

Correlation between BMI Percentile and Physical Activity among School Children between 11 and 14 Years of Age: A Cross Sectional Study

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ABSTRACT

Background: Childhood obesity is the major problem faced by our country due to urbanization. Childhood obesity leads to major disabilities in the adulthood

Objective: The objective of the study is to find out the association between BMI percentile and physical activity among the school going children between 11 and 14 years of age

Materials and methods: 100 school children from the schools in Thiruvananthapuram city were included in the study using purposive sampling method. Healthy school students both boys and girls between 11 and 14 years were included in the study. There were 50 boys and 50 girls. BMI percentile has been calculated for all the students. Modified Physical Activity Questionnaire was the outcome measure. The school children were asked to fill in the modified physical activity questionnaire. The modified physical activity questionnaire consists of four components, i.e., Physical activity during the past 7 days, during physical education classes, during lunch and right after the school. The scoring ranges from 1 to 5 where 1 represents minimal or no physical activity and 5 represents maximal physical activity.

Result: The result was analyzed using SPSS software version 24. The Pearson correlation value for physical activity during the past seven days was -.860, physical activity during physical education classes was -.774, during lunch was -.761 and right after the school was -.808 and the p value was 0.000 which shows that there is a significant correlation at 0.01 level between BMI percentile and physical activity score. Also the value shows that the correlation is negative, i.e., as the physical activity decreases the BMI increases and vice versa.

Conclusion: The study concludes that lack of physical activity is the main contributing factor for the increase in BMI percentile and thus obesity.

Key words: Physical Activity, Childhood Obesity, Body Mass Index percentile

INTRODUCTION

Childhood obesity is a major problem faced by school children in India. Childhood obesity is the cause for the development of the non communicable diseases such as cardiovascular diseases, musculoskeletal disorders, Type 2 Diabetes, cancer, premature death, disability in adulthood etc. [1-5] The rise of non communicable diseases increases with the

increase of BMI. The basic reason behind the obesity is the imbalance between the calories intake and calories spent. Consumption of high carbohydrate and fat diets and lack of physical activity is the main source of non communicable diseases such as diabetes, cardiovascular diseases and obesity. [6-8]

Urbanization leads to a gross reduction of time being spent outdoor. By

considering the studies as the highest priority and the heavy load of homework given by schools, there is very less time to think about the outdoor physical activities such as playing games. Another reason for the less physical activity is there is less space available outdoor in urban areas. Some parents are having the fear of safety about their children and that leads to the restriction of physical activity.^[9,11] Most of the children are involving in indoor activities such as playing computer games, mobile games, watching TV, social media etc. that require no physical activity. A reduction in outdoor activities and an increase in indoor activities are the main source of childhood obesity.^[10] Factors such as heavy traffic, lack of separate lane for bicycle, unmarked intersections, and poor street connectivity have reduced the number of children who transport themselves to and from school.^[11]

The World Health Organization (WHO) defines physical activity as movement of the body that has been produced by the skeletal muscles that increases the energy expenditure.^[12] Physical activity is responsible for the weight reduction, visceral fat reduction and it lowers the blood pressure.^[13] Physical activity also prevents the Type 2 diabetes.^[14] Moderate intensity physical exercises, reduces the rise of risk factors related to NCDs.^[15] Adopted by the World Health Assembly in 2004, the "WHO Global Strategy on Diet, Physical Activity and Health" describes the actions needed to support healthy diets and regular physical activity to reduce the prevalence of Non communicable diseases. The Strategy calls upon all stakeholders to take action at global, regional and local levels to improve diets and physical activity patterns at the population level. The Political Declaration of the High Level Meeting of the United Nations General Assembly on the Prevention and Control of Non-communicable Diseases of September 2011, recognizes the critical importance of reducing unhealthy diet and physical

inactivity. The political declaration commits to advancing the implementation of the "WHO Global Strategy on Diet, Physical Activity and Health", including, where appropriate, through the introduction of policies and actions aimed at promoting healthy diets and increasing physical activity in the entire population. WHO has also developed the "Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013-2020" which aims to achieve the commitments of the UN Political Declaration on Non-communicable diseases (NCDs) which was endorsed by Heads of State and Government in September 2011. The "Global Action Plan" will contribute to progress on 9 global NCD targets to be attained by 2025, including a 25% relative reduction in premature mortality from NCDs by 2025 and a halt in the rise of global obesity to match the rates of 2010.^[16] The World Health Assembly welcomed the report of the Commission on Ending Childhood Obesity (2016) and its 6 recommendations to address the obesogenic environment and critical periods in the life course to tackle childhood obesity. The implementation plan to guide countries in taking action to implement the recommendations of the Commission was welcomed by the World Health Assembly in 2017.

MATERIALS AND METHODS

100 school children from the schools in Thiruvananthapuram city were included in the study using simple random sampling method. Healthy school students both boys and girls between 11 and 14 years were included in the study. School children who were mentally unstable, suffering from illness and taking medications for the past 6 months were not included in the study. BMI in percentile has been calculated for all the students. Modified Physical Activity Questionnaire has been given to them^[17-19] (Table 1). They were instructed to answer all the questions and based on that the score has been given. The modified physical activity questionnaire consists of four

components, i.e., Physical activity during the past 7 days, during physical education classes, during lunch and right after the school. The scoring ranges from 1 to 5 where 1 represents minimal or no physical activity and 5 represents maximal physical

activity. The result was analyzed using SPSS software version 24.

Statistical Analysis:

The result was analyzed using SPSS software version 24. The statistical tool used was Pearson correlation.

RESULTS

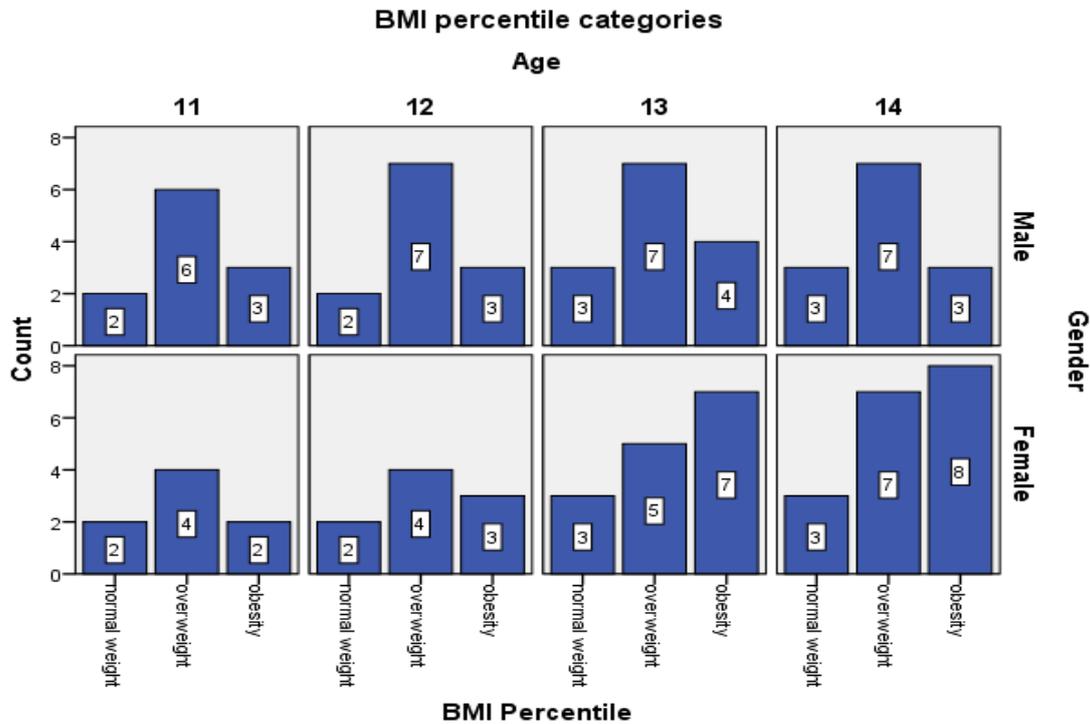


Figure 1: Age wise and Gender wise distribution of subjects in BMI percentile categories, i.e., Normal weight, over weight and obesity

Figure 1 shows the Age and Gender wise distribution of the subjects in BMI percentile categories. Under 11 years of age 2 boys and 2 girls were under normal weight category, 6 boys and 4 girls were under over weight category and 3 boys and 2 girls were under obese category. Under 12 years of age 2 boys and 2 girls were under normal weight category, 7 boys and 4 girls were under over weight category and 3 boys and 3 girls were under obese category. Under 13 years of age 3 boys and 3 girls were under normal weight category, 7 boys and 5 girls were under over weight category and 4 boys and 7 girls were under obese category. Under 14 years of age 3 boys and 3 girls were under normal weight category, 7 boys and 7 girls were under over weight category and 3 boys and 8 girls were under obese category.

Table 1 shows the physical activity score of BMI percentile categories. In normal weight subjects, the mean value of physical activity score during the past 7 days was 4.55, standard deviation was .51, minimum value was 4 and maximum value was 5. The mean value of physical activity score during the physical education class was 3.85, standard deviation was .48, minimum value was 3 and maximum value was 5. The physical activity score during lunch was 4.05, standard deviation was .22, minimum value was 4 and maximum value was 5. The physical activity score right after school was 4.10, standard deviation was .51, minimum value was 4 and maximum value was 5 in over weight students. The mean value of physical activity score during the past 7 days was 1.78, standard deviation

was .54, minimum value was 1 and maximum value was 3. The mean value of physical activity score during the physical education class was 1.95, standard deviation was .20, minimum value was 1 and maximum value was 2. The physical activity score during lunch was 1.31, standard deviation was .47, minimum value was 1 and maximum value was 2. The physical activity score right after school was 1.19, standard deviation was .39, minimum value was 1 and maximum value was 2 in obese students. The mean value of physical

activity score during the past 7 days was 1.12, standard deviation was .33, minimum value was 1 and maximum value was 2. The mean value of physical activity score during the physical education class was 1.75, standard deviation was .43, minimum value was 1 and maximum value was 2. The physical activity score during lunch was 1.27, standard deviation was .45, minimum value was 1 and maximum value was 2. The physical activity score right after school was 1.06, standard deviation was .24, minimum value was 1 and maximum value was 2.

BMI Percentile		PA during PE class	PA during lunch	PA after school	PA past seven days
normal weight	Mean	3.8500	4.0500	4.1000	4.5500
	Std. Deviation	.48936	.22361	.30779	.51042
	Minimum	3.00	4.00	4.00	4.00
	Maximum	5.00	5.00	5.00	5.00
overweight	Mean	1.9574	1.3191	1.1915	1.7872
	Std. Deviation	.20403	.47119	.39773	.54916
	Minimum	1.00	1.00	1.00	1.00
	Maximum	2.00	2.00	2.00	3.00
obesity	Mean	1.7576	1.2727	1.0606	1.1212
	Std. Deviation	.43519	.45227	.24231	.33143
	Minimum	1.00	1.00	1.00	1.00
	Maximum	2.00	2.00	2.00	2.00
Total	Mean	2.2700	1.8500	1.7300	2.1200
	Std. Deviation	.87450	1.18386	1.23791	1.34300
	Minimum	1.00	1.00	1.00	1.00
	Maximum	5.00	5.00	5.00	5.00

Table 1: Physical activity score for BMI percentile categories

Correlations

		BMI Percentile	PA past seven days	PA during PE class	PA during lunch	PA after school
BMI Percentile	Pearson Correlation	1	-.860**	-.774**	-.761**	-.808**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	100	100	100	100	100
PA past seven days	Pearson Correlation	-.860**	1	.858**	.907**	.913**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	100	100	100	100	100
PA during PE class	Pearson Correlation	-.774**	.858**	1	.830**	.861**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	100	100	100	100	100
PA during lunch	Pearson Correlation	-.761**	.907**	.830**	1	.951**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	100	100	100	100	100
PA after school	Pearson Correlation	-.808**	.913**	.861**	.951**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	100	100	100	100	100

** Correlation is significant at the 0.01 level (2-tailed).

Table 2: Correlation between BMI percentile and Physical activity during past seven days.

Table 2 shows the Correlation between BMI percentile and Physical activity during past seven days. The pearson correlation value for physical activity during the past seven days was $-.860$, physical activity during physical education classes was $-.774$, during lunch was $-.761$ and right after the school was $-.808$ and the p value was $.000$ which shows that there is a significant correlation at 0.01 level between BMI percentile and physical activity score. Also the value shows that the correlation is negative, i.e., as the physical activity decreases the BMI increases and vice versa.

DISCUSSION

100 school children from the schools in Thiruvananthapuram city were included in the study using purposive sampling method. Healthy school students both boys and girls between 11 and 14 years were included in the study. There were 50 boys and 50 girls. BMI percentile has been calculated for all the students. Modified Physical Activity Questionnaire was the outcome measure (Table 1). The school children were asked to fill in the modified physical activity questionnaire. The modified physical activity questionnaire consists of four components, i.e., Physical activity during the past 7 days, during physical education classes, during lunch and right after the school. The scoring ranges from 1 to 5 where 1 represents minimal or no physical activity and 5 represents maximal physical activity. Under 11 years of age 2 boys and 2 girls were under normal weight category, 6 boys and 4 girls were under over weight category and 3 boys and 2 girls were under obese category. Under 12 years of age 2 boys and 2 girls were under normal weight category, 7 boys and 4 girls were under over weight category and 3 boys and 3 girls were under obese category. Under 13 years of age 3 boys and 3 girls were under normal weight category, 7 boys and 5 girls were under over weight category and 4 boys and 7 girls were under obese category. Under 14 years of age 3 boys and

3 girls were under normal weight category, 7 boys and 7 girls were under over weight category and 3 boys and 8 girls were under obese category (Figure 1). The result of the present study shows that the physical activity score was a minimum of 1 and a maximum of 2 in over weight and obese children in all activities, i.e., physical activity during past seven days, physical activity during physical education classes, physical activity during lunch and physical activity right after the school whereas the physical activity score was a minimum of 4 and a maximum of 5 in normal weight children in all activities, i.e., physical activity during past seven days, physical activity during physical education classes, physical activity during lunch and physical activity right after the school. Also, the pearson correlation value for physical activity during the past seven days was $-.860$, physical activity during physical education classes was $-.774$, during lunch was $-.761$ and right after the school was $-.808$ and the p value was $.000$ which shows that there is a significant correlation at 0.01 level between BMI percentile and physical activity score. Also the value shows that the correlation is negative, i.e., as the physical activity decreases the BMI increases and vice versa.

Lack of physical activity and more involvement in indoor leisure activities like using social media, television watching, mobile and computer games, lack of open spaces for outdoor physical activities, unsafe outdoors for walking, jogging or any other physical activities, over protection and forced feeding by the parents, academic overload all these things are responsible for childhood obesity. Pocket money given by the parents is used to make use of transport facilities to go to school instead of walking or bicycling. Also the money will be used for having junk foods. These factors also lead to childhood obesity. [20-24]

At least 60 minutes of physical activity a day has been recommended by the WHO for 5 to 17-year-old children,

including vigorous-intensity activity that strengthens muscle and bone at least 3 times per week. [25]

CONCLUSION

The result of the study shows that there is a correlation between the BMI percentile and the physical activities score among school students between 11 to 14 years of age. The correlation is negative, i.e., as the physical activity decreases the BMI percentile increases and vice versa. Thus the study concludes that lack of physical activity is the main contributing factor for the increase in BMI percentile and thus obesity. Hence measures should be taken to increase the physical activity of the children to prevent childhood obesity.

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