Nutrition Education and Lifestyle Changes: Results from a Controlled Intervention in Lebanon

Diamant Boutros, Yonna Sacre* and Joane Matta

Department of Human Nutrition and Dietetics, Faculty of Agricultural and Food Sciences, Holy Spirit University of Kaslik, Kaslik, Lebanon

*Corresponding Author: Yonna Sacre, Department of Human Nutrition and Dietetics, Faculty of Agricultural and Food Sciences, Holy Spirit University of Kaslik, Kaslik, Lebanon.

Abstract

The aim of this study was to determine the changes in knowledge, attitudes and practices of adolescents in the Lebanese private schools after receiving an educational nutrition intervention for four weeks.

A total of 212 students from four private schools were divided into two groups, intervention group (IG) and a control group (CG). The intervention group received nutrition education taught by a dietician while the control group received simple dietary instructions without any explanation, using the same questionnaire.

The daily breakfast intake increased significantly in the intervention group (p = 0.026 < 0.05) with no significant changes in the control group. Students in the intervention group reported consuming more dairy products (p = 0.03 < 0.05), vegetables (p = 0.00 < 0.05) and fruits (0.000 < 0.05) following the intervention compared to the control group. There were no significant differences in the consumption of commercial products, physical activity and screen time habit between groups after intervention. The school-based intervention was effective in increasing significantly the nutrition knowledge and the ability to read nutrition labels in the intervention as compared with the control group (p = 0.000 < 0.05).

Keywords: *Nutrition Education; Adolescents; Nutrition Knowledge; Eating Habits; Prevention*

Introduction

"Nutrition education is the set of communication activities aimed at the voluntary modification of practices that affect the nutritional status of the population, with a view to improving it" [1]. Nutrition education programs are designed to improve nutrition knowledge, which is intended to support food intake within the community [2].

It should be noted that the school is a privileged place where well-trained people can offer nutritional education to young adolescents [3]. On the other hand, lack of knowledge about healthy lifestyles can lead to remarkable weight gain especially among adolescents [4].

These developments have resulted in nutritional imbalances that include irregular meal patterns; consumption of foods and beverages of low nutritional value; skipping breakfast; intake of refined carbohydrates; low intake of dairy products, fruits and vegetables influencing immediate well-being [5].

These will surely condition their health in the years that follow [6]. These imbalances can be avoided by practicing a better adapted diet to the needs, by the development of a regular physical activity as well as by a healthy food environment, especially in school. This should help to avoid chronic diseases such as cardiovascular diseases, diabetes, obesity and certain cancers. Hence it has been shown that there is a need for nutritional intervention among adolescents [7].

Purpose of the Study

The purpose of this study was to determine the changes in the knowledge, attitudes and practices of adolescents in private Lebanese schools after receiving a nutritional intervention. Our study tries to detect the presence of a significant change in dietary habits and nutritional knowledge of adolescents in private schools after intervention of a specific region of Lebanon (Keserouan).

The starting hypothesis is: "Nutritional interventions in private Lebanese schools improve dietary habits and nutrition knowledge".

Hence our primary goal is to carry out this study on the Lebanese field so as to be able to open the field to other possible studies and to evaluate the effectiveness of this intervention to improve the nutritional knowledge and the eating habits of the adolescents in Lebanon.

Materials and Methods

The design of the study uses three phases, the first is the planning phase or the pre-intervention phase, during which school connections and the preparation of education sessions will be made, where a baseline study, two questionnaires were used to test their nutritional knowledge, and the second was used to assess their eating habits and their physical activity at baseline (t0). The second phase is the post-intervention phase, when the same questionnaires used previously were used to assess their nutritional knowledge and eating habits of adolescents two weeks after the intervention program (t1). The third phase of the program is the sustainability phase at the end of which the comparison between pre- and post-intervention and even between intervention and control groups is made.

Sampling methods

An intervention study was conducted with a sample of adolescents aged between 12 and 15 years, between 2 January and 25 October 2016.

Because randomization is at the school level, which could lead to a reduction in sample size because of the risks intra-residual correlation in responses among students within the same school? Therefore, although the expected sample size was 240 students, is reduced to 212 students due to the effect of the plan and exclusion factors from the study.

Students of foreign nationality, and those who do not complete the questionnaires and those who were absent 2/4 of the nutritional education sessions were excluded from the study.

212 adolescents of the 7th and 8th grades were divided into two groups; 114 students from the nutritional intervention group: an experimental group that will attend nutritional education sessions (4 sessions including activities, practical work, posters...) 98 students from the control group that will receive dietary instructions.

The goal of the control group was to highlight the importance of nutritional education sessions in schools. Both male and female genders are included without any distinction between the two sexes.

Data Collection

(Survey Administration)

The quantitative and qualitative data were collected from the seventh, eighth year students in each school during the months of May and June 2016.

Survey distribution and instructions took approximately 10–15 minutes, whereas about 25–30 minutes were needed for participants to complete the survey questionnaires.

Statistical analysis

The Statistical Analysis System (SPSS version 16 computer software) was used to evaluate the data for this study. One simple t-test was used to calculate the difference in knowledge and paired simple t-test was used to evaluate the effect of nutritional education on food habits and altitudes in both groups before and after intervention.

Results were analyzed with a significance level of 0.05.

Intervention program

-   Each lesson plan include objectives, session content, key messages, and activities for each lesson.
-   The six posters contain the content of the four education sessions.
-   The cards of recommendations for the parents written in Arabic were sent home on the first day of the campaign, to the both groups, the purpose of which is to encourage family discussions.
-   The lessons contained elements on the content and benefits of food groups, types of macronutrients and micronutrients, their food sources and functions, including carbohydrates, proteins, fats, vitamins and minerals, MyPlate guidelines, The nutritional value of natural foods versus processed foods, and how to read the nutritional label of food products, and the benefits of physical activity and Its role in the development and growth of adolescents. The duration of each education session was 50 minutes.

Dietary instructions distributed to the control group summarize the four education sessions.

Results and Discussion

According to our knowledge, this is the first study that evaluates the effectiveness of nutritional education in schools in improving knowledge, attitudes and practices of adolescents in Lebanon.

Subjects characteristics

As shown in table 1, a total of 212 students participated in both the pre-test and post-test. The average age of students was 13.82 years in the control group and 13.47 years in the intervention group (age 12 - 15 years). There were 51 girls and 47 boys in the control group, while the intervention group had 63 girls and 51 boys.

	CG	%	IG	%
Age	13.82		13.47	
Gender				
Male	47	48	51	44.7
Female	51	52	63	55.3
Grade in school				
7th	44	44.9	54	47.4
8th	54	55.1	60	52.6
Total	98	46.2	114	53.7
Schools				
School 1	62	63	-	-
School 2	36	37	-	-
School 3	-	-	69	61
School 4	-	-	45	39

Table 1: *Characteristic of the responds.*

IG: Intervention group; CG: Control group.

The survey was conducted at four private schools, two classes in each school. The number of students in the 7th grade is 44 in the control group and 54 in the intervention group, while the number in the 8th grade is 54 in the control group and 60 in the intervention group. Moreover, the representative of the sample is satisfactory. In fact, the structure of the sample in the two groups is substantially identical.

Eating habits

Adolescence is a critical step in the development of healthy eating habits because habits developed during this period will likely continue into adulthood [8,9]. Hence the nutritional intervention at this stage is very important to prevent the development of bad eating habits.

Breakfast is not an essential meal for young teenagers. Only 54.1% of CG students and 52.6% of IG take their breakfasts at t0, which is comparable to the percentages of the recent comprehensive school health survey conducted in Lebanon [10], which indicates that only 54% of students aged 13 - 18 years old take breakfast most of the time or always. The results of our study indicate that there was a remarkable change in the IG (p = 0.026), the rate of students who ate their breakfast at t1 increased to an acceptable level to 77.2%.

This Effect is absent in the CG since p = 0.436 is well above the threshold value 0.05. This shows that most parents offer breakfast to their children or provide adequate food for breakfast but they refuse to eat but seem to be convinced by the importance of breakfast.

Approximately, 55.3% of IG and 51.8% of CG consume less than three servings per day of dairy products, so more than half of the Lebanese adolescent population does not meet the recommendations and may no longer meet their calcium and phosphorus needs. Table 2 shows that at t1, this rate decreased to 35.1% this decrease was significant in the IG (p = 0.03) with no remarkable changes in the CG (0.059).

		To (%)	T1 (%)	p
Daily breakfast IG	Yes	52.6	77.2	0.026*
	No	47.4	22.8	
Daily breakfast CG	Yes	48.1	51.6	0.436
	No	51.8	48.4	
Dairy products IG	< 3 portions/day	55.3	35.1	0.03*
	> 3portions/day	44.7	64.9	
Dairy products CG	< 3 portions/day	51.8	39.2	0.059
	> 3 portions/day	48.2	60.8	
Vegetables IG	≤ 1 portion/day	51.8	23.7	0.000*
	2 à 3 portions/day	38.6	40.4	
	> 4 portions/day	9.6	36.0	
Vegetables CG	≤ 1 portion/day	50.0	49.0	0.698
	2 to 3 portions/day	40.8	39.8	
	> 4 portions/day	9.2	11.2	

Fruits IG	≤ 1 portion/day	45.6	21.1	0.000*
	2 portions/jour	36.8	37.7	
	> 3 portions/day	17.5	41.2	
Fruits CG	≤ 1 portion/day	49.0	42.9	0.070
	2 portions/day	35.7	36.7	
	> 3 portions/day	15.3	20.4	
Commercial desserts IG	< 2 /week	19.3	29.8	0.057
	> 2/week	80.7	70.2	
Commercial desserts CG	< 2/week	15.3	21.4	
	> 2/week	84.7	78.6	0.158
Beverages GI	< 2 glasses/week	14.1	18.4	0.468
	2 à 4 glasses/week	41.2	39.5	
	> 4 glasses/week	44.7	45.1	
Beverages GC	< 2 glasses/week	14.3	17.3	
	2 to 4 glasses/week	44.9	41.8	0.470
	> 4 glasses/week	40.8	40.8	
Salty snacks IG	≤ 1/day	14.0	21	
	1 à 3/day	50.9	43.9	0.373
	> 3/day	35.1	35.1	
Salty snacks GC	≤ 1/day	16.3	15.3	
	1 to 3/day	48.0	48.0	0.834
	> 3/day	35.7	36.7	

Table 2: *The effect of nutritional education on eating habits.*

*Significant p value if p < 0.05.

T0: Pre Intervention; T1: Post Intervention; IG: Intervention group; CG: Control Group Control.

More than 50% (51.8% and 50.0%) of young adolescents in both sexes consume less than one serving of vegetables per day in IG and CG respectively. The rate of post-intervention adolescents who consume more than four servings per day increased from 9.6% to 36% in the IG, but this effect is absent in the CG since p = 0.698.

45.6% of teenagers consume less than one serving per day of fruit at t0, this rate decreased at t1 to reach 21.1% after intervention in the IG with no significant difference in the CG.

Healthy eating behaviors become less common as adolescence progresses: fruit and vegetable consumption decreases between 11 and 15 years.

Americans do not eat the recommended amount of fruits and vegetables. Guenther., *et al.* found that 60% of Americans did not respond to fruit and vegetable recommendations compared to 50% of Lebanese teenagers [11]. The statistics for American and Lebanese teenagers are particularly alarming, and a significant decrease in fruit and vegetable consumption is seen during the transition from childhood [12]. The data show that this decline during adolescence is becoming an international problem, hence the need for nutritional intervention [13].

This could be explained by the easy access to staple foods, given that Lebanon is a country rich in fruits and vegetables during all seasons. Youngsters admit that fruits and vegetables are necessary for a good diet but do not consume it for lack of practice.

Having to peel, wash, pit or even prepare them is an obstacle for new generations, who have a clear preference for "practical" products whose storage date is not limited to 2 or 3 days. However, if the consumption of fresh fruit is minimal, it is compensated by non-fresh fruit packaged in various forms such as fresh cocktail bottles, canned fruits and veggies which seem to satisfy the need for convenience that we have just mentioned.

Student behavior

Labels on packaged snacks serve as a reliable source of information related to nutrition. These labels provide simple visual guides that allow consumers to make healthier choices [14].

It is shown that nutritional education, age, gender and attitudes predict the use of labels of food by adolescents. They are specifically targeted at marketing efforts by manufacturing companies to promote unhealthy snacks as they represent future adult consumers [15]. Some examples of these marketing strategies include representation of popular figures, brand promotion and nutritional and ethical claims posted on food/beverage labels. To minimize these vulnerabilities, adolescents should be well alarmed by the correct knowledge and attitudes of using food labels.

Table 3 shows that when young adolescents consume a food product for the first time about two over ten (18.4% CG, 20.2% IG,) read and understand the Nutrition Facts label information, this rate remained unchanged in the CG (23.5%) at t1, a remarkable change in the IG to become 43.0% at t1 (p < 0.05).

		To (%)	T1 (%)	p
Reading the nutrition label IG	No	79.8	57.0	0.00*
	Yes	20.2	43.0	
Reading the nutrition label CG	No	81.6	76.5	0.356
	Yes	18.4	23.5	
Physical activity IG	< 30 minutes	43.9	27.2	
	30 à 60 minutes	34.2	36.0	0.246
	> 60 minutes	21.9	36.8	
Physical activity CG	< 30 minutes	44.9	38.8	
	30 to 60 minutes	32.7	32.7	0.061
	> 60 minutes	22.4	28.6	
Screen time IG	< 2 hours	25.4	31.6	0.06
	> 2 hours	74.6	68.4	
Screen time CG	< 2 hours	26.5	23.5	0.834
	> 2 hours	73.5	75.5	

Table 3: The effect of nutritional education on student behavior.

*Significant p value if p < 0.05.

T0: Pre Intervention; T1: Post Intervention; IG: Intervention group; CG: Control Group Control.

The physical activity patterns of these adolescents were consistent with that observed in other studies in adolescence: a remarkable decrease during puberty. Television and electronic games take a lot of their time [16].

In our study, it was not possible to demonstrate the effect of nutritional education on physical activity, since p is much higher than the threshold value 0.05, as shown in table 3. Many girls revealed that they had no interest in sports, but had more physical activity after the intervention, such as walking, running and jumping. The boys expressed dissatisfaction with not being allowed to play ball during recess at school. Another explanation for the lack of positive outcomes: Children need the approval of parents to participate in post-school sports. Reasons for not enrolling are: budget, time, scheduling constraints and a lot of home works. Parents' lack of time and financial constraints have also been reported in other studies, creating barriers for young adolescents to participate in organized sports [17]. Students, on the other hand, asked for more physical activity sessions to be included in future interventions. Since then, the school curriculum has only two sessions per week.

Sedentary time is considered a product of time spent in specific sedentary behaviors, such as watching TV, playing electronic games or talking on the phone [18]. Effective strategies to reduce sedentary behavior in children are rare. Some studies have been effective in reducing overweight and reducing screen time in children in the short term [19]. Other studies have used behavior modification sessions that encourage children to reduce screen behaviors and find alternatives to physical activity [20]. However, some have claimed to have replaced television and computer games by football or basketball whenever possible.

On the other hand, our study found no significant effect of nutritional education on the number of hours spent in front of the screen in the IG and the CG since p is well above 0.05.

Nutritional knowledge

Our intervention was effective in enriching knowledge about the health of students in Grades 7 and 8 and these results show the success of the intervention. The difference in nutrition scores within the group before and after the intervention was assessed using the independent t-test.

Table 4 shows how the nutritional score of adolescents changed after the nutritional intervention.

	Intervention group N = 114			Control group N = 98		
	T0	T1	p	T0	T1	p
Score/30	12.43 (11.92 - 12.94)	20.72 (20.03 - 21.39)	0.00*	12.35 (11.67 - 13.02)	11.83 (11.06 - 12.59)	0.071

Table 4: The effect of nutritional education on nutrition score of adolescents.

T0: Pre intervention; T1: Post intervention.

Participants in both the CG and the IG took the same baseline test and the two groups reported similar scores, with an average score of 12.35 (41.17%) for the control group and 12.43 (41.4%).

The nutritional knowledge score for the IC was significantly higher (p < 0.005) 20.72 than for the CG; 11.83.

On the other hand, CG students failed to enrich their nutritional knowledge of pre-test and post-test. The results revealed that there was no significant difference (p = 0.071 > 0.05) in the nutritional knowledge at t1 within the control group. The results of the current study are consistent with previous studies. In evaluating a nutritional education intervention program in grades four to six, Willeford., *et al.* found that all students had significant increases from pre to post-intervention [21].

Other randomized studies have reported a significant increase in nutrition knowledge in intervention groups compared to control groups [22].

Based on this convincing approach, it has been possible to conclude that school-based nutrition education is effective in increasing adolescent's knowledge, regardless of the intervention components. This result provides important scientific evidence for national and international school policies regarding poor knowledge management in nutrition.

Conclusion

In a conclusive way, our study was developed to encourage healthy eating and physical activity and improve nutrition knowledge among Lebanese teenagers, from the 7th and 8th school years. The hypothesis begun at the beginning is: "Nutritional intervention in private Lebanese schools improves eating habits and nutritional knowledge".

The program has been adapted according to Lebanese and Arabic culture which includes interactive learning and complementary to their education program. In summary, the results of this study suggested that the nutritional knowledge reported appears to increase in students after being exposed to a nutritional education intervention program. The program has also been successful in increasing the daily intake of teens in fruit, vegetable dairy products and breakfast consumption. On the other hand, the intervention group did not have a positive effect on physical activity and sedentary behaviors. This suggests that longer interventions and efforts to increase physical activity during school hours would be needed. The school environment provides an excellent opportunity for intervention, since most children spend much of their time in the school environment. The result of this survey showed that while small-scale interventions can bring some improvement in nutritional knowledge and habits.

The information obtained during this survey is now useful to assist in the design of future school interventions in other areas of Lebanon.

It is from this that this study made it possible to elaborate a new approach on the Lebanese field giving the possibility to clarify the thoughts on the problem of bad food behavior and the poor knowledge in nutrition among all Lebanese students and particularly among Adolescents. But at what scale can we say that parents and health professionals are aware of this alarming problem? Will they limit themselves to nutritional recommendations in the target of improving their eating habits? Is the effect of nutritional education sustainable? Time remains the best indicator for correcting changes.

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