

RESEARCH ARTICLE

NUTRITIONAL KNOWLEDGE, CONCEPTION AND BEHAVIOR OF LEBANESE STUDENTS: A COMPARATIVE STUDY

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Abstract

Background: Life style and nutrition habits of young Lebanese students are related to what they have learned from their family and teachers at schools. We examined the relationship between knowledge and conception of Lebanese university students gained from schools curriculum with their nutritional behavior and life style.

Method: A self-reported questionnaire is distributed to 150 students at the faculty of pedagogy, Lebanese university. Demographic and mean comparison analysis of the data is presented; a regression analysis and correlations are applied to test the relationship between parametric variables. A t-test is used to check whether there is a difference between two types of Lebanese baccalaureate (sciences and non-sciences) on students' nutrition habits.

Results: Our results showed that type of baccaclaurate affects only the conception and that the location affects only their nutritional behavior. Therefore young Lebanese students studying at the faculty of pedagogy have their own conception from high school curriculum and only the science section is affected by this conception more than non-science. Moreover, their home location (urban vs rural) affects only their behavior.

Conclusions: The University is very important for the health education, it is the last chance for the students to improve their way of living and follow a healthy diet. Our findings suggest the need of a high emphasis to improve competence in the area of nutrition.

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Introduction

Nutrition, defined by WHO, is the intake of food, considered in relation to the body's dietary needs. Good nutrition – an adequate, well balanced diet combined with regular physical activity – is a cornerstone of good health (WHO,a). Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity'' (WHO,b).Connection between Nutrition and Health is well known long time ago. Hippocrates said (around 400 BC): ''Let your food be your medicine and your medicine be your food''.

Better health is central to human happiness and well-being. It also makes an important contribution to economic progress, as healthy populations live longer, are more productive, and save more Unhealthy habits and life style

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contributed to an international over weight and obesity epidemic especially among children, increase risks of cardiovascular diseases, diabetes, osteoporosis and even some types of cancers (breast and colorectal) (USDA, 2015). On the other hand, healthy patterns contribute to overall healthy growth and development, including healthy bones, skin, and energy levels; and a lowered risk of dental caries, eating disorders, constipation, malnutrition, and iron deficiency anemia (Dehghan et al, 2005; Livingstone, 2001; James, 2004). Scientific health studies demonstrated that a good diet is the most powerful weapon we have against disease and sickness (Campbell, 2006).

Diet choices are based on six keys: (Shepherd & Farleigh, 1986; Murcott, 1989; Shepherd, 1989; Shepherd, 1999)

- 1. Biological determinants such as hunger, appetite, and taste,
- 2. Economic determinants such as cost and income,
- 3. Physical determinants such as access, education, skills and time,
- 4. Social determinants such as religious, demographic, class, culture, and social context,
- 5. Psychological determinants such as personality, mood, stress and guilt,
- 6. Attitudes, beliefs and knowledge about food.

A study released by the 'Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) on 2013, shows the impact of nutrition education on food choices. This study provides clear evidence that well-designed nutrition education programs can lead to healthier food choices (FNS, 2013) especially among children.

Schools are considered a primary target to deliver nutrition education based on the rationale that proper nutrition is essential for physical and mental development of children and adolescents (FAO, 2013). Moreover, school children are at the phase of life when they are acquiring habits that will last a lifetime; and children are an important link between school and home and community (Olivares et al., 1998). As such, schools are now receiving more attention as a specific setting for nutrition education. At the global level, the WHO's Global Strategy on Diet, Physical Activity and Health recommends that school policies and programs support the adoption of healthy diets and physical activity (WHO, 2004). In 2008, WHO published a "School Policy Framework: Implementation of the Global Strategy on Diet, Physical Activity and Health" (WHO, 2008). The objective was to guide policy-makers at national and sub-national levels in the development and implementation of policies that promote healthy eating and physical activity in the school setting, as well as to recommend changes in the school food environment. The guide recommends the insertion of nutrition education in school policies and programs, in order to: (FAO, 2013)

- 1. Provide knowledge and skills about the relationship between a good diet, physical activity, and health.
- 2. Address the safe preparation of food and its consumption as an essential positive and enjoyable aspect of life.
- 3. Allow students to identify barriers to making healthy food choices and solutions to overcome the identified barriers.
- 4. Provide media and marketing literacy to students.
- 5. Involve teachers in imparting health messages to students.

Moreover, the Centers for Disease Control and Prevention (CDC) report on "School Health Guidelines to Promote Healthy Eating and Physical Activity" (CDC, 2011) recommend implementing health education that provides students with the knowledge, attitudes, skills, and experiences needed for healthy eating and physical activity. Such kind of education supports the development of health-related knowledge, skills, and attitudes to increase the likelihood that students engage in healthy behaviors and to avoid or reduce health risks. According to this report, health education curricula and instruction should address various health topics, including healthy eating and physical activity. It should also be developmentally appropriate and address physical, mental, emotional, and social dimensions of health to improve health knowledge, attitudes, skills, and behaviors. Strategies suggested were as follow: (CDC, 2011)

- 1. Require health education from prekindergarten through grade 12.
- 2. Implement a planned and sequential health education curriculum that is culturally and developmentally appropriate, addresses a clear set of behavioral outcomes that promote healthy eating and physical activity, and is based on national standards.
- 3. Use curricula that are consistent with scientific evidence of effectiveness in helping students improve healthy eating and physical activity behaviors.
- 4. Use classroom instructional methods and strategies that are interactive, engage all students, and are relevant to their daily lives and experiences.

Brief Review of Nutrition and Health Education in the Lebanese Curriculum (CRDP Center for Educational Research and Development)

The Lebanese official science curriculum requires "nutrition and health education" within the Biology lessons under a specific part named "Man and his health". This part is introduced to students from Grade1 – Elementary Level until Grade 12- Secondary Level.

Elementary Level- Cycle 1 and 2:

Food groups, their sources and importance, food pyramid, examples of traditional Lebanese Cuisine and digestion are primarily introduced during the first and second cycle of Elementary Level. Kinds of nutrients, their main sources and functions are explained too. In this part, the learning objectives are to recognize different familiar kind of nutrients such as sugar, starch, proteins, lipid, vitamins, etc... and to give examples of food rich in a particular nutrient. Moreover, natural food and industrialized food are also discussed, where one of the learning objectives of this chapter is to take a suitable attitude towards consuming processed foods.

Intermediate level:

"Man and his Health" is introduced in this level during Grade 7 and 9 science curriculum only. Attention is focused primarily on the transformation of food into simple nutrients during the digestion and how our body will utilize them after absorption. Students are also asked to draw / indicate the pathway of food within the digestive system. Moreover, the benefits of food in regard to man's growth and development and how eating ensures energy to human's body are also discussed.

Secondary Level:

During secondary level, nutrition is taught only to grade 11 students for the "science" series and grade 12 students for both "Literature / humanity" series and "Sociology / Economics" series.

For science series, nutrition chapters include a comprehensive reading (and no memorization) for the roles of vitamins and minerals. Quantitative and qualitative food needs, balanced diet, diseases due to excessive food intake (cardiovascular diseases and obesity), energy expenditure of organism and protein synthesis.

In regard to "Literature / humanity" and "Sociology / Economics", both series have almost the same curricula. Health and nutrition topics are more emphasized and detailed than "sciences series". They discuss the diversity of food habits, the basic principles for a balanced diet, human body needs for vitamins, amino acids, fatty acids and minerals, food digestion and dissimilation and synthesis of molecules. The table below summarizes the "Health and Nutrition Education" curricula within the Science Curriculum suggested by the Official Lebanese Center for Educational Research and Development (CRDP)

	Year		Topics Discussed under the "Man and his Health" part		
Elementary	Grade 1		Growth and needs of children		
Level – Cycle 1	Grade 2		Different Food Groups		
	Grade 3		General functions in Human body		
Elementary	Grade 4		Food Pyramid		
Level – Cycle 2	Grade 5		Nutrients and Digestion		
	Grade 6		Effects of smoking		
Intermediate	Grade 7		The Digestive system		
Level			Mechanisms of Digestion and Absorption		
	Grade 8		N/A		
	Grade 9		Digestion, Nutrition and Health: Utilization of nutrients,		
			diversity of foods, Balanced food diet		
Secondary	Grade	Humanities Series	N/A		
Level	10	Science Series	N/A		
	Grade	Humanities Series	N/A		
	11	Science Series	Energy Metabolism in man		
			Uses of glucose, fatty acids, amino-acids		

Table1:

		Storing organs (Liver, muscles, etc)		
Grade	Literature and	Nutrition and health:		
12	humanity series/	 diversity of food habits 		
	Sociology and	• basic principles for a balanced diet		
	Economics series	• needs of vitamins, amino acids, fatty acids, minerals		
		 food digestion and dissimilation 		
		• synthesis of molecules		
	Life science series	N/A		

Problematic issue

When discussing nutritional issues with 1st year university students, we noticed a lack of some basic nutrition information although they were mentioned in the Lebanese Science Curriculum. On the other hand, a number of false / incorrect nutritional information circulate among students where some of them have bad/ unhealthy effects on their body's health and wellness. Moreover, when discussing Healthy behaviors and diet style, students were referring to their culinary and culture background acquired from their parents rather than knowledge acquired from the curriculum.

Hypotheses

- 1. Students studying "Nutrition" at high school have better attitude and believes about healthy diet.
- 2. Students studying "Nutrition" at high school have better nutritional behavior and life style.
- 3. There is a difference between Lebanese student's Secondary background (Scientific and non-scientific) in regard to their nutrition knowledge, attitudes/ believes, and life style.
- 4. Student's nutritional knowledge affect their attitudes/ believes and nutritional behavior/ life style.

The purpose of this study

The aim of this statistical survey is to:

- 1. Determine the knowledge of Lebanese students in regard to nutrition and their attitude and believes.
- 2. To study if those two factors have any impact/ relation on their behavior and daily nutrition life style.
- 3. To analyze the impact of different demographical factors on student's life style

Method

A Questionnaire was distributed among 150 students registered in the faculty of pedagogy, in their first academic year. The survey was checked by three professors to insure its validity and reveals a good reliability when testing using SPSS. The questionnaire was divided into 4 parts:

Personal information

Demographic and basic student's information was collected: age, height and weight in order to calculate their BMI, student's address (urban or rural) and type of the acquired baccalaureate (scientific or non-scientific).

Knowledge acquired from the curriculum

Knowledge is the understanding of any given topic; it refers to an individual's understanding of nutrition, including the intellectual ability to remember and recall food- and nutrition-related terminology, specific pieces of information and facts (FAO, 2014). Basic nutrition information was covered in this part and questions were based on knowledge acquired from the secondary Lebanese curriculum. Each question was accompanied by a list of answers plus the option "I have no idea". All Knowledge questions have a single right answer. Questions were about calories, food nutrients and their effects on human body.

Nutritional conception

In order to evaluate how students perceive nutritional information acquired from the Lebanese curriculum, we included the nutritional conception questions part. This list was prepared based on questions frequently asked by our students in classes. Each question was accompanied with a list of answers plus the option "I have no idea". All conception questions have a single right answer.

Nutritional behavior

In this part, the nutritional behavior of our students was evaluated. The questions covers the intake of specific foods, frequency of intake of specific foods, specific observable behaviors (FAO, 2014). Each question was accompanied by the following answers: Never, Rare, Sometimes, and Always.

Reliability and Validity Analysis of the Questionnaire

The questionnaire was prepared by the researchers and its reliability was calculated for each part of the survey; knowledge, conception and behavior. The results of the analysis revealed a considerable reliability where each part gives a Cronbach's alpha around 0.6. The scale reliability of the questionnaire appeared to be 0.603. The results of the reliability of each part and of the whole questionnaire appears in Table 2 below

Table 2: Reliability Analysis

	Cronbach's Alpha	N of Items
Questionnaire	.603	26
Knowledge	.608	10
Conception	.690	7
Behavior	.698	9

Regarding the validity; three qualified professors agreed on the validity of this questionnaire before conducting the study.

Participants

The research group met students after classes and they explained the objectives of the study. After obtaining oral consent, students fulfilled an anonymous and self-administered questionnaire.

Results

Since the nutrition and health curriculum for "Literature / humanity" and "Sociology / Economics" series are the same, students were divided into two groups: Science and Non-Science groups in order to compare their nutritional knowledge, conception, behavior and life style, and to analyze if there is any influence of their baccalaureate background on the above mentioned parameters.

Statistical analysis:

Demographical and basic students' information:

Approximately 78% of the students were aged between 18 and 21. They were all inscribed at their first university year. Among which, 54% earned a science baccalaureate and 46% non-scientific baccalaureate. When calculating their BMI, 24% were considered under-weight, 66% normal and 10% over weight. Students were also asked if they are following any restrictive diet in order to lose weight; 6% of the students answered by "yes". Student's locations were also assessed. 46% lived in the city of Beirut and 54% lived outside Beirut (rural areas).

Student's level of nutritional information, conception and behavior:

In general, students are considered to have a good nutritional knowledge background were 62% of them answered the first part of the survey that deals with knowledge in a good way. On the other hand, approximately half of the students (53%) acquired acceptable nutritional concepts. In regard to nutritional behavior and life style, students were following good nutritional habits with a percent of 77 (Table 3).

Table 3: Student's level

	Nutritional Knowledge	Conception	Nutritional behavior
		in regard to nutrition	and life style
Bad	38%	47%	23%
Good	57%	43%	61%
Excellent	5%	10%	16%

Knowledge, conception and behavior relationships:

The relationship "knowledge-conception" and "knowledge-behavior" of our students were evaluated by performing chi-square tests. The results are presented in table 4.

Table 4: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Knowledge*Behavior	131.348	108	.063
Knowledge*Conception	258.477	228	.081

The chi-square tests demonstrated that no relationship exists between knowledge and conception from one side and knowledge and behavior from the other side, where p-value > 0.05 for both relations.

Science series versus Non-Science series

By comparing Means of each group (Science and Non-Science) in regard to Knowledge, Conception and behavior, we noticed that science students and non-science students have almost the same nutritional knowledge level and the same nutritional behavior. But when comparing the nutritional conception we noticed that science students have by far better conception (Table 5).

Table 5: Means

Bacalureate type		Knowledge	Conception	Behavior
Science	Mean	59.47	61.77	62.45
	Std. Deviation	15.995	22.320	15.128
Non-Science	Mean	56.65	43.35	59.68
	Std. Deviation	18.573	23.572	14.244

Furthermore, independent samples test was performed to test these three variables (Tab 6). The results showed a high significance of the conception with respect to the type of baccalaureate which explains the high average of the results in table 5. As a summary, students with scientific baccalaureate have almost same knowledge, by far better conception and almost same behavior then their fellow earning a non scientific baccalaureate.

Table 6:Independent Samples Test

	t	df	Sig. (2-tailed)	Mean Difference
Knowledge	.931	122.979	.354	2.822
Conception	4.601	127.285	.000	18.428
Behavior	1.062	125	.290	2.773

This difference may be due to the concept acquainted during the past years of studying biology courses. Knowing well the functions of our organs and systems (especially the digestive system) will help students understanding more the effects of food on our body. By this mean, students will build the well known connection food- body- health and will understand more the impact of their food choices on their wellness.

Data showed also that all students of both series have the same nutritional behavior and life style no matter what were their knowledge backgrounds or their nutritional conception. Although the sciences series students were considered having a good conception in regard to their colleagues from the humanity and economic series, both groups were considered to have the same life style.

A graph showing the high conception of students in the science section compared Non-science section is presented in figure 1.

Figure 1: shows a high count of the science section (1) in favor Non-science (2) regarding conception



The researchers further studied the significance correlation of the three variables: knowledge, conception and behavior for both groups "science" and "non-science" (Tab 7).

Table 7:Correlations

			Bacalureate	Knowledge	Conception	Behavior
			type			
			science1			
			non-			
			science 2			
Bacalureate	type	Pearson	1	082	375**	095
science1	non-	Correlation				
science 2		Sig. (2-tailed)		.350	.000	.290
		Ν	133	132	132	127
Knowledge		Pearson	082	1	.271**	.282**
_		Correlation				
		Sig. (2-tailed)	.350		.002	.001
		Ν	132	132	132	127

Conception	Pearson	375**	.271**	1	.283**
	Correlation				
	Sig. (2-tailed)	.000	.002		.001
	Ν	132	132	132	127
Behavior	Pearson	095	.282**	.283**	1
	Correlation				
	Sig. (2-tailed)	.290	.001	.001	
	N	127	127	127	127

Conception = $\alpha + \beta$ Type of school program. This table reveals that Type of baccalaureate affects student's conception with high significance. Moreover, there was a high correlation between conception, knowledge on behavior and this appears where p-value < 0.05 for all the three variables. The model with the three variables is $\beta 1$ Knowledge + $\beta 2$ concept+ $\beta 3$ Behavior = $\alpha + \gamma$ type of Baccalaureate.

The three variables are in high correlations together and this was affected directly by the type of program students chose in high school.

The variable location is tested using regression to check whether it affects knowledge behavior or conception, the results appear in table 8.

Table 8: Coefficients

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		-
	В	Std. Error	Beta		
(Constant)	71.668	4.507		15.902	.000
Location	-6.236	2.742	220	-2.274	.025

Dependent Variable: Behavior

This table shows that student's location (whether living in the city or outside) appears to affect only the behavior and not the conception or knowledge.

A t- test for independent samples for location and the three variables is displayed in table 9.

Table 9:	Independent	Samples	Test
I unic / i	macpenaem	Sumples	1000

	t	df	Sig. (2-tailed)	Mean Difference
Knowledge	.656	105	.513	2.278
Conception	1.359	105	.177	6.474
Behavior	2.262	92.830	.026	6.236

In this test, the effect of location on behavior is clear where significance <0.05. When comparing the means to check which location is higher than the other in comparing the three variables under investigation, we obtain "village" higher than "city" and this is reflected in table 10.

Table 10: Means

Location type		Knowledge	Conception	Behavior
City	Mean	59.48	58.22	59.20
	Std. Deviation	19.959	20.792	14.169
Village	Mean	57.21	51.74	65.43
	Std. Deviation	15.910	26.587	13.608

Other parameters such as BMI didn't affect knowledge, conception or behavior where the significance level is greater than 0.05.

Discussion

Conception among scientific and non-scientific students

This study showed a significant difference in the type of program followed (scientific versus non-scientific baccalaureate program) with respect to student's conception on nutrition. Students earning a scientific baccalaureate have a better conception toward nutrition than their fellow from the non-scientific program. Science series students have studied more biology and understand well our human body's functions. Thus they are aware of the effects of food on our organism. Knowing well our body's functions and specially the digestive system may influence the understanding of nutritional issues. Accordingly, students will build the well known connection food- body- health and will understand more the impact of their food choices on their wellness. In addition, science education makes a particular contribution to developing powerful ways of thinking (UNESCO, 2008). Indeed, science and mathematics education (SME) that is relevant and of quality can develop critical and creative thinking among students (UNESCO, 2008). Hence, science students could have a positive view of some scientific topics than non-science students (Kaldo, 2010; Gregory, 2009). The above mentioned explanation could be the reasons why student's conception toward nutrition showed high among science series students than non-science series.

Nutritional Knowledge vs Behavior

Diet choices are based on six keys among which we can list "Education" and "Culture" (Shepherd & Farleigh, 1986; Murcott, 1989; Shepherd, 1989; Shepherd, 1999). Student's nutritional background is not related to the education program they choose to follow during their secondary years of study. All students from all type of series (Sciences and non-sciences series) are the same although the nutritional topics are more discussed and emphasized in nonsciences curricula. Moreover, the type of program doesn't affect student's behavior and nutritional life style. All students (scientific and non-scientific) have the same behavior and are following the same life style in regard to nutrition regardless what their nutritional knowledge background and nutritional conception were. As such the positive impact of nutrition education programs on student's healthier food choices proven by the Food and Nutrition Service (FNS, 2013) is not applicable in Lebanon. Adding to that, there is no correlation between student's nutritional knowledge and conception respectively with their behavior.

The impact of student's location on their behavior

The only parameter that could influence the behavior was student's location. Students living in rural areas have better nutritional behavior than their colleagues living in Beirut although they have almost the same level of knowledge (Tab 9, 10). Students living outside Beirut (mainly from Mount Lebanon) are apparently following a healthy life style that is strongly attached to their culture. A large number of this population is still following the Lebanese Traditional Diet (LTD) known for its benefits on health and wellness (Naja et al, 2013; Issa et al, 2014; Naja et al, 2015; Jomaa et al, 2016). This survey demonstrated that culture rather than knowledge has a great influence on Lebanese students' nutritional behavior.

Conclusion and Recommendation

According to our results, we can conclude that nutrition education in the Lebanese curriculum is not fully achieving its pedagogic objectives due to different reasons:

The Program is not appropriate

Nutrition education design in the Lebanese science curriculum and especially among secondary level is apparently not appropriate to our students. The present education is not influencing students toward a better nutritional behavior and life style. The nutrition part should be reviewed and re-assessed by nutritional education experts to identify the problem and adjust it.

Health and Nutrition Education

Health and Nutrition Education is not continuous during the year of studies from grade1 till grade12 as recommended by the CDC (CDC, 2011). As mentioned in table 1, we can notice the "breaks" among different grades. Starting with the intermediate level and up till the secondary level, nutrition parts are discussed only in grade 9 and 11 for science group and in grade 9 and 12 for non-science group.

Shortage of time

Instructors are sometimes not covering the nutrition – related material due to lack of time they eliminate it in favor to other biology related chapters. Making Biology program more "Light" is specially faced in the secondary level.

Lebanese Traditional Diet

Apparently, our culinary culture has a great impact on our students' food choice especially for those living in rural areas. Students' nutritional behavior is inherited / acquired from their parents and society where part of the population is still following the healthy Lebanese traditional diet. In the present curriculum, the majority of food examples presented are not well related to Lebanese culinary culture, and the only area where the LTD is discussed in Grade 2. Thus, one of the nutrition program's pedagogic objectives should follow the strategies suggested by CDC (CDC, 2011) by implementing a planned and sequential health education curriculum that is culturally and developmentally appropriate. This strategy could be realized by "Promoting our Lebanese Traditional Diet" and by stressing on its benefits on our health (Naja et al; 2015).

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