

## FOOD AND NUTRITION KNOWLEDGE IN CHILEAN HIGH SCHOOL GRADUATES<sup>1,2</sup>

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### SUMMARY

The purpose of this study was to determine the degree of knowledge on food and nutrition in students graduating from high school in the Metropolitan Area of Santiago. The sample included 272 students of both sexes and type of school (public and private) and from high, medium and low socioeconomic level (SEL), measured through the Graffar Modified Scale. The degree of knowledge on food and nutrition was measured through a test of 48 items based on curriculum program objectives. The test covered three areas: Area 1, Food and Requirements; Area 2, Food, Personal and Environmental Hygiene, and Area 3, Nutritional Physiology.

Students showed a good achievement of the food and nutrition objectives that are considered essential for obtaining and adequate nutrition and health status. Students from high SEL registered a significantly higher degree of knowledge on food and nutrition than students from other strata ( $p < 0.001$ ). However, sex and type of school had no effect on the degree of food and nutrition knowledge.

This study is a contribution to the better understanding of factors affecting the food and nutrition knowledge, and provides good foundations for further studies.

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## INTRODUCTION

The goals that Chile's educational system sustains are, among others, to form people responsible to their family group, their national community, and the cultural development of the world. To achieve these goals, it is imperative that students obtain the fundamental knowledge that will enable them to continue into higher education (1, 2).

In this context, food and nutrition knowledge in students becomes of major importance insofar as it allows them and their families —by means of a permanent educational process— to obtain an adequate nutrition and health status according to their genetic potential.

Reciprocal effect of the school-family dyad has already been emphasized in several studies. Nutrition programs aimed at students have had significant results both in his/her as well as in his/her family group's food culture (3-5). On the other hand, nutrition education programs with parental involvement have a positive effect on the food behavior of students (5, 6).

As in other populations, the food and nutrition situation of the school population is mainly determined by genetic and environmental factors. The degree of knowledge on food and nutrition plays an important role in food consumption, biological utilization of nutrients, diet quality and, consequently, in the health status (7-10). This acquires great importance, as health status of the students is also reflected on educational achievement (11, 12).

Nutrition diseases have for a long time affected an important part of the world's population, and because of their magnitude, at present these have become collective nutrition problems. The high incidence of malnutrition, anemia, goiter and hypovitaminosis in developing countries, contrasts with an increase in obesity, diabetes and atherosclerosis in developed countries. In recent years, a significant decrease in undernutrition and an important increase in obesity has been registered (13). Many of these problems could be prevented through an adequate nutrition education program inserted in the formal education process. Education constitutes an important vehicle in the improvement of nutritional status, both in individuals as well as in the population as a whole (14, 15).

The Programs of Studies prepared by the Ministry of Education of Chile, for both elementary and high school include a series of objectives in the area of nutrition that cover a great variety of contents. In spite of this, there has been insufficient research to measure the degree of food and nutrition knowledge both in students as well as in the general population (16, 17).

Considering the objectives of the Chilean Educational System in the area of food and nutrition, the aims of this study were to measure the degree of knowledge on food and nutrition in students graduating from high school in the Metropolitan Area of Santiago. A second purpose was to determine the effect of the socioeconomic level, sex, and dependency of the educational establishment on what concerns the degree of knowledge on food and nutrition on the part of students.

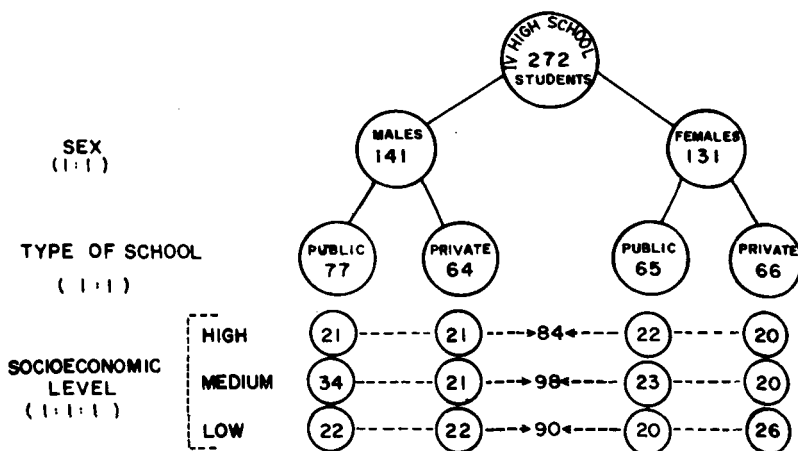


FIGURA 1

Description of the sample

## MATERIAL AND METHODS

*Sample*

A random sample of 272 students from the Metropolitan Area of Santiago, was selected (Figure 1). The sample included the same number of students of both sexes, dependency (public and private schools) and of high, medium and low socioeconomic level (SEL). They belonged to IV Grade, last year of High School. The field study was carried out during the second semester of 1982.

*Socioeconomic Survey*

SEL of the students was measured through the Graffar Modified Scale (18,19) which included schooling, occupation of the household head and housing conditions (property, water supply, sanitation and goods).

*Food and Nutrition Knowledge Test*

The degree of food and nutrition knowledge was measured through a test of 48 items and the degree of difficulty of the test and of each question, was determined by the percentage of correct responses. Question homogeneity was measured relating the variable measured by the

question and overall point of the test. Estimation was carried out through point-biserial correlation, and all questions registering biserials of less than 0.30 in the pilot test, were eliminated.

The test was designed on the basis of the objectives pursued by the basic and high school curriculum program of the Ministry of Education of Chile, for which purpose a table of specifications was prepared (1,2). This table considered, on the one hand, the objectives of the area of nutrition, that the student to graduate from high school, should have acquired during his school life and, on the other, the contents contemplated by these objectives (Table 1). From the table of specifications, it became evident that the test was divided into three main areas:

- Area 1: Food and Requirements
- Area 2: Food, Personal and Environmental Hygiene
- Area 3: Nutritional Physiology

#### *Statistical Analysis*

Data were analyzed by chi-square procedures (20). For each variable it compared students who obtained less than 50% of correct responses with those who obtained equal to or more than 50% of correct responses.

### RESULTS AND DISCUSSION

The degree of knowledge on food and nutrition in students to graduate from high school by percentage of correct responses, is shown in Table 2. As the data show, only 4.4% and 6.2% of students registered optimum and very insufficient food and nutrition knowledge, respectively. Due to the fact that these extreme groups represented such few students, the very insufficient group was merged with the insufficient one, and the optimum group with the sufficient group. Thus, the degree of knowledge on food and nutrition was expressed in two classes: sufficient food and nutrition knowledge (equal to or more than 50% of correct responses), and insufficient food and nutrition knowledge (less than 50% of correct responses). Therefore, students who obtained sufficient food and nutrition knowledge—in fact to approve the test which constitutes the minimum degree for them to have a positive food behavior—have an acceptable nutrition and health status, considering that an optimum food and nutrition knowledge degree was obtained only by a reduced number of students. In this context, students that registered 50% of correct responses did not pass the test, and their degree of knowledge on food and nutrition was estimated as insufficient.

The degree of knowledge on food and nutrition on what concerns the overall results as well as the different areas of the test, are shown in Figure 2. In relation to the overall results we can say that 21% of the students obtained a score showing sufficient knowledge. In Areas 1, 2 and 3, 60.7, 83.1 and 7.0% of the students obtained sufficient knowledge scores, respectively. Low achievement in Area 3 could be explained in the light of its being a selective subject, of great importance to university studies in the area of biology, which is not of interest to all students. For this reason, the overall results of the test do not include Area 3. In

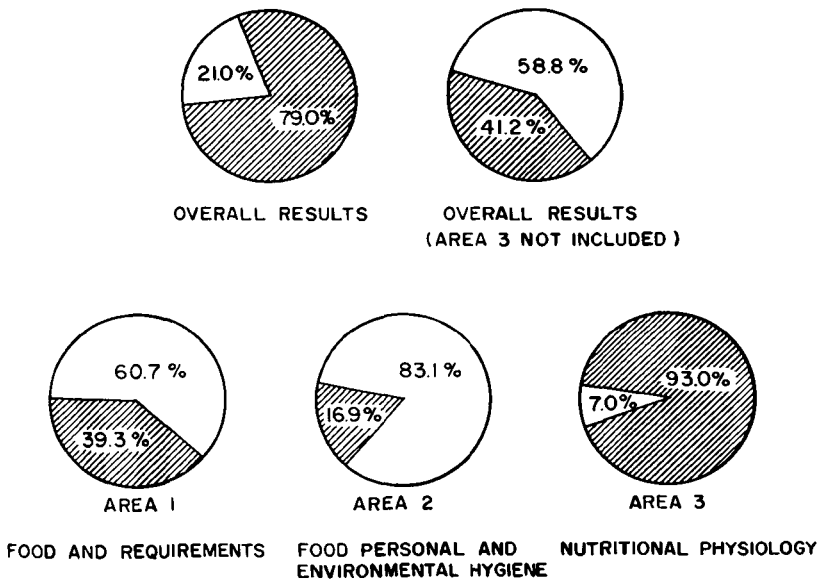
TABLE 1

SPECIFICATION TABLE OF OBJECTIVES AND CONTENTS FROM BASIC AND HIGH SCHOOL CURRICULUM PROGRAMS																
Area of measurement	Contents	Specific objectives											Total questions			
		1) Identify the foods necessary to normal growth of man & classify them by their composition and function	2) Knowledge of nutrients & their function in the human organism	3) Characterize & appreciate the consequences of some status & common deficiency diseases	4) Describe the characteristics of the balanced diet & establish its contribution to health preservation	5) Knowledge of the variations of the model allowance & its adjustment to family budget	6) Appreciate the effect of limiting factors of man's defensive capacity	7) Know and value the importance of satisfying the mother & lactating food needs	8) Establish & apply basic goals of food hygiene in storage, distribution, handling, preparation & consumption of foods	9) Apply basic hygiene goals to practical situations to provide for postural & nutritional troubles	10) Identify the structural & functional characteristics of the human digestive system	11) Explain the blood functions	12) Describe the energy-releasing process of Krebs cycle	13) Explain the physiological processes of the endocrine glands	By contents	By area
AREA 1 Food and Requirements	1. Classification of foods	6													6	
	2. Nutrients and their function in the human organism		3	4											7	
	3. Balanced diet				2										2	2
	4. Nutritional requirements in the human being				2										2	
	5. Model allowance and its budget					2									2	
	6. Food preparation and budget					1									1	
	7. Alcoholism, drugs and undernutrition							2							2	
	8. Pregnancy and lactation								3						3	
AREA 2 Food, Personal and Environmental Hygiene	1. Food, hygiene goals								7						7	
	2. Personal and environmental hygiene goals												2	2	9	
AREA 3 Nutritional Physiology	1. Foods, nutrients and digestion											4			4	
	2. Anatomy and physiology of the digestive system											1			1	
	3. Absorption of nutrients											1			1	
	4. Blood functions												1		1	14
	5. Anatomy and physiology of blood cells													3	3	
	6. Cell and energetic metabolism												2		2	
	7. Endocrine glands and hormones													2	2	
Total questions (by objectives)		6	3	4	4	3	2	3	7	2	6	4	2	2	48	

**TABLE 2**  
**DISTRIBUTION OF THE SAMPLE BY PERCENTAGE OF CORRECT RESPONSES\***

Conceptual evaluation	Percentage of		Total sample	
	Correct	Responses	N	Percentage
Optimum		>74	12	4.4
Sufficient	50	—	74	16.6
Insufficient	25	—	198	72.8
Very insufficient		<25	17	6.2
Total			272	100.0

\* Mean  $\pm$  SD of correct responses =  $41.5 \pm 12.2\%$ .



**FIGURE 2**

Food and nutrition knowledge degree of Chilean high school graduates. Blank and shaded areas represent students who obtained sufficient and insufficient degree of knowledge on food and nutrition, respectively

these conditions, 58.8% of the students obtained sufficient knowledge scores in the test, an overall result which adjusts to reality, since the objectives of Areas 1 and 2 are very important for the personal and family life of the students. This acquires special significance, as a large percentage of students do not continue their studies into higher education (21).

On the basis of 48 test items, the total score of students to be graduated from high school ranged from 6 to 42, with a mean of  $19.94 \pm 5.86$ , such as expressed in Table 3. According to the areas measured, the lowest mean score was registered in Area 3, with a mean of  $2.60 \pm 2.24$  and a percentage score of 18.6, the reason being that, as explained previously, this is a selective area. Thus, in overall results (Area 3 not included) the total score ranged from 6 to 32, with a mean of  $17.33 \pm 4.33$  and with a percentage score of 51.0, higher than the registered value yielded by the students in the overall results, which was 41.5.

The answers of Chilean high school graduates to food and nutrition knowledge items are presented in Table 4. As data reveal, in Area 1, more than 80% of students recognized the importance that calcium and phosphorus have for the formation of bones (item 9), related physical activity and caloric intake (item 17), and knew the frequency of vegetables and fruit consumption (item 20). About three-fourths identified a meat substitute (item 3), the characteristics of a balanced diet (item 14) and selected the most nutritious meal (item 16). However, less than one-third of students knew the major nutrients present in milk (item 4), the function of carbohydrates and lipids (item 8) and the results of iron deficiency (item 12). Fewer than one-fourth of them identified major food sources of iron (item 7), the results of vitamin A and iron deficiency (item 10 and 12, respectively), the cheaper meal (item 21), and optimum maternal lactation length (item 25). Nevertheless, almost half could differentiate food from nutrient; identified the four food groups, named major food sources of vitamin A, recognized nutrient requirements during pregnancy; the characteristics of undernutrition, and the benefits of maternal lactation (items 1,2,6,18,23 and 24). Only 39% knew the consequences of alcohol consumption (item 22).

In Area 2, about three-fourths identified typhoid fever and dental caries causes (items 27 and 33, respectively) and the importance of garbage elimination (item 34). Approximately half of the students could identify an adequate process to kill meat parasites (item 26); knew the consequences of intestinal parasites (item 28), and the importance of washing leaf vegetables and milk pasteurization (items 29 and 30, respectively). A total of 40.8% identified fresh fish (item 31) and only 35.3% a canned food in good conditions (item 32).

In Area 3, about one-fourth of students responded correctly to items dealing with basic concepts about digestion (item 35), functions of liver (item 39), characteristics of nutritional anemia (item 41), function of vitamin K (item 43), importance of plasmatic transport of nutrients (item 44), and energy-releasing process (item 46). Less than 15% of them were able to identify the characteristics and functions of monosaccharides, amino acids, triglycerides and proteins (items 36, 37 and 38). Only 7.7% knew the factors that affect nutrient absorption (item 40), and 10.3% defined correctly a calorie (item 45). In regard to com-

TABLE 3

**NUTRITION KNOWLEDGE TEST SCORES OF CHILEAN STUDENTS  
GRADUATING FROM HIGH SCHOOL BY AREA OF MEASUREMENT**

Area of measurement	Highest possible score	Range	Mean score
Area 1	25	3-23	12.21 ± 3.27*
Area 2	9	1-9	5.13 ± 1.67
Area 3	14	0-11	2.60 ± 2.24
Overall results (Area 3 not included)	34	6-32	17.33 ± 4.33
Overall results	48	6-42	19.94 ± 5.86

\* Mean ± SD.

munity nutritional problems related to an excess in nutrient consumption, only 19.5% identified the characteristics of diabetes (item 47), and one third knew the causes for atherosclerosis, considering that, in this sample, high SEL females aged over 16 years presented a lipoproteic pattern of possible atherogenic risk (item 42) (22).

The effect of SEL on the knowledge on food and nutrition in the students is shown in Figure 3. Students belonging to high SEL registered a degree of knowledge on food and nutrition that was significantly higher in comparison to students from others levels. This was observed in the overall results in general, in the overall results not including Area 3, in Area 1 and also in Area 3 ( $p < 0.01$ ). In Area 2, SEL had no significant effect on the degree of knowledge on food and nutrition, since a student to graduate from high school has acquired basic norms on food, and on personal and environmental hygiene.

The significant effect of SEL on the degree of knowledge on food and nutrition has been underlined in some studies, wherein students from high SEL obtained a degree of knowledge on these topics significantly higher than that acquired by students belonging to other social strata (23,24). On the other hand, it has been described that the complexity of an adolescent's diet increases significantly with an increase in parents' sociocultural levels (25).

Figure 4 shows the effect of sex on knowledge on food and nutrition, knowledge which was higher in females than males, but differences were significant in Areas 1 ( $p < 0.001$ ) and 2 ( $p < 0.02$ ). Results of other studies concerning the effect of sex on the degree of knowledge on food and nutrition and food habits did not point at any relationship between both variables (25-27). Other investigators, however, have confirmed that females had nutrition-related attitudes significantly higher than males (28).

The type of school had no effect on the degree of knowledge on food and nutrition on the part the students. This fact must be explained because the same number of students by socioeconomic level was selected

TABLE 4

RESPONSES OF CHILEAN HIGH SCHOOL GRADUATES ON ITEMS OF  
KNOWLEDGE DOMAIN BY AREA OF MEASUREMENT

Item number by area of measurement	Question content	Correct responses %
<i>Area 1: Food and Requirements</i>		
1	Diferentiation of food from nutrient	59.6
2	Identification of four food groups	57.0
3	Identification of meat substitute	72.1
4	Major nutrients present in milk	32.0
5	Nutrients and balanced diet	45.2
6	Major food sources of vitamin A	54.8
7	Major food sources of iron	20.6
8	Function of carbohydrates and lipids	30.9
9	Importance of calcium and phosphorus	85.7
10	Results of vitamin A deficiency	22.4
11	Identification of food source of iodine	37.9
12	Results of iron deficiency	12.5
13	Results of vitamin B deficiency	27.6
14	Characteristics of a balanced diet	77.2
15	Selection of factors to consider in balanced diet planning	63.6
16	Selection of the most nutritious meal	70.2
17	Relate physical activity and caloric intake	89.7
18	Identification of pregnant nutrient requirements	54.8
19	Knowledge of the frequency of consumption of meat	40.8
20	Knowledge of the frequency of consumption of vegetables and fruits	87.9
21	Identification of the cheaper meal	19.9
22	Consequences of alcohol consumption	39.0
23	Characteristics of undernutrition	50.0
24	Benefits of maternal lactation	46.7
25	Identification of maternal lactation length	23.5
<i>Area 2: Food, Personal and Environmental Hygiene</i>		
26	Identification of an adequate process to kill meat parasites	58.5
27	Identification of typhoid fever cause	78.7
28	Consequences of intestinal parasites	48.5
29	Importance of washing leaf vegetables	51.1
30	Importance of milk pasteurization	56.2
31	Characteristics of fresh fish	40.8
32	Identification of canned food in good conditions	35.3
33	Causes of dental caries	70.6

34

## Benefits of garbage elimination

72.8

## Area 3: Nutritional Physiology

35	Importance of food digestion	22.8
36	Characteristics of monosaccharides and amino acids	8.1
37	Characteristics of triglycerides	12.5
38	Protein structure	14.3
39	Functions of liver	26.1
40	Factors that affect nutrient absorption	7.7
41	Characteristics of nutritional anemia	22.8
42	Atherosclerosis causes	33.5
43	Function of vitamin K	20.2
44	Importance of plasma in nutrient transport	21.0
45	Definition of calorie	10.3
46	Importance of mitochondrias	29.0
47	Characteristics of diabetes	19.5
48	Function of tyrosine in basal metabolism	12.5

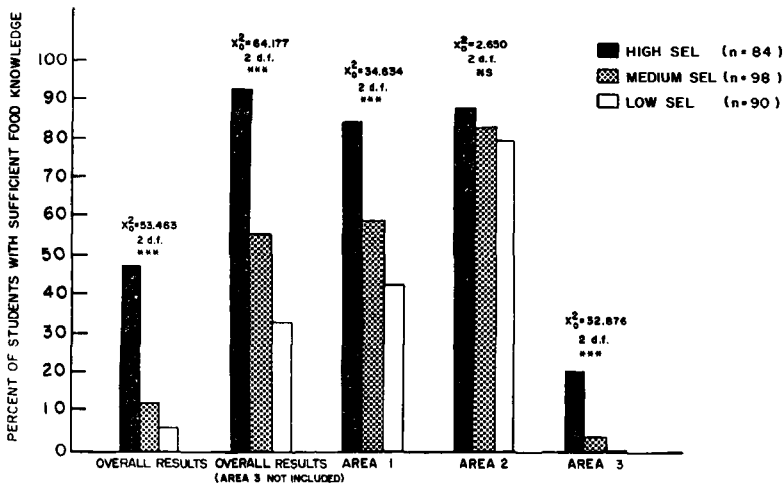


FIGURE 3

Effect of socioeconomic level on the degree of knowledge on food and nutrition of Chilean high school graduates (\*\*\*)  $p < 0.001$

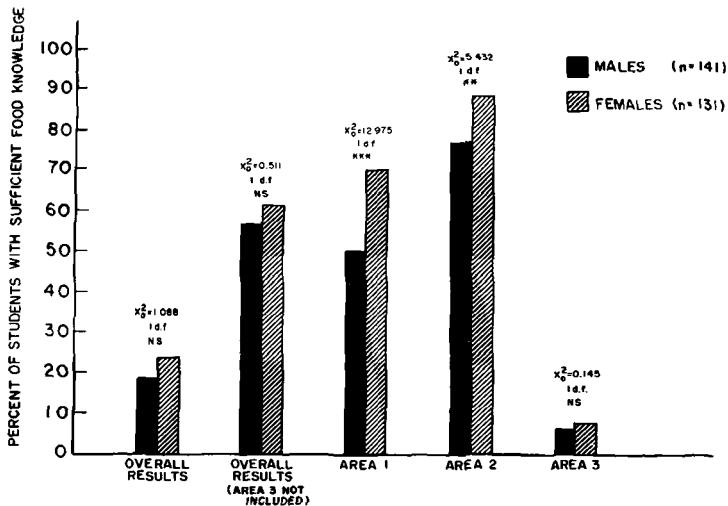


FIGURE 4

Effect of sex on the degree of knowledge on food and nutrition of Chilean high school graduates (\*\*  $p < 0.02$ ; \*\*\*  $p < 0.001$ )

both in public as well as in private schools. In fact, private schools mainly concentrate students from high socioeconomic level and, under real conditions, we would expect that knowledge would be higher in these establishments. However, the cause of these differences is not dependency, but rather the socioeconomic level. On the other hand, it has been reported that students enrolled in private schools score higher than those enrolled in public schools, mainly because the former have specific admission policies of an academic nature (27).

- From the results of this study we can conclude that in this sample:
- Fifty-eight per cent (58%) of the students had sufficient knowledge, indicating a good achievement of essential educational objectives, to obtain an adequate nutrition and health status.
  - Twenty-one per cent (21%) of the students registered sound knowledge on food and nutrition, which is of major importance so as to go on to higher studies.
  - The effect of the socioeconomic level was a significant factor on the degree of knowledge on food and nutrition acquired by the students.

- Sex had no significant effect on the degree of knowledge on the aforementioned subjects, although it was higher in females.
- The type of school had no significant effect over the degree of knowledge on food and nutrition.

### *Significance of the Study*

This study increases the understanding of factors affecting knowledge on food and nutrition, and can be of value in planning nutrition education as part of the curriculum programs by the Ministry of Education. Information concerning knowledge on food and nutrition by the school population in Chile, is practically nonexistent.

### ACKNOWLEDGEMENTS

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### RESUMEN

#### CONOCIMIENTOS ALIMENTARIOS Y NUTRICIONALES DE ESTUDIANTES CHILENOS QUE EGRESAN DE EDUCACION MEDIA

La finalidad de este estudio fue determinar el nivel de conocimientos alimentarios y nutricionales de estudiantes que egresan de Educación Media, en el Area Metropolitana de Santiago. La muestra incluyó 272 estudiantes de ambos sexos y tipo de colegio (públicos y privados) y de nivel socioeconómico (NSE) alto, medio y bajo, medido a través de la escala de Graffar Modificada. El nivel de conocimientos alimentarios y nutricionales se midió a través de un test que incluía 48 ítems, basados en los objetivos que contemplan los programas oficiales de estudio. El test se estructuró en base a tres áreas: Area 1, Alimentación y Requerimientos; Area 2, Higiene Alimentaria, Personal y Ambiental y Area 3, Fisiología Nutricional. Los estudiantes registraron un buen logro de los objetivos del área alimentaria y nutricional, que se consideran esenciales para alcanzar un estado nutricional y de salud adecuado. Los estudiantes de NSE alto registraron un nivel de conocimientos alimentarios y nutricionales, significativamente mayor que los estudiantes pertenecientes a otros estratos ( $P < 0.001$ ). Sin embargo, el sexo y la dependencia del establecimiento educacional no ejercieron efecto significativo en el nivel de conocimientos de los estudiantes. Este estudio es una contribución al campo de la nutrición, que persigue una mejor comprensión de los factores que afectan los conocimientos alimentarios y nutricionales de los estudiantes.

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