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RESEARCH ARTICLE

INADEQUATE SLEEP, REDUCED PHYSICAL ACTIVITY AND INCREASED SCREEN TIME RESPONSIBLE FOR OBESITY IN CHILDREN

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ABSTRACT

Obesity is a pandemic, spread throughout world and is attributing largely to industrialisation with reduced physical activity, increased screen timings and lack of adequate sleep. Overweight and obese children from affluent class schools were screened, their sleeping pattern, screen time and outdoor and indoor gaming time was studied. Two thousand four hundred and ninety nine children were screened for overweight and obesity on the basis of BMI cut-off given by IOTF. Children were categorized as normal (57.94%) overweight (20.89 %) and obese (5.20%). Based on WHR classification more than 85% girls were categorized as 'at risk' and 27.27 % boys were 'at risk'. Overweight and obese children's screen time was more than 1.5 hours/day and had a sleep of less than 8 hours per day. A strong association was found among the environmental factors like weight, diet (milk and energy intake), sedentary life style, total energy expenditure, basal metabolic rate and the time spent in front of computer playing games.

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INTRODUCTION

We are currently facing a major obesity pandemic and most alarming is the accelerated increase in overweight and obesity in children, with childhood obesity tracking into adulthood (Taheri, 2005). Technology has become a contributing factor as adolescents engage in greater "screen time" which consists of television, movies, games, internet and more. Sitting in this type of medium does nothing but promote unhealthy foods as children are bombarded with fast food commercials (Akasaki, 2004). Television, through advertisements has a marked influence on the minds of children. In India, Kuriyan et al, (2007) and Stettler *et al.* (2004), showed a significant association between use of electronic games and obesity, with nearly a 2-fold increased risk of obesity for every hour spent playing electronic games daily. The mechanism of effect of TV exposure on overweight risk is undoubtedly multi-factorial. It appears to operate independently from reduced physical activity. Excessive TV exposure may instead operate through the extensive advertising messages for unhealthy foods targeted at very young children or from a tendency of children to snack while watching TV. There is association between exposure to advertisements and children's requests for specific foods, food purchasing, and food consumption (Wiecha *et al.,* 2006). Epstein *et al.* (2002) conducted a randomized trial and found that reducing television viewing and computer use may have an important role in preventing obesity and in lowering BMI in young children, and these changes may be related more to changes in energy intake than to changes in physical activity. Children's lack of physical activity and their growing disconnect with natural environment has been influenced by the rise in electronic media, decreased time for unstructured play and environment barriers (McCurdy *et al.,* 2010). Physical inactivity is increasing globally among adolescents and is reported in various surveys. In a survey on children aged 9-13 years, it was revealed that 61.5% children do not participate in any organized physical activity during their non-school hours and 22.6% do not engage in any free time physical activity (CDC, 2003).

It has been shown by Tremblay *et al.* (2003) that organized and unorganized physical activity is negatively associated with obesity. Physical activity decreased the risk of child (Canadian) becoming obese by at least 23% to 43%. In contrast, watching television and playing video games increases the risk of becoming overweight by 17% to 44% and becoming obese by 10 to 61%.

MATERIALS AND METHODS

Obese and overweight children were screened from 2499 boys and girls studying in 5 affluent class schools of Jaipur city. Screening was done on the basis of IOTF cut offs, for BMI for children aged 5-18 years by Cole, 2002. A set of detailed questions were used to study the physical activity pattern of the school going children. The type of activity of the subject was

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judged by asking the subject to report the time spent in various activities. The subjects were asked to record a minute by minute record of their activities for 2 days one of which was a holiday. On the basis of this information their average energy expenditure was determined. Besides this, information about their usual duration of sleep (day and night), time spent playing games (both indoor and outdoor), screen timings (both computer and television was also obtained. SPSS 19 was used for performing statistical analysis.

RESULTS AND DISCUSSION

From 5 affluent class schools, out of 2499 children were screened for overweight and obesity on the basis of BMI cut-off given by IOTF. Children were categorized as normal (57.94%) overweight (20.89 %) and obese (5.20%). Based on WHR classification more than 85% girls were categorized as 'at risk' and 27.27 % boys were 'at risk'. The BMI of both boys and girls gradually increased with age. To test the difference between the genders 't' test was applied and the difference was found to be statistically significant in the age group of 11-12 years only. In a study conducted in Tamil Nadu, India where CDC cut offs were used to measure BMI of children aged 11-15 years indicated a much higher BMI than the present study (Parimalavalli and Kowsalya, 2011).

% boys. Time spent in playing games have a major role in determining the activity levels of the children. It was observed that girls spent more time playing indoor games as well as outdoor games as compared to boys. The difference in time spent on various activities by girls and boys was found to be statistically significant for outdoor games, time spent on computer and day time rest at 5% significance level.

In the present study overweight and obese children's screen time (time spent in front of computer, playing games or doing homework and watching television or playing games through play stations) was more than 1.5 hours/day (Table 2). There was a significant difference in mean time spent in front of computer between total girls and boys ($t=2.166$; $p<0.01$). It was noticed that screen time spent in front of television was more than computer, television viewing was more in girls (110.11 ± 36.46 minutes) than boys (108.47 ±33.15 minutes), and computer usage was more in boys (96.55 ±39.73 minutes) than girls (89.55 ± 41.70 minutes). The results of the present study were consistent with that of a study by Goyal *et al.* (2010) where it was found that physical activity in childhood attenuated BMI and body mass in children is influenced by the sleeping habit in the afternoon, lack of physical exercise, and sports habits as sleeping habit in afternoon influenced BMI through displacing the time that could be spent playing sports in engaging in other

Table 1. Mean BMI and WHR of Overweight and Obese Children

AGE GROUP	10-11 YEARS			11-12 YEARS			12-13 YEARS			13-14 YEARS			TOTAL		"t" value
	Girls (n=46) Mean±SD	Boys (n=90) Mean±SD	"t" value	Girls (n=66) Mean±SD	Boys (n=98) Mean±SD	"t" value	Girls (n=106) Mean±SD	Boys (n=128) Mean±SD	"t" value	Girls (n=49) Mean±SD	Boys (n=69) Mean±SD	"t" value	Girls (n=267) Mean±SD	Boys (n=385) Mean±SD	
BMI	22.75 ±2.10	22.59 ±2.20	0.382^{NS}	23.16 ±2.34	23.94 ±2.61	1.949*	24.92 ±2.39	25.20 ±3.02	0.776^{NS}	26.01 ±2.26	25.34 ±3.20	1.260^{NS}	24.31 ±2.59	24.29 ±2.97	0.068^{NS}
WHR	0.92 ±0.68	0.96 ±0.05	3.212**	0.95 ±0.06	0.94 ±0.07	1.141^{NS}	0.93 ±0.07	0.92 ±0.09	0.780^{NS}	0.95 ±0.06	0.95 ±0.09	0.259^{NS}	0.93 ±0.07	0.94 ±0.08	0.433^{NS}

** Highly significant P value< 0.001, * Significant P value < 0.05, NS: Non-significant

Table 2. Age and Gender Wise Time Spent in Different Activities by children

AGE GROUP	10-11 YEARS			11-12 YEARS			12-13 YEARS			13-14 YEARS			TOTAL		TOTAL
	Girls (n=46)	Boys (n=90)	't' value	Girls (n=66)	Boys (n=98)	't' value	Girls (n=106)	Boys (n=128)	't' value	Girls (n=49)	Boys (n=69)	't' value	Girls (n=267)	Boys (n=385)	652
INDOOR GAMES (in minutes)	82.17 ±36.57	77.67 ±28.40	0.792^{NS}	84.55 ±36.80	80.20 ±34.40	0.771^{NS}	80.66 ±36.181	84.61 ±3478	.849^{NS}	77.14 ±27.38	72.17 ±26.39	0.992^{NS}	81.24 ±34.86	79.64 ±32.09	0.604^{NS}
OUTDOOR GAMES (in minutes)	73.70 ±29.46	68.67 ±19.20	1.198^{NS}	85.00 ±36.30	74.69 ±25.93	2.212**	80.66 ±39.152	75.23 ±27.40	1.432^{NS}	74.69 ±28.14	73.04 ±22.70	0.352^{NS}	79.44 ±31.58	73.17 ±24.53	2.848**
ON COMPUTER (in minutes)	82.17 ±40.71	95.67 ±39.69	1.859^{NS}	72.27 ±45.86	85.10 ±40.109	1.895^{NS}	95.94 ±39.15	99.38 ±36.67	0.646^{NS}	105.92 ±32.46	108.70 ±22.70	0.467^{NS}	89.55 ±41.70	96.55 ±39.73	2.166**
WATCHING TV (in minutes)	116.09± ±44.04	105.67 ±27.06	1.655^{NS}	113.18 ±42.36	105.31 ±40.46	1.199^{NS}	107.26 ±29.55	112.03 ±30.46	1.208^{NS}	106.53 ±30.65	110.00 ±33.60	0.573^{NS}	110.11 ±36.46	108.47 ±33.15	0.598^{NS}
DAY TIME REST (in minutes)	60.19 ±20.24	65.47 ±37.91	1.956*	70.60 ±26.57	76.83 ±32.35	1.932*	59.64 ±42.60	64.98 ±48.68	1.495^{NS}	58.57 ±21.21	68.35 ±15.66	1.984^{NS}	68.27 ±36.68	77.84 ±37.87	1.982*
NIGHT TIME SLEEP (in minutes)	440 ±42.213	430.00 ±33.95	1.590^{NS}	450.00 ±42.42	442.04 ±37.93	1.256^{NS}	423.40 ±23.17	420.47 ±27.66	.886^{NS}	423.67 ±22.61	420.00 ±20.58	0.917^{NS}	433.02 ±34.78	428.10 ±32.25	1.858^{NS}

** Highly significant- P value< 0. 001; * Significant P value< 0.05; NS: Non-significant

The mean waist hip ratio (WHR) of boys (0.96) was significantly higher than that of girls (0.92) in the age group of 10-11 years (Table 1). The mean WHR of boys declined from 10 – 11 years to 12-13 years (0.92), thereafter it increased sharply in the age group of 13 – 14 years (0.95). In case of girls the WHR was lowest in the age group of 10 – 11 years (0.92) it increased sharply at 11-12 years (0.95), in the age group of 12-13 years (0.93) it declined with an increase again at 13-14 years (0.95).On the basis of WHR girls were more at-risk than boys. The WHR of overweight and obese children were found to be above the safe criteria in case of 85.77 % girls and 27.27

forms of physical activity (Goyal *et al.,* 2010). High levels of television viewing elevated the risk of obesity in children and children who slept less and who viewed ≥ 2 h of television per day had a 17% higher chance of becoming overweight compared with those who viewed television fewer hours (Taveras *et al.,* 2008).

In the present study, average night sleeping time for girls and boys was calculated as 433.02±34.78 minutes and 428.10±32.25 minutes, respectively (Table 2). On an average, the children slept for less than 8 hour per night. Many reasons

exist for the reduction of opportunity to sleep in children and adolescents. Adolescents spend more time on the internet and watching television (Anderson *et al.,* 2008). Delayed sleep time, coupled with early school, imposes a significant constraint in adolescents' sleep schedules and predisposes them to reduction in total sleep time (Marshall *et al.,* 2006, Wolfson and Carskadon, 1998). Lumeng *et al.* (2007) in his study of 785 children aged 9-12 years concluded that shorter sleep duration is associated with increased risk of being overweight. Short sleep duration in children is associated with an increase in the odds of becoming obese as well as increase in body fat per cent (Nixon *et al.,* 2008).

Health promotion from the early stages in life by fostering healthy eating practices and regular physical activity has the potential for a major impact on health and well- being during childhood and later stages in life which influence adult physical activity, attitudes and behaviours and also because many serious diseases begin their course in childhood preventive measures should be undertaken at early stage of life eating habits and physical activity are particularly important of an attitudes towards health issues. Making physical activity equipment and clothing available to children would help. As parents, limiting children's amount of "Screen time" (watching TV or video tapes, video games, computer use) and encouraging children to play outside whenever possible would help in combating childhood obesity.

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