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Physical Activity and Sedentary Behaviors as Risk Factors of Obesity among Rural Adolescents

Nasser Alqahtani*, Jane Scott and Shahid Ullah

Flinders University, Adelaide, Australia

***Corresponding author:** Nasser Alqahtani, Ministry of Health, Adelaide, Riyadh PO Box 42248, Saudi Arabia, Tel: +966530102200; E-mail: nasadiet23@gmail.com

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Abstract

Objective: The aim of this study is to explore relationship between Physical activity and sedentary behavior (screen time) and obesity among adolescents in rural areas.

Methodology: Cross-sectional study was conducted in 2011 using a multistage randomization method. It surveyed 370 from rural areas of Riyadh region in Saudi Arabia.

Results: This study found a strong association between the moderate to vigorous METs and overweight and obesity among male participants ($p<0.001$). Prolonged screen time has strong association with overweight in males ($p=0.01$) and females ($p<0.001$). Similar association found between screen time and obesity in males and females ($p<0.001$).

Conclusion: low physical activity and prolonged screen time are the main predictors for overweight or obesity or both of them in rural adolescents.

Keywords: Overweight; Obesity; Adolescents; Saudi arabia

Introduction

Overweight and obesity are descriptions of excessive body fat [1]. The WHO estimates that, globally, approximately 20 million children under age five are overweight [2], and Kosti and Panagiotakos (2006) have estimated that about 155 million children and adolescents are overweight; that is, one in every 10 children globally are afflicted with overweight problems. Saudi Arabia is experiencing an alarming prevalence of overweight and obesity as one in every three Saudis is obese [3].

Reports by the Saudi Diabetes and Endocrinology Society (SDES) indicate that in 2012 about 70 % of Saudi adults were obese, a statistic which is consistent with the predictions of the Saudi Obesity Research Centre (SORC) [4,5]. In the last two decades several cross-sectional studies have found that the average body fat of Saudi adolescents has been increasing nationally [6-9]. The proportion of Saudi adolescents who are overweight or obese is now very high, their combined prevalence being 47 % [10,11].

Obesity in adolescents has been associated with chronic illnesses such as cardiovascular disease [12,13], pre-diabetes [14] and Type 2 diabetes [15,16]. Moreover, obese adolescents are at serious risk of sleep apnoea, joint problems, and social and psychological problems [17-19].

So far, research into obesity in Saudi Arabia has focussed mostly on males in urban cities and there are no national data about the prevalence of overweight and obesity in rural areas; additionally, relatively few studies have investigated overweight and obesity in adolescent females. In a cross-sectional study in urban area, the researchers noting that the general lack of participation in physical activity was a predictor of obesity in adolescents (OR=1.35; 95% CI 1.06-1.94).This study aim to evaluates the influences physical activity, and screen time on overweight and obesity in adolescents in rural districts of Saudi Arabia.

Methodology

This is a cross- sectional study conducted among adolescents in Riyadh region, Saudi Arabia in 2011. Schools and participants were selected using multistage randomization method. Thirty five eligible participants were chosen from twenty five elementary and secondary schools. This project surveyed 370 school children (196 males and 174 females) aged 14 to 19 years old.

physical activity and sedentary behaviour were measured using the physical- activity questionnaire which has been designed and validated for use with Saudi Arabian adolescents [20]. This study was approved by the Social and Behavioral Research Ethics Committee of Flinders University (Project No 4793: 11 May 2010).

Data-entry and statistical analyses were conducted using Excel 2010 and SPSS software version 19.0 (SPSS, Inc., Chicago IL.) and STATA version 12.0 (StataCorp. 2011). The two-sided tests were performed for all analyses and the level of significance was set at $P < 0.05$. Where appropriate. Descriptive statistics were expressed as median and Interquartile ranges (IQR) were reported for the data.

Results

Table 1 show that there was no significant association between weight-status and age amongst rural male and female participants.

Age and gender	Normal%	OW%	Obese%	P*
Males				
14-15	51.8	15.7	32.5	0.8
16-17	58.4	18.2	23.4	
18-19	55.6	16.7	27.8	
Females				
14-15	56.9	27.6	14.5	0.92
16-17	55.9	25.4	18.6	
18-19	51.3	28.2	20.5	
P* values are based on Chi-square test between urban and rural areas; P values of less than 0.05 were considered statistically significant.				

Table 1: Weight status of participants by age group and gender

Table 2 shows the median and IQR of screen time and the MET of moderate and vigorous physical activities for normal, overweight, and obese adolescents in rural areas. Normal weight males spent less time on screen activities and more time exercising than did overweight and obese males ($p<0.001$), but there were no particular differences between overweight and obese males. In the same regions, normal weight females spent less time on screen-based activities and more time on METs than did overweight and obese females ($p<0.001$) but there were no differences between overweight and obese females.

Screen time and physical activity	(N=370)			
	Normal (n=205)	OW (n=80)	Obese (n=85)	P*
Male	(n=108)	(n=33)	(n=55)	
Screen time (hours per day)	1.8^{a} (1.2-2.4)	2.6^{b} (1.8-2.9)	4.3^{c} (2.8-5.1)	<0.001
Moderate METs per week	3360^{a} (2137-6063)	1260^{b} (420-2152)	1260^{b} (840-1620)	<0.001
Vigorous METs per week	6160^{a} (3918-1116)	2310^{b} (770-3946)	2310^{b} (1540-2970)	<0.001
Total moderate to vigorous METs per week	9520^{a} (6056-7180)	3570^{b} (1190-6098)	3570^{b} (2380-4590)	<0.001
Female	(n=97)	(n=47)	(n=30)	
Screen time (hours per day)	1.4^{a} (1.0-2.0)	3.0^{b} (1.7-3.2)	2.6^{b} (1.9-4.0)	<0.001
Moderate METs per week	1260^{a} (840-1890)	630^{b} (630-1050)	652^{b} (630-1102)	<0.001
Vigorous METs per week	2131^{a} (1540-3465)	1155^{b} (1155-1925)	1196^{b} (1155-2021)	<0.001
Total moderate to vigorous METs per week	3570^{a} (2380-5355)	1785^{b} (1685-2975)	1848^{b} (1785-3123)	<0.001
*P values are based on Kruskal-Wallis Test. Differing superscript letters denote significantly different column proportions at the 0.05 level. Absence of superscript letters denotes no significant difference between column proportions.				

Table 2: Median (Inter-quartile range) screen time and physical activities for normal, overweight and obese participants by gender.

In order to determine more precisely the net independent effects that any particular factor had on weight status. The multivariate multinomial logistic regression model was used in this study [21,22] to help explain the confounding effects of the factors in the model. Tables 3 show the final stage of multivariate multinomial logistic regression model. Among rural males, total moderate to vigorous Kilo METs was inversely associated with the risk of both overweight (OR=0.84; 95% CI 0.75-0.95; p=0.01) and obesity (OR=0.71; 95% CI 0.56-0.90; p<0.01). In addition, the amount of time spent on screen-based activities was directly associated with risk of overweight (OR=2.58; 95% CI 1.19-5.58; p=0.02) and obesity (OR=9.63; 3.70-25.06; p<0.001). Finally, the amount of time spent on screen-based activities was

directly associated with the risk of overweight among rural females (OR=4.75 95% CI 1.96-11.47; P<0.01) and obesity (OR=7.41 95% CI 2.49-22.05; p<0.001).

	Male (n=196)						Female (n=174)					
	Overweight [b]			Obese [c]			Overweight [b]			Obese [c]		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Total Kilo METs per week	0.84	0.75-0.95	0.01	0.71	0.56-0.90	<0.01	0.79	0.58-1.06	0.12	0.82	0.47-1.44	0.50
Screen time (hours per day)	2.58	1.19-5.58	0.02	9.63	3.70-25.06	<0.001	4.75	1.96-11.47	<0.01	7.41	2.49-22.05	<0.001

[a] the reference is normal weight equivalent to an adult BMI of 18.50 to 24.99 kg/m^2

[b] overweight equivalent to an adult BMI of 25.00 to 29.99 kg/m^2

[c] obesity equivalent to an adult BMI of equal or more than 30 kg/m^2

Table 3: Multinomial logistic regression model (Odds ratios and 95% confidence intervals) of dietary factors, total Kilo METs, and screen time for different weight statusa for male and female rural adolescents.

Discussion

Physical activity

Health research has consistently found that the general increase in overweight and obesity has an association with low and/or reduced levels of physical activity by children [23-28]. Also, as noted by Patrick et al. among adolescents in the USA low physical activity has been associated with an increased risk of having a high BMI [24].

Physical activity guidelines recommend that adolescents should participate in moderate to vigorous activity for at least 60 minutes every day [29-31].

The results of this study show that there is a low prevalence of physical activity among Saudi adolescents. Only 29% of male and 25% of female participants were participating in moderate or vigorous activity for at least one hour daily. The proportion is similar to that reported in two earlier Saudi studies which reported that only 30% of adolescents aged 12 to 20 years met the requirements for physical activity [32,33].

There are several possible explanations why Saudi adolescents have low levels of physical activity. Firstly, young Saudis prefer to use cars instead of walking, even for short distances such as going to and from school [34]. For cultural and religious reasons female students cannot practice any physical activity in their schools. However, in April 2013, the Ministry of Education allowed female students in private schools to play sports and games such as volleyball and soccer [35].

This study found that the female participants perform significantly less physical activity in comparison to the male participants, this result confirming other studies of Arab children and adolescents [36-38]. A survey of 9,433 Saudi adolescents by Collison et al in 2010 found that males were spending significantly more time in exercise than females (p 0<0.05)[36]. In a cross-sectional study among Palestinian children, male children participated more in physical activities than females [37], and in the United Arab Emirates, the amount of physical activity among female adolescents was very low compared to their peers in the UK, Sweden and Australia [38].

This study found a strong association between the moderate to vigorous METs and overweight and obesity. The risk of overweight and obesity can be reduced by performing moderate to vigorous activity.

Insufficient physical activity (less than 30 minutes per week) by Saudi male adolescents in an earlier Saudi study was found to be associated with obesity (OR=1.6; 95% CI 1.01- 2.62) [39]. This confirms the results of a survey conducted in the South province by Mahfouz in 2008, the researchers noting that the general lack of participation in physical activity was a predictor of obesity in adolescents (OR=1.35; 95% CI 1.06-1.94)[40]. In a Spanish cross-sectional study among 2,859 adolescents, high levels of moderate to vigorous exercise (more than 15 minutes per day) were associated with lower abdominal obesity [41].

Screen time

While the WHO does not have any guidelines for screen time, other health organisations have recommendations for the maximum time young people should spend watching screens of any sort. The Australian Department of Health and Ageing (ADHA), and other international authorities such as the American Academy of Paediatrics (AAP), recommend that children and adolescents should not spend more than two hours per day viewing TV [31, 42]. Based on this recommendation, only 25% of male and 22% of female participants in this study met the recommendation of less than or equal to 2 hours of watching TV. The average time participants spent viewing television was 2.4 hours per day, a figure similar to the 2.5 hours reported in a study of adolescents aged 14 to 16 years in the United Arab Emirates [38]. A survey of Italian adolescents reported an average of 2.8 hours per day [43].

While the average hours the Saudi participants spent watching television was similar to, or somewhat lower than, other studies, the proportion of children watching more than the recommended two hours of television is higher than that reported in other surveys. For instance, in this study 53% of subjects watched more than two hours of television per day, a figure higher than the 47.6% reported for adolescents in the Greek part of Cyprus [44]. In Finland, 44% of male and 48% of female adolescents had reported watching TV more than

two hours daily [45]. In a Chinese study among adolescents aged 13-18, 44.3% of male and 34.7% female participants spent more than two hours of watching TV per day [46]. From the 1999 to 2006 American National Health and Nutrition Examination Survey (NHANES), the prevalence of the USA adolescent who watch TV for more than 2 hours/day was 29% [47].

This study found a strong association between screen time and weight, the risk of overweight and obesity being directly associated with the amount of screen time. However it is not the lack of movement that is the only causal factor, and previous research has concluded that sedentary behaviour is associated with other obesogenic practices such as consuming high calories snack and sweetened carbonated drinks [48, 49]. That is, people tend to snack on high-calorie food while watching television, foods which are highly advertised on TV.

Conclusion

This research found that, among rural Saudi adolescents, low physical activity and prolonged screen time are the common predictors for overweight or obesity or both of them.

This research provides, for the first time, an exploration of the determinants of overweight and obesity among adolescents in rural areas. These results are valuable because they will provide the basis for action to help resolve this health issue - at least among this age group.

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