

Artículo original: Relación entre seguridad alimentaria y el estado nutricional en niños menores de cinco años en siete regiones administrativas de Guatemala



Original article: Relationship between food security and nutritional status in children under five years old in the seven administrative regions of Guatemala

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Resumen: La seguridad alimentaria (SA) se consigue cuando la persona tiene acceso constante a suficiente alimento seguro y nutritivo, para satisfacer y llevar una vida activa y sana. En Guatemala, no existen estudios que establezcan la relación entre el nivel de inseguridad alimentaria (INSA) en el hogar y el estado nutricional agudo y crónico en niños menores de cinco años, lo que derivó en el objetivo de esta investigación. La muestra estuvo constituida por 809 hogares con al menos un menor de cinco años, pertenecientes a las siete regiones administrativas de Guatemala. La SA fue medida por medio de la Escala Latinoamericana y Caribeña de Seguridad Alimentaria, y para determinar el estado nutricional agudo y crónico se emplearon los indicadores antropométricos de peso para la talla y talla para la edad. Para establecer la relación entre las variables, se empleó la prueba estadística de Ji cuadrado con un nivel de significancia de 5%. De los hogares evaluados, 674 (83%), IC 95% [80.7, 85.9] se encontraron con algún nivel de INSA. En los hogares con INSA, 93 (93%) [88.0, 98.0] de los niños menores de cinco años presentaron desnutrición aguda moderada, 8 (89%) [68.4, 109.4] desnutrición aguda severa, 218 (87%) [83.1, 91.3] retraso de crecimiento moderado y 129 (95%) [91.1, 98.6] retraso de crecimiento severo. Se concluyó que existe relación entre el estado nutricional agudo/estado nutricional crónico con el nivel de INSA en los hogares de los municipios estudiados obteniendo $\chi^2(6) = 69.00, p < .0001$.

Palabras clave: seguridad alimentaria, inseguridad alimentaria, Escala Latinoamericana de Seguridad Alimentaria (ELCSA), estado nutricional agudo, estado nutricional crónico.

Abstract: Food security (FS) is achieved when a person has constant access to enough safe and nutritious food to satisfy and lead an active and healthy life. In Guatemala, there are no studies that establish the relationship between the level of food insecurity (FI) in the home and the acute and chronic nutritional status in children under five years old, which motivated the objective of this research. The sample consisted

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of 809 households with at least one child under five years old belonging to the seven administrative regions of Guatemala. FS was assessed using the Latin American and Caribbean Food Security Scale (ELCSA), while acute and chronic nutritional status was determined using anthropometric indicators: weight-for-height and height-for-age. The relationship between variables was analyzed using the Chi-Square test at a significance level (alpha) of 5%. Among the evaluated households, 674 (83%) [80.7, 85.9] experienced some level of FI. In households experiencing FI, 93 (93%) [88.0, 98.0] of children under five years old were found to have moderate acute malnutrition (MAM), 8 (89%) [68.4, 109.4] severe acute malnutrition (SAM), 218 (87%) [83.1, 91.3] moderate stunting and 129 (95%) [91.1, 98.6] severe stunting. It was concluded that there is indeed a relationship between acute nutritional status/chronic nutritional status and the level of FI in the households studied, obtaining $\chi^2(6, N = 809) = 69.00, p < .0001$.

Keywords: Food Security, Food Insecurity, ELCSA, Acute Nutritional Status, Chronic Nutritional Status.

Introduction

Food security (SA) at the individual, home, nation and global level, is achieved when all people, at all times, have physical and economic access to sufficient food, safe and nutritious, to meet their food needs and preferences, so it is essential to ensure an optimal nutritional status of the individual (United Nations Food and Agriculture Organization [FAO], 2019; Secretariat of Food and Nutritional Security [SESAN], 2019). Food insecurity (INSA) is defined as the limited or uncertain availability to acquire adequate and safe food or to acquire it in socially acceptable ways. It can manifest itself in transient, seasonal (seasonal hunger), or chronic forms, reflecting an insufficient intake of food. (Special Food Security Program [PESA], 2011). Therefore, guaranteeing SA is one of the transversal and fundamental elements to certify compliance with the 17 Sustainable Development Goals (SDGs) of the 2030 agenda for sustainable development (World Food Summit, 1996; Ramírez et al., 2020).

The components that determine the SA are food availability, access, food consumption and biological use (Institute of Nutrition of Central America and Panama [INCAP], 2013), this has an impact on the nutritional status (EN) of children under five years of age since it is the reflection of how the body's energy and nutrient needs have been covered (Ministry of Public Health and Social Assistance [MSPAS] et al., 2012).

An INSA measurement scale based on household experience on food insecurity is the Latin American and Caribbean Food Security Scale (ELCSA), which provides a dimension of hunger in households and, consequently, a real measure of INSA (FAO, 2012). The current challenge on the issue of INSA in Guatemala is growing, estimates are worrying, derived from climate change, migration due to harvest time, or migration to another country, single-parent homes, among others. According to the results of the ELCSA Report (2014), 77.4% of Guatemalan households have INSA, where 40.4% correspond to mild INSA, 24.9% to moderate INSA, and 12% to severe INSA.

On the other hand, the acute nutritional status in children under 5 years of age is determined by the weight index for height and is classified as normal nutritional status, moderate acute malnutrition (AD), severe AD, overweight, or obesity. The classification of chronic nutritional status or growth retardation is determined by the size index for age, and is classified as normal height, moderate growth retardation (CR), severe RC (MSPAS & SESAN, 2019; SESAN, INCAP & National Institute of Statistics [INE], 2022). In Guatemala, according to the National Maternal and Child Health Survey (ENSMI) 2014-2015, 46.5% of children under five years of age had growth retardation, of which 16.6% had severe growth retardation. In another aspect, 0.7% of children under five years of age presented acute malnutrition (MSPAS & Secretariat of Planning and Programming of the Presidency [SEGEPLAN] & INE 2017; INE, 2022; SESAN et al., 2022).

Currently, in Guatemala, there are no studies that correlate the nutritional status with the INSA. The background of research in other countries has addressed this relationship, evidencing the importance of understanding how food insecurity affects the nutritional status of children under five years of age. For example, in the study by Ríos-Marín et al. (2022) in Montería, Colombia, the relationship between food security and nutritional status was examined in 388 families with children under 5 years of age who receive food support from Child Development Centers. ELCSA was used to classify food safety. The nutritional status of the children was evaluated by anthropometric measurements and Z scores according to the WHO. Likewise, Cárdenas Gómez et al. (2021) investigated in Luxembourg, Macas, the relationship between security

family food and chronic nutritional status, where he showed that there is an increase in the risk of chronic nutritional status, 42% higher in children under five years of age who live in homes with severe food insecurity compared to those who live in nutritional food security situations in children under 2 years of age. Using the ELCSA, they evaluated the prevalence of food insecurity in 151 families, thus highlighting the importance of the ELCSA to analyze the relationship between food security and child nutrition.

Taking into account the current situation at the national level of the INSA and the acute and chronic nutritional status in children under five years of age, the level of food security at home was related to the nutritional status of children under five in the coverage homes of the Supervised Professional Exercise (EPS) of Community Nutrition during the period from July to December 2023, through a sample made up of 809 households with at least one child under five years of age. In order to have scientific evidence that supports strategies and interventions focused on strengthening food security in vulnerable households, ensuring adequate nutrition and well-being in children under five years of age. For which ELCSA was used at the household level, and the acute and chronic nutritional status of children under five years of age was established with the weight indices for size (P/T) and size for age (T/E).

Materials and methods

Type of study. Cross-sectional correlation type

Population and sample. The sample size was 809 according to population projections of children under five years of age for the year 2022, XII National Population Census, and VII Housing Census, assuming one child under five years old per household, located in the following regions of the country. The sample was distributed equally throughout each municipality, these being Amatitlán, Chinautla, San José Pinula, San Juan Sacatepéquez, Villa Nueva of the department of Guatemala (metropolitan region), San Jerónimo, Purulhá and Granados of the department of Baja Verapaz (northern region) San Andrés Itzapa, Chimaltenango and Santa Apolonia of the department of Chimaltenango, Escuintla of the department of Escuintla, San Juan Alotenango and Santa Lucía Milpas Altas of the department of Sacatepéquez (central region), Guastatoya and Sanarate from the department of El Progreso Río Hondo and Gualán from the department of Zacapa (northeastern region), Quetzaltenango from the department of Quetzaltenango (southwestern region), Cuilapa and Barberena from the department of Santa Rosa (southeastern region), San Juan La Laguna and Panajachel from the department of Sololá (southwestern region). No information was received from the administrative area corresponding to Petén.

The sample was established to determine the association between the variables of the acute and chronic nutritional status with the level of SA/INSA, with 6 degrees of freedom, an effect size ($w=0.3$) equivalent to an average effect, significance level (α) of 5% and a power of 95% with a design effect of 3.5 because it is a study at the national level by stratified in the regions, of the 26 municipalities selected from the 10 departments that cover the students of the second rotation of the EPS in Community Nutrition.

Inclusion criteria. Integrated families with at least one child under five years of age residing in the municipalities selected from the EPS coverage departments of the University of San Carlos de Guatemala, who previously signed the informed consent voluntarily.

Exclusion criteria. Families whose child under five years of age has been diagnosed with physical disability, spinal cord injury, cerebral palsy, or Down syndrome, or who had edema at the time of the evaluation.

Instrument. It was made up of three sections: section I, composed of demographic information of the home; section II included the collection form available in the ELCSA use and application manual for INSA measurement (FAO, 2012). Finally, section III was made up of the registration of anthropometric data for the classification of the acute and chronic nutritional status of the child under five years of age.

Methods. The head of the household or a member who knew about the feeding of the household was interviewed, explaining the work methodology and asking if they wanted to voluntarily participate in the research. The signature or fingerprint of the person participating in the informed consent/assent was read and requested, then the interview was conducted by recording the answers provided in the data collection instrument, which was entered through a Google electronic form. Finally, the anthropometric evaluation of the weight and height of the five-year-old child was carried out with the necessary equipment for taking anthropometric measurements. At the time of the evaluation, the pollster performed the calculation of the Z-score of the weight indexes for height/length and height/length for age, using the growth graphs of the World Health Organization (WHO) (2006) to determine the diagnosis of acute and chronic nutritional status.

Data analysis. The data obtained were tabulated in a Microsoft Excel document, based on what was registered in the Google Forms form. To analyze the SA/INSA data, the methodology established in the ELCSA Manual for households made up of adults and children was used (ELCSA Scientific Committee, 2012). The cutoff points for households made up of adults and children under 18 were: safety: 0 positive responses; mild insecurity: 1-5 positive responses; moderate insecurity: 6-10 positive responses; severe insecurity: 11-15 positive responses. The nutritional diagnosis of acute or chronic state was analyzed using the WHO Anthro Software, importing the data from the nutritional survey using the following classification of the weight indices for height/length and height/length for age, respectively, using the WHO growth graphs (2006): for acute nutritional status: obesity: ≥ 3 DE, overweight: < 3 to ≥ 2 DE, normal: < 2 to ≥ -2 DE, moderate DA: < -3 to < -2 DE, and severe DA: ≤ -3 DE. For chronic nutritional status: normal: $> + 2$ to -2 DE, moderate growth retardation < -2 to -3 DE, and severe growth retardation ≤ -3 DE. Then, the frequencies, percentages, standard deviations, average, and 95% confidence intervals were generated according to the variable by sociodemographic characteristics. Finally, the relationship between food security at the home level and the acute and chronic nutritional status of children under five years of age was established by means of the statistical test of Ji square with a significance level (alpha) of 5%.

Ethical considerations. The investigation was carried out in accordance with the principles of the Declaration of Helsinki, being of minimal risk. The investigation sought the well-being of the participants, so they were required to sign an informed consent/assent, to guarantee their rights and confidentiality, in addition to allowing a free conscious, and voluntary decision to participate in the study. The results obtained were not used for purposes other than those of the research.

Results

Of the sample evaluated, 674 (83%) [80.7, 85.9] are in INSA. Of this percentage, 433 (54%) [50.1, 57.0] correspond to mild INSA, 172 (21%) [18.4, 24.1] to moderate, and 69 (9%) [6.6, 10.5] to severe (Table 1). The regions with the highest percentage of food insecurity are the southwestern and south-eastern region (107 (97%) [94.2, 100.3] and 56 (90%) [83.0, 97.7] respectively) and rural households (438 (88%) [85.1, 90.8]) have a higher percentage of INSA than urban households (236 (76%) [71.1, 80.6]). In relation to the acute and chronic nutritional status of children under five years of age, a higher percentage of INSA is observed in households with children under five years of age diagnosed with moderate acute malnutrition (DAM) (93 (93%) [88.0, 98.0]) and severe growth retardation (RCS) (129 (95%) [91.1, 98.6]), respectively.

Table 1

Level of food insecurity according to the variables evaluated of the households interviewed that are in the municipalities covered by the Supervised Professional Exercise of Community Nutrition of the University of San Carlos de Guatemala in 2023

Variable		SA	INSA	Leve	Niveles de INSA Moderada	Severa
		n (%) [IC95%]	n (%) [IC95%]	n (%) [IC95%]	n (%) [IC95%]	n (%) [IC95%]
Región	Metropolitana	23(19) [12.3,26.6]	95 (81) [73.4,87.7]	65(55) [46.1,64.1]	23(19) [12.3,26.6]	7(6) [1.7,10.2]
	Norte	13(14) [6.9,21.0]	80(86) [79.0,93.1]	75(81) [72.6,88.7]	4(4) [0.2,8.4]	1(1) [-1.0,3.2]
	Nororiental	23(15) [9.2,20.3]	133(85) [79.7,90.8]	59(38) [30.2,45.4]	57(37) [29.0,44.1]	17(11) [6.0,15.8]
	Suroriental	6(10) [2.3,17.0]	56(90) [83.0,97.7]	29(47) [34.4,59.2]	17(27) [16.3,38.5]	10(16) [7.0,25.3]
	Central	64(26) [20.2,31.0]	186(74) [69.0,79.1]	118(47) [41.0,53.4]	43(17) [12.5,21.9]	25(10) [6.3,13.7]
	Suroccidental	3(3) [-0.3,5.8]	107(97) [94.2,100.3]	76(69) [60.5,77.7]	24(22) [14.1,29.5]	7(6) [1.8,10.9]
Lugar de residencia	Noroccidental	3(15) [-0.6,30.6]	17(85) [69.4,100.6]	11(55) [32.2,76.8]	4(20) [2.5,37.5]	2(10) [-3.1,23.1]
	Rural	60(12) [9.2,14.9]	438(88) [85.1,90.8]	258(52) [47.4,56.2]	132(27) [22.6,30.4]	48(10) [7.0,12.2]
	Urbana	75(24) [19.4,28.9]	236(76) [71.1,80.6]	175(56) [50.8,61.8]	40(13) [9.1,16.6]	21(7) [4.0,9.5]
Estado nutricional agudo	Obesidad	1(33) [-20.0,86.7]	2(67) [13.3, 120.0]	2(67) [13.3, 120.0]	0(0) [0,0]	0(0) [0,0]
	Sobrepeso	6(30) [9.9,50.1]	14(70) [49.9,90.1]	8(40) [18.5,61.5]	3(15) [-0.6,30.6]	3(15) [-0.6,30.6]
	Normal	120(18)	557(82) [79.4,85.2]	388(57)	124(18)	45(7) [4.8,8.5]
	DAM	[14.8,20.6]	93(93) [88.0,98.0]	[53.6,61.0]	[15.4,21.2]	18(18)
	DAS	7(7) [2.0,12.0]	8(89) [68.4,109.4]	35(35) [25.7,44.3]	40(40) [30.4,49.6]	[10.5,25.5]
Estado nutricional crónico		1(11) [-9.4,31.6]		0(0) [0,0]	5(56) [23.188.0]	3(33) [2.5,64.1]
	Normal	96(23)	327(77) [73.3,81.3]	242(57)	62(15) [11.3,18.0]	23(5) [3.33,7.6]
		[18.7,26.7]		[52.5,61.9]		
	RCM	32(13) [8.7,16.9]	218(87) [83.1,91.3]	130(52)	66(26) [20.931.9]	22(9) [5.3,12.3]
Total				[45.8,58.2]		
	RCS	7(5) [1.4,8.9]	129(95) [91.1,98.6]	61(45) [36.5,53.2]	44(32) [24.5,40.2]	24(18) [11.2,24.1]
		135(17) [14.1,19.3]	674(83) [80.7,85.9]	433(54) [50.1,57.0]	172(21) [18.4,24.1]	69(9) [6.6,10.5]

Note: *DAM = Moderate acute malnutrition; DAS = Severe acute malnutrition; RCM = Moderate growth retardation; RCS = Severe growth retardation.

Table 2 presents the Ji square test of acute and chronic nutritional status of children under five years of age compared to the level of food insecurity of the households interviewed, where it is shown that there is a relationship between the acute and chronic nutritional status of children under five years of age and the level of food insecurity in the households interviewed, respectively.

Table 2

Contingency table of acute and chronic nutritional status of children under five years of age compared to the level of food insecurity of the households interviewed in the municipalities covered by the Supervised Professional Exercise of Community Nutrition of the University of San Carlos de Guatemala in 2023.

Estado Nutricional			Niveles de INSA				χ^2 (gl)	p
			SA	Leve	Moderada	Severa		
Agudo	Obesidad/ Sobrepeso	Recuento	7	10	3	3	69.00 (5)	<.0001
		Frecuencia esperada	3.84	12.31	4.89	1.96		
	Normal	Recuento	120	388	124	45		
		Frecuencia esperada	112.97	362.35	143.94	57.74		
	DAM / DAS	Recuento	8	35	45	21		
		Frecuencia esperada	18.19	58.34	23.17	9.30		
Crónico	Normal	Total	135	433	172	69		
		Recuento	96.00	242.00	62.00	23.00		
	RCM	Frecuencia esperada	70.59	226.4	89.93	36.08		
		Recuento	32.00	130.00	66.00	22.00		
	RCS	Frecuencia esperada	41.72	133	53.15	21.32		
		Recuento	7.00	61.00	44.00	24.00		
	Total	Frecuencia esperada	22.69	72.79	28.91	11.59		
		Total	135	433	172	69		

Note: DAM: moderate acute malnutrition; DAS: severe acute malnutrition; RCM: Moderate growth retardation; RCS: severe growth retardation

Discussion

Of the total number of households evaluated, only 135 (17%, 95% CI [14.1,19.3] were found in a food security situation, while 674 (83%)[80.7,85.9] live in an INSA situation; where 433(54%) [50.1,57.0] of these households are in mild INSA, 172(21%)[18.4,24.1] moderate and 69(9%)[6.6,10.5] severe (Table 1), which coincides with the results reported in the latest ELCSA analysis carried out in Guatemala as part of the ENCOVI 2014, where it is indicated that three out of four households in the country live in a situation of INSA (of five live in mild INSA, one out of four in moderate INSA and one out of 10 households live severe INSA). The results presented are similar to the data compiled by the National Food Safety Assessment for Guatemala (World Food Program [WFP], 2023), which determined the state of food security for the rural population, where 16% of the population is safe, 58% is slightly insecure, 23% moderately insecure, and 3% severely insecure.

In the analysis of the data according to the place of residence of households living in INSA conditions, the National Survey of Living Conditions (ENCOVI) (2014) (INE, 2015) mentions that the percentage of INSA was approximately in four of five rural households (84.4%), higher than in urban households (71.6%). This coincides with the values obtained in this study, since 438 (88%) [85.1,90.8] of INSA was found in rural homes and 236 (76%) [71.1,80.6] in urban households, evidencing the vulnerability of the rural area to this situation.

In Table 1, it is observed that 109 (13%) [11.1,15.8] children under five years of age from the households interviewed have some degree of DA, data that differ considerably from those reported in the ENSMI (2014) of 0.7%. This difference may be due to the fact that there is a bias in the taking of the sample, since within the health services, families were interviewed with children benefiting from the interventions of the Nutritional Food Security Program (PROSAN), a program dedicated to the prevention and treatment of children with acute malnutrition. In addition, the Growth Control Registry Analysis Report (SIGSA 5A) of Children aged 0 to 59 Months who attended Public Health and Social Assistance Services (2019) showed that 1.7% of children presented some type of DA. Within this group, 1.3% corresponds to DAM and 0.7% DAS, the latter being closer to that found (1.1% of DAM).

In the case of chronic nutritional status, it is shown that 386 (48%) [44.3,51.2] children under five years of age have some growth retardation. This coincides with the results of the 2014-2015 ENSMI, which indicated a prevalence of growth delay of 46.5% (MSPAS et al., 2017), being the highest prevalence in Latin America and sixth worldwide. This means that five out of ten children under the age of five do not reach the ideal height for their age. The study by Hoddinott et al. (2008) in Guatemala explored the nutritional status and food insecurity in rural communities, It was also found that precarious socioeconomic conditions and food insecurity contribute significantly to child malnutrition in Guatemalan rural areas. Although the focus of this study does not exclusively focus on growth retardation, its findings provide a valuable context for understanding the underlying factors that affect the nutritional health of children in similar environments. A similar study conducted by Shamah-Levy et al. (2014) in Mexico found that households with moderate insecurity had a higher prevalence of low size (chronic malnutrition) and emaciation (acute malnutrition) in preschool children.

According to table 2, the analysis of Ji square was performed by comparing the count of nutritional status with the expected frequencies according to INSA levels, which indicates that there is a significant relationship between these, since the experimental value was higher than the critical value. This coincides with the study conducted in Colombia by Cortázar et al. (2020), in which a clear relationship between nutritional status and the level of INSA was evidenced. In this study, it was found that 50% of the minors had an adequate weight for their size, 68.33% had a delay in height, and 10% were in some level of acute malnutrition. In addition, it was determined that 78.7% of households had severe INSA. The results showed a significant association between severe food insecurity and height delay, as well as with acute malnutrition, concluding that the higher the level of INSA, the greater the height delay.

In relation to chronic nutritional status and INSA levels, a higher frequency was detected in mild INSA levels compared to growth retardation, with a higher frequency in the RCM than in the RCS. After the analysis of Ji cuadrado, it is established that there is a relationship between the chronic nutritional status and the INSA by obtaining an experimental value greater than the critical one (Table 2), a similar result obtained by Cortázar et al. in Colombia (2020), concluding that, if there is a direct relationship between the height indicator for age and the level of food safety, identifying 41 (68.3%) cases of children under five years of age with CR with some level of INSA, mostly severe.

The study by Huamán Guadalupe et al. (2018), also found a significant association between the INSA and the RC in Peru, where of 87 boys and girls who suffered CR, 26 (29.9%) were with RCS, observing inadequate practices due to the lack of food and nutritional and health education. In Mexico, Cuevas-Nasu et al. (2014) determined that there is a 42% increase in the risk of growth retardation in children under five years of age living in homes with severe food insecurity compared to those living in food security situations.

Therefore, the results obtained highlight the importance of interventions that improve the situation of food insecurity of households and the nutritional status, both acute and chronic of children in Guatemala, especially in rural areas; serving as a basis for making specific decisions, creating policies and programs that contribute to improving child nutrition and ensuring access and consumption of quality food and in sufficient quantity in Guatemalan households, mainly taking into consideration that the results obtained from the ELCSA refer to a reduction in the amount of food served, omission of any of the daily meals, presence of hunger in some of the members of the household, and suspension of meals due to lack of money or other resources.

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**Original article: Relationship between food security and
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