

## Study on prevalence of thinness among adolescents in urban set up in western Tamil Nadu

*Dr. N. Kumar<sup>1</sup>, Dr. P. Thiyagarajan<sup>2</sup>, Dr.P. Senthil kumar<sup>3</sup>*

<sup>1</sup>MD, Assistant professor of Pediatrics.

<sup>2</sup>MD, DCH, Assistant professor of Pediatrics

<sup>3</sup>DM, Neonatology Assistant professor of Pediatrics

Coimbatore Medical College Hospital, Coimbatore, Tamil Nadu, India

**Abstract:** This study is aiming to assess the prevalence of thinness among adolescents in urban setup in western Tamil Nadu. As thinness is a common problem in adolescents, we tried to address this vulnerable group needs and to help in alleviating their problem. It is a cross sectional study conducted in urban and semi urban school going children from 11-17 years of age. Both boys and girls included. Anthropometries were measured in all children in these schools belonging to the age group 11-17 years. Thinness is defined as BMI < International Cut offs for age and sex defined to pass through BMI 16, 17, and 18.5 at 18 years and graded as grades 3, 2 and 1 respectively through the ages between 2 and 18 years<sup>1</sup>. The diagnosed cases of thinness were followed with questionnaire containing their age, sex, class, socio demographic profile, including economic class, mother, father occupation, educational status, living area, co morbid diseases etc. A total of 11,520 students (5942 boys and 5578 girls) were taken. The prevalence of thinness among adolescents was 35.5% (boys = 42.7 %; girls = 28.3 %; P = 0.001). Adolescents in 11-13 year old age group (Adjusted Odds ratio (AOR) = 2.36; 95 % CI: 1.22, 4.08), boys (AOR = 3.22; 95 % CI: 1.52, 4.21) and rural residents (AOR = 2.85; 95 % CI: 1.20, 3.94) had significantly higher odds of having severe thinness compared to their counterparts. Furthermore, boys had higher (AOR = 2.04; 95 % CI: 1.19, 3.55) odds of being thin compared to girls. Age-specific overall thinness was found to be highest in 12 years (46.3%) of age. Compared to those 11 to 13 years of age, adolescents in 15 to 17 years of age were (AOR = 0.44; 95 % CI: 0.23, 0.95) less likely to be thin. Prevalence of grades 1, 2 and 3 of thinness was higher among 11, 12 year old students in our study.

**Key words:** Thinness, Prevalence, Adolescent

### INTRODUCTION:

Adolescence is last chance for curbing the consequences of malnutrition and breaking the intergenerational cycle of malnutrition and poor health. Adequate nutrition during adolescence is important for optimal physical and cognitive development and for pregnancy either during adolescence or later life<sup>1</sup>. Early adolescence after the first year is the second critical period of rapid physical growth and changes in body composition, physiology and endocrine function<sup>1</sup>. Achievement of optimum growth during adolescence is of utmost importance in maintaining good health thereafter. Under nutrition among adolescents is a serious health problem in developing countries. Thinness among adolescent girls in low- and middle-income countries has been little studied. Adolescents form vulnerable sector of population 21.4 % of Indian population. Poor nutrition results in short stature and low lean body mass that ultimately leads to lots of health problem in adult life. Early detection of thinness helps in prompt treatment and prevents future complications. The grades of thinness particularly severe thinness should be diagnosed at the earliest.

Generally, childhood under-nutrition is assessed by stunting (low height for age), underweight (low weight for age) or

wasting (low weight for height) following different internationally and regionally recommended standards<sup>2-4</sup>.

Body mass index (BMI) is an inexpensive and non-invasive measure that has been extensively utilized to assess the nutritional status of adults and thinness in adolescents<sup>4</sup>. Low BMI is more strongly correlated with lean mass than fat mass. Very recently, international cut-off for thinness has been developed and classification of thinness is made on the basis of cut-off values for the assessment of public health<sup>1</sup>.

The World Health Organization defines grade 2 thinness in adults as BMI < 17. This same cut off, applied to the six datasets at age 18 years, gave mean BMI close to a z score of -2 and 80% of the median. Thus it matches existing criteria for wasting in children based on weight for height. For each dataset, centile curves were drawn to pass through the cut off of BMI 17 at 18 years. The resulting curves were averaged to provide age and sex specific cut-off points from 2-18 years. Similar cut offs were derived based on BMI 16, 17 and 18.5 at 18 years, together providing definitions of thinness grades 1, 2, and 3 in children and adolescents consistent with the WHO adult definitions<sup>1</sup>. To describe the prevalence of 'graded thinness' in children aged 11, 13 and 15 years in eleven



developed countries and to identify trends in the prevalence of 'thinness' (BMI < 17 kg/m<sup>2</sup> at age 18 years) by age and gender has been taken as reference. The proposed cut-off points should help to provide internationally comparable prevalence rates of thinness in children and adolescent <sup>1</sup>. Overweight: >+1SD (equivalent to BMI 25 kg/m<sup>2</sup> at 19 years) Obesity: >+2SD (equivalent to BMI 30 kg/m<sup>2</sup> at 19 years) Thinness:<-2SD (equivalent to BMI 18.5 kg/m<sup>2</sup> at 18 years). Severe thinness: <-3SD.(equivalent to I 16 kg/m<sup>2</sup> at 18 years).

**MATERIALS AND METHODS:**

It is a cross sectional study conducted in urban and semi urban school going children from 11-17 years of age. Both boys and girls included. Anthropometries were measured in all children in these schools belonging to the age group 11-17 years. BMI is calculated based on the standard formula Wt/Ht <sup>2</sup>. Thinness is defined as BMI < International Cut offs for age and sex defined to pass through BMI 16, 17, and 18.5 at 18 years and graded as grades 3, 2 and 1 respectively through the ages between 2 and 18 years<sup>1</sup>. The diagnosed cases of thinness were followed with questionnaire containing their age, sex, class, socio demographic profile, including economic class, mother, father occupation, educational status, living area, co morbid diseases etc. T-test was employed to evaluate mean weight and height differences between groups. Pearson chi-

square, chi-square trend and Fisher's exact tests were used to explore the crude association of categorical outcome variables and associated factors. Sample size was calculated statistically based on the previous studies. Epi info soft ware 2000 is used for analysis of data.

**RESULTS:**

A total of 11,520 students (5942 boys and 5578 girls) were taken. The prevalence of thinness among adolescents was 35.5% (boys = 42.7 %; girls = 28.3 %; P = 0.001) Adolescents in 11-13 year old age group (Adjusted Odds ratio (AOR)= 2.36; 95 % CI: 1.22, 4.08), boys (AOR = 3.22; 95 % CI: 1.52, 4.21) and rural residents (AOR = 2.85; 95 % CI: 1.20, 3.94 had significantly higher odds of having severe thinness compared to their counterparts. Furthermore, boys had higher (AOR = 2.04; 95 % CI: 1.19, 3.55) odds of being thin compared to girls. Age-specific overall thinness was found to be higher in 11 years (60.83%) of age, Compared to those 11 to 13 years of age, adolescents in 15 to 17 years of age were 53 % (AOR = 0.44; 95 % CI: 0.23, 0.95) less likely to be thin. Prevalence of grades 1, 2 and 3 of thinness was higher among 11-year-old students compared with the 13- and 15-year-olds in our study. The distribution of sample, mean ± SD of BMI and prevalence of thinness are presented in Table 1.

Age-wise subject distribution, BMI mean ± SD and different grades of thinness among adolescents						
Age (Years)	n	BMI (mean ± SD)	Prevalence of different grades of thinness			Overall thinness
			Grade I	Grade II	Grade III	
11	1685	14.27 ± 1.89	156 (09.25)	162 (09.61)	386 (22.90)	704 (41.78)
12	1542	14.88 ± 2.07	186 (12.06)	195 (12.64)	333 (21.59)	714 (46.30)
13	1478	15.51 ± 2.49	165 (11.16)	143 (09.67)	324 (21.92)	632 (42.76)
14	1682	16.37 ± 2.21	107 (06.36)	130 (07.72)	265 (15.75)	502 (29.84)
15	1589	16.79 ± 2.21	182 (11.45)	165 (10.38)	170 (10.69)	517 (32.53)
16	1720	15.56 ± 1.03	132 (07.67)	158 (09.18)	199 (11.56)	489 (28.43)
17	1824	17.25 ± 1.05	225 (12.33)	186 (10.19)	121 (06.63)	532 (29.16)
Total	11520		1153 (10.00)	1139 (09.88)	1798 (15.60)	4090



## DISCUSSION:

There was a consistent increasing trend in mean BMI with age. The overall prevalence of thinness was 35.5%. It was observed that thinness was more prevalent among 11–12 years of age. There was a slight decreasing trend in the rate of thinness from 14 years (29.84%) to 15 years (32.53%) among subjects. This study provides evidence of high prevalence of adolescent thinness in this area. However, these rates were lower than the report of other parts of world<sup>7</sup>. Recently, Mondal and Sen observed the overall thinness level is 67.77% among girls, aged 5–12 years of West Bengal<sup>8</sup>. A noteworthy point is that thinness is common among the early age group of boys in our study.

## CONCLUSION:

### WHAT IS ALREADY KNOWN ON THIS TOPIC?

Malnutrition in children and adolescents is a serious public health concern.

It is better assessed as thinness (low body mass index for age) than as wasting (low weight

for height). There are no suitable thinness cut offs for this age group

### WHAT THIS STUDY ADDS:

Prevalence of thinness among adolescents in western part of Tamil Nadu is 35.5% which is high comparing other part of the world.

Prevalence is more in early adolescent boys

## REFERENCES:

1. Tim J Cole, professor of medical statistics<sup>1</sup>, Katherine M Flegal, senior research scientist<sup>2</sup>, Dasha Nicholls, consultant child and adolescent psychiatrist<sup>3</sup>, Alan A Jackson, professor of human nutrition<sup>4</sup>. Body mass index cut offs to define thinness in children and adolescents: international survey. *BMJ* 2007; doi: <https://doi.org/10.1136/bmj.39238.399444.55> (Published 25 June 2007)
2. WHO. Physical status: the use and interpretation of anthropometry, Geneva: WHO, 1995.
3. Jelliffe DB. The assessment of nutritional status of the community, Geneva: WHO, 1966.
4. WHO- Multicentre Growth Reference Study Group. WHO child growth standards based on length/height, weight and age. *Acta Paediatr.* 2006;(suppl 450):76-85.
5. Ying-xiu Zhang<sup>Email author</sup>, Zhao-xia Wang, Mei Wang, Li Xie, *European Journal of Nutrition*, March 2016, Volume 55, Issue 2, pp 809–813, Prevalence of thinness among children and adolescents in Shandong, China
6. *J Adolesc Health.* 2017 Apr; 60 (4):447-454.e1. doi: 10.1016/j.jadohealth.2016.11.003. Epub 2017 Jan 16. Prevalence of Thinness in Adolescent Girls in Low- and Middle-Income Countries and Associations With Wealth, Food Security, and Inequality. Candler T<sup>1</sup>, Costa S<sup>1</sup>, Heys M<sup>2</sup>, Costello A<sup>3</sup>, Viner RM<sup>4</sup>.
7. *Public Health Nutr.* 2014 Oct;17(10):2207-15. doi: 10.1017/S1368980013002541. Epub 2013 Sep 24. Trends in thinness prevalence among adolescents in ten European countries and the USA (1998-2006): a cross-sectional survey. Lazzeri G<sup>1</sup>, Rossi S<sup>1</sup>, Kelly C<sup>2</sup>, Vereecken C<sup>3</sup>, Ahluwalia N<sup>4</sup>, Giacchi MV<sup>1</sup>.
8. *Arch Public Health.* 2015 Oct 28; 73:44. doi: 10.1186/s13690-015-0093-9. eCollection 2015. Prevalence and factors associated with stunting and thinness among adolescent students in Northern Ethiopia: a comparison to World Health Organization standards. Melaku YA<sup>1</sup>, Zello GA<sup>2</sup>, Gill TK<sup>3</sup>, Adams RJ<sup>3</sup>, Shi Z<sup>3</sup>.
9. Maiti S, Ghosh D, Paul S (2011) Prevalence of thinness among early adolescent in rural school girls of Paschim Medinipur, West Bengal, India. *J Trop Pediatr* 57:496–497
10. Takimoto H, Yoshiike N, Kaneda F, Yoshita K (2004) Thinness among young Japanese women. *Am J Public Health* 94:9–16
11. Misra M, Aggarwal A, Miller KK, Almazan C, Worley M, Soyka LA, Herzog DB, Klibanski A (2004) Effects of anorexia nervosa on clinical, hematologic, biochemical, and bone density parameters in community-dwelling adolescent girls. *Pediatrics* 114:1574–1583
12. Bovet P, Kizirian N, Madeleine G, Blossner M, Chiolerio A (2011) Prevalence of thinness in children



and adolescents in the Seychelles: comparison of two international growth references. *Nutr J* 10:65–70

13. Marques-Vidal P, Ferreira R, Oliveira JM, Paccaud F (2008) Is thinness more prevalent than obesity in Portuguese adolescents? *Clin Nutr* 27:531–536
14. Schönbeck Y, van Dommelen P, HiraSing RA, van Buuren S (2014) Thinness in the era of obesity: trends in children and adolescents in The Netherlands since 1980. *Eur J Public Health*. doi:
15. O’Dea JA, Dibley MJ (2014) Prevalence of obesity, overweight and thinness in Australian children and adolescents by socioeconomic status and ethnic/cultural group in 2006 and 2012. *Int J Public Health* 59:819–828
16. Mak KK, Tan SH (2012) Underweight problems in Asian children and adolescents. *Eur J Pediatr* 171:779–785.
17. Ferrar K, Olds T (2010) Thin adolescents: who are they? What do they do? Socio-demographic and use-of-time characteristics. *Prev Med* 51:253–258
18. The double burden of overweight and thinness among children and adolescents in Shandong China, Zhang, Ying-xiu, Sun, Gui-zhi, *International Journal of Cardiology* 2015.
19. Woodruff BA, Duffield A. Anthropometric assessment of nutritional status in adolescent populations in humanitarian emergencies. *Eur J Clin Nutr* 2002;56:1108-18.
20. Flegal KM, Wei R, Ogden C. Weight-for-stature compared with body mass index-for-age growth charts for the United States from the, Centers for Disease Control and Prevention. *Am J Clin Nutr*, 2002;75:761-6.
21. Leung SSF, Cole TJ, Tse LY, Lau JTF. Body mass index reference curves for Chinese children, *Ann Hum Biol*, 1998;25:169-74.