

The Prevalence of Obesity and Factors Contributing to It in School Going Children between 5-12 Years

Dhanasekhar R.S¹, Kirubakaran S², Thamizharasu P³

¹Post Graduate Student, Department of Paediatrics, Meenakshi Medical College Hospital and Research Institute, Chennai

²Department of Community Medicine, Aarupadai Veedu Medical College & Hospital, Pondicherry.

³Professor, Department of Paediatrics, Aarupadai Veedu Medical College & Hospital, Pondicherry.

Corresponding Author: Kirubakaran S

ABSTRACT

Background Obesity mainly in childhood is becoming a potential risk factor for obesity in adulthood. It is one of the leading causes for all the health which includes cardiovascular diseases, gallbladder disease diabetes mellitus, osteoarthritis, and some sex hormone-sensitive cancers. Overall prevalence of obesity and factors contributing to it in school going children between 5-12 years is therefore essential.

Aims: Our study aimed in assessing the rate of prevalence of overweight and obesity among school age adolescents (11-17 years) residing in north Chennai zone; understand the underlying various factors influencing overweight and obesity and the influence of individual factors in the development of overweight and obesity.

Methodology: A cross sectional and institutional study adopting multistage stratified cluster sampling procedure. This study was done with 4960 school going adolescents of age 5 to 12 years was included in the study carried in the department of paediatrics at a medical college and hospital. Age, sex, BMI, Socioeconomic status, occupation of the father, literacy status of parents, mode of conveyance to school, type and hours of physical activity, hours involved in seeing television or playing video games were assessed in the form of questionnaire.

Results: A total of 4960 adolescents studied 22.1% were overweight and 4.1% were obese. Among them 49% were boys and 51 % were girls. Proportion of overweight was higher among girls than among boys and was statistically significant ($p < 0.05$). Prevalence of overweight girls peak is at age of 9 years (27.9%) compared with boys (21.58%). Obesity is significantly higher among adolescents of higher socio economic status (53.82%); occupation of fathers was either service/business or the others (24.94%); children from semi private schools; and children who consume junk food (30.14%). Similarly incidence of overweight among group – I was higher than those among group – II. The prevalence of overweight was significantly lower among the adolescents who participated in outdoor games than those who not participated ($p < 0.005$).

Discussion and Conclusions: To conclude from this study is that low levels of physical activity, watching television, and consuming junk foods are associated with a higher prevalence of overweight that can be overcome by participation in household activities, regular physical exercise, TV viewing of more than 2 hrs a day and by avoiding outside foods

Key words: Obesity, overweight, adolescent, Socio-economic status.

INTRODUCTION

Obesity is envisaged as foremost stage of non-communicable diseases called

“New World Syndrome” thereby generating a massive socioeconomic and public health burden in poorer countries. [1] Obesity

mainly in childhood is becoming a potential risk factor for obesity in adulthood of which approximately 80% result in obese adults. [2]

During early days in India, under nutrition is widely reported resulting in low rates of childhood obesity, [3] where as in recent years the results are contradictory and the prominent reason behind is the life style modification. This resulted in replacement of outdoor games and other social activities among children. [2-5] According to various studies; the prevalence rate of childhood overweight in India is ranging from 4% to 22%; [4-5] whereas in worldwide it is an estimated as 10% of school going children between 5 and 17 yr of age, are overweight or obese. [6] The most significant consequence of childhood obesity is its persistence into adulthood with all its health risks including cardiovascular diseases and diabetes mellitus etc., which has increased possibility to continue when its onset is in late childhood or teens. [7-8]

When there is excess intake of high calorie foods or insufficient physical activity or both result in overweight and obesity in children and adolescents. [9] Even a relatively smaller increase in body weight, not only with marks obesity, but possess a health risk because of the body fat. [10] Obesity also results in poor physical strength, mental disorders, respiratory problems and diabetes mellitus entry even at the age of early adulthood. [11]

A numerous cross sectional studies in western countries have reported that overweight and obese children are comparatively less physically active than non – obese subjects. Less hours of physically activity, high social economic back ground and dietary transition were found to be major risk factors for childhood obesity. This study will analysis the role of participation in physical activities, partaking in household chores, lesser hour's physical inactivity such as television viewing and playing computer/ video games and consumption of junk food were also studied. Therefore this study was undertaken to estimate the overall prevalence of obesity

and factors contributing to it in school going children between 5-12 years

Aims & Objectives:

The aim of the study is to assess the prevalence of overweight and obesity among school age adolescents (11-17 years) residing in north Chennai zone. This study also aims in accessing the various factors influencing overweight and obesity and the influence of individual factors in the development of overweight and obesity.

MATERIALS & METHODS

It is a cross sectional and institutional study adopting multistage stratified cluster sampling procedure. This study was done with 4960 school going adolescents of age 5 to 12 years was included in the study. Schools belonging to all categories (government, private, semi-private) were included in the study. Children from both sex randomized from random numbers generator. The total number of high and higher secondary schools include were 26. The numbers selected for sampling are 14 which include government schools 5 and private and semi private 9. Children less than 5 years, adolescents more than 12 years and educational institutions catering to disabled children are excluded from the study

This study was carried out from Oct 2016-Oct 2017, in the Department of Paediatrics in a medical college and hospital. The study protocol was approved by the institutional ethics sub-committee (IRB) after which the study was initiated. Informed verbal consent was taken from the patient's parents / guardian before including into the study. The sample size was calculated using prevalence value. Considering the prevalence of obesity of 17 percent reported in earlier studies in 95 percent confidence interval with 20 percent relative precision in 1.2 design effect, the sample size arrived was 4700 to 4750. The formula used is $n = [(z \alpha/2 * \sigma) / e]^2$.

After the approval of institutional ethical review board, consent from the heads of the educational institutions and the

students were selected and oral assent from all the selected adolescents were obtained. A predesigned and pre tested questionnaire was used to interview the students. The data was analyzed using SPSS. Adolescence were categorized into two groups, overweight (≥ 85 th percentile) and non overweight (< 85 th percentile) using age and sex specific percentiles of BMI. Socioeconomic status is calculated based on modified Kuppusamy scale into lower (0-10), lower middle (11- 15), upper middle (16- 25) and upper (> 25). The occupation of the father are categorized into group 1 (service or business), group 2 (others). The literacy status of parents is grouped as group 1 (≥ 8 th standard) and group 2 (< 8 th standard). the mode of conveyance to school is categorized as group 1, those who come by bus, car or two wheeler and group 2, those by bicycle and walking. Physical activity were assessed by participation in household activities, indoor games, outdoor games and those involved in exercises like walking and jogging. Viewing television or playing video games were taken as marker of physical inactivity. Each variable was categorized based on hours of involvement per day/ week. The prevalence of overweight and obesity and 95% confidence interval were calculated according to age, sex, socioeconomic status, type of school and physical activity level. Association was assessed using χ^2 test.

RESULTS

Total numbers of children aged 5 to 12 years were 4960. The children belong to all categories of school. Total number of higher secondary schools include were 26; selected for sampling are 14; government schools 5 and private and semi private 9. All children under went thorough predesigned and pre tested questionnaire. Age, sex, BMI, Socioeconomic status, occupation of the father, literacy status of parents, mode of conveyance to school, type and hours of physical activity, hours involved in seeing television or playing video games were assessed.

A total of 4960 adolescents in the age group of 5 – 12 years, with the mean age of 8 years, were studied. Of these 1085 were overweight and 210 were obese. The overall prevalence of overweight (BMI ≥ 85 th percentile) is 22.1% (95%CI: 21.2, 22.9). The prevalence of overweight among adolescents tends to increase at 9– 10 years of life. The overall prevalence of obesity (BMI ≥ 95 th percentile) is 4.1% (95%CI: 3.9, 4.3) (Shown in table 1).

Approximately 49% were boys and 51 % were girls. The proportion of overweight was higher among girls (24.64%; 95% CI: 22.9, 24.9) than among boys (19.86%; 95% CI: 19.4, 20.8) and the difference found was statistically significant ($p < 0.05$) regarding obesity the difference is same as of overweight (Shown in table 2). Prevalence of overweight among boys tends to rise gradually with highest at the age of 8 years (18.27) (Shown in table 3) and decreased to 21.58% at the age 12 years whereas in girls peak is at age of 9 years (27.9) and decreased to 25.1 at 12 years of age (Shown in table 4).

Table 1: Demographic profile of overweight and obesity on urban adolescents

age	total	Overweight	Obese
5	620	95(15.32)	19(3.06)
6	620	116(18.70)	23(3.70)
7	620	129(20.80)	18(2.90)
8	620	149(24.03)	34(5.48)
9	620	158(25.48)	31(5)
10	620	138(22.25)	24(3.87)
11	620	151(24.35)	29(4.67)
12	620	149(24.03)	32(5.16)
total	4960	1085	210

Table 2: Sex distribution

	overweight	Obese	total
Male	463(19.86)	69(3.19)	2436(49.11)
Female	622(24.64)	141(5.86)	2524(50.88)
total	1085	210	4960

Table 3: Overweight trend in boys

age	total	Overweight	Obese
5	298	49(16.44)	7(2.34)
6	290	64(22.06)	9(3.10)
7	318	57(17.92)	10(3.14)
8	290	53(18.27)	8(2.75)
9	323	56(17.33)	7(2.16)
10	288	61(21.18)	11(3.81)
11	314	55(17.51)	9(2.866)
12	315	68(21.58)	8(2.53)
total	2436	463	69

Table 4: Overweight in girls:

Age	total	Overweight	Obese
5	286	54(18.88)	15(5.24)
6	310	76(24.51)	21(6.77)
7	348	72(20.68)	10(2.84)
8	290	87(30)	11(3.79)
9	346	84(24.27)	22(6.35)
10	310	92(29.67)	27(8.70)
11	309	89(28.80)	16(5.17)
12	325	108(33.31)	19(5.84)
Total	2524	622	141

Understanding the association between overweight/obese and role of socio economic status, 24% of sample belongs to lower socio-economic class and lower middle, upper middle and upper is represented by 34, 26, 17 % respectively. It is significantly higher among adolescents of higher socio economic status (53.82%) compared to those with lower socio economic status (4.98%) (Shown in table 5). The major occupation of fathers was either service/business or the others forms. We have found that the prevalence of overweight (24.94%) was higher among adolescences whose parents' occupation was service or business than others. Regarding literacy status of parents, those adolescents whose parents have studied 5th standard and above were found to be less overweight (shown in table 6).

Table 5: Association with Socio Economic Factors

Class	total	overweight	Obese
Lower	1163(24)	58(4.98)	10(0.86)
Lower middle	1662(34)	242(14.56)	46(2.76)
Upper middle	1286(26)	328(25.50)	60(4.66)
upper	849(17)	457(53.82)	94(11.07)
total	4960	1085	210

Table 6: Literacy Status

literacy	Total	overweight	Obese
<10	2432	787(32.36)	163(6.7)
>=10	2528	298(1179)	47(1.86)
total	4960	1085	210

Of the 14 schools sampled, 5 belong to government sector and 9 from private and semi-private groups. Generally adolescence from governments schools cater from lower socio economic status, whereas middle class caters semi-private schools and upper class represents private schools. The prevalence of overweight among the adolescence studying in private including semi private is significantly higher among those in government schools (shown in table 7).

Table 7: Type of school:

Type of school	Total	Overweight	Obese
Government	1850	375(20.27)	80(4.32)
private	3110	710(22.83)	130(4.18)
total	4960	1085	210

Table 8: Junk foods total overweight Obese:

Junk foods	Total	overweight	Obese
Like	2920	880(30.14)	173(5.92)
dislike	2040	205(10.04)	37(1.81)
total	4960	1085	210

Approximately 60% of adolescents preferred to consume junk food because they are their favourite dishes. 880 children of those who consume junk food were overweight, with the prevalence being 30.14%. Among those who don't consume junk food 205 were overweight. The prevalence found in this variable is statistically significant schools (shown in table 8). Similarly Prevalence of overweight among group – I (those come by car, bus, and motorcycle) was significantly higher than those among group – II (by bicycle and walking).

About two third adolescents participating in house hold chores, whereas 99% reported watching television on school days. About two- fifth of adolescents did not participate in outdoor games whereas 38% were participating in outdoor games more than 6 hours per week. The prevalence of overweight was significantly lower among the adolescents who participated in outdoor games than those who not participated ($p < 0.005$). It was also significantly higher among the adolescents who did not perform any household chores. Similarly, overweight and obesity was significantly higher in who were not involved in physical activities like walking, cycling and jogging. The prevalence of overweight among adolescents who were sedentary, watching television more than three hours per day was also significantly higher compared to those who watch 0 or less than 3 hours. This analysis revealed risk of overweight was 10 times higher among adolescents of high socioeconomic status, 2.3 times higher among who were participating in <6 hours per week in outdoor games, 3.8 times higher who were not participating in household

activities, 9 times higher among those who were watching television more than 3 hours per day (Shown in figure 1)

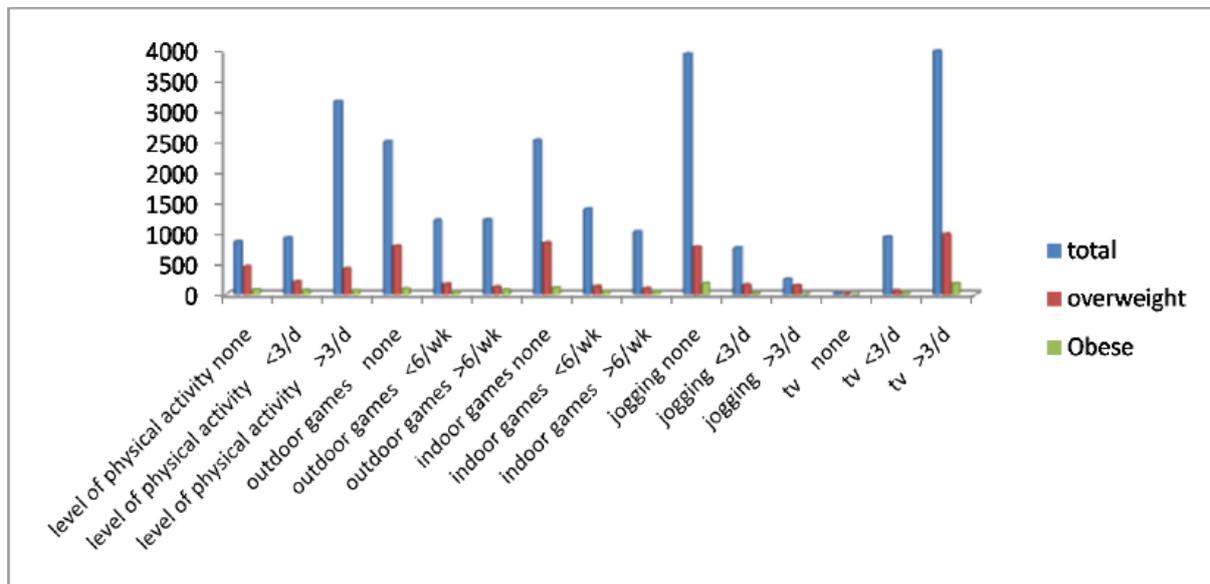


Figure 1: ROLE OF PHYSICAL ACTIVITY

DISCUSSION

Obesity is a global nutritional concern. This study showed that the overall incidence of obesity is high in urban Chennai. Among 4960 adolescents in the age group of 5 – 12 years included in the study, 1085 were overweight and 210 were obese. Overall prevalence of overweight is 22.1%; prevalence of obesity is 4.1%. This results correlates with other studies carried out by Baby S Nayak *et al.*, 2011, [12] Laxmaiah *et al.*, 2007, [13] Dietz W H 2004. [14]

The proportion of overweight was higher among girls (24.64%) than among boys (19.86%) and the difference found was statistically significant ($p < 0.05$) regarding obesity the difference is same as of overweight. Our study also showed a higher prevalence rate of overweight/obesity among girls, as did a previous study done in Chennai. [15,16] There is a higher degree of influence among gender and adolescence on obesity can be featured to hormonal changes at puberty and the development of secondary sexual characteristics which result accumulation and redistribution of fat. It has been reported that the number of fat cells amplify during periods of rapid growth up to 16 years after which fat ordinarily

accumulates by increasing size of fat cells already present. [17-20]

The present study documented that the prevalence of overweight and obesity was higher in the higher socio economic status (53.82%) compared to those with lower socio economic status (4.98%). These results show consistency with results from other Indian studies. [16,21,22] Combined influences of socioeconomic status, lifestyle and chronological age with a high incidence of obesity among adolescents as seen in our study have also been reported earlier. [23,24] The prevalence was also seem to be increasing in our city as the previous studies shows about 17 % were obese in the year 2002 studied by Ramachandran *et al* group in Chennai. [25]

There is a positive co-relationship between overweight and obesity with the consumption of unhealthy foods. Approximately 60% of adolescents preferred to consume junk food because they are their favourite dishes. Children of those who consume junk food were overweight, with the prevalence being 30.14%. The prevalence found in this variable is statistically significant. Our results correlates with the study carried out by Keerthan Kumar *et al.*, 2011. [26]

Prevalence of overweight among group – I (those come by car, bus, and motorcycle) was significantly higher (31.42%) than those among group – II (by bicycle and walking) (6.72). Similarly the percentages of children who are under obese category are higher in group – I (5.49%) compared to group – I (2.43%). Similar findings were reported by Laxmaiah *et al.*, [27] the prevalence of overweight was significantly lower ($p>0.05$) among adolescents who either walked to school or came on bicycle than among the adolescents who used vehicular transport such as motorcycles or cars. Similarly, Goyal *et al.*, [28] reported that 7.6% students go to school by walking/ bicycle whereas 92.4% use auto/bus. The prevalence of overweight was significantly lower among the adolescents who participated in outdoor games than those who not participated ($p<0.005$). Klesges *et al.*, [29] also reported the effect of watching television on metabolic rate and overweight and obesity in children. In urban areas, considering the safety of keeping children away from heavy traffic, parents feel more comfortable if their children play indoor games or watch television and, therefore, do not encourage them to participate in outdoor sports and games. [30]

CONCLUSION

The major conclusion drawn from this study is that low levels of physical activity, watching television, and consuming junk foods are associated with a higher prevalence of overweight. Thus, participation in household activities and regular physical exercise could help in lowering the prevalence of overweight. TV viewing of more than 2 hrs a day, is a reported major culprit for childhood obesity, parents and teachers should be advised to engage children in outdoor games and healthy activities. Children carrying having home cooked foods, tend to be leaner and hence healthier, as they refrain from eating unhealthy food from out. Hence parents should be advised to take a genuine effort to play a major role in their children's health.

Elders-parents and teachers are recommended to educate children about the ill effects of aerated drinks and energy dense food. There is an urgent need to educate the urban community on the aspects of healthy food habits and desired lifestyles to prevent overweight/obesity and its associated ill effects.

Financial support: NIL

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Submission declaration: This submission has not been published anywhere previously and that it is not simultaneously being considered for any other publication.

REFERENCES

1. Singh M, Sharma M. Risk factor for obesity in children. *Indian Paediatr* 2005;; 183-5.
2. World Health Organization. *Obesity: preventing and managing the global epidemic. Technical Report Series No. 894*, Geneva: WHO; 2000.
3. Wong JPS, Ho SY, Lai MK, Leung GM, Stewart SM, Lam TH. Overweight, obesity, weight-related concerns and behaviours in Hong Kong Chinese Children and dolescents. *Acta Paediatr* 2005; 94 : 595-601
4. Vohra R, Bhardwaj P, Srivastava JP, Srivastava S, Vohra A. Overweight and obesity among school-going children of Lucknow city. *J Family Community Med.* 2011;18:59-62.
5. Gupta DK, Shah P, Misra A, Bharadwaj S, Gulati S, Gupta N, *et al.* Secular trends in prevalence of overweight and obesity from 2006 to 2009 in urban Asian Indian adolescents aged 14-17 years. *PLoS One.* 2011;6:e17221.
6. Mossberg HO. 40 year's follow-up of overweight children. *Lancet* 1989; 2 : 491-3.
7. Whitaker CR, Dietz WH. Role of the prenatal environment in the development of obesity. *J Pediatr* 1998; 132 : 768-76
8. Must A, Jacques PF, Dallal GE, Bagsma CJ, Dietz WH. Longterm morbidity and mortality of overweight adolescents: a

- follow-up of the Harvard follow-up of the Harvard growth study of 1922 to 1935. *N Engl J Med* 1992; 327: 1350-5.
9. Ranjani H, Mehreen TS, Pradeepa R, et al. Epidemiology of childhood overweight & obesity in India: A systematic review. *The Indian Journal of Medical Research*. 2016;143(2):160-174. doi:10.4103/0971-5916.180203.
 10. D.R. Bharati, P.R. Deshmukh & B.S. Garg. Correlates of overweight & obesity among school going children of Wardha city, Central India. *Indian J Med Res* 127, June 2008, pp 539-543.
 11. Centers for Disease Control and Prevention (CDC), Fact sheets. [accessed on July 15, 2017]. <http://www.cdc.gov/healthyouth/obesity/facts.htm>.
 12. Baby S Nayak, H. VinodBhat. Prevalence of Overweight / Obesity among School Children In Karnataka, South India. *International Journal of Public Health Research Special Issue* 2011, pp (180-184).
 13. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M, Factors Affecting Prevalence of Overweight Among 12 to 17 year old Urban Adolescents in Hyderabad, India. *OBESITY*. June 2007; 15(6):1384-1390.
 14. Dietz W H. Overweight in childhood and adolescence. *N. Engl J Med* 2004; 350:855-857.
 15. Jagadesan S, Harish R, Miranda P, Unnikrishnan R, Anjana RM, Mohan V. Prevalence of overweight and obesity among school children and adolescents in Chennai. *Indian Pediatr*. 2014; 51:544-9
 16. Shabana T, Vijay V. Impact of socioeconomic status on prevalence of overweight and obesity among children and adolescents in urban India. *The Open Obesity Journal*. 2009; 1: 9-14.
 17. Christine M, Christopher R. Obesity and the pubertal transition in girls and boys. *Reproduction*. 2010; 140: 399-410.
 18. Marwaha R, Tandon N, Singh Y, Aggarwala R, Grewal K& Mani K. A study of growth parameters and prevalence of overweight and obesity in school children from Delhi. *Indian Pediatrics*.2006; 43: 943-951.
 19. Chhatwal J, Verma M & Riar SK Obesity among pre-adolescent and adolescents of a developing country (India). *Asia Pac J Clin Nutr* 2004; 13 (3):231-235.
 20. Raj M, Sundaram K R, Paul M, Deepa AS, Kumar R K Obesity in Indian children: Time trends and relationship with hypertension. *The national medical Journal of India*. 2007; 20(6): 288-293.
 21. Marwaha RK, Tandon N, Singh Y, et al. A study of growth parameters and prevalence of overweight and obesity in school children from Delhi. *Indian Pediatr* 2006; 43(11): 943-52.
 22. Kaur S, Kapil U. Prevalence of overweight and obesity in school children in Delhi. *Indian Pediatr* 2008; 45: 330-331.
 23. Ramachandran A, Snehalatha C, Vinitha R, Thayyil M, Kumar CK, Sheeba L, et al. Prevalence of overweight in urban Indian adolescent school children. *Diabetes Res Clin Pract*. 2002; 57: 185-90.
 24. Goyal RK, Shah VN, Saboo BD, Phatak SR, Shah NN, Gohel MC, et al. Prevalence of overweight and obesity in Indian adolescent school going children: its relationship with socioeconomic status and associated lifestyle factors. *J Assoc Physicians India*. 2010; 58:151-8.
 25. Ramachandran A, Snehalatha C, Vinitha R, et al. Prevalence of overweight in urban Indian adolescent school children, *Diabetes Res Clin Pract*, 2002, vol. 57, 185-90.
 26. Keerthan Kumar M., Prashanth K., Kavya Elizabeth Baby, Kavya Rashmi Rao, et al. Prevalence Of Obesity Among High School Children In Dakshina Kannada And Udupi Districts. *NUJHS Vol. I, No.4, December 2011, 16-20.*
 27. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M. Factors affecting prevalence of overweight among 12- to 17-year-old urban adolescents in Hyderabad, India. *Obesity (Silver Spring)*.2007;15(6):1384-90.
 28. Goyal JP, Kumar PN, Indira P, Vijay SB, Patel PB. Determinants of overweight and obesity in affluent adolescent in Surat city, South Gujarat

- region, India. *Indian J Community Med* 2011;36 (4):296–300.
29. Klesges, R. C., Shelton, M. L., Klesges, LM. (1993) Effects of television on metabolic rate: potential implications for childhood obesity. *Pediatrics* 91: 281– 286.
30. Subramanyam V, Jayashree R, Raft M. Prevalence of overweight and obesity in affluent adolescent girls in Chennai in 1981 and 1998. *Indian Pediatr* 2003; 40: 332-336.

How to cite this article: Dhanasekhar RS, Kirubakaran S, Thamizharasu P. The prevalence of obesity and factors contributing to it in school going children between 5-12 years. *Int J Health Sci Res.* 2017; 7(10):6-13.
