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Food insecurity in Chilean university students during the COVID-19 pandemic

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ABSTRACT

Background: *Food and nutrition were affected by the COVID-19 pandemic, increasing levels of food insecurity. University students were a risk group for food insecurity due to the closure of educational establishments where they received their main meals.* ***Aim:*** *To assess food insecurity among Chilean public university students before and during the COVID-19 pandemic.* ***Material and Methods:*** *The study had a non-probabilistic before-and-after design. Undergraduate students from all colleges at the university were invited to answer an online survey about food insecurity, devised based on FAO Food Insecurity Experience Scale.* ***Results:*** *Nine hundred and one students answered the survey. The prevalence of moderate/severe food insecurity increased from 9.5% to 14.3% before and during the pandemic, respectively. Forty two percent (n = 196) of student households became food insecure during the sanitary crisis. Students commented on the positive and negative aspects of the pandemic in their eating behaviors.* ***Conclusions:*** *Undergraduate students are vulnerable to food insecurity. Mitigation actions should be carried out when educational establishments are closed.*

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Key words: *COVID-19; Education, Medical, Undergraduate; Food Insecurity; Students.*

Inseguridad alimentaria en estudiantes universitarios durante la pandemia de COVID-19

Antecedentes: *La alimentación y la nutrición se están viendo afectadas por la pandemia por COVID-19, aumentando los niveles de inseguridad alimentaria. Un grupo susceptible a la inseguridad alimentaria son los estudiantes universitarios debido al cierre de los establecimientos educativos donde ellos pueden recibir sus alimentos principales.* ***Objetivo:*** *Evaluar la inseguridad alimentaria de los estudiantes de una universidad pública de Chile, antes y durante la pandemia por COVID-19.* ***Material y Métodos:*** *El estudio tuvo un diseño de antes y después, no probabilístico. Se invitó a participar a estudiantes universitarios de todas las facultades de la universidad a contestar un cuestionario en línea, desarrollado basado en la escala de experiencia de inseguridad alimentaria de la FAO.* ***Resultados:*** *Novecientos y un estudiantes respondieron*

la encuesta. En estos estudiantes, la prevalencia de inseguridad alimentaria moderada/grave aumentó de 9,5% a 14,3% antes y durante la pandemia, respectivamente. El 42,3% (n = 196) de los hogares estudiantiles pasó a tener inseguridad alimentaria durante la crisis sanitaria. Los estudiantes comentaron aspectos positivos y negativos de la pandemia en sus conductas alimentarias. ***Conclusiones:*** *Estos resultados reflejan que estos estudiantes son vulnerables para inseguridad y amerita acciones de mitigación cuando los establecimientos educativos están cerrados.*

Palabras clave: *COVID-19; Educación de Pregrado en Medicina; Estudiantes; Inseguridad alimentaria.*

At the World Food Summit, countries agreed that food security exists when "all people have, at all times, physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"[1]. In contrast, the concept of food insecurity (FI) refers to the lack of one or more of the elements. During the sanitary crisis due to COVID-19, food security has been threatened worldwide. Diets and nutrition are being affected by confinement, by economic depression, by access difficulties, and by the lack of availability of healthy and safe food, especially for the most vulnerable groups[2,3].

In Chile, by 2019, 13% of the population had moderate or severe FI, and 3.4% had severe FI[4]. During the pandemic period, national data showed that FI increased to 19%[5]. To face this situation, the Chilean government implemented measures such as delivering food baskets to vulnerable families, keeping food programs at schools, and allocating food scholarships for college students, which included the use of a debit card to buy food[6,7].

Students are among the groups whose food access has been affected since the imposed sanitary measures have generally closed educational establishments. A significant number of students received important amount of food from schools, leaving this group of the population in risk for FI. Even before COVID, a significant proportion of college students had some degree of FI in Latin America[8,9] and the world[10-12], which may have worsened during the pandemic.

Different studies have shown that college students had decreased food security due to changes at home and their families' employment status[13,14]. There is not much research on FI of students in Latin America and the Caribbean during this health crisis.

Before the pandemic, a study in 54 higher education institutions in Chile revealed that less than half of the respondents ate breakfast daily, about a third of the young people did not eat lunch every day, and the frequency of regular dinner consumption was very low[15]. Another study indicated that about 43% of college students skip breakfast and about 50% eat meals after hours "sometimes" or "almost always"[16]. Additionally, Durán et al. report a high consumption of alcohol, junk food, and sweet snacks in the college population[17]. These eating habits can contribute to the FI risk in college students.

In this context we hypothesize that college students increased levels of FI because of the pandemic. The objective of this study was to estimate the food and nutritional security status of students at a Chilean public university before and during the COVID-19 pandemic.

Materials and Methods

Design

The present study has a before-and-after, non-probabilistic design. This research was carried out online, to reach a greater number of participants, in less time and at a lower cost[18,19].

The study protocol was approved by the Faculty of Medicine Ethics Committee (#084-2020). Each participant had to review and approve the informed consent before participating.

Participants

Undergraduate students from all the colleges of a public university were invited to participate

through an institutional teaching platform with universal access. In addition, the survey was disseminated through a mass email managed through the Vice-Rector's Office for Student and Community Affairs.

Data collection

A closed response self-report questionnaire was developed using a virtual platform. This questionnaire included: sociodemographic data, a questionnaire based on the Food Insecurity Experience Scale[20] (FIES, Table 1); and additional comments section, which was open-ended. The survey was available on the platform for two months (from July to September 2020).

The FIES was developed by the "Voices of the Hungry" project[21]. The questionnaire consists of 8 dichotomous questions regarding different aspects connected to FI[20,22]. Questions range from the concern for having or not having food and the food quality to different degrees of food scarcity and even the feeling of hunger. The FIES classifies FI into different severity levels: mild (uncertainty about the ability to obtain food but also food security-which is why the use of this category is not recommended); moderate (the food quality is put at risk, the food variety is compromised, the food quantity is reduced, or meals are skipped); and severe (no food is consumed for a day or more)[22]. To make the comparison with the pre-pandemic situation, students were asked about their situation by February 2020 and the period in which the survey was available.

Data analysis

Descriptive statistics were used to characterize the sample and the categorical variables. The Rash model (Appendix A) was used for the analysis of FI[23], as recommended by the Food and Agriculture Organization[24,25]. To compare FI before and during pandemic, we use Chi square test.

The answers to the open question were analyzed using an inductive qualitative analysis based on Grounded Theory[26,27]. A researcher carried out an open coding process[28] and created as many codes as necessary, applying one or more codes to each comment. Then the codes were grouped and related to describe the findings and analyze the information. The analysis was conducted in the Atlas ti software. Quotations from the students are used to illustrate the topics.

Results

Students' characterization

The questionnaire was answered by 901 students from several schools at the University (Table 2). Most of these students were female (66.9%). Forty-two percent of them were be-

Table 1. Food Insecurity Experience Scale items

ITEM: Questions
Worried: Did you or someone else in your household worry about not having enough food to eat due to lack of money or other resources? Yes or No
Healthy: Have you or someone else in your household ever been unable to eat healthy and nutritious food due to lack of money or other resources? Yes or No
Fewfood: Have you or someone else in your household ever eat a small variety of foods due to lack of money or other resources? Yes or No
Skipped: Have you or someone else in your household ever had to skip breakfast, lunch, eleven, or dinner due to there wasn't enough money or other resources to get food? Yes or No
Ateless: Have you or someone else in your household ever ate less than you thought you should due to of lack of money or other resources? Yes or No
Runout: Has your household ever run out of food due to lack of money or other resources?
Hungry: Have you or someone else in your household ever felt hungry and did not eat due to lack of money or other resources to obtain food? Yes or No
Whlday: Have you or someone else in your household ever stopped eating for a whole day due to lack of money or other resources? Yes or No

Table 2. Students' sociodemographic characteristics (n = 901)

Variable		Value
Gender (%)	Female	66.9
	Male	28.4
	Other	4.70
Mean Age (SD)		21.90 (3.40)
School (%)	Maths and Physics	17.2
	Medicine	11.6
	Economy and Business	10.9
	Chemical and Pharmaceutical Sciences	10
	Odontology	9.1
	Social Sciences	5
	Law	4.77
	Philosophy and humanities	4.2
	Others	27.3
Household Income per month during 2020 (%)	February	June
> US $1,430	28.31	23.26
US $ 977 - $1,430	11.35	9.33
US $ 702 - $977	10.56	9.21
US $ 568 - $702	7.53	8.31
US $ 488 - $568	6.85	6.4
US $ 418 - $488	5.39	6.74
US $ 376 - $418	4.27	4.94
US $ 293 - $376	3.48	4.16
US $ 142 - $297	6.63	8.2
<US $ 142	4.61	7.75
Do not know/Do not respond	11.02	11.7

Note: *US $ 1 = $ CLP 721,8

tween 18 and 20 years old, while nearly all of the rest were between 21 and 30 years old. Only two participants were older than 30 years (0.22%). In terms of household income during the month of February 2020, almost one third of the participants indicated having a household income greater than CLP$1,025,000 (US $1.430), while less than 5% reported less than CLP$102,500 (US $142) in income per month. Regarding the income of June 2020, being in a pandemic, 23.53% reported household income above CLP$1,025,000 (US $1.430), which represents 5% less than in February 2020 and, in the case of the lower income bracket, an increase of 1.55% was reported compared to February of the same year (Table 2).

Food insecurity

The prevalence of moderate and severe FI prior to the pandemic was 9.92%, increasing to 14.31% during it. However, the prevalence of severe FI decreased from 1.81% to 0.89%, during the sanitary crisis. When comparing before and after per FI items, the betas for the WORRIED, HEALTHY, FEWFOOD, ATELESS, WHLDAY items were statistically different (Table 3). We could not compare FI prevalence by socioeconomic variables since we did not have enough information in each subsample.

Of all those surveyed, 51% of the students indicated having no FI in their households before the pandemic. From these, 196 students (42.3%)

Table 3. Prevalence and absolute difference between before and during pandemic

Item	Before the pandemic	During the pandemic	z[a]	p - value
Worried	0.23	0.25	7.513	0.000
Healthy	0.35	0.54	2.095	0.036
Fewfood	0.42	0.04	2.229	0.026
Skipped	0.16	0.28	-1.487	0.137
Ateless	0.10	0.10	-1.963	0.05
Runout	0.10	0.11	-1.416	0.157
Hungry	0.52	0.79	-1.11	0.267
Whlday	0.09	0.16	-2.291	0.022
Moderate + severe prevalence rate	9.92%	14.98%		
Severe prevalence rate	1.33%	1.04%		
Correlation between the items in common	97.96%	98.50%		

[a]: Statistic for the χ^2 test.

Table 4. Changes in the level of food insecurity at college students' households between both states, before and during the pandemic

		Before the pandemic	
During the pandemic	**Food insecurity**	**No food insecurity**	**Total**
Food insecurity[a]	376 (85.8%)	196 (42.3%)	572 (63.5%)
No food insecurity[b]	62 (14.2%)	267 (57.7%)	329 (36.5%)
Total	438 (100%)	463 (100%)	901 (100%)

Note: [a]: Cases with at least one question answered "Yes", including the extreme cases -all questions answered "Yes"- (7 cases of extreme food insecurity); [b]: Cases without any type of food insecurity, every question answered "No".

said that they changed their household status to having FI during the pandemic. The prevalence of moderate to severe FI in that group that changed their status reached 20.15%. In contrast, in the households with FI before the pandemic, 14.2% of the students reported changing their status to FI situations during the pandemic (Table 4).

Before the pandemic, the main FI situation declared by the participants was to eat few kinds of food due to having no money (23.4%), followed by the situation of being worried about not having enough food (19%). During the pandemic, 38% of students declared being worried about not having enough food, followed by eating few kinds of food (32.9%) and being unable to eat healthy and nutritious food (21.4%). Just a few students declared they had not eaten for a whole day before (1.9%) and during the pandemic (1.3%) (Figure 1).

In Table 5, we show a summary of the themes and the corresponding quotes found from the open-ended comments. There were negative and positive aspects related to FI. The impact of the pandemic on the household economy was large and some students reported food shortages at home. Another group of students noted that spending more time at home, added to increased food prices, has resulted in increased household spending on food, a forced redistribution of the budget, and some even reveal that their households had to resort to rationing. Additionally, some respondents indicated it was difficult to access to healthy food; reasons mentioned with reduced consumption of healthy food was lack of income and the low availability of foods such as fruits, vegetables, and legumes, as well as the limitation of home delivery services.

In the positive side, some students indicated that there were some benefits during the pan-

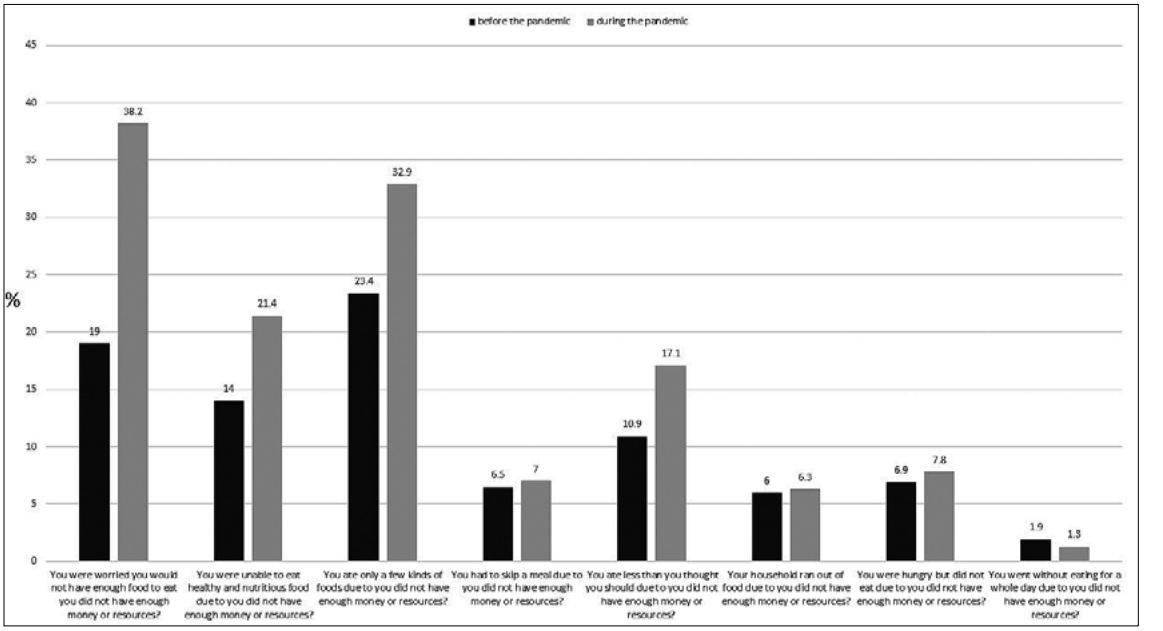

Figure 1. Percentage of college students' households that declare that some member presented any of the following situations related to food insecurity before and during the pandemic.

demic regarding food. Some respondents mentioned that state aid - specifically the state food scholarship for higher education students (BAES) from by the Ministry of Education through the National Board of Scholarships (JUNAEB) - has helped reduce food uncertainty. Other students noted that they were eating more nutritious foods; spending more time at home gives them time for shopping and cooking, as well as maintaining meal, times, and frequency. An important distinction made by students who lived alone prior to the pandemic and who returned to their family homes, spent the quarantine in the homes of classmates, or who lived with other students in their homes, is that living with more people encourages greater dedication to cooking, or rather that living alone discourages cooking more elaborate meals or ones for which many ingredients are required.

Discussion

This study presents results on the change in FI for college students in Chile, using an online survey containing the FIES Scale and an open-ended question. We found that the prevalence of moderate and severe FI increased from 9.92% pre-pandemic to 14.31% during pandemic. Our findings are consistent with other international studies. For example, a study by the University Student Experience Consortium, from 10 U.S. public universities and more than 30,000 students, showed that 20% of undergraduate and graduate students experienced FI during the first months of pandemic, especially those belonging to the most underrepresented or marginalized groups[14]. Another study from the University of Texas confirms that finding showing that 34.5% of students have suffered FI during the pandemic[29].

Our study showed that the prevalence of severe FI decreased from 1.81% to 0.89%, during the sanitary crisis probably because some of these students returned to their parents' home, so they could have had more resources for eating better. Furthermore, it is likely that the risk of FI in this population group was mitigated by the Chilean government keeping college food scholarships without the need for further processing. According to governmental data, this scholarship benefited more than 650,000 college students during the pandemic[6]. This measure was perceived as

positive in the open-ended question. Additionally, a qualitative study in Chilean college students found that this benefit was used to feed the whole family during the pandemic, contributing to the household food budget[30]. Some students in our study also commented that during the pandemic they were cooking more and this was perceived as healthier; this could have also contributed to reducing the perception of FI.

Significant changes were observed before and during the pandemic when the students reported that someone in the household was worried about not having enough food, not eating healthy and nutritious food, eating few or less food, or not eating during the whole day due to lack of resources. Similar results were found in a study in Kenya in which the researchers also applied the FIES, although this study was not conducted on college students[31].

Additionally,196 students said that their households went from not having situations related to FI before the pandemic to having some degree of FI. The prevalence of FI in that group reached 20.15%. It is possible that some students had to move with their families or into multi-person households, so the household budget was not enough to maintain their previous food condition. This fact was also mentioned in the open-answer question.

International studies suggest that FI of college students tends to be higher than the overall population. In the U.S., while FI affects 13% of the population, the average across studies is 32.9% for college students (ranging from 14.1% to 58%)[32,33]. Meanwhile, in Ecuador the prevalence of national FI fluctuates between 5.1% in urban areas and 9% in rural areas, while the prevalence in college students is 51%[8]. However, our results do not match this. In Chile, the national prevalence of FI prior to the pandemic was 13%, compared to 9.47% for our participants. Likewise, the national prevalence of FI measured during the pandemic is 19%[8], compared to our finding of 14.31%.

The findings of this study contribute to understanding the impact of the pandemic on a group that has been scarcely studied (higher education students) and that is scarcely considered in public food and nutrition policies. Our results are also in line with other international studies that show that the COVID-19 pandemic has had profound consequences for food security of individuals and communities. Confinement, physical distancing, border closures, and economic slowdowns are affecting food systems. Several problems have arisen due to sanitary measures taken due to COVID-19 such as the disruption of food supply chains; loss of household income and greater inequality, suspension or insufficiency of social protection programs, and alteration of food environments[34,35]. Latin American organizations such as the CEPAL and FAO also report that food prices have increased, with the regional consumer price index for food increasing by 5.6% in 2020, which directly affects the accessibility and quality of food in households[35].

Our study has some limitations that restrict the results to be extrapolated to all college students in the country. The sample is not probabilistic, there can be recall bias in the pre-pandemic information. It is also possible that those who answered the survey have a better situation than the average university students - as online surveys tend to be skewed towards higher socioeconomic status respondents - although this study also found reduced household incomes for some of our participants. Also, during the month in which the survey was administered traditionally, most students are on vacation, which could somewhat alter how they eat.

Based on our study, it is possible to recommend some measures for avoiding the different degrees of FI in the students, especially during times of social and economic crisis. As FI could affect both their health status and educational performance, university authorities should design programs focused on the constant monitoring of students' food security status. Additionally, programs could include financial aids, the formation of support groups, and the opening of community kitchens subsidized by the institution.

As a conclusion, while to a lesser degree than other countries, during the pandemic the prevalence of moderate and severe FI increased from 9.92% to 14.98% in the households of surveyed students from a public university in Chile. The university closure could have contributed to a deterioration of the FI status and suggests some degree of food dependance on the educational system. This group is therefore vulnerable to crisis situations and warrants mitigation actions beyond current food scholarships, which do seem to be helpful. Food banks at universities are less

Table 5. Summary of themes from the open comments from the students

Topics	Main points	Quote
Negative aspects		
Impact of the household economy	- Food shortages at home - Increased household spending on food - Budget redistribution of the budget	I am the oldest of my brothers and obviously I worry that they eat, if I have to go fasting it does not matter, they need it more than I do. (JS, Dentistry)
		Since my mother is a traveling merchant and receives irregular income, we cannot organize "a shopping day" where we buy what is necessary for the week, but, as the income comes in, we can buy what is necessary for 1 or 2 days. (AR, Law)
Difficult access to healthy food	- Lack of income - Low availability of healthy foods - Limitation of home delivery services	I have not had problems in general, what if I must emphasize is that here in the county, as it is a countryside, things do not arrive or things end quickly ... ... (EU, Arts)
		The problem is not the lack of money but the access to gluten-free food and fruits / vegetables… (FV, Social Sciences)
		The accessibility to buy fruits and vegetables and the shortage was the cause of the dietary change. (DM, Dentistry)
Positive aspects		
State aids	-State aids helped reduce food uncertainty - Role of the food scholarship for higher education students (BAES)	I think that food was not affected due to aid such as food boxes [given by the State]... my sister receives a JUNAEB box every month from school, and I am a beneficiary of the JUNAEB scholarship (about 40 dollars monthly)... my parents were months without any job... this support has served so, there was no lack of food at any time (PD, Chemistry, and Pharmacy)
Improving time organization for cooking and eating	- More time at home - More time for food shopping and cooking - Time for meals at home	The consumption of fruits, vegetables, and legumes has increased in my house since we have more time to go to the farmer's market and more time to cook food that takes more dedication (SA, Medicine)
		I have been eating better since I've been here because I have to cook yes or yes, we don't eat much junk, we eat less meat and more vegetables (KA, Architecture, and Urbanism)
Family or peers' life as a protector factor	- Students spent the quarantine in the homes with others (family and peers) - Greater dedication to cooking more elaborate meals	During the pandemic, I stayed with a partner and his family …… If I had been alone in my apartment, surely my diet would have been much worse (NM, Medicine)
		Being in the south and at home, I have eaten much better than I do in Santiago and as I would have if the pandemic had happened there. (MV, public affairs)

useful in contexts like the COVID-19 pandemic where physical locations are shut and students often move home, thus suggesting the need for innovative public policies to increase economical and food support.

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