Original Research Article

Prevalence and determinants of under-nutrition among children aged 5-10 years in an urban area of Kancheepuram district, Tamil Nadu

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ABSTRACT

Background: Childhood is a phase of swift growth and development after infancy. One of the foremost public health problems in developing countries like India is extensive prevalence of under nutrition among school children resulting in delayed cognitive development and severe health impairment. Hence early detection helps in prompt prevention and treatment of complications. Aim was to assess the prevalence and factors associated with under-nutrition among children aged 5-10 years in an urban area of Kancheepuram district, Tamil Nadu.

Methods: A descriptive cross sectional study conducted among 210 children in the age group of 5-10 years residing at Anakaputhur, an urban field practice area of Sree Balaji Medical College and hospital for a duration of 4 months by simple random sampling technique. A pre-tested semi-structured questionnaire was employed to interview the children and their mothers. The data obtained was subjected to statistical analysis using SPSS version 22.

Results: Prevalence of underweight among children was found to be 52.4% of which 58.5% of the undernourished children were boys when compared to 47.4% among girls. Underweight was significantly associated with source of drinking water [($p<0.0125$), OR=2.0566], episode of diarrhea [($p<0.0054$), OR=2.3624] and ARI [($p<0.0000$), OR= 8.6417] in the last 3 months, history of passing worms [($p<0.0348$), OR=1.8878], meal frequency <3 times/day [($p<0.0000$), OR=7.5432].

Conclusions: Half of the children (52.4%) in the study had poor nutritional status. To combat under-nutrition good living conditions, education to the mothers, clean water source, good personal hygiene, period deworming and delivery of integrated programs are recommended.

Keywords: BMI for age, Risk factors, Mother's education, School aged children, Underweight

INTRODUCTION

Childhood is a period of rapid growth after infancy. Children are considered to be the most important natural resource of every country. However even after so many years of independence, India has only made little progress in improving the health condition of school children aged 5-14 years in comparison to the developed countries. Nutritional requirements of these children are different than that of adults which is marked by their rapid growth rate. Monitoring of children's nutritional status is a fundamental tool for the evaluation of their overall good health anddevelopment.[1]

Under-nutrition is defined as the outcome of insufficient food intake and repeated infectious disease which includes three components namely, wasting (low weight-for-height), stunting (low height-for-age) and underweight (low weight-for-age). Low weight-for-height is known as wasting. It usually indicates recent and severe weight loss, because a person has not had enough food to eat and/or they have had an infectious disease, such as diarrhea, which has caused them to lose weight. A young child who is moderately or severely wasted has an increased risk of death, but treatment is possible. Low height-for-age is known as stunting. It is the result of chronic or recurrent under-nutrition, usually associated

with poor socioeconomic conditions, poor maternal health and nutrition, frequent illness, and/or inappropriate infant and young child feeding and care in early life. Stunting holds children back from reaching their physical and cognitive potential. Children with low weight-for-age are known as underweight. A child who is underweight may be stunted, wasted, or both.[2]

Under-nutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and delays recovery. Major consequence of chronic under-nutrition is slower cognitive development, serious health impairments and poor survival. Hence the early detection of childhood malnourishment through regular monitoring helps in prompt treatment and prevention of serious complications.

According to a recent estimate around 45% of deaths among children under 5 years of age are linked to under-nutrition. One of the major public health problems in many low and middle-income countries including India is widespread prevalence of under-nutrition.

According to National family health survey (NFHS-4) 36% of children in India and 23.8% of children in Tamil Nadu, below age five years are underweight for their age.[3] However, it does not throw light on the prevalence of underweight among school-aged children, only studies conducted by independent authors in India quote the prevalence of underweight in school-aged children as around 50%.

The classification based on weight for age, height for age, and weight for height were primarily devised for quantifying the prevalence of under-nutrition in under-five children. Gender specific growth chart for 2 to 20 years by WHO, CDC (Center for disease control) and National centre for health statistics (NCHC) specifies Body mass index (BMI) as more appropriate marker of thinness, overweight or obesity in an older child.

The WHO currently recommends using BMI for age compared to reference standards (NCHS) and defines under-nutrition as <5th percentile of BMI for age.[4]

There are many factors present in the day to day household setting of children which make them vulnerable to under nutrition. In India, many studies have been conducted to find out the prevalence of under nutrition among children below 5 years of age but similar data among children in the age group of 5-10 years is limited. Moreover, majority of the studies among school-aged children have been conducted within school premises.

So this study was conducted to assess the prevalence of under-nutrition among children aged 5-10 years residing in an urban area of Kancheepuram district, Tamil Nadu.[4]

METHODS

Study design

This was a cross sectional descriptive study carried out among children aged 5-10 years residing in Anakaputhur, an urban field practice area of Kancheepuram district, Tamil Nadu.

Study population

School going children in the age group of 5-10 years, residing at an urban field practice area of a Sree Balaji Medical College in Kancheepuram district, Tamil Nadu were selected for the study.

Study area

Anakaputhur, an urban field practice area of Sree Balaji Medical College in Kancheepuram district, Tamil Nadu.

Sample size

A study conducted by Rawat et al from Trivandrum found the prevalence of undernutrition among children aged 5-10 years to be 48%. This was used to calculate the sample size using the formula $4pq/L^2$, where p=48%, q=52%, allowable error =15%, L=5%. Adding a non-response rate of 10% at 95% confidence interval, the sample size thus obtained was 210.

Sampling method

Simple random sampling method was used for selection of study participants.

Study period

The study was conducted over a period of 4 months from September 2019 to December 2019

Inclusion criteria

Children in the age group of 5-10 years who were willing to participate and those parents who gave consent for their children were included in the study.

Exclusion criteria

Children who suffer from any mental ailment and children of those parents who did not give consent were excluded from the study.

Data collection

Data was collected using pretested questionnaire which includes Socio-demographic details, details regarding their sanitation, hygiene and history of relevant illness. Body-mass index (BMI) was calculated for each of the

study participants by calculating their height and weight and by using the formula BMI = weight in kg/height in meter^2. It is commonly used to classify underweight, overweight and obesity in adults. For children and adolescents between 2 and 20 years old, BMI is interpreted relative to a child's age and sex by percentiles because the amount of body fat changes with age and varies by sex. Less than 5th percentile- underweight; 5th percentile to less than 85th percentile- healthy weight; 85th percentile to less than 95th percentile-overweight; equal to or greater than the 95th percentile- obese.[5]

Statistical analysis

Data entry was done in Microsoft excel and analysis was carried out in SPSS version 22.

Ethical clearance and informed consent

The study was carried out after obtaining approval from the Institutional Ethical Committee of Sree Balaji Medical College and Hospital, Chrompet. The mothers of the participants were briefed about the purpose of the study and informed consent and oral assent was obtained prior to the data collection.

RESULTS

Total number of children participated in the study was 210.

Table 1: Socio-demographic details of the study participants.

Characteristics	Category	Frequency n=210	Percentage (%)
Age	5-6	82	39.1
	7-8	65	30.9
	9-10	63	30
Sex	Boys	94	44.8
	Girls	116	55.2
Education level of mother	Illiterate	3	1.4
	Primary/ secondary	115	54.8
	Higher secondary	40	19
	Graduate/ postgraduate	52	24.7
Mother's occupation	Unemployed	123	58.6
	Employed	87	41.4
Family type	Nuclear family	161	76.7
	Joint family	33	15.7
	Extended family	16	7.6
Socio-economic status	Upper class	23	11.14
	Upper middle class	107	51.14
	Lower middle class	65	31.05
	Upper lower class	15	7.14

Table 1 shows the socio-demographic details of the study participants which includes 94 boys and 116 girls of which majority of the participants were in the age group 5-6 years (39.1%). Regarding educational status of mother's 24.7% of them were either graduate or post-graduate, whereas majority (54.8%) of them were education below the primary/secondary level. As regard to mother's occupation 58.6% mothers were unemployed compared to 41.4% of them who were employed. Around 76.7% of the study participants belong to nuclear type of family with 51.14% of the children belonging to upper middle class and 31.05% belong to middle socioeconomic class.

Table 2: Nutritional status of children according to BMI percentile.

Nutritional status based on BMI (Total N=210)	Boys n=94		Girls n=116		Total n=210	
	No.	%	No.	%	No.	%
Underweight (BMI <5th percentile)	55	58.5	55	47.4	110	52.4
Healthy weight (BMI 5th to <85th percentile)	33	35.1	46	39.6	79	37.6
Overweight (BMI 85th to <95th percentile)	3	3.1	6	5.1	9	4.3
Obese (BMI 95th percentile or more)	3	3.1	9	7.7	12	5.7

Table 2 shows nutritional status of children according to BMI percentile where prevalence of underweight (BMI<5th percentile) was found to be 52.4% of which 58.5% were boys and 47.4% were girls, however this difference between sexes was not statistically significant.

Table 3 shows the association of under-nutrition (BMI<5th percentile) with socio-demographic details. On analysis of various factors which influence the nutritional status of the study participants, the prevalence of underweight was high among children <7 years (55.45%) than among those >7 years of age, with no statistical significance. The prevalence of underweight was equal (50%) among both sex with no significant association. The proportion of underweight was high among those children whose mother's education level was <10th standard (58.18%) than among those whose mothers were educated >10th standard, but this difference was not statistically significant.

In the present study the rate of underweight (68.18%) was higher among those children whose mothers were unemployed and this difference was statistically significant. Majority of the underweight (80.90%) children belong to nuclear type of family, with no statistical significance. The prevalence of underweight was high (56.36%) among middle and lower middle class and this difference was statistically significant.

Table 3: Association of under-nutrition (BMI <5th percentile) with socio-demographic details.

Characteristics		Underweight based on BMI percentile		Chi-square χ^2	P value	Odd's ratio	95% CI
		No=110	%				
Age (years)	<7 years	61	55.45	1.4989	0.2688	1.4038	0.8151-2.4179
	>7 years	49	44.54				
Sex	Male	55	50	2.5634	0.1270	1.5641	0.9035-2.7077
	Female	55	50				
Education level of mother	<10th std.	64	58.18	0.3721	0.5790	1.1852	0.6865-2.0462
	>10th std.	46	41.81				
Mother's occupation	Unemployed	75	68.18	8.7924	0.0033	2.3214	1.3245-4.0687
	Employed	35	31.81				
Family type	Nuclear	89	80.90	2.3241	0.1433	1.6481	0.8643-3.1429
	Joint/Extended	21	19.09				
Socioeconomic status	Lower middle/ upper lower class	62	56.36	32.6902	0.0004	5.8843	3.1206-11.0953
	Upper/ upper middle class	48	43.63				

Table 4: Association of under-nutrition (BMI < 5th percentile) with other factors.

Characteristics		Underweight based on BMI percentile		Chi-square χ^2	P value	Odd's ratio	95% CI
		No=110	%				
Source of drinking water at home	Bore/corporation water	59	53.63	6.5767	0.0125	2.0566	1.1816-3.5798
	Water can	51	46.36				
Habit of drinking boiled water	No	68	61.81	6.6818	0.0125	2.0606	1.1874-3.576
	Yes/Not applicable	42	38.18				
Diarrhoea in the last 3 months	≤2/>2 episodes	60	54.54	20.3636	0.0000	3.8	2.1004-6.8747
	Nil	50	45.45				
ARI in the last 3 months	≤2/>2 episodes	103	93.63	29.6842	0.0000	8.6417	3.633-20.556
	Nil	7	6.36				
Passing of worms in stools	Yes	71	64.54	8.0932	0.0054	2.2251	1.2776-3.8752
	No	39	35.45				
Deworming last done	>6 months/never done	59	53.63	9.9860	0.0021	2.4583	1.4-4.3167
	<6 months	51	46.36				
Habit of washing hands before having meals	No	61	55.45	12.7251	0.0004	2.7709	1.5724-4.8828
	Yes	49	44.54				
Habit of cutting nails	No	73	66.36	1.9475	0.2004	1.4884	0.8505-2.6047
	Yes	37	33.63				
Meal frequency per day	<3 times	57	51.81	11.2786	0.0011	2.6331	1.487-4.6623
	≥3 times	53	48.18				
Mothers age at the time of child birth	<18/>30 years	14	12.72	2.7511	0.1062	2.2847	0.8424-6.1967
	18-30	96	87.27				
Duration of breast feeding	<12 months	67	60.90	15.1937	0.0001	3.0246	1.7211-5.3153
	>12 months	43	39.09				

Table 4 shows association of under-nutrition (BMI<5th percentile) with other factors. The prevalence of underweight was found to be high (53.63%) among those children whose source of drinking water was bore well/corporation when compared to those who drink can water, which was statistically significant. High prevalence of underweight (61.81%) was found among those who did not drink boiled water than among those who drank boiled water, and this difference was statistically significant. Children who suffered from acute diarrheal disease in the last 3 months were found to have higher proportion of under-weight (54.54%) than those without did not suffer from diarrhea. Similarly higher prevalence of under-weight (93.63%) was found among those children who had ARI in the last 3 months when compared to those without ARI and this difference was found to be statistically significant. In the present study the prevalence of underweight was found to be high

(64.54%) among those with symptoms of worm infestation than those without symptoms and similarly higher prevalence of underweight (53.63%) was found among those who have never done deworming/those who have taken it >6 months back when compared to those who had taken it <6 months back and this difference was statistically significant. The study also found higher prevalence of underweight among those children who do not wash their hands before eating (55.45%) and those who had meal frequency <3 times per day(51.81%). The prevalence of underweight (39.09%) was much lower among children who were breastfed for >12 months as compared to those who breastfed for <12 months.

DISCUSSION

Nutrition of primary school children determines their life time health, strength and intellectual vitality. This span of life is a dynamic stage of physical growth and mental development. But till now in India, the position of health and nutritional status of the children are not at satisfactory level which is evident from NFHS-4 fact sheet of Tamil Nadu, 2015-16.[6]

The present study revealed the overall prevalence of under-weight among the study participants to be 52.4%. The prevalence of underweight in boys was 58.55%and in girls it was 47.4%. The prevalence of underweight was more among boys compared to girls. This difference in prevalence may be due to strong influence of nutritional habits and lifestyle pattern among boys and their parents. The prevalence of thinness was 48% in a study conducted by Mandal et al in a slum area of Kolkata and the prevalence of thinness was 29% in a study done by Fazili et al in Kashmir and it was 22% in a study done by Kumawat et al in Rajasthan.[7-9] This slight higher prevalence of underweight in the present study may be attributed to increasing level of knowledge and consciousness about overweight among the study participants living in an urban area than those living in slum area and rural areas.

There was no significant association with many of the socio-demographic characteristics and underweight of the children in this study. The prevalence of underweight (55.45%) was high among younger children in the present study which was not found to be statistically significant when compared to the study done by Gopal et al in West Bengal where prevalence of underweight had a statistically significant association with younger children.[10] The difference could be due to feeding practices, exposure to infection and socio-economic differences between the study areas, hence younger age groups should be the main target for nutritional surveillance and intervention. The gender of the children had no significant effect on the weight status of the children and which was contrary to the study done by Gopal et al in West Bengal.[10]

The proportion of under-nutrition (58.18%) was higher among those children whose mother's education was less than higher secondary but there was no statistically significant association between undernutrition and mother's education. Similar results were obtained in a study done by Yadav et al in Pune.[11] In this study the prevalence of under-weight was found to be lower in working mothers (31.81%) and the association between them was found to be statistically significant. Similar findings werereported in the study done by Yadav et al in Pune.[11] These findings may be due to better social support and higher educational status in the working mothers of the study participants.

In the present study the prevalence of under-nutrition (80.90%) was more among children living in nuclear family than among children in joint family. In a study done by Hasan et al in Bangalore, similar findings were obtained.[12] The reason may be due to lack of elders to look after the children when the mothers are involved in household chores in these families.

Around 56.36% of underweight children belong to either lower middle/upper lower class and a statistical significant association was found between them. Similar results were obtained in a study done by Xavier et al in Coimbatore.[13] Socio-economic status remains as a crucial determinant of nutritional status among the children due to the reduced purchasing power that will hinder providing balanced nutrition to these children.

Comparatively higher prevalence of undernutrition (53.6%) was found in children whose main source of drinking water was bore/corporation water when compared with those who consume can water and the association was also found to be statistically significant. Similar results were found in a study done by Yeasmin et al.[14] This may have been due the improper boiling and water storage practices among parents of children consuming bore/corporation water. The lack of access to clean water pose a high risk of developing childhood morbidities ultimately resulting in undernutrition.

One of the most important indicators of personal hygiene among children is proper hand washing practices.[15] In this study underweight was more prevalent among children who did not follow proper hand washing practices before meals and children who suffered from episodes of diarrhea in the past 3 months. The association between them was also found to be statistically significant. Similar results were found in a study done by Debottam et al in Kolkata.[16]

Worm infestation was found to be an important indicator for underweight and malnutrition [15]. In this study, history of passing worms in the stools in the past 6 months was found to be significantly associated with underweight. It was also observed that the prevalence of underweight among children who had taken deworming <6 months back was significantly lower when compared to children

who have taken deworming >6 months back or those who had never taken deworming. These findings were similar to the study done by Osei et al and Rawat et al in Trivandrum, Kerala.[17,18]

An important factor related to undernutrition was the meal frequency of the child. The prevalence of underweight was high among children having meals <3 times per day than those with ≥3 times per day, which is similar to the study done Yeasmin et al in Bangladesh.[14] Another important determinant of undernutrition was the duration of breast feeding among the children. The prevalence of underweight (39.09%) was low among those children who were breast fed for >12 months as compared to those who were breast fed for <12 months, and the association was statistically significant. Similar results were found in a study done by Priyanka et al and Gopinath et al.[19,20]

CONCLUSION

The present study highlights that undernutrition is prevalent in urban primary school children. The value of this study lies in the fact that children of this age group are available and amenable for early identification and intervention. Hence this issue needs to be addressed immediately and promptly through multipronged approach. Routine health checkup for children is recommended. Health education regarding personal hygiene, nutrition and health should be a part of school curriculum. Mother's education plays an important role in nutritional status of the children, hence informal education to parents regarding nutrition, hygiene and childhood illness through parent teacher meetings in school.

ACKNOWLEDGEMENTS

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