Energy Intake, Diet Composition among Low Social Class Overweight and Obese Egyptian Adolescents

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Abstract: Obesity has become a leading global public health problem. Better understanding of dietary habits and activity patterns is needed to reduce obesity prevalence. This study aims to compare dietary intakes and physical activity in normal weight, overweight and obese Egyptian adolescent females of low social class. It entails a case-control cross-sectional study that included 129 girls (39 obese, 30 over weights, and 60 normal weights). Their food and energy intake was analyzed. Exercise activity and sedentary behaviors were recorded. Results revealed that overweight and obese daily consumed more grams of macronutrients (carbohydrates, fat and protein) with high fat percentage. Vitamin C and calcium intake was low (P<0.05). Despite a high incidence of skipping breakfast, they had more than three meals per day (P<0.05). They used to eat junk food at least once daily, fast food more than 2 times per week and their daily food intake does not regularly include fresh vegetables and fruits (P<0.05). They used to spend long time watching TV or playing computer games (P<0.05). This piece of work recommends inviting health professionals and parents to encourage Egyptian adolescents to eat balanced regular meals and to get use to active lifestyle. [Journal of American Science 2010;6(9):160-168]. (ISSN: 1545-1003).

Keywords: Obesity, overweight, adolescence, diet, macronutrients, micronutrients, physical lifestyle, television watching, playing computer games.

1. Introduction

Obesity has become a leading global public health problem. The International Obesity Task Force (IOTF, 2008) terms obesity as the millennium disease and emphasizes on the international impact of this condition. Currently more than one billion over weight adults and 300 million of these are clinically obese. It is estimated that 17.6 million children less than five years of age are overweight worldwide (World Health organization, 2008). Over the past 2 decades, the prevalence of overweight has doubled in children and nearly tripled in adolescents in the United States (CDC, 2008). Since 1980 in USA the prevalence of overweight has doubled in children and nearly tripled in adolescents (CDC, 2008).

There have been few reviews on the prevalence of childhood obesity in Middle Eastern countries (Kelishadi, 2006). Because the Middle East has the highest dietary energy surplus of the developing countries and because of rapid changes in the demographic characteristics of the region, with large shifts in dietary and physical activity patterns, a rapid rise in non-communicable disease risk factors, especially obesity, is occurring (Galal,2003). In a review of 39 surveys from 28 developing countries to determine obesity among women, Martorell et al (2000) reported that women in Egypt and Turkey have the highest proportion of overweight (31.7% for both), as well as the highest proportion of obesity (20.1% for Egypt and 18.6% for Turkey). Most of the surveys in this region have been performed in adult populations. There are few published studies that focus on the rise of overweight and/or obesity among adolescent girls (Ibrahim et al, 2000; El-zeiny et al., 1999).

Changes in lifestyle and socioeconomic status in Middle Eastern Region have had a significant effect on physical activity, life has become more sedentary, and the pattern of practicing exercise has diminished steeply in most countries. In Egypt, it was found that practicing exercise is the activity least done during leisure time in a typical day. Only 2% of adults (20–70 years) were reported as practicing exercise in a typical day, 8.5% practicing during the weekend and 2.5% during their annual leave (Yasin,1998).

A large proportion of young people engage in sedentary behaviors such as watching television for prolonged periods of time. Data from the National Health and Nutrition Examination Survey and the Centers for Disease Control and Prevention show that at least 1 in 4 youth watch television and/or play computer games >4 hours per day. Most studies have found a negative relationship between the amount of physical activity, especially of vigorous intensity, and the prevalence of overweight/obesity. Time spent watching television and playing on the computer was also predictive of overweight/obesity. Some studies have shown that sedentary behaviors such as prolonged television viewing may predict weight status in youth independent of physical activity level *(*Zoeller, 2009**).**

Clearly, there is a need for effective intervention strategies to control obesity, including better understanding of dietary habits and activity patterns of overweight and obese. Studies regarding lifestyle factors associated with obesity among Egyptian adolescent girls are at most scanty. Hence, this study is an attempt to evaluate the association between some dietary and behavioral factors (physical activity and sedentary behaviors including television viewing) which lead to an increased risk of obesity in Egyptian adolescent females using a low socioeconomic class population.

2. Subjects and Methods

This case-control cross sectional study included 129 adolescent females their age ranged between 17 -18 years old. They were selected from students in the first year of Al -Tarbia College, 2007-2008, of Cairo-University. All studied females provided signed written informed consent to participate in assessments. Thorough history and general examination were done to exclude forms of obesity other than exogenous dietetic obesity.

Anthropometric measurements including weight and height were assessed at the National Research Centre. The studied females were dressed in physical training uniforms during the measurement sessions. Height was measured to the nearest 0.5 cm without shoes using wall-mounted stadiometer. Body weight was measured to the nearest 0.1kg by a standard clinical balance. All measurements were made on the right side of the body by using techniques described in the Anthropometric Standardization Reference Manual (Lohman et al, 1988). Each measurement was performed twice. The mean of the two trials was used in all statistical analyses. Body mass index (BMI) was calculated by dividing weight by height squared (kg/m^2), which was plotted on BMI age and sex specific charts available from the Centers for Disease Control and Prevention (www.cdc.gov.growthcharts). Adolescents from 5^{th} up to 85^{th} percentiles were considered within normal weight, those above the 85^{th} percentile were considered overweight (85^{th} to 95^{th} percentile), whereas 95^{th} or above were considered obese cases (Ogden et al, 2002).

Dietary assessment was done using two 24-hour recalls and one 1-day food record. This combination has been previously validated (Lytle et al, 1993) and provides a good overview of the habitual diet. Volumes and portion sizes for the 24-hour recalls were estimated using measuring cups and spoons, photographs of food portions, and graduated food samples of cheese and bread. For the 1-day-food record individual digital kitchen scales were used. Soda consumption questions indicated that the serving size was a can, glass, bottle, or cup (serving per day) and eating junk food (at least one time/day) includes potato chips, cookies, cake, and sweets. The extent of underreporting was assessed using the criteria defined by Goldberg et a1 (1991). Macronutrients analyzed were fat, protein, carbohydrate and fiber. Micronutrients analyzed were vitamin A, vitamin C, calcium, magnesium, iron, zinc and cupper.

The physical activity questionnaire aimed at recording the usual physical activity pattern. Questions included the way to college, activity and the amount of regular exercise performed in a week, the habitual use of free time, as well as the time per day spent watching TV and playing computer games. The questionnaire regarding the socioeconomic background included queries about the parent's education (scores form 0 = no professional education to 3 = university degree), and parent's occupation (scores from 0= no occupation to 3= high salary occupation). Low socioeconomic status correspond to neither or the only parent having no more than a high school degree, while high socioeconomic status correspond to both parents having a college degree. The socioeconomic status of all parents included in this study was considered as low socioeconomic status according to the previously mentioned criteria (Delva et al 2007).

Dietary data obtained from the three records were checked carefully and manual analysis of macro- and micro-nutrient content was done for each 100 gram of different food item included in our study according to the food composition tables for Egypt, Nutrition Institute, Cairo University in 1996. Energy and nutrient data were averaged over the three days to obtain a mean daily energy and nutrient intake for each child.

Statistical analysis using the SPSS program of personal computer version 10 employed the ANOVA test for comparison of the mean values and the simple correlations. Pearson Correlations were calculated to evaluate the relationship between the variables. P-values <0.05 were considered statistically significant.

3. Results

Anthropometric and socioeconomic data

The study included 129 adolescent females. Sixty adolescent were normal weight (group 1) with a BMI 23.2±1.5, thirty adolescent were overweight (group 2) with a BMI 26.5±0.8, and thirty-nine were obese (group 3) with a BMI 34.3±5.2. The maternal level of education was low in group 3 (1.7±0.8) and group 2 (1.9±0.8) compared with that of group 1 (2±0.6). The difference between group 1 and 3 was statistically significant (P<0.05). Maternal occupation level of group 2 (0.5±1) and group 3 (1±1.1) was low compared with group 1 (1.4±1.2). The difference between the maternal occupational level of group 2 and group 1 was statistically significant (P<0.05). Paternal education and occupation level was comparable for the three groups (Table 1).

Energy, macro-and micro-nutrient intakes:

The mean energy intake was 2184±530.7 kcal, 2713±321.6 and 3338.4±1176.4 kcal for normal weight, overweight and obese adolescent females respectively. The difference in the mean energy intake between the three groups was statistically significant (P<0.05) (Table 2).

The macronutrient composition of the diet was 51.4% carbohydrates, 33.7% fat and 14.9% protein in normal weight females, and 48.9% carbohydrates, 36.4% fat and 14.7% protein in overweight females, and 52.2% carbohydrates, 35.3% fat and 12.6% protein in obese females. On average, obese and overweight females consumed more grams of carbohydrates, fat and protein compared to normal weight females.

The micronutrient diet intake was significantly low in vitamin C and calcium whereas iron and zinc intake was high in obese and overweight compared with their intake in normal weight females. The intake of vitamin A, magnesium, and cupper did not significantly differ between the females of the three groups.

Eating pattern:

Despite a high incidence of skipping breakfast, they had more than three meals per day (P<0.05) (Table 3). They used to eat junk food at least once daily, fast food more than 2 times per week and their daily food intake does not regularly include fresh vegetables and fruits (P<0.05).

Television watching and physical activities:

Obese and overweight females spent more time per day watching TV or playing computer games compared with normal weight females (P<0.05) (Table 4). However there was no difference regarding number of reported exercise or play sessions per week between females of the three groups.

4. Discussions

The immediate cause of obesity is net energy imbalance. The key causes are increased consumption of energy-dense foods high in saturated fats and sugars, and sedentary lifestyle. It has been suggested that excessive energy intake is the primary cause of obesity (Miller and Lindeman 1997).

Results of our study revealed that the mean energy intake was significantly high for overweight and obese females compared with normal weight females. The macronutrient composition of the diet was 51.4% carbohydrates, 33.7% fat and 14.9% protein in normal weight females, and 48.9% carbohydrates, 36.4% fat and 14.7% protein in overweight females, and 52.2% carbohydrates, 35.3% fat and 12.6% protein in obese females. Thus, regarding diet composition overweight and obese females had high intake of fat percents compared with normal weight females. Data from the food balance sheet (2000) showed an increase in calories consumed during 1971–1997 in the Middle Eastern countries, and a high percentage of these calories came from animal foods. Over the same period, during the past 4 decades daily per capita fat intake showed notable increases, ranging from 13.6% in Sudan to 143% in Saudi Arabia (Musaiger,2002). Scientists have reported that excessive consumption of dietary fat may be a more important determinant of obesity than excessive consumption of either carbohydrate or protein (Bolton-Smith and Woodward, 1994). Dietary fat has been related with obesity because of its energy density, its palatability, its weak effect on satiety, and its more efficient conversion to body fat (Mela and Sacchetti, 1991). In contrast, carbohydrates have lower energy density, are more satiating, and are converted to body fat less efficiently (Acheson et al, 1982). Those observations imply that diet composition, as well as energy balance, and are associated with obesity.

The Centre for Disease Control and Prevention (CDC), estimates that only 15% of adolescents aged 12 to 19 years meet the recommendation that less than 30% of total daily energy intake come from fat and that only 7% of adolescents meet the recommendation that less than 10% of total daily energy intake come from saturated fat (Kann et al, 2000).

Thus prevalence of adolescent obesity among low social class can be mainly attributed to their improper diet composition. Energy dense diets (e.g., diets based primarily on foods with added sugars, fats, or both) are more affordable than prudent diets (e.g., diet based primarily on healthy foods such as fresh fruits and vegetables) (Drewnowski and Specter, 2004). Thus, it has been hypothesized that association between deprivation and obesity is mediated in part by the low cost of energy dense food (Drewnowski and Specter, 2004). This was supported by our findings because low socio economic standard (SES) obese adolescents were eating unhealthy foods compared to normal weight ones. Eating fruits less than one time per week ($P<0.01$), eating vegetables less than one time per day ($P<0.05$), eating fast food (more than two times/week) ($P<0.05$), eating junk food (at least one time/day) ($P<0.05$), and consuming more number of meals ($P<0.05$).

Government food pricing policies can be one of the drivers of obesity. A previous study conducted in Egypt showed that the country's food subsidy program reduces the per-calorie costs of energy-dense foods such as bread, oil, and sugar compared to energy-dilute but nutrient-dense foods such as fruits and vegetables. The study also revealed that mother Body Mass Index increased as the price of energy-dense food items decreases and decreases as the price of energy-diluted food items decreased. This suggests that the food subsidy program may aggravate obesity in the country by lowering the direct costs of becoming obese (Asfaw, 2006 a and Asfaw, 2006 b).

Daily consumption of fruit and vegetables is an important indicator of a healthy diet and the beneficial effect of lowered body mass index (BMI) has been well documented (Epstein et al, 2001). Our results were similar to some studies have also reported low consumption of fruits and vegetables in obese adolescents (Cavadini et al, 1999 and Cavadini et al, 2000).

Obese and overweight adolescents consume more fast food, junk food and number of meals than their normal weight counterparts observed in this study, may be indicative of increased energy intake(Forslund et al,2005) as a result of consumption of energy-dense foods in between meals, as well as by increasing the frequency of such intake(Jahns and Popkin,2001).

The findings that skipping breakfast was significantly related to the weight status of female adolescents are in accordance with observations made among adolescents in Brazil and in the Gulf region. (Terres, 2006 and Musaiger, 1991). American teenagers who skip breakfast are more likely to be obese than those who eat a morning meal (Maureen et al, 2008**).** Breakfast can enhance children's diets by positively contributing to daily nutrient intake, augmenting intake of key nutrients such as fiber and calcium, and provides an opportunity to help meet the recommendations of the Dietary Guidelines for Americans. Breakfast also is associated with more healthful food choices. Cross-sectional studies support that eating breakfast more often may help children and adolescents maintain a healthful weight (Gail and Rampersaud, 2009). It is also possible that girls who miss breakfast tend to consume greater amounts of food at lunch thereby gaining weight. However, in study done by Mota et al (2008) breakfast skipping is not seen as a predictor of being overweight/obese.

Analysis of the dietary intake showed that the micronutrient dietary intake was significantly low in vitamin C and calcium.

The findings of this study suggest that nutrition education is necessary, better adherence to the traditional diets, and prevention of the upward trend of overweight in this age.

Low physical activity levels may be as important as excess energy intake (Molnar and Livingstone 2000; Rodriguez and Moreno 2006), but data from previous studies are equivocal. Swinburn et al. (2006) found energy intake was a more important determinant of high body weight than low physical activity.

Participation in high-intensity exercise appears to positively impact on weight status, independent of sedentary activity in adults (McMurray et al, 1995). Some studies have shown that sedentary behaviors such as prolonged television viewing may predict weight status independent of physical activity level in youth (Zoeller, 2009**)** Thus, both measures of physical inactivity and activity may need to be considered.

Results of our study revealed that there was no significant difference regarding number of reported physical activities per week between females of the three groups (obese, overweight and normal weight). However obese and overweight females spent more time per day watching TV or playing computer games compared with normal weight females (P<0.05).

The influence of physical activity (PA) on body weight and body fat in adolescents is controversial. Beunen et al (1992) and Laurson et al (2008) could not demonstrate an effect of physical activity on adiposity. In contrast; Deheeger et al (1997) reported physical activity was significantly correlated with less adiposity. However, data suggesting that lower levels of physical activity promote childhood overweight are equivocal (Livingstone, 2001).

Previous studies regarding television viewing habits and weight status have been equivocal, with some showing a relationship (Anderson et al, 1998; Giammattei et al, 2003 and Janssen et al 2004) and others not finding a relationship (Robinson et al, 1993; DuRant et al, 1994 and Burke et al, 2006). A positive correlation was found between TV and prevalence of obesity in youth even after controlling for age, race/ethnicity, family income, weekly physical activity, and energy intake (Kaur et al, 2003). Sedentary lifestyle began early in life and worsened throughout childhood and adolescence LaFontaine(2008).

Our results have shown that significant effect of television viewing in obese and overweight females was a more important factor than physical activity. Similarly Robert et al (2000) showed a similar trend in female adolescents. Television viewing has been suggested to contribute to obesity through reducing energy expenditure from displacement of physical activity and increased dietary energy intake, either during viewing or as a result of food advertising. Repeated episodes of eating while watching television may result in televisions becoming a conditional stimulus for eating and exposure to distracting stimuli can increase energy intake (Temple et al, 2007). Dubois et al(2008) reported that children who consumed snacks while watching television on a daily basis, or some times during the week, had higher BMI, ate more carbohydrates (total), more fat and less protein, fewer fruits and vegetables, and drank soft drinks more often than children who never ate snacks in front of the television.

The discrepancy between studies showing relationship between either physical activity and television viewing and body weight could be related to several factors including, methodological variation in the measurement of physical activity and television viewing data, classification of overweight and that many studies have not accounted for socioeconomic status (SES).

Low SES appears to be related to increased body fat (Wolfe et al, 1994) and may influence PA levels (Macera et al, 1995). Robert et al (2000) noted that those female adolescents with a low SES were more likely to be overweight. Kristjansdottir and Vilhjalmsson (2001) concluded that adolescents from families with lower socioeconomic status have less opportunity to participate in physical activities pursuits because of cost or other access barriers such as poor parental support.

The maternal level of education and occupation was low in overweight and obese adolescent females compared with that of normal weight group. Similarly low maternal education level was significantly related to children's overweight in low-income families in Korean society (Cho et al,2009) .Therefore health education especially for mothers is needed for improving the dietary composition, food habits and promoting physical activities to combat obesity.

5. Conclusion

Obesity among adolescents is attributable to defective diet composition and to sedentary lifestyle. Understanding feeding and activities contexts may help parents and health professionals to develop strategies promoting healthy food and lifestyle among adolescents. Health education for improving dietary composition and food habits, encouraging physical activities and reducing time spent with TV or computer games can decrease obesity prevalence.

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Table 1: Anthropometric and socioeconomic data

	Group (1) Normal weight (n=60)	Group (2) Over-weight (n=30)	Group (3) Obese (n=39)
Age (y)	17.51 (±0.13)	17.38 (±0.32)	17.36 (±0.33)
Height (m)	158 (±2.38)	160.32 (±4.20) [a]	159.69 (±7.10) [b]
Weight (kg)	58 (±4.73)	68.30 (±4.45) [a]	86.73 (±14.82) [b, c]
BMI	23.20 (±1.51)	26.54 (±0.79) [a]	34.34 (±5.19) [b, c]
Education Mother	2 (±0.63)	1.9 (±0.84)	1.69 (±0.83) [b]
Education Father	2.2 (±0.40)	2.1 (±0.71)	2 (±0.83)
Occupation Mother	1.4 (±1.21)	0.5 (±1.04) [a]	1 (±1.12)
Occupation Father	2.2 (±0.40)	2.1 (±0.71)	2.1 (±0.77)

Mean (SD)
Parent's education (scores form 0 = no professional education to 3 = university degree).
Parent's occupation (scores from 0= no occupation to 3= high salary occupation).

ANOVA test: [a] significant P value (<0.05) comparing group 1 &2
[b] significant P value (<0.05) comparing group 1 &3
[c] significant P value (<0.05) comparing group 2 &3

Table 2: Dietary intake in normal weight, over weight and obese groups

	Group (1) Normal weight (n=60)	Group (2) Over-weight (n=30)	Group (3) Obese (n=39)
Energy intake (k. cal)	2184 (±530.72)	2713 (±321.57) [a]	3338.38 (±1176.42) [b, c]
Protein intake (g)	82.26 (±17.76)	101.66 (±20.06) [a]	116.73 (±36.90) [b, c]
% of energy intake as protein	14.95 (±2.16)	14.65 (±3.34) [c]	12.56 (±3.25) [b, c]
Fat intake (g)	81.32 (±11.71)	116.16 (±36.72) [a]	140.24 (±127.82) [b]
% of energy intake as fat	33.65 (±4.55)	36.42 (±6.23)	35.28 (±15.84)
Carbohydrate intake (g)	292.78 (±103.98)	344.85 (±73.35)	492.50 (±189.56) [b, c]
% of energy intake as carbohydrate	51.39 (±6.35)	48.93 (±6.96)	52.16 (±13.60)
Fiber (g)	5.64 (±3.36)	7.26 (±3.24)	10.86 (±7.67) [b, c]
Vitamin A (IU)	1275.60 (±883.68)	1456.30 (±1322.59)	1337.84 (±1424.19)
Vitamin C (mg)	154.60 (±168.26)	18.60 (±35.01) [a]	21.61 (±33.15) [b]
Calcium (mg)	1089.40 (±339.88)	950.83 (±572.30) [a]	820.91 (±634.30) [c]
Magnesium (mg)	170 (±55.14)	156 (±40.25)	198.69 (±130.40)
Iron (mg)	10.34 (±1.54)	12.16 (±4.44)	18.58 (±7.14) [b, c]
Zinc (mg)	9.74 (±2.53)	10.81 (±5.47)	13.84 (±7.20) [b, c]
Cupper (mg)	1.63 (±0.30)	1.67 (±0.65)	1.67 (±1.13)

Mean (SD)
ANOVA test: [a] significant P value (<0.05) comparing group 1 &2
[b] significant P value (<0.05) comparing group 1 &3
[c] significant P value (<0.05) comparing group 2 &3

Table 3: Eating pattern in normal weight, over weight and obese groups

	Group (1) Normal weight (n=60)	Group (2) Over-weight (n=30)	Group (3) Obese (n=39)
Eating fruits less than one time/day	24 (40%)	12 (40%)	30 (77%) [b, c]
Eating vegetables less than one time/day	12 (20%)	15 (50%) [a]	17 (44%) [b]

Soda consumption at least one time/day	12 (20%)	9 (30%)	13 (33%)
Eating fast food more than 2times/week	12 (20%)	15 (50%) [a]	13 (33%)
Eating junk food at least one time/day	36 (60%)	18 (80%)	13 (33%) [b, c]
Skipping breakfast	12 (20%)	12 (40%) [a]	26 (67%) [b, c]
Number of meals/day (mean ±SD)	(4.4 ±0.49)	(3.6 ±0.81) [a, c]	(4.3 ± 0.79) [c]

The values are prevalence and percentage of participants saying yes in each category.
ANOVA test: [a] significant P value (<0.05) comparing group 1 &2
[b] significant P value (<0.05) comparing group 1 &3
[c] significant P value (<0.05) comparing group 2 &3

Table 4: TV watching (hours/day) and number of reported exercise or weekly play sessions in normal weight, over weight and obese groups

	Group (1) Normal weight (n=60)	Group (2) Over-weight (n=30)	Group (3) Obese (n=39)
TV watching, hours/day (mean ±SD)	(1.2 ±1.17)	(3 ±2.18) [a]	(3.2 ±2.45) [b]
Sports sessions One time/week	36 (60%)	18 (60%)	23 (58.9%)
Sport sessions 2 times/week	12 (20%)	6 (20%)	7 (18%)

The values are prevalence and percentage of participants saying yes in each category.
ANOVA test: [a] significant P value (<0.05) comparing group 1 &2
[b] significant P value (<0.05) comparing group 1 &3
[c] significant P value (<0.05) comparing group 2 &3

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