Effect of the School Meal on Improving The Health Status of Children Ages (6-12) Years

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Abstract

This study was designed to determine the effect of school meal on improving the health status of children (6-12 years old). The study was conducted on 100 male children. The meal contained 70 g fino bread, 40 g tahini sweet, 30 g cooked cheese and 150 g orange fruit for a period of 6 months. The nutritional status of children was determined by a 3-day and 24 h. recall and food habits questionnaire. Body composition was analyzed by body mass index was calculated. Blood samples were collected to determine hemoglobin and red blood cells. The results showed that there was a marked improvement in the health status of children after they were given the school meal. The school meal supplies children 41.771% calorie, protein, 36.7% and fat 44.81%, while carbohydrates were 46.67% .Calcium, iron and zinc were 29.10%, 19.49% and 41.33%, respectively in the school meal .The hemoglobin level and red blood cells were improved after eating the school meal. There was statistically significant differences in BMI before and after eating school meal: (P value $\leq$ 0.05); it was higher in after eating school meal than before 17.66 vs. 16.62 respectively. So, these results can be recommended that school children need a good meal in order to grow in a healthy way and provide them with protection from diseases of deficiency and malnutrition.

Keywords: School meal, children, health, improvement, hemoglobin.

Introduction

School meals are one way in which the programmers operate. Children are fed breakfast, lunch or both in school, These meals can be prepared in schools in the community or be delivered from centralized kitchens. Some in-school meal programmers provide complete meals and while others provide high energy biscuits or snacks ***(*** **Visith *et al.*, 2009*)***.

The school meals are improved micronutrient intake and macronutrient intake leads to enhanced nutrition and child health, increased learning and decreased morbidity for students. School meals can help to get children into school and to keep them there, through enhancing enrolment and reducing absenteeism. School meals transfers resources to households, averting negative coping strategies and allowing investments in productive assets. School meals is often linked to health and nutrition/essential package interventions. School feeding favors spin offs to community development and local production, in particular when food is being sourced from poor, small-holding farmers ***(*****Lillian *et al*., 2012)**.

Nutrition programs and subsequent healthy school programs showed that the academic performance and mental ability of students with good nutritional status are significantly higher than those of pupils with poor nutritional status **(Daneshkazemi and Davari, 2015).**

School meals support good nutrition throughout the school day. Program participants are less likely to have nutrient inadequacies and are more likely to consume fruits, vegetables, and milk at breakfast and lunch. For school breakfast, similar dietary benefits are observed among students attending schools that provide breakfast at no cost to all students, when compared to students who eat away from school or through a traditional means-tested breakfast program. For school lunch, researchers conclude "school lunches provide superior nutrient quality than lunches obtained from other sources, particularly for low-income children. This is consistent with other studies comparing school lunches to packed lunches brought from home or elsewhere. School meals support and improve student physical and mental health, including weight-related outcomes. For instance, free or reduced-price school lunches reduce rates of poor health by at least 29 percent and rates of obesity by at least 17 percent, based on estimates using national data.26

Multiple studies find an association between school breakfast participation and lower body mass index (BMI), lower probability of being overweight, and lower probability of obesity. School breakfast, including breakfast offered at no cost to all students in a school, also has been linked with fewer visits to the school nurse, particularly in the morning,31 and positive impacts on mental health, including reductions in behavioral problems, anxiety, and depression **(Fletcher& Frisvold,2017 and Fox & Gearan,2019).**

The main objective of the present study was studied the effect of the school meal on improving the health status of children ages (6-12 years).

Subjects and methods

Subjects

This study was carried out on 100 male who were chosen randomly from primary schools in Menouf city, Menoufia Governorate, Egypt. Aged was from 6 to 12 years. The study was carried out in early October 2018 and ended in March 2019.

Instrumentation

The instrument of this study consisted of a structured interviewing questionnaire. Questionnaire consisted of three parts. The first was to collect the data about the anthropometric measurement. The second part was to collect data about socio-economic parameters while the third part was about the diet and food intake by using 24h. recall method .

Methods

Socio-economic parameters

Socio- economic status was included the educational level of father, the educational level of mother, family size and family income.

Food habits

Food habits was to collect data about number of consumed meals, omitted meals, snacks, opinions of students about variable items of different food groups **(Fouque *et al*., 2007).**

Daily food intake

The daily food intake had been assessed from the data collected by using 24-hours recall method. This included consumed foods in

breakfast, lunch , dinner and snacks between meals or after dinner **(KDOQI, 2000).**

Anthropometric measurements

The body weight was measured in light cloth and without cloth. Height was measured by measuring tape. BMI was calculated as the ratio of body weight in Kg divided by the square of the height in meters **(Din-Mohammadi and Pourmemari, 2003).**

Laboratory investigation

Hemoglobin and red blood cells were carried out according the methods of **Dacie and Lewis (1998).**

Statistical analysis

The results were analyzed using SPSS for Windows (Version 10.0) statistical software and expressed as Mean ± standard deviation. Analysis of variance between groups was performed using one-way ANOVA test followed by Duncan's multiple range test at a significance level of($P \leq 0.05$) **(SPSS,1998).**

Results and discussion

The results of table (1) represent the characteristics of social variables. With respect to sex, all children were male with (100%). For father's education, the higher percentage of children having secondary education to their fathers (54.0%); however (12.0%) having primary, but the lowest percentage was universal (8.0%). In case of mother's education, the higher percentage of children having secondary education to their mothers (40.0%); however (8.0%) having universal, but the lowest percentage was illiterate (6.0%).The majority of children having daily income (54.0%); followed by monthly (48.0%). The high percentage of children having 4 persons (46.0%) as family size; followed by 5 persons (34.0), but the lowest percentage was 7 persons (6.0%)

Table (1) the characteristics of social variables

Variable	Study Sample (100)	
	Frequency	Percent %
Sex		
Male	100	100.0
Total	100	100.0
Father's Education		
Primary	12	12.0
Preparatory	26	26.0
Secondary	54	54.0
University	8	8.0
Total	**100**	**100.0**
Mother's Education		
Illiterate	6	6.0
Primary	30	30.0
Preparatory	16	16.0
Secondary	40	40.0
University	8	8.0
Total	**100**	**100.0**
Income		
Monthly	48	48.0
Daily	52	52.0
Total	100	100.0
Family Size		
4Persons	46	46.0
5Persons	34	34.0
6Persons	14	14.0
7Persons	6	6.0
Total	**100**	**100.0**

Table (2) illustrate the characteristics of the food habits for children. For the number of meals you eating at a day, the highest percentage of children eaten three meals (82.0%); however 18.0% were eaten two meals. The lowest percentage of children omitted breakfast meal (18.0%); while the highest percentage of sample study none omitted meals (82.0%). In case of the cause of not eating breakfast, the highest percentage of sample study have other reasons (82.0%); while the lowest percentage of sample study have low appetite (6.0%). Concerning to the kind of food snacking

between meals, the highest percentages of children eaten Potato chips (42.0%); followed by sweets (30.0%); however the lowest percentage of sample study drunk juices (4.0%); followed by eaten fruits (6.0%).The majority of children added two sugar spoons to tea (84.0%); while the lowest percentage of sample study added three sugar spoons to tea (16%).The majority of children sometimes eaten pickles (84.0%); while the lowest percentage of sample study eaten pickles (6.0%); followed by wasn't eaten pickles (10.0%).With regard to drink tea directly after meals, the highest percentage of sample study wasn't drunk tea directly after meals (44.0%); followed by sometimes drunk tea directly after meals (40.0%); while the lowest percentage of sample study drunk tea directly after meals (16.0%). The majority of children added moderate salt to food (98.0%); sometimes drunk milk (78.0%); wasn't drunk soft drink during and after eating food (80.0%) and watched T.V during eating food (50.0%);while the lowest percentage of sample study added salty to food (2.0%), drunk milk (22.0%), drunk soft drink during and after eating food (2.0%) and watched T.V during eating food (10.0%). From the obtained results, it could be noticed that the majority of children ate three meals, ate potato chips as a snack between meals, sometimes drunk milk and sometimes drunk tea directly after meals. This indicated that the lack of calcium and iron due to lack of milk and drunk the tea . Eating the potato chips led to increase the weight gain and lack the appetite to healthy food **(Fox & Gearan,2019)**

Table (2) the characteristics of the food habits

Variable	Study Sample (100)	
	Frequency	Percent %
What is the number of meals you eating?		
Two Meals	18	18.0
Three Meals	82	82.0
More than three meals	0	0.0
Total	100	100.0
What is the omitted meal?		
None	82	82.0
Breakfast	18	18.0
Total	100	100.0
What is the Cause of not eating breakfast?		
Low Appetite	6	6.0
Non Habitual	12	12.0
Other reasons	82	82.0
Total	100	100.0
What is the Kind of food snacking between meals?		
Sweets	30	30.0
Juices	4	4.0
Sandwich	18	18.0
Fruits	6	6.0
Potato Chips	42	42.0
Total	100	100.0
What is the number of Sugar spoons you add to tea?		
Two	84	84.0
Three	16	16.0
Total	100	100.0
Do you eat pickles?		
Yes	6	6.0
No	10	10.0
Sometimes	84	84.0
Total	100	100.0
Do you drink tea directly after meals?		
Yes	16	16.0
No	44	44.0
Sometimes	40	40.0
Total	100	100.0
What is the quantity of salt in food?		
Moderate	98	98.0

Variable	Study Sample (100)	
	Frequency	Percent %
Salty	2	2.0
Total	100	100.0
Do you drink milk?		
Yes	22	22.0
Sometimes	78	78.0
Total	100	100.0
Do you have soft drink during and after eating food?		
Yes	2	2.0
No	80	80.0
Sometimes	18	18.0
Total	100	100.0
Do you watch T.V during eating food?		
Yes	10	10.0
No	40	40.0
Sometimes	50	50.0
Total	100	100.0

The results of table (3) represent the means and standard deviations of nutrients intakes compared with **RDA (2013).** It could be noticed that total protein, phosphorus, total iron, sodium, potassium and magnesium intake (64.43, 951.44,13.99, 2433.39, 2103.11, 267.05 and 128.265), respectively which were higher than recommended dietary allowances; but calories, total fat, fiber, carbohydrates, calcium and zinc intake (1583.54, 61.63, 10,76, 192.86, 380.95 and 7.78) which were lower than recommended dietary allowances. It could be noticed that vitamin C, vitamin E, vitamin B2, niacin, vitamin B12 and folate intake (93.62, 15.09, 1.98, 17.08, 6.01 and 164.42) respectively by which were higher than recommended dietary allowances; but vitamin A, vitamin D, vitamin B1 and vitamin B6 intake (501.61, 1.12, 5.02 and 1.05) were lower than recommended dietary allowances. From the above results, it could be observed that the high intake of protein especially plant protein source, phosphorus, total iron especially plant source, sodium, potassium, magnesium intake and cholesterol led to problem for long period as effect of normal growth, anemia, lose teeth, abnormal bones, kidney

disease and high blood cholesterol to increase the fat animal source (**Daneshkazemi and Davari, 2015 and Fletcher& Frisvold,2017).**

Table (3) Means and standard deviations of nutrients intakes compared with RDA

Nutrients intake	Sample study (100)		
	Mean ± SD	RDA	% RDA
Calories (kcal)	1583.54±21.719	2030	78.01
Protein A (g)	38.08±13.484	20	214.76 %
Protein p (g)	26.35±8.053	10	
Total protein (g)	64.43±14.424	30	
Fat A (g)	34.17±12.497	28.7	71.66
Fat P (g)	27.48±9.035	57.3	
Total fat (g)	61.63±15.372	86	
Carbohydrates (g)	192.86±15.491	225	85.71
Fiber (g)	10.76±2.707	30	35.86
Ca (mg)	380.95± 17.139	800	47.61
P (mg)	951.44±12.168	700	135.92
Iron A (mg)	4.56±1.178	6.7	139.90
Iron B (mg)	9.45±1.930	3.3	
Total iron (mg)	13.99±2.148	10	
Na (mg)	2433.39±25.369	400	608.34
K (mg)	2103.11±27.386	1014.6	207.28
Zinc (mg)	7.78±1.045	10.53	73.88
Mg (mg)	267.05±14.80	150.42	177.53
Vit A (µg)	501.61±21.821	693.21	72.36
Vit C (mg)	93.62±15.839	45	208.04
Vit D (µg)	1.12±0.832	10	11.20
Vit E (µg)	15.09±1.778	7.31	206.42
Vit B1 (mg)	5.02±1.797	5.07	99.01
Vit B2 (mg)	1.98±0.144	1.21	163.63
Niacin (mg)	17.08±2.635	13.38	127.65
Vit B6 (mg)	1.05±0.564	1.35	77.77
Vit B12 (mg)	6.012±2.684	4.36	137.88
Folate (mg)	164.42±1.155	101.7	161.67
Cholesterol (mg)	256.53±24.587	200	128.26

Table (4) showed that the school meal supplies children 41.771% calorie, protein, 36.7% and fat 44.81%, while carbohydrates were 46.67% and given the proportion of calcium, iron and zinc, it was 29.10%, 19.49% and 41.33%, respectively, while the school meal was extended by 26.89% as well as 13.28% for both vitamin A and vitamin C, respectively. The academic performance and mental ability of students with good nutritional status are significantly higher than those of pupils with poor nutritional status **(Haapala and Probart, 2004**).Also, It concluded that children having a school meal had better quality diets. Improving the quality of packed lunches is difficult **(Charlotte, 2015**) .School meals in twelve or more countries provide high-energy food with high nutritional values either free or at economical rates (**Aliyar *et al*., 2015).**

Table (4) The average nutrient from a school meal (100g)

Nutrients intake	Amount %
Calories(kcal)	41.6719
Protein (g)	36.7008
Fat (g)	44.8166
Carbohydrate(g)	46.673
Ca (mg)	29.1079
Fe (mg)	19.9469
Zn (mg)	41.3348
Vit A (µg)	26.8926
Vit C (mg)	13.2868

Data presented in table (5) explained the differences in anthropometric measurements before and after eating school meal. There was statistically significant differences in height before and after eating school meal: (P value ≤ 0.05); it was higher after eating school meal than before 126.10±11.440 vs. 124.15±11.453 respectively. There was statistically significant differences in weight before and after eating school meal: (P value ≤ 0.05); it was higher after eating school meal than before 28.01±8.000 vs. 26.16±7.449 respectively. There was statistically significant differences in BMI before and after eating school meal: (P value ≤ 0.05); it was higher in after eating school meal than before 17.66±1.959 vs. 16.62±2.333

respectively. From that, children having a school meal had better quality diets. School meals gave high nutritional values which effect on the anthropometric parameters of children for a long time (**Aliyar *et al.*, 2015).**

Table (5) Anthropometric measures before and after eating school meal

Variable	Before	After	Mean difference	T	P value
	Mean ±SD	Mean ±SD			
Height:					
Mean ± SD	124.15±11.453	126.10±11.440	-1.95	-12.073	0.000***
Weight					
Mean ± SD	26.16±7.449	28.01±8.000	-1.85	-5.358	0.000***
BMI:					
Mean ± SD	16.62±2.333	17.66±1.959	-1.04	-9.759	0.000***

***** P≤ 0.001 :**
Each value is presented as Mean ± standard deviation (n=100)

Data presented in table (6) explained the differences in blood analysis before and after eating school meal. There was statistically significant differences in hemoglobin before and after eating school meal: (P value ≤ 0.05); it was higher in after eating school meal than before 12.37±0.703 vs. 10.85±0.667 respectively. There was statistically significant differences in red blood cells before and after eating school meal: (P value ≤ 0.05); it was higher in after eating school meal than before 3.99±0.325 vs. 3.57±0.419 respectively. Increasing the level of hemoglobin due to containing the diet iron source and vitamin C which increase the absorption of iron especially plant source **(Lillian *et al.*, 2012).**

Table (6) Blood analysis before and after eating school meal

Variable	Before	After	Mean difference	T	P value
	Mean± SD	Mean± SD			
Hemoglobin:					
Mean ± SD	10.85±0.667	12.37±0.703	-1.52	-59.807	0.000***
Red blood cells					
Mean ± SD	3.57±0.419	3.99±0.325	-0.424	-30.270	0.000***

***** P≤ 0.001 :**
Each value is presented as Mean ± standard deviation (n=100)

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تأثير الوجبة المدرسية على تحسين الحالة الصحية للأطفال من سن (٦-١٢) سنة

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صممت هذه الدراسة لتحديد أثر الوجبة المدرسية في تحسين الحالة الصحية للأطفال (٦-١٢) سنة، فأجريت الدراسة على ١٠٠ من الأطفال الذكور. واحتوت الوجبة على ٧٠ جرام خبز فينو، ٤٠ جرام حلاوة طحينية، ٣٠ جرام جبن مطبوخ و ١٥٠ جرام فاكهة البرتقال لمدة ٦ أشهر. تم تحديد الحالة الغذائية للأطفال من خلال استرجاع المتناول اليومي من الغذاء من خلال استرجاع ٢٤ ساعة لمدة ٣ أيام واستبيان العادات الغذائية. تم حساب مؤشر كتلة الجسم. تم جمع عينات الدم لتقدير الهيموجلوبين وكرات الدم الحمراء . وأظهرت النتائج أن هناك تحسناً ملحوظاً في الحالة الصحية للأطفال بعد تناول الوجبة المدرسية. حيث أمدت الاطفال من الطاقة ٤٤,٧٧ % والبروتين ٣٦,٧% والدهون٤٤,٨١% بينما الكربوهيدرات كانت ٤٦,٦٧% . بينما الكالسيوم ، الحديد والزنك كانت ١٩,٤٩% ، ٢٩,١٠% ، ٤١,٣٣% على التوالي في الوجبة المدرسية. مستوى الهيموجلوبين وخلايا الدم الحمراء قد تحسن بعد تناول الوجبة المدرسية. وجد اختلافات معنوية ($P \leq 0.05$) ما بين مؤشر كتلة الجسم قبل وبعد تناول الوجبة المدرسية حيث كانت اعلى بعد تناول الوجبة المدرسية عن قبلها ١٧,٦٦ مقابل ١٦,٦٢ على التوالي. لذلك توصى هذه النتائج بأن أطفال المدارس يحتاجون إلى وجبة جيدة من أجل النمو بطريقة صحية وتوفير الحماية لهم من أمراض نقص وسوء التغذية .

الكلمات الافتتاحية: الوجبة المدرسية، الأطفال، الصحة، التحسن، الهيموجلوبين.