

Evaluation of Diet Quality of Egyptian Children and Adolescents using Healthy Eating Index

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Abstract:

Background: Healthful eating is essential for development and well-being. Some dietary patterns are associated with 4 of the 10 leading causes of death (coronary heart disease, certain types of cancer, stroke, and type 2 diabetes). Major improvements in the health of the public can, therefore, be made by improving people's dietary patterns. The U.S. department of Agriculture has developed an index, called the Healthy Eating Index (HEI) that was updated in the year 2002. It is based on different aspects of a healthful diet; the Index is designed to provide a measure of overall dietary quality, and the compliance with specific Dietary Guidelines recommendations. The aim of our study is to use the healthy eating index to assess the diet quality of a representative sample of the Egyptian children and adolescents and to examine the association between body mass index and caloric intake of the studied sample.

Materials & Methods: This study is a part of National Egyptian survey, Diet, Nutrition and Prevention of Chronic Non-communicable Diseases. The Healthy Eating Index was applied with slight modifications to measure how well the studied Egyptian students' diet conforms to recommended healthy eating pattern. The data were based on representative sample (2145) of children and adolescents (10 -18) years in 7 governorates from. One day of dietary intake data (24 hours recall) was collected, during an in-person interview. The Healthy Eating Index measures how well the studied children and adolescents' diets conform to the American Dietary Guidelines recommendations and the Food Guide Pyramid applied in our country. Ten dietary components have been identified and the overall Index has a total possible score ranging from zero to 100.

Results: Our results showed that the average Healthy Eating Index score was 59.1 out of a possible 100 and it ranged from 20 to 86, Only 0.5 percent of the students had Healthy Eating scores above 80; while 16.9 percent of them received scores below 50 and the majority (82.5 percent) had scores on the Healthy Eating Index between 51 and 80. In an effort to provide a "rating" of the overall student's diet, a grading scale was developed, the majority of students had diets rated as "Needs Improvement", only 0.5 % received diets rated as "Good" and 16.9 % had diets rated as "Poor". Males achieved a slightly higher average Index than females (59.7 Vs 58.2). The average score for food groups is much lower than that for dietary guidelines (23.5 Vs 35.6) out of total score of 50 for each. There was a significant positive correlation of BMI with caloric intake for male adolescents while, for females the correlation was insignificant and negative. More than 80 percent of the sample achieved the recommendations of the American Dietary Guidelines for total fat and cholesterol. Less than two-thirds of the students met the recommendations for saturated fat, Almost 30 percent of the students had the maximum score for sodium. Only 1.0 percent of them received a score of 10 for fibers.

Conclusion: the majority of Egyptian children and adolescent' eating patterns, as measured by the HEI, need improvement. The results of the Index are useful in targeting nutrition education and health promotion activities, as it is a single summary measure of diet quality that can be used to monitor changes in food consumption patterns over time. A Food Quality System based on nutrient density can be one tool that can facilitate more healthful food purchases and dietary patterns.

Keywords: Evaluation – Diet – Healthy – Index – Adolescents

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Introduction:

Dietary Guidelines for Americans provide nutrition advice aimed at promoting healthy dietary choices for life-long health and reducing risk of chronic diseases. With the advancing age of the population, the 2010 *Dietary Guidelines* confront increasing risks for age-related problems of obesity, osteoporosis, type 2 diabetes, Metabolic Syndrome, heart disease, and sarcopenia **Donald, (2009)**.

Healthful eating is essential for development and well-being. Some dietary patterns are associated with 4 of the 10 leading causes of death, coronary heart disease, certain types of cancer, stroke, and type 2 diabetes **(DHHS, 2000)**. A healthful diet, however, can reduce major risk factors for chronic diseases such as obesity, high blood pressure, and high blood cholesterol **(USDA & DHHS, 2000)**. Studies have shown an increase in mortality associated with overweight and obesity resulting from poor eating habits **(DHHS, 2001)**. Major improvements in the health of the public can, therefore, be made by improving people's dietary patterns.

The role of nutrition and diet in reducing the risk of certain chronic diseases, such as cardiovascular disease, diabetes mellitus and some forms of cancer, has been well documented. The Dietary Guidelines and Food Guide Pyramid recommended the selection of foods from a variety of food groups, the choice of a diet that is low in total fat, saturated fat, cholesterol, moderate use of salt and sodium **(AHA, 2000)**.

Adolescence is the transition period between childhood and adulthood. It is one of the fastest growth periods of a person's life. During this time, physical changes affect the body's nutritional needs, while changes in one's lifestyle may affect eating habits and food choices. Nutritional health during childhood and adolescence is important for supporting the growing body and for preventing future health problems **(Duyf, 2002)**.

Healthy eating Index is designed to provide a measure of overall dietary quality, and the compliance with specific Dietary Guidelines recommendations. It makes available for the first time a single summary measure to monitor change in food consumption patterns **USDA (2002)**. It had been developed by U.S. department of Agriculture **(USDA) in 1995** and updated in 2002. It was based on different

aspects of a healthful diet. It is the first time to be developed in Egypt.

Objectives:

1. To assess the diet quality among Egyptian children and adolescents.
2. To assess the compliance with specific dietary guidelines.
3. Give a single measure to monitor change in food consumption pattern.
4. Help developing more effective nutrition promotion messages for the public.

Subjects & Methods:

The Healthy Eating Index of USDA was applied with slight modifications. This study is a part of National Egyptian survey, Diet, Nutrition and Prevention of Chronic Non-communicable Diseases **DNPCNCD, (2008)**. Data was based on random sample (2145) of children and adolescents (10 -18) years from preparatory and secondary schools in 7 Governorates (El Giza, Aswan, Sohag, El-Menia, Gharbia, Kaliobia and Kafr El-Shikh).

One day of dietary intake data (24 hours recall) was collected, during an in-person interview based on findings of **Basiotis et al (1987)** which revealed no difference in pattern of results for 1 day and 3 days of intake **USDA (2002)**.

1.Components of the healthy eating index table (1) and figure (1):

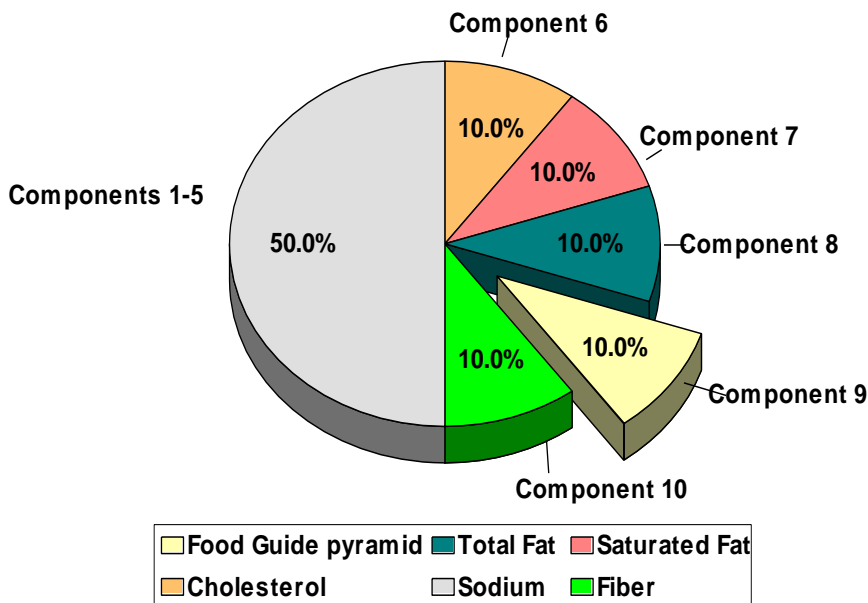
Ten dietary components have been identified and are shown below. (Fig.1). The overall Index has a total possible score ranging from zero to 100. Each of the 10 dietary components has a scoring range of zero to 10. Individuals with an intake at the recommended level received a maximum score of 10 points. A score of zero was assigned when no foods in a particular group were eaten. Intermediate scores were calculated proportionately.

Table (1): Components of Healthy Eating Index

Food Group	Range of Scores	* Perfect score of 10	Criteria for minimum score of 0
1. Grains & tubers	0 to 10	11 Servings	0 servings
2. Vegetables	0 to 10	5 Servings	0 servings
3. Fruits	0 to 10	4 Servings	0 servings
4 Milk	0 to 10	3 Servings	0 servings
5. Meat	0 to 10	3 Servings	0 servings
6. Total fat	0 to 10	30% or less energy from fat	45% or more energy from fat
7. Saturated fat	0 to 10	Less than 10% energy from saturated fat	15% or more energy from saturated fat
8. Cholesterol	0 to 10	300 mg. or less	450 mg or more
9. Sodium	0 to 10	2400 mg. or less	4800 mg or more
10. Fiber	0 to 10	40 gm/ day for males 31 gm/ day for females	No fibers

* Recommended Numbers of Servings per Day at Food Energy levels *Food Guide Pyramid Bulletin USDA, (1992)*

Fig.(1):The Components of the Healthy Eating Index.



- **Components 1-5:** measure the degree to which a person's diet conforms to the Food Guide Pyramid serving recommendations for the Grain and Tubers, Vegetable, Fruit, Milk (including dairy products) and Meat (including eggs and legumes) groups. The Food Guide Pyramid translates recommendations from the Dietary Guidelines for Americans (which conforms with healthy recommendations developed

by WHO and is applied in our country) (*Dietary Guidelines Advisory Committee, 2000*) into types and amounts of foods people should eat to have a healthful diet. The recommended number of Pyramid servings for the five food groups depends on a person's caloric requirement.

- **Component 6:** measures total fat consumption as a percentage of total food energy intake. Total fat intake of less than

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or equal to 30 percent of total calories in a day was assigned a maximum score of 10 points. This percentage was based on the recommendations of the *Dietary Guidelines for Americans (2000)*. Fat intake equal to or greater than 45 percent of total calories in a day was assigned a score of zero, and fat intake between 30 and 45 percent was scored proportionately.

- **Component 7:** measures saturated fat consumption as a percentage of total food energy intake. This percentage was also based on the recommendations of the *Dietary Guidelines for Americans (2000)*. A score of 10 points was assigned to saturated fat intakes at less than 10 percent of total calories. Zero points were assigned when the saturated fat intake reached a level of 15 percent of the total calories. Scores between the two cut off values were calculated proportionately. Percentages for the upper limits of fat and saturated fat intake (45 and 15 percent, respectively) were based on consultation with nutrition researchers and exploration of the consumption distribution of these components *USDA (2002)*.

- **Component 8:** measures total cholesterol intake. A maximum point value for cholesterol was assigned when intake was at a level of 300 milligrams or less based on recommendations of the *Committee on Diet and Health of the National Research Council (1989)*. Zero points were assigned when intake reached a level of 450 milligrams or more. Values between the two cut off points were scored proportionately.

- **Component 9:** measures total sodium intake. A maximum score for sodium was assigned at an intake level of 2400 milligrams or less, the amount based on recommendations of the *Committee on Diet and Health of the National Research Council (1989)*. Zero points were assigned at a level of 4800 milligrams or more. Scores between the two levels of intake were scored proportionately. The upper limit for sodium intake was based on consultation with nutrition researchers and exploration of the consumption distribution of this component. Sodium scores reflect sodium content of foods reported consumed and do not include salt added at the table *USDA (2002)*.

- **Component 10** measures the amount of fibers in a male and female students' diet per day. Male and female students with an intake at the recommended level 14 grams per 1000 kilocalories *Joanne & Paula (2006)*, 40 & 31 grams/ day respectively received a maximum score of 10. A score of zero was assigned when no fibers were eaten. Intermediate scores were calculated proportionately.

2- Estimation of Food Group Serving Requirements by Age and Sex:

Scoring of food group serving was estimated according to recommendation of U.S. Department of Agriculture Center for Nutrition Policy and Promotion *USDA, CNPP, (1996)*. The Food Guide Pyramid recommends different number of servings from each food group according to age and sex categories.

Adolescent females have daily recommended energy allowances (REAs) of about 2200 calories compared to adolescent males who have REAs of about 2800 calories that is slightly higher than the highest calorie level in the Food Guide Pyramid. Simple extrapolation would result in a greater number of servings than the maximum, because the Food Guide Pyramid does not specify food group servings for diets beyond 2800 kilocalories, CNPP truncated the food group servings at the maximum numbers indicated by the Food Guide Pyramid.

Results:

Table (1): illustrates components of Healthy Eating Index

Table (2): shows the average Healthy Eating Index score

Table (3): illustrates Healthy Eating Index (HEI) Grading Scale

Table (4): shows the average score for food groups

Table (5):reveals the percent of students meeting 75 Percent or more of RDAs by HEI levels.

Tables (6 & 7): show energy Intake as a percentage of RDA versus body mass index for male and female adolescents.

Figure (1): illustrates components of Healthy Eating Index.
 Figure (2): reveals levels of Healthy Eating Index component (average student score)

Figure (3): shows levels of components of Healthy Eating Index (percent of student receiving score of 10).

Table (2): Distribution of the students by Healthy Eating Index level

Level of Index score	No %
0-30	0.2%
31-40	2.0%
41-50	14.7%
51-60	38.9%
61-70	35.2%
71-80	8.4%
81-90	0.5%
91-100	0.0%
Total mean	59.1
Males	59.7
Females	58.2
Range	20-86
Sample size	2145

Table (3): Healthy Eating Index (HEI) Grading Scale.

HEI	Rating	Percent
Greater than 80	Good	0.5
51-80	Needs Improvement	82.5
Less than 51	Poor	16.9

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Table 4: Average score of the individual component of the Healthy Eating Index

Component	Average score
Food groups:	9.1
Grains & Tubers	
Vegetables	3.1
Fruits	2.1
Milk and dairy products	4.5
Meat, legumes and eggs	4.8
Total	23.6
Dietary guidelines:	
Total fat	9.3
Saturated fat	7.2
Cholesterol	8.7
Sodium	6.7
Fiber	3.6
Total	35.5

Table (5): Percent of Students Meeting 75 Percent or More of RDAs by HEI levels.

Nutrient	Index Score					Correlation Coefficients of indent with nutmeats		
	0-50	51-60	61-70	71-80	81-100	*FGI	**DGI	***HEI
Total Energy	49.6	40.7	50.2	71.3	90.9	0.286	- 0.251	- 0.019
Protein	74.4	80.5	91.3	96.1	100.0	0.395	- 0.287	0.047
Vitamin A	51.8	36.6	39.6	56.9	45.5	0.156	- 0.219	- 0.080
Vitamin E	17.1	19.6	23.7	32.6	72.7	0.148	- 0.003	0.117
Vitamin C	60.6	67.8	77.1	91.7	100.0	0.344	- 0.148	0.141
Thiamin	59.5	68.5	75.6	81.8	100.0	0.191	- 0.062	0.094
Riboflavin	82.1	82.0	84.8	86.7	100.0	0.155	- 0.213	- 0.068
Niacin	42.4	43.0	52.2	68.5	100.0	0.198	- 0.203	- 0.031
Folic acid	65.8	58.3	66.0	84.5	100.0	0.157	- 0.180	- 0.042
Calcium	11.0	6.8	6.8	16.0	27.3	0.246	- 0.082	0.091
Magnesium	34.7	31.6	40.5	55.2	81.8	0.182	- 0.230	- 0.070
Iron	10.5	9.5	11.1	21.0	63.6	0.204	- 0.208	- 0.039
Zinc	56.5	54.9	64.4	73.5	81.8	0.215	- 0.254	- 0.066

* Food Groups Index

** Dietary Guidelines Index

*** Healthy Eating Index

The Healthy Eating Index score ranged from 20-86.

Table (6): Energy Intake as a Percentage of RDA versus Body Mass Index for Male Adolescents

% Kilocalories	BMI				Row % (n)
	RDA ¹	<5 th	≥5 th - <85 th	≥85 th - <95 th	≥95 th
< 60%	11.2	72.1	11.2	5.4	25.5 (276)
60-80%	11.5	69.9	10.7	8.0	34.6 (375)
81-100%	10.7	69.8	12.0	7.4	22.3 (242)
101-120%	7.3	71.8	10.9	10.0	10.2 (110)
>120%	3.8	67.5	17.5	11.3	7.4 (80)
Column Percent	10.2	70.5	11.6	7.7	100.0 (1083)

RDA¹ = energy intake as a percent of RDA.

Correlation coefficient: r = 0.139 (p = 0.000)

Table (7): Energy Intake as a Percentage of RDA versus Body Mass Index for Female Adolescents

% Kilocalories	BMI				Row % (n)
	RDA ¹	<5 th	≥5 th - <85 th	≥85 th - <95 th	≥95 th
< 60%	3.7	68.1	19.8	8.4	30.4 (323)
60-80%	2.8	70.5	18.2	8.5	33.1 (352)
81-100%	7.2	69.4	18.5	5.0	20.9 (222)
101-120%	5.6	80.9	12.4	1.1	8.4 (89)
>120%	0.0	75.0	13.2	11.8	7.2 (76)
Column Percent	4.0	70.7	17.9	7.3	100.0 (1062)

RDA¹ = energy intake as a percent of RDA.

Correlation coefficient: r = - 0.040 (P = 0.194)

**Fig.(2): Levels of Healthy Eating Index Components .
Students Average Score**

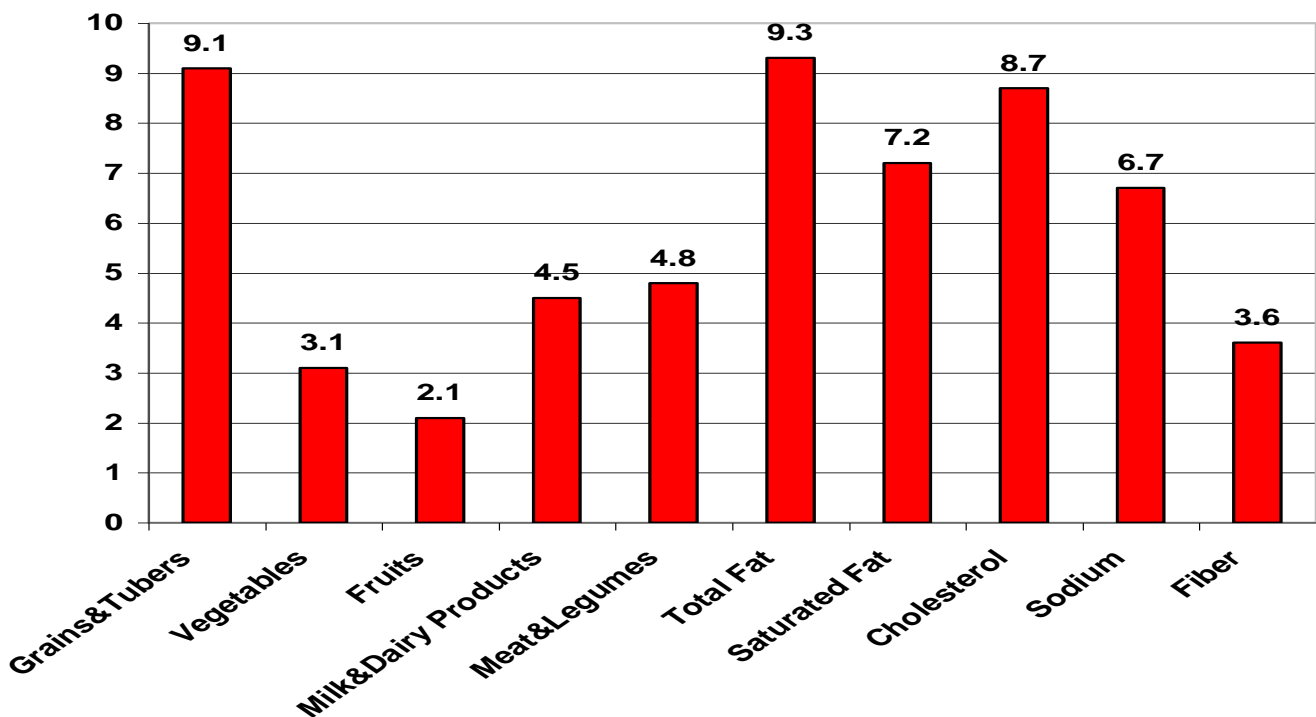
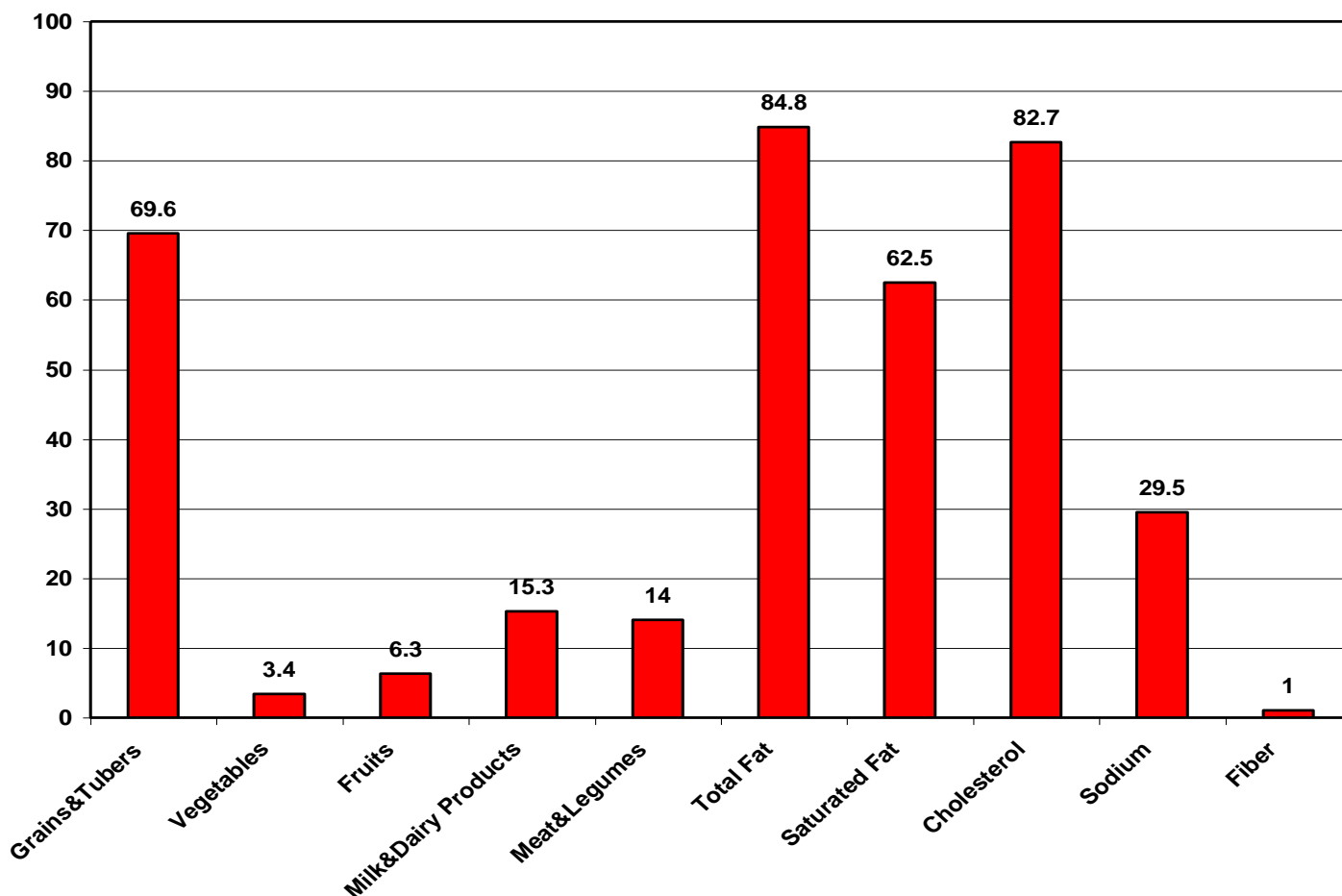


Fig.(3): Levels of Healthy Eating Index Components.
Percent of Students Receiving a Score of 10



Discussion:

Nutrition plays a vital role in the prevention of chronic diseases such as coronary heart disease, hypertension, and diabetes. Consumption patterns are changing globally. As a result both researchers and policy makers require simple, easy to use measures of diet quality *Eileen Kennedy (2008)*. The Healthy Eating Index (HEI) has been used effectively for monitoring, evaluation and has been adapted to a more consumer friendly version *Kennedy and Richard (2007)*. It is a measure of the overall quality of an individual's diet. It was developed by the U.S. Department of Agriculture (USDA) to assess how well individual diets comply with the Dietary Guidelines and the Food Guide Pyramid *Basiotis (2002)*. The higher the score on the Healthy Eating Index, the better the diet conformed to the American Dietary

Guidelines and the Food Guide Pyramid (applied in our country). Concerning crude overall scores, table 2 showed that the average healthy eating index score was 59.1 out of a possible 100. This was lower than the average American score (63.8-63.9-63.8) study at 1989-1990- 2000 respectively *USDA, (2002)*. The healthy eating index score ranged from 20 to 86. There was only 0.5 percent of the studied Egyptian adolescents had scores on the HEI that were 80 or above, compared to 12% of Americans either adults or adolescents *Healthy Eating index (1999-2000)*. On the other side 16.9% of studied group received scores below 50%. The American study was approximately near this figure (14-15% scored ≤ 50). Most of the studied individuals had scores on the HEI between 51 and 80, this was similar to the American HEI study. Males achieved a slightly higher

average Index than females (59.7 Vs 58.2) respectively. This is in contrast to results of American healthy eating index where females had slightly higher overall scores than males (64.5 vs. 63.2) respectively *USDA, (2002)*. Concerning rating of adolescent's diet table (3) revealed that the majority of students (82.5 percent) had diets rated as "Needs Improvement", only 0.5 percent received diets rated as "Good" and 16.9 percent had diets rated as "Poor". While the American study showed that 11-12% had diets rated as (good) and 14-15 % as (poor) *USDA, (2002)*. School-age children scored 62.8 points on the overall HEI, the majority of them (78 percent) need improvement of their diets, 15,8% reported having poor diet while only 6.2 % had good diet. They scored 7.2 on dairy and 7 on grains compared to 3.7 on fruits and 4.4 on vegetables. Recommendations were better met for milk, dairy products and grains groups than for fruits and vegetables groups [*National Health and Nutrition Examination Survey (1988-94)*].

With increasing recognition of multidimensional nature of diets consumed by free living individuals, dietary patterns have emerged as an alternative or an adjunct to the traditional approach of using single nutrients or food groups as exposures for examining the diet and health associations (*Jacques and Tucker, 2001*). Intuitively, dietary patterns may modify the risk of disease through established risk-factors of disease, and also by relating to intake of micronutrients. Thus, evaluation of dietary patterns for predicting objective biomarkers of dietary intake and risk of chronic diseases is an important step in their validation as predictors of health outcome (*Kant et al 2004*). The average score of the individual component of the Healthy Eating Index are presented out of a possible score of 10 as shown by table (4) and fig. (2) which revealed that the average score for food groups was much lower than that for dietary guidelines (23 & 35 respectively) out of total score of 50 for each. Higher component scores are indicative of intake within recommended ranges, while the lower the component score, the poorer the intake levels. Mean score of the different components ranged from 2.1 to 9.3. Vegetables, fruits, milk (and dairy,

products), meat and fiber component had the lowest mean component scores, indicating they are the areas needing greater improvement. The highest mean component scores were for total fat (9.3), grains (9.1), cholesterol (8.7) and saturated fat (7.2). Sodium (6.7) also, had a relatively high proportion of individuals at the maximum. Comparing this result with the American healthy eating index during 1999-2000, the highest mean HEI component scores for the U.S. population were for cholesterol and variety, both scored 7.7 on a scale of 10 . With an average score of 6.9, total fat accounted for the next highest component score. Similar to our results, American people had the two lowest mean scores for the fruits and milk components of the HEI, averaging 3.8 and 5.9, respectively [*Healthy Eating index (1999-2000)*].

Figure (3) showed the percentage of students receiving score of 10. Regarding food groups, almost two-thirds of the sample consumed the recommended servings of grains and tubers, about one out of six of the adolescents consumed the recommended servings of either milk or meat group and a very small proportion of the students consumed the recommended servings of vegetables and fruits (3.4%, 6.3% respectively). While dietary guideline revealed that more than 80 percent of the subjects covered the recommendations of the American Dietary Guidelines for total fat and cholesterol, near to two-thirds of the students met the recommendations for saturated fat, almost 30 percent of the students had the maximum score for sodium and only 1.0 percent of them received a score of 10 for fibers.

People who have better healthy eating score are more likely to have a better nutrient intake. The Index was compared to nutrient intake as a percent of the RDAs to assess the degree to which it correlates with other conventional measures of diet quality. The criterion of meeting 75 percent of RDA was selected. Table 5 shows the relationship between key nutrients and scores on the Index. A higher Index score is associated with an increased likelihood that at least 75 percent of the RDA for most nutrients will be met. Nutrient intake improves as the Index score improves. For example, only 74 percent of the adolescents with index scores

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50 or less have protein intakes greater than 75 percent of the RDA. With an Index score between 71 and 80, it increases to 96 percent. For Index scores of 80 or above, the likelihood increases to 100 percent. The American study reported 86.3% with index score ≤ 50 for protein intake greater than 75% RDA with an index score between 71 and 80, the likelihood increases to 98.19% with index score of 80 or above. Putting the concept of nutrient density into practice is a great challenge. Further research needs to be conducted to ascertain the effect of Food Quality Scores, or indeed any food rating system, on consumer food choices. Researchers have long known that the major determinants of food choice are taste, price, and convenience (*Frazao, 1999*).

Correlation coefficients provide a statistical measure of the Index ability to rank individuals along a distribution of high intake to low intake. The correlation coefficients between the Index (HEI) and nutrient intake levels confirmed a weak positive relation for only 5 of the 13 nutrients analyzed. The correlation coefficients ranged from 0.04 to 0.14, indicating that an increase in these nutrients level will not improve the index. Each Nutrient contributes only in HEI score however; it is not responsible for the overall forming of it. On the other hand, the correlation coefficients between the HEI and the other 8 nutrients analyzed proved a weak negative relation ranged from 0.01 to 0.08. It is true to record that Food Group Index positively correlated with each of the 13 nutrients analyzed, the correlation coefficients ranged from 0.14 to 0.39. On the contrary Dietary Guidelines Index negatively correlated with each of the 13 nutrients analyzed the correlation coefficients ranged from -0.003 to -0.28. The high score in total fat, saturated fat and cholesterol could be attributed to low average score of milk and meat groups, which in turn leads to dramatic improvement in the total HEI score in spite of low nutrient intake.

The current focus of obesity research has been on environmental factors that promote inactive lifestyles and excess energy intakes (*Adam and Specter, 2004*). In developing the Index, consideration was given to including a component to address food

energy intake. Obesity and underweight are significant health problems in our country. Nevertheless, inclusion of a physical measure of appropriate body weight, such as a body mass index (BMI), would be inappropriate since it is influenced by factors, such as physical activity, unrelated to students' eating patterns. A comparison of the BMI and caloric intake is presented in tables (6) and (7). BMI values from ≥ 85 - < 95 percentile in male and female adolescents indicate that they are at risk of obesity; those who are equal to or over 95 percentile are obese. Adolescents with a BMI less than 5 percentile are underweight (*Styne, 2001*). There was a significant positive correlation with caloric intake for male adolescents (table 6) while, for females the correlation was insignificant and negative (table 7). This is in accordance with the American study (1989- 1990) where it revealed that BMI is not highly correlated with caloric intake (*Healthy Eating index, 1989-1990*).

In conclusion, the majority of Egyptian children and adolescent' eating patterns, as measured by the HEI, need improvement. The results of the Index are useful in targeting nutrition education and health promotion activities. The Healthy Eating Index is a single summary measure of diet quality that can be used to monitor changes in food consumption patterns over time. A Food Quality System based on nutrient density can be one tool that can facilitate more healthful food purchases and dietary patterns.

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مؤشر الغذاء الصحى للأطفال والمرهقين المصريين

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ملخص الرسالة

الغذاء السليم ضرورة أساسية للاحتفاظ بالصحة والحياة. أفادت كثير من الدراسات أن العادات الغذائية الخاطئة مرتبطة بالإصابة بأربعة (من عدد إجمالي عشرة) من الأمراض الرئيسية المسببة للوفاة. الهدف من الدراسة هو استخدام مؤشر الغذاء الصحى لتقييم كفاءة الغذاء ومدى اتباع التوصيات الغذائية السليمة للأطفال والمرهقين المصريين. وأيضاً إيجاد وسيلة بسيطة وموحدة لقياس مدى التغير فى النمط الغذائى ومحاولة رفع الوعي الصحى للمواطنين المصريين. تم استخدام مؤشر الغذاء الصحى الذى وضعته وزارة الزراعة الأمريكية مع بعض التطوير الذى يناسب العادات الغذائية لدى المصريين لقياس مدى مطابقة العادات الغذائية للأطفال والمرهقين للتوصيات الغذائية العالية. أخذت عينة عشوائية متعددة المراحل بحيث تمثل تلاميذ المرحلة الاعدادية و الثانوية فى 7 محافظات فى جمهورية مصر العربية. كان العدد الكلى للدراسة 2145 من الأطفال والمرهقين فى الفئة العمرية من 10-18 سنة. ثم تسجيل النمط الغذائى من خلال استرجاع غذائى لأربع وعشرون ساعة من خلال المقابلة لشخصين و تم قياس الوزن والطول وحساب مؤشر كتلة الجسم. ينقسم مؤشر الغذاء الصحى إلى عشرة محاور غذائية ويتراوح التقييم الكلى من صفر - 100 و كل محور من هذه المحاور يتراوح تقييمه من صفر - 10 . تناول الغذاء بما يتناسب مع التوصيات الغذائية يأخذ أعلى تقييم (10) بينما تقييم الصفر يؤخذ عندما يبتعد النمط الغذائى نهائياً عن التوصيات الغذائية. أسفرت النتائج إلى أن متوسط مؤشر الغذاء الصحى للعينة الكلية كان 59.1 وكان يتراوح من 20-86، أما نسبة التلاميذ الذين سجلوا نسبة أعلى من 80 كانت 0.5% فقط بينما 16.5% سجلوا تقييماً أقل من 50 و الغالبية العظمى (82.5%) كان يتراوح تقييمهم من 50-80. أيضاً متوسط التقييم لمجموعات الغذاء أقل من المتوسط للتوصيات الغذائية (23.5 و 35.6 على التوالي). وقد سجل المؤشر الغذائى نسبة أعلى قليلاً فى الذكور عن الإناث (59.7، 58.2 على التوالي). كانت هناك علاقة قوية موجبة بين مؤشر كتلة الجسم والسعرات الكلية بين الذكور، بينما كانت العلاقة سالبة وغير معنوية بين الإناث. وقد تم استنتاج أن العادات الغذائية للغالبية العظمى من الأطفال و المرهقين المصريين تحتاج إلى تحسين بينما نسبة ضئيلة جداً من التلاميذ تصنف وجباتهم على أنها صحية وهناك أيضاً نسبة تدرج وجباتهم تحت وصفة فقيرة إلى العادات السليمة.