Determinants of Malnutrition (Overweight and Obesity) in School-Going Children of Coimbatore City, Tamil Nadu

¹MC Anitha, ²K Anusuya Devi

¹Ph.D Research Scholar, ²Assistant Professor, Department of Nutrition and Dietetics, PSG College of Arts and Science, Coimbatore – 641014, Tamil Nadu, INDIA.

Abstract

Background & Objectives: Obesity is an emerging problem in India. The author sought to determine prevalence of obesity and malnutrition in school-going children, from grades 5 to 7 of different schools of Coimbatore and assess Socio-Economic Status that affects the weight of the children.

Methods: A cross sectional study design with children studying in grades 5 to 7 grade, in different schools of Coimbatore. We visited 23 schools of which 10 consented; five subsidized government schools and five non-government schools. A validated questionnaire was developed. Height and weight were measured on calibrated scales.

Results & Interpretation: Of our total population, 17% of children were underweight, 50% of the entire population lay within the normal range.

Conclusion: Obesity and under nutrition co-exist in Indian school-children. Our study shows that socio-economic factors are important since obesity and overweight increase with SES. Higher SES groups should be targeted for overweight while underweight is a problem of lower SES.

Keywords: Socio-Economic Status, Prevalence of Obesity, Overweight, Under-nutrition, underweight

Introduction

Overweight prevalence varied between 3 to 24.7 per cent and obesity ranged from 1.5 to 14 per cent in India (1). Studies from metropolitan cities in India have reported a high prevalence of obesity among affluent school children (2,3). On the other hand some studies reported a high prevalence of under nutrition among rural school children and children in urban slums (4, 5, 6, 7). In Asian countries, youth (aged 5–15 years) consume at least one snack on a daily basis, with snacks providing 18% of their total daily energy (8). Consequently, snacking is commonly regarded as a contributing factor in the development of childhood overweight and obesity, although studies that have examined the association between snacking and body mass index have yielded mixed results (9, 10, 11, 12).

Methods

1. Selection of population

The author contacted 6 Government schools and 5 non-government schools. Government schools are run by government where the fee ranged from Rs.1000-2000/year, whereas the selected non-government school collected a fee of Rs.30,000-50,000/year. Permission was granted and data collection was done among 6 government and 5 non-government schools respectively. Consenting male and female students of class 5-7 were included in the study.

2. Selection of Sample

Our estimated sample size was 1409 school children. Gender differences were not considered in our calculation. However, we collected data from all consenting students from within the selected grades and schools.

3. Data collection

Using validated questionnaire, data like Socio-Economic Background, anthropometry and snack pattern were collected. Data collection was carried out using interview schedule method as it allows the researcher to build a rapport with the child and gives validation to the data.

3.a. Socio-Economic Status

India, a country with vast differences among people based on their economy so this is assessed using Revised Kuppuswamy Scale 2012(13) as tabulated below

Socio-Economic Category	Monthly Income (Rs)
Upper	≥ 32,050
Upper Middle	12020-32,049
Middle/Lower Middle Income	12,019-8,010
Lower/Upper Lower	8,009-4,810
Lower	4,809- 1,600/ and less

* Revised Kuppuswamy Scale 2012

Because of the convenience, we have merged upper middle and Middle/lower Middle income to a category of middle SES, in the same way lower SES comprises of lower/ upper lower and lower income.

3.b. Anthropometry :

i) Height

A stadiometer was used to measure the height of the children. The children were made to stand erect without shoes on a flat floor by the scale with heels together and toes apart. The head was comfortably held erect and the arms were relaxed and held in a natural manner. The head piece of the stadiometer was lowered slowly and was placed in the sagital plane over the head of the child applying a slight pressure to reduce the thickness of hair and make contact with the top of the head. Using this technique, the height of the children was measured to the nearest 0.1cm accuracy (14).

ii) Weight

Body weight is the most widely used and the simplest reproducible anthropometric measurement for the evaluation of nutritional status of young children. Body weight of all the children was measured using a digital weighing balance. The balance was validated using known weight for every 5 readings. The children were made to stand erect with minimum clothing and barefoot. The weight was noted to the nearest 0.1 kg. (14).

iii) Body Mass Index (BMI)

BMI is a simple index and is defined as weight in kilograms divided by height in meters squared (15).

Height (metres)²

After calculating the BMI for the children, BMI percentiles and Z score were calculated using the online calculator.

3.c. Snacking Pattern

Details like Snacking pattern, availability of snacks, snacking frequency, time of snacking, snacking preferences were collected.

Ethical Statement

The study was granted approval by the Ethics Review Committee of the <u>PSG Institute of Medical Research, Coimbatore</u>. Consent forms, in both English and Tamil, for all students of grades 5 to 7th were signed by either of the parents of the children, and data were collected only from them.

Results & Interpretation

The results depicts that government school students comprise 58 % of the study population whereas 40% were from nongovernment schools. More than 50% of the children belong to 11 years age in both the schools (Table I)

Table I

	Number of children by Age Group (n=1409)									
S.No	Schools		Age Gr	oup (in Y	(ears)					
		1	10 11		11 12		2	Total Number	Percentage	
		No	%	No	%	No	%			
1	Government	264	32	443	54	111	13.5	818	58	
2	Non-government	116	20	386	65	89	15	591	42	

Distribution of different school children according to Socio-Economic status (n=1409)

S. No	Socio-Economic Class	Governme child	ent school Iren	Non-gov School	vernment children	Total Number	Percentage
		No	%	No	%		
1	Low SES	154	19	2	0.33	156	11

2	Middle SES	406	49.6	160	27	566	40
2	High SES	257	31.4	430	73	687	49

Distribution of different school children according to Socio-Economic status



Figure 1

Table II and Figure 1 shows that 50% of government school students belong to middle Income category (Rs.12,020-32,049/ month) and 73% of non-government school students belong to the family earning Rs. \geq 32,050/month (High Income category). Overall we could note that 49% of the selected school children belong to high SES followed by 40% (Middle SES) and 11% in low SES category (Rs. <12,000/month

	Table III																
	BMI categories against Socioeconomic status for selected school children (n=1409)																
	Socio	(Obese	(n=407)		0	Overweight(n=284)			Normal (n=526)				Under			
	economic													Weight (n=192)			
	Status	Gover	rnme	Non-	govt	Gover	rnme	Non	Non-govt		rnment	Non	-govt	Governme		Non-govt	
		n	t	Sch	School		t	School		School		School		nt		School	
		Sch	ool	child	lren	Sch	ool	chil	dren	chil	dren	chil	dren	Sch	ool	child	dren
		child	lren			child	lren							child	lren		
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
1	Low	2	1			24	22			62	41	1	50	55	26	1	50
	SES	2	1			54	22		-	05	41	1	50	55	50	1	30
2	Middle SES	95	23	102	64	62	15	33	21	202	50	12	8	47	12	13	8
3	High	40	16	168	30	30	15	116	27	141	55	107	25	37	14	30	2
3	SEC	40	10	108	39	39	15	110	21	141	55	107	23	57	14	39	2
	SES																
	Total	137	17	270	46	135	17	149	25	406	50	120	20	139	17	53	9

BMI categories against Socio-economic status for selected school children



We could note that 17% of government school children were categorized as underweight and obese, as usual results support that underweight was prevalent among low SES. It's hard to believe that 22% of the government school children under low SES were overweight. It's happy to address that normal BMI was seen among 50% of government school children. Overall we could note that non-government school contributed to overweight and obesity slightly higher than government schools.

Data Analysis & Interpretation

Mean BMI levels were found out for low, middle and high income groups. High income group have the highest Mean BMI of 20.16 ± 5.61 SD. The middle income group has the lesser mean BMI of 18.51 ± 5.38 SD. The lowest mean BMI is 16.69 ± 3.24 SD found in low income group. This shows that the higher level of income results in higher BMI levels. The ANOVA test shows that the BMI levels differs significantly among low, middle and high income groups (F=33.217, p <0.01)

4

S.No	Category	Gover School (n=	rnment children :818)	Non-Government School children (n=591)			
		No	%	No	%		
1.	Professional (Engineer/Advocate/Doctor)	16	1.5	206	35		
2.	Employed: a. Private Sector b. Public Sector	308	38	101	16.5		
		114	14	63	11		
4.	Self Employed : Entrepreneur/Business	106	13	119	20		
5.	Unemployed: a. Housewife	32	4	58	10		
	b. Land Resource	202	25	28	5		
	c. Others	40	4.5	16	2.5		
	Total	818	100	591	100		

 Table IV

 Occupational status for the selected school children (N=1409)

Private school children had 35% of their parents as professionals followed by 20% of entrepreneur and 17% employed in private sector. Government school children's parents were employed in private sector (38%) and 25% receive money through land source.

	Snacking pattern of the selected school children (N=1409)							
S.No	Snacking Patterns	Governn School chi (n=818	nent Idren 8)	Non-Government School children (n=591)				
1	Frequency of snacking(i)Daily(ii)4-5 Times/Week(iii)2-3Times/Week(iv)Once a week(v)Never	No 645 142 26 5 	% 79 17 3 0.61 	No 571 18 1 1 	% 97 3 0.1 0.1			
2	Time of snacking(i)Morning snack(between breakfast and lunch time)(ii)Evening snack (between lunch and dinner time)	486 332	59 40.5	199 392	34 66			
3	Snacking context (i) Travelling from school (ii) While watching television (iii) While hanging out with friends (iv) While doing homework or studying	112 447 92 167	14 55 11 20	183 292 80 36	31 49 13.5 6.5			
4	Availability of snacks (i) Small shops (ii) School canteen (iii) Present in home (iv) Grocery shop/supermarket	301 178 50 289	37 22 6 35	24 342 20 205	4 58 3 35			
5	Buying snacks (i) T.V advertisements (ii) Friends (iii) Freebies inside the pack (iv) Parents preference (v) Newspaper/Magazine advertisements	465 199 106 19 29	57 24 13 2 3.5	229 168 145 21 28	39 28 24.5 3.5 5			

Chi-Square Test

	Value	df	Sig.
Chi-Square	18.800	9	*

*. Correlation is significant at the 0.05 level

Daily snacking was a part of school children's daily routine in both non-government (97%) and government school (79%). We could note that the regularity of government school children (59%) preferred mid morning snack whereas 34% of non-government school children preferred evening snack. T.V watching is the first they did once they reach home and snack was the companion for 2-3 hours for both government school (55%) and non-government school (49%) children. For some children travelling took more than 30 minutes so students consume snacks in transportation modes like bus, van, auto etc. School canteen and shops near school/home contribute a lot for snack consumption (60%), T.V advertisements (49%) attract the children and made they purchase snacks followed by friends (26%) and freebies (18%).

Data Analysis and Interpretation

Chi square test data revealed a significant association between BMI and levels and snacking pattern frequency (Chi-square=18.80, < 0.05).

Conclusion

Obesity and under nutrition co-exist in Indian school-children. Thus, the results of the study shows that the prevalence of overweight and obesity among school children is becoming high in both urban and rural areas which is an alarming signal and calls for an immediate action. Effective implementation of lifestyle modification behaviors such as healthy diet intake, avoidance of high calorie foods, and promoting physical activity in early school life help in preventing future complications as a part of primordial preventive strategies (16-19).

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