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Socio-economic Determinants Factors of Overweight and Obesity among Saudi Children

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Abstract

Background: In recent decades obesity has emerged as a serious health issue among adolescents in developed and developing countries.

Objective: The aim of this study is to investigate relationship between Socio-economic Status (SES) and obesity among adolescents in both urban and rural areas of Saudi.

Methodology: Cross-sectional study was conducted in 2011 using a multistage randomization method. It surveyed 1139 adolescents, 447 from rural areas and 692 from urban districts of Riyadh region in Saudi Arabia.

Results: Male adolescents living in households which had a domestic driver were at a significantly higher risk of being obese in both the urban ($p=0.02$) and rural areas ($p<0.001$). Urban females living in a medium-income household are at the risks of overweight ($p=0.02$) and obesity ($P<0.01$). The risk of obesity was almost 11-times higher for females living in households which had a driver ($p=0.01$). Owning a computer was associated with an increased risk of overweight among urban adolescent females ($p=0.01$).

Conclusion: Overweight and obesity now represent a national health crisis threatening adolescents in particular. An immediate action is indeed important to fight against this serious health issue among this age group.

Keywords: Childhood; Obesity; Overweight; SES

Introduction

The Body Mass Index (BMI), a straightforward tool for monitoring childhood/adults obesity is influenced by both the genetic and non-genetic factors [1]. Obesity is a health condition characterized by an accumulation of excess body fat [2]. It is associated with serious illnesses such as cardiovascular and respiratory diseases, Type 2 diabetes, and certain kinds of cancer [3,4], pre-diabetes [5], and Type 1 and Type 2 diabetes [6,7]. Obesity is now a major worldwide health concern and it is a serious problem in people of all ages in both developed and developing countries. Globally, it is estimated that 1.4 billion adults and about 200 million children and adolescents are overweight or obese [8,9]. Numerous of Arabic speaking countries are leading the prevalence of overweight and obesity in the world. Saudi Arabia has one of the highest rates of obesity, with 70 per cent of the adult population either overweight or obese [10,11]. Moreover, excessive body weight among Saudi children and adolescents is a rampant disease which has continued to escalate in recent decades. Among adolescents in Kuwait, the incidence of obesity reached 24.8% [12]. Results of cross sectional study among survey indicated an overall level of 30% of children were overweight or obese [13]. To date there has been relatively little empirical research on this issue in this region. Indeed there is need to conduct work which can explore the relationship between obesity and its determinants.

The main aim of this study was to explore the prevalence and the relationship between socio-economic status and body weight (overweight and obesity) among adolescents in Saudi Arabia.

Methodology

Socio-demographic data including age, gender, and location of participant's current residence were self-reported by participants who were also asked about household ownership of the internet, computers, televisions, DVDs, and satellite dishes. Participants were asked to list the number of drivers and maids employed in their household. Additional questions related to socioeconomic status including family income, and the educational levels and employment status of both parents. This information was collected in a short questionnaire completed by parents and returned by participants.

Ethical considerations

This study was approved by the Social and Behavioural Research Ethics Committee of Flinders University (Project No 4793: 11 May 2010). Permission was also obtained from the local school health and education directorate authorities. Potential participants received a verbal explanation of the study, a written information sheet, and a consent form. Signed informed consent was required from both the participants and their parent or guardian.

Data management and data processing

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). Data were entered using the unique ID code for each participant. Data were checked, and inconsistencies and outlying responses were identified and checked against the hardcopy questionnaires and corrected accordingly.

Results

Table 1 shows the socio-demographic characteristics of participants according to location of residence. Although there were no significant gender differences, the percentages of males from urban areas (52.6%) and from rural areas (53.0%) was slightly higher than females (urban: 47.4%; rural: 47.0%). Rural participants were significantly younger than urban participants, 43.0% of rural participants being 14-15 years of age of compared with 17.1% of urban participants (p<0.001).

Almost 43% of participants' mothers had some sort of primary or elementary education, the proportion of rural mothers with no education was more than double that of urban mothers (25.9% vs. 10.2%) while the number of rural mothers with university degrees was approximately half that of urban mothers (17.4% vs. 7.8%) (p<0.001). Fathers in both areas were more likely to have had some sort of formal schooling compared with mothers but the proportion of rural fathers with no schooling was almost four times that of urban fathers (12.7% vs. 3.4%). Conversely the proportion of urban fathers with university degrees was almost four times higher than that of rural fathers (29.3% vs. 7.6%) (p<0.001). With regard to family income, almost half (48.7%) of the rural families had a low income (less than 5000 Saudi Riyals SR) compared with one quarter (24.2%) of urban families. Conversely, significantly more urban families had a high family income (more than 12000 SR per month) than rural families (41.4% vs. 18.6%) (p<0.001). Urban families were significantly more likely to have a driver (p<0.001) or a maid (p<0.001) than rural families.

Weight status by socio-demographic characteristics

This section addresses the interrelationships between different socio-demographic characteristics and the weight-status of participants. Table 2 shows the percentages of weight-status in three groups (normal, overweight, and obese) for all participants and between rural and urban areas across various characteristics including parents' education, mother's occupation, family income, house ownership, and availability of a domestic maid and a driver.

Marked differences (p<.001) were found amongst urban participants in terms of family income, participants from low income families being more likely to be of normal weight. Medium-income families, (with monthly incomes between 5000 and 12000 Saudi Riyals) were more likely to have adolescent children who were overweight or obese. Families with high incomes of more than SR12000 were likely to have obese children. In both urban and rural areas, participants who had a driver were more likely to be obese than those who did not have a driver.

Characteristics	Groups	Percentage of adolescents			P*
		Total (n=1018)	Urban (n=648)	Rural (n=370)	
Gender	Male	52.8	52.6	53.0	0.91
	Female	47.2	47.4	47.0	
Age	14-15	26.5	17.1	43.0	<0.001
	16-17	47.5	53.7	36.8	
	18-19	25.9	29.2	20.3	
Mother's education	Never studied	15.9	10.2	25.9	<0.001
	Primary or elementary	43.1	39.5	49.8	
	Secondary or diploma	27.0	32.9	16.5	
	Bachelor, Master or PhD	13.9	17.4	7.8	
Mother's occupation	Working	20.2	21.1	18.7	0.34
	Not working	79.8	78.9	81.5	
Father's education	Never studied	6.8	3.4	12.7	<0.001
	Primary or elementary	30.6	24.1	42.2	
	Secondary or diploma	41.2	43.2	37.6	
	Bachelor, Master or PhD	21.4	29.3	7.6	
Father's occupation	Government	45.2	44.0	47.3	0.39
	Private	19.6	20.8	17.6	
	Business owner	8.4	9.1	7.3	
	Retired/No work	26.7	26.1	27.8	
Family income (SR)**	<5000	33.1	24.2	48.7	<0.001
	5000-12000	33.8	34.4	32.7	
	12000+	33.1	41.4	18.6	
House ownership	Own	73.3	72.4	74.9	0.39
	Rent	26.7	27.6	25.1	
Drivers	Yes	37.8	43.4	28.1	<0.001
	No	62.2	56.6	71.9	
Maid	Yes	51.5	61.0	34.9	<0.001
	No	48.5	39.0	65.1	

Table 1: Socio-demographic characteristics of participants by location of residence. *P values are based on Chi-square test between urban and rural areas; P values of less than 0.05 were considered statistically significant. **Saudi Riyals: 1 SR≈3.50$AU.

Characteristics	Group	Percentage of adolescents											
		Total (n=1018)				Urban (n=648)				Rural (n=370)			
		Normal n=442	OW n=247	Obese n=329	P*	Normal n=237	OW n=167	Obese n=244	P*	Normal n=205	OW n=80	Obese n=85	P*
Mother's education	No	17.4	11.7	17.0	0.08	11.4	7.8	10.7	0.26	24.4	20.0	35.3	0.43
	Primary or elementary	45.0	43.3	40.4		39.7	38.9	39.3		51.2	52.5	43.5	
	Secondary or diploma	26.5	26.3	28.3		53.4	29.9	32.8		16.1	18.8	15.3	
	Bachelor, Master or PhD	11.1	18.6	14.3		13.5	23.4	17.2		8.3	8.8	5.9	
Mother's occupation	Working	18.3	21.9	21.6	0.41	16.9	25.1	22.5	0.11	20.0	15.0	18.8	0.62
	Not working	81.7	78.1	78.4		83.1	74.9	77.5		80.0	85.0	81.2	
Father's education	Never studied	7.0	5.3	7.6	0.11	3.0	1.8	4.9	0.35	11.7	12.5	15.3	0.94
	Primary or elementary	34.2	26.7	28.9		26.6	21.0	23.8		42.9	38.8	43.5	
	Secondary or diploma	41.2	43.3	39.5		44.7	44.3	41.0		37.1	41.3	35.3	
	Bachelor, Master or PhD	17.6	24.7	24.0		25.7	32.9	30.3		8.3	7.5	5.9	
Father's occupation	Government	43.4	45.3	47.4	0.07	40.5	45.5	46.3	0.23	46.8	45.0	50.6	0.06
	Private	21.0	17.0	19.8		21.9	18.0	21.7		20.0	15.0	14.1	
	Business owner	7.9	11.7	6.7		8.0	12.0	8.2		7.8	11.3	2.4	
	Retired/No work	27.6	25.9	25.9		29.5	24.6	23.7		25.3	28.8	33.0	
Family income (SR)**	<5,000	41.4[a]	30.0 [b]	24.3 [b]	<0.001	32.9[a]	24.6[a]	15.6 [b]	<0.001	51.2	41.3	49.4	0.57
	5000-12000	28.5[a]	38.9 [b]	37.1 [b]		27.0[a]	38.3[b]	38.9 [b]		30.2	40.0	31.8	
	12000+	30.1[a]	31.2[b]	38.6[c]		40.1[a]	37.1[a]	45.5[a]		18.5	18.8	18.8	
House ownership	Own	74.4	72.5	72.3	0.77	74.7	70.7	71.3	0.60	74.1	76.3	75.3	0.93
	Rent	25.6	27.5	27.7		25.3	29.3	28.7		25.9	23.8	24.7	
Drivers	Yes	23.3[a]	30.4[b]	62.9[c]	<0.001	29.1[a]	35.9[a]	62.3[b]	<0.001	16.6[a]	18.7[a]	46.7[b]	<0.001
Maid	Yes	46.2	58.3	53.5	0.06	57.4	46.7	61.9	0.78	33.2	45.0	29.4	0.25

Table 2: Percentage of normal, overweight, and obese adolescents by socio-demographic characteristics and location of residence. *P values are based on Chi-square test between urban and rural areas; P values of less than 0.05 were considered statistically significant. **Saudi Riyals≈3.50 $AU. 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 3 is the final multivariate statistical result for males which found that employment of a domestic driver remained a significant influence after controlling for all potential confounders. Compared to males living in families that did not employ a domestic driver, participants living in households which had a domestic driver were at a significantly higher risk of being obese in both the urban (OR=5.35; 95% CI 1.56-18.38; p=0.02) and rural areas (OR=4.15; 95% CI 0.86-9.97; p<0.001).

Table 4 is the final multivariate model for females which shows that; for urban females living in a medium-income household the risks of overweight (OR=4.64; 95% CI 1.49-14.38; p=0.02) and obesity (OR=8.52; 95% CI 2.37-30.69; P<0.01) were significantly greater than for urban females living in a low-income family. There was no association between weight status and family income among rural females. However, the results found that, compared to rural females living in families that had no domestic driver, the risk of obesity was almost 11-times higher for females living in households which had a

driver (OR=10.86; 95% CI 1.65-71.65; p=0.01). Owning a computer was associated with an increased risk of overweight among urban adolescent females (OR=6.60; 95% CI 1.57-27.72; p=0.01).

		Urban (n=648)						Rural (n=196)					
		Overweight[b]			Obese[c]			Overweight[b]			Obese[c]		
		OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Drivers	Yes	2.52	0.87-7.30	0.09	5.35	1.56-18.38	0.02	2.04	0.37-11.17	0.41	4.15	0.86-9.97	<0.001

Table 3: Multinomial logistic regression model (odds ratios and 95% confidence intervals) in different weight status[a] and location of residence for male adolescents. [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.

Socio-demographics	Urban (n=307)						Rural (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
Family income (Saudi Riyals)												
Low (<5000)	1.00	-	-	1.00	-	-						
Medium (5000-12000)	4.64	1.49-14.38	0.02	8.52	2.37-30.69	<0.01						
High (>12000)	1.19	0.39-3.66	0.76	2.76	0.76-9.99	0.12						
Drivers												
Yes							1.93	0.44-8.48	0.38	10.86	1.65-71.65	0.01
Computer												
Yes	6.60	1.57-27.72	0.01	1.73	0.39-7.71	0.47						

Table 4: Multinomial logistic regression model (odds ratios and 95% confidence intervals) in different weight status[a] and location of residence for female adolescents. [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.

Discussion

Parental level of education

This study found that in rural areas, the number of mothers who had no education was more than double that of urban mothers (25.9% vs. 10.2%) while the number of rural mothers with university degrees was approximately half that of urban mothers (7.8% vs. 17.4%). Fathers in both areas were more likely to have had some formal schooling compared with mothers, but the proportion of rural fathers with no schooling was almost four times that of urban fathers (12.7% vs. 3.4%). Conversely, the proportion of urban fathers with university degrees was almost four times that of rural fathers (29.3% vs. 7.6%). It is clear that, in general, parents in urban areas had higher educational attainments than those in a rural area. Urban people in Saudi Arabia have ready access to all levels of education; indeed, tertiary institutions are found only in the main cities and towns. Moreover, people in rural areas tend to leave school early, the men commonly seeking employment in the military and the women marry early.

Despite clear differences in level of education attainment between urban and rural parents this study found no independent association between parental education and overweight or obesity which is consistent with results of another Saudi study [14]. It might be that environmental (e.g. traffic free open spaces) and cultural (tradition of home gardens) characteristics of rural Saudi communities have more of an impact on the lifestyle practices of children and adolescents than level of parental education.

Family income

This study has found that almost half (48.7%) of the rural families had a low income (less than SR5000 per month) compared with one quarter (24.2%) of urban families. Conversely, significantly more urban families had a high household income (more than SR12000 per month) than rural families (41.4% vs. 18.6%).

In less industrialized countries, such as Brazil and China, the prevalence of overweight children is markedly greater in families that have high incomes [15]. Wang et al. [15] suggests that this might be because such families consume more food and have more leisure time to spend on sedentary activities.

No significant independent association was found between family income and overweight or obesity among either rural or urban males or rural females in this study. Similar findings were reported by Al-Saeed et al. [16] who surveyed urban adolescents.

Among urban females living in medium-income households, the risks of overweight and obesity were significantly greater than urban females in low-income families. In this study urban females were found to be idler; that is they spent more time watching TV and less time in physical activities than rural females.

Domestic maid and driver

This study reported that 61% of urban households and 34.9% of rural households employed a housemaid, but no association was found between having a housemaid and overweight and obesity. Housemaids can be found in many Saudi households and as such is not necessarily an indicator of wealth or socioeconomic status.

Saudi women are not permitted to drive for religious and cultural reasons and so drivers are employed by families to drive female members of the household when a male relative is not available, with families often employing more than one driver. This study found that 43.4% of urban and 28.1% of rural adolescents had access to the services of at least one driver working for their families. The findings show that in both urban and rural areas, participants who had a driver were significantly more likely to be obese than those who did not have access to a driver ($p<0.001$). Moreover, the multivariate analysis found a direct association between having a domestic driver and obesity in rural females and in both urban and rural males. The availability of a driver means that many people have become dependent on cars for commuting. In fact, Saudi adolescents have been found to prefer taking a car rather than walking even for a short distance [16], a pattern of behaviour which can decrease daily physical activity [17] and increase the risk of overweight and obesity [18,19].

Dependence on motor vehicles for even short journeys is not unique to Saudi Arabia and in the United Kingdom the distances which people walk and cycle decreased by 26% between 1979 and 2000 [17]. An American study found that every additional hour per day spent in the car increased the risk of obesity by six per cent [19]. Similarly, in Australia, driving to work has been associated with the increased risk of overweight and obesity [18].

Availability of media devices

This study found males were spending more time than females in using screen devices like watching TV, playing video games and using a computer. This can be the result of cultural influences. In Saudi culture, females are not expected to play video games or spend long time using computers. In addition, female adolescents spend more time helping their mother in house activities which might limit their screen time.

Although availability of TV was almost universal in both areas, the proportion of adolescents having access to TV was significantly more in urban areas (97.2%) than in rural areas (94.5%) ($p=0.04$). Urban participants were significantly more likely ($p<0.001$) to have the use of DVD players, satellite dishes, computers, and the internet than those in the rural area.

The univariate analysis found that access to the internet ($p=0.02$), to DVD players ($p=0.02$), and computers ($p<0.001$) at home were lowest amongst adolescents of normal weight compared with those who were overweight and obese. After adjusting for physical activity the multivariate analysis found that owning a computer was independently associated with increased risk of being overweight ($p=0.01$) among female urban adolescents only, but not urban or rural males or rural females. Ownership of media devices can be considered a weak proxy indicator of physical activity and its usefulness as predictor of overweight and obesity diminishes as ownership of devices approaches universality.

Conclusion

Overweight and obesity have become a global epidemic, and in Saudi Arabia they now represent a national health crisis threatening the welfare of the entire community. It is a major medical concern in Saudi Arabia as obesity is predicted to affect more than 70 per cent of the population by 2015 [11].

Many short-term and long-term medical consequences are associated with adolescents' overweight and obesity. Overweight and obese adolescents can develop serious health problems such as diabetes and heart diseases and are at risk of experiencing hypertension, asthma, skin infection, and liver disease. Moreover, obesity developed early in life is extremely difficult to reverse and often leads to obesity in adulthood.

The findings of this study provide the basis for future study in overweight and obesity among Saudi adolescents. Further qualitative studies are needed to understand and clarify the relationships between overweight and obesity and the different causes. Intervention programs can be established which can help to reduce the risk of overweight and obesity in adolescents, and these need to be trialed and evaluated. Other potential causes, such as the contributions of genetic and environmental factors, should be explored further to assess their impacts on overweight and obesity.

As a result of the lack of a suitable database for research regarding overweight and obesity in Saudi Arabia, further qualitative and quantitative studies are needed. A national health survey should be conducted to gather primary data regarding childhood and adolescent nutrition, health, and physical activity in both urban and rural areas.

Conflict of Interest

All authors state that there were no conflicts of interest in this research.

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