

Original Article

The association between watching television and obesity in children of school-age in Saudi Arabia

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ABSTRACT

Background: There is little information on the association between watching Television (TV) and obesity in the Arabian Peninsula. **Aim of the Study:** The aim of this study was to explore the association between the watching of television and obesity in Saudi children of school-age. **Materials and Methods:** A case-controlled study was conducted with students between the ages of 9 and 14 years who attended the school health clinic in King Abdulaziz Housing for National Guard (Iskan), Riyadh, Saudi Arabia, during the study period (February to April 2012). During each clinic, children were selected by simple random sampling (five obese and five non-obese). For data collection, two trained physicians interviewed the participants using a 20-item Arabic questionnaire. Well-trained nurses collected the anthropometric measurements of weight and height. **Results:** The study included 397 students. Higher (body mass index) BMI was associated with a higher number of televisions at home ($P < 0.001$), watching TV for more than three hours per day at the weekend ($P = 0.047$), eating more than three snacks per day ($P = 0.005$), watching TV at night ($P = 0.026$), and siblings' decisions on how much TV to watch ($P = 0.025$). The prevalence of childhood obesity was significantly lower among those whose mothers determined how much TV they could watch ($P = 0.03$). In logistic regression analysis, the increase in the child's age, the presence of more than one TV at home, having his or her own TV, and an increase in the number of hours of watching TV over the weekend were significantly associated with an increased risk of childhood obesity. Personal computers and the Internet were not significantly associated with an increased risk of childhood obesity. **Conclusion:** The present investigation revealed that watching TV represents an important risk factor for obesity in children of school-age.

Key words: Obesity, Saudi Arabia, school-age children, television

INTRODUCTION

The rate of childhood obesity is increasing in developing countries, but this rate is highest in the Middle East.^[1] In the last few decades, the Kingdom of Saudi Arabia (KSA) has experienced rapid socio-cultural changes caused by the dramatic rise in the economy of the Arabian Gulf region. This transformation, associated with major changes in food choices and eating habits, have become increasingly "Westernized." This "nutritional transition" has been

implicated as a cause of the rising rates of overweight and obesity recently observed in the Saudi population.^[2]

In Saudi Arabia, the overall prevalence of overweight, obesity, and severe obesity in otherwise healthy children and adolescents aged 5 to 18 years is 23.1%, 9.3% and 2%, respectively.^[3]

Although several genetic and lifestyle factors have been recognized to induce obesity, sedentary behaviors, including watching TV, have attracted a great deal of attention as potential risk factors for obesity since any child can be sedentary.^[4]

Despite documented increase in the prevalence of childhood obesity worldwide, and the implication of the time spent watching TV in these trends, there is little information on the association between watching TV and obesity in the Arabian Peninsula. This information has

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special relevance in a developing country, such as Saudi Arabia, where globalization has increased the availability of television, computers, and video games at home.

The aim of the current study was to explore the association between the watching of television and obesity in Saudi children of school-age.

MATERIALS AND METHODS

A case-control study was performed with students between nine and 14 years of age who attended a school health clinic in King Abdulaziz Housing for National Guard (Iskan), Riyadh, Saudi Arabia from February 2012 to the end of April 2012.

The cases were obese children of school-age, and the controls were non-obese students. Cases of obesity secondary to medical illnesses or chronic drug use were excluded.

The estimated sample size was based on the prevalence of excessive watching of TV of the children found in Gomez *et al.*'s study.^[5] (For the study population, 41.5% of parents reported that their child's TV watching level was <2 hours/day). The estimated sample size was 373, with $\pm 5\%$ accuracy, an alpha of 0.05 (95% confidence interval), and a power of 0.8. The sample size was adjusted to 400 to account for possible data loss during collection.

The study was conducted by enrolling children who made unscheduled visits to the school health clinic. Every day of the study period, five children were included in the obese group (cases) and five in the non-obese group (controls).

For data collection, two trained physicians interviewed participants using a 20-item Arabic questionnaire. The questionnaire used was based on a review of the published literature. The following information was collected: Part 1: Demographic data, part 2: TV watching, part 3: Physical activity, part 4: Meals, and part 5: Anthropometric measurements.

Well-trained nurses collected the anthropometric measurements of weight and height. Height was measured to the nearest "0.5 cm" without shoes, and weight was measured to the nearest "100 g" with the subject in lightweight clothes and without shoes. A Health O Meter Digital Scale (made in USA), which reads to the nearest 100 g, was used as the weighing scale. A single scale was used to weigh all the students. This scale was calibrated daily, and zero was assured before the weight of any student was taken.

Body mass index (BMI), which is weight in kilograms divided by height in meters squared (kg/m^2), was calculated for all study participants.

Obesity was defined using the gender- and age-specific cut-off points for BMI adopted by the International Obesity Task Force.^[6]

The reliability of the questionnaire was examined by re-testing 10% of the participants from each school to compare their answers.

Permission was procured from the King Abdullah International Medical Research Center in Riyadh, and a verbal consent of each participant's parents obtained before conducting the study.

Data entry and analysis

Statistical Package for Social Sciences (SPSS) software version 18.0 was used for data entry and analysis. Both descriptive statistics (e.g., number and percentage) and analytic statistics were examined. Chi-Square tests (χ^2) were employed to test for the association and/or the difference between two categorical variables. *P* values equal to or less than 0.05 were considered statistically significant. Logistic regression analysis was used to identify the factors leading to obesity.

RESULTS

A total of 397 students between 11 and 14 years were interviewed. Approximately half of the students were male (201; 50.6%).

Table 1 illustrates that slightly less than two-thirds of the 13-year-olds (64.4%) and 14-year-olds (62%) were obese, compared to 53.1% and 43.9% of students at 11 and 12 years of age, respectively. This difference was significant ($P = 0.009$). Approximately half of the females (50.2%) and males (49.8%) were obese ($P = 0.958$).

As shown in Table 2, obesity was significantly associated with the number of TVs available at home. Of the students who had more than three TVs at home, 83.6% were obese compared to only 33.3% of students with only one TV at home ($P = 0.001$). Children who watched TV late at night were more likely to be obese than those who watched television at other times ($P = 0.026$). There was no significant association between a history of eating while watching TV and obesity ($P = 0.893$). The children who watched TV with their brothers/sisters showed a higher rate of obesity (52.1%) than those who watched TV alone (45%) or with parents (40.5%). However, this difference was not significant ($P = 0.349$).

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Table 1: BMI in relation to age and gender

Variables	Categories	Body mass index		Total	Chi square (χ^2)	P value
		Obese (n=200) No. %	Non-obese (n=197) No. %			
Age (years)	11	26 (53.1)	23 (46.9)	49	11.46	0.009
	12	105 (43.9)	134 (56.1)	239		
	13	38 (64.4)	21 (35.6)	59		
	14	31 (62)	19 (38)	50		
Gender	Male	101 (50.2)	99 (50.5)	201	0.003	0.958
	Female	100 (49.8)	97 (49.5)	196		

BMI: Body mass index

Table 2: The relation between BMI and different TV/computer variables

Variables	Categories	Body mass index		Total	Chi square (χ^2)	P value
		Obese (n=200) No. %	Non-obese (n=197) No. %			
Number of TVs at home	One	12 (33.3)	24 (66.7)	36	33.09	0.001
	Two	79 (51.3)	75 (48.7)	154		
	Three	63 (41.7)	88 (58.3)	151		
	>Three	46 (83.6)	9 (16.4)	55		
Usual time of watching TV during the week	After school	45 (48.4)	48 (51.6)	93	0.218	0.640
	Between noon and afternoon	78 (55.3)	63 (44.7)	141		
	Between afternoon and Maghreb	49 (49.5)	50 (50.5)	98		
	Between Maghreb and Isha	44 (55.0)	36 (45.0)	80		
	After Isha	47 (56.0)	37 (44.0)	84		
History of eating while watching TV	At night	32 (65.3)	17 (34.7)	49	4.983	0.026
	Never	24 (48.0)	26 (52.0)	50		
	Sometimes	109 (49.3)	112 (50.7)	221		
	Often	48 (53.3)	42 (46.7)	90		
	Very often	19 (52.8)	17 (47.2)	36		
With whom they watch TV	Alone	9 (45.0)	11 (55.0)	20	3.28	0.349
	Parents	17 (40.5)	25 (59.5)	42		
	Brothers and sisters	174 (52.1)	161 (47.9)	334		
Average time spent daily using a computer (hours)	Zero	28 (54.9)	23 (45.1)	51	6.479	0.166
	One	80 (53.7)	69 (46.3)	149		
	Two	37 (45.1)	45 (54.9)	82		
	Three	18 (36.7)	31 (63.3)	49		
	>Three	37 (56.1)	29 (43.9)	66		
Average time spent daily watching TV (hours)	Yesterday				3.62	0.465
	Zero	10 (66.7)	5 (33.3)	15		
	One	66 (54.5)	55 (45.5)	121		
	Two	60 (49.2)	62 (50.8)	122		
	Three	25 (44.6)	31 (55.4)	56		
	>Three	39 (47.0)	44 (53.0)	83		
	Weekday				5.88	0.210
	Zero	7 (46.7)	8 (53.3)	15		
	One	67 (51.1)	64 (48.9)	131		
	Two	59 (52.2)	54 (47.8)	113		
	Three	20 (36.6)	35 (63.6)	55		
	>Three	47 (56.6)	36 (43.4)	83		
	Weekend				4.136	0.042
	≤Three	111 (46.3)	129 (53.8)	240		
	>Three	89 (56.7)	68 (43.3)	157		

BMI: Body mass index; TV: Television

There was no significant association between the average number of hours spent daily using a computer

and obesity. There was also no significant association between the time spent watching TV and childhood

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obesity, either on the previous day ($P = 0.465$) or on a weekday (Saturday-Wednesday) ($P = 0.210$). Of the participants, 21% and 40% viewed TV for more than three hours during the week and at weekends, respectively. However, more than half of the children (56.7%) who spent more than three hours watching TV over the weekend (Thursday-Friday) were obese, compared to 46.2% of the students who watched TV for less than three hours over the weekend ($P = 0.042$). More than one-third of the participants had either two (38.7%) or three (37.9%) TVs at home.

As shown in Table 3, there was no significant association between the number of meals and childhood obesity ($P = 0.285$). Obesity was reported among most children who consumed more than three snacks/day (73.5%) compared to 40.3% and 45.5% of those who consumed two or three snacks/day, respectively. This difference was significant ($P = 0.005$).

As shown in Table 4, there was no significant association

between the parents' feelings about how much TV the children watched and obesity among children.

There was no significant association between obesity and the people with whom the intermediate school children talked about time spent watching TV, although a higher percentage of obesity was reported among children who talked with their brothers/sisters (54.9% versus 45.1%).

The prevalence of childhood obesity was significantly lower among those whose mothers determined how much TV they could watch (44.8% versus 55.2%). However, if it was the brother/sister who determined how much TV the child watched, the prevalence of childhood obesity was significantly higher (57.3% versus 42.7%). The prevalence of childhood obesity was not significantly affected if the father or child made the decision.

Table 5 demonstrates that there were no significant associations between obesity and the rate of exercising, whether at school, home, or outdoors.

Table 3: The relation between participant's BMI and frequency of diet

Variables	Frequency	Body mass index		Total	Chi square (χ^2)	P value
		Obese (n=200) No. %	Non-obese (n=197) No. %			
Number of meals/day	One	22 (59.5)	15 (40.5)	37	3.81	0.285
	Two	36 (57.1)	27 (42.9)	63		
	Three	120 (46.9)	136 (53.1)	256		
	>Three	22 (53.7)	19 (46.3)	41		
Number of snacks/day	One	75 (55.1)	61 (44.9)	136	12.64	0.005
	Two	25 (40.3)	37 (59.7)	62		
	Three	75 (45.5)	90 (54.5)	165		
	>Three	25 (73.5)	9 (26.5)	34		

BMI: Body mass index

Table 4: Relation between participant's BMI and parents' feelings about how much TV their child watches (n=397)

Parents' feelings about how much TV the child watches (no.)	Body mass index		χ^2 value* (<i>P</i> value)
	Obese (<i>n</i> =200) no. (%)	Non-obese (<i>n</i> =197) no. (%)	
Mother			
Do not know (52)	26 (50.0)	26 (50.0)	2.28 (0.816)
Do not mind (65)	30 (46.2)	35 (53.8)	
Should watch a bit less (251)	129 (51.4)	122 (48.6)	
Should watch a lot less (18)	11 (61.1)	7 (38.9)	
Should watch more (3)	1 (33.3)	2 (66.7)	
Should not watch at all (8)	3 (37.5)	5 (62.5)	
Father			
Do not know (67)	32 (47.8)	35 (52.2)	1.69 (0.949)
Do not mind (74)	39 (52.7)	35 (47.3)	
Should watch a bit less (230)	115 (50.0)	115 (50.0)	
Should watch a lot less (18)	10 (55.6)	8 (44.4)	
Should watch more (1)	1 (100)	0 (0.0)	
Should not watch at all (7)	3 (42.9)	4 (57.1)	

BMI: Body mass index; TV: Television

Logistic regression analysis of risk factors for childhood obesity

In the logistic analysis, as the child's age decreased by one year, there was a 32% reduction in obesity (OR = 0.68, $P = 0.003$). The presence of only one TV at home was associated with a 42% reduction in the risk of childhood obesity (OR = 0.58, $P < 0.001$). The child's personal ownership of TV was associated with an increased risk of childhood obesity (OR = 1.75, $P = 0.002$). As the number of hours of watching TV at weekends decreased by one hour, there was a 19% reduction in the risk of obesity (OR = 0.81, $P = 0.009$). Personal computers and the Internet were not significantly associated with an increased risk of childhood obesity [Table 6].

DISCUSSION

Previous Saudi studies have confirmed that the prevalence of overweight and obesity among Saudi children of

school-age and adolescents is high.^[7-9] The current study has confirmed that watching television during childhood is associated with an increased BMI. Hancox and Poulton^[10] reported that these associations were stronger and more consistently significant in girls. By contrast, there was no gender difference in the present study. In addition, the current study found that obesity was more frequent in older children. Similar findings have been documented by others.^[10,11]

The findings from the present study are in accordance with a large number of cross-sectional surveys, a smaller number of longitudinal studies, and one randomized trial that indicate that watching television is a risk factor for childhood obesity.^[12]

Children spend a substantial portion of their lives watching television.^[12] Investigators have hypothesized that watching television causes obesity through at least one of the following three mechanisms: (1) displacement of physical activity, (2) increased calorie consumption while watching as a result of advertising, and (3) reduced resting metabolism. The relationship between watching television and obesity has been examined in a relatively large number of cross-sectional epidemiologic studies, but few longitudinal studies. Many of these studies have found relatively weak, positive associations, but others have found no association or mixed results. However, the weak and variable associations may be the result of limitations in measurement. Several experimental studies to reduce television watching have recently been completed.^[10] Most of these studies did not directly test the effects of reducing television watching behaviors alone. However their results support the suggestion that reducing the time spent in watching television may reduce the risk of obesity or help promote weight loss in obese children.^[13]

Many studies^[5,10,14,15] have shown that longer TV watching time is associated with higher BMI, lower levels of fitness, and higher blood cholesterol levels. Although the effect size estimated from observational studies is small (with watching TV explaining very little of the variance in BMI), the results of intervention studies show large effect sizes. In this study, watching TV for more than three hours per day,

Table 5: BMI of participant, based on exercise (n=396)

Daily exercise (day)	Body mass index		χ^2 value* (P value)
	Obese (n=200) No. (%)	Non-obese (n=197) No. (%)	
At school			
Never (114)	60 (52.6)	54 (47.4)	1.248 (0.870)
Once (76)	37 (48.7)	39 (51.3)	
Twice (86)	41 (47.7)	45 (52.3)	
Three times (94)	50 (53.2)	44 (46.8)	
>Three times (27)	12 (44.4)	15 (55.6)	
At home			
Never (58)	30 (51.7)	28 (48.3)	1.032 (0.905)
Once (94)	49 (52.1)	45 (47.9)	
Twice (60)	30 (50.0)	30 (50.0)	
Three times (137)	70 (51.1)	67 (48.9)	
>Three times (48)	21 (43.8)	27 (56.2)	
Outdoors			
Never (90)	47 (52.2)	43 (47.8)	2.604 (0.626)
Once (92)	41 (44.6)	51 (55.4)	
Twice (51)	29 (56.9)	22 (43.1)	
Three times (115)	60 (52.2)	55 (47.8)	
>Three times (49)	23 (46.9)	26 (53.1)	

BMI: Body mass index

Table 6: Risk factors for childhood obesity: Results of logistic regression analysis

Variable	B	Standard error	Wald	P value	Odds ratio
Age	-0.384	0.130	8.650	0.003	0.68
TV (number)	-0.545	0.134	16.446	<0.001	0.58
Own TV	0.560	0.177	10.027	0.002	1.75
Weekend no. of hours	-0.216	0.083	6.789	0.009	0.81
PC and internet	0.162	0.086	3.592	0.058	1.18

TV: Television; PC: Personal computer

especially over the weekend, was significantly associated with childhood obesity.

In the current study, after adjusting for confounders, computer and Internet use was associated with a slight increase in childhood obesity, although the association was borderline and not significant. Electronic games may have an effect on unhealthy weight gain, but they are less related to increased energy intake and their usage is relatively new; thus, the effect size is difficult to determine. Overall, watching of TV does not explain much of the difference in individuals' body size or the rise in obesity over time, perhaps because of the uniformly high and relatively stable time spent watching TV.

The present study did not find a significant association between the parents' feelings about how much TV their children watched and obesity among children. It is difficult to reduce TV watching hours because potential strategies, such as social marketing and education, are likely to be relatively weak interventions. However, the evidence suggests that a reduction in the watching of TV could significantly reduce the prevalence of obesity.^[16]

Computer use was not significantly associated with obesity. The behavior of children, who use home computers rather than watch television, is generally viewed as positive. However, using computers rather than participating in sports and social activities raises concerns about the possible effects on the children's physical and psychological well-being.^[17] Little research has been done on how children's growing use of computers may displace activities other than television watching, and the few findings available are ambiguous. Some evidence indicates that children who use home computers may watch less television than non-users, but other evidence suggests that television watching remains the same or may even increase with the use of home computers.^[17]

This study did not investigate the relationship between the duration of watching TV and computer use. However, sedentary pursuits, such as watching television and using the computer, may be important environmental factors that have contributed to the prevalence (25%) of childhood overweight and obesity in the United States.^[15]

Although no research has systematically documented a relationship between obesity and computer use, there is evidence that childhood obesity is linked to excessive watching of television, that is, five or more hours per day.^[18,19] As children spend increasing amounts of time in front of computer monitors (in addition to the time spent in front of a television screen), they are likely to increase their risk of obesity.^[20] In the present study,

this was confirmed, especially with regard to the time spent over the weekend. Consequently, the American Academy of Pediatrics advises parents to limit the time their children spend with the media and to emphasize alternative activities, such as athletics, physical conditioning, and imaginative play.^[21] The relationship between computer use and adiposity warrants confirmation and further study, especially since the trend is of more computer use among children of school-age with increasing availability of software that targets this group.

CONCLUSION

The present investigation reveals that TV watching represents an important risk factor for obesity in children of school-age. It confirms that a substantial percentage of children of school-age view TV for more than three hours on week days and at weekends. Increase in a child's age, the presence of more than one TV at home, having their own TV, and an increase in the number of hours of watching TV over the weekend were significantly associated with an increased risk of childhood obesity. Personal computers and the Internet were not significantly associated with an increased risk of childhood obesity. School-based intervention programs should be properly implemented, as these programs effectively reduce the exposure to TV and BMI, especially in older children. In addition, parents should play a more positive role in reducing the time their children spend watching TV and encourage them to engage in physical activities.

Limitations

- The study was conducted in a limited area and does not necessary reflect the characteristics of the general population.
- Levels of television watching and computer use were obtained by reports of personal interview, which may affect the validity.^[22] Student recall was used to assess television/video and computer usage. These subjective measures may contribute to the weak associations with obesity in this study and previous studies.^[20]
- Other forms of the use of technology, such as playing of video games, were not assessed. Moreover, combining television/video watching with computer use was likely to have underestimated the true use of the media. This approach may bias the findings for overall media use toward the null hypothesis and help explain why we found only a borderline association between computer use and weight status.
- The study provides no information on the content of media use; therefore, we cannot ascertain which types of programs or advertisements are associated with a higher weight status.

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