

Original Articles

Analysis of nutritional status and factors associated with undernutrition in children aged 6-59 months in a rural area of Sri Lanka

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Abstract

Objective: To describe the prevalence and factors associated with undernutrition in children aged 6-59 months in a rural area of Sri Lanka.

Method: A community-based, cross-sectional study was carried out among children aged 6-59 months attending well baby clinics in Dehiattakandiya Medical Officer of Health area from November 2016 to January 2017. Data collection was done using an interviewer-administered questionnaire. Weight and height measurements were taken with calibrated instruments. Data analysis was done using logistic regression by SPSS 16.0.

Results: Four hundred and sixty four children were recruited having a mean age of 29.3 ±14.6 months; 53% were females. Prevalence of stunting, underweight and wasting was 36.4%, 42.9% and 19.0% respectively. The following independent associations were identified: for stunting– low birth weight, breastfeeding beyond 2 years, lower maternal education and paternal smoking; for underweight– birth order more than 2, low birth weight, breastfeeding beyond 2 years, lower maternal education and paternal smoking and alcohol use; for wasting– male sex, low birth weight and paternal smoking.

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Conclusions: Low birth weight, prolonged breastfeeding, lower maternal education level and paternal smoking had a significant association with stunting and underweight whilst male sex, low birth weight, and paternal smoking had a significant association with wasting in children aged 6-59 months.

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(Key words: Nutritional status, wasting, stunting, undernutrition)

Background

Undernutrition is a global health problem which is particularly common in children in the developing world. Global estimates of undernutrition among children under five years report that 22.9% of children are stunted and 7.7% are wasted¹. Childhood undernutrition is extremely high in south Asia. The reported prevalences are 45% in India, 38% in Pakistan and 30% in Sri Lanka².

Sri Lanka, a low-middle income South Asian country, has a population over 20 million. It has extremely good health indicators for a third world country, and has the lowest maternal and child mortality figures in the region³. However, undernutrition is yet a major health problem and contributes to a significant proportion of childhood mortality and morbidity. Undernutrition prevalence is particularly high in rural poor communities as opposed to rich urban populations.

Several factors are known to be associated with undernutrition in children. Knowledge of these factors is particularly important in planning out preventive strategies to decrease the burden of undernutrition. Several previous studies have shown that a number of perinatal factors, including birth weight, birth interval, parity, gestational age^{4,6}, and the child's gender⁷, are related to the nutritional status in children. Furthermore, socio-economic conditions^{4,8}, living standards, water and sanitation, food intake, weaning practices, and maternal education^{4,9}, are also shown to affect the nutritional status in young children. However, only a few studies have evaluated the burden of undernutrition and explored the factors which are associated with childhood undernutrition in rural areas of Sri Lanka.

Objectives

To describe prevalence and factors associated with undernutrition in children aged 6-59 months in a rural area of Sri Lanka.

Method

We conducted a community based cross-sectional study in well-baby clinics in Dehiattakandiya Medical Officer of Health (MOH) area from 1st November 2016 to 31st January 2017. Dehiattakandiya is an under-privileged, low-income, remote rural area in the Eastern province of Sri Lanka. All children permanently residing in the area attend one of the two weekly well-baby clinics at least three-monthly for weight checks and routine immunization. We recruited consecutive children aged between 6 to 59 months attending well baby clinics during the study period after obtaining informed written consent from the mother. Children with acute or long-term medical problems were excluded.

Data collection was done utilizing an interviewer-administered questionnaire containing questions assessing socio-demographic background, birth and medical history, feeding practices and diet of each participant and was pre-tested in a pilot study done in a well-baby clinic of an adjacent MOH area. Data collectors were trained medical or nursing staff. Weight was measured using a calibrated beam balance on minimal clothing and length (under 2 years) or height (over 2 years) were measured using infantometer and stadiometer respectively by trained public health staff. Weight and length/height were plotted in WHO growth charts. Data were analysed utilizing SPSS version 16.0 with descriptive statistics and binary logistic regression. A *p* value less than 0.05 was taken to be of statistical significance. The study was ethically approved was by the Ethics Review Committee of the Sri Lanka College of Paediatricians. Informed written consent was obtained from the child's parents before recruitment into the study.

Results

Socio-demographic characteristics

Four hundred and sixty four children were recruited into the study with a mean age of 29.3±14.6 months. All mothers were Sinhalese and 99.8% were Buddhists. The socio-demographic characteristics of the 464 children are demonstrated in Table 1.

Living conditions and personal hygiene

The main water source in a majority (88.8%) of families was tap water. Three hundred and ninety (84.1%) families used safe drinking water, 222 (47.8%) used boiled water, 94 (20.3%) used filtered water and 107 (23.1%) used chlorinated water. Sanitary latrines were available in 448 (96.6%) households and 455 (98.1%) mothers claimed that

they washed hands with soap and water after going to toilet. Four hundred and twenty nine (92.5%) mothers washed hands with soap and water before feeding their children. Substance abuse was common among fathers, 255 (55.0%) being involved in some form of substance abuse; 205 (44.2%) were smoking, 145 (31.4%) were using alcohol and 9 (1.9%) were using illicit drugs.

Table 1
Socio-demographic characteristics of study population (n=464)

Characteristic	Frequency (%)
<i>Age (months)</i>	
6-11	47 (10.1)
12-23	140 (30.2)
24-35	118 (25.4)
36-47	93 (20.0)
48-59	66 (14.2)
<i>Sex</i>	
Male	216 (46.6)
Female	248 (53.4)
<i>Marital status of parents</i>	
Married	460 (99.2)
Unmarried	03 (0.60)
Divorced	01 (0.20)
<i>*No. of children in family</i>	
One	173 (37.3)
Two	196 (42.2)
Three	84 (18.1)
Four	09 (01.9)
<i>Mother's age (years)</i>	
<18	03 (0.60)
18-25	113 (24.4)
26-30	167 (36.0)
31-35	114 (24.6)
>35	67 (14.4)
<i>Mother's education level</i>	
No formal education	02 (0.40)
Up to grade 10	183 (39.4)
Up to advanced level	264 (56.9)
Vocational training	03 (0.60)
Higher education – Diploma	04 (0.90)
Higher education – Degree	08 (01.7)
<i>Father's education level</i>	
No formal education	06 (01.3)
Up to grade 10	221 (47.6)
Up to advanced level	225 (48.5)
Vocational training	04 (0.90)
Higher education – Diploma	03 (0.60)
Higher education – Degree	05 (01.1)
<i>**Father's occupation</i>	
Unemployed	03 (0.6)
Employment with monthly salary	168 (36.2)
Daily paid employment	86 (18.5)
Farmer	150 (32.3)
Fisherman	01 (0.20)
Trader	23 (05.0)
Manufacturing/ handicraft	04 (0.90)
Live stock	06 (01.3)
Other	20 (04.3)
<i>*Monthly family income (LKR)</i>	
<10,000	103 (22.2)
10,001-20,000	111 (23.9)
20,001-40,000	212 (45.7)
>40,000	36 (07.8)

*Data missing from 2 participants; **Data missing from 3 participants

LKR: Sri Lankan rupees

Feeding practices

Mean duration of exclusive breastfeeding in the study population was 5.92±0.59 months. Age of initiation of complementary feeding ranged from 2-12 months. A majority (80.0%) of babies were

started on complementary feeds at 6 months and in 62 (13.4%) children the commencement of complementary feeding was delayed beyond 6 months. Most children (72.6%) were given more than 3 meals containing solids per day; the number of meals with solid foods per day were; one - 6.5%, two - 19.0%, three - 49.4%, four - 17.5%, five - 5.0% and six - 0.9%. Most kids (85.6%) were receiving nutritional supplements or nutritional therapy; 355 (76.5%) received nutritional supplements (*Thripasha*) and 27 (5.8%) received high energy

biscuits. Forty three (9.3%) and 49 (10.6%) children respectively received iron and multivitamin supplements.

Nutritional status and prevalence of undernutrition

Anthropometric data showed that prevalence of stunting, underweight and wasting was 36.4%, 42.9% and 19.0% respectively. Anthropometric data and prevalence of nutritional problems in each age group are shown in Tables 2 and 3 respectively.

Table 2: Anthropometric characteristics of the study population (n=464)

Z Score (SD value)	Length or height / age	Weight / age	Weight / length or height
> +2SD	-	1 (0.2%)	10 (2.2%)
+1SD to +2SD	-	4 (0.9%)	10 (2.2%)
Median to +1SD	7 (1.5%)	5 (1.1%)	37 (8.0%)
Median to -1SD	89 (19.2%)	74 (15.9%)	171 (36.9%)
-1SD to -2SD	199 (42.9%)	181 (39.0%)	148 (31.9%)
-2SD to -3SD	129 (27.8%)	150 (32.3%)	62 (13.4%)
< -3SD	40 (8.6%)	49 (10.6%)	26 (5.6%)

Table 3: Prevalence of stunting, underweight and wasting in different age groups

Age group	Number of individual with nutritional problems (%)		
	Stunting	Underweight	Wasting
6-11 months (n=47)	08 (17.0%)	15 (31.9%)	12 (25.5%)
12-23 months (n=140)	45 (32.1%)	47 (33.6%)	28 (20.0%)
24-35 months (n=118)	56 (47.5%)	68 (57.6%)	23 (19.5%)
36-47 months (n=93)	37 (39.8%)	45 (48.4%)	16 (17.2%)
48-59 months (n=66)	23 (34.8%)	24 (36.4%)	09 (13.6%)
Total (n=464)	169 (36.4%)	199 (42.9%)	88 (19.0%)

Factors associated with undernutrition

Next, we performed binary logistic regression analysis with the aim of identifying independent factors which are associated with undernutrition. Several socio-demographic and health related factors including sex, birth order, mode of delivery, maturity, birth weight, breastfeeding duration, mother's education level, monthly family income,

paternal smoking and alcohol abuse were included in the logistic regression model. This analysis identified that low birth weight (p<0.05), prolonged breastfeeding beyond 2 years (p<0.05), lower maternal education level (p<0.001) and paternal smoking (p<0.01) are significantly associated with a higher risk of stunting (Table 4).

Table 4: Association between socio-demographic and health related factors and stunting*

Socio-demographic/ health factor	No. (%) of stunted children with associated factor (n=159)	No. (%) control (non-stunted) children with associated factor (n=277)	Odds ratio (95%CI) [Unadjusted]	Odds ratio (95%CI) [Adjusted]	p value
Male sex	66 (41.5%)	137(49.5%)	0.72 (0.48-1.07)	0.67 (0.43-1.04)	0.076
Birth order >2	35 (22.0%)	53 (19.1%)	1.19 (0.73-1.92)	0.94 (0.54-1.62)	0.832
Delivered by LSCS	37 (23.3%)	53 (19.1%)	1.28 (0.79-2.06)	1.37 (0.80-2.33)	0.243
Prematurity	18 (11.3%)	20 (7.2%)	1.64 (0.84-3.20)	1.18 (0.53-2.59)	0.68
Low birth weight	43 (27.0%)	42 (15.2%)	2.07 (1.28-3.35)	1.93 (1.08-3.45)	<0.05
Breastfeeding beyond 2 years	82 (51.6%)	99 (35.7%)	1.91 (1.28-2.84)	1.77 (1.14-2.74)	<0.05
Maternal education level - below grade 10	95 (59.7%)	85 (30.7%)	3.35 (2.23-5.03)	2.23 (1.42-3.50)	<0.001
Family income < LKR 20,000 per month	88 (55.3%)	118 (42.6%)	1.67 (1.12-2.47)	1.40 (0.90-2.17)	0.132
Paternal smoking	102 (64.2%)	96 (34.7%)	3.37 (2.24-5.07)	2.29 (1.43-3.68)	<0.01
Paternal alcohol abuse	74 (46.5%)	66 (23.8%)	2.78 (1.83-4.22)	1.58 (0.97-2.59)	0.065

* Data incomplete in 28 subjects

Factors significantly associated with a higher risk of underweight were; birth order above 2 (p<0.05), low birth weight (p<0.01), prolonged breastfeeding

beyond 2 years (p<0.05), lower maternal education level (p<0.001) and paternal smoking (p<0.001) and alcohol abuse (p<0.05) (Table 5).

Table 5: Association between socio-demographic and health related factors and underweight*

Socio-demographic/ health factor	No. (%) of underweight children with associated factor (n=188)	No. (%) control (non-underweight) children with associated factor (n=248)	Odds ratio (95%CI) [Unadjusted]	Odds ratio (95%CI) [Adjusted]	P value
Male sex	94 (50.0%)	109 (44.0%)	1.27 (0.87-1.86)	1.31 (0.84-2.04)	0.221
Birth order >2	50 (26.6%)	38 (15.3%)	2.00 (1.24-3.21)	1.80 (1.05-3.10)	<0.05
Delivered by caesarean section	41 (21.8%)	49 (19.8%)	1.13 (0.71-1.80)	1.11 (0.65-1.89)	0.695
Prematurity	20 (10.6%)	18 (7.3%)	1.52 (0.78-2.96)	0.95 (0.42-2.12)	0.902
Low birth weight	50 (26.6%)	35 (14.1%)	2.20 (1.36-3.57)	2.21 (1.22-4.01)	<0.01
Breastfeeding beyond 2 years	93 (49.5%)	88 (35.5%)	1.78 (1.20-2.62)	1.76 (1.13-2.75)	<0.05
Maternal education level - below grade 10	112 (59.6%)	68 (27.4%)	3.90 (2.60-5.83)	2.60 (1.65-4.09)	<0.001
Family Income < 20,000 rupees per month	95 (50.5%)	111 (44.8%)	1.26 (0.86-1.84)	0.87 (0.56-1.36)	0.553
Paternal smoking	122 (64.9%)	76 (30.6%)	4.18 (2.79-6.26)	2.58 (1.62-4.10)	<0.001
Paternal alcohol abuse	89 (47.3%)	51 (20.6%)	3.47 (2.28-5.28)	1.89 (1.15-3.11)	<0.05

*Data incomplete in 28 subjects

Wasting was significantly associated with male sex ($p<0.01$), low birth weight ($p<0.01$) and paternal smoking ($p<0.05$) (Table 6). Acute illnesses during

past two weeks, maternal employment status and paternal education level were not significantly associated with undernutrition in children.

Table 6: Association between socio-demographic and health related factors and wasting*

Socio-demographic/ health factor	Number (%) of wasted children with associated factor (n=84)	Number (%) control (non-wasted) children with associated factor (n=352)	Odds ratio (95%CI) [Unadjusted]	Odds ratio (95%CI) [Adjusted]	p value
Male sex	53 (63.1%)	150 (42.6%)	2.30 (1.40-3.76)	2.19 (1.31-3.65)	<0.01
Birth order >2	20 (23.8%)	68 (19.3%)	1.30 (0.74-2.30)	1.41 (0.76-2.60)	0.271
Delivered by caesarean section	16 (19.0%)	74 (21.0%)	0.88 (0.48-1.61)	0.84 (0.44-1.58)	0.597
Prematurity	9 (10.7%)	29 (8.2%)	1.33 (0.60-2.94)	0.85 (0.35-2.08)	0.735
Low Birth weight	28 (33.3%)	57 (16.2%)	2.58 (1.51-4.41)	2.47 (1.35-4.52)	<0.01
Breastfeeding beyond 2 years	33 (39.3%)	148 (42.0%)	0.89 (0.54-1.45)	0.91 (0.54-1.53)	0.727
Maternal education level - below grade 10	44 (52.4%)	136 (38.6%)	1.74 (1.08-2.82)	1.33 (0.77-2.29)	0.298
Family Income < 20,000 rupees per month	39 (46.4%)	167 (47.4%)	0.96 (0.59-1.54)	0.80 (0.48-1.34)	0.409
Paternal smoking	52 (61.9%)	146 (41.5%)	2.29 (1.40-3.73)	1.80 (1.02-3.19)	<0.05
Paternal alcohol abuse	36 (42.9%)	104 (29.5%)	1.78 (1.09-2.91)	1.28 (0.72-2.28)	0.385

*Data incomplete in 28 subjects

Discussion

This study was conducted in a prototype economically deprived rural area of Sri Lanka which is located in the Eastern Province, over 200 km away from the capital, Colombo. Prevalence rates of stunting, underweight and wasting reported were 36%, 42% and 19% respectively. These figures are higher than the Sri Lankan prevalence rates of stunting, underweight and wasting which are reported as 18%, 21% and 15% respectively³. Similarly, prevalence rates are higher than the global prevalence rates which are reported as 22%, 16% and 7% for stunting, underweight and wasting respectively^{1,10}. These findings reflect the poor nutritional status in rural communities of Sri Lanka where a majority of families live in poverty. In this study, highest prevalence of stunting and underweight were reported in the 24-35 month age group whereas the highest prevalence of wasting was observed in the 6-11 month age group. These findings are in accordance with the previous results of the Demographic Health Survey of Sri Lanka conducted in 2006³.

This study revealed several factors which are positively associated with undernutrition. Of note, stunting, underweight and wasting were significantly greater in children who were born with low birth weight. Similar findings were reported in several studies including one done in the southern part of Sri Lanka¹¹. Additionally, we found that higher birth order (over 2) was significantly associated with underweight in children. Comparable results were reported in a study done in Ethiopia which revealed that children of mothers who delivered three or more offspring were more likely to become underweight in comparison with children of mothers who delivered less than three offspring¹². This can be partially due to the fact that children have a higher chance of being neglected in larger families compared to smaller ones. We also found that breastfeeding beyond 2 years of age was significantly associated with stunting and underweight. No significant relationship was found between wasting and duration of breastfeeding. These findings suggest that prolonged breastfeeding may decrease the calorie intake of children and could lead to chronic malnutrition.

Another significant association of stunting and underweight was lower maternal education level. Several other studies done in the southern and northern parts of Sri Lanka have also concluded that all 3 undernutrition indicators were increasing with declining maternal educational level^{13,14}. Additionally, this study revealed that all 3 undernutrition indicators were significantly increased with paternal smoking. Prevalence of paternal smoking in this area (44%) was comparatively higher than in the rest of the Sri Lanka which reports extremely low rates of smoking in the world. Although there could be several confounding factors for higher risk of stunting, underweight and wasting in children of smoking fathers, it showed independent associations in logistic regression after adjusting for other variables.

In our study, there was no statistically significant relationship between undernutrition and acute illness during past two weeks. Same had been shown in studies done in the southern and western parts of Sri Lanka^{12,13}. However, contrasting findings have been reported in several studies done in other countries; studies done in Ethiopia, Jordan and Brazil revealed that diarrhoeal diseases and respiratory infections were determinants of undernutrition in children^{15,16}.

Conclusions

This study revealed that prevalence of stunting, underweight and wasting in Dehiattakandiya MOH area is much higher than the national and global figures. Low birth weight, prolonged breastfeeding, lower maternal education level and paternal smoking were significantly associated with both stunting and underweight whereas male sex, low birth weight and paternal smoking were significantly associated with wasting in children aged 6-59 months. Birth order above two and paternal alcohol abuse were significantly associated with underweight but not with stunting or wasting.

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