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Original Research Article

Relationship between Physical Activity and Childhood Obesity in School - Going Children (6 - 11 Years) of Central India

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ABSTRACT

Childhood obesity is spreading in various parts of India, one of the reasons being lower levels of physical activity and sedentary lifestyle. The present study was done in Bhopal district to find the relationship between childhood obesity and physical activity of in the children where economy and standard of living are evolving gradually. This cross sectional study included randomly selected 600 respondents (300 male and 300 female) of age group of 6 - 11years from four different schools of Bhopal District. Pre-validated questionnaire was used to acquire physical activity profile of the respondents and nutritional status was assessed using BMI and BMI - cut off points given by International Obesity Task Force (IOTF). Mean, standard deviation and coefficient of variance were calculated to assess the central tendency of various factors and dispersion around the central tendency in the sample. Chi – square test was used to establish significant association between variables. Lack of moderate or rigorous outdoor sports (p value= 0.010), commuting type to nearby places (p value=0.012), activities when alone at home (p value= <0.0001), preference of staircase (p value= 0.007), TV viewing/ playing computer games (p value=0.014), hobbies of the respondents (p value= <0.0001) and getting tired easily while doing light physical activity (p value= 0.013) showed significant association with the BMI status of the respondents.

Keywords: BMI, Childhood, Obesity, Overweight, Physical activity, TV viewing.

INTRODUCTION

Obesity is recognized as a major and prevalent disease of the century and a public health priority at national level. [1,2] Rising prevalence of obesity in India may be attributed to various factors, like sedentary life style, unhealthy food habits, cultural practices and increasing affluence in middle class population. [3] The increase in obesity is due for the most part to an energy balance where the amount of energy being consumed by an individual is greater than the amount of energy being expended. Inverse relationship between leisure time, physical activity and obesity has been demonstrated. [4-6] Physical activity is the process of engaging in bodily movement that results in energy expenditure, and it is essential for good health. [7] Activity patterns in children have shifted from outdoor play to indoor entertainment like television, internet, and computer games. In many developing countries, there is acute dearth of open spaces and playgrounds in schools and communities. Neighborhoods are often considered unsafe for walking and other outdoor activities. An increasing pressure on academics and reduced emphasis on physical activity in schools is another contributory factor to weight gain.

[8,9] Physical activity behaviours of children and adolescents are influenced by many sections of society, including the family, school, peers, child care setting, medical care provider, faith-based institutions, government agencies, the media, the food and beverage market and the entertainment industry. All these together form the built environment. Changes in the built environment over the past three decades have upset the energy balance equation. [10,11]

The present study aimed to assess and find the association between physical activity and childhood obesity, influence of the built environment on the children, recreational habits and facilities available to them. The current study was carried out in Bhopal district which still has open spaces and playgrounds for the children to play, lesser options of public transport and due to its gradually changing and evolving economy has less effect on the built environment compared to metropolitan cities.

MATERIALS AND METHODS

Design: A cross-sectional epidemiological study was conducted. Informed consent was obtained prior to data collection both from the school authorities and from the parents of the children after explaining the objectives and the method of study. A day prior to data collection a pre tested questionnaire was distributed amongst the respondents to get the information on family characteristics like type of residence, type of family, education, occupation and income of parents etc. The questionnaires were filled by the parents of the respondents. The exact age of the child was verified from their date of birth and rounded to the completed years. Anthropometric measures were taken at school using the standard equipments and methodology.

Sample: The study was conducted among 600 randomly selected children of 6 -11 year of age from four different public and private sector schools of Bhopal district, Madhya Pradesh. The sample consisted of 300(50%) male and 300 female (50%) respondents who came from different socio-economic groups.

Measurements: Anthropometric measurements were taken and BMI was calculated. Respondent's height without shoes was measured to the nearest 0.1 cm using an inch tape attached to wall. Weight without shoes and in light clothing was measured to the nearest 0.1 kg using a digital weighing scale. The scale was calibrated using standard weights and calibration procedure at the beginning of each measurement session. Waist to hip ratio was also calculated to assess the central obesity using an inch tape. All measures were obtained by anthropometrists using standard protocols. [12] Body mass index (BMI) was calculated using Qutelets index as weight in kilograms / (Height in meter). [12] International Obesity Task Force (IOTF) classification was used for the estimation of obese respondents. [13]

Statistical analysis: Mean of variables was calculated to assess the central tendency, standard deviation (SD) and coefficient of variance was calculated to understand the measure of dispersion. Chi-square test was used to estimate the p value to find out significant relationship between obesity and overweight and different factors. SPSS and Microsoft Excel were used for data analysis.

RESULTS

The sample was equally divided into male and female (50% of each). 78.5% of the subjects had nuclear families and only 21.5% were from joint families. 65% constituted the middle income group, 26% higher and 9% lower income group. The mean age of respondents with normal BMI was 8 ± 2 years and that of overweight and obese children were 9 ± 1 years. Anthropometric means of the respondents according to their BMI status are shown in Table1.

Coefficient of variance (CV) is a standardized measure of dispersion and CV<100% shows low variance. In this sample, each anthropometric factor shows

low variance, i.e., the level of dispersion is less around the mean in all three categories.

Table1: Anthropometric measurements of the respondents

Anthropometric Factor		Boys			Girls		
		Normal	Overwt	Obese	Normal	Overwt	Obese
Number of respondents		**232**	**38**	**30**	**209**	**43**	**48**
Height (cm)	Mean	126.0	138.6	135.2	124.7	135.8	140.8
	Standard Deviation	10.9	12.2	8.9	11.1	13.9	7.9
	Coefficient of variation	9%	9%	7%	9%	10%	6%
	Minimum	105.0	108.0	114.0	103.0	102.0	114.5
	Maximum	159.0	155.0	145.0	150.7	150.0	160.0
Weight (kg)	Mean	24.0	42.2	47.4	23.1	39.3	50.9
	Standard Deviation	6.3	9.2	8.5	6.4	9.1	7.4
	Coefficient of variation	26%	22%	18%	27%	23%	14%
	Minimum	15.0	21.0	26.0	13.0	20.0	30.0
	Maximum	47.0	60.0	60.0	43.0	51.0	67.0
Waist to Hip ratio	Mean	0.902	0.921	0.925	0.894	0.912	0.929
	Standard Deviation	0.043	0.039	0.050	0.040	0.044	0.041
	Coefficient of variation	5%	4%	5%	5%	5%	4%
	Minimum	0.769	0.844	0.844	0.804	0.826	0.800
	Maximum	1.007	0.994	1.052	1.007	0.988	1.000
Body Mass Index (kg/m^2)	Mean	14.9	21.6	25.7	14.6	20.9	25.6
	Standard Deviation	2.2	1.9	3.1	2.3	1.5	2.2
	Coefficient of variation	15%	9%	12%	16%	7%	8%
	Minimum	10.6	18.0	20.0	9.5	17.5	21.6
	Maximum	21.3	25.0	35.4	20.7	23.1	30.0

Table 2a: Distribution of respondents according to their physical activity and BMI status

Physical Activity		Body Mass Index Categories						Total	
		Normal		Overweight		Obese			
		Count	Row %	Count	Row %	Count	Row %	Count	p-value
Daily play outdoor sports	> 2-3 hours	126	70.8%	24	13.5%	28	15.7%	178	
	2 hours	184	80.3%	29	12.7%	16	7.0%	229	
	1 hour	75	65.2%	21	18.3%	19	16.5%	115	
	0-30 minutes	56	71.8%	7	9.0%	15	19.2%	78	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.010***
Participate in physical education at school	1-2 hours	272	73.5%	46	12.4%	52	14.1%	370	
	0-30 minutes	169	73.5%	35	15.2%	26	11.3%	230	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.440**
Commuting type to nearby market/ friend's house	Walk	114	73.1%	27	17.3%	15	9.6%	156	
	Cycle	215	78.5%	28	10.2%	31	11.3%	274	
	Parent drops	112	65.9%	26	15.3%	32	18.8%	170	
	Public transport	0	0.0%	0	0.0%	0	0.0%	0	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.012***
Activities when alone at home	Outdoor games	29	59.2%	10	20.4%	10	20.4%	49	
	TV and chips	190	81.9%	22	9.5%	20	8.6%	232	
	Indoor games	129	76.3%	20	11.8%	20	11.8%	169	
	Computer games	93	62.0%	29	19.3%	28	18.7%	150	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**<0.0001***
Activities during vacations	Outdoor games	157	72.4%	29	13.4%	31	14.3%	217	
	Sports	83	76.9%	16	14.8%	9	8.3%	108	
	Computer/ Indoor games	103	73.6%	21	15.0%	16	11.4%	140	
	Hobby classes	98	72.6%	15	11.1%	22	16.3%	135	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.590**

Playing outdoor sports daily showed a significant association with obesity and overweight in the respondents (p-value=0.01). About 28% of the children who indulged in only 30 minutes or less in outdoor games were overweight and obese. Also, type of conveyance showed statistical significance with overweight and obesity (p-value=0.012). 19.3% were overweight and 18.7% were obese among those who chose to play computer/ indoor games when alone at home. Participating in physical education at school and activities done by respondents during their vacation did not show any significant relationship with obesity.

Hobbies of the respondents were significantly associated with obesity (p value=0.0001), 40% of the overweight and 39% obese children had computer games and indoor activities as their hobby. 17%

and 16% of overweight and obese children preferred elevators over staircase and thus it can be considered a risk factor of childhood obesity. Daily watching television or playing computer games for more than 1 hour was also a statistically significant risk factor of overweight and obesity in these respondents (p value= 0.014). 29% of the obese respondents get easily tired which can influence their physical activity levels. The above mentioned factors can influence the amount and levels of daily physical activity in the children.

Table 2b: Distribution of respondents according to the factors affecting their physical activity and BMI status

Factors Influencing Physical Activity of Respondents		Body Mass Index Categories						Total	
		Normal		Overweight		Obese			
		Count	Row %	Count	Row %	Count	Row %	Count	p-value
Hobbies	Computer games	70	63.6%	14	12.7%	26	23.6%	110	
	Cricket	128	78.5%	24	14.7%	11	6.7%	163	
	Football	35	60.3%	10	17.2%	13	22.4%	58	
	Swimming	14	100.0%	0	0.0%	0	0.0%	14	
	Cycling	103	81.7%	8	6.3%	15	11.9%	126	
	Dancing	54	84.4%	7	10.9%	3	4.7%	64	
	Indoor games	37	56.9%	18	27.7%	10	15.4%	65	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**<0.0001***
Preference of staircase or lift	Stairs	263	78.5%	36	10.7%	36	10.7%	335	
	Elevators	178	67.2%	45	17.0%	42	15.8%	265	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.007***
Daily watch television/play computer games (hrs)	0-30 minutes	36	85.7%	3	7.1%	3	7.1%	42	
	1 hour	242	77.6%	36	11.5%	34	10.9%	312	
	> 1 hour	163	66.3%	42	17.1%	41	16.7%	246	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.014***
Feel tired after walking short distance/climbing stairs or recurrent headache	No	420	74.2%	78	13.8%	68	12.0%	566	
	Yes	21	61.8%	3	8.8%	10	29.4%	34	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.013***
Difficulty in walking or playing	No	434	73.6%	80	13.6%	76	12.9%	590	
	Yes	7	70.0%	1	10.0%	2	20.0%	10	
	Total	441	73.5%	81	13.5%	78	13.0%	600	**0.782**

DISCUSSION

Lack of physical activity has an important association with obesity. In this study, daily hours of outdoor physical sports showed a significant relationship with the BMI status of the respondents (p value= 0.010) and children who asked their parents to drop them to nearby places rather than cycle or walk showed higher chances of overweight and obesity (p value= 0.012). Also, activities done by the respondents in the free time when they are alone was significantly associated with overweight and obesity. Preference of elevators over lifts by the respondents were associated with their BMI as well (p value=0.007). Few other studies have shown to have a link between obesity and less or lack of physical activities in the daily routine of children. [14,15] Statistically significant association between physical education classes and activity in school and obesity was not seen. The reason maybe, the less hours and classes devoted to physical education (30-45 minutes) which was equal for all respondents and thus did not make any major difference.

There are a lot of factors and inhibitions which can influence physical activity in children. With increasing urbanization, there are less open spaces to play and more indoor activities like playing computer games and watching TV, which the children are getting influenced by. Also, sometimes with the long working hours of parents, children are bound to stay at home and play indoor games. In this study, watching TV or playing computer games for more than 1 hour have shown to have a significant relationship with obesity (p value= 0.014), as this reduces the time for these children to play outdoor sports involving rigorous physical activity. Studies conducted in South India and other parts have shown comparable results. [16,17] Hobbies might influence the children for the choice of their activity and thus it showed

an association with the BMI status (p value = <0.0001) of the respondents. Limitation to the physical activity due to getting fatigued easily or having recurrent headaches in the respondents were significantly related to their overweight and obesity statuses (p value = 0.013), this may be due to deficiency of essential micronutrients which needs further examination.

To summarize, physical activity does have an important role in development of overweight and obesity in the children and effective measures needs to be incorporated to prevent/treat obesity at an early age. Along with studies and other hobbies, children should be encouraged to be physically active. Parents should ensure that their children play some sort of outdoor active sport or games daily. Hobbies and activities like dancing, cycling, swimming, martial arts, yoga, etc can be incorporated to keep the child physically active. Parents must support their children to use public transport or cycle or walk down to short distance along with them. TV viewing and computer games ought to be discouraged in the children for long hours. Schools should provide healthy and supportive environment to emphasize physical activities along with studies. Parents and teachers should also have an active lifestyle with healthy eating habits and should try to be the role models for the children.

CONCLUSION

Based on the findings of the study, it can be said that physical activity is closely related to childhood obesity. The study demonstrated that the imperative factors which may increase the probability of developing overweight and obesity included lack of moderate or intense physical activity, spending too much time in front of television or playing computer/ indoor games, hobbies and getting fatigued easily with light or moderate physical activity. Government should plan public awareness and interventional programmes for the children, parents and teachers to edify them about importance and inclusion of physical activity in daily life.

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