RESEARCH PAPER

Effect Of Web-Based Health Education About Dietary Habits Among School Children

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Abstract:

Background: Sufficient nutrition is essential for well-being, health, and development among school-aged children. Malnutrition, involving underweight and obesity. Malnutrition exhibits a worldwide public health problem. It emphasizes the vital need for successful nutritional education. Web-based modules are a favorable approach to providing nutritional education. **Aim:** This study aimed to evaluate the effect of implementing a web-based module on knowledge and practice regarding nutrition among school children. **Method:** A quasi-experimental study was conducted on 41 schoolchildren by using the convenience sampling technique. A purposive sampling technique was used to recruit 15 experts. Four online questionnaires were used for data collected to assess demographic data, knowledge, and dietary habits. A Delphi survey checklist was used to develop consensus for web-based education sessions. The intervention's effect was evaluated at pre-test, post-test, and three-month follow-up. **Results:** The results displayed a statistically significant increase in nutrition knowledge and practice scores across the three times of data collection ($P \leq 0.05$). Students' knowledge level was poor among 95.1% in the pretest, converted to good level among 95.1% in the post-test, and continued good at follow-up among 73.2% of students. Proper total dietary practice improved from 0% pre-test to 100% at follow-up. Both experts and students provided strongly positive feedback on the module's quality, design, and usability. **Conclusion:** The web-based module is a reliable and highly accepted educational tool that successfully improved and sustained nutrition-related knowledge and dietary practices among school children. **Recommendations:** Key recommendations include immediately integrating nutritional health education into the curriculum and conducting a long-term study to measure the sustainability of improved dietary habits

Key Words: Dietary practice, E-learning, Health education, Knowledge, Nutrition, School children, Web-based module.

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1. Introduction

Nutrition is described as the process of how food and nutrients influence the growth and development of the human body. In addition, it is the intaking enough nutrients, which are necessary for gaining energy and growing body tissues. The basic nutrients involve carbohydrates, protein, fats, and micronutrients like minerals and vitamins (WHO, 2024).

The school-age period, or childhood age, has three phases. It starts with middle childhood, which ranges from 5 to 9 years old; adolescence, which ranges from 10 to 14 years old; and late childhood, which ranges from 15 to 20 years old. Each phase of the three phases is characterized by special developmental stages, which are physical growth, cognitive development, and psychosocial development. Although these phases are interconnected, the growth rate in each category can vary individually from other categories Accordingly, the school-age period is characterized by different changes in behaviors that vary from one phase to another (Abrams, 2021; Karaağaoğlu & Şanlıer, 2020; Saavedra& Prentice, 2023).

Healthy nutrition is very essential for each phase of the school-age period to ensure their growth and development and to maintain a healthy life (Saavedra & Prentice, 2023). Several factors affect the

nutritional needs for school-age children, such as gender, weight, height, activities, metabolic rate, and health condition. The children build their nutritional habits at early ages and are strongly affected by many factors, some of which are related to the children themselves, such as food choices, and other factors related to the family, such as dietary habits, educational level, and socioeconomic status (Albardan, & Platat,2025). Inadequate nutrition or improper nutritional habits would probably result in obesity, vitamin deficiencies, and dental problems. In addition to undernutrition, such as stunting, wasting, underweight, and micronutrient deficiencies (Çelikel Taşci et al., 2024; WHO, 2024).

School-aged children, both undernutrition and overweight/obesity present critical global public health challenges. Undernutrition is associated with poor cognitive development and a poor decrease in scholastic achievement. While childhood obesity is associated with a greater likelihood of adult obesity, which increases the risk of cardiovascular diseases and diabetes (WHO, 2024).

Effective nutrition education plays a vital role in preventing malnutrition by improving children's knowledge, attitudes, and behaviors regarding healthy food. Providing nutrition for school children would be achieved through incorporating it into the school curriculum and other channels of informal health education (CDC, 2024). Efficient nutrition education focuses on promoting a cultural aspect of food choice to be healthy (Mohammadi & Koo, 2025).

Digital transformation has made digital nutrition education an effective and promising method for school children and adolescents (Fahrizki & Dwiriani, 2025). Web-based platforms, mobile apps, games, and short videos are attractive to this age group. Digital apps are increasing children's engagement and accelerating access to information. These digital channels can prominently increase nutrition knowledge and inspire healthy dietary habits (Bucher Della Torre, Lages, Dias, Guarino & Braga-Pontes, 2023).

Web-based educational modules afford notable improvements compared to conventional in-person methods. Primarily for the reason of their ease of access and availability at any time. Web-based education removes geographical boundaries, permitting the reliable transfer of high-quality content to huge and varied populations (Mahdavi Ardestani, Adibi, Golshan, & Sadeghian, 2024). Moreover, the digital format permits fast content updates and improved engagement through interactive structures (Bucher Della Torre, Lages, Dias, Guarino & Braga-Pontes, 2023). Therefore, the study aimed to evaluate the effect of employing a web-based module on nutritional knowledge and dietary practice among schoolchildren.

1.1. Aim of the study:

The study aim was to investigate the effect of the implementation of a web-based module on nutrition knowledge and dietary practice among schoolchildren.

1.2. Research Hypothesis

H1: Nutritional knowledge among schoolchildren after the implementation of the web-based module will be improved.

H2: Dietary practice among schoolchildren after the implementation of the web-based module will be improved.

2. Method

2.1. Study Design

A quasi-experimental study design was utilized to accomplish this study.

2.2. Setting

The study was carried out on the World Wide Web (WWW) for globalization.

2.3. Participants

1. School age children were selected according to the following criteria:

- Both genders (male and female)
- Children aged ≤ 18, able to read and write, and they can navigate the Web. They are also able to buy food and snacks by themselves. 2. experts in nutrition, health education, and Web development.

2.4. Sampling techniques Sampling Size:

1. **School children:**

Convenience sampling techniques were used to recruit schoolchildren. By using the G*Power calculation, the sample size was 41 children. The sample size is calculated by considering 5% significance level with a power of 95%, and a high effect size (0.7) of web-based health

education in improving knowledge regarding healthy dietary habits, according to Adeoya, Akinwusi& Nagatomi , (2023).

2. **Experts:**

A purposive sampling technique was used for recruiting experts. The expert panel involved 15 experts in nutrition, health education, and Web development.

2.5. Tools of Data Collection

Data were collected by using four structured online self-administered questionnaires that were developed by the researchers based on relevant literature.

Tool I: Demographic data assessment structured online self-administered questionnaire.

A structured online self-administered questionnaire was developed by the researchers to assess demographic characteristics such as age, gender, residency area, and education.

Tool II: Structured online self-administered knowledge assessment questionnaire about a healthy diet*:*

A The researchers were awarded one mark for each correct answer, and zero for incorrect or did not know. The total knowledge score was 18 marks. Knowledge level was categorized into three levels as follows:

The total score of knowledge was categorized into three categories:

- Poor = scores less than 50% of total scores (<9 marks)
- Fair = scores 50% to less than 65% of total scores (9-11.6 Marks)
- *Good = scores of 65% or more of total scores* (>11.6 Marks*)*

Tool III: A Structured Self-Administered Questionnaire to Assess Children's Dietary Practices.

This questionnaire was used to evaluate the participants' nutritional practices by using a 5-point Likert scale, such as dietary habits, school snacks, home snacks, drinks, meal content, dietary intake, and food choices.

Scoring System:

Students' responses to the 5-point Likert scale from 1 to 5, by assigning the highest value for healthy dietary practice (5 = 'Always,'4 = 'Most Frequent,' Sometimes' =3, 'Rarely' = 2, and 'Never' = 1). For items that were phrased negatively, the scoring was reverse-coded. The total dietary practices score was 178 marks.

The total score of practice was categorized into two categories:

- Improper = scores less than 50% of the total scores (<89 Marks)
- Proper = scores of 50% or more of the total scores (≥ 89 Marks)

Tool IV: Delphi survey checklist:

Part 1 for expert: Researcher used a structured checklist that was constructed on a rubric system to obtain opinions and feedback of an expert group about the structure and content of the intended health education web-based sessions. The Delphi technique has been useful in developing an educational module **(Kitt-Lewis et al., 2019).**

Part 2 for expert: Researcher used a structured checklist that was constructed on a rubric system to obtain opinions and feedback of students about the structure and content of the intended health education web-based sessions**.**

2.6. Procedure:

1. **Administrative process:**

The researcher obtained permission from the Committee of the Community Health Nursing Department, Faculty of Nursing, Mansoura University, to permit the researcher to carry out the study.

2. **Ethical considerations:**

- Approval was obtained from the Faculty of Nursing, Mansoura University Research Ethics Committee.
- Oral consent was obtained from the parents as an agreement on the participation of their children in the study. The researchers explained the purpose of the study and assured them that their children have the right to withdraw from the study at any time. The collected data were treated confidentially, as they would be used only for the research purpose of the study.

3. **Development of the Study Tools.**

All tools were developed by the researchers, after reviewing the relevant literature.

Testing the validity of study tools:

A jury that involved five experts in the field of nutrition and health education assessed the content validity of the designed questionnaires.

A pilot study was conducted on 4 students (10%) of the total study sample to assess the feasibility of the study, clarity, and objectivity of the developed tools, as well as to examine issues related to the design, sample, data collection, procedure, and data analysis approaches. Then the tool was modified according to the result of the pilot study and was excluded from the actual study according to the modification required. The reliability of the developed tools was tested using Cronbach's coefficient alpha to evaluate internal consistency. The results demonstrated acceptable reliability levels, with a Cronbach's alpha of 0.81 for knowledge and tool and 78 for dietary practices tool.

4. **Designing and implementing the web-based dietary health education sessions:**

- The researcher designed a web-based module about dietary habits among school-age children. This module targeted the school-age children and aimed to provide them with knowledge and motivation to make healthy habits and better food choices to enhance maximum health and well-being.
- The web-based module is composed of four sessions. The first session is about the definition and importance of a healthy dietary pattern and the classification of nutrients. The second session included health problems associated with eating unhealthy diet. The third sessions included the elements of the health plate and caloric requirements according to the food pyramid for healthy eating. The fourth session tackled the avoidance of unhealthy food and beverages and health massages.
- The web-based design team developed the website-based module throughout a set of technical and instructional standards as follows:
  - The research team chose an educational platform that gives the learners full access to information, tools, and resources for the designed module.
  - Then, the researcher uploaded the content of the educational module on the website (https://share.google/eVJXlLcQzIG3zP9HI) in the form of educational videos that explain each https:
  - Then the researcher sent the link of the web-based educational module to the participants by mail and other social media applications such as WhatsApp and Facebook.

5. Evaluation of the effect of web-based health education:

Knowledge and dietary health habits were assessed using tools II and III, with the first assessment conducted a week after health education sessions and the second after 3 months.

6. Data Analysis

The collected data were tabulated and statistically analyzed using an IBM computer and the Statistical Package for Social Science (SPSS) advanced statistics, version 26 (SPSS Inc., Chicago, IL). Qualitative data were presented as numbers and percentages, while quantitative data were described as mean/SD as appropriate. Repeated Measures ANOVA was used to compare between mean at different periods. Furthermore, intra-class correlation (ICC) was used to establish inter-rater reliability between the experts and the student beneficiaries regarding the feedback dimensions.

Results

Table 1 demonstrates that 53.7% of the participants were female. Regarding education, ,61% of students were in secondary school and 46.3% were in the first academic year. As regards living area, 58.5% of them lived in rural areas. Regarding weight and height,53.7% of them weighed from 45 to less than 60kg without shoes, with a mean weight of 53.88(12.158), and 36.6% had a height from 150 to <160 cm with a mean height 159.37 (10.767). Additionally, 19.5 % of them were overweight, and 61% of the participants were within normal weight. Concerning health problems,51.2% of them were suffering from concentration problems.

Table 1: ***Students' demographic and health history***

Items	**(N) = 41**	**(%)**
Gender		
Male	19	46.3
Female	22	53.7
School		
Primary	1	2.4
Preparatory	15	36.6
Secondary	25	61.0

Primary	1	2.4
Academic Year		
First Year	19	46.3
Second Year	13	31.7
Third Year	8	19.5
Fourth Year	1	2.4
Residence		
Rural	24	58.5
Urban	17	41.5
Weight Without Shoes or Heavy Clothes (kg)		
30 < 45	6	14.6
45 < 60	22	53.7
60 < 75	11	26.8
75 and more	2	4.9
Mean (SD)	***53.88 (12.158)***	
Height Without Shoes (cm)		
140<150	8	19.5
150<160	15	36.6
160<170	13	31.7
170 and more	5	12.2
Mean (SD)	***159.37 (10.767)***	
BMI Category		
Underweight	8	19.5
Normal weight	25	61.0
Overweight	8	19.5
Mean (SD)	***21.02 (3.226)***	
Obese	6	14.6
Underweight	9	22.0
Anemia	15	36.6
Hair Problems	14	34.1
Skin Problems	8	19.5
Poor concentration	21	51.2

Table 2 shows that 95.1 % of participants had a poor level of knowledge at pretest. While 95.1% &73.2% of them had a good level of knowledge post and after 3 months of intervention.

Table 2: ***Students' nutritional Knowledge Score Levels pre, post, and follow up (n=41)***

Items	Pre-test			Post-test			Follow up		
	Poor	**Fair**	**Good**	**Poor**	**Fair**	**Good**	**Poor**	**Fair**	**Good**
Definition **(2 items)**	22 (53.7)	15 (36.6)	4 (9.8)	1(2.4)	8 (19.5)	32 (78.0)	2 (4.9)	14 (34.1)	25 (61.0)
Food group **(2 items)**	18 (43.9)	18 (43.9)	5 (12.2)	1(2.4)	12 (29.3)	28 (68.3)	3 (7.3)	15 (36.6)	23 (56.1)
Calories **(2 items)**	30 (73.2)	6 (14.6)	5 (12.2)	7 (17.1)	9 (22.0)	25 (61.0)	11 (26.8)	13 (31.7)	17 (41.5)
Food Importance **(4 items)**	27 (65.9)	11 (26.8)	3 (7.3)	2 (4.9)	9 (22.0)	30 (73.2)	2 (4.9)	11 (26.8)	28 (68.3)
Risk Factor **(2 items)**	20 (48.8)	16 (39.0)	5 (12.2)	2 (4.9)	14 (34.1)	25 (61.0)	2 (4.9)	17 (41.5)	22 (53.7)
Healthy Food **(4 items)**	33 (80.5)	8 (19.5)	0 (0.0)	0 (0.0)	7 (17.1)	34 (82.9)	0 (0.0)	17 (41.5)	24 (58.5)
Fat intake **(2 items)**	33 (80.5)	8 (19.5)	0 (0.0)	0 (0.0)	25 (61.0)	16 (39.0)	2 (4.9)	26 (63.4)	13 (31.7)
Total knowledge	**39 (95.1)**	**0 (0.0)**	**2 (4.9)**	**0 (0.0)**	**2 (4.9)**	**39 (95.1)**	**0 (0.0)**	**11 (26.8)**	**30 (73.2)**

Table 3 presents a statistically significant difference in knowledge score pre, post and after 3 months, $p < 0.001$, indicating that participants' knowledge significantly improved following the intervention and after 3 months.

Table 3: Comparison of nutritional knowledge between pre, post, and follow up score

Item	Time	Mean (SD)	F	P.value
Definition	Pre	0.56 (0.67)	71.11	**< 0.001**
	Post	1.75 (0.48)		
	Follow	1.56 (0.59)		
Food group	Pre	0.682 (0.686)	46.683	**< 0.001**
	Post	1.65(0.529)		
	Follow	1.48 (0.63)		
Calories	Pre	0.39 (0.70)	43.698	**< 0.001**
	Post	1.439 (0.77)		
	Follow	1.14(0.82)		
Food importance	Pre	1.146 (1.06)	122.495	**< 0.001**
	Post	2.95 (0.83)		
	Follow	2.78 (0.75)		
Risk factor	Pre	0.63 (0.69)	58.471	**< 0.001**
	Post	1.56 (0.59)		
	Follow	1.48 (0.59)		
Healthy food	Pre	0.75 (0.76)	178.378	**< 0.001**
	Post	3.17 (0.70)		
	Follow	2.7 (0.75)		
Fat intake	Pre	0.195(0.40)	180.247	**< 0.001**
	Post	1.39 (0.49)		
	Follow	1.26 (0.54)		
Total Knowledge	Pre	4.36 (2.87)	463.635	**< 0.001**
	Post	13.92 (1.55)		
	Follow	**12.51(1.48)**		

Table 4 illustrates that 100% of the participants had improper level of practice regarding dietary habits, home snacks, and food choices. Furthermore, there was an improvement noticed in the post-test findings regarding some areas, as 100% of participants had proper practice regarding meal numbers and fast food and 73.2% of them had proper practice-related dietary habits. Concerning total practices, 92.7 % of them had improper practice level at pretest. While 56.1% & 92.7% of them had proper practice level post and after 3 months of intervention.

Table 4: *Students' dietary practice score levels pre, post, and follow up (n=41)*

Items	Pre-test		Post-test		Follow up	
	Improper	Proper	Improper	Proper	Improper	Proper
Dietary habits **(32 items)**	41 (100)	0 (0.0)	11 (26.8)	30 (73.2)	0 (0.0)	41 (100)
Meal Number **(8 items)**	9 (22.9)	32 (77.1)	0 (0.0)	41 (100)	0 (0.0)	41 (100)

Fast Food **(6 items)**	4 (9.8)	37 (90.2)	0 (0.0)	41 (100)	0 (0.0)	41 (100)
School Snack **(8 items)**	39 (95.1)	2 (4.9)	12 (29.3)	29 (70.7)	19 (46.3)	22 (53.7)
Home Snack **(8 items)**	41 (100)	0 (0.0)	12 (29.3)	29 (70.7)	15 (36.6)	26 (63.4)
Beverage **(6 items)**	40 (97.6)	1 (2.4)	35 (85.4)	6 (14.6)	33 (80.5)	8 (19.5)
Balanced meal Content **(6 items)**	32 (77.0)	(9) 22.9	12 (29.3)	29 (70.7)	8 (19.5)	33 (80.5)
Dietary pattern **(40** items)	40 (97.6)	1 (2.4)	30 (73.2)	11 (26.8)	22 (53.7)	19 (46.3)
Proper dietary choice **(64 items)**	41 (100)	0 (0.0)	25 (61)	16 (39)	12 (29.3)	29 (70.7)
Total Practice	**38 (92.7)**	**3 (7.3)**	**18 (43.9)**	**23 (56.1)**	**3 (7.3)**	**38 (92.7)**

Table 5 portrays a statistically significant difference in knowledge score pre, post and after 3 months, p 0.001 <, indicating that participants' dietary practices significantly improved following the intervention and after 3 months.

Table 5: Comparison between dietary practices score between pre, post, and follow up

Item	Time	Mean (SD)	F	P.value
Dietary habits	Pre	16.02 (4.68)	468.928	< 0.001
	Post	25.43 (3.24)		
	Follow	29.17 (1.80)		
Meal Number	Pre	6.048(1.44)	57.687456	< 0.001
	Post	7.41 (0.54)		
	Follow	7.75(0.43)		
Fast Food	Pre	4.90 (0.30)	155.765	< 0.001
	Post	6 (0.000)		
	Follow	5.80 (0.40)		
School Snack	Pre	2.75 (1.33)	181.076	< 0.001
	Post	6 (0.89)		
	Follow	5.60 (1.09)		
Home Snack	Pre	3.024(1.106)	161.485	< 0.001
	Post	5.87 (0.87)		
	Follow	5.65 (1.25)		
Beverage	Pre	4.43 (0.83)	40.655	< 0.001
	Post	5.4 1(0.92)		
	Follow	5.60 (0.80)		
Balanced meal Content	Pre	2.63 (0.73)	76.087	< 0.001
	Post	3.75 (0.85)		

	Follow	4.09 (0.58)		
Dietary pattern	Pre	18.17(5.16)	253.239	< 0.001
	Post	27.73(2.98)		
	Follow	29.02(2.44)		
Proper dietary choice	Pre	24.75(10.32)	485.694	< 0.001
	Post	47(5.63)		
	Follow	49.80(4.55)		
Total Practice	Pre	84.70(21.72)	**427.902**	**< 0.001**
	Post	134.63 (8.49)		
	Follow	142.53 (6.37)		

Table **6** shows that an excellent degree of reliability was found between participants and experts' scores in all domains. The average raters' scores ICC ranged from (.990) to (.997) with a confidence interval ranging from (.931) to (.999

Domains	Experts N=15			End beneficiaries N=41		
	Interclass correlation.	95% confidence interval		Interclass correlation	95% confidence interval	
		Lower bond	Upper bond		Lower bond	Upper bond
Single measure	0.983	0.961	0.994	0.874	0.738	0,995
Average measure	0.997	0.992	0.999	0.990	0.931	0,999

Table 6: ***Internal reliability and intra-class correlation for feedback domains of the web-based health education of experts and students.***

Discussion

Regarding the demographic characteristics and health history of students, the findings of the present study indicated more than half of participants were female adolescents from rural secondary schools. This aligns with Abd El Aal Thabet Omar et al. (2023), who reported similar results in rural youth. The current study reported an equal percentage of students were underweight and obese, who represented more than one-third of them. This reveals a dual problem of malnutrition. This figure was described as a global pattern according to the World Health Organization (2024). Fahrizki and Dwiriani (2025) also reported similar nutritional imbalances among Indonesian teenagers. Furthermore, the informed prevalence of anemia, hair problems, and concentration difficulties reproduces the probable impact of poor nutrition on intellectual and physical health. These effects prove the findings of Mohammadi and Koo (2025), who found that insufficient dietary intake weakens physical and intellectual status. In addition to poor scholastic achievement. The stated malnutrition manifestation could be attributed to the poor nutritional level and the unsatisfactory dietary practice among students that was detected in the initial evaluation.

It was realized that web-based health education is mainly valuable for adolescents. Web-based health education can improve nutrition knowledge deficits. It is an accessible, flexible, and self-directed learning resource (Hegazy 2025). Regarding the improvement in knowledge levels, the present study showed that students' nutritional knowledge had significantly improved after the implementation of the web-based module. Knowledge scores were significantly increased on the post-test compared to the pretest, and this improvement persisted after 3 months of follow-up.

This agrees with the findings of Adeoya, Akinwusi, and Nagatomi (2023), who found that students' understanding and remembrance of nutritional concepts are considerably enhanced by efficient nutrition education. Furthermore, Hegazy (2025) acknowledged similar results in Egyptian secondary schools, in which web-based health education positively boosted students' knowledge about nutrition-related subjects. These results are consistent with the findings of Talens et al. (2025), who found that information retention increases by using digital learning tools. This might be attributed to the role of multimedia and videos in encouraging student commitment in health education.

Regarding the improvement of dietary practices, it was substantially improved with time, as reported in the current study after being

subjected to the web-based module. Students revealed enhanced meal regularity, better food preferences, and reduced eating of junk food. During follow-up, satisfactory behavior persisted, suggesting an extended-continuing consequence. The findings are reinforced by the CDC recommendations (CDC, 2024), which emphasize that effective nutrition programs use behavioral reinforcement to promote long-term healthy practices. Moreover, Fahrizki and Dwiriani (2025) found that digital nutrition approaches significantly improved the food choices and decreased unwanted eating habits among youth.

According to validation and module quality, high inter-rater consistency and strong consensus were found among appraisers. Expert and student feedback proved strong satisfaction with the web-based module's structure, design, and content. These results are consistent with the findings of Hajar and Alghizzi (2025), who revealed that interactive digital education is effective because of its use of multimedia integration. Additionally, Al-Fraihat et al. (2020) pointed out that learner involvement and the accomplishment of e-learning are significantly affected by consumer consensus. The current study's high intra-class correlation coefficients are consistent with the conclusions of Norouzian and Farahani (2021) about interrater reliability requirements in the validation of educational tools.

Conclusion

This quasi-experimental study conclusively showed the significant effect of a web-based health education module on improving schoolchildren's nutrition knowledge and dietary practice.

Recommendations

Based on the findings of the current study, the following recommendations are suggested:

1. Employing the web-based nutrition module in official school health education curricula.
2. Design health education programs to address obesity and underweight school children.

7. Acknowledgment

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8. Conflict of Interest

The authors declare that there is no conflict of interest.

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