International Journal of Contemporary Pediatrics
Selvaraj V et al. Int J Contemp Pediatr. 2016 May;3(2):468-472
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20161028

Research Article

Nutritional status of adolescent school children in a semi-urban area based on anthropometry

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Received: 27 February 2016
Revised: 08 April 2016
Accepted: 11 April 2016

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ABSTRACT

Background: Adolescent nutrition is generally given less importance when compared to the under-five nutrition in developing countries like India. Studies throwing light on the nutritional status of adolescent children are needed. Aims and objectives of the study were to know the prevalence of obesity, overweight, thinness, severe thinness and stunting in adolescent schoolchildren based on anthropometry and its association with various factors.
Methods: A cross sectional study was done in six schools in a semi urban area of Southern part of India during November 2012-November 2013.Obesity,overweight,thinness, severe thinness and stunting were determined in the children of the age group of 9-17 years based on WHO Z scores. A predesigned questionnaire and clinical examination were used to find out the factors associated with malnutrition and their implications.
Results: Out of the 2100 children studied, the prevalence of obesity was 6%; overweight 10.9%, thinness 13%; severe thinness 5% and stunting 19.8%. Mother's education, occupation and socioeconomic status have significant associations with both over nutrition and under nutrition. Skipping breakfast is associated with thinness.
Conclusions: Even though obesity and overweight are increasing in recent times; under nutrition is still prevalent in adolescent school children. Routine school health visits, improving female literacy, dietary modifications, imparting health as well as physical education are the need of the hour to avoid malnutrition in adolescent school children.

Keywords: Obesity, Thinness, Stunting, Anthropometry

INTRODUCTION

Children decide the future of a country and hence a lot of importance is given to childhood nutrition. School age is the vital period during which body's nutritional status is built. Adolescence is a critical phase in the life cycle of human beings. Rapid rate of growth occurs in this phase and it is a transition from childhood to adulthood.[1] Hence adequate nutrition is essential for this spurt of growth.[2] Adolescence is also considered as a second chance for growth or catch up growth for those children who had undergone deficits in nutrition in their early life.[3] Adolescents contribute to approximately 21.4% of Indian population (National Youth Policy 2002).[4] A lot of studies have been done on the nutritional status of children in the under-five age group. Hence we had proposed a study to focus on the adolescent nutritional status based on anthropometry.

METHODS

This cross-sectional study was done in a semi urban area of Southern part of India during November 2012-November 2013, after obtaining clearance from the

institutional ethical committee. A sample size of 1825 was calculated presuming the prevalence of obesity as 5% in school children with a relative precision of 1% at 95% confidence.

Six schools in the semi urban areas were selected by simple random sampling. All children in the age group of 9-17 years of both sexes in these schools were included in the study. They were divided into three groups 9-11 years, 12-14 years, 15-17 years by stratified random sampling. Children suffering from chronic and congenital diseases were excluded.

Informed consent was obtained from the principals of all selected schools, children and their parents. Children were made to stand straight without footwear, with hands hanging by the side, feet parallel and with the heels, gluteal region, shoulders and occiput touching the wall. Height was measured using a stadiometer with a near accuracy of 0.5cm. Children were instructed to stand on the dial type bathroom weighing scale looking straight without footwear with feet apart. Weight was measured to the nearest 0.5 kg.

Body mass index was calculated using the formula:

BMI = Weight in kg / Height in metre.^{2}

A pre-designed questionnaire was given to all children of the study population. The variables used in the questionnaire were clearly explained to the children, parents and teachers through a general meeting conducted in the schools. Parents of the children in the age group of 9-14 years were asked to fill up the questionnaire forms and then they were collected with the help of teachers. Children in the age group of 15-17 years and children of illiterate parents themselves filled up the forms.

The variables in the questionnaire were mother's education, mother's occupation, socio economic status, time for television and videogames per day, snacking and soft drinks between meals, skipping breakfast, physical activity per day.

A total of 2100 children were assessed and examined. WHO criteria based on Z scores were used to define the nutritional status (Table 1). After collection, all data were compiled and analysed and appropriate statistical tests were applied. The group comparisons for the categorical variables were analysed using Chi square test. Odds ratio, which is used to measure the association between exposures and outcomes, was calculated whenever needed. The group comparison for quantity variables were analysed using Independent student t test and Analysis of Variance (ANOVA) .The p value of less than 0.05 was considered as statistically significant. The statistical analysis was carried out using statistical software SPSS 19.0.

Table 1: Definition of nutritional status.

Criteria	Parameter	WHO Definition based on Z scores
Obesity	BMI for age	2 SD above the mean.
Overweight	BMI for age	1 SD to 2 SD above the mean.
Thinness	BMI for age	2 SD below the mean.
Severe thinness	BMI for age	3 SD below the mean
Stunting	Height for age	2 SD below the mean

RESULTS

Out of the 2100 study population, 968 were boys (46.1%) and 1132 were girls (53.9%). Among them, 744 children (35.4%) were in the age group of 9-11years, 836 (39.8%) were in the age group of 12-14 years and 520 (24.8%) were in the age group of 15-17 years. The mean BMI of the children of age 9-11 years age was 16.19$\pm$3.09, 12-14 years age was 17.82$\pm$5.60, 15-17 years age was 20.28$\pm$4.35.

Table 2: Prevalence of obesity, overweight, thinness, severe thinness.

BMI	No. of children	Percentage
Normal	1370	65.2
Obese	126	6.0
Over Weight	228	10.9
Severe thinness	104	5.0
Thinness	272	13.0
Total	2100	100

Table 3: Association of obesity and overweight with mother's education.

Mother's education	Normal	Obese/ overweight	Total
Illiterate	18 (100)	0	18
Primary/middle school	145 (81.9)	32 (18.1)	177
Higher secondary school	545 (83.3)	109 (16.7)	654
Graduate	662 (75.7)	213 (24.3)	969
Total	1370	354	1724

Numbers inside parenthesis indicate percentage; P=0.000 since p<0.05, there is a significant association between obesity and overweight with mother's education

The prevalence of obesity and overweight were 6% and 10.9% respectively, whereas thinness contributed 13% and severe thinness 5% (Table 2). The prevalence of stunting was 19.8%. Obesity and overweight were more prevalent in children of educated mothers while thinness, severe thinness and stunting were common in children of illiterate mothers (Table 3, 4). Both over nutrition (Obesity and overweight) and under nutrition (thinness and severe thinness) were high in children of working

mothers which was statistically significant (p value: 0.000) (Table 5, 6). There was no significant association of stunting with mother's occupation (p value: 0.839).

Table 4: Association of thinness and severe thinness with mother's education.

Mother education	Normal	Thinness	Total
Illiterate	18 (37.5)	30 (62.5)	48
Primary/middle school	145 (62.2)	88 (37.8)	233
Higher secondary school	545 (76.9)	164 (23.1)	709
Graduate	662 (87.6)	94 (12.4)	756
Total	1370	376	1746

Numbers inside parenthesis indicate percentage; P=0.000 since p<0.05, there is a significant association between thinness and severe thinness with mother's education.

Table 5: Univariate analysis for obesity and overweight.

	P value	Odds Ratio	95% Confidence interval	
			Lower	Upper
Working mothers	0.0001	2.033	1.457	2.836
TV/Video games >2 hours /day	0.0001	13.282	9.958	17.714
Skipping breakfast > 3 days per week	0.097	1.259	0.959	1.652
Physical activity <60 minutes per day	0.0001	0.346	0.256	0.467

Table 6: Univariate analysis for thinness and severe thinness.

	P value	Odds Ratio	95% Confidence interval	
			Lower	Upper
Working mothers	0.0001	2.121	1.535	2.929
Skipping breakfast >3 days per week	0.000	2.825	2.219	3.597
Physical activity <60 minutes per day	0.689	1.049	0.829	1.328

Children of upper socioeconomic status were obese and overweight (p value-0.0001) whereas children of lower socioeconomic status were more thin (p value-0.0001) and stunted (p value-0.0001). Television time of more than two hours per day (p value-0.0001), physical activity less than 60 minutes a day (p value-0.000) were significantly associated with obesity and overweight (Table 5). Snacking daily lead to obesity and overweight. (p value-0.0001). Children who skipped breakfast more than three days a week were thinner than those who skipped less than three days a week (p value-0.0001) (Table 6).

DISCUSSION

In our study the prevalence of obesity was 6 % and overweight 10.9%. Uma Iyer, et al in Vadodara noted the prevalence of both overweight and obesity as 20.3%.[5] However a higher prevalence was reported in England with overweight and obesity being 23.6% and 9.2% respectively, while a lower prevalence of obesity was noted in Cameroon (1.9%) and China (1.2%).[6]

Total prevalence of both thinness and severe thinness in our study is 18% with thinness being 13% and severe thinness being 5%. Anjum Fazili et al, and Saxena, et al showed a higher prevalence of thinness as 29% and 43.47% respectively when compared to our study.[7,8] Contrary to Indian children, the prevalence of thinness in children around the world was lower as shown by Ponce Cedric Fouejeu Wamba, et al (9.5%), Yan-Ping li, et al (7.4%), Ene-Obong H, et al (13%) in their studies in Cameroon, China and Nigeria respectively.[6,9,10]

Prevalence of stunting in our study was 19.8%. Prevalence of 17.9%, comparable to our study were reported by Chowdhary, et al in West Bengal.[11] Mitra, et al and Anand K, et al observed a higher prevalence while Anjum Fazili, et al reported a lower prevalence of 9.25%.[7,12,13]

The children of graduate mothers were more obese and overweight in our study. However data from NHANES in U.S. revealed children of graduate mothers were less obese.[14] The prevalence of thinness, severe thinness and stunting was high in children of illiterate mothers in our study. It is worth mentioning that, the uneducated mothers in India still have poor knowledge about nutrition and diet of their children and they should be enlightened in this regard. Senbanjo, et al found that among the various influencing factors, association between low maternal education and stunting was highly significant.[15]

We found out that obesity, overweight, thinness and severe thinness were more prevalent in children of working mothers. Anurag Srivatsava, et al showed that children of non-working mothers have better health than children of working mothers.[16] The reason attributed to this difference was that non-working mothers had more time to care for their children than their counterparts.[17] However, there was no significant association between mother's occupation and stunting in our study (p value-0.839).

Children from higher socioeconomic status were more obese and overweight while their counterparts from lower socioeconomic status were more thin and stunted. Studies by Marwaha et al, Wickramasinghe VP et al and Senbanjo et al echoed similar results.[16,18,19] However Ogden CL et al stated that adolescents and children of low income strata were more likely to be overweight and obese than the high income groups.[14]

Children who watched TV and indulge in videogames more than two hours a day were more obese and overweight in our study. Mendoza JA et al presented a similar view.[20] Robinson TN et al opined that reducing the TV time is a promising population based approach to tackle obesity.[21] Children who had the habit of taking snacks and soft drinks between meals daily were more obese than others in our study. Intake of energy dense food and junk food more than thrice a week have been associated with obesity and overweight as observed by Goyal RK et al and Ishaque A et al in their respective studies when compared to the daily intake in our study.[22,23]

A study by Croezen et al on Dutch adolescents found out a positive association between overweight and skipping breakfast.[24] On the contrary, the results in our study showed that the children who skipped breakfast more than three days a week were thinner. This could be attributed to other associated factors like lower socio-economic status and low literacy level of mothers in children of this group. We found no significant association of obesity and overweight with skipping breakfast (p value-0.097). Children who were physically active less than 60 minutes a day were more overweight and obese, as per our study. Similar observations between physical inactivity and weight gain were stressed upon by Kapil U et al and Tremblay et al.[25,26]

Limitations of the study were the information on the dietary and lifestyle habits of the children by parents may be ambiguous.

CONCLUSION

The study highlights the nutritional imbalance among adolescent school children in the semi-urban areas of Southern part of India. Mother's education and socioeconomic status were the two vital factors which serve as a pivot around which the nutritional status of adolescent school children revolve as both affect the prevalence of over nutrition and under nutrition uniformly. Improving female literacy and socioeconomic status will go a long way in curbing malnutrition.

Restriction of television time, avoiding daily snacking between meals, promotion of physical activity will help in reducing obesity in adolescent school children. Regular follow up of at-risk children should be done after dietary and lifestyle modifications.

The importance of routine school health visits is stressed upon to detect malnutrition at the earliest in order to provide early intervention. Promotion of physical education and implementation of school health programmes focusing on adolescent nutrition are recommended.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Selvaraj V, Sangareddi S, Velmurugan L, Muniyappan U, Anitha FS. Nutritional status of adolescent school children in a semi-urban area based on anthropometry. Int J Contemp Pediatr 2016;3:468-72.