

Dietary Behaviours and Body Mass Index Among Secondary School Students in Dubai

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Abstract

Obesity is often defined as a condition of abnormal and excessive fat accumulation in adipose tissue to the extent that health may be adversely affected. The prevalence of obesity is increasing worldwide at an alarming rate in both developing and developed countries. Several dietary behaviours have been linked with adult and childhood obesity. The objective is to identify dietary behaviors in the past 7 days preceding the study and determine their association with BMI among secondary school students in Dubai. A cross sectional study was carried out in private and governmental schools in Dubai, 2011. Stratified random sample was used to select a sample of 1221 students. Self-administered questionnaire was used to collect data of dietary behaviours in the past seven days. Body weight and height were measured in order to calculate Body Mass Index and link it with dietary behaviours. A percentage of 20.1% of the students had good dietary behaviours, 67.8% had fair dietary behaviour, and 12.1% had poor dietary behaviors. A percentage of 34.6% of the students were overweight and obese (19.5% & 15.1% respectively) while 5.0% were underweight. Looking to soft drink consumption, it was observed that, students who were consuming soft drinks everyday had the highest percentage of overweight/ obesity (44.6%), as compared to those who were not consuming soft drinks in the past 7 days of the survey (25.8%) and this was statistically significant. Concerning fast food consumption, 41.0% of students who were eating fast food 5 times or more per week were overweight/ obese, as compared to 27.5% who were not eating fast food in the past 7 days of the survey, and this was statistically significant. The highest mean dietary behavior score was found among those with normal BMI (13.43 kg/m²), while it was 12.56 kg/m² among overweight and 12.12 kg/m² among obese. The difference was statistically significant. There was only one significant predictor for overweight and obesity which was soft drink consumption. Students who consume soft drink everyday were more likely to be overweight/ obese relative to those who did not drink it in the past 7 days preceding the study, (OR=2.31, CI= 1.65-3.24). Students who demonstrated the highest mean dietary behavior score were more likely to be of normal BMI, while those of lowest one were overweight or obese. There was only one significant predictor for overweight and obesity, which was soft drink consumption. Further studies are needed.

Keywords

Dietary Behaviour, Body Mass Index, Adolescents, Dubai

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1. Background

Obesity is often defined as a condition of abnormal and

excessive fat accumulation in adipose tissue to the extent that health may be adversely affected [1]. The prevalence of obesity is increasing worldwide at an alarming rate in both developing and developed countries. It has become a serious epidemic health problem, estimated to be the fifth leading

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cause of mortality at global level [2].

Due to its high economic growth, the United Arab Emirates (UAE) has evolved into one of the most dynamic and vibrant economies in the region and globally [3]. However, in recent times the UAE has started to experience high rates of obesity and diabetes [4]. A recent study in Dubai (2011) among UAE national adolescents aged 12-17 years old revealed that, the overall prevalence of overweight and obesity were 19.3% and 21.6% in males; and 12.3% and 19.5% in females [5].

The rapid increase over the past three decades in the prevalence of childhood obesity in developed countries across the world has led to increased concern about the diets of adolescents and children [6-8]. Although increased levels of sedentary behavior are likely to be associated with this increase in obesity, changes in food consumption patterns are also likely to play an important role [9].

Several dietary behaviors have been linked with adult and childhood obesity, including increased number of meals eaten outside the home, larger portion sizes of meals at restaurants and fast-food takeaways, and increased consumption of soft drinks [10, 11]. The increasing prevalence of snacking has also recently been suggested as a potentially important influence on energy regulation in adolescents and adults [12].

This study was conducted as adolescents' dietary behaviors are considered an important determinant of BMI and there are few studies regarding the association between dietary behaviors and BMI among school children in Dubai.

2. Objectives

To identify dietary behaviors in the past 7 days preceding the study and determine their association with BMI among secondary school students in Dubai.

3. Methodology

Study design and setting:

A cross sectional study was carried out in governmental and private secondary schools in Dubai.

Target population: Students of secondary schools (males and females) in grades 10-12.

Sampling design:

Sample size:

Sampling size is calculated using computer program EPI-INFO version "6.04" considering the following: 20.8% of unsatisfactory dietary habits among school children [13], 3% degree of precision, 1.5 design effect and 95% confidence interval. The minimum sample size required is 1034.

Sampling technique:

Stratified random sample with proportional allocation was carried out. The stratification was based upon the regions (Dubai is classified administratively into two regions Bur Dubai and Deira), type of school (governmental and private), and gender (male and female). Overall in both Deira and Bur Dubai, the total number of private schools exceeds the number of governmental one. Selection of schools was carried out proportional to the number of schools; for every four private schools selected, one governmental school was selected. The total number of the selected schools was 16 private and 4 governmental schools.

Data collection plan:

The data was collected from the students through the structured pilot tested self-administered questionnaire.

The English questionnaire was translated into Arabic language then back translation was carried out.

The questionnaire included the following sections.

Section I: Socio-demographic Data: it included type of school (governmental & private), age, sex, nationality grade of education, parents' education, mother working status and monthly family income

Section II: Nutritional knowledge:

It consists of 9 questions, adopted and modified from validated and reliable dietary questionnaire [14]. It aims at investigating the knowledge of the students regarding healthy components of a balanced diet, breakfast importance, knowledge about foods that contain carbohydrates, fibers, protein, fats, and knowledge about foods with more calories.

A score of (1) was given for the correct answer and score of (0) was given to the incorrect answer or do not know. The total score of this section was ranged from 0-9, and it was divided and categorized as <33.3% = poor nutritional knowledge, 33.3% -< 66.6% = fair nutritional knowledge, ≥66.6% = good nutritional knowledge [15].

Section III: Dietary behaviors:

It is composed of 11 questions adopted and modified from valid and reliable dietary questionnaire [16, 17].

It investigated the students' healthy and unhealthy dietary behaviors in the past 7 days preceding the study. The questions about healthy dietary behaviors included the intake of breakfast, food variety, milk, vegetables and fruits consumption, while questions about the unhealthy dietary behaviors were soft drinks, snacks, and fast food consumption, in addition to reasons of not eating breakfast.

Overall Dietary behaviors score: Calculation of overall dietary behavior scores was carried out as follows: A score assigned for each question ranges from 0 to 3; with the

maximum score (3) assigned to the healthiest one and the minimum score (0) to the least healthy one [18].

Section IV: Anthropometric Measurement:

Measuring students' body weight and height to calculate Body Mass Index (BMI), in order to assess the nutritional status of the students.

Weight and height were measured by the school nurse using standard procedure. (101) Weight was measured to the nearest 0.1 kg using an electronic scale. To ensure accuracy in measurement the scale was checked for a zero reading before each time of measurement. The height of the student was measured, in the standing position, to the nearest 0.1 cm using a portable stadiometer which was attached to the weighing scale. The student was asked to stand without shoes and socks, back against the scale, heels together and head in the upright position. The movable headboard was lowered until it firmly touched the upper part of the subject's head and a direct reading of height was obtained [19].

Body mass index (BMI) was calculated as weight (kg) divided by the square of the height (m) (kg/m^2). Body mass index is then classified using the cut-off values as recommended by the World Health Organization (WHO) according to age and sex [20] as the following:

1. Underweight: < 5th percentile of BMI
2. Normal weight: 5th to < 85th percentile of BMI
3. Overweight: 85th to < 95th percentile of BMI
4. Obese: \geq 95th percentile of BMI

Statistical analysis:

The statistical analysis was carried out using computer program SPSS version "19". The following statistical analyses were performed:

1. Frequency tables with descriptive statistics (mean, mode, median and standard deviation) were used for the quantitative variables.
2. Testing the normality of data concerning the overall dietary behaviors score was carried out using: Comparison of mean and median, Box and Whisker-plot and Kolmogorov Smirnov Test. The data proved to be normally distributed so parametric statistics was preferred to use.
3. Student t-test and ANOVA were used to compare the overall mean dietary behaviors score between two and three independent samples respectively.

Stepwise multiple linear regression analysis was carried out for adjustment of the confounders and delineating the predictors for the overall dietary behaviors. Dependent variable: overall dietary behaviors score. Independent

variables: socio-demographic variables and BMI. To minimize the effect of multicollinearity among the factors, significant variables from bivariate analysis were forced into stepwise multiple linear regression analysis. P value < 0.05 was used as a cut off level of significance.

4. Results

Figure 1 demonstrates the distribution of secondary school students according to their overall dietary behaviors level, Dubai 2011. The figure displayed that 20.1% (Confidence Interval (CI)= 17.9-22.4) of the students had good dietary behaviors, 67.8% (CI=65.3-70.5) had fair dietary behavior, and 12.1% (CI = 10.3-13.9) had poor dietary behaviors.

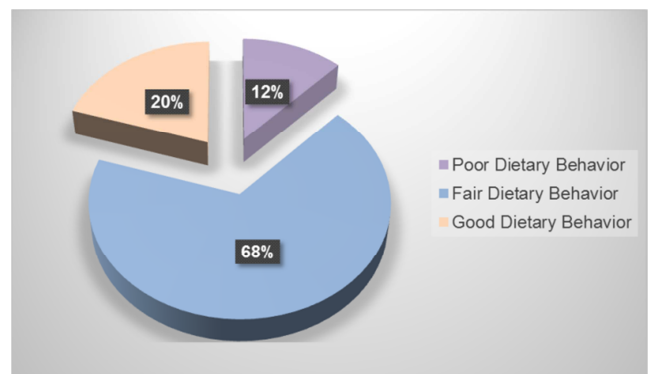


Figure 1. Distribution of the study sample of secondary school students according to their dietary behaviors level.

Figure 2 presents the distribution of the study sample of secondary school students according to their Body Mass Index (BMI), Dubai 2011. The figure displayed that, 34.6% of the students were overweight and obese (19.5% & 15.1% respectively) while 5.0% were underweight.

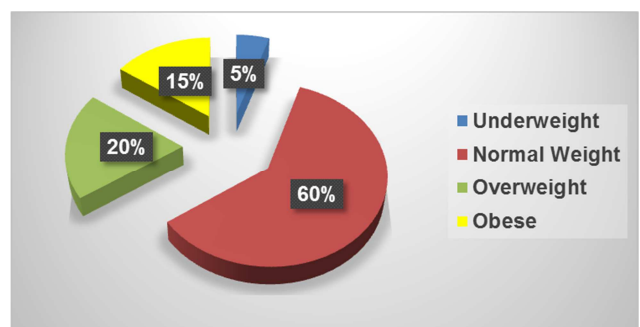


Figure 2. Distribution of the study sample of secondary school students according to their Body Mass Index.

Figure 3 represents the overall mean dietary behaviors score by BMI, Dubai, 2011. It was demonstrated that, the highest mean dietary behavior score was found among those with normal BMI (13.43 kg/m^2), while it was 12.56 kg/m^2 among overweight and 12.12 kg/m^2 among obese. The difference was statistically significant.

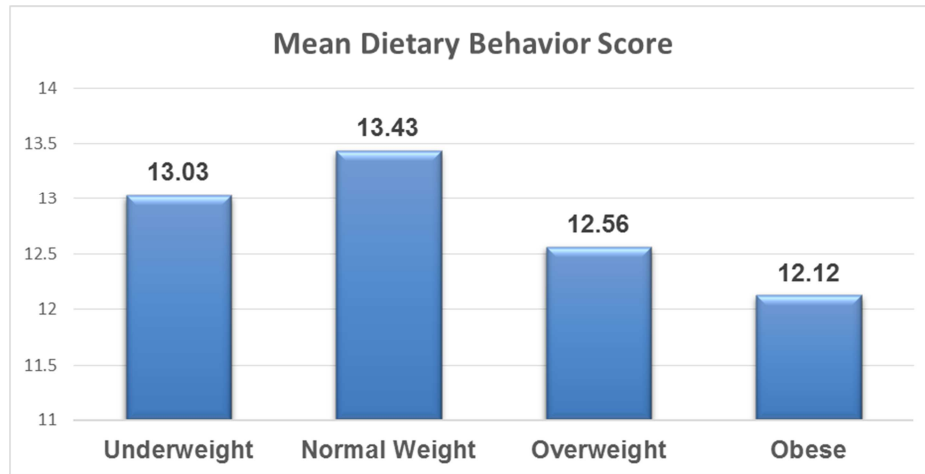


Figure 3. Overall mean dietary behaviors score by body mass index of the study sample of secondary school students.

Table 1 represents the distribution of the study sample of secondary school students according to dietary behaviors and their BMI, Dubai, 2011. Looking to soft drink consumption, it was observed that, students who were consuming soft drinks everyday had the highest percentage of overweight/ obesity (44.6%), as compared to those who were not consuming soft

drinks in the past 7 days of the survey (25.8%) and this was statistically significant. Concerning fast food consumption, the table showed that, 41.0% of students who were eating fast food 5 times or more per week were overweight / obese, as compared to 27.5% who were not eating fast food in the past 7 days of the survey, and this was statistically significant.

Table 1. Distribution of the study sample of secondary school students according to their Dietary Behaviors and Body Mass Index.

Dietary Behaviors	BMI						P- Value
	Underweight (n= 61)		Normal Weight (n= 738)		Overweight/ Obese (n= 422)		
	No.	%	No.	%	No.	%	
Eating breakfast							
Not eating breakfast	9	4.0	133	59.4	82	36.6	0.166
1-5 times per week	33	5.8	328	57.5	209	36.7	
6-7 times per week	19	4.4	277	64.9	131	30.7	
Diet content is based mainly on:							
High fat content foods	4	4.7	50	58.8	31	36.5	0.736
High carbohydrate	8	4.1	124	64.2	61	31.6	
High Protein content foods	20	5.4	211	57.0	139	37.6	
Different foods everyday	29	5.1	353	61.6	191	33.3	
Drinking milk							
Did not drink milk during the past 7 days	6	3.4	95	54.6	73	42.0	0.129
Some days (Not in all days)	16	5.5	168	58.1	105	36.3	
Everyday	39	5.1	475	62.7	244	32.2	
Eating vegetables							
Did not eat vegetables in the past 7 days	9	3.6	157	62.3	86	34.1	0.307
Some days (Not in all days)	27	6.8	239	60.2	131	33.0	
Everyday	25	4.4	342	59.8	205	35.8	
Eating Fruits							
Did not eat fruits in the past 7 days	5	3.0	93	56.7	66	40.2	0.153
Some days (Not in all days)	26	6.8	230	60.5	124	32.6	
Everyday	30	4.4	415	61.3	232	34.3	
Drinking soft drinks							
Did not drink soft drinks in the past 7 days	12	5.1	163	69.1	61	25.8	<0.01
Some days (Not in all days)	19	4.2	308	68.6	122	27.2	
Everyday	30	5.6	267	49.8	239	44.6	
Eating snacks							
Did not eat snacks in the past 7 days	6	4.7	75	59.1	46	36.2	0.245
Some days (Not in all days)	22	4.5	316	64.4	153	31.2	
Everyday	33	5.5	347	57.7	223	37.0	
Eating fast food							
Did not eat fast food in the past 7 days	13	4.5	195	67.9	79	27.5	0.007
1-2 days per week	26	4.5	354	61.8	193	33.7	
3-4 days per week	15	5.7	137	52.5	109	41.8	
≥5 days per week	7	7.0	52	52.0	41	41.0	

Table 2 represents stepwise logistic regression of factors affecting body mass index, among secondary school students, Dubai, 2011. The table illustrated that, there was only one significant predictor for overweight and obesity which was soft drink consumption. Students who consume soft drink everyday were more likely to be overweight/ obese relative to those who did not drink it in the past 7 days preceding the study, (OR=2.31, CI= 1.65-3.24).

Table 2. Stepwise logistic regression of factors affecting body mass index among secondary school students.

Independent variables		B	S. E.	Wald	P	OR	95% CI for OR	
							Lower	Upper
Soft drinks	Not drinking soft drinks in the past 7 days			41.89	0.000			
	Some days (Not in all days)	0.068	0.183	0.14	0.710	1.07	0.71	1.53
	Everyday	0.837	0.172	23.60	0.000	2.31	1.65	3.24
	Constant	-0.752	0.067	124.52	0.000	0.471		

5. Discussion

It is well recognized that, obesity is a major public health problem in the world, and the prevalence of obesity is increasing in both developed and developing countries [21]. It was found that, more than one third of the students in the present study were overweight and obese. Similar results was reported by Bahrain study (2004) [22], but it is higher than Iranian study (2000) [23], and Egypt study (2011) [24], where the overweight and obesity were presented in 28.9%, and 25.6% respectively.

Childhood obesity is a very complex issue. Several studies [25, 26] indicated the association between less healthy eating habits and obesity in children. Therefore, identifying dietary behaviors associated with weight status is a priority [27]. Poor dietary choices, including high consumption of soft drinks, sweets, snack foods, take-away foods and large food portions have been associated with a high BMI in adults, children and adolescents [28].

Several studies suggests that there is a positive, significant relationship between soda consumption and BMI [29], This findings was consistent with the present study, and with Pereira et al study in US, (2001) [30] which found that, consumption of fast food is believed to increase the risk of obesity and diabetes, and it is directly associated with weight gain and obesity. Overall, individuals who consumed fast food frequently (more than twice weekly) gained an extra 4.5 kg bodyweight compared with those who consumed it less than once per week.

Limitations are:

1. The use of self-reported dietary intake can affect the accuracy and may lead to miss reporting of the actual food and beverage consumption.
2. The food practices recall period was set as seven days, which may not truly reflect actual long term dietary behaviors. Reputed behavior surveys have used the same period regarding dietary practices.

3. The questionnaire can give imprecise estimates of nutrient intake and the actual quantity and portions of food consumed.
4. Due to the cross-sectional nature of the study design, it is not possible to ensure whether the differences in determinants precede or follow changes in healthy eating behavior or BMI.

6. Conclusion & Recommendations

High percentage of the students has poor dietary behavior. More than one third of the students were overweight and obese. Students who demonstrated the highest mean dietary behavior score were more likely to be of normal BMI, while those of lowest one were overweight or obese. Regarding factors affecting body mass index among secondary school students there was only one significant predictor for overweight and obesity which was soft drink consumption. Further studies are needed and interventional programs should be planned for in order to tackle this important health problem.

Conflict of Interest

The authors declare that they do not have any conflict of interest.

References

- [1] World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser 2000; 894: 1-253. (Accessed on 12/05/2018). Available from: http://whqlibdoc.who.int/trs/WHO_TRS_894.pdf.
- [2] World Health Organization. Obesity and overweight. Fact sheet N°311. Updated March 2011. (Accessed on 14/05/2018). Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/index.html>.

- [3] UNDG Resident Coordinator Annual Report for 2006 for the United Arab Emirates. United Nations Development Group, New York, United Nations, 2007. (Accessed on 03/05/2018). Available from: http://www.undp.org/ae/documents/RCAR_2006_UAE_NAR.pdf.
- [4] Mackay J, Mensah G. The atlas of heart disease and stroke. Geneva, World Health Organization, 2004.
- [5] Bin Zaal AA, Brebner J, Musaiger AO, D'Souza R. Anthropometric characteristics and obesity among adolescents in the United Arab Emirates. *EMHJ* 2011; 17 (5): 382-386.
- [6] Lobstein T, Baur L, Uauy R: Obesity in children and young people: a crisis in public health. *Obesity Reviews* 2004; 5 (1): 4-104.
- [7] Nicklas TA, Yang SJ, Baranowski T, Zakeri I, Berenson G: Eating patterns and obesity in children: The Bogalusa Heart Study. *Am J Prev Med* 2003; 25: 9-16.
- [8] Robinson TN. Television viewing and childhood obesity. *Pediatr Clin North Am* 2001; 48 (4): 1017-1025.
- [9] Nielsen SJ, Siega-Riz AM, Popkin BM: Trends in energy intake in U.S. between 1977 and 1996: similar shifts seen across age groups. *Obes Res* 2002; 10 (5): 370-378.
- [10] Ello-Martin JA, Ledikwe JH, Rolls BJ. The influence of food portion size and energy density on energy intake: implications for weight management. *AM J Clin Nut* 2005; 82: 236-241.
- [11] Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 2001; 357: 505-508.
- [12] Howarth NC, Huang TTK, Roberts SB, Lin BH, McCrory MA. Eating patterns and dietary composition in relation to BMI in younger and older adults. *Int J Obes* 2007; 31 (4): 675-684.
- [13] Shama ME, Abdou SS. Evaluating the Impact of Health Promoting School Initiative on Dietary Habits and BMI of Students in Oman. *J Egypt Public Health Assis* 2009; 84 (1-2): 119-39.
- [14] Turconi G, Celsa M, Rezzani C, Biino G, Sartirana MA, Roggi C. Reliability of a dietary questionnaire on food habits, eating behavior and nutritional knowledge of adolescents. *European Journal of Clinical Nutrition* 2003; 57: 753-763.
- [15] Turconi G, Guarcello M, Maccarini L, Cignoli F, Setti S, Bazzano R, Roggi C. Eating Habits and Behaviors, Physical Activity, Nutritional and Food Safety Knowledge and Beliefs in an Adolescent Italian Population. *J Am Coll Nutr* 2008; 27 (1): 31-43.
- [16] Kim MJ. Parenting Style and Older Children's and Young Adolescents' Dietary Intake and Nutritional Status. A dissertation submitted by the Office of Graduate Studies of Texas A&M University in partial fulfillment of the requirements for the degree of philosophy. 2006. P-197.
- [17] World Health Organization/Centre of Disease Control and Prevention. U.A.E Global School Based Student Health Survey (GSHS). United Arab Emirates GSHS 2009. (Accessed on 02/02/2018). Available from: http://www.who.int/chp/gshs/UAE_GSHS_questionnaire_2009.pdf.
- [18] CDC. Youth Risk Behavior Surveillance—United States, 2009. *MMWR* 2010; 59 (SS-5): 1-142. (Accessed on 04/05/2011). Available from: <http://www.cdc.gov/mmwr/pdf/ss/ss5905.pdf>.
- [19] World Health Organization. Department of Nutrition for Health and Development. WHO Child Growth Standards. Training course on Child Growth Assessment. 2008. (Accessed on 20/02/2011). Available from: http://www.who.int/childgrowth/training/module_b_measuring_growth.pdf.
- [20] World Health Organization. Child Growth Standards. BMI for age (5-19 years). (Accessed in 20/02/2011). Available from: http://www.who.int/childgrowth/standards/bmi_for_age/en/index.html
- [21] Reilly JJ. Obesity in childhood and adolescence: evidence based clinical and public health perspectives. *Postgrad Med J* 2006; 82: 429-437.
- [22] Al-Sendi AM, Shetty P, Musaiger AO. Body weight perception among Bahraini adolescents. *Child Care Health Dev* 2004; 30: 369-376.
- [23] Mohammadpour B, Rashidi A, Karandish M, Eshraghian MR, Kalantari N. Prevalence of overweight and obesity in adolescent Tehrani students, 2000-2001: an epidemic health problem. *Public Health Nutr* 2004; 7: 645-648.
- [24] El-Gilany A, El-Masry R. Overweight and Obesity among Adolescent School Students in Mansoura, Egypt. *Childhood Obesity* 2011; 7 (3): 215-222.
- [25] Triches RM, Giugliani ER. Obesity, eating habits and nutritional knowledge among school children. *Rev Saude Publica* 2005; 39 (4): 541-547.
- [26] Nicklas TA, Baranowsky T, Cullen KW, Berenson G. Eating pattern, dietary quality and obesity. *J Am Coll Nutr* 2001; 20: 599-608.
- [27] McGartland C, Robson PJ, Murray L, Cran G, Savage MJ, Watkins D, Rooney M, Boreham C. Carbonated soft drink consumption and bone mineral density in adolescence: the Northern Ireland Young Hearts project. *J Bone Miner Res* 2003; 18 (9): 1563-9.
- [28] Dubois L, Farmer A, Girard M, Peterson K. Regular sugars sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. *J Am Diet Assoc* 2007; 107 (6): 924-934.
- [29] O'Dea JA, Wilson R. Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: possibilities for childhood obesity prevention. *Health Educ Res* 2006; 21 (6): 796-805.
- [30] Pereira MA. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet* 2005; 365: 36-42.