

Diet quality in Egyptian Obese Children and Adolescents

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Abstract: The epidemic increase in the prevalence of obesity is now seen in most countries. Dietary composition, the relative proportions of calories coming from fats, carbohydrates, protein and intake of fiber has been suspected of playing a role in obesity. So, the aim of the present study was to analyze the diet quality and also to determine if an association exists between obesity and the relative percentage of fats, carbohydrates, protein and fiber in the diets of children and adolescent. A cross-sectional survey, comprised 5760 children (2638 boys and 3122 girls) was recruited from 6 public schools. Each child underwent a complete physical examination, including anthropometric measures. Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters) squared. Only one thousand and one hundred children of the total sample (19.1%), (417 boys and 683 girls, aged 13.43±2.65 years), with the complaint of obesity, were included. Repeated Twenty-four hour recall method, record food intake for three scattered days (3 recalls), includes one day as a holiday was done to assess the nutritional status of obese children. Nutrient intake were calculated using the computer program World Food Dietary Assessment System⁽¹⁾ compared with National Research Council USA1989⁽²⁾, while vitamins and minerals were compared with USDA, 2005⁽³⁾. This study highlights the importance of nutritional data that it is not what you eat but rather how much the total number of calories consumed which contributes to obesity. Success in obesity prevention is most likely to be achieved when preventive measures are initiated early and sustained throughout childhood and adolescence. More researches must be done for more evaluation, also, to achieve physical activity and life style for obese children and adolescence.

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1. Introduction:

The epidemic increase in the prevalence of obesity is now seen in most countries. Several studies have examined relations between nutrients, particularly dietary fat and obesity, but the epidemiological evidence remains controversial⁽⁴⁾.

Dietary composition, the relative proportions of calories coming from fats, carbohydrates, protein and intake of fiber has been suspected of playing a role in obesity. However, few studies have examined the association between excess weight and the consumption of these nutrients and the results are inconsistent. Many studies found that higher total energy intake significantly increased the odds of obesity but, the composition of their diets, the relative percentages of carbohydrates, protein, fats, and fiber was generally not a factor. So, it seems that for obesity, quantity (total energy intake) is more important than quality (the balance of nutrients consumed)^(5,6).

Dietary pattern analysis; based on the concept that foods eaten together; are as important as a reductive methodology characterized by a single food or nutrient analysis. Dietary pattern analysis is a better method to examine the effect of overall diet: food and nutrients are not eaten in isolation, and the

single food or nutrient approach will not take into account the complex interaction between food and nutrients⁽⁷⁾.

The aim of the present study was to analyze the diet quality and also to determine if an association exists between obesity and the relative percentage of fats, carbohydrates, protein and fiber in the diets of children and adolescent.

2. Subject and Methods:

This study was conducted by the National Research Centre, Egypt, through a project titled: "Obesity Profile among Egyptian School Children and Adolescents: Early Diagnosis of Metabolic Syndrome and Nutritional Intervention".

It was a cross-sectional survey, comprised 5760 children (2638 boys and 3122 girls). The pupils were recruited from 6 public schools (two Primary, two preparatory and two secondary schools) situated in Giza governorate, during the period of October, 2007 to April 2009. Permission to perform the study was granted by the Ministry of Education, and the directors of the schools. Parents were informed about the purpose of the study and their research permission in the form of written consent was obtained. The

protocol was approved by the “Ethical Committee” of the “National Research Centre”.

Each child underwent a complete physical examination, including anthropometric measures. Their pubertal development stages were assessed using the criteria of Tanner stages. The height and the weight were measured. The height was measured to the nearest 0.1 cm on a Holtain portable anthropometer, and the weight was determined to the nearest 0.01 kg on a Seca scale Balance with the subject dressed minimum clothes and no shoes. Body mass index (BMI) was calculated as weight (in kilograms) divided by height (in meters) squared.

Of the total sample, one thousand and one hundred children only (19.1%), (417 boys and 683 girls, aged 13.43±2.65 years), diagnosed as having obesity, were included. These children were required to meet the following inclusion criteria: age, 7–18 years and BMI, greater than the 95th percentile for age and gender based on the Egyptian Growth Reference Charts 2002⁽⁸⁾. Children were excluded if they had a prior major illness, including type 1 or 2 diabetes, received medications or had a condition known to influence body composition, insulin action or insulin secretion (e.g. glucocorticoids therapy, hypothyroidism and Cushing’s disease).

Assessment of the nutritional status of the students included the following:

Repeated Twenty-four hour recall method, record food intake for three scattered days (3 recalls), includes one day as a holiday. Data were collected by qualified dietary staffs, by personal interview. Detailed description of all food and beverages consumed, including cooking methods and the amount of each ingredient, was recorded. The conversion of household measures to grams was achieved through the use of prepared list of commonly used household measures in Egypt. Nutrient intake were calculated using the computer program⁽¹⁾. The daily intakes of calories and protein were compared with National Research Council⁽²⁾, while vitamins and minerals were compared with USDA⁽³⁾.

3. Results

Prevalence of obesity

Table 1- Distribution of the sample

	Sex	N	Obese		Overweight	
			N	%	N	%
STUDENTS AGED 7 -12 YEARS	Boys	859	30	3.5	66	7.7
	Girls	1193	92	7.7	151	12.7
SYUDENTS AGED 13-18 YEARS	Boys	1779	144	8.1	177	9.9
	Girls	1929	196	10.2	244	12.4
Total		5760	462	8.02	638	11.07

The Prevalence of obesity of our sample is represented in table (1). In our sample of 2052 children aged 7 to 12 years, we found that 30 boys and 92 girls were obese (BMI>95th percentile). Over weight (BMI >85th and <95th percentile) was represented by 66&151 boys and girls respectively.

The prevalence of obesity in the total sample (3708 children aged 13 to 18 years) was 144 boys(9.9%) and 196 girls(12.4%) , while, 177 boys and 244 girls were overweight.

Nutrition

Food quality analysis showed that the obese children consumed more calories than the recommended dietary allowance (RDAs) for the same age. However, they consumed the relative average percentage of calories from carbohydrates, protein and fats

Table (2) represents the obese boys and girls aged 7 to 12 years. They had higher energy intake than RDA, while the % calories from protein are on the low normal % of RDAs. The %calories from fat are within the normal % of RDAs, but the percentage from saturated fat are high. The% calories from CHO are within high normal%. The consumed dietary fibers are higher than RDA.

Table (3) represents the amount of some nutrients of consumed food items. We found deficiency of some vitamins and minerals as E, calcium and, potassium.

Analysis of food of female adolescent aged 13-18 years showed that they are consuming higher% of total energy intake than RDAs. However, the % calories from protein and fats are at low normal RDA %. The percentage calories from CHO are at the high normal RDAs range. The consumed amount of fibers is higher than RDAs (table 4). Vitamin D, E and calcium are deficient in their eating food. While, copper, sodium, manganese and other nutrients are very high than normal (Table 5).

On the other hand, the male adolescents of the same age have a high total energy intake than RDA. The percentage of calories from protein, CHO and fat are within normal range, while dietary fiber intake are low than normal (Table 6).

Table (7) showed the nutrients of their eaten food in relation to RDAs.

Table 2: Daily intake of selected nutrients by obese boys and girls aged 7 to 12 years

Nutrient	Minimum	Maximum	Mean	SD	RDAs
Energy intake (kilocalories)	1574	5932	3746.48	1086.44	1400-2000 (kcal)
Carbohydrates (% of energy)	26.5	76.19	57.77	8.83	45-65 (%)
Protein (% of energy)	6.21	18.56	12.18	2.79	10-30 (%)
Total fat (% of energy)	11.97	60.78	30.61	8.85	25-35 (%)
Saturated fat (% of energy)	13.6	87.5	43.01	16.36	< 10 (%)
Fiber (average grams per day)	2.1	121.8	36.69	23.16	31 (%)

Table (3): Daily intake of some vitamins and minerals by obese boys and girls aged 7-12 years.

	Mean	SD	RDAs
VITA	1201.48	2719.375	600 ug/d
VITD	4.45	13.561	5 ugm
VITE	6.63	4.173	11 mgm
VITC	52.03	79.162	45 mgm
Thiamin	1.4887	.68016	0.9 mg/d
Riboflavin	1.6369	.71907	0.9 mg/d
Niacin	18.495	9.0781	12 mg/d
Vit.b6	1.5177	.62135	1 mg/d
Folate	412.08	317.389	300 ug/d
Vit.b12	6.9677	14.88752	1.8 ug/d
Pantothenic acid	6.5245	2.14169	4 mg/d
Calcium	514.74	292.597	1,300 mg/d
Phosphorus	1689.02	599.517	1,250 mg/d
Magnesium	448.23	214.636	240 mg/d
Potassium	2375.55	1089.749	4500 mg/d
Sodium	2433.21	1692.336	1500 mg/d
Iron	14.6871	7.40039	8 mg/d
Zinc	14.4887	4.99131	8 mg/d
Copper	2.5352	1.21921	0.7 mg/d
Manganese	8.3597	4.07729	1.9 mg/d

Table 4: Daily intake of selected nutrients by obese female students aged 13 to 18 years

Nutrient	Minimum	Maximum	Mean	SD	RDAs
Energy intake(average in kilocalories)	2025	6710	3267.76	1463.52	1800 (kcal)
Carbohydrates(% of energy)	31.13	83.27	64.17	9.94	45-65 (%)
Protein((% of energy)	9.48	19.59	12.92	2.44	10-30 (%)
Total fat (% of energy)	8.79	48.62	23.88	8.59	25-35 (%)
(%)Saturated fat (% of energy)	9.8	76.6	32.36	15.81	< 10 (%)
Fiber (average grams per day)	8.8	82.6	38.84	20.18	26 (%)

Table 5: Daily intake of some vitamins and minerals by obese female aged 13-18 years

	Mean	SD	RDAs
VITA	1137.52	2760.101	700 ug
VITD	3.39	7.306	5 ugm
VITE	5.15	2.874	12 mgm
VITC	117.00	179.276	65 mgm
VITB6	1.6006	.67874	1.2 mgm
Folate	430.97	252.471	400 ugm
VITB12	5.3512	14.14864	2.4 ugm
Pantothenic acid	6.6124	3.17699	5mg
Calcium	598.00	595.231	1300 mgm
Phosphorus	1631.85	756.446	1250 mgm
Magnesium	448.97	206.934	360 mg
Sodium	3187.85	7481.990	2300 mg
Iron	15.1170	6.57190	15 mgm
Zinc	14.4315	6.58555	9 mg
Copper	2297	1.09556	890 ugm
manganese	7.8788	3.70968	1.6 mg

Table 6: Daily intake of selected nutrients by obese male students aged 13 to 18 years

Nutrient	Mean	SD	RDAs
Energy intake (kilocalories)	2978.12	1388.48	2200-2400 (kcal)
Carbohydrates(% of energy)	58.66	12.36	45-65 (%)
Protein((% of energy)	12.6	2.35	10-30 (%)
Total fat (% of energy)	29.92	12.73	25-35(%)
Saturated fat (% of energy)	42.64	40.89	< 10(%)
Fiber (average grams per day)	33.29	20.59	38(%)

Table (7): Daily intake of some vitamins and minerals by obese males aged 13-18 years.

	Mean	SD	RDAs
VITA	1175.04	1818.643	900 ug
VITD	2.38	3.869	5 ugm
VITE	5.62	3.742	15 mgm
VITC	31.04	33.267	75 mgm
Thiamin	1.3435	.74677	1.2 mg/d
Riboflavin	1.4585	1.02729	1.3 mg/d
Niacin	15.946	8.6574	16 mg/d
Vit.b6	1.2888	.68673	1.3 mg/d
Folate	390.73	236.543	400 ug/d
Vit.b12	4.1735	10.02323	2.4 ug/d
Pantothenic acid	5.6077	2.85355	5 mg/d
Calcium	564.65	684.134	1,300 mg/d
Phosphorus	1487.73	747.284	1,250 mg/d
Magnesium	412.31	233.672	410 mg/d
Potassium	2245.77	1387.113	4700 mg/d
Sodium	1691.96	1618.841	1500 mg/d
Iron	14.1442	8.12319	12 mg/d
Zinc	12.6304	6.28201	11mg/d
Copper	2.0284	1.33606	0.890 mg/d
Manganese	7.3624	3.96358	2.2 mg/d

4. Discussion:

Although obesity was rarely observed among children and adolescent 30 years ago, it is now evident among children in all ages⁽⁹⁾.

Childhood obesity is an independent risk factor for adult overweight and obesity⁽¹⁰⁾, with obese children having at least a 25%-50% increased risk of being obese as adults.

A nutrition survey was done to characterize the quality of diets consumed by obese children and adolescent. The analysis of data revealed that our sample of overweight and obese children consumed energy intake higher than RDAs, however, the composition of their diets –the relative percentage of carbohydrates, protein, and fats are within the RDAs for the same age and sex, while the fiber intake was higher than RDAs except in male adolescent.

In our study, the % of calories from protein is at the low normal range in both sexes and in different age group. Langlois, et al.⁽¹¹⁾, found no significant relationship between obesity and the percentage of calories derived from proteins, while a prospective study in 2006, found an inverse relationship between protein intake and five year differences in waist

circumference⁽¹²⁾. Ludwig et al⁽¹³⁾ found a positive relationship between protein intake and body weight.

The percentages of calories derived from carbohydrate are at high normal range value in children and adolescent either male or female. Tucker & Kano,⁽¹⁴⁾ and Davis et al⁽¹⁵⁾, showed no association between carbohydrate consumption and excess weight. Other search adjusted that a higher percentage of calories coming from carbohydrate was negatively associated with obesity among men⁽¹⁶⁾.

Many literature studied fat as one of the most nutrient in obesity because of their high caloric count (9 kilocalories per gram versus 4Kcal per gram for each CHO & protein). They assumed that excess consumption may contribute to higher energy intake⁽¹⁷⁾. In our study, we found the % of calories from fat are within normal range of RDAs in both sexes and in different age. Langlois, et al,⁽¹⁸⁾ found no association between fat intake and obesity among men and women. Some studies have examined specific types of fat, because it has been suggested that saturated, monounsaturated and polyunsaturated fats might have different effects on adiposity⁽¹⁹⁾. In our results, saturated fat is higher than normal. Moussavi et al⁽⁶⁾

found a positive association between saturated fat intake and obesity prevalence, while Bhargava & Gutjrie⁽²⁰⁾ found no relation between saturated fat and BMI.

Dietary fiber delays gastric emptying and thereby, contributes to a sensation of fullness, so, it has been studied as a preventive factor in the developing obesity⁽¹⁸⁾. In the present study the mean average of dietary fiber are higher than RDA in children and in female adolescent, while in male adolescent, we found it less than normal. Newby et al,⁽²¹⁾ showed no association between dietary fiber intake and annual BMI changes in boys and girls. Hassapidou et al,⁽²²⁾ found that fiber intake were significantly lower in overweight boys while no significance among girls.

Concerning micronutrient intake : Calcium intake level among Egyptian adolescents is far below the recommended international figures to prevent osteoporosis, the results of a national survey (DNPCNCD) carried out by the National Nutrition Institute, Egypt⁽²³⁾, reported that, the 25th percentile of the daily calcium intake among adolescents aged 10-18 years was 323.5g, while the 50 and 75 percentiles were 494.8g and 704.2 respectively, this is agreed with our results as we found deficiency of calcium in all age groups

Vitamin D deficiency is highly prevalent among children and adolescents worldwide. The high rates of vitamin D deficiency during childhood are of major public health relevance⁽²⁴⁾. Our results found vitamin D and vitamin E deficiency in all age groups.

Two epidemiologic studies published in the early 1960s noted an association between overweight status among children and adolescents and iron deficiency^(25, 26).

Saloojee H,et al,⁽²⁷⁾. & Bhatia D et al,⁽²⁸⁾, found that there was a greater prevalence of iron deficiency in overweight and obese children and adolescents. Obese children and especially female adolescents are at risk of increased morbidity starting already in childhood or adolescence. Interestingly, despite their excessive dietary and caloric intake, obese children and adolescents may be at risk of iron deficiency anaemia because they tend to consume unbalanced meals, particularly rich in carbohydrates and fat, this is agreed with our results as we found iron deficiency among adolescent girls (table 5).

This study highlights the importance of nutritional data that it is not what you eat but rather how much the total number of calories consumed which contributes to obesity. Success in obesity prevention is most likely to be achieved when preventive measures are initiated early and sustained throughout childhood and adolescence. More

researches must be done for more evaluation, also, to achieve physical activity and healthy life style for obese children and adolescence.

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