloa West Education Zone granted permission. The participants were also informed that they had the right to withdraw at any stage of the study without penalty. Information to mother's/care givers and teachers were described through information sheets. Informed consents were obtained in writing, Prior to data collection. It was ensured that all data collected and written transcripts were kept safe and secure, and would not to be accessed by any unauthorized and there was no possibility of physical risk to participants of this study. Measures were taken to safeguard confidentiality, anonymity and the psychological wellbeing of the participants.

In addition to taking anthropometric measurements of weight and height, a pilot-tested, face validated and interviewer administered questionnaire (IAQ) consisting questions on socio-demographic details, knowledge, attitude and factors related to nutritional status and food habit was used. Pilot study was conducted among 20 students (outside of the study setting) one or two weeks before the commencement of the main research. By then any possible adjustments in the variables or approach would be identified in order make the data collection process effective. Information sheet about the present study was issued on local language and written consent was received from the participants. Anthropometric measurements and interviews were carried out by trained and qualified data collectors using calibrated and standard equipment. The anthropometric measurement was categorized as per the WHO guideline. Height was recorded to the nearest 0.1 cm by using UNICEF stadiometers. Body weight was measured to the nearest 0.1 kg using a SECA UNICEF weighing scales. The participants were identified randomly in school settings. In the anthropometric measurements, section A and some part of section D of the questionnaire was completed by the interviewer. The parents of selected students were invited through school authority to gain additional information.

D. Statistical Analysis

Prevalence of nutritional indicators height- for – age (HA), weight- for – age (WA) and BMI- for - age (BMIA) were obtained as percentages and frequencies through descriptive statistics. The Z scores HAZ, WAZ and BMIAZ and the frequency distribution curves were obtained using WHO anthro plus software. The associations between dependent and independence variables were obtained through regression analysis. Statistical Package of Social Science (SPSS v.20) and WHO anthro plus software were employed in entering, analyzing and interpreting the data.

III. RESULTS AND DISCUSSION

Parents are the main source of influence for growth and development of children especially during infancy and childhood. The higher prevalence of underweight among primary school children was seen in the present study. The study included 375 school children where the females 196(52.3%) and males were 179 (47.7%). Hindus accounted for 323(86.1%) of the sample and the rests of them were Christians 52(13.9%). Most of the students 347 (92.5%) monthly family income was less than nine thousand rupees. Less amount 6 (1.5%) of children monthly family income was greater than thirty-two thousand rupees. In this population, most of them are living as a nuclear family 216 (57.7%) and the rest of them (42.3%) are in joint family system.

The percentages of children having a HAZ, WAZ and BMIAZ below -2D were calculated for 5 sub age categories and total children using WHO anthro software. For all children, boys and girls together, the prevalence of stunting was 32.0% (95% CI; 24.3%,39.7%). These percentages were given separately for boys and girls. The mean HAZ was -1.37 with a standard deviation of 1.17. More girls (27.4%) were stunted than boys (21.4%) for the age group 61-119 months. Distribution of WAZ and the factors contributing to underweight of 375 children were assessed in these grades. For both gender together, the percentage of children with a BMIAZ<-2 was 44.4 % (95%CI; 36.9, 52.0) to the children aged 61-119 months. The mean BMIAZ was -1.5 with a standard deviation of 1.59. More girls (39.7%) had lower BMIAZ than boys (34.4%) for the age group 61-119 months (See tables 1,2, and 3)

Table 1: Nutritional Status of Primary School Children in Eastern Sri Lanka (both gender, N=375)

Age in months	No	HAZ<-2SD				WAZ<-2SD				BMIAZ<-2SD			
		% < -2SD	(95% CI)	Mean	SD	% < -2SD	(95% CI)	Mean	SD	% < -2SD	(95% CI)	Mean	SD
61-71	62	14.3	11.3, 27.3	-1.0	1.0	33.3	16.3, 56.3	-1.0	2.2	37.1	19.7, 54.6	-1.1	1.8
72-83	82	9.7	7.8, 21.7	-1.1	1.0	48.6	30.6, 66.6	-1.9	1.2	9.5	8.3, 19.6	-1.2	0.9
84-95	54	32.5	16.7, 48.3	-1.6	1.2	18.2	5.6, 30.7	-1.4	1.2	79.3	62.8, 95.8	-1.8	1.8
96-107	88	35.5	33.3, 66.7	-1.9	1.4	74.2	57.2, 91.2	-2.7	1.6	66.7	49.9, 83.5	-0.6	1.1
108-119	89	33.3	20.6, 50.3	-2.9	1.1	0.0	0, 1.3	0.0	0.2	41.9	23.0, 60.9	-1.1	1.7
61-119	375	32.0	24.3, 39.7	-1.4	1.2	32.0	24.3, 39.7	-1.4	1.3	44.4	36.9, 52.0	-1.5	1.6

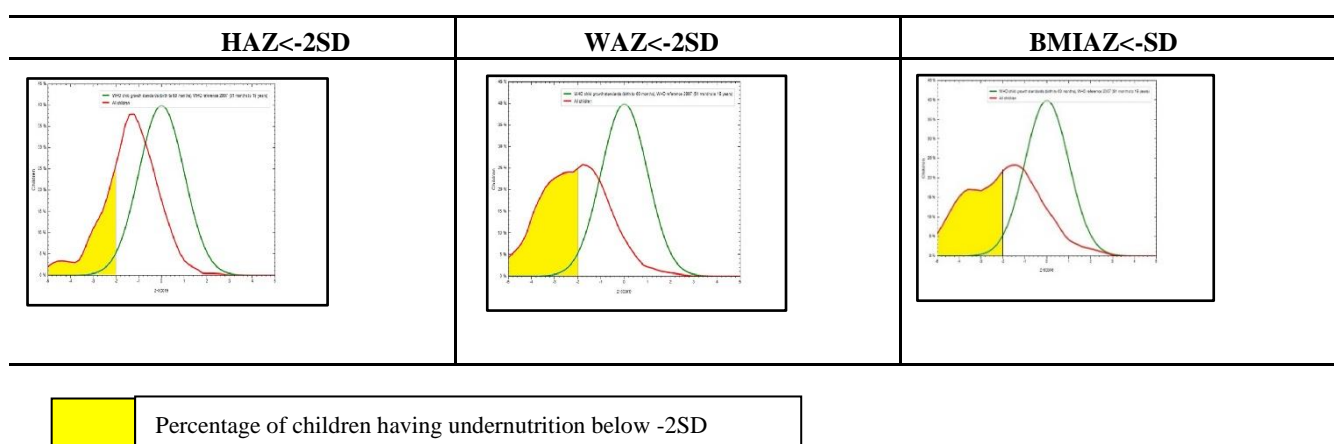


Figure 1: Nutritional Status of Primary School children in Eastern Part of Sri Lanka (N=375)

The data was analyzed in order to obtain the curve of distribution for HAZ, WAZ and BMIAZ. The frequency distributions of the nutritional indicators are illustrated in figure.1. The distributions were skewed right and the central tendency was shifted to left. The yellow area of the curve shows the number of children aged 61-119 months, living in the study area having a Z score pf below WHO standard (below -2SD). Comparatively a large proportion of children fall into the category of undernutrition according to WHO reference (see and Figure -1).

Table 2: Prevalence of Undernutrition by age and gender boys (N=189)

Age in months	No	% < -2SD	(95% CI)	mean	SD	% < -2SD	(95% CI)	mean	SD	% < -2SD	(95% CI)	mean	SD
		HAZ<-2SD				WAZ<-2SD				BMI AZ>-SD			
61-71	32	22.7	13.7-43.4	0.5	0.9	33.3	15.5- 55.5	-1.0	2.2	44.4	18.7- 60.2	-1.1	1.3
72-83	42	16.7	10.7-36.7	-1.4	0.9	32.2	18.1-45.5	-2.4	0.9	17.5	10.4-28.3	-1.0	1.3
84-95	27	22.5	15.5-29.4	-0.9	0.6	27.3	6.4-48.2	-1.7	1.5	46.2	15.2-77.1	-1.8	1.9
96-107	44	21.1	17.5-45.3	-1.1	0.6	36.9	20.2- 50	-2.5	1.0	47.8	25.2 -70.4	-0.6	1.1
108-119	44	33.3	13.7-53.1	-1.6	1.2	11.8	8.6-33.6	0.0	0.0	30.0	18.1- 63.4	-1.1	1.9
61-119	189	21.4	13.2- 29.8	-1.4	1.2	30.1	25.2-47.1	-1.4	1.2	34.4	24.1- 44.8	-1.3	1.2

Table 3: Prevalence of Undernutrition by age and gender girls (N=186)

Age in months	No	% < -2SD	(95% CI)	mean	SD	% < -2SD	(95% CI)	mean	SD	% < -2SD	(95% CI)	mean	SD
		HAZ<-2SD				WAZ<-2SD				BMI AZ>-SD			
61-71	30	11.8	10.2-30.3	-0.6	0.9	27.2	14.2-46.7	-1	2.2	29.4	4.8- 54	-1.3	1.3
72-83	40	9.1	12.3 - 23.4	-1.1	0.8	23.5	11.4- 46.6	-1.4	1.3	19.4	12.4-28.4	-1.3	1.5
84-95	27	16.7	13.5- 36.7	-1.1	1.3	9.1	7.5-23.4	-1.2	0.7	31.3	24.3- 45.5	-0.9	1.8
96-107	44	30.8	11.7- 59.7	-1.8	1.1	22.2	20.8-45.7	-2.8	1.9	39.2	30.3- 58.2	-0.7	0.8
108-119	45	56.0	20.5- 77.5	-1.8	1.2	24.7	21.3-48.6	-0.1	0.3	42.9	19.3- 66.4	-1.4	1.8
61-119	186	27.1	17.7- 36.5	-1.3	1.2	27.1	16.0- 38.3	-1.4	1.4	39.7	27.3- 52.1	-1.4	1.3

The determinations of the predictors of stunting, underweight and low BMI were identified through percentages of undernourished children who had these predictors in their day to day life. The percentages were obtained through descriptive statistics. Linear regression model was utilized to determine the association. Considering the children having a HAZ below -2SD, nearly 54 percent among the stunted children are girls. Among them, nearly 87% were Hindu by religion and around 90 percent of stunted children belonged to families having a monthly income less than 9000 LKR. The children who did not take worm treatment recently got higher prevalence (91.7%) of having stunted. Nearly 56 percentages of stunted children were having dental caries. Among the children having a WAZ below -2SD, more boys were (64.6%) underweight in comparison with girls (35.4%). Among the underweighted children nearly 84% are Hindu by religion higher percentages (88.6%) of them were from poor economic background of having a monthly income of less than 9000 LKR. The children who did not take worm treatment recently got higher prevalence (92.4 %) of having underweighted. Nearly 54 percentages of underweighted children were having dental caries. Among the stunted children with lower BMI for age, nearly 89% were Hindu by religion and 90 percent of children with lower BMI for age belonged to families having a monthly income less than 9000 LKR. The children who did not recently take worm treatment got higher prevalence (91.3%) of having a lower BMI for age. Half of the low BMI children (50%) were having dental caries.

Linear regression was used to identify the significance of the variables. For 95% confident interval, several factors were tested for identifying significant associations with under nutrition. Although several predictors associated with stunting, underweight and lower BMI for age, only few had significant associations having a p-value of less than 0.05. Lower grade school children (grade 5 & 6) had significant association with all three poor nutritional indicators (p=0.000). Having dental caries was significantly associated with underweight (p=0.047) (See table 4).

The present study revealed that in families with greater number of children, less attention was paid for the fulfillment of the nutritional requirement of the children. This finding was statistically significant. Similar association was seen in other studies done in Patna [8] and the children in urban slums of a city in Northern India [9]. A study carried out among 6 to 11 years children in Patna [8] arrived at a unique finding that there was not much of an effect of family type in determining the nutritional status of the children. Both studies show that no significant relationship exists between the nutritional status and the family type. Therefore, this is in contradiction to the general belief that children in joint families are less cared for or not cared for with regard to their nutrition as compared to the children in the nuclear families. This fact may be attributed to the lack of awareness of nutrition among parents and guardians.

The female children had comparatively lower nutritional status than male children [8]. Considering stunting and low BMI for age, similar findings were observed in this study. Gender has a significant impact on the nutritional status in children. In Kalutara area, Study [10] also found that association with the sex and the nutritional status among school children was highly statistically significant. Comparing the findings with demographic and health survey conducted in 2009, there were

remarkable increase in the number of undernourished primary school children in Batticaloa [6]. Undernutrition among primary school children is a severe health threat to the country in many aspects. It will cause unhealthy future generation and health cost of the country will also increase [11]. As many predictors causing undernutrition among primary school children are modifiable, suitable intervention should be identified considering the socio economic factors of the region. Several nutritional interventions are targeted the primary school children time to time in Sri Lanka. Latest update in this series is giving milk packets every day to primary school children in selected schools. In addition to this, the parents and families should involve in community participation for identifying locally grown and cost effective foods for their families.

The main limitation was the cross-sectional nature of the study using structured questionnaire which compelled the participants to provide limited information. Nutritional supplementation programmes have more effects on the nutritional status of the children. So the nutritional supplement programme in the schools should be continued without any interruption. There is a need for school health programmes to monitor periodically children's eating habit and personal hygiene.

Table 4: Significant Associations of Predictors with HAZ<-2SD, WAZ<-2SD and BMAZ<-2SD

Variables	p-values		
	HAZ<-2SD	WAZ<-2SD	BMAZ<-2SD
Gender -Girls	0.230	0.174	0.146
Monthly total income- Below 9000 LKR	0.092	0.901	0.482
Type of family – Nuclear Family	0.539	0.424	0.408
Taken worm treatment- No	0.286	0.778	0.224
Dental caries- Yes	0.152	0.047	0.412
Grade- Lower Grades (Grade 5 and 6)	0.000	0.000	0.000

Appropriate counseling on nutritional intake should be given not only to school children but also to their teachers and parents or caregivers. There is a need to train more health workers on recommended infant and young child feeding practices since they are primary source of nutrition information for mothers and care givers. Mothers should also be encouraged to attend antenatal, postnatal care and child welfare clinics where they are likely to be taught appropriate infant and young child feeding practices. The observed declining trends among key indicators highlight the urgent need to evaluate the effectiveness, approaches and coverage of all nutrition interventions being implemented to promote optimal feeding practices in Sri Lanka. Community-based nutrition interventions are needed in Sri Lanka to improve food production at household level and ensure food security.

IV. CONCLUSION

Underweight (32 %) and low BMI for age (44.4%) are alarming nutritional problems denoting chronic undernutrition among primary schoolchildren in this community. among the primary school children. The percentage of stunting in this population is 24.1% and overweight is not a health issue in this population. Over all, undernutrition among the children was higher in the eastern province and there were no improvements in their nutritional status in comparison with the findings of SLDHS 2006/7. Most predictors of undernutrition identified in the study were modifiable through behavior change communications and interventions. Interventions to improve nutritional quality of the foods are also recommended based on dietary diversity. These interventions may include micronutrient fortification and should be implemented in the whole country.

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