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Effect of Applying Different Educational Strategies on Dietary Habits of Preparatory Schools' Pupils

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Abstract: *Adolescence is seen as a nutritional vulnerable time that requires special nutritional needs. In addition, in this age dietary habits are still developing which track into adulthood*. *Nutritional health education is one of the most important determinants of food choice that make adolescents choose healthy diet. Thus, it will likely prevent health problems such as overweight, obesity and the development of chronic diseases later in life. Schools are uniquely positioned to shape children's eating habits. Therefore, the possibility of correcting eating habits can be done through health education. Educational strategies include traditional which include lecturing being passive learner and non traditional methods include computer based simulation.*

Aim: *The purpose of this study was to assess the effect of applying different educational strategies on dietary habits of preparatory schools' pupils.*

Study Design: *Quasi- experimental design was used to carry out this study at two private preparatory schools located at Mansoura District in Dakahlia Governorate, Egypt. Total sample size of 74 adolescents involved in the study (37 adolescents / each group), in addition to a group of eight professional experts who were academic staff members and had experience in health education and community health nursing. The study was conducted throughout four stages, which were preliminary assessment stage, development stage of the computer-based nutritional health education sessions, implementation of health education sessions, and evaluation of pupils satisfaction to health education sessions.*

Results: *The study showed that 86.5% of pupils in both intervention groups had poor knowledge level about healthy diet and its components. However, traditional face-to-face and computer-based intervention resulted in improvement of knowledge level for both groups with the computer- based intervention (CBI) group having the higher mean score than the traditional- based intervention (TBI) group. Regarding pupils' dietary habits, the findings of the present study illustrated that (97.3%, 91.9%) of pupils in the face to face and computer groups respectively showed unsatisfactory dietary habits. However, both interventions resulted in improvement of dietary habits for both groups with the TBI group having the higher mean score than the CBI group. In addition, the study revealed high satisfaction of pupils. Most of pupils in both groups mentioned that the design of health educational sessions was appropriate; the teaching methods were useful, facilitate learning process and help them to change their dietary habits.*

Conclusion: *Both of educational strategies led to positive changes in preparatory school pupils' healthy eating behaviors and nutritional knowledge. However, computer-based education has been shown to have a greater effect in nutritional knowledge than motivating pupils to adopt healthy dietary habits compared to traditional based education. The findings support the importance of providing pupils with nutrition knowledge to promote healthy dietary behaviors.*

Keywords: *Adolescents, Nutritional knowledge, Dietary habits, Schools pupils, Nutritional health education, Educational strategies, Traditional- based education, Computer –based education.*

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I. Introduction

According to WHO, children in the age group of 10–19 years are referred to as adolescents **(1)**. Adolescents form 18% of the world's population. The vast majority of adolescents (88%) live in developing countries **(2)**. Adolescence is a time of rapid physical growth; during this period children gain up to 50% of their adult weight and 45% of skeletal mass and more than 20% of their adult height **(3)**. During this period of life, there are biological, psychological, and social changes along with cognitive and emotional changes. Also, the

need for independence happen synchronously **(4)**. Due to all of these transitions, adolescence is seen as a nutritional vulnerable time that requires special nutritional needs **(5)**.

Overall, global estimates that 46% of school- age children are anemic **(6)**. In Egypt, 28.4% of males' adolescents aged 10-14yrs were overweight and 9.9% were obese. While 27.4% of adolescents females were overweight and 8.5% were obese **(7)**. Jamorabo-Ruiz & Serrano-Claudio **(8)** and CDC **(9)** acknowledged that nutrition is an input to and foundation for health and development. However, it is common for adolescents to substitute main meals with high-calorie snacks or to skip important meals such as breakfast. In addition, they consume many foods with a high content of sugar, refined carbohydrates and saturated fats. Furthermore, they do not consume enough fruits and vegetables; they are also prone to adopting monotonous diets or food fads **(10)**. These poor eating habits lead to child obesity **(11)**. Which increase risk for cardiovascular disease, hypertension, diabetes mellitus type II and certain types of cancer **(12, 13)**. Therefore, healthy lifestyles intervention programs are important issues for public and government services **(14)**. Schools are the preferred setting for the implementation of these programs because most children spend the greatest part of their time in school **(15)**. Fortunately, in this age dietary habits are still developing and can be positive modified **(16)**. A study recommended nutritional health education for adolescents to help them develop appropriate dietary patterns **(17)**. A lecture may be the oldest method of teaching; it is economical and can be an effective means of providing new information and clarifying existing information to a large heterogeneous group in a short period of time **(18)**. While, Computer-based simulations have been employed as tools in contemporary clinical decision-making and even management experiential training **(19)**. Computer-based nutrition education programs have the potential to persuade adolescents to improve overall dietary habits and curb the expansion of overweight and obesity **(20)**.

As, the school nurse provides health information to individual students and groups of students through health education. The school nurse assists on health education curriculum development teams and may also provide programs for staff, families, and the community **(21)**. Therefore, it was important to assess the effect of applying different educational strategies on dietary habits of preparatory schools' pupils.

II. Aim Of The Study

The study aimed to assess the effect of applying different educational strategies on dietary habits of preparatory schools' pupils.

III. Subjects And Methods

3.1. Study design:

The study design was determined to be quasi- experimental design. The study was conducted at two private preparatory schools located at Mansoura District in Dakahlia Governorate. The study subjects were preparatory school pupils and professionals in the fields of health education and community health nursing at Mansoura University.

3.2. Subjects and sampling:

Regarding to subjects and sampling, pupils who involved in the study were male and female recruited from second academic year of preparatory schools. Purposive sampling technique was used to select one group from each school pre-and post-tests. The minimum required pupils sample size considering drop outs by adding 10% was 74 adolescents (37 adolescents/each group). The first group studying with traditional face-to-face learning (lecture) and the second group studying with computer-based learning (simulation). Based on a hypothetical, the mean knowledge scores regarding healthy dietary habits is 56.9±14.37 among adolescents received computer based health education and 46.7± 15.14 among adolescents who did not receive health education by the same methods in a text by D Raghunatha Rao et al., (2007**)** with an equal sample size in both groups, with a power of 80% at 95% confidence level **(22)**. Schools were selected randomly.

Convenient sampling technique was used which included (8) professionals in the fields of health education and community health nursing at Mansoura University who were interviewed to obtain their opinions in relation to health education topic, educational strategies, and required recommendations before designing the computer based health education sessions.

3.3. Process of interventions:

3.3.1. Preliminary assessment stage:

The researcher started by introducing herself to the pupils and giving them a brief orientation about objectives and sessions of the health education. Pretest questionnaires were collected to explore pupils' socio-demographic data, health assessment, dietary habits and knowledge about healthy diet. This preliminary assessment showed poor score level of knowledge related to functions and sources of nutrients, healthy diet, food guide pyramid, caloric content of nutrients and diet related diseases.

Five tools were used in conducting the preliminary assessment. The first tool was ***"Pupils' socio-demographic self-administered structured questionnaire".*** The first part was used to assess demographic characteristics of pupils (age, sex, class). The second part was adopted from Fahmy and El-Sherbini Socio Economic Scale, (1983) which was modified by El Gilany, El-Wehady and El-Wasify, (2012). El- Gilany socioeconomic scale; it was used to assess socioeconomic level of pupils. According to this scale the very low socio-economic level scored from 1-21 points. Low socio-economic level scored 22-42 points. Middle socio-economic level scored 43-63 points and high socio-economic level scored more than 64 + points **(23)**. The second tool was ***"Pupils' health assessment"*** to assess pupils' past health history, present health complains and physical examination (pupils' weight and height were measured to calculate body mass index) **(24)**. Body Mass Index (BMI) was used to assess their nutritional health status. BMI is calculated by a person's weight in kilograms divided by the square of height in meters (kg/m^2). For adolescents, BMI is age- and sex-specific and is often referred to as BMI-for-age which was then categorized as underweight, normal weight, overweight and obese by using cut –off points according to WHO **(25)**. The Third tool was **" *Pupils' dietary habits self administered structured questionnaire ".*** This questionnaire was used to assess the pupils' dietary habits related to frequency of food intake, eating pattern and food safety practice prior and after the health educational sessions. Dietary habits were classified into satisfactory that equal 65% scores of total scores and unsatisfactory that equal less than 65% of total scores.*" **Pupils' knowledge self-administered structured questionnaire "***was the fourth tool used to assess pupils' knowledge about healthy diet. The questionnaire was classified to pupils' knowledge regarding healthy diet and food guide pyramid, caloric content of nutrients, function of nutrients, sources of nutrients, and diet related diseases prior and after the health educational sessions. The total scores were divided into three levels; poor level = less than 50% of total scores, fair level= 50% to 65% of total scores, good level= more than 65% of total scores. The "total food frequency consumption method" was used as stated by **(26, 27)**. ***The fifth tool was" Pupils' satisfaction to the health education sessions conducted by traditional and computer based-learning self-administered structured questionnaire"*** the questionnaire was used to assess pupils' satisfaction to the health education sessions conducted by traditional and computer based-learning.

3.3.2. Development stage of the computer- based nutritional health education sessions

According to the results of preliminary assessment of knowledge and dietary habits of pupils and based on professional experts' opinion, the researcher developed nutritional health education sessions included the following objectives; raising awareness of the pupils about healthy dietary habits, reduce pupils' consumption of junk food and soft drinks to adopt healthy dietary habits. Combined efforts of the researcher and information technologist were done to develop computer-based health education sessions (Written documents & interactive media) based on health education sessions ' objectives and the desired outcomes.

The health education sessions included the following topics (functions and sources of nutrients, body mass index, healthy diet, food guide pyramid, junk food, principals of food safety and food label) was developed by the researcher based on the literature review. The researcher provided the designer with word processed documents representing each distinct learning unit, videos, description of games and interactions. The theoretical content was identical to that of the traditional health education sessions. The content of the computer-based health education sessions was displayed by using graphics, pictures, videos and animation. These interactive computer-based health education sessions allow the pupils to see, hear and interact with the computer and his/her classmates during the learning process.

The computer-based health education sessions composed of 3 sections:

(1) Written content consisted of knowledge related to the previous topics.

(2) Videos

(3) Interactive section which include (games and simulation games).

The health education sessions were presented by using a CD that was containing text, pictures, videos, games and simulation games. There is a first screen included title of each learning unit, when the participant click on any title of learning unit another screen appear included 3 sections (read, watch, play) a movable play bar that enabled participant to click on read, the written content displayed, click on watch, videos displayed, click on play, games and simulation games displayed. When playing the video, the pupil found flexible moving by a fixed play bar that enabled moving play, previous, or next buttons. Moreover, sound control and full screen option. "The interactive" section of the program included games and simulation games used for training.

3.3.3. Formulation of educational booklet

A health educational booklet was developed by the researcher in order to be printed handout distributed to the traditional face to face study group.

3.3.4. Implementation of nutritional health education sessions

The same content of health educational sessions was displayed by using two different educational strategies (traditional face to face learning (lecture) and computer – based learning (simulation). ***Traditional face to face learning (lecture)*** conducted at Abu-Bakr Elsedeik preparatory school classrooms included 37 pupils; they divided into two subgroups (Group A 19 pupils and group B 18 pupils). The researcher conducted one session for each group/ day for three days a week. The duration of each session was 45 minutes. The researcher used lecture, group discussion, brainstorming, and role play as teaching methods. Clarified teaching by learning materials as white board, printed handout (educational booklet), visual materials (posters), papers, platform scale, measuring tap, body mass index for age chart, pictures, real packaged food specimen. In addition, hands-on activities were included in the intervention in order to increase the participants' self efficacy for improving their dietary intake (i.e. reading food label, plan nutritionally balanced menu for one day). Participants received the manual handouts (educational booklet) covered to be retained in their memories.

Computer-based learning (simulation) conducted at Gamaiate Reaiete Eltalaba preparatory school computer lab included 37 pupils; they divided into two subgroups (Group A 19 pupils and group B 18 pupils). The researcher provided instructions and demonstrated how to operate the interactive CD to the participants and then participants were instructed to work through the health education sessions independently for the duration of one large education session for each group. The researcher distributed a CD to each pupil to learn at home, contact with the pupils occurred in various ways: face book and mobile phone.

3.3.5. Evaluation of nutritional health education sessions

To determine the effect of applying the health educational strategies (traditional face to face learning; lecture and computer-based learning; simulation) the pupils in the first and second study groups were evaluated by post –test by using the study tool III, IV and V. After 2 months follow up, participants were evaluated for post test. The researcher follows up intervention groups weekly and traces the dropped points.

3.4. Official, ethical issues and other technical issues:

3.4.1. Approval and permissions:

The study was approved by the dean of Faculty of Nursing, Mansoura University and from the educational Directorate of Dakahlia Governorate.

3.4.2. Informed consent:

Approval was obtained from the Research Ethics Committee Faculty of Nursing, Mansoura University. The pupils' oral approval was taken at the beginning of the study after explanation of the study purpose. The pupils had the right to withdraw from the study at any time they were assured that their identities and responses to the interview would be confidential and used only for research purpose, answering was voluntary.

3.4.3. Validity testing of the developed tools:

Validity testing was done to the tools by submitting the tools to five experts in the field of "community health nursing and nursing education ". Their recommended modifications were done. In addition to a pilot study that was conducted on 10 % of pupils (8 pupils) who were selected randomly and not included in the study to evaluate the clarity, applicability, and reliability of the research tools. As well as the pilot study used to estimate the approximate time required for data collection. On the basis of collected information, the necessary modifications were done, some questions were added and others were clarified or omitted. Each questionnaire consumed about (25-30 minutes) to be filled.

3.5. Statistical Analysis

Data were analyzed using SPSS (Stands for Statistical Product and Service Solutions) version 20.0. Data were presented by using descriptive statistics in the form of frequencies and percentage. ANOVA test was used for comparison between and within groups. $P < 0.05$ was considered to be statistically significant.

IV. Results

Table (1) shows that 43.2%, and 73.0% of pupils in the face to face and computer groups respectively were aged 13 years and 51.4% of pupils in the studied groups were female. Concerning pupils' pocket money, 89.2 %, and 78.4% of pupils in the face to face and computer groups respectively got pocket money daily. In addition, 73.0%, and 89.2% of pupils in the face to face and computer groups respectively spent their pocket money in junk food. Table reveals that, 62.2%, and 56.8% of pupils in the face to face and computer groups respectively belonged to middle socio-economic level.

Table (1): Distribution of the studied groups according to their socio- demographic characteristics

Socio - demographic characteristics	Traditional face to face learning group		Computer- based learning group	
	N=37	%	N=37	%
Age (years)				
13	16	43.2	27	73.0
14	21	56.8	10	27.0
Sex				
Male	18	48.6	18	48.6
Female	19	51.4	19	51.4
Pupil's pocket money				
Daily	33	89.2	29	78.4
Weekly	2	5.4	5	13.5
Monthly	2	5.4	3	8.1
Spend pocket money				
Junk food	27	73.0	33	89.2
Others	10	27.0	4	10.8
Socio-economic level				
High socio- economic level	14	37.8	16	43.2
Middle socio- economic level	23	62.2	21	56.8

Table (2) presents that 48.6%, and 59.5% of pupils in the face to face and computer groups respectively showed normal body mass index. While, 29.7%, and 24.3% of pupils in the face to face and computer groups respectively were overweight. Whenever, 18.9%, and 16.2% of pupils in the face to face and computer groups respectively were obese. Only 2.7% of pupils in the face to face group were underweight compared to none of pupils in the computer group.

Table (2): Distribution of the studied groups according to their nutritional health status (body mass index)

BMI categories	Traditional face to face learning group		Computer- based learning group	
	N=37	%	N=37	%
Underweight	1	2.7	0	0.0
Normal	18	48.6	22	59.5
Overweight	11	29.7	9	24.3
Obese	7	18.9	6	16.2

Table (3) reveals poor score level of knowledge for majority (86.5%) of pupils in both groups in relation to knowledge regarding healthy diet and its components pre-health education sessions. However, post health education sessions most (91.9% & 97.3%) of pupils in traditional and computer groups respectively showed good score level of knowledge. There was highly statistical significant difference between traditional and computer groups regarding the previous item ($p \leq 0.01$).

Table (3): Distribution of the studied groups pre-and post health educational sessions according to their knowledge regarding healthy diet

Knowledge items	Traditional group				Computer group				F	P
	Pre		Post After 2 months		Pre		Post After 2 months			
	N=37	%	N=37	%	N=37	%	N=37	%		
1- Healthy diet and food guide pyramid (Score=14)									29.398	.000**
Good	7	18.9	31	83.8	4	10.8	33	89.2		
Fair	8	21.6	5	13.5	15	40.5	3	8.1		
Poor	22	59.5	1	2.7	18	48.6	1	2.7		
2- Caloric content of nutrients (Score=3)									36.364	.000**
Good	1	2.7	26	70.3	1	2.7	28	75.7		
Poor	36	97.3	11	29.7	36	97.3	9	24.3		
3- Functions of nutrients (Score=9)									85.454	.000**
Good	3	8.1	30	81.1	1	2.7	35	94.6		
Fair	3	8.1	5	13.5	0	0.0	2	5.4		
Poor	31	83.8	2	5.4	36	97.3	0	0.0		
4- Sources of nutrients (Score=15)									70.679	.000**
Good	2	5.4	35	94.9	5	13.5	37	100.0		
Fair	6	16.2	1	2.7	4	10.8	0	0.0		
Poor	29	78.4	1	2.7	28	75.7	0	0.0		
5- Diet related diseases/health problems (Score=3)									28.421	.000**
Good	10	27.0	27	73.0	8	21.6	36	97.3		
Poor	27	73.0	10	27.0	29	78.4	1	2.7		

6- Total score level of knowledge (Score=44)									90.972	.000**
Good	2	5.4	34	91.9	2	5.4	36	97.3		
Fair	3	8.1	3	8.1	3	8.1	1	2.7		
Poor	32	86.5	0	0.0	32	86.5	0	0.0		

Poor= scores less than 50% of total scores
Fair= scores 50% to 65% of total sores
Good= scores more than 65% of total scores
F (one way-ANOVA)
P (significance)
** Highly significant (p< 0.01)

Table (4) illustrates the mean difference between the studied groups pre-and post-health educational sessions according to their knowledge regarding healthy diet. With respect to healthy diet and food guide pyramid, the percent of change was 40.3% for traditional group, while for computer group was 36%. In relation to caloric content of nutrients, the percent of change was 94.7%, and 95% for traditional and computer group respectively. Regarding function of nutrients, the percent of change was 69.5% for traditional group, while for computer group was 78.3%. Concerning sources of nutrients, the percent of change was 59.5%, and 54.2% for traditional and computer groups respectively. As regard to diet related diseases, the percent of change was 63.6% for traditional group, while for computer group was 70.3%. The percent of change of total knowledge was 56.9% for traditional group while for computer group was 56.6%. Table reveals that there was no statistically significant difference in the pre-test score on the knowledge between the face to face group (15.1±7.2) and computer group (15.7±6.5). However, after 2 months follow up post test scores in the computer group was significantly higher than in the face to face group with a mean score of (36.2±3.3) for the computer group compared with a mean score of (35.1±5.5) for the face to face group

Table (4): Mean difference between the studied groups pre-and post health educational sessions according to their knowledge regarding healthy diet

Categories of knowledge	**Traditional face to face learning group N=37**			**Computer- based learning grou N=37**		
	Pre test	**Post test** After 2 months	**% of change**	**Pre test**	**Post test** After 2 months	**% of change**
	$\bar{X}$± SD	**$\bar{X}$ ± SD**		**$\bar{X}$ ± SD**	**$\bar{X}$ ± SD**	
Healthy diet and food guide pyramid(Score=14)	6.8 ± 2.59	11.4 ± 1.99	*40.3%*	7.1 ± 2.17	11.1 ± 1.77	*36%*
Caloric content of nutrients(Score=3)	0.1 ± 0.41	1.9 ± 1.06	*94.7%*	0.1± 0.44	2.0 ± 0.78	*95%*
Function of nutrients(Score=9)	2.1± 2.1	6.9 ± 1.46	*69.5%*	1.6 ± 1.45	7.4 ± 1.11	*78.3%*
Sources of nutrients(Score=15)	5.1 ± 2.88	12.6 ± 1.99	*59.5%*	5.9 ± 3.38	12.9± 1.36	*54.2%*
Diet related diseases(Score=3)	0.8± 0.94	2.2± 0.97	*63.6%*	0.8± 0.77	2.7 ± 0.51	*70.3%*
Total score level of knowledge(Score=44)	**15.1± 7.2**	**35.1 ± 5.5**	***56.9%***	**15.7 ± 6.5**	**36.2 ± 3.3**	**56.6%**

Table (5) shows that unsatisfactory level of dietary habits for most (97.3%, & 91.9%) of pupils in traditional and computer groups respectively pre-health education sessions. However, 56.8% of pupils in traditional compared to 59.5% of pupils in computer groups showed satisfactory level of dietary habits post health education sessions.

Table (5): Distribution of the studied groups pre-and post health educational sessions according to their dietary habits

Knowledge items	**Traditional group**				**Computer group**				**F**	**P**
	Pre		**Post After 2 months**		**Pre**		**Post After 2 months**			
	N=37	**%**	**N=37**	**%**	**N=37**	**%**	**N=37**	**%**		
1- Frequency of food intake (Score=96)									17.149	.000**
Satisfactory	1	5.4	14	37.8	2	5.4	13	35.1		
Unsatisfactory	35	94.6	23	62.2	35	94.6	24	64.9		
2- Eating pattern (Score=72)									29.231	.000**
Satisfactory	2	5.4	23	62.2	3	8.1	19	51.4		
Unsatisfactory	35	94.6	14	37.8	34	91.9	18	48.6		
3- Food safety practice (Score=42)									17.272	.000**
Satisfactory	21	56.8	37	100.0	27	73.0	37	100.0		
Unsatisfactory	16	43.2	0	0.0	10	27.0	0	0.0		
4- Total score level of dietary habits (Score=210)									34.879	.000**
Satisfactory	1	2.7	21	56.8	3	8.1	22	59.5		
Unsatisfactory	36	97.3	16	43.2	34	91.9	15	40.5		

Satisfactory= scores more than 65% of total scores
Unsatisfactory= scores less than 65% of total scores
F (one way-ANOVA)
P (significance)
** Highly significant (p< 0.01)

Table (6) presents the mean difference between the studied groups pre-and post-health educational sessions according to their dietary habits. With respect to frequency of food intake, the percent of change was 25.9%, and 18.8% for traditional and computer groups respectively. In relation to eating pattern, the percent of change was 37.9%, and 30.5% for traditional and computer groups respectively. Regarding food safety practice, the percent of change was 19.9%, and 15.6% for traditional and computer groups respectively. The percent of change of overall dietary habits was 28.6% for traditional group, while for computer group was 21.9%.

Table (6): Mean difference between the studied groups pre-and post health educational sessions according to their dietary habits

Categories of knowledge	**Traditional face to face learning group N=37**			**Computer- based learning group N=37**		
	Pre test	**Post test** After 2 months	**% of change**	**Pre test**	**Post test** After 2 months	**% of change**
	$\overline{X}$± SD	**$\overline{X}$ ± SD**		**$\overline{X}$ ± SD**	**$\overline{X}$ ± SD**	
Frequency of food intake (Score=96)	42.9 ± 8.4	57.9 ± 7.4	*25.9%*	46.6 ± 9.3	57.4 ± 8.6	*18.8%*
Eating pattern (Score=72)	30.4± 9.8	49 ± 6.9	*37.9%*	32.3 ± 10.7	46.5 ± 7.5	*30.5%*
Food safety practice (Score=42)	27.7±6.0	34.6±2.8	*19.9%*	29.7±5.2	35.2±3.3	*15.6%*
Total score level of dietary habits (Score=210)	**101.1±18.1**	**141.6±14.3**	***28.6%***	**108.7±18.7**	**139.2±16.1**	***21.9%***

Table (7) shows that consumption of fruits, vegetables and milk /milk products of pupils in post intervention groups increased compared to pre, moreover, the consumption increased for traditional group than computer group. While, the consumption of seafood, grains and legumes of pupils in post intervention groups increased compared to pre, moreover, the consumption increased for computer group than traditional group. On the other hand, the consumption of sweets, soft drink, fast food and tea /coffee of pupils in post intervention group decreased compared to pre, moreover, the consumption decreased for traditional group than computer group.

Table (7): Distribution of the studied groups pre-and post health educational sessions according to their frequency of food items

Food consumption (frequency /week)	**Traditional face to face learning group N=37**		**Computer based- learning group N=37**	
	Pre	**Post After 2 months**	**Pre**	**Post After 2 months**
	$\overline{X}$± SD	**$\overline{X}$± SD**	**$\overline{X}$± SD**	**$\overline{X}$± SD**
Fruits (28-35)	7.9±7.1	13.6±8.1	8.2±5.9	10.3±5.7
Vegetables (35-49)	8.3±9.6	16.7±12.7	11.9±12.6	16.5±12.9
Meat , poultry and egg (13-16.5)	19.6±26.5	9.8±7.6	22.9±23.5	14.9±10.8
Seafood (4- 5.5)	3.3±3.7	4.3±3.3	4.6±6.4	5.2±4.4
Grains (42- 70)	11.8±8.1	15.4±6.7	11.7±6.4	15.8±6.8
Legumes (Beans& peas) (3-5)	1.7±2.2	3.3±2.5	3.2±4.7	4.4±4.7
Milk/ milk products (21)	14.3±15.2	21.6±13.5	17.4±15.3	20.5±14.7
Sweets/ Sugars (0)	10.1±8.5	3.7±3.4	10.8±7.0	4.5±4.6
Soft drink (0)	11.6±8.5	2.3±2.5	9.4±6.8	2.4±2.4
Fast food (0)	5.8±6.4	1.5±0.7	11.3±8.6	2.4±2.5
Tea, coffee and its derivatives(0)	17.2±14.4	9.2±8.9	7.3±10.7	4.7±6.3
Natural juices (3.5)	7.8±8.4	6.0±4.6	11.7±8.4	7.7±4.8

Table (8) reveals high satisfaction of pupils. The mean score was (96.8 ± 2.6) of the face to face group compared with the mean score (96.6 ± 2.2) of the computer group. Regarding the design of health educational sessions, both groups indicated that the design was appropriate with the mean score (89.6 ± 2.2) of traditional group compared to computer group with a mean score (89.3 ± 2.3). In relation to usefulness of the health education sessions, both groups revealed that the teaching methods were useful and facilitate learning process with a mean score (7.2 ± 0.6) of traditional group compared to the mean score (7.2 ± 0.5) of computer group.

Table (8): Studied groups satisfaction levels regarding health educational sessions

Satisfaction categories	Traditional face to face learning group N=37	Computer- based learning group N=37
	Mean ± SD	Mean ± SD
Design of health educational sessions (**92 marks**)	**89.6 ± 2.2**	**89.3± 2.3**
Content of health educational sessions (**44 marks**)	42.4 ± 1.4	42.7 ± 1.4
Objectives of health educational sessions (**4 marks**)	4.0 ± 0.0	3.7 ± 0.49
Quality of media and activities (**44 marks)**	43.1 ± 1.1	42.8 ± 1.03
Usefulness of the health educational sessions **(9 marks)**	**7.2 ± 0.6**	**7.2 ± 0.5**
Total score of satisfaction (**101 mark**s)	**96.8 ± 2.6**	**96.6 ± 2.2**

Mean ± SD= mean± standard deviation

5 point Likert-scale (4 = Excellent; 3= Very good; 2 = Good; 1= Fair; 0=Poor).

V. Discussion

Dietary choices and habits established during adolescence greatly influence future health **(28)**. However, dietary patterns of adolescents frequently include higher than recommended intakes of total fat, saturated fat, sodium, cholesterol, refined carbohydrates with sub-optimal intake of dairy products, fruits and vegetables **(17, 29)**. The intake of soft drinks has almost doubled within the adolescent female group, and almost tripled among adolescent males **(30).** Therefore, the present study was carried out to assess the effect of applying different educational strategies on dietary habits of preparatory schools' pupils.

The age of the pupils in this study was ranged from 13-14 yrs. More than half of the studied groups were female. This was consistent with two different studies; the first study was conducted on adolescents of both genders attending municipal public schools in the urban area of Montes Claros, Brazil, **(10)** who revealed that more than half of the target groups were aged 11-13 years of age, and less than half were 14 years, more than two thirds were females. The second study **(31)** was conducted in three schools in urban middle-income group of school children in India, reported that majority of the subjects were in the age group of 10- 14 years. Similarity of these studies clarified the vulnerability of this age group. According to ***nutritional status of the studied pupils***, the findings of the present study showed that very few numbers of pupils in the studied groups were underweight. More than one fourth and less than one fourth of pupils in the face to face and computer groups respectively were overweight. Whenever, less than one fifth of pupils in the studied group were obese. The findings were consistent with the findings of studies in Southwestern United States **(32)** and on US **(33)** who revealed a higher incidence of being overweight in minority adolescents. Another study revealed that the prevalence of overweight among adolescents in urban Sharkia Governorate and Dubai were one fifth and obesity were 10.7% and one fifth respectively **(34, 35)**. However, in Västra Götaland Region in Western Sweden, 12.4% of all adolescents were overweight and 2.4 % were obese **(36)**.

Regarding pupils' ***socio-economic level***, more than half of the studied groups belonged to middle socio-economic level in the present study. The same results were found among adolescents in Tehran **(37)**. The findings of the present study indicated that less than three fourths of adolescents in the face to face group and the majority of adolescents in the computer group spent their pocket money in junk food. The same findings were found among adolescents in India and Bangladesh **(31, 38)**.

According to ***pupils' knowledge regarding nutrition***, the present study revealed that the pupils in both groups had similar poor score level of knowledge in knowledge test about nutrition prior teaching intervention. In addition, there was no statistically significant difference in the total knowledge score belonged to pretest between the face to face group and computer group. These findings were similar to the findings of a study conducted in Hyderabad, India revealed that at the baseline, the mean nutritional knowledge levels were not significantly different between traditional and computer groups (P> 0.05) indicating the homogeneity of the groups **(39)**. The findings of the present study illustrated that traditional face-to-face and computer-based intervention resulted in improvement of knowledge level for both groups in relation to the different components of nutrition. These findings were in agreement with other study conducted **(40)** on middle school students within a large metropolitan setting, who stated that students in the nutrition education intervention group demonstrated a significant knowledge improvement pre-to post and were also significantly higher than the control group. In addition, the present study showed that the computer-based intervention produced significant knowledge improvement with a mean score of (36.2±3.3) for computer group in post test compared with a mean of (35.1±5.5) for the traditional face to face group. This result clarified that, computer – based education is more effective than traditional face-to-face education. Maybe it simplifies the content of nutrition through graphics,

animations, high quality pictures and videos which help pupils to sustain their interests. In addition; pupils in computer-based learning are acquired knowledge by self learning which is active learning while traditional face-to-face method is passive learning.

This finding was consistent with different studies in 3 schools in Florida **(41, 42)**, who stated that the computer-based intervention was more effective at eliciting a prolonged increase in nutrition knowledge. For adolescents, a computer-based educational approach allows them to be actively involved in their own learning process by using interactive simulations and games which result in greater cognitive gains than traditional instruction being a passive audience. Moreover, the Italian adolescents' scores about nutrition significantly increased only after computer education **(14)**. Computer based education is a fun way to promote a healthy lifestyle among adolescents by teaching nutrition notions. On the other hand, the present study was inconsistent with a study conducted at Urbana-Champaign, Urbana, Illinois in United States, revealed that nutrition knowledge increased in both the computer-based and lecture-based groups with no significant difference between groups **(20)**.

Regarding pupils' dietary habits, dietary habits as an important part of a life-style represent important determinant during childhood and adolescence. Adequate qualitative and quantitative composition of diet is necessary for appropriate development and maturation **(16)**. The most important finding of the present study is that increased prep school pupils' nutrition knowledge with changed in their dietary habits. This study was in agreement with different studies, on middle school students in a metropolitan area, primary schools' children in Gatanga district, Muranga Country, Kenya and in three primary schools in the rural area in the north of the city of Rome (Italy) **(40, 43, and 44)**. However, the present study was inconsistent with the study conducted in suburban area in southern Ontario on high school **(45)**, showed no significant differences in healthy eating habits between those participants who have taken a course with nutrition education and those who had no exposure to nutrition education.

Studies conducted in 5 cities in the South of the Netherlands (Holland), at Urbana-Champaign, Urbana and Illinois reported that computer-based nutrition education programs have the potential to persuade adolescents to improve overall dietary habits and curb the expansion of overweight and obesity **(46, 20)**. All the computer-based interventions improved eating behaviors **(14)** on Italian students, **(47)** in USA, **(48)** on adolescents in south Florida and **(49)** among urban African-American adolescents.

The findings of the present study showed that there was statistically significant difference in the pre-test score on the score of dietary habits in the computer group than in the face to face group with a mean score of (108.7±18.7) for the computer group compared with a mean of (101.1±18.1) for the face to face group. However, after 2 months follow up post test scores in the face to face group were significantly higher than in the computer group with a mean score of (141.6±14.3) for the face to face group compared with a mean of (139.2±16.1) for the computer group.

This was inconsistent with a study conducted in Miami (Florida) **(41)**, suggested that compared to traditional didactic teaching, computer-based nutrition education has greater potential to elicit change in dietary behavior as well as promote maintenance of the behavior change over time. While the study conducted in South Florida **(48)** demonstrated that a computer-based nutrition intervention was equally as effective as a lecture-style intervention delivering the same information in terms of behavior change and maintenance.

The consumption of fruits and vegetables of pupils in post intervention groups increased compared to pre. Moreover, the consumption increased for post face to face group than computer group. These findings were similar to different studies which stated that students in the intervention group increased their reported consumption of fruits and vegetables in the post intervention period compared to pre among adults in the Paso Del Norte Region, Texas, United States **(50)** , and among primary schools children in Gatanga district, Muranga Country, Kenya **(43)** .While, in Spain **(51)** , the study reported an increase of fruits and vegetables consumption and found that this effect was attributable to computer-based interventions.

Concerning ***frequency of milk and milk products intake,*** the consumption of milk and milk products of pupils in post intervention groups increased compared to pre. Moreover, the consumption increased for post face to face group than computer group. This finding was inconsistent with the findings of the study conducted in Detroit, Michigan, reported that intake of milk and dairy group was similar between the pre-and post-intervention periods **(52)**. However, this finding was consistent with the study conducted in two charter schools located in Southwestern United States **(32)**, reported that dairy consumption improved significantly more in the treatment group compared to a drop in the control group.

In relation to ***frequency of legumes intake***, the consumption of legumes of pupils in post intervention groups increased compared to pre. Moreover, the consumption increased for post computer group than face to face group. Similar to a study conducted among primary schools' children in Gatanga district, Muranga Country, Kenya **(43)**, who reported that 14.9% ate legumes once / twice per week at pre-test, however, increased to one fifth at post test. On the other hand, this finding was contrary to a study conducted in Detroit, Michigan **(52)**, revealed that no differences were detected in the beans and legumes group.

Regarding ***frequency of fast food and soft drink intake***, the consumption of fast food and soft drink of pupils in post intervention groups decreased compared to pre. Moreover, the consumption decreased for post computer group than face to face group. These findings were consistent with the study conducted in three high schools in two cities in the northeast New Haven, United states **(53)**, which found that there was a decline in daily soft drink intake and daily junk food intake in both groups at post test. On the other hand, a study conducted in Miami, Florida **(41)**, reported that CBI group demonstrated a decrease in soft drink intake by the third month, whereas the didactic group did not demonstrate a change over the course of the study. These data indicated that the CBI was more effective at eliciting a behavior change that supports healthier dietary choices than the didactic version of the intervention.

According to Program Satisfaction, the results of the present study revealed high satisfaction of pupils. Regarding health educational sessions design, both groups indicated that the design was appropriate and well. In relation to usefulness of the health education sessions, both groups revealed that the teaching methods were useful and facilitate learning process. Besides, all the pupils in the intervention groups indicated that they enjoyed the content of each health education session. In addition, all the pupils in the computer group indicated that the health education sessions provided effective feedback on both right and wrong answers and they could select the lesson and, the majority of pupils in the computer group indicated that it was easy to use the computer.

These findings were consistent with a study conducted in Paso DelNorte region **(54)**, reported that majority of participants rate their satisfaction with the program in the „very good" to „excellent" range (5–7 on Likert scale). Learning by game was interesting and well designed, and they learned something useful. They found the information presented in the game to be credible, and personally relevant to them as found in Michigan State **(55)**.

VI. Conclusion And Recommendations

The study concluded that nutritional health education resulted in significant positive changes in both nutrition knowledge and behaviors in prep school pupils. Both of educational strategies led to positive changes in preparatory school pupils' healthy eating behaviors and nutritional knowledge. However, computer-based education has been shown to have a greater effect in increasing nutritional knowledge than motivating pupils to adopt healthy dietary habits compared to traditional based education. The findings support the importance of providing children with nutrition knowledge to promote healthy dietary behaviors as dietary behaviors established during adolescence may well extend into adulthood. It was recommended to there is an urgent need for national policy promoting healthy eating and reducing sedentary behaviors among children and adolescents. School should provide healthy school meals, or increased the availability of healthy food in school campus and combined this with a nutritional curriculum on food intake. Public health initiatives should educate children and adolescents regarding balanced food choices. These actions may be helpful in reducing risks for overweight and obesity.

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