

Development of Web- Based Nutritional Health Education Module

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Abstract : Young adulthood is a vulnerable period for weight gain and the health consequences of becoming obese. University years are a time of emerging identity and habit formation for young adults. During university years, individuals practice unhealthy eating patterns such as meal skipping, snacking, and fast food consumption. Eating pattern could be modified by providing valid nutritional information. The young adults used to obtain information from different internet websites.

Aim: The purpose of this study was to develop a web- based nutritional health education module.

Study design: A cross-sectional design was used to carry out this study at different faculties of Mansoura University. Total sample size of 650 university students involved in the study, in addition to a group of ten professional experts who were academic staff members and had experience in health education, online education and community health nursing. The Study was conducted throughout four stages, which were preliminary assessment stage, development stage of the web evidence- based nutritional health education module, dissemination stage, and evaluation of module's internal validation stage.

Results: The study showed that 94 % of students had poor knowledge level about healthy diet and its components and 78.5% of students showed unsatisfactory dietary pattern. The developed Web- based nutritional health education module composed of five lessons. Each lesson included a number of nutritional health education messages that were illustrated in texts companied with attractive media. University students and experts described the module, as a comprehensive and attractive health education module that uploaded on an accessible and easy navigated website.

Conclusion: The developed web-based nutritional health education module was accepted to both university students and experts. The entire content that presented by using of multimedia fulfilled the nutritional health education needs of university students.

Keywords: Nutritional health education, Dietary pattern, University students, Web- based module, Evidence-based practice

I. Introduction

Young adult period that starts from age 18 to 25 years old usually is the university-studying period. Individuals' independent choices about lifestyle and health practices are built during this period ⁽¹⁾. University life plays an important role in placing young adults as nutritionally vulnerable group, while adequate nutrition is essential issue for a well health ^(2, 3, and 4). However, during university years, individuals practice unhealthy eating patterns such as meal skipping, snacking, and fast food consumption ^(2, 3). Irregular meal patterns and consumption of high caloric snakes and fast food may contribute to overweight, obesity and other chronic diseases ⁽⁵⁾. This dietary pattern of young adulthood may have long-term health implications into adulthood period ⁽⁶⁾. Fortunately eating behavior is a modifiable health behavior ⁽²⁾. Knowledge, attitudes, beliefs, and food preferences are modifiable personal factors that influence eating behavior ⁽⁷⁾. Young adults may try to modify their eating behavior by obtaining nutritional information from numerous channels, but not all of these channels are valid sources ⁽⁸⁾. So that valid sources of health information should be provided for young adults via their preferred channels. The interacting via internet and web-based learning systems is an effective learning channel in the 21st century ^(9, 10). The internet provides low-cost access to health messages for a large sector of people that stimulate their perceptions of autonomy ⁽¹¹⁾. Web-based learning provides a multimedia environment and support interactive communication ⁽⁹⁾. Internet can provide many lifestyle interventions that concerning about diet, exercise, and smoking. Community health nurses as health educators provide health educational services to individual, families, and groups. They have effective role in the development of population based health education programs ⁽¹²⁾.

Using of evidence-based practice approach that has a great attention in public health would be constructive in building nutritional health education. Evidence- based public health include six key components. The first and second keys are making decisions based on the best available scientific evidence and using data and information systems systematically. Third and fourth keys are applying program-planning frameworks and

engaging the community in decision-making. The fifth key is conducting sound evaluation and finally disseminating what is learned⁽¹³⁾. Therefore, it was important to provide valid information about nutritional issues through information channel that is preferable to university student.

II. Aim of the Study

The study aimed to develop web- evidence based health education module for university student.

III. Subjects and Methods

3.1. Study design:

The study design was determined to be cross sectional design, which was selected for investigating the health education needs of university students. The study was conducted at 13 faculties at Mansoura University. The study subjects were university students and health education experts.

3.2. Subjects and sampling

Regarding to subjects and sampling, university students who involved in the study should be free from diseases/ health condition that require special dietary regimen or affect the body weight. Convenient sampling technique was used to select the students involved in both preliminary assessment stage and evaluation stage of the intended module. The minimum required students sample size for the preliminary assessment stage was 650 students after adding 10% for none responding, when the population size= 135458 students who were registered the different faculties of Mansoura University. The desired precision= 4%, Expected frequency of correct knowledge about healthy diet= 50%, and design effect=1 in confidence limit of 95%⁽¹⁴⁾. Proportion allocation technique was used to determine the sample size from each faculty.

Sixty-five students agreed to provide their feedback about the developed web site web. The professional experts group included ten academic staff members who had experience in health education, online education, and community health nursing. They were interviewed to obtain their opinions in relation to health education topic, web based teaching method, and required recommendations before designing the web based module. Their feedback was also obtained after the establishing the web-based module. This number of students and experts was enough to provide a feedback for content and face validity of the web- based nutritional health education module according to the Day J and Bobeva M (2005) who stated that useful results could be obtained from small size, homogeneous groups of 10-15 experts sampling⁽¹⁵⁾.

3.3. Process of module development:

The intended web- based nutritional health education module was developed based on evidence- based approach.

3.3.1. Preliminary assessment stage:

The preliminary assessment stage concerning about assessing students' nutritional needs. It included assessment of students' nutritional knowledge and their dietary practice. Students' nutritional health status was also assessed by determining their Body Mass index (BMI). During this stage, Researchers explored the students' preferences regarding the content of a nutritional health education module, preferred media, and web site based criteria. Moreover, it was important to figure out views of the professional experts regarding content, and suggested media of nutritional health education module.

Five tools were used in conducting the preliminary assessment. The first tool was "*Students' socio-demographic self-administered structured questionnaire*". Fahmi and El-Sherbeiny socioeconomic scale was adopted to assess students' socio-economic level. According to this scale the high social class scored from 24-29 scores, middle social class scored from 18- 23 scores, low social class scored from 12- 17 scores and very low social class scored from 0- 11 scores⁽¹⁶⁾. Students' demographic characteristics such as age, sex, academic year, faculty name, residency area were added as introductory part. The second tool was "*Students' nutritional health measurement*". Students' weight and height were measured to calculate their body mass index that was calculated by dividing body weight in kilograms by the square of height in meters (kg/m^2). The Centers for Disease Control and Prevention cut –off points of BMI was used⁽¹⁷⁾. The third tool was "*Students' nutritional knowledge self-administered structured questionnaire*". This questionnaire was used to assess students' knowledge about healthy diet and its components, as well as function of nutrient, nutritional related diseases and nutritional facts label. The total scores is 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 fourth tool was "*Students' dietary practices self-administered structured questionnaire*". This questionnaire was used to assess the student's dietary practices. The questionnaire was divided into four categories related to dietary pattern, food choices practices, foodstuff consumption practices, and food safety habits. Dietary practice was classified into satisfactory practice that equal 65% scores of the questionnaire total scores and unsatisfactory practice that equal less than 65% of the questionnaire total scores. The "total food frequency consumption method" was used as

stated by ^(18, 19). The fifth tool was "*Opinions of students and professional experts about criteria of health education structured self-administered questionnaire*". This questionnaire was used to explore the students and professional experts' opinions in relation to the construction of the web- evidence based nutritional health module. The questionnaire concerned with the content of nutritional health education module, educational methods, media, and the general features of the web site.

3.3.2. Development stage of the web- based nutritional health education module

3.3.2.1. Content development

According to the results of the preliminary assessment, which indicated unsatisfactory dietary pattern among students, as well as the findings of the valid evidences, this web- based nutritional health education module was developed. Evidence- based practice approach was used in developing the current module.

3.3.2.1.1. Developing Answerable Clinical Questions:

The answerable searching questions were developed according to Glazioet al. 2007 ⁽²⁰⁾ in a PICOT framework (Patient, Intervention, Comparison, Outcome and Time) (Box 1). A number of keywords was used to answer the searching questions (Box 2).

Box 1: Answerable searching questions

1. What is the effect of student's university knowledge on adherence to healthy nutritional practices?
2. What are the major nutritional concerns of the university students?
3. What are the food choices motives that promote healthy eating of university students?
4. What are the nutritional requirements of university students?
5. Among university students, Dose healthy diet combined with physical exercise compared healthy diet only maintains normal weight?
6. Dose health educations on food safety measures increase awareness of university students?
7. What is the main source of nutritional information that used by university students?
8. Is using web based teaching compared with traditional teaching effective in providing health education for university students?
9. What are the principles of effective web based teaching strategies?
10. What are the most appropriate design for web based nutritional health education module
11. What are the preferences of university students regarding multimedia that enhance learning?

Box 2: The keywords that used to answer answerable search questions

1. University student: college, youth, young adult, adult
2. Nutrition: healthy eating, diet, dietary habits, dietary practices, food determinant ,food choices motives
- 3 Diet control: weight control, weight gain, lose weight, obesity
4. Diet related disease: diabetes, hypertension, heart diseases, cancer, obesity, osteoporosis
5. Serving size: portion, amount, size, quantity
6. Food label: canned food, packaged food, nutritional fact
7. Food safety: food hygiene, healthy food, food storage, food preparation
8. Web: internet, computerized teaching, technology
9. Health education: awareness, teaching methods, materials, strategies, evaluation, media, multimedia

3.3.2.1.1. 2. Tracking down of evidences:

Tracking down of evidence included published literatures in English language from the year 2005 up to 2016. A total number of 350 studies were tracked down from the electronic databases (Box 3). Out of these studies, a total number of 205 studies were valid and used in the development of health education module. The valid studies included 50 systematic reviews and meta-analysis, 9 randomized control trial, 10 cohort studies, 4 case control studies, and 22 cross sectional studies in addition to 120 guidelines.

Box 3: The searched electronic bibliographic databases were:

1. Center for Disease Control (www.cdc.gov)
2. Center for evidence-based nursing (<http://www.york.ac.uk/healthscience/centres/evidence/cebn.htm>)
3. Cochrane Database of Systematic Review (<http://www.thecochranelibrary.com>)
4. EBSCO (www.Ebscohost.com)
5. ERIC (<http://eric.ed.gov>)
6. Google scholar (<https://scholar.google.com/eg/>)
7. National Guideline Clearing House (<http://www.guidelines.gov>)
8. Pub Med (<http://www.pubmed.gov/entrez/query.fcgi>)
9. Research Gate (<https://www.researchgate.net>)
10. Science Direct (<http://www.sciencedirect.com/>)
11. SIGN (<http://www.show.scot.nhs.uk/sign/guidelines/index.html>)
12. Springer (www.link.springer.com)
13. WileyOnlineLibrary (<http://onlinelibrary.wiley.com/advanced/search>)
14. World Health Organization (www.who.int)
15. Worldwide Science (<http://worldwidescience.org>)

3.3.2.1.1.3. Critical appraisal of evidence and grading recommendations

The retrieved studies were appraised throughout three main steps namely; study validity rating, determination level of evidence and finally the grade of recommendation.

3.3.2.1.1.4. Study Validity Rating: -

All primary studies and reviews addressing the relevant topic were appraised by using the "SIGN checklist" ⁽²¹⁾ that appropriate to the study design, and then were individually rated for internal validity using the following system (Box 4).

Box 4: Rating of the internal validity description system for the tracked evidences according to the Scottish Intercollegiate Guideline Network (SIGN) System

Rating	Description
++	All or most of the criteria have been fulfilled
+	Some of the criteria have been fulfilled
-	Few or no criteria fulfilled

3.3.2.1.1.5. Determination of evidence level:

Determination of evidence level was determined by the "Generic Appraisal Tool for Epidemiology" ⁽²²⁾. The study design of each tracked evidence was assigned by numerical prefix and rating level of evidence using the system below (Box 5):

Box 5: Numerical prefix assigned to different study designs rating level of evidence according to the Generic Appraisal Tool for Epidemiology" (GATE 2001)

Type of study design	Grading level of study numerical prefix	Rating level of evidence	Type of evidence
Systematic review or meta-analysis or randomized control trials (RCTs).	1	1++	High quality meta-analysis, systematic reviews of randomized control trails with a very low risk of bias.
		1+	Well conducted meta –analysis, systematic reviews or randomized control trails with a low risk of bias.
		1-	Meta-analysis, systematic reviews or randomized control trails with a high risk of bias.
Cohort and case-control studies	2	2++	High quality systemic reviews of case-control or cohort studies with a very low risk of bias and a high probability that the relationship is causal.
		2+	Well conducted case-control or cohort studies with a low risk of bias and a moderate probability that the relationship is causal.
		2-	Case-control or cohort studies with a high risk of bias and a significant risk that the relationship is not causal.
Case report series.	3	3	Non-analytic studies, e.g. case reports and case series.
Expert's opinion/logical argument/common sense	4	4	Expert opinion

3.3.2.1.1.6. Grading of Recommendations

The detailed results of each study were considered in the formulation of each health education module recommendations that were then graded using the system of the "Scottish Intercollegiate Guideline Network" (www.sign.ac.uk) ⁽²¹⁾, (Box 6)

Box 6: Grading system of recommendations used in developing the web- based nutritional health education module according to the Scottish Intercollegiate Guideline Network (SIGN) System

Grade	Recommendation
A	At least one meta–analysis, systematic review, or RCT rated as 1++. And directly applicable to the target population, or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results.
B	A body of evidence including studies rated as 2++, directly applicable to the target population and demonstrating overall consistency of result, or extrapolated evidence from studies rated as 1++ or 1+.
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of result, or extrapolated evidence from studies rated as 2++.
D	Evidence level 3 or 4, or extrapolated evidence from studies rated as 2+.

3.3.2.2. Formulation of web - based nutritional health education module

A framework was developed based on the evidence-based recommendations related to components of web- based nutritional health education module was drawn up.

3.3.2.3. Website development

The web site was developed by using set of technical and instructional standards which developed by web designer team. The researchers with the web designer selected a learning platform. A learning platform is a set of interactive online services that provide learners with access to information, tools, and resources to support educational delivery and management through the Internet.

3.3.3 Dissemination stage

The content of the designed module were uploaded to the web site. The web site marketing was done through posting a face- book posts during the period from 21 to 30 June 2016.

3.3.4. Evaluation of module's internal validation stage:

Web- based health education module was evaluated for its internal validation by obtaining the experts and students feedback. The link of the site (www.Thehealthgardens.com) was distributed to 10 experts and 65 university students to test the content and face validity of the module. Any specific instructions and comments from experts' evaluation were documented and considered in the module formulation. A checklist of "*Expert and students feedback checklist*" was developed by the researchers to test the internal validity of the health education module. This checklist explored experts and students' feedback about the developed web based nutrition module. The feedback checklist concerned with the content, design, educational strategies, accessibility of the web site, language used, and quality of media.

3.5. Official, ethical, and other technical issues:

3.5.1. Approval and permissions

The approval of community health nursing department was obtained. An official letter from undergraduate affairs Faculty of Nursing was submitted to all faculties affiliated to Mansoura University to obtain their approval to conduct the study.

3.5.2. Informed consent:

Approval of the research ethics committee of the Faculty of Nursing, Mansoura University was obtained. A written informed consent was obtained from the students to participate in the study after explanation of the study purpose.

3.5.3. Validity testing of the developed tools:

The content and face validity of all study tools that were developed by the research was tested. A jury group of five experts of community health nursing tested the content validity of the developed tools. In addition to a pilot study that was conducted on 10% of study subjects (65 students). Those students were selected randomly from different faculties and they were not included in the study. The pilot study aimed at evaluation of the clarity and applicability of the research tools. As well as the pilot study used to estimate the approximate time required for data collection, and to identify the possible obstacles that may hinder data collection. Based on the collected information, the necessary modifications were done.

3.6. Data Analysis

Data were analyzed by using SPSS (Stand for Statistical Productive and Service Solution) version 20.0. Descriptive statistics in the form of frequencies for nominal and categorical variables and arithmetic mean ± standard deviation for continuous variables.

IV. Results

4.1. Preliminary assessment

Table (1) shows that 57.8% of students were female and 73.2% of them were aged less than 20 years. Regarding residence area, 55.8% of students lived in rural area and 88.2% of them lived at their family home. Table reveals that 48.9% of students belonged to middle social class, and 34.3% belonged to high social class. While only 13.2% and 3.5% of the students belonged to low and very low social class respectively.

Table (1): Distribution of students according to their socio demographic characteristics

Items	Frequency N= 650	Percent %
Gender		
Male	274	42.2
Female	376	57.8
Age		
≥ 20 Years	476	73.2
≤ 20 years	174	26.8
$\bar{X} \pm SD$	20.1± 1.2	
Current residence area		
Family home	573	88.2
House of emigrants	21	3.2
College town	56	8.6
Permanent residence area		
Urban	287	44.2
Rural	363	55.8
Social class		
High social class	223	34.3
Middle social class	318	48.9
Low social class	86	13.2
Very low social class	23	3.5
$\bar{X} \pm SD$	18.95 ± 0.77	

Table (2) reveals that 94 % of students had poor knowledge level about healthy diet and its components with overall mean knowledge score of 7.17 ± 3.74 . More than half of them (58%) and 70.8% of them showed poor knowledge level related to their functions of nutrients and nutrition related diseases, respectively.

Table (2): Distribution of students according to their level of knowledge regarding to healthy diet and its component

Items	$\bar{X} \pm SD$	Score level N=650					
		Poor < 50%		Fair 50- <65%		Good $\geq 65\%$	
		N	%	N	%	N	%
Healthy diet and its components (Score= 28)	7.17 ± 3.74	611	94	30	4.7	9	1.4
Functions of nutrients (Score= 10)	3.85 ± 2.12	377	58	164	25.2	109	16.8
Nutrition related diseases (Score= 11)	4.08 ± 2.41	460	70.8	133	20.5	57	8.8
Nutrition facts label (Score = 1)	0.02 ± 0.14	637	98	0.0	0.0	13	2
Overall knowledge scores (Score= 50)	16.77 ± 7.56	546	84	80	12.3	24	3.7

Table (3) illustrates that the university students consumed mean serving of foodstuff less than the ideal serving by at least -30% for fruits up to -81% for beans and legume. They consume other foodstuff and beverage much higher than the recommended ideal serving such as sweets, soft drinks as well as tea and coffee.

Table (3): Distribution of study group according to their daily consumption of food and beverages

Ideal serving*/week of foodstuff and beverages	Consumed serving of foodstuff and beverages / week $\bar{X} \pm SD$	% of difference between consumed and ideal serving of foodstuff and beverages
Fruits (14-28)	9.8 ± 6.7	-30%
Vegetables (21-35)	6.8 ± 5.7	-67.6%
Bread and cereals (42-56)	12.3 ± 7.3	-70.7%
Milk and milk products (14-21)	6.2 ± 6.3	-55.7%
Sweets (0)	6.5 ± 6.8	650%
Tea and coffee (2)	6.9 ± 8.5	245%
Fresh juices (3-5)	6.6 ± 6.4	120%
Soft drinks (0)	6.8 ± 7.1	680%
Meat and Poultry (2-3)	2.3 ± 7.7	15%
Fish (2-3)	1.4 ± 7.7	-30%
Beans and Legume (6-8)	1.1 ± 6.2	-81.6%

***Serving**: is a standard measured amount that used to help give advice about how much to eat or to identify how many calories and nutrients are in a food ⁽²³⁾

% of difference calculated from the minimum ideal serving/ week

Table (4) displays that 78.5% of students showed unsatisfactory dietary pattern. The most of them (99.2%) exhibited unsatisfactory eating and food choice habits. On other hand, 83.7% of students exhibited satisfactory food safety practices. Generally, 98.6% of them showed unsatisfactory dietary practices.

Table (4): Distribution of student's according to their satisfactory level of dietary practices

Items	$\bar{X} \pm SD$	Score level N=650			
		Unsatisfactory < 65%		Satisfactory $\geq 65\%$	
		N	%	N	%
Dietary pattern (Scores= 57)	31.59 ± 4.6	510	78.5	140	21.5
Eating and food choice habits (Scores= 158)	73.23 ± 11.8	645	99.2	5	.8
Food safety practice (Scores= 18)	14.80 ± 3	106	16.3	544	83.7
Total practice score (Scores= 233)	131.46 ± 14.4	641	98.6	9	1.4

Table (5) reveals that 34.3% of the students were overweight and only 7.4% of them were obese. Results show insignificant difference between body mass index categories and gender, although the overweight and obesity were higher among females than males.

Table (5): Distribution of students according to their gender in relation to body mass index

BMI categories	Total number N= 650		Gender				χ^2	P
			Male N= 274		Female N= 376			
			N	%	N	%		
Under weight	17	2.6	4	1.5	13	3.5	7.16	0.12
Normal weight	362	55.7	167	60.9	195	51.8		
Over weight	223	34.3	83	30.3	140	37.3		
Mild obesity (obesity grade I)	37	5.7	16	5.8	21	5.6		
Moderate obesity (obese grade II)	11	1.7	4	1.5	7	1.8		
Body mass index ($\bar{X} \pm SD$)	24.57 ± 3.99							

Box (7) reveals that all students recommended content topics of the module. The content was approved to include general information concerning healthy diet, weight maintenance, and information related to nutrition related disease. All of them mentioned that, the module should contain topics of preventive nutrition and food safety issues. Regarding preferred media, all students mentioned using of audiovisual such as video that grasp attention and confirm the health education messages combined with text. All experts recommended the same media types plus using of graphics and animation. In relation to website design criteria, all students preferred that website should be easy to open at any time, easy to navigate, contain concise and update information, and the learning material can be download. Experts add that web site would include feedback and evaluation tools.

Box (7): Criteria of nutritional health education web based module as mentioned by university students and experts

Criteria of nutritional health education web based module	University students' preference	Experts' opinions
Module contents	Healthy diet Weight maintenance Related to nutritional related diseases	Basic concept of nutrition Components of healthy diets Nutritional label and purchasing healthy packaged food Weight maintenance Food safety Diet related diseases
Media	Audio visual Picture and text	Audiovisual Picture and graphic with animation
Website design criteria	Easy to navigate Easy to open at any time Contain concise information Contain tutorial icon Content can be downloaded	Easy to navigate Open at any time and any were Contain comments and feedback icons Contain evaluating test

4.2. Description of the developed web - based nutrition health education module

Box (8) presents the evidence- based linked components of the nutritional health education module. The module composed of two main items; content and instructional strategies that were stated based on evidence-based approach.

4.2.2. Module Content:

Component of healthy diet should include macronutrients and micronutrient. This recommendation was based on twenty cross sectional studies(graded level 2++), and five systematic review of strong design (graded level 1++),five expert opinion (graded level 4) and 17 guideline (graded level 4), (*Component number 1.1 Box 8*).The component of healthy diet would follow the eating plate model. This model determined a specified amount of all nutrients should be included in each eating plate. This conclusion based on of two expert opinions (graded level 4) and five guidelines (graded level 4), (*Component number 1.2 Box 8*).

The daily-required amount of foodstuff and beverage serving should focus in health education. According to four expert opinions (graded level 4) and twenty guidelines (graded level 4), the amount of serving is expressed as the size and number of each nutrient that foodstuff included (*Component number 1.3 Box 8*).

Combination of physical activity with dietary regimen is essential element for maintaining healthy weight was highly recommended in two systematic reviews (graded level 1+), two systematic reviews (graded level 2++), and ten guidelines (graded level 4). In addition, the amount of daily physical activities should be mentioned in nutritional health education module (*Component number 1.4 and 1.5 Box 8*).

Based on three expert opinion (graded level 4), two randomized control trails (RCTs) (graded level 1+), and five guidelines (graded level 4), it was recommended that health education should provide information about the characteristics of packaged food and the importance of reading food label. These are crucial issues in selecting healthy food (*Component number 1.6 and 1.7 Box 8*).

Safety food and healthy way of cooking are important issues that reduce food borne diseases based on two systematic review (graded level 2++), three expert opinions and two guidelines (graded level 4). Therefore, these issues should be included in health education according to two expert opinion (graded level 4) and five guidelines (graded level 4), (*Component number 1.8 Box 8*).

4.2.3. Instructional strategies:

Based on evidence there are instructional strategies, which should be followed in establishing web- based health education module. It is essential to consider the criteria of effective web based design. These criteria include easy navigation, simple structure with help icons, and possibility to assimilate different types of multimedia. These criteria were recommended on the basis of one systematic review (graded level 1+), one systematic review (graded level 2++), three experts opinion (graded level 4) and three guidelines (graded level 4), (*Component number 2.1 Box 8*).Scientific content of the module should be delivered in simplified focused health education messages. This strategy was Based on one guideline (graded level 4), and one expert opinion (graded level 4) (*Component number 2.2 Box 8*).

To achieve the goal of effective web- based health education, it is important to use effective teaching and learning methods. It was concluded that using appropriate health educational strategy and different multimedia would attract the learners' attention. Accordingly, promotion in their learning process would be achieved. This instructions were synthesized on the basis of five systematic reviews (graded level 1++), three systematic reviews (graded level 1+), one systematic reviews (graded level 2++), twenty cross sectional studies (graded level 2++), and four RCTs (graded level 1), (*Component number 2.3 Box 8*).

Other important issue is the evaluation of the achieved learning outcomes; the web- based health education module should include appropriate evaluation strategy for measuring the achieved learning outcomes through posttest and feedback. This was recommended according to one systematic review (graded level 1+), two RCTs (graded level 1+), four experts opinions (graded level 4), three guidelines (graded level 4), (*Component number 2.4 Box 8*).

Box 8: Evidence- linked components of web based nutritional health education module

Ser.	Components	Grade
1.	Module Content	
1.1	Component of healthy diet include macronutrients and micronutrient	A, D
1.2	Healthy eating plate	D
1.3	Serving from different nutrient	D
1.4	Maintenance of healthy weight	A, B, C, D
1.5	Physical activity	A, D
1.6	Healthy packaged food	B, D
1.7	Food Label	B, D
1.8	Food safety and healthy cooking technique	A, D
2	Instructional strategies	
2.1	Apply the criteria of effective web based design	B, C, D
2.2	Simplify the scientific content that are focused on the criteria of effective health education messages	D
2.3	Use teaching and learning methods that stimulate and encourage e-learning process recall, understanding, and retention of the relevant information should be utilized	A, B, C, D
2.4	Use the most appropriate evaluation strategy for measuring the achieved learning outcomes	A, D

Box (9) displays the components of web evidence –based nutritional health education module. It was written in Arabic language and English. It was started with a brief introduction about the burdens of unhealthy diet and benefits of providing this information. The general goal of the module aimed at promoting the individuals' health and wellbeing of young adult. The content was arranged at five lessons, which included 21 health messages. Audiovisual media in forms of pictures, graphic, and video were used to support these messages. The web- based nutritional health education module was uploaded on web site "www.Thehealthgardens.com".

Box (9): Description of web evidence based nutritional health educational module

Components	Description
Language	Arabic version and English
Introduction	Highlight on: - Burden of unhealthy diet - Benefits of increasing nutritional awareness
Intended users	Healthy young adults
Scope	Preventive nutrition
Goal	To promote the individuals' health and wellbeing
Specific objectives	- To enable university students to select healthy food - To enable university students to calculate their daily calories intake
Content	
Lesson one: component of healthy diet and its importance	Message 1: Definitions of healthy diet Message 2: Component of the healthy diet Message 3: Importance of nutrients Message 4: Sources of the nutrients Message 5: Daily required amount of nutrients
Lesson two: Healthy eating plate	Message 1: Healthy eating plate Message 2: Vegetables Message 3: Fruits Message 4: Whole grains Message 5: Proteins Message 6: Types of fat Message 7: Waters
Lesson three: Packaged food and food label	Message 1: Characteristics of healthy packaged food Message 2: Food label
Lesson four: weight maintenance	Message 1: Body mass index Message 2: Keep the healthy weight Message 3: Physical activity
Lesson five:	Message 1: Consideration when buying, handling, and storing packaged foods

Food safety	Message 2: Healthy cooking techniques Message 3: Best Choices for cooking oils Message 4: General food safety practices
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4.3. Testing internal validity of the developed web based module

The content validity of the developed web based module was evaluated by experts and target population themselves (university students). Diagram (1) reveals that all experts found the topic of educational web based module is important and significant for the target group. All experts mentioned that the objectives were clear and written according to Bloom's taxonomy. They approved that the content is adequate and updated to achieve the intended objectives and appropriate to the level of understanding. Production of the module in Arabic and English languages would facilitate approaching the target group. They described the illustrations manner to be simple, related to content, and integrated with text. All experts found the used media was clear, attractive, appropriate to the content, and clarify the health messages. Regarding the general design of the web site, all experts mentioned that the web site design followed the principles of web design and facilitated navigation. All experts mentioned that the format of web pages was appropriate in size, style of letters as well as the spacing and length of lines. Using of bold characters and bullet points draw attention to the key content.

Diagram (1): Distribution of experts' evaluation regarding to web evidence based nutritional education design

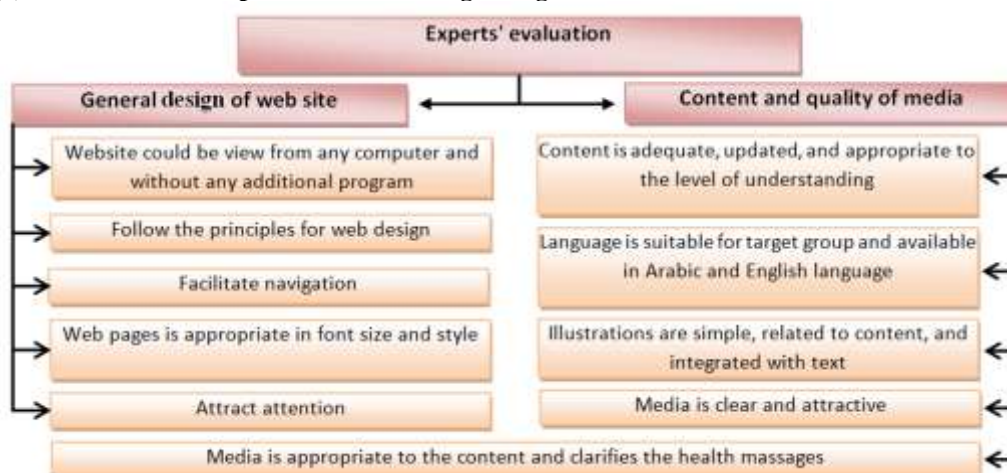
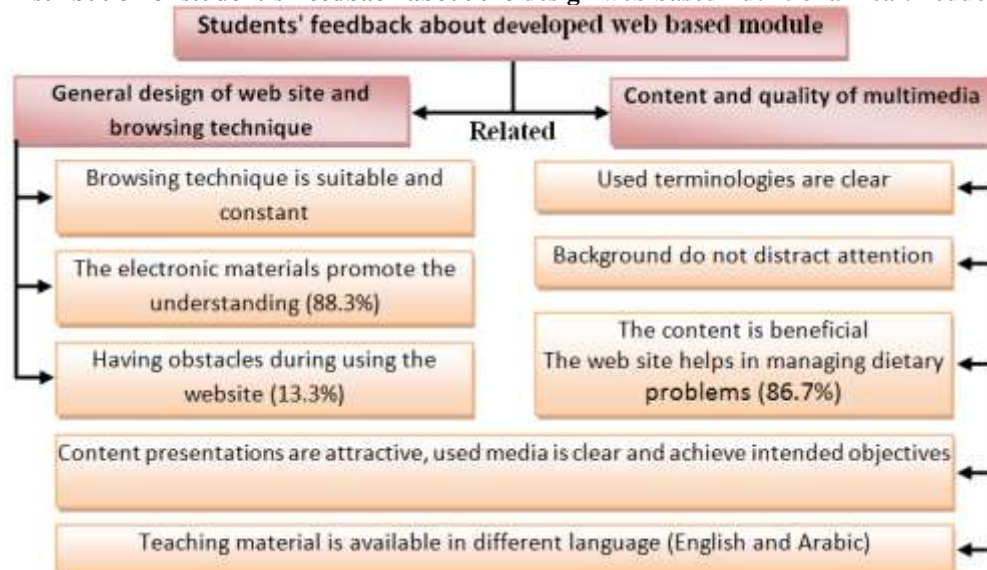


Diagram (2) shows that all students found the general design of the web site, was beneficial, and covered the intended objectives. The majority of students (88.3% and 86.7%) found the electronic materials would promote learning and would help in solving their dietary problems, respectively. On other hand, only 13.3% of them had obstacles during using the web site. Regarding the browsing technique, all students mentioned that the browsing technique is suitable and constant. They found the presentation of content was attractive, and the used terminologies were clear. All of them mentioned that the used media achieve the intended objectives, video was clear; and background did not distract attention.

Diagram (2): Distribution of student's feedback about the design web based nutritional health educational module



V. Discussion

Healthy nutrition is a fundamental key to a better quality of life. The years spent at the university represent a critical period of individuals' health. Individuals may practice unhealthy changes in eating behavior during university time. These changes negatively influence their quality of lifestyle including eating habits^(24, 25). Therefore, this study aimed at developing a web- based nutritional health education module that might improve healthy eating behaviors among university students. Prior to the development of this module, nutritional knowledge and dietary pattern indices of university students were explored.

Nutritional knowledge is important issue because it influences healthy food choices and dietary pattern. However, socio- economic, cultural, and food availability are factors that limit translating knowledge into practice. University students may choose cheap and convenient foods that are easily available regardless of their nutritional values⁽²⁶⁾. The present study showed poor knowledge level among most of studied university student in relation to the healthy diet and its components. They showed poor knowledge level regarding to the importance of nutritional label as well as nutrition related diseases. These findings were in agreement with several studies, which indicated a lack of knowledge in all nutritional aspects^(26, 27). The reported poor knowledge level of the current studied university students was reflected on their food choices and dietary pattern. Dietary pattern is viewed as food habits that include the types of food eaten as well as number and time of meals intake. Dietary patterns reflect the types of foods and their nutrient content taken by individuals or groups of people⁽²⁸⁾. According to the WHO, the recommended intake of fruits and vegetables is 400 gram per day that equal 5 serving/ day⁽²⁹⁾. The present study was in agreement with Al-Rethaiaa et al, (2010)⁽³⁰⁾, who reported that university students used to consume low daily intake of fruits and vegetables. Regarding to milk and milk products the "American Dietary Guidelines, 2015"⁽³¹⁾ reported that the consumption of that stuff must be two to three serving per day. The present study found that university students reported low consumption of milk and milk products. This finding was in agreement with Poddar et al, (2009)⁽³²⁾ study, who found that the total amount of dairy consumed by students was approximately 1.5 servings per day. The present study revealed low fish intake as same as the findings of Milosavljević et al, 2015⁽³³⁾ who reported low intake of fish among university students.

However, the poor dietary pattern was also reflected by the reported high intake of tea, coffee, and beverage among university students of this study. These findings were consistent with Milosavljević et al, 2015⁽³³⁾ who found that university students used to consume high amount of soft drinks. In general, the current study showed unsatisfactory dietary pattern among more than three quadrants of university students and unsatisfactory food choice habits among the majority of them. These finding could be interpreted on the highlights of the findings of many authors, who reported that choice of food is related to the individual's level of nutritional knowledge and their awareness about nutrition related diseases^(26, 27, 34, and 35).

Lack of nutritional knowledge and poor dietary pattern were reflected on the health status of the studied university students. Overweight and obesity were observed among 34.3% and 7.4% of the studied university students respectively. These findings were similar to a study that was conducted in Lebanon by Yahia et al, 2008⁽³⁶⁾. Overweight and obesity were higher in female than male, this finding consistent with other study of⁽³⁷⁾. The observed total BMI mean in the current study was consistent with study conducted in Saudi Arabia⁽³⁰⁾ in which the mean of BMI was laid within the overweight category.

Unhealthy lifestyle behaviors such as dietary habits are modifiable and usually established during youth or young adulthood⁽³⁸⁾. These dietary habits need to be promoted by providing health education information⁽³⁹⁾. According to the results of the current study and reviewed literatures university students are active group in finding the necessary nutritional information by searching the internet^(40, 41, and 42). However not all social media and internet sources could be considered valid sources of nutritional information. So that the current web- based nutritional health education module was developed. For this aim, it was important to explore the opinions of health education experts and the end beneficiaries (university students) in relation to the best design of the module.

The current study revealed that both university students and health education experts emphasized on using of multimedia in web-based module would facilitate learning. They also agreed on the importance of simplicity of the web-based module in relation to navigation, content, and instruction icons. These findings were consistent with Kartam and AL-Reshaid⁽⁴³⁾ who mentioned that any website should include multimedia and necessary education materials to promote the learning process.

Based on the conducted preliminary assessment and the valid available literatures the current web-based nutritional health education module was designed. The elements of the web- based module were identified and the overall course goal translated into more specific learning objectives for each unit. According to the revised Bloom's taxonomy, the learning objectives were developed to include the appropriate cognitive domains^(44, 45). Since students vary in their learning styles, different instructional methods were used throughout the module. The taken approach in designing the present module go along with several studies which indicated that using of different illustrations forms is more effective in achieving the learning goals^(43, 46 and 47).

Kartam and AL-Reshaid⁽⁴³⁾ and Singh⁽⁴⁷⁾ stated that the end product of a web course should be tested for technical functionality on the website and simplicity of use to students. Whenever the system failed to carry out any of its functions, it was taken back to the design stage for further technical reviews and modifications. This is consistent with the present study in which the content validity of the current web site was tested by experts and students. Likewise, other developed web- based modules the current one was revised for the used media, navigation, accessibility, and learning strategies. Experts and students found the developed web- based nutritional health education module was accessible, illustrated information clearly with attractive multimedia. These findings were similar to the results of several researchers whose modules were described to have effective text combined with graphs and multimedia-based educational content^(43, 46 and 47). Finally nutrition health education that targeted university students, focused on improving dietary patterns by increasing knowledge on food value to promote the nutritional status of students.

VI. Conclusion and Recommendations

The study concluded that university students required valid information about healthy nutrition that increase their nutritional awareness and consequently promote their health status. They preferred to receive this information via internet in attractive presentation. The developed web based nutritional health education module focused on measures that encourage students to form a good quality dietary practice. University students and health education experts accepted the current module. They were satisfied with the module content and the illustration methods. It was recommended to disseminate the current web- based nutritional health education module to university students. Further study to be conducted to evaluate the impact of disseminating this module on dietary practice of university students.

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