Influence of Westernized culture and changed dietary habits on the BMI status of the school children of Tirunelveli

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Abstract: The prevalence of obesity among our nation's children has increased over the past few decades and the statistics are alarming. In the present study the BMI and other related parameters observed from the school going children of Tirunelveli, gives lot of information regarding their health condition. In order to identify the obesity percentage among school going students, a cross-sectional study was carried out in matriculation schools, aided schools and municipal schools of Tirunelveli. Anthropometric measurements were taken and noted. The total sample size was fixed at 860 consisting of 430 boys and 430 girls each. The incidence of overweight and obesity are very high among males (14.2%) who are within the age group of 13-17 years. In female the obeic percentage observed was 12.8%. The prevalence of obesity was found to be more common among the students of matriculation (24%) school. On the contrary a significant underweight category was observed predominantly among the municipal school (64.9%) students. Since the obeic students hails from rich family, they enjoy all sorts of sophistication in home as well as outside and this leads to immobility, resulted in obesity.
Keywords: Obesity, Overweight, Underweight, Inactiveness.

Introduction

Overweight is associated with the onset of major chronic diseases leading to complications and also psychosocial problems in children and adults. The transition in nutrition and lifestyle by the popularity of fast foods, soft drinks, sedentary lifestyle, and lack of exercise, increased television watching and computer use are the common trends adopted by children today. Most snack foods are high in energy value but contain little protein, vitamins or minerals. Pizzas, hamburgers, noodles are some of the western fast foods which have become popular in the metropolitan cities of our country. Recreational physical activity for adults has probably increased, but sedentary activity such as television viewing and computer work has also increased[1]. Obesity is an important risk factor for premature death[2] and health problems like diabetes, gallbladder disease, coronary heart disease, high cholesterol, hypertension and asthma[3]. Excess weight reduces the quality of life, raises medical expenditures, places stress on the health care system and results in productivity losses due to disability, illness and premature mortality[4].

Poor rural and urban slum populations have a high prevalence of under nutrition and on the other side, the newly rich urban, middle, and high income populations suffer from an emerging problem of obesity due to changing lifestyles and diet[5]. Paediatric obesity is a public health problem of increasing concern in the developed world and in

populations undergoing cultural transition[6]. Childhood obesity is alarmingly increasing worldwide[7] and it is linked with an increased risk of obesity in adulthood. There is a great concern about the global increase in the prevalence of obesity especially in children and adolescents[8].

Frequent fast food consumption may contribute to weight gain[9]. Establishment of fast food restaurants near schools increase the risk of obesity among the student population[10-12]. Reducing the time for television viewing and computer use reduced the calorie intake by the youngsters and decrease thought to be the greatest risk of BMI to a greater extent[13]. Numerous studies have shown that sedentary behaviors like watching television and playing computer games are associated with increased prevalence of obesity[14-17]. In the past few years, childhood obesity is increasingly observed with the changing lifestyle of families with increased purchasing power, increased hours of inactivity due to television, video games and computers have replaced outdoor games and other social activities[18]. Several studies reported a positive association between soft drink consumption development of obesity and type II diabetes among children[19-27].

In India a few studies have been conducted on overweight and obesity among children, mostly in metropolitan cities. Even though some work has been done on the prevalence of obesity among school going children of India, the impact of western food on school going children and the truth behind the increase of obesity percentage among school going children are not properly explored so far. Hence the present study was undertaken to study the magnitude of overweight/obesity and its impact among the students of southern city Tirunelveli of Tamilnadu.

Methodology

The BMI scale <18.5 considered as underweight, 18.5-24.9 as normal weight, 25.0-29.9 as overweight, above 30 as obese and above 40 as severe or morbid obesity[28]. In order to identify the obesity percentage among school going students, a cross-sectional study was carried out in matriculation schools, aided schools and municipal schools of Tirunelveli. All school going children from sixth to twelfth standard irrespective of sex and age from all these schools were included in the study. A pre-designed and pre-tested questionnaire was used to interview the study participants and elicit the information on family characteristics like residence, type of school, religion, type of family, education and occupation of parents; and information on individual characteristics like age, sex, eating habits, and time spent on television viewing and outdoor games. Anthropometric measurements were taken and noted. The total sample size was fixed at 860 consisting of 430 boys and 430 girls each. In the present study the normal weight (BMI 19.0-24.9) students were considered as the control population for comparison purpose. The statistical analysis the 'Z' and Co-efficient of Variation (CV) was performed in order to see whether the differences observed in the prevalence of obesity was statistically significant.

Table 1 BMI status of students. The values indicated in parenthesis are the percentage.

Sex	Normal wt (< 24.9)	Severe Underwt (<17)	Underwt (17-19)	Total Underwt	Overwt (25-30)	Obese (> 30)	O.obese (> 40)	Total Obeic
Boys	278 (64.6)	35 (8.1)	56 (13.0)	91 (21.1)	27 (6.3)	24 (5.6)	10 (2.3)	34 (14.2)
Girls	284 (66.0)	27 (6.3)	64 (14.9)	91 (21.2)	24 (5.6)	18 (4.2)	13 (3.0)	31 (12.8)
Total	562 (65.3)	62 (7.2)	120 (13.9)	182 (21.8)	51 (5.9)	42 (4.9)	23 (2.7)	65 (13.5)

Table 2 Percentages of body weight difference observed in relation to body mass index in aided, matriculation and Government schools of Tirunelveli. The values indicated in parenthesis are the percentage.

School	Normal wt (< 24.9)	Severe Underwt (Below 17)	Underwt (17-19)	Overwt (25 - 30)	Obese (> 30)	Overobese (> 40)	Total Obese (25>40)
Aided school (350)							
Boys (n = 177)	127 (71.7)	14 (7.9)	22 (12.4)	5 (2.8)	6 (3.4)	3 (1.7)	
Girls (n = 173)	130 (75.1)	12 (6.9)	18 (10.4)	7 (4.0)	3 (1.7)	3 (1.7)	
Total (n = 350)	257 (73.4)	26 (7.4)	40 (11.4)	12 (3.4)	9 (2.6)	6 (1.7)	27 (7.7)
Matriculation School (350)							
Boys (n = 176)	126 (71.6)	2 (1.1)	3 (1.7)	21 (11.9)	17 (9.6)	7 (3.9)	
Girls (n = 174)	113 (70.7)	3 (1.7)	9 (5.2)	15 (8.6)	14 (8.0)	10 (5.7)	
Total (n = 350)	249 (71.1)	5 (1.4)	12 (3.4)	36 (10.3)	31 (8.8)	17 (4.9)	84 (24)
Municipal School (160)							
Boys (n = 77)	25 (32.5)	19 (24.7)	31 (40.2)	1 (1.3)	1 (1.3)	0	
Girls (n = 83)	31 (37.3)	12 (14.5)	37 (44.6)	2 (2.4)	1 (1.2)	0	
Total (n = 160)	56 (35)	31 (19.4)	68 (42.5)	3 (1.9)	2 (1.3)	0	5 (3.2)
Overall Total (n = 860)	562 (65.3)	62 (7.2)	120 (13.9)	51 (5.9)	42 (4.9)	23 (2.7)	116 (13.5)

Table 3 Mean BMI of school going children of Tirunelveli in relation to their age and sex. The values in parenthesis are the percentage increase/decrease of the observed in relation to control (normal weight group) which are significant at 0.05% level.

Age in years	Normal wt. (Control)	Underwt.	Overwt.	Normal wt. (Control)	Underwt.	Overwt.
		Boys			**Girls**	
13 CV Z	20.7 ± 1.6 7.8	18.0 ± 0.6 3.3 22.8 (13.0)	26.5 ± 0.9 3.7 17.7 (28.0)	20.2 ± 1.0 5.0	18.4 ± 0.3 1.8 21.4 (8.9)	26.9 ± 0.6 2.2 27.9 (33.2)
14 CV Z	21.8 ± 1.5 7.0	17.8 ± 0.5 2.7 40.7 (18.3)	25.2 ± 0.2 1.1 39.3 (15.6)	20.8 ± 1.6 7.9	17.9 ± 0.5 2.9 22.5 (13.9)	26.1 ± 0.5 2.0 33.0 (25.5)
15 CV Z	21.5 ± 1.3 6.2	17.9 ± 0.4 2.4 36.5 (16.7)	25.5 ± 0.4 1.5 36.6 (18.6)	20.4 ± 1.2 6.1	18.2 ± 0.4 2.3 24.8 (10.8)	26.3 ± 0.7 2.8 30.7 (28.9)
16 CV Z	21.3 ± 1.7 7.9	18.2 ± 0.4 2.1 27.7 (14.5)	25.9 ± 0.4 1.6 42.8 (21.6)	21.6 ± 1.4 6.7	17.7 ± 0.5 2.8 38.5 (18.1)	26.3 ± 0.3 1.1 59.6 (21.8)
17 CV Z	21.3 ± 1.5 7.1	18.1 ± 0.6 3.3 17.7 (15.0)	25.9 ± 0.5 2.1 31.4 (21.6)	20.7 ± 1.5 7.4	18.4 ± 0.3 1.9 24.0 (11.1)	26.2 ± 0.5 1.9 34.0 (26.6)

* - Significant at 0.05% level

Table 4 Number of overweight and obeic students observed in matriculation (affluent) Government and aided schools (non-affluent) of Tirunelveli in relation to age. The values indicated in parenthesis are the percentage.

Age	Affluent (Matriculation School)				Non-affluent (Government and Aided School)				Over all total
	Overweight	Obese	Overobese	Total Obese	Overweight	Obese	Overobese	Total Obese	
13	7 (46.7)	4 (26.7)	2 (13.3)	13 (15.4)	1 (6.7)	1 (6.7)	0	2 (6.2)	15 (12.9)
14	5 (23.8)	7 (33.3)	5 (23.8)	17 (20.2)	2 (9.5)	1 (4.8)	1 (4.8)	4 (12.5)	21 (18.1)
15	10 (35.7)	7 (25.0)	3 (10.7)	20 (23.8)	3 (10.7)	3 (10.7)	2 (7.1)	8 (25)	28 (24.1)
16	9 (32.1)	8 (28.5)	2 (7.1)	19 (22.6)	5 (17.8)	2 (7.1)	2 (7.1)	9 (28.1)	28 (24.1)
17	5 (20.8)	5 (20.8)	5 (20.8)	15 (17.8)	4 (16.7)	4 (16.7)	1 (4.2)	9 (28.1)	24 (20.7)
Total	36 (31.0)	31 (26.7)	17 (14.7)	84 (24)	15 (12.9)	11 (9.5)	6 (5.2)	32 (6.3)	116

Table 5 Mean body weight of school going children of Tirunelveli in relation to their school and sex. The values in parenthesis are the percentage increase/decrease of the observed in relation to normal weight (control) which are significant at 0.05% level.

Category	Normal weight (control)	Underweight	Overweight	Normal weight (control)	Underweight	Overweight	Normal weight (control)	Underweight	Overweight
	Aided school			Matriculation school			Municipal school		
Boys CV Z	21.2 ± 1.6 7.5	17.9 ± 0.6 3.1 35.3 (15.6)	26.0 ± 0.9 3.7 18.3 (22.6)	22.6 ± 1.7 7.7	18.3 ± 0.5 2.6 27.0 (19.0)	25.7 ± 0.8 3.7 23.8 (13.7)	20.3 ± 1.5 7.2	17.9 ± 0.5 3.0 31.5 (11.8)	27.4 ± 0.3 1.0 35.5 (34.9)
Girls CV Z	20.6 ± 1.4 6.8	18.2 ± 0.5 2.5 28.1 (11.6)	26.4 ± 0.7 2.6 30.1 (28.1)	23.5 ± 1.5 6.3	18.4 ± 0.4 2.1 45.7 (21.7)	26.8 ± 0.6 2.3 33.4 (14.0)	19.8 ± 0.7 3.5	18.1 ± 0.5 2.8 23.9 (8.6)	26.9 ± 0.7 2.6 17.3 (35.8)

 * - Significant at 0.05% level

Table 6 Breakfast consumed by the students

Category	Partial	Sufficient	Excess	Total
Tiffen with veg	89 (10.3)	56 (6.5)	55 (6.4)	200 (23.2)
Tiffen with non-veg	179 (20.8)	197 (22.9)	264 (30.7)	640 (74.4)
Rice with veg dishes	55 (6.4)	97 (11.3)	68 (7.9)	220 (25.6)
Rice with non-veg dishes	182 (21.2)	182 (21.2)	276 (32.1)	464 (53.9)
Gruel	6 (0.7)	14 (1.6)	-	20 (2.3)

Figure 1 Food preferences by students
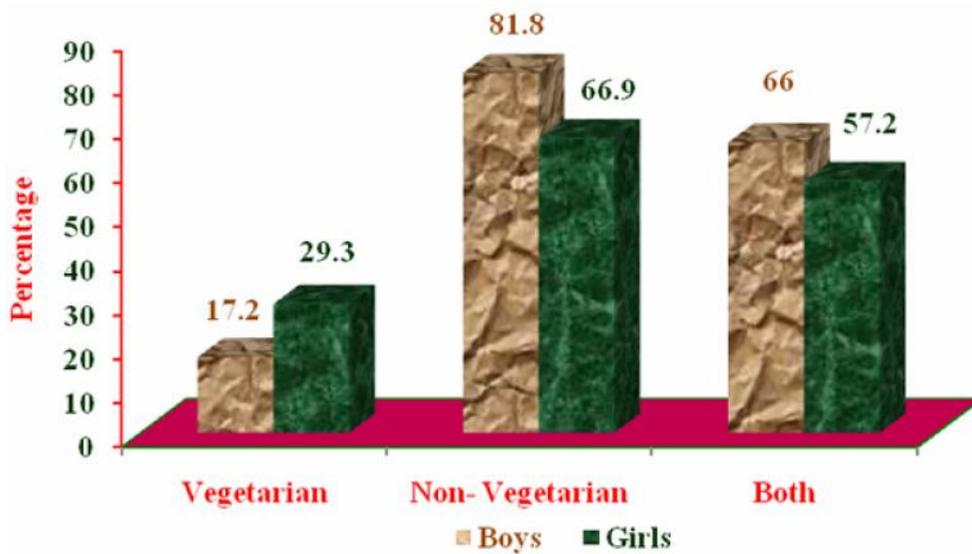
Table 7 Special fondness of obese students

Special fondness	Overweight (25 - 30) (n=51)		Obese (> 30) (n=42)		Overobese (> 40) (n=23)		Total
	Boys	Girls	Boys	Girls	Boys	Girls	
Ice cream	7 (6.0)	4 (3.4)	5 (4.3)	5 (4.3)	4 (3.4)	3 (2.6)	28 (24.1)
Chocolate	10 (8.6)	7 (6.0)	2 (1.7)	4 (3.4)	3 (2.6)	2 (1.7)	28 (24.1)
Soft drinks	2 (1.7)	2 (1.7)	1 (0.9)	0	0	0	5 (4.3)
Biscuits and bread	2 (1.7)	4 (3.4)	2 (1.7)	1 (0.9)	0	1 (0.9)	10 (8.6)
Mixture/chips	1 (0.8)	3 (2.6)	4 (3.4)	2 (1.7)	0	1 (0.9)	11 (9.5)
Pizza, burger	3 (2.5)	2 (1.7)	3 (2.6)	1 (0.9)	0	1 (0.9)	10 (8.6)
Fried chicken, Mutton/Fish etc.	2 (1.7)	2 (1.7)	7 (6.0)	5 (4.3)	3 (2.6)	5 (4.3)	24 (20.7)
Total	27 (23.3)	24 (20.7)	24 (20.7)	18 (15.5)	10 (8.6)	13 (11.2)	116

Table 8 Frequency of junk food consumption of obese students

Special fondness	Daily	Weekly once	Weekly twice	Weekly thrice	Total
Ice cream	7 (6.0)	13 (11.2)	7 (6.0)	1 (0.9)	28 (24.1)
Chocolate	8 (6.9)	10 (8.6)	8 (6.9)	2 (1.7)	28 (24.1)
Soft drinks	0	2 (1.7)	2 (1.7)	1 (0.9)	5 (4.3)
Biscuits and bread	5 (4.3)	4 (3.4)	1 (0.9)	0	10 (8.6)
Mixture/chips	4 (3.4)	6 (5.2)	0	1 (0.9)	11 (9.5)
Pizza, burger	6 (5.2)	3 (2.6)	0	1 (0.9)	10 (8.6)
Fried chicken, Mutton/Fish etc.	9 (7.8)	7 (6.0)	6 (5.2)	2 (1.7)	24 (20.7)
Total	39 (33.6)	45 (38.8)	24 (20.7)	8 (6.9)	116

Table 9 Showing the percentage of obese students regarding knowledge about their health status and nutrition.

Variables	Overweight	Obese	Overobese	Total
Eating habits				
Healthier	14 (12.1)	13 (11.2)	9 (7.7)	36 (31.0)
Less healthy	37 (31.9)	29 (25.0)	14 (12.1)	80 (68.9)
Knowledge about nutrition				
More knowledge	12 (10.3)	11 (9.5)	13 (11.2)	36 (31.0)
Less knowledge	39 (33.6)	31 (26.7)	10 (8.6)	80 (68.9)

Table 10 Time of sleep after dinner by the obeic students

Category	Boys	Girls	Total
Immediately	36 (59.0)	26 (47.3)	62 (53.4)
After 1 hour	9 (14.7)	10 (18.2)	19 (16.4)
After 2 hours	11 (18.0)	8 (14.5)	19 (16.4)
After 3 hours	5 (8.2)	11 (20.0)	15 (13.8)
Total	61 (52.6)	55 (47.4)	116

Table 11 showing the number and percentage of obeic students who use various modern sophisticated equipments and conveyance to their daily activities (Schoolwise)

	Matriculation School		Aided School		Municipal School		Total
Articles used	Boys	Girls	Boys	Girls	Boys	Girls	
Two wheelers	36 (59.0)	21 (38.2)	4 (6.5)	7 (12.7)	-	-	68 (58.6)
Car	11 (18.0)	8 (14.5)	2 (3.3)	1 (1.8)	-	-	22 (18.9)
Cycle	-	-	6 (5.2)	14 (2.5)	2 (3.3)	4 (7.3)	26 (22.4)
Refrigerator	40 (65.6)	30 (54.5)	20 (32.8)	16 (29.1)	1 (1.6)	3 (5.4)	110 (94.8)
Air conditioner	30 (49.2)	18 (32.7)	8 (13.1)	5 (9.1)	-	-	61 (52.6)
Washing machine	32 (52.4)	21 (38.2)	8 (13.1)	5 (9.1)	-	-	66 (56.9)

Table 12 showing the number and percentage of obeic students who are become inactive due to various daily activities

Category	Daily duration				
	No	1 hour	2 hour	3 hour	Above 3 hour
Boys					
TV Watching	-	11 (18.0)	21 (34.4)	17 (27.8)	12 (19.7)
Computer usage	-	13 (21.3)	18 (29.5)	14 (22.9)	15 (24.6)
Reading and Studying	-	21 (34.4)	24 (39.3)	10 (16.4)	6 (9.8)
Playing or doing Exercise	43 (70.5)	8 (13.1)	4 (6.5)	-	-
Girls					
TV Watching	-	8 (14.5)	14 (25.4)	15 (27.3)	18 (32.7)
Computer usage	-	3 (5.4)	14 (25.4)	18 (32.7)	20 (36.4)
Reading and Studying	-	9 (16.4)	18 (32.7)	21 (38.2)	7 (12.7)
Playing or doing Exercise	36 (65.4)	10 (18.2)	7 (12.7)	2 (3.6)	-
Participation in home need works	39 (70.9)	11 (20)	5 (9.1)	-	-

Results and Discussion

The result indicated that the overweight/obesity among children is progressing towards epidemic level. The BMI and other related parameters observed from the school going children of Tirunelveli, gives a lot of information regarding their altered health condition. The prevalence of obesity observed was 13.5% and it was very close to the world wide observations[29-30]. The percentage (13.5%) observed in the present study is alarmingly higher than the result of the national survey conducted by the National Health Evaluation Survey (NNHES) in 2003 which is only 4.9% (Table 1,2). The occurrence was very high among boys (14.2%) than the girls (12.8%)[31]. The incidence of obesity among the age of 15-17 years are in an alarming range (18.6-28.9) and it has increased to a greater extent (Table 3) as the age of the students increased[32]. On the other hand a significant underweight categories were also observed predominantly among the municipal school (61.9%) students whereas among the aided (18.8%) and matriculation school students (4.8%) the percentage of underweight was limited. Among the underweight students of municipal school severe underweight students were observed in more percentage among boys (24.1%) than girls (14.5%) (Table 2). The severe underweight categories were observed more or less in equal percentage in all age group of students irrespective of sex (Table 3)[33]. When compared to the municipal and aided school students (non-affluent), the obesity observed among the matriculation school students (affluent) was in alarming condition and the percentage observed was 24% in matriculation school, 7.7% aided school and only 3.2% in municipal school (Table 2)[34-35].

The observed high percentage of obesity among the affluent students in the present study is influenced by several factors. The main influential factor observed in the present study is the changed pattern of dietary habit which is also influenced by other supporting factors such as inactiveness, less physical work, spending more time in front of TV and computer (Table 12)[36,34]. Obesity observed among the student community in the present study is mainly influenced by switching over of the dietary habit from the traditional one to the westernized type. The study report showed that 74.4% of student community prefers the non-vegetarian diet (Figure 1). Only 23.2% of the students alone prefer the vegetarian diet. About 27.5% and 30.9% of vegetarian students consume excessive breakfast tiffin and noon meals respectively. Whereas 41.2%

and 43.1% of non-vegetarian students consume excessive breakfast tiffin and noon meal respectively (Table 6). As far as the obese students are concerned they prefer sweet items (62.1%) than the other. The special fondness regarding the food of the obeic students is illustrated in Table 7. Ice creams and chocolates scores the first position (21.1%) followed by fried chicken, mutton, fish (20.7%), mixture, chips and other karam item (9.5%) (Figure 2). Biscuits, pizza, burger scores the next position (8.5%). Most of the special fonded food are consumed daily or frequently in a week by the obese students (Table 7) that definitely influence the accumulation of fat deposits in their body resulting in obesity. Another important dietary influencing agent for obesity among the student community observed in the present study was junk food. It was observed that about 51% of the obese students consume excess of junk food and 40% of them consume sufficient junk food and only 8.7% consumed partial junk food (Table 7). The frequency of junk food consumption also widely varied among the obese students that is about 33.6% consume these junk food daily, 38.8% consume weekly once, 21.7% consumes weekly twice 6.9% consumes weekly thrice (Table 8). Duboris[37] stated dumping the pre-school kids with junk food as their breakfast resulted in serious problem of obesity. Their consumption of fruits and vegetable are very limited. 56% of obeic students consume fruits and vegetables less than 5 times per week. Less consumption of fibres may further aggravate the increased percentage of obesity. Parental socio-economic status of affluent students found to increase the risk of obesity to a greater extent in the present study[38].

It is pathetic to say that most of the obeic students do not know about the healthy and unhealthy nature of the food and no knowledge about the food and feeding habits (Table 9). Other visible bad habits observed among the obeic students are the sleeping habits. More than 53% of them go to bed immediately after night supper and only 13.8% alone go to bed after 3 hours of night supper. One more important factor that influences the obesity among the student was their inactive behavior. Most of the modern devices in the home knowingly or unknowingly convert the students into inactive personalities. Most of the obeic students spend their leisure time by watching TV or using computers. Television viewing has been associated with overweight, decreased physical activity, and unhealthy dietary behavior among children and adolescents, and may represent a modifiable cause of childhood obesity[39]. Lowry[40] suggest the presence

of cultural factors to consider when developing interventions to promote physical activity, healthy eating, and healthy weight through reduced TV viewing among adolescents.

Spending time for studying or playing is dropped to a greater extent among students[38]. More than 70% of the obeic students of both sexes are not doing any physical exercise (Table 10). Another pathetic observation made among the student community was their avoidance of walking even for a small distance. They use all sorts of conveyance for their movements. Maximum number (58.6%) of students use two wheelers and four wheelers (18.9%) as their conveyance (Table 12). Using car as a conveyance was very common among matriculation school students (14.5%). Two wheeler usage is very common among both sexes of matriculation and aided school[41]. But this usage is totally nil among municipal students. Among both sexes boys in matriculation school (59%) and girls in aided school (12.7%) use two wheelers as their conveyance (Table 11). In the home also most of the obeic students enjoy sophistication such as refrigerator (94.8%), air conditioner (52.6%), and washing machine (56.9%)[41]. Participation in the house hold works by the affluent students also dropped to a greater extent. Only 24% of the students do some house hold works and among them 24% and 18% hail from the municipal school students (Table 11). All sorts of such kind of inactiveness might be the main factor for obesity observed in the present study among the student community[42].

Most of the overweight and obese children have sedentary behavior with less physical activity. There is lack of physical activities both in school and within the home environment. Technological advancement has caused this factor together with the security risk that the children are exposed to whenever they are away from home. Walking activity is limited or totally nil and most of the affluent students use vehicle for their mobility. The inadequacy of facilities where children can safely engage in physical activities, both in school and in the community, use of vehicles and other sophistication further aggravate the problem. However, the inactive attitude of obeic students were mainly due to TV watching and computer usage. The results also showed that 21% of the students were under weight personalities and it was concluded that this condition was mainly influenced by the poor economic status of their parents.

Conclusion

From the present study conducted among school students of Tirunelveli, the research concluded that the prevalence of obesity among school going children is greatly influenced by the change in their food habits such as inclusion of more western food in their daily menu. There is evidence that children and adolescents of affluent families are more overweight possibly because of decreased physical activity, sedentary lifestyle, altered eating pattern and increased fat content of diet and adoption of westernized lifestyle. It is further aggravated by the lack of physical exercise that is influenced by the usage of modern devices such as computers, other electronic appliances, usage of two wheelers and four wheeler and other home need appliances. Since, family characteristics are found to be important for the predisposition of an individual to overweight/obesity, preventive and promotive efforts need to be directed towards family for the health of future generation. The obese children are advised about the corrective measures in the form of regular exercise, eating a well balanced diet which is rich in fiber and low in fat, and avoiding junk food to counter ill effects of obesity.

We should feel proud that we all are Indians and we have a rich cultural heritage which is very rare and unique. We should carry this forward and inherit the same to our new blooms that are going to be our future.

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