



INFLUENCE OF EDUCATIONAL INTERVENTIONS ON NUTRITION AND SUSTAINABILITY IN ECUADORIAN UNIVERSITY STUDENTS RESIDING IN HONDURAS

INFLUENCIA DE INTERVENCIONES EDUCATIVAS SOBRE NUTRICIÓN Y SOSTENIBILIDAD EN UNIVERSITARIOS ECUATORIANOS RESIDENTES EN HONDURAS

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Article received on October 19th, 2020. Accepted, after review, on February 24th, 2021. Published on September 1st, 2021.

Abstract

Eating habits can be compromised in the transition to college life specially in a new country. In addition, the eating patterns of college students could be improved through various strategies during the college adjustment process. A key point is nutrition and sustainability, whose content can be taught through educational sessions at universities. The objective of this study was to evaluate the effect of educational interventions and adherence to the Mediterranean diet (MD) in Ecuadorian first-year university students in Honduras, where the student population of Ecuador ranks second, after Honduras. Eating patterns were evaluated using a questionnaire on adherence to MD and one on eating behaviors. The educational interventions focused on the benefits of sustainability, culture, environment, and health that MD provides. The study had a diagnostic phase with the participation of the universe of students ($n = 65$), and an intervention phase where 32 students participated: 18 in the group that received nutritional education and 14 in the control group. The group that received educational intervention improved their eating behaviors, going from unhealthy to moderately healthy, however, adherence to MD did not show increases at the end of the interventions ($p > 0.05$). The control group did not present changes in any attribute, remaining in unhealthy behaviors and low adherence to MD. Fifty percent of the students in the intervention group returned to Ecuador during the COVID-19 crisis, while in the control group it was 71.4%. In conclusion, it is important to provide advice on nutrition and sustainability from the beginning of university studies, since young people migrate to a country with totally different customs from those of Ecuador and even the Andean Community.

Keywords: Eating habits, Ecuadorian students, nutritional education, sustainable diets.

Resumen

Los hábitos alimenticios pueden verse comprometidos en la transición a la vida universitaria especialmente en un nuevo país. Además, los patrones alimenticios de los jóvenes universitarios podrían mejorarse mediante diversas estrategias durante el proceso de adaptación a la universidad. Por lo cual, un punto clave lo constituyen la nutrición y la sostenibilidad, cuyo contenido puede ser impartido mediante sesiones educativas en las universidades. El objetivo de este estudio fue evaluar el efecto de intervenciones educativas en la adherencia a la dieta mediterránea (DM) y hábitos alimenticios en estudiantes ecuatorianos de primer año universitario en Honduras, donde la población estudiantil de Ecuador se posiciona en segundo lugar, luego de Honduras. Los patrones alimenticios se evaluaron mediante un cuestionario de adherencia a la DM y uno de conductas alimenticias. Las intervenciones educativas se centraron en los beneficios sobre la sostenibilidad, cultura, ambiente y salud que brinda la DM. El estudio tuvo una fase diagnóstica con la participación del universo de estudiantes ($n = 65$), y una fase de intervenciones donde participaron 32 estudiantes: 18 en el grupo que recibió educación nutricional y 14 en el grupo control. El grupo que recibió intervención educativa mejoró sus conductas alimenticias pasando de poco saludables a moderadamente saludables, sin embargo, la adherencia a la DM no presentó incrementos al final de las intervenciones ($p > 0,05$). El grupo control no presentó cambios en ninguna evaluación, manteniéndose en conductas poco saludables y una baja adherencia a la DM. Cincuenta por ciento de los estudiantes del grupo con intervención regresaron a Ecuador durante la crisis de COVID-19, mientras que en el grupo control fue el 71,4%. En conclusión, es importante brindar asesoramiento sobre nutrición y sostenibilidad desde el inicio de los estudios universitarios, ya que los jóvenes migran hacia un país con costumbres totalmente distintas a las de Ecuador e incluso de la Comunidad Andina.

Palabras clave: Dietas sostenibles, educación nutricional, estudiantes ecuatorianos, hábitos alimenticios.

Suggested citation: Enriquez, J.P. and Hernández-Santana, A. (2021). Influence of educational interventions on nutrition and sustainability in Ecuadorian university students residing in Honduras. *La Granja: Revista de Ciencias de la Vida*. Vol. 34(2):77-87. <http://doi.org/10.17163/lgr.n34.2021.05>.

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1 Introduction

Changes in agricultural practices have increased global food supply capacity in a more productive way, providing greater food diversity and less seasonal dependence (Kearney, 2010). Therefore, it is important to guarantee food stability through access, use and economic conditions in food, which is closely linked to the principles of food security (Anderson, 2019). In addition, according to the World Health Organization (WHO), non-communicable diseases (NCDs) are the leading cause of death in the world (WHO, 2014). On the other hand, an encouraging fact indicates that the probability of premature death from NCD has decreased 15% globally in the last decade, with high-income countries showing the greatest progress due to reduced mortality (WHO, 2015).

There are alternative consumption patterns such as organic food that seek to improve people's health and eating habits, for this reason they are considered healthier, tastier and more authentic than traditional food, however they are also listed as more expensive (Bryła, 2016). In this sense, price is one of the main barriers to healthy diets. For example, in Galapagos-Ecuador, residents have increased consumption of processed and ultra-processed food due to its easy access, thus reducing consumption of fresh produce (Freire et al., 2018).

Thus, sustainable diets aim to meet energy requirements through safe, high nutritional quality foods, being attainable, accessible and culturally appropriate (Dernini et al., 2016). In addition, having a reduced environmental impact, they contribute to food and nutrition security (FNS) and guide the population toward healthy living (FAO, 2012; Donini et al., 2016). Sustainable diets include the Mediterranean diet (MD), being presented as a cultural and ecological model for prevention and risk reduction of NCD as autoimmune, cardiovascular, metabolic syndrome, cancer and neurodegenerative diseases (Dussallant et al., 2016; Cadarso et al., 2017; Gómez, 2018), which can have severe consequences in adulthood, but an appropriate lifestyle especially since college years or even before can help prevent them.

Most college campuses have cafeterias that offer a variety of food choices, generating positive but

also not so adequate eating choices (Abraham et al., 2018). Transition to college causes significant changes in dietary options, generating dietary challenges. Even school customs can be a determining factor to eating habits in college. Sánchez et al. (2018), at an Ecuadorian school found that 90% of their students consume junk food and snacks during their recess, pointing to the risk of early appearance of metabolic diseases with a high social and economic cost to the family and the state.

Students may have an important knowledge of nutritional requirements. However, the transition to college life gives them more freedom to choose the type and amount of food they eat. This pattern is generated by the situation that college students face in a new environment for meal preparation and planning during the transition to college life (Abraham et al., 2018).

Educational interventions allow a consumer to relate to the concept of responsible consumption, which involves some awareness and active choices. In Quito, citizens can influence their food environment through campaigns and organizations that promote the creation of open and agroecological markets (Paredes et al., 2019). However, a single promotional measure is not enough to discourage the consumption of unhealthy foods.

Currently, no studies have been carried out on eating behaviors for Ecuadorian university students in Honduras. For this reason, the objective of this study was to evaluate the effect of educational interventions and the consumption of a healthy and sustainable diet (Mediterranean diet) in freshmen Ecuadorian students in Honduras.

2 Materials and Methods

2.1 Study design

An analytical, longitudinal, descriptive study was conducted between February and June 2020 at the Zamorano Pan-American Agricultural School, located in Honduras, which has a student population from 29 countries, especially from Latin America, who live in the campus from January to December, for four years. The data presented in this study are derived from surveys of food behaviors and con-

sumption of MD before and after nutritional educational interventions during COVID-19 pandemic.

2.2 Participants

Sixty-five Ecuadorian students were invited to a nutritional master class during the first period of the 2020 academic year, before the beginning of the COVID-19 pandemic in Latin America. The meeting took advantage of the voluntary recruitment of these students, prior to socializing the study indicating the objective, subject matter and benefits for the participant and the researcher. Participation was voluntary, by signing an informed consent. For this analysis, only first-year Ecuadorian students were considered, and the first data collection took place in the second month of classes. In addition, second, third and fourth-year students were excluded, since they had already had their critical transition to the university system and the cultural environment of the new country.

2.3 Diagnosis phase

In order to contextualize the situation of the 65 Ecuadorian students, data were taken on nutritional behaviors and adherence to MD. Forty-two participants were male and 23 female.

2.4 Intervention phase

At the beginning of the first year, the university equally randomizes students by nationality and gender in eight subgroups. With this background, four of these subgroups were randomly assigned to form the control group and the remaining four to form the intervention group. A final sample of 32 participants was obtained. A group ($n = 18$) was provided with nutritional education interventions, out of which 7 students were male and 11 females. Eight sessions of approximately one hour each were held, four of them in-person and four online due to COVID-19. The topic focused on the benefits of MD in the areas of nutrition, health, sustainability, biodiversity and environmental impact. The electronic platforms used to share content between the researcher and participants were social networks (Facebook, WhatsApp and Microsoft Teams). The use of social media included educational information, messages, reminders, surveys, and event information related to MD. Emphasis was placed on the

proper choice of food by consumers and its future benefits. For its part, the control group ($n = 14$) received no nutritional education; this group was formed by 6 male participants and 8 females.

2.5 Instruments

A 31 multi-choice questionnaire designed and validated by Márquez et al. (2014) was used, omitting two questions that represent the schedules and people with whom students eat during the week and the weekend, since they eat in the campus with an established meal schedule and the social circle of the students is always the same, having a final number of 29 questions. The topic of the questions focused on eating habits, behaviors, and tastes in personal, family, cultural, and institutional settings. The scores obtained from eating habits are grouped into four categories: Healthy (23-30 points), moderately healthy (16-22 points), unhealthy (8-15 points) and very unhealthy (<8 points). Self-perception of improvement in food behaviors during COVID-19 was also taken into consideration.

For the adherence of the MD, the 14-point questionnaire used in the PREDIMED study (Prevention with Mediterranean Diet) was applied, which is a nutritional intervention study carried out and validated in Spain and was used to evaluate the long-term efficacy of MD in the primary prevention of cardiovascular diseases (Martínez et al., 2015). The questionnaire is composed of 14 direct questions about the consumption of the main food of MD: Olive oil, fruits, vegetables, legumes, fish, nuts, moderate consumption of wine and white meat, and low consumption of red and processed meat. The scores obtained are grouped into four categories: High (12-14 points), medium (8-11 points), low (5-7 points) and very low (<5 points).

2.6 Statistics

For the diagnosis phase, the results were summarized using descriptive statistics with means, percentages and standard deviation. For the intervention phase, a comparison test of independent samples (control group and group to which educational interventions were applied) was performed, with the aim of identifying the effect of educational interventions on behaviors and adherence to MD. Paired samples were also analyzed using student's t

test (before and after, in each group) to identify differences between behavioral effects and adherence to MD. In addition, McNemar test was performed to evaluate the significance of adherence distributions and dietary behaviors over the two periods. All analyzes had a 95% confidence level, and the JAMOVI and Statistical Analysis Software SAS® versión 9.4 programs were used.

3 Results

3.1 Diagnosis phase

The overall mean for dietary behaviors was 14.28, showing unhealthy eating behaviors. Most students (68%) had unhealthy and very unhealthy behaviors. In addition, none of the participants had healthy behaviors. In the case of MD adherence, an overall mean of 8.05 was obtained, indicating a mean adherence. The majority of participants (94%) had a medium and low MD adherence (Table 1).

Table 1. Distribution of food behaviors and adherence to MD through their respective levels.

Food behaviors	n		Adherence to MD	n	
	n	%		n	%
Healthy	0	0	High adherence	2	3
Moderately healthy	21	32	Medium adherence	40	62
Unhealthy	43	66	Low adherence	21	32
Very unhealthy	1	2	Very low adherence	2	3

3.2 Intervention phase

The group that received educational interventions for dietary behaviors from the first data collection showed 72% of participants with unhealthy behaviors. However, in the second data collection, 50% of participants showed moderately healthy and healthy behaviors. In terms of MD adherence, in the first data collection, 61% had a medium adherence level, remaining in the same classification with 44% of participants for the second data collection (Table 2). In this group, 50% of students were on campus during the pandemic and 50% in Ecuador.

For the control group, 64% of participants in the first data collection had unhealthy behaviors, remaining in the same classification in the second

data collection with 43% of participants. In relation to the adherence to MD, 64% of the observations in the first data collection belonged to medium adherence and 36% to low adherence. In the second collection, medium adherence was observed in 50% of the participants (Table 2). In this group, 28.6% of students were on campus during the pandemic and 71.4% in Ecuador.

According to McNemar's test, changes in dietary behavior distributions over the two periods were significant in the group with unhealthy behaviors that received educational interventions ($p=0.046$). Regarding MD adherence, this was only significant in the control group, presenting a medium adherence ($p=0.025$).

Table 3 shows that the group that received educational interventions increased from 13.89 (unhealthy) to 16 (moderately healthy). As the control group, the first data collection reported an overall average of 14.79 with unhealthy eating behaviors.

However, the average dietary behavior was 14.71 in the second data collection.

According to the t-test of paired samples, there was only significance for the group with educatio-

Table 2. Distribution of the group with interventions and control in the two data collection using McNemar test.

	Group intervention					Control group				
	Before		After		<i>p</i>	Before		After		<i>p</i>
	n	%	n	%		n	%	n	%	
Food behavior										
Healthy	0	0	1	6	-	0	0	1	7	-
Moderately healthy	5	28	8	44	0.083	5	36	6	43	0.317
Unhealthy	13	72	9	50	0.046	9	64	6	43	0.083
Very unhealthy	0	0	0	0	-	0	0	1	7	-
Adherence to MD										
High adherence	1	6	0	0	-	0	0	1	7	-
Medium adherence	11	61	8	44	0.083	9	64	4	29	0.025
Low adherence	6	33	8	44	0.157	5	36	7	50	0.157
Very low adherence	0	0	2	11	-	0	0	2	14	-

Spaces that do not have a numerical value for probability are due to zero observations in one of the two periods

nal interventions in dietary behaviors, where there was a difference between the dietary behaviors after interventions ($p < 0.001$). Regarding the analysis of independent samples, MD behaviors and adherence were not significantly different in any period ($p > 0.05$).

Table 4 shows that the overall adherence mean in the group with interventions was initially 8.5, and it was then 7.06 for the second data collection. As the control group, the initial mean was 7.93 showing

low adherence and in the second collection the mean was 7, evidencing low adherence.

According to the t-test of paired samples, there was only significance for the group with educational interventions, where there was a difference between initial and posterior adherence ($p = 0.010$). As for the analysis of independent samples, MD behaviors and adherence were not significantly different in any period ($p > 0.05$).

Table 3. Food behavior of the two groups during the two periods with paired and independent samples.

	Intervention		Control		<i>p</i> Independent samples
	Mean	SD	Mean	SD	
Initial food behavior	13.89	3.14	14.79	3.45	0.449
Posterior food behavior	16.00	3.34	14.71	5.34	0.410
	Student's t	<i>p</i>	Student's t	<i>p</i>	
Paired Samples	-4.421	< 0.001	0.053	0.959	

Table 4. Adherence to the Mediterranean Diet (MD) of the two groups in the two periods with paired and independent samples.

	Intervention		Control		<i>p</i> Independent samples
	Mean	SD	Mean	SD	
Initial adherence to MD	8.50	1.76	7.93	2.09	0.407
Posterior adherence to MD	7.06	1.80	7.00	2.60	0.943
	Student's <i>t</i>	<i>p</i>	Student's <i>t</i>	<i>p</i>	
Paired Samples	2.890	0.010	1.447	0.172	

4 Discussion

The unhealthy eating behavior of the total group of Ecuadorian students ($n = 65$) is a negative indicator since it could cause overweight, obesity or even chronic diseases. In this sense, Racette et al. (2005), mention that the greatest increases in overweight and obesity occur in people between 18 and 29, which is an age range of college students. In addition, most college students leaving their parents' homes adapt to social, environmental changes, and experience new financial responsibilities (Das and Evans, 2014), which might worsen unhealthy behaviors.

University students may represent a high-risk group to develop abnormal eating behavior and compulsive exercise (Guidi et al., 2009). In addition, there are limitations to have a healthy diet, such as time constraints, unhealthy refreshments, caloric snacks, stress, expensive healthy food and easy access to junk food (Sogari et al., 2018). In general, university students are affected by constraints related to time availability, environmental barriers such as the lack of cheap, tasty, and healthy dining options in the university's dining room (Hilger and Diehl, 2019). Therefore, a timely nutritional education intervention can be a key point in improving the lifestyles of young university students.

Educational interventions have improved eating habits from unhealthy to moderately healthy ($p < 0.001$) in the group that completed the training course. This is consistent with Hekler et al. (2010), where students who took a Food and Society course increased their healthy eating habits, improving their vegetable consumption and decreasing the intake of fatty dairy products. In addition, Boyle and LaRose (2009) found that intra-personal,

inter-personal, and environmental factors affect the physical activity and eating habits of college students. Boucher et al. (2015), found that educational interventions allowed students to increase the consumption of fruits and vegetables, emphasizing the importance of developing interventions in university students to promote healthy behaviors. On the other hand, those who perceive that food poisoning is a personal threat tend to eat less dangerous food (Byrd et al., 2008).

The change observed in 22% of students (from 72% to 50%) with unhealthy eating behavior ($p = 0.046$) shows the willingness of the participants to change the eating patterns, contrary to the control group where, despite the decrease from 64% to 43%, there was no significant difference ($p = 0.083$). This is consistent with Reed et al. (2011), in which 10 to 19% of university students participating in the study modified their food choices after receiving intervention.

An effectiveness survey of a health-promoting smartphone application for university students showed that many students were unhealthy and did not have healthy behavior despite mentioning that the application was useful, beneficial, and increased self-awareness (Miller et al., 2015). This is consistent with the current study where despite completing the nutrition education course with good participation, not all students improved their eating habits. One possibility is that because of the pandemic, stress related to confinement has caused alterations with respect to binge eating and dietary restrictions (Flaudias et al., 2020).

50 and 71.4% of the students in the intervention and control group, respectively, returned to Ecuador due to the pandemic, which could be one of the

causes of positive results in improving eating habits, since they had the family support to apply the acquired knowledge. This would be consistent with an ethnographic study that examined the university trajectories of first-generation rural students by stating that families should be involved and family support models should be replicated due to the importance of family, institutional, state and federal policies and practices (Beasley, 2016).

Attempts to change the diets of the population often adopt highly individualistic approaches which may overlook structural factors that influence access to and availability of healthy food options (VanHeuvelen and VanHeuvelen, 2019). Most people agree that the population's eating habits are unhealthy, however, they feel that they eat healthier than other people around them (Sproesser et al., 2015). Therefore, efforts are needed at university campuses to promote healthy lifestyles among their student population during the college years (Groppe et al., 2012).

When evaluating adherence to MD of the entire group of Ecuadorian students in the diagnostic phase, an average of 8.05 points were obtained, positioning the group in medium adherence. However, once the interventions were completed with the 18 participants in this group, there was a significant decrease ($p = 0.01$) of this adherence, reducing it to low adherence, indicating levels higher than 50% in the two groups with low and very low adherence. This is similar to what was presented by Míguez et al. (2013), who found that 90% of university students need to modify their eating habits to adapt to this dietary pattern. In addition, a study carried out in a Spanish university population also agrees with the current research, where 96.1% of participants need to improve the quality of their diet and only 5.3% of the students achieved a high adherence to the (García et al., 2014).

A study of nutritional knowledge in Italy shows that it was significantly associated with higher adherence to MD regardless of socioeconomic factors (Bonaccio et al., 2013). This contrasts with this research, where socioeconomic factors, especially COVID-19, may have limited the availability of certain food in students in Ecuador. Navarro et al. (2014), found that students living in their parents' home had a high adherence percentage, which was

significantly higher than those living in apartments or student residences. In addition, the pandemic threatens millions of people living or are at risk of developing food insecurity (Paslakis et al., 2020), a situation that could occur in both groups due to limited access to certain food in all countries.

A study that aimed to determine adherence to the Mediterranean diet of a university population and to analyze several factors that can condition its nutritional quality found that 9.5% of university students had a low adherence, 62.1% showed an intermediate adherence and 28.4% a high adherence (Durá and Castroviejo, 2011), which is consistent with our first data collection. Therefore, it is necessary to ensure that food security, healthy eating attitudes and behaviors are a global priority in order to ensure the health of the population, especially during the pandemic (Paslakis et al., 2020).

5 Conclusions

This study indicates a higher trend in improving dietary behaviors when educational interventions are performed at a university level. Therefore, these programs can reduce the bad eating habits generated in the transition from home to university life in a new country. However, adherence to a healthy and sustainable dietary pattern reduced, which may have been due to problems of accessibility to certain food as a result of the pandemic.

Policies and programs to support students need to be developed to strengthen their knowledge of nutrition and sustainability. These notions should generate an impact factor on students that will enable them to improve their eating habits and adopt dietary patterns that benefit human and environmental health. In addition, it is important to give this support from the beginning of university studies, because young people migrate to countries with customs which are totally different from their home country. The improvement in food habits in times of pandemic among Ecuadorian students reflects the need to develop institutional programs that facilitate their transition to university.

Acknowledgments

The authors thank Zamorano's Master Program in Sustainable Tropical Agriculture (MATS) and the Institute for Technology in Health Care (ITHC) for supporting research materials. In addition, the authors are very grateful to all study participants.

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