



International Journal of Home Science

ISSN: 2395-7476
IJHS 2017; 3(3): 90-96
© 2017 IJHS
www.homesciencejournal.com
Received: 17-07-2017
Accepted: 18-08-2017

Dr. Shilpa Deshpande
Asst Prof. Home Science,
Chishtiya College of Arts,
Khultabad, Aurangabad,
Maharashtra, India

Socio-demographic aspects and adolescent obesity

Dr. Shilpa Deshpande

Abstract

Adolescents comprise about 20 percent of the global population of which 80 percent lives in the developing countries. Adolescence is a period of rapid growth and development as 80 percent of growth is completed in early adolescence. At the same time it is a high risk period for weight gain. Considering this fact many researchers are now focusing on issues related to overnutrition in adolescence. The magnitude of the problem among children and adolescents in India is unclear due to paucity of well-conducted nationwide studies and lack of uniformity in the cut-points used to define childhood overweight and obesity. Maharashtra is economically advanced state in the country. Present study was conducted to know prevalence of overweight and obesity in Aurangabad school children and socio demographic factors associated with it. Birth order, standard, religion, family member count, medium of education, father's education, mother's occupation, parental obesity, family residence, s.e.s. found to be statistically significant factors.

Keywords: BMI, adolescent, obesity, socio –demographic aspects

Introduction

Although world hunger remains a significant problem, a recent report from the World Health Organization says that more people die now worldwide from being overweight and obese than from being underweight. WHO has described obesity as one of today's most neglected public health problem. Following the increase in adult obesity, the proportion of children and adolescents who are overweight and obese also has been increasing.

WHO projection for 2015 estimates that over 1.5 billion people will be overweight, of which children are expected to constitute about 10%. An overweight adolescent has a 70% chance of becoming obese (Sharma *et al.*, 2007) ^[17]. Overweight and obesity during adolescence increases the risk for the development of non-communicable diseases and predisposes the individual to the development of other disorders in adulthood.

Globally, a sharp rise in the incidence of obesity has been noticed in last three decades. It has not only involved developed countries but also developing countries. It is estimated that 170 million children under the age of 18 years are overweight (WHO, 2014). Obesity in adolescents is gradually becoming a major public health problem in India. Nutrition transition and shifting to sedentary life style is likely to be important precursors of overweight and obesity among adolescents. In India no significant gender difference for obesity prevalence was seen among the children from a less privileged background, however, among children from affluent families significantly more boys were obese as compared to girls. Obesity in children and adolescents in most developing countries is a problem of urban children of a higher socio-economic class where as in developed countries children of lower socio-economic group show higher prevalence of obesity. Transport facilities, medical care, food habits, educational status all these living conditions had dramatically improved with increased socio-economic status (SES) in India. Overweight and obesity are largely preventable. Supportive policies, environments, schools and communities are fundamental in shaping parent's and children's choices, making the healthier choice of foods and regular physical activity the easiest choice (accessible, available and affordable), and therefore preventing obesity.

Keeping in mind the increasing trend of obesity in school children, present study was conducted in order to understand seriousness of obesity in school children of Aurangabad city (M.S.).

Correspondence

Dr. Shilpa Deshpande
Asst Prof. Home Science,
Chishtiya College of Arts,
Khultabad, Aurangabad,
Maharashtra, India

2. Materials and methods

The present investigation was carried out in Aurangabad city, Maharashtra, India. Aurangabad city is historical place and is capital of Marathwada region of Maharashtra, India. It is also gaining importance as it is becoming education hub. For present study, sample size was estimated at 5% level of significance with an allowable error of 20% using formula $n=4pq/l$. A previous studies recorded 7% prevalence anticipated prevalence was also considered same. Finally 6000 school children were selected as study sample from 12 govt. And 12 private schools of Aurangabad city. Children of 10 to 15 years were selected randomly from schools.

Schedules were prepared to collect data on socio demographic aspects. Anthropometric measurements were taken to determine weight status of selected children by using standard procedures. BMI status was determined by using specific charts published by CDC-2000. Statistical analysis was carried out to know odd ratio and chi square value. Total 518 overweight/obese school children were considered as experimental group where assume number of children matching with age and gender were selected as control group.

3. Result and discussion

Table 1: Distribution of school children as per BMI (n=6000)

Sr. No.	BMI	Weight Category	No. of students	Percentage
1.	$\leq 5^{\text{th}}$ Percentile	Underweight	1491	24.85
2.	5 th to 85 th Percentile	Normal Weight	3909	65.15
3.	85 th to 95 th Percentile	Overweight	420	7.00
4.	$\geq 95^{\text{th}}$ Percentile	Obese	180	3.00

Table explains distribution of children as per Body Mass Index (BMI). BMI classification as per CDC-2000 was used to determine weight category. Out of 6000 children, 3909 (65.15%) children were normal weight, 1491 (24.85%) were underweight, 420 (7%) were overweight and 180 (3%) were obese. The prevalence rate of overweight was 7% and obesity

was 3%. Combined prevalence of overweight and obesity was 10% in present study Dhole and Mundada (2013) [5] mentioned prevalence rate of overweight as 7.5 percent and obesity as 6.3 percent from same city. Thakre *et al.*, (2011) also reported 14.52% prevalence for overweight/ obesity in Nagpur children.

Table 2: Association of socio-demographic aspects of students with overweight/obesity.

Sr. No.	Variables	Experimental group (n=518)	Control group (n=518)	Chi-square value	P-value
1	Birth order 1 st 2 nd 3 rd >3 rd	206 (39.76)	215 (41.50)	28.052	0.000 S
		160 (30.88)	206 (39.76)		
		75 (14.47)	68 (13.12)		
		77 (14.86)	29 (5.59)		
2	Standard 5 th 6 th 7 th 8 th 9 th 10 th	66 (12.74)	41 (7.91)	15.658	0.028 S
		87 (16.79)	75 (14.47)		
		96 (18.53)	93 (17.95)		
		113 (21.81)	132 (25.48)		
		86 (16.60)	118 (22.77)		
3.	Religion Hindu Muslim Christian Buddha Sikh Jain	300 (57.91)	373 (72.00)	41.259	0.028 S
		67 (12.93)	58 (11.19)		
		36 (6.94)	67 (12.93)		
		77 (14.86)	16 (3.08)		
		26 (5.0)	02 (0.38)		
4.	Type of family Joint Nuclear	257 (49.61)	245 (47.29)	1.514	0.469 NS
		261 (50.38)	273 (52.70)		
5.	Family member <4 Count 4-6 >6	125 (24.13)	158 (30.50)	11.440	0.003 S
		284 (54.82)	288 (55.59)		
		109 (21.04)	72 (13.89)		
6.	Type of Govt. School Private	175 (33.78)	234 (45.17)	14.063	0.000 S
		343 (66.21)	284 (54.82)		
7.	Medium of English Education Semi. Eng Marathi Hindi Urdu	201 (38.80)	95 (18.33)	105.631	0.000 S
		178 (34.36)	264 (50.96)		
		101 (19.49)	159 (30.69)		
		35 (6.75)	0 (0.0)		
		03 (0.57)	0 (0.0)		

Figures in parenthesis indicate percentage.

NS = Not Significant, S = Significant at probable value 0.05.

Association of socio-demographic aspects of students with their overweight and obesity was shown as follows.

Birth order

The data explains that 39.76% and 30.88% children from

experimental group were first and second born while 14.47% were third born and 14.86% had birth order more than three.

In control group 41.5% were first born, 39.76% were second born, 13.12% were third born and 5.59% with birth order more than third. This indicated that maximum percentage of overweight and obese children were first and second born child. It was also clear from data that birth order of a child is significantly associated with risk of being overweight and obese ($X^2 = 28.05$, $P=0.000$). A study from Dhaka (Ferdousi and Alamgir, 2011) [6] showed that the order of birth of the student in family was found significant ($p<0.05$) having more prevalence of overweight among the first child (56.76% v/s 51.52%).

Standard

From the selected children maximum students were from 8th standard in both groups i.e. 21.81% in experimental and 25.48% in control group. Fifth and tenth standard students were comparatively less in both groups. Prevalence of overweight and obesity was found to be highest in 8th standard children followed by 7th, 6th, 9th and 10th standard children. There was a significant association between standard and overweight/obesity in studied sample ($p=0.028$).

Goyal *et al.* (2010) showed an increase in prevalence of overweight and obesity occurred at the age of 12 years and decreasing with age, which indicates that, children at age of 12 yrs are at high risk while students at the age of 17 yrs are at lower risk of overweight or obesity.

Religion

A highly significant association was observed between religion and overweight/obesity in children ($p=0.028$). 57.91% Hindu, 14.86% Buddha and 12.93% Muslim children were overweight and obese. Comparatively very low percentage of children from Sikh (5.0) and Jain (2.31) religion were found to be overweight and obese. In control group there were total 72% children from Hindu, 11.19% from Muslim, 12.93% from Christian, 3.08% from Buddha religion, only 0.38% were from Sikh and Jain religion. The higher percent of overweight and obesity in Hindu children was observed in this study. It may be due to enrolment of more number of children from Hindu religion as compared to other religions.

Type of Family

A family environment is considered as important factor influencing obesity in children by many researchers. When family type and its association with overweight and obesity in children was observed, for present study it was statistically not significant ($p=0.469$).

It was recorded that number of overweight and obese children was slightly more in nuclear families than joint families. Worldwide, India is famous for joint family system but now-a-days most of the Indians prefer nuclear family. Parents and one or two children with them is known as nuclear family. In nuclear family, parents are busy and unable to provide proper attention towards child's food needs. Mostly they choose ready-to-eat food items, take-away foods and eating out frequently becomes regular habit. In nuclear family system,

parents and children get sufficient time and money to spend on food. This may be the reason behind this trend. Lawhale (2014) [11] found that nuclear family is an influencing factor for overweight and obesity when studied 1000 school children from Aurangabad city (M.S.).

Family member count

The table explains a significant association of overweight and obesity with family member count ($p=0.003$). Prevalence of overweight and obesity was found maximum (54.82%) with family member count 4-6, followed by 24.13% with family member count <4 and 21.04% with family member count >6. From control group, there were 55.59% children with family member count 4-6, 30.5% with <4, 13.89% with >6. In present study, higher prevalence of overweight and obesity in families with 4-6 members may be due to food habits and better economic condition of family. Ng. M *et al.* (2014) also observed a small family size was significantly associated with overweight and obesity and stated that individuals who were within small family might live in good economic conditions, which create opportunity to secure the household family security as they needed.

School Type

From the table, it is evident that, a highly significant association of overweight and obesity in children with school type exist ($x^2 = 14.063$, $p = 0.000$). Number of overweight and obese children in private school i.e. (66.21%) were nearly double than number of overweight and obese children from government school i.e. (33.78%). This indicated that prevalence of overweight and obesity was greater in private schools than government schools. The possible explanation for this may be that students in private schools come from high socio-economic status family with better living conditions. In addition to this, private schools use bus service to transport their students, giving less chance for physical activity. Srikant *et al.* (2011) [15] studied 2404 children from Bangalore and observed majority of obese children were from private schools and non-obese from government schools. The difference between two groups was highly significant.

Medium of Education

The results of the present study also showed that children from English medium schools were more overweight and obese than other medium schools. Association of overweight and obesity to medium of education was statistically significant ($x^2 = 105.631$, $p = 0.000$).

In Aurangabad city (M.S.) most of the private schools are providing English and semi-English as medium of education due to the tendency of parents to educate their child in English medium school. English being worldwide accepted language preferences for regional languages like Marathi, Hindi, and Urdu were found lower comparatively. Mandal and Mandal (2012) [13] recorded higher prevalence of overweight (28.5%) and obesity (4.2%) in urban English medium school girls of Kolkata, India.

Table 3: Association of socio-demographic aspects of parents with children overweight and obesity.

Sr. No.	Variables	Experimental group (n=518)	Control group (n=518)	Chi-square value	P-value
1	Father's Illiterate	0 (0.00)	1 (0.19)	15.381	0.009 S
	Education Middle School	45 (8.68)	69 (13.32)		
	High School	121 (23.35)	86 (16.60)		
	Graduate	130 (25.09)	156 (30.11)		
	Post Graduate	132 (25.48)	129 (24.90)		

	Prof. Degree	90 (17.37)	77 (14.86)		
2	Mother's Illiterate	0 (0.00)	2 (0.38)	5.711	0.335 NS
	Education Middle School	85 (16.40)	97 (18.72)		
	High School	149 (28.76)	125 (24.13)		
	Graduate	158 (30.50)	165 (31.85)		
	Post Graduate	100 (19.30)	97 (18.72)		
	Prof. Degree	32 (6.17)	26 (5.01)		
3	Father's Unemployed	03 (0.57)	4 (0.77)	8.238	0.144 NS
	Occupation Agriculture	56 (10.81)	48 (9.28)		
	Govt. service	139 (26.83)	117 (22.58)		
	Private Service	198 (38.22)	235 (45.36)		
	Business	122 (23.55)	112 (21.62)		
4	Mother's Agriculture	24 (4.63)	24 (4.60)	41.588	0.000 S
	Occupation Govt. service	37 (7.14)	36 (6.94)		
	Private Service	83 (16.02)	102 (19.69)		
	Business	58 (11.19)	127 (24.51)		
	Housewives	316 (61.00)	229 (44.20)		
5	Paternal Present	147 (28.37)	45 (8.68)	69.645	0.000 S
	Obesity Absent	371 (71.62)	472 (91.11)		
6	Maternal Present	127 (24.51)	69 (13.32)	21.546	0.000 S
	Obesity Absent	391 (75.48)	449 (86.67)		
7	Family Elite	56 (10.81)	58 (11.19)	41.833	0.000 S
	Residence U.M. Class	143 (27.60)	106 (20.46)		
	M. Class	196 (37.83)	148 (28.57)		
	L.M. Class	109 (21.04)	158 (30.50)		
	Slum	14 (2.70)	48 (9.26)		
8	Family <5000	32 (6.17)	46 (8.88)	33.665	0.000 S
	Monthly 5000-15000	109 (21.04)	163 (31.46)		
	Income 15000-30000	138 (26.64)	156 (30.11)		
	(Rs.) 30000-45000	132 (25.48)	79 (15.25)		
	>45000	107 (20.65)	74 (14.28)		
9	S.E.S. U. Class	93 (17.95)	60 (11.58)	12.712	0.013 S
	U.M. Class	112 (21.62)	103 (19.88)		
	L.M. Class	164 (31.66)	164 (31.66)		
	U.L. Class	112 (21.62)	142 (27.41)		
	L. Class	37 (7.14)	49 (9.45)		

Figures in parenthesis indicate percentage

NS – Not Significant, S = Significant at probable value 0.05.

U – Upper, U.M. – upper Middle, L.M. - Lower Middle, U.L. – Upper Lower and L – Lower.

Table describes association of socio-demographic aspects of parents with child's overweight and obesity in both experimental and control group. Identification of socio-demographic variables may be particularly useful in targeting and preventing efforts against the development of obesity. Socio-demographic characteristics are to be considered as a major cause of obesity as these characteristics promote a sedentary life-style and an increased consumption of energy dense foods.

Father's Education

Education is one of the important parameter deciding socio-economic status of an individual. It raises standard of living as gives chances to earn money, and used as a key tool to teach healthier life-style to parents and children. Considering this fact educational status of parents was studied.

A significant association was recorded between father's education and overweight/obesity status of children in present study ($p=0.009$) ($\chi^2=15.381$). Result from this table also state that problem of overweight and obesity was more in children whose fathers were graduate and post-graduate. High educational status provides better employment opportunities resulting in high SES may be the reason behind this. Shree and Parvathi (2014) [16] said higher education of father had significant impact on the increased BMI ($p=0.003$)

Mother's Education

Association of mother's education to overweight obesity in children was found to be non-significant in present study

($p=0.335$)

Overweight and obesity was high in children whose mothers were graduate and education till high school level. Similar observations were given by many researchers. Bhuiyan *et al.* (2013) [2] observed that mothers of overweight and obese children were more educated than mothers of healthy children, although the association was not significant.

Father's Occupation

Occupation of parents plays an important role in overall development of family. In 21st century, it is need of the hour that both parents are forced to earn money. In this study, we found highly significant association between mother's occupation and overweight/obesity in children but in case of father's occupation and overweight/obesity in children it was non-significant.

The higher percentage of overweight and obesity found in children with father's occupation as government service, private service and business may be due to the raised economic and educational status forcing them to adopt westernised life style. Ramchandran (2002) [14] also reported that prevalence of overweight and obesity increased with better occupation of father.

Mother's Occupation

In present study, a highly significant association was seen between mother's occupation and child's overweight/obesity status. Maximum children were overweight or obese whose mothers were housewives (61%). Mothers who were

housewives were having lot of free time to plan and prepare nutritious and healthy meals for their children. They can provide variety of recipes to their children at the same time they did not expect their children to do household work as they have sufficient time to do it. This may be the reason for increased percentage of overweight and obesity in children whose mothers were housewives. Lawhale (2014) ^[11] when studied Aurangabad children she also found similar results.

Paternal and Maternal Obesity

Heredity plays an important role in development of obesity due to shared genes. Considering this, association of parental obesity to children's overweight and obesity was studied in present study. Results revealed that a statistically significant association exist between paternal and maternal obesity to child's overweight and obesity ($p=0.000$). Hormis and D'silva, 2012 ^[9]; Lawhale, 2014 ^[11] and Gaikwad, 2014 also focused that parental or familial obesity as a well-recognized risk factor for childhood obesity.

Family Residence

A highly significant association was found between family residence and overweight/obesity among children. Bhave *et al.* (2004) ^[1] found in their study that at least one in every ten urban middle class children was overweight. It is well documented that high income neighbourhoods have more supermarkets, more small grocery stores and higher per capita fast food establishments. Children living in this area are habituated to purchase food items from these outlets and are at higher risk of developing obesity. Mahajan *et al.* (2011) ^[12]

also suggested area of residence is an important contributor towards child's overweight and obesity.

Family Monthly Income

The studies related to obesity indicated that family income is one of the influential factors in development of obesity. In present study association between monthly income and overweight/obesity in children was found to be significant ($p=0.000$). Hormis and D'silva (2012) ^[9] found a significant association between occurrence of obesity and family income. The increased income has direct impact on food habits and sedentary life styles. There is tendency of consumption of variety of foods which are rich in fats and sugar with raised income level. Available money is also spent on increased use of motor vehicles, technology in home and more passive leisure activities along with decreased physical activity. All these things in turn are reflected in weight gain.

Socio-economic Status

The socio-economic status of parents showed a significant association with overweight and obesity in children. The prevalence of overweight and obesity was highest in lower middle class as compared to other classes. It was observed that regardless of socio-economic status (SES) there is tendency to spend money on food and clothing. SES also influences food choices and dietary habits; this may be the reason for above findings in present study.

Risk factors associated with overweight and obesity in children

Table 4: Risk factors of overweight and obesity in children

SR.NO.	Risk Factors	Experimental group (n=518)	Control group (n=518)	Odds Ratio	95% CI
A)	Socio-demographic aspects				
1)	Type of family Joint	257	245	1	-
	Nuclear	261	273	0.91	0.71-1.16
2)	Type of school Govt.	175	234	1	-
	Private	343	284	1.96	1.26-2.08
3)	Mother's occupation				
	Agri.	24	24	1.37	0.76-2.49
	Govt. Service	37	36	1.34	0.82-2.19
	Private Service	83	102	1.69	1.21-2.73
	Business	58	127	3.02	2.12-4.31
	Housewives	316	229	1	--
4)	Paternal obesity				
	Present	147	45	4.15	2.89-5.96
	Absent	371	472	1	-
5)	Maternal obesity				
	Present	127	69	2.11	1.53-2.91
	Absent	391	449	1	-
6)	S.E.S. U. class	93	60	2.05	1.20-3.50
	U.M. Class	112	103	1.44	0.87-2.58
	L.M. Class	164	164	1.32	0.82-2.14
	U.L. Class	112	142	1.04	0.64-1.71
	L. Class	37	49	1	--

Type of Family

On applying odds ratio it was found that risk of overweight and obesity was 0.91 times lower in nuclear family than joint family (95% CI = 0.71-1.16). A study conducted at Amritsar city also revealed that preschool children living in nuclear families had higher chances of development of obesity than living in joint family (OR=1.8, 95% CI=1.2-2.6).

School Type

School type appears to play a role on BMI. In present study,

the prevalence of overweight and obesity was high in private schools than government schools. The risk of becoming overweight and obese was 1.96 times more in private schools than government schools (OR=1.96, 95% CI = 1.26-2.08).

High economic status, freedom given to children and sedentary life style are supposed to be the reasons for higher rates of overweight and obesity in private children.

Mother's occupation

In present study, it was noticed that a non-significant

association exist between mother's occupation and overweight and obesity in children. The risk of becoming overweight and obese was higher in mothers doing business (OR=3.02, CI=2.12-4.31) than other professions.

Paternal and Maternal obesity

The data from table suggested that risk of being overweight and obese was 4.15 times (95% CI = 2.89-5.96) and 2.11 times (95% CI = 1.53-2.91) more when paternal and maternal obesity was present. Obesity in one or both parents probably influences the risk of obesity in their offspring because of shared genes or environmental factors within families.

Many researchers observed that overweight and obesity in children was strongly associated with parental overweight and obesity status. When both parents are overweight or obese (OR=49, 95% CI = 4.1-6.0) then there are more chances of the development of overweight and obesity than their normal counterparts denoted by Kaur *et al.* (2005)^[10].

Socio-economic Status

A clear socio-economic gradient in the prevalence of overweight and obesity was observed in present study. The risk of becoming overweight and obese was 2.05 times (95% CI=1.20-3.50) and 1.44 times (95% CI = 0.87-2.38) greater in upper class and upper middle class than lower class. Similarly risk was 1.32 times (95% CI = 0.82-2.14) and 1.04 times (0.69-1.71) more in lower middle class and upper lower class than lower class.

4. Conclusion

- Obesity is a ticking time bomb that poses a serious threat to global health and healthcare systems as well as economic productivity. The prevalence of overweight among studied sample was 7% where as prevalence of obesity was 3%. Together prevalence of overweight and obesity was found to be 10%. Overweight and obesity was found to be significantly high in children with birth order first and children studying in 8th standard.
- The problem of overweight and obesity was found more in children belonging to Hindu religion, with family member count 4-6, studying in private schools and taking education in English medium.
- Overweight and obesity was significantly higher when father's education was at graduate and post-graduate level. In case of mother's education a non-significant association was observed with overweight and obesity.
- A non-significant association was also observed in case of overweight/obesity and type of family. Obesity and overweight was more common in nuclear families.
- When occupation of parents was observed there was a non-significant association between child's overweight/obesity and father's occupation. Whereas a significant association was present with mother's occupation to child's overweight and obesity.
- Parental obesity was found to be significantly associated risk factor of overweight and obesity in children.
- The problem of overweight and obesity was significantly higher among children with family monthly income Rs. 15,000-30,000, living in middle class area and had lower-middle class socio-economic status.

5. Recommendation

Family environment exerts the most influence on children's energy balance related behaviour. Family is considered as school of social life as socialization starts in family. Effective

interventions in a family setting can be beneficial to change child's behaviour of overeating and unhealthy food choices.

6. Acknowledgement

The author would like to acknowledge school authorities, parents and students participated in study.

7. References

1. Bhav S, Bavdekar A, Otiv M. IAP national task force for childhood prevention of adult diseases: childhood obesity. *Indian pediatrics*, 2004; 41(6):559-576.
2. Bhuiyan MU, Zaman S, Ahmed T. Risk factors associated with overweight and obesity among urban school children and adolescents in Bangladesh: a case-control study. *Bio Med Center Pediatrics*. 2013; 13:72. doi: 10.1186/1471-2431-13-72.
3. Centers for Disease Control and Prevention. Childhood overweight and obesity, consequences. Available from:
4. Centers for Disease Control. CDC growth charts: United States. *Advance data*, 2000; 4(314). From <http://www.cdc.gov/nchs/data/ad/ad314.pdf>
5. Dhole SS, Mundada VD. Assessment of obesity in school children. *Journal of Medical Nutrition and Nutraceuticals*. 2013; 3(1):30-35.
6. Ferdousi J, Alamgir AKM. Prevalence and determinants of overweight in schools students: A developing country perspective. *Canadian Journal of Diabetes*. 2011; 35(2):195-199.
7. 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. *The Journal of the Association of Physicians of India*. 2010; 58:151-158.
8. Gaikwad A. Prevalence of obesity among adolescents. (M.Sc. Dissertation, Dr. Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, M.S. India.). 2012.
9. Hormis N, D'silva F. Obesity among adolescents of urban and rural schools in Mangalore. *The Nursing Journal of India*. 2012; 104(3):106-109.
10. Kaur S, Kapil U, Singh P. Pattern of chronic diseases amongst adolescent obese children in developing countries. *Current Science*. 2005; 88(7):1052-1056.
11. Lawhale RT. Childhood obesity. M.sc. dissertation, Indira Gandhi National Open University, Maharashtra, India, 2014.
12. Mahajan PB, Purty AJ, Singh Z, Cherian J, Natesan M, Arepally S *et al.* Study of childhood obesity among school children aged 6 to 12 years in union territory of Pondicherry. *Indian Journal of Community Medicine*. 2011; 36(1):45-50.
13. Mandal A, Mandal G. Prevalence of overweight and obesity among the urban adolescents English medium school girls of Kolkata, India. *Italian Journal of Public Health*. 2012; 9:1-5.
14. Ramachandran A, Snehalatha C, Vinitha R, Thayyil M, Sathish Kumar CK, Sheeba L *et al.* Prevalence of overweight in urban Indian adolescent school children. *Diabetes Research and Clinical Practice*. 2002; 57(3):185-190.
15. Srikanth J, Jayant Kumar K, Narasimha NS. Factors influencing obesity among urban high school children Bangalore City. *Indian Journal of Nutrition and Dietetics*. 2011; 48:8-17.
16. Shree GK, Parvathi S. Interventions to combat obesity

- among school children at Madurai, Tamilnadu. Asian Journal of Scientific Research. 2014; 7(2):176-80.
17. Sharma A, Sharma K, Mathur KP. Growth pattern and prevalence of obesity in affluent school children of Delhi. Public Health Nutrition, 2007; 10(5):485-491.
 18. From <http://www.who.int/mediacentre/factsheets/fs363/en/>
 19. World Health Organization. Obesity and overweight. Available from <http://www.who.int/mediacentre/factsheets/fs311/en>