OVERWEIGHT AND ITS DETERMINANTS IN ADOLESCENT GIRLS IN JEDDAH CITY, SAUDI ARABIA

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Abstract: There are growing concerns about increasing levels of obesity in adolescents in Saudi Arabia. To address the problem requires an understanding of the determinants. The objective of the study was to quantify the problem of overweight and obesity in adolescent girls in Jeddah, Saudi Arabia and to explore the determinants, with a view to informing policy. A cross-sectional survey was conducted among girls aged 13 to 18 in Jeddah. Height and weight measurements were taken and girls completed a questionnaire which explored a range of nutrition-related issues. A total of 1519 female adolescents participated in the study, 24% were overweight or obese and 14% were underweight. This is the first Saudi study to use an ecological model to investigate comprehensively factors that might have an effect on adolescents' eating behaviours and nutrition status.

Keywords: *Adolescents, Girls, Overweight Status, Ecological Framework, Personal and Environmental Factors, Eating Behaviours*

BACKGROUND AND AIMS

Adolescents comprise 20% of the world's total population. Twenty-four percent of Saudi females are in the 10 to 19 years age range (Ministry of Economy and Planning, 2007). It is well known that multiple influences on adolescents' eating behaviour make them especially prone to nutritional disorders such as obesity and anorexia. This may predispose adolescents to long-term health

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problems. Adolescence is a timely period to shape and consolidate healthy eating and lifestyle behaviours, thus preventing nutrition-related chronic diseases in adulthood (Williams et al., 1995).

In previous studies of Saudi adolescent females' weight status, the prevalence of overweight ranged from 11% (n=767) to 27% (n=13,177) and obesity from 8.1% (n=600) to 24% (n=13,177) (Figure 1). National studies showed prevalence of overweight ranged from 12.7% (n= 12,701) to 23.1% (n= 19, 317) and obesity from 6.7% to 11.3% (El-Hazmi and Warsy, 2002) & (El Mouzan et al., 2010).

Unhealthy eating habits such as a low intake of fruit, vegetables,

fibre, and dairy foods, a high intake of fast foods and fizzy drinks, snacking outside home and erratic eating behaviours, such as skipping meals, especially breakfast were reported in some Saudi studies (Al-Shoshan, 1990), (Al-Sheri, 1996), (Al-Sudairy and Howard, 1992), (Musaiger et al., 2005). No studies have focused exclusively on Saudi adolescent girls. This study assesses the nutritional status of female adolescents in Jeddah and could fill a gap in the data regarding the nutritional status and eating habits of this population. It will help to inform policy in this area. The objectives were to assess the BMI and to explore the relationships between weight status and personal and environmental factors influencing the eating
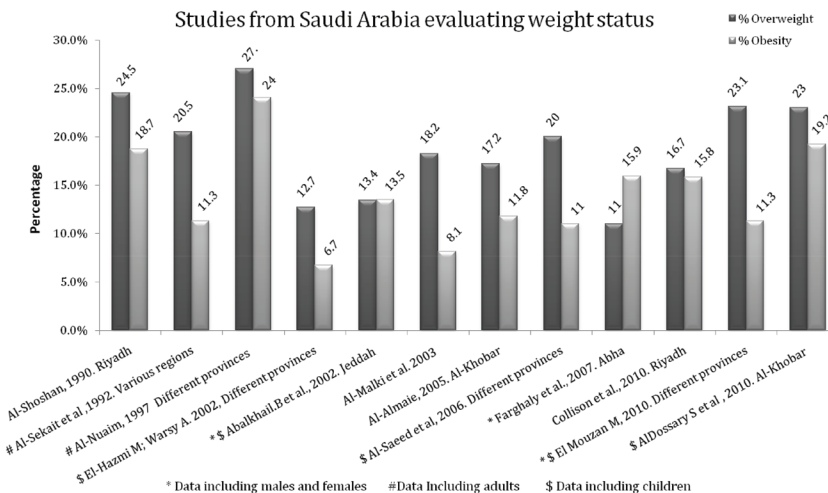

Figure I: Shows some of the studies on prevalence of overweight and obesity among adolescent girls in Saudi Arabia over the last 20 years

behaviours and nutritional status of adolescent girls in Jeddah city.

THEORETICAL FRAMEWORK

In order to analyse the multiple influences on adolescents' eating behaviours and nutritional status, the study uses Mary Story's (2008) ecological models where food environments and factors affecting food choices are conceptualised. According to the model, these factors fall into individual-level factors and three environmental-level factors: social, physical, and macro-level environments. The model also emphasises the interaction and integration of factors within and across levels of influence.

METHODS AND MEASURES

Anthropometric and questionnaire-based data were collected from intermediate- and high-school-girls in Jeddah in the school setting between September 2008 and June 2009. Eighteen schools were selected randomly from both intermediate and secondary levels in both governmental and private sectors (Figure II). A total of 1519 girls between the ages of 13 and 18, were stratified by age groups, 13 to 15 and 16 to 18 and selected through their schools using a multistage random sampling technique. Participants completed a self-report questionnaire and height and weight measures were collected. To adjust BMI for age in this study, all individual data were converted into standard deviation scores (SDS) using the LMS growth programme (Pan and Cole, 2011), relative to the World Health Organization (WHO) 2007 growth data (Onis et al., 2007). Overweight status was defined using the 2007 WHO guidelines for BMI classification by age and gender for 5-19 year-olds. Overweight was defined as from the 85th to 95th centiles and obese at 95th centile and above.

Explanatory measures were derived from the self-completed questionnaires and include socio-demographics and biological categories. Explanatory variables related to knowledge, perceptions and attitudes about nutrition, health and body image were also included. In addition, variables related to participants' self-reports of concerns of media influence (books, magazines, computer and computer games and TV viewing) on their food choice, especially through the use of food advertisements was used in this integration. In addition to personal behaviours and lifestyle variables were also included.

Environmental variables include those that are related to the three levels of the environment: socio-environmental, physical environmental and Macrosystem (media and marketing, and their influences on participants' eating behaviours). However the present study focuses on a limited number of outcome measures that were found previously to be related to overweight status. Data was coded and analysed using SPSS software (version 18). Overweight status and eating behaviours were analysed using descriptive statistics and chi-square analyses were performed to detect significant relationships.

RESULTS AND DISCUSSIONS

Socio-demographic characteristics & weight status of the sample

The study comprised 1519 participants from intermediate and high schoolgirls. Their ages range was 13 to 18 years with a mean age of 15.5 years (SD=1.70). Sixty two percent
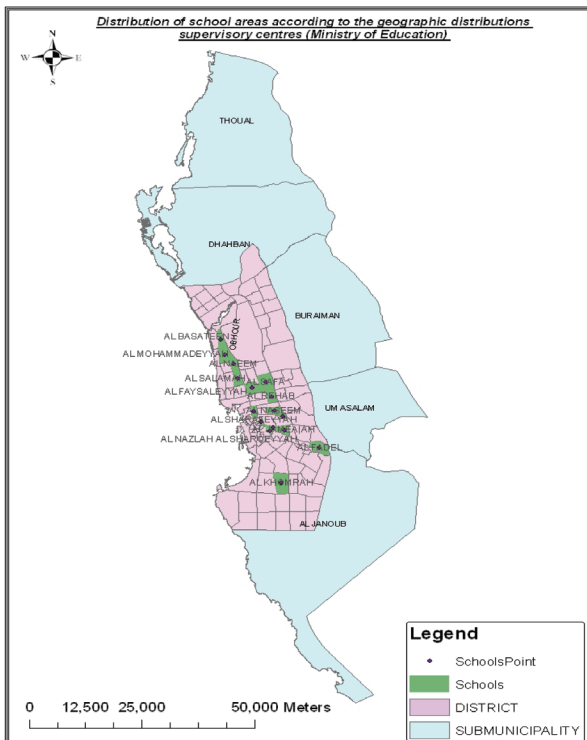

Figure II: Map of Sample distribution

(938) of participants were Saudi nationals. Seventy-seven percent of adolescents' mothers in the survey were not working. The reported monthly household incomes for more than half of the population were more than 7500 SR (£ sterling >1250). The proportion of home ownership was 51%. Fifty-five percent of the participants had live-in domestic workers in their houses. The overall prevalence of overweight girls (BMI≥85th and <95th percentile) was 10.6% (n=161), whereas obese (BMI≥95th percentile) girls constituted 13.5% (n=205) of the study population and 14.4% (n=217) were underweight. The prevalence of overweight is lower than reported in previous national report while obesity is higher (El-Mouzan et al., 2007). However, the national data did not include a population from Jeddah city, so the present findings could be a baseline of prevalence rates for overweight and obese in Jeddah adolescent girls. Other recent studies in various areas of Saudi suggested different prevalence rates of weight status among young Saudi girls and the present study indicates that Jeddah girls are less likely to be overweight or obese compared to their counterparts in the capital city of Saudi Arabia (Collison et al., 2010) & (Mohamed and Fayad, 2011).

Associations of overweight status with individual and environmental factors

Individual (intrapersonal) factors: The survey findings suggested overweight status is significantly related to age of menarche. A lower proportion of overweight girls, who had a BMI-for-age ≥85th started menstruation before age 12 compared with normal girls who had a BMI of ≥5 to <85th. This is in contrast with other international studies were BMI status was strongly and positively associated with age at menarche. The higher the BMI, the lower is the age at menarche (Goon et al., 2010) & (Acharya et al., 2006). Obese girls reported more medical problems including allergy, asthma, anaemia, and gastrointestinal disturbances, compared to normal weight counterparts.

The education level (intermediate or high school) was also significantly related to overweight status, compared to normal weight status of participants.

Significant differences in levels of physical activities were also found between overweight girls

and normal girls. Overweight girls (P=0.003) reported lower physical activity levels compared to normal weight girls. However, time spent on sedentary behaviours such as reading, computer time and screen time were not significantly associated with weight status. Moreover, findings confirmed no differences in BMI status according to moderate physical activities such as walking and swimming, or other behaviours such as smoking. This is in agreement with Fayssal in 2007 who found that physical activity did not significantly relate to BMI on a 12-19 years old population from three different provinces including the Western province of Saudi Arabia (Fayssal et al., 2007).

Skipping breakfast was associated with being overweight (P= 0.018) and overweight girls reported a lower consumption of snacks compared to their normal weight counterparts (P=0.02). Girls' dieting behaviour was significantly related to their weight status (P<.01). Overweight girls were less likely to go on weight reduction diets than normal weight girls. Following a special diet (prescribed by health professionals) was significantly related to weight status of the girls (P<.01). Overweight girls were

less likely to follow and ask for health professional advice to control their undesired weight, compared to their normal weight counterparts (37% vs. 63%). These observations tend to confirm that Jeddah's overweight girls have low weight concerns and they may be less concerned about their weight problem. This may indicate non-awareness of overweight problems and the possible adverse health effects associated with being overweight or obese. Saudi young girls have been reported to have poor knowledge about overweight and obesity and a lack of information about the health complications of excess weight (Mohamed and Fayad, 2011).

Questions that were designed to solicit information regarding media and their effect on eating behaviours and weight status of Jeddah young girls, showed no significant associations with weight status. Despite the significant relationships, girls who were exposed to screen time for two hours or more and girls who were believing in TV promotion, we more likely to be overweight (BMI>85th centiles), compared to their normal weight counterparts.

ENVIRONMENTAL FACTORS (INTERPERSONAL, COMMUNITY SETTINGS & SOCIETAL)

Environmental factors that were associated with weight status of Saudi girls are listed in Table II. Estimations of mothers' weight as "about the right weight", was negatively related to weight status with a *P*-value of *P*<0.01. Overweight girls were less likely to rate their mothers' weight as normal weight, compared to normal weight girls (21.2% vs. 57.5%). Parents of overweight girls were less likely to ignore weight problems of their daughters, compared to parents of normal weight girls (5.3% vs. 22.5%). Thus family encouragement for girls to lose weight significantly associated with girls' wishes to lose weight by following a weight reduction regime. Overweight girls were significantly less likely to report their eating outside home times, compared to their normal weight counterparts (*P*=0.014).

The present study showed a strong association between a number of factors and weight status of Jeddah adolescent girls. These factors include individual factors such as biological factors (e.g. age of menarche), eating habits and lifestyle and environmental factors such as family influence, access to food and societal influence. Previous Saudi research studies, which were mostly cross-sectional in nature, have examined bivariate relationships between adolescent overweight and individual and/or family risk factors and socio-economic status such as parental work and education. They have also examined physical inactivity and a family history in addition to television use and diet (Alwan and Zamakhshary, 2009). However, these risk factors often do not occur in isolation and the ecological system theory used in this study emphasizes the importance of considering the individual as well as the environment within which the adolescent girls exist. Behavioural choices are made within the broader social environment including the family and friends, community and the societal environment.

CONCLUSION

In Jeddah 24% of the adolescent girls are overweight or obese. The study illustrates the importance of using and applying an ecological

model in understanding and explaining the multiple influential (intrapersonal and interpersonal) factors on Saudi adolescent girls. Unhealthy eating patterns and dietary practices are common among Jeddah adolescent girls and some of these practices are related to their overweight status.

RECOMMENDATIONS AND FURTHER RESEARCH DIRECTIONS

- An understanding of how the individual and environmental levels of influence interact and associate with Saudi adolescent weight status is needed for development of effective nutrition interventions to tackle overweight problem. The data collected here and the findings could be used as a basis for healthcare workers, particularly nutritionists and dieticians to prepare materials for obesity intervention in Saudi Arabia.

- Improving dietary and lifestyle patterns of Saudi adolescents will not only addresses individual behaviors but also the environmental context and conditions in which these young people live and make choices.

- Individual behaviour change of adolescents is difficult to achieve without addressing the context in which people make decisions. So initial, significant steps are needed by parents, schools, dieticians and other health professionals and policy makers to make healthful food choices available, identifiable, and affordable for Saudi adolescent girls.

BIOGRAPHY

Dr Elham Al Jaaly was previously a Lecturer on an undergraduate course in clinical nutrition at applied medical college, King Abdul-Aziz University (KAU), Jeddah, Saudi Arabia. She was also the chief of Nutrition and Dietetics at King Abdulaziz University Hospital. She was the Main Researcher in the international programme. This included the smart heart challenge (SHC), 'Lowering your cholesterol by Oats' in 2003-2004. She is a member of various committees in the Saudi Council for Health Specialist and a member of Different Committees on Medical Nutrition Therapy and health education. She is a regular presenter at national and regional level. She also

presented some of her work in a number of international meetings. She holds a B.A. in clinical nutrition and was the first Saudi graduate in therapeutic dietetics in Saudi Arabia. She is the 1st Saudi Dietician. Also she is a MMedSci holder in Human Nutrition, University of Sheffield, Faculty of Medicine. U.K. Currently, is a PhD researcher at CIHD, ICH, UCL and working on a project that assessing the nutritional status and eating patterns of Saudi adolescent girls in Jeddah city

Dr Margaret Lawson is a State registered dietician since 1969, MSc in Human Nutrition, and PhD in Clinical Biochemistry (1990). A fellow of the British Dietetic Association in 2001 and A Postgraduate certificate in Allergy was awarded by Southampton University in 2004. She is a member in a number of Committees include Department of Health, British Dietetic Association, Journal of Human Nutrition & Dietetics, Caroline Walker Trust and Royal College of General Practitioners. Her research interests are the links between eating habits and health in native and immigrant groups of children in the UK

(including obesity management) and assessment of body composition in various disease states, particularly HIV infected children. Has published a number of books and articles.

Professor Therese Hesketh is a Professor in Global Health specialising in he impact of difficult circumstances on the health and psychosocial well-being of children; reproductive health, demographic change and health systems in China. Trained in paediatrics in Bristol and London, Therese has worked with NGOs and UN organisations in China, Indonesia, Cambodia and Laos as a clinical teacher and manager of health programmes. These included the development of the first Neonatal and Paediatric Intensive Care Unit in China and the first neonatal outreach programme for the training of doctors and nurses. Since joining CIHD she has developed a number of research projects in China in adolescent and reproductive health. She has explored the epidemiology of hepatitis B and C, STIs and HIV, the vertical transmission of infection and the impact of population policy on the health of women and children in China.

Table I: Associations of weight status (overweight & Normal) with different individual factors

Variables (No of respondents)	Normal weight	Overweight	P. Values ***	Variables (No of respondents)	Normal weight	Overweight	P. Values ***
Socio-demographic characteristics				*Knowledge, beliefs, attitudes and perceptions*			
-Age, years (1302)			$P=.06$	-Do you consider yourself healthy? (1075)*	784(72.9)	291 (27.1)	$P=.059$
13-15	445 (34.2)	196 (15)		-In your opinion, do you think that you eat healthy?(585)	447(76.4)	138 (23.6)	$P=.001*$
16-18	490 (37.6)	171 (13)		-How active are you, in comparison to others? (1287)			$P=.003*$
-Menarche age (1171)			$P<.01*$	below average	103(8.0)	67 (5.2)	
<12	110 (9.4)	92 (7.9)		average	707(54.9)	256(19.9)	
≥12	728 (62.2)	241 (20.5)		above average	113(8.8)	41 (3.2)	
-Education Level (1302)			$P=.01*$	-How do rate your figure compared to others your age?(1291)			$P<.001*$
intermediate	461 (35.4)	209(16.0)		too thin	57 (4.4)	6 (0.46)	
high	474 (36.4)	158 (12.2)		about the right figure	808(62.6)	188 (14.7)	
-School Sectors (1302)			$P=.25$	too fat	65 (5.03)	167 (12.9)	
public	699 (53.7)	263(20.2)		*Food consumption, food patterns, lifestyle & dieting practices*			
private	236 (18.3)	104(8.0)		-Do you take time considering the type of food when hungry? (773)	573(74.1)	200(25.9)	$P= .03*$
What is your nationality? (1302)			$P=.49$	-Do you eat snacks between meals? (1154)	836 (72.4)	318 (27.6)	$P=0.02*$
Saudi	578 (44.4)	218(16.7)		-Have you ever tried losing weight? (759)	475 (62.6)	284 (37.4)	$P<.001*$
non-Saudi	357 (27.4)	147(11.3)		-Did you lose weight on the followed weight reduction diet? (422)	241(57.1)	181 (42.9)	$P<.001*$
Does your mother work? (284)	186(65.5)	98 (34.5)	$P=.03*$	-Are you following any special diet? (259)	166 (64.1)	93 (36.9)	$P <.01*$
Does your father work? (1195)	864 (72.3)	331 (27.7)	$P=.82$	-Have you been in a weight reducing diet before? (534)	302 (56.6)	232 (43.4)	$P<.001*$

* Data reflects positive response. **P Value is significant at <0.05 **C to N: P values of overweight were compared to normal

Table II: Associations of weight status (overweight & normal) with different environmental factors

Factors (No of respondents)	Normal P$\geq$5 to <85th	Overweight P$\geq$85th n (%)	P Value C to N**
Where do you usually eat? (1293)			P= 0.8
Dining room	312 (24.1)	120 (9.3)	
Bed room	36 (2.8)	19 (1.5)	
Kitchen	42 (3.3)	14 (1.1)	
In front of TV	498 (38.5)	195 (15.1)	
Different places	41 (3.2)	16 (1.2)	
Do you buy food from school canteen? (1118)*	810 (72.5)	308(27.5)	P=0.33
How many times/week do you eat outside home(1250)			P=.014
One- two times	648 (52)	257(20.6)	
Three times or more	251(20)	94 (7.5)	
When I try to change my weight, my parents (1239)			
Encourage me	371 (29.9)	240 (19.7)	P<.001
Discourage me	232(18.7)	51 (4.1)	
Not caring and consider it personal	279(22.5)	66 (5.3)	
In my opinion, my mother figure is classified as (1264)			P<.001
Too thin	46 (3.6)	26 (2.5)	
About the right	727(57.5)	268 (21.2)	
Too fat	135(10.7)	62 (4.9)	
In my opinion, my father figure is classified as (581)			P=.132
Too thin	29(5.6)	11(1.9)	
About the right	59(10.5)	260 (44.8)	
Too fat	131(22.5)	91(15.7)	

* Data reflects positive response. **P Value is significant at <0.05
**C to N: P values of overweight were compared to normal

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