



A Case Control Study on Physical Activity and Obesity among Adolescent Children in an Urban Area of Tamilnadu

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ABSTRACT

Background: Physical activity has a crucial role in prevention of obesity. Adolescents are required to spend at least 60 minutes a day in physical activity. This Case control study compares physical activity pattern among obese and non-obese adolescent school children studying in an urban area of Tamilnadu.

Methods: We recruited 110 age matched obese and non-obese adolescents between the ages of 10-17 years. WHO growth reference charts were used for selecting cases and controls. Data were collected on socio demographic information, physical activity at school and at home, and sedentary behaviour.

Results: Inadequate physical activity was noted among 73.6% of cases and 30.9% of controls. Around 83.6% of cases and 68.2% of controls had the regular habit of watching television while having food at home. The factors found to be associated with adolescent obesity were inadequate physical activity (OR: 6.24), sedentary behaviour for more than two hours a day (OR: 4.39) and watching television while having food (OR: 2.39).

Conclusion: This study highlights the gross inadequacy of physical activity among obese adolescents. Increased sedentary life style and use of electronic gadgets serve as a risk factor for development of obesity. Public health measures need to be taken to increase the awareness among children and parents on the importance of regular and adequate physical activity. Physical education activities have to be strengthened in schools and students need to be encouraged to involve in diverse physical activities.

Key words: Urban adolescents, weight gain, sedentary behaviour

INTRODUCTION

India is facing the Double Burden of Disease i.e. under nutrition coexisting with over nutrition. In the year 2014, India was among the top five countries with high obesity burden, ranking 5th and 3rd for obesity in men and women respectively.¹ Physical inactivity is among the top five risk factors for global mortality contributing to 6% of deaths worldwide. For children and young people belonging to the age group of 5-17 years, physical activity includes play, sports, games, recreation, transportation, or physical

education in the school, family, and community environments.² Since the progress in tackling obesity in infants, children and adolescents has been very slow and variable, WHO established the Commission on Ending Childhood Obesity in the year 2014 to review the drawbacks, and address the gaps in existing strategies in order to prevent the target groups from developing obesity. The Commission presented a comprehensive package of recommendations to guide the countries to address childhood obesity. Six key areas of action were identified promote physical activity, promote intake of healthy foods, preconcep-

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tion and pregnancy care, early childhood diet and physical activity, health, nutrition and physical activity for school children, and weight management.³

In case of adolescent obesity, multiple social and environmental factors play a role as determinants of obesity. The origin of obesity however, is primarily due to an energy imbalance where calorie consumption exceeds calorie expenditure. The growing consumption of high calorie, low nutrient, inexpensive processed foods along with a sedentary lifestyle combine to result in the growing obesity trend.^{4,5} The Framingham Children's Study showed that children who spent more time watching television had increased body fat over a period of time.⁶ Spending time in physical activity in schools has been found to be low and this decreases further with age. Children who engage in daily physical activity routinely during school hours or leisure time were likely to continue similar physical activity pattern in adulthood.⁷ With this background, this Case control study aimed to determine the physical activity pattern among adolescent school children in an urban area of Tamilnadu.

MATERIALS AND METHODS

Study Design: Case Control study conducted in an urban area of Chengelpet district, Tamil Nadu.

Study area, population and period: The study was carried out in schools located in Chrompet, an urban residential area in Chengelpet district. Study population was school children between the age 10-17 years, studying in V standard to XII standards. The study was conducted between November 2019 and January 2020.

Inclusion and exclusion criteria: Students for the study were included based on the World Health Organization's BMI for age and sex criteria.⁸ Child who had a BMI for age and sex $>+2$ SD of WHO growth reference median was taken as a case, and BMI for age and sex between $-2SD$ and $+1SD$ was taken as a control. Students who were overweight (BMI for age and sex between $+1SD$ and $+2SD$) and underweight (BMI for age and sex less than $-2SD$) were excluded from the study.

Sample size: With the proportion of exposure among cases as 59% and among controls as 40%⁹, ratio of cases and controls as 1:1, the sample size estimated was 110 cases and 110 controls.

Sampling method: From the list of Higher Secondary Schools in the study area, two schools were selected by using simple random sampling method. Permission was obtained from the Head of the Institution before initiation of the study. Adolescent who had a BMI for age and sex $>+2$ SD of WHO growth reference median was taken as a case. Group matching method was adopted taking age as the factor for selection of controls.

Informed consent and ethics approval: Written informed Consent was obtained from the parents and assent was obtained from each child. The study was approved by Institutional Ethics Committee, Sree Balaji Medical College.

Data collection: A standardized, pilot tested questionnaire in local language was used and data were collected on socio demographic characteristics such as age, sex, residence, parents' education and occupation, monthly family income and physical activity practices. The students were asked to report on how long they spent every day in a typical week doing physical activity of moderate to vigorous type. The time spent for these activities both at school and at home was noted. They were also asked about their time spent in sedentary activities like watching TV, and playing games in mobile or laptop. Recommended physical activity for adolescents is defined as at least 60 minutes of moderate to vigorous physical activity per day for minimum five days a week.² Adolescents who fulfilled this criterion were considered to have "adequate physical activity" and those who didn't were considered to have "inadequate physical activity". Sedentary behaviour includes activities with low energy expenditure such as watching television, computer use, playing games in mobile and other forms of screen-based entertainment. Adolescents who spent more than two hours per day in sedentary activities were considered as having "increased sedentary behaviour".¹⁰

Statistical analysis: Data was entered in Microsoft excel and analysed using IBM SPSS Statistics for Windows, version 22 (IBM Corp., Armonk, N.Y., USA). The descriptive statistics were presented as frequency distribution and percentage. The analytical statistics used were Odds Ratio (OR), 95% Confidence Interval (CI) and p value.

RESULTS

A total of 110 cases and 110 controls were included in the study. About 53% of children were in the age group of 13-15 years. Among cases, about 55.5% were females and among controls, 51.8% were females. Around 80% of cases and 78.2% of controls belonged to Hindu religion. Among the cases, 5.5% of their fathers were engaged in professional jobs, 38.1% in semi-professional jobs, 4.5% in clerical category, 30% in skilled work, 16.4% in semi-skilled work, 5.5% in unskilled jobs and none of them were unemployed.

Table 1: Active involvement of children in Physical education classes at school

Involvement in Physical activity at school	Cases (n=110)	Controls (n=110)
Quite often	11 (10%)	26 (23.6%)
Sometimes	18 (16.4%)	50 (45.5%)
Hardly ever	77 (70%)	31 (28.2%)
Never	4 (3.6%)	3 (2.7%)

Table 2: Association between Physical activity and adolescent obesity

Factors	Obese	Non-obese	OR (95% CI)	Chi square	p value
Physical activity					
Inadequate	81 (73.6%)	34 (30.9%)	6.24 (3.47-11.22)	40.25	<0.0001*
Adequate	29 (26.4%)	76 (69.1%)			
Increased sedentary behaviour					
Yes	66 (60%)	28 (25.5%)	4.39 (2.47-7.79)	26.82	<0.0001*
No	44 (40%)	82 (74.5%)			
Watching TV while having food					
Yes	92 (83.6%)	75 (68.2%)	2.39 (1.25-4.55)	7.18	0.007*
No	18 (16.4%)	35 (31.8%)			

OR: odds ratio; CI: confidence interval; *p<0.05 statistically significant at 95% CI

Among the controls, 7.3% of their fathers were involved in professional jobs, 23.6% in semi-professional jobs, 20% in clerical jobs, 31.8% in skilled work, 15.4% in semi-skilled work, and 1.8% were unemployed. About 55.5% of the mothers of cases and 47.4% of the mothers of controls were unemployed. Among the cases, 20% of their mothers were engaged in semi-professional work, 10% in clerical work, 4.5% in skilled work and 10% in unskilled work. Among the controls, 3.6% of the mothers were professionals, 9.1% were involved in semi-professional jobs, 12.7% in clerical work, 13.6% each in skilled work and semi-skilled work. About 54.5% of the cases belonged to upper-middle class, 30% to lower-middle class and 10% to upper class. Among the controls, 70% were in upper-middle class category, 16.4% in upper class and 13.6% in lower-middle class.

Comparison of physical activity among cases and controls: About 26.4% of cases and 69.1% of controls had adequate physical activity, combining the time spent both in school and at home. During physical education classes in schools, the active involvement of school children is presented in Table 1. Increased sedentary behaviour was seen in 60% of cases and 25.5% of controls. Nearly 83.6% of cases and 68.2% of controls had the habit of watching television while having food at home.

Association between physical activity and adolescent obesity: Physical activity pattern between the cases and controls was analysed (Table 2) and the risk factors that were found to be significantly associated with adolescent obesity are inadequate physical activity, increased sedentary behaviour and watching television while having food.

DISCUSSION

This case control study assessed the physical activity pattern of obese and non-obese adolescents. The factors found to be associated with adolescent obesity are discussed below in comparison to similar studies done in different settings.

Inadequate physical activity at school and at home: In the present study, inadequate physical activity was found to be a risk factor for adolescent obesity. Panda SC in a similar study reported physi-

cal inactivity as an important risk factor for obesity among adolescents.¹¹ Rajaat Vohra et al in a study from Lucknow city reported less time in outdoor games (less than 30 min) as significant factor associated with adolescent obesity.¹² Siraj Ahmed et al in a study among school going adolescent girls in Uttar Pradesh noted physical activity more than two hours a day as a protective factor against obesity.¹³ In the study by Rexlin et al, adolescents who had adequate physical activity like playing outdoor games and walking to school had decreased odds of developing obesity.¹⁴

Due to increasing population in urban areas and overcrowding, adolescents do not have enough spaces in the cities for outdoor games. This could also be a reason for them to spend more time indoors and end up in watching television or playing games in mobile or laptop. Pirgon O and Aslan N analysed the role of urbanization in childhood obesity and noted that rapid and unplanned urbanization has led to decreased access to any means of outdoor sports activities. Since there are limited spaces available for walking and playing, parents do not allow their children to play outside and prefer them to stay indoors. After certain time, children also get accustomed to this sedentary lifestyle and spend more time with electronic gadgets.¹⁵

Increased sedentary behaviour: In the present study, increased sedentary behaviour showed a statistically significant association with adolescent obesity. Similarly, Rathnayake KM et al in their case control study showed that sedentary behaviour for more than two hours a day was a risk factor for adolescent obesity.¹⁶ Another case control study among adolescents in Brazil found that obesity had a significant positive association with increased time spent in computer or video games.¹⁷ Neutzling et al in a study among 250 obese and 250 non-obese adolescents reported that screen viewing time for ≥ 4 hours a day was more seen among cases when compared to controls.¹⁸

In the study by Rexlin et al, the factor identified to be associated with adolescent obesity was sedentary lifestyle.¹⁴ In the study by Piryani et al, spending time in front of television more than 2 hrs a day was noted as a significant risk factor for adolescent obesity.¹⁹ Increased screen viewing time can also be linked to increased exposure to advertisements on high fat

and sugar snacks and junk foods which might influence the adolescents quickly and can lead to adoption of unhealthy dietary habits.²⁰

Watching television while dining: In the present study, watching television while dining showed a significant association with adolescent obesity. Kumari D and Krishna B in a similar study on risk factors of adolescent obesity found that having food by watching television was significantly associated with obesity.²¹ Similar finding was noted in a study by Mendoza et al and the authors suggested limiting the exposure of children to television.²² The current generation of parents and children have the habit of having food by watching television, rather than talking to each other and sharing their day's experiences. This is a form of unhealthy lifestyle, which would affect their dietary habits.

CONCLUSION & RECOMMENDATIONS

This study highlights the pattern of physical activity among adolescents living in an urban area. The difference in the physical activity and sedentary behaviour among obese and non-obese adolescents was statistically significant. Health interventions should focus on both the adolescents and their parents to make environment conducive for the adolescents to adopt healthy lifestyles. In addition, school health and physical education programs would play a major role in reducing the burden of adolescent obesity and thereby the future burden of associated chronic diseases. As adolescent health will be reflected in adulthood, interventions during the period of adolescence will pave way for better quality of life in the future.

Adolescents should be encouraged to do at least 30 minutes of moderate to vigorous physical activity every day at school. Specific period for physical activity should be included in the class timetable and properly utilized. Physical activities like yoga, aerobic exercises, cycling, swimming, volleyball, football, basketball and running can be encouraged. Provisions/facilities to practice these activities should be made available by the school authorities. School teachers have to enforce a healthy lifestyle by making the children to use the physical training period appropriately. At home, parents should encourage their children to do at least 30 minutes of moderate to vigorous physical activity every day at home. They should also restrict the time spent by the children in sedentary activities like watching television, playing games in mobile or computer.

Creation of walking paths, cycling paths, parks and similar social activity areas in cities will promote regular physical activity of adolescents. Workshops or Health talks can be arranged for parents and children on specific public health days like World Health Day, Women's Day, Children's Day to improve their awareness on nutrition and physical activity. Large scale media campaigns delivering messages on health promotion through physical activity and bal-

anced diet can be done via radio, television, newspaper and social media.

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