

Impacto de factores socioeconómicos en la nutrición de niños entre 2,5 a 5 años en la ciudad de Pasto, Colombia

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Resumen

Considerando que la seguridad alimentaria es de gran preocupación para la seguridad nutricional y la salud humana, se identificó factores claves en el acceso físico, social y económico de la alimentación en hogares con niños de 2,5 a 5 años; se evaluó factores como: ingreso, consumo, costos de los productos, accesibilidad y nivel de educación; adicionalmente, se consideró los efectos y algunos aspectos para mejorar el acceso de alimentos. La información se recopiló mediante encuestas distribuidas a padres y cuidadores en la ciudad de Pasto, Colombia. El programa 'Soluciones de Productos y Servicios Estadísticos' se utilizó para el análisis estadístico y el desarrollo descriptivo. Aunque los ingresos estuvieron condicionados al salario mínimo, no se encontró desnutrición. Entre las estrategias para mejorar la seguridad alimentaria, una oferta sostenible de alimentos y un mejor acceso a su consumo deben ser garantizados. Se refuerza la promoción de la educación para la población más vulnerable.

Palabras clave: Accesibilidad; Colombia; ingresos; nutrición; salud infantil; seguridad alimentaria.



Este artículo es el resultado de la investigación titulada: *Caracterización de la seguridad alimentaria y nutricional de los hogares urbanos de niños y niñas entre 2.5 a 5 años de la ciudad de Pasto*, desarrollada desde el 13 de septiembre de 2016 hasta el 31 de julio de 2019 en la ciudad de Pasto, departamento de Nariño, Colombia.

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Impact of the socioeconomic factors on the nourishment of children between 2.5 and 5 years of age in San Juan de Pasto, Colombia

Abstract

Without a doubt, food security is of great concern to nutritional security and human health. In the physical, social and economic access to food in households with children from 2.5 to 5 years old, key factors were identified and evaluated such as: income, consumption, product costs, accessibility, and level of education; additionally, the effects and some aspects to improve food access were considered. The information was collected through surveys distributed to parents and caregivers in the city of Pasto, Colombia. The 'Statistical Products and Services Solutions' program was used for statistical analysis and descriptive development. Although income was conditional on the minimum wage, no malnutrition was found. Among the strategies to improve food security, a sustainable supply of food and better access to its consumption must be guaranteed. To conclude, the promotion of education for the most vulnerable population is reinforced.

Keywords: Accessibility; Colombia; income; nutrition; children health; food security.

Impacto de fatores socioeconômicos na nutrição de crianças de 2,5 a 5 anos em Pasto, Colômbia

Resumo

Considerando que a segurança alimentar é uma grande preocupação para a segurança nutricional e saúde humana, foram identificados fatores-chave no acesso físico, social e econômico aos alimentos em domicílios com crianças de 2,5 a 5 anos. Os fatores: renda, consumo, custo do produto, acessibilidade e nível de escolaridade foram avaliados. Efeitos e alguns aspectos para melhorar o acesso aos alimentos foram concebidos. As informações foram coletadas por meio de pesquisas distribuídas a pais e responsáveis na cidade de Pasto, na Colômbia. O programa 'Soluções de Produtos e Serviços Estatísticos' foi utilizado para análise estatística e desenvolvimento descritivo. Embora a renda fosse condicionada a um salário-mínimo, não foi encontrada desnutrição. Entre as estratégias para melhorar a segurança alimentar, deve-se garantir o abastecimento sustentável de alimentos e um melhor acesso ao seu consumo. A promoção da educação para a população mais vulnerável é reforçada.

Palavras-chave: Acessibilidade; Colômbia; renda; nutrição; saúde da criança; segurança alimentar.

1. Introduction

As living beings, food and nutrients are needed to conduct daily activities and to survive. However, malnutrition and the lack of micronutrients can be an obstacle that avoids people actively participate in the modern society (Oh and Hong, 2003). This situation makes a severe damage to a significant percentage of the population and affects the economic and social development of countries, as well as their role in the global economy (Oh and Hong, 2003; Organización de las Naciones Unidas para la Alimentación y la Agricultura, FAO, 2013). A food crisis worldwide was observed between 2006 and 2009; it was characterized by two stages: the first one (2006-2008) took place due to the rising of the international prices of commodities (food and non-food). The second one (2008-2009) was caused by the economic and financial crises. The actual income of families has been affected by these stages, reducing the food access and other basic goods, and therefore leading to increase poverty and hungry. These events, reinforced by natural factors (i.e., weather change and natural disasters), have augmented the uncertainty and vulnerability of low-income families (FAO, 2009).

The increase of the temperatures associated with climate change upsurges the frequency and intensity of natural disasters and can lead to the expansion of arid areas, greater desertification, and a changing agricultural frontier, distressing the productive processes and, directly, the human food system. Likewise, some effects can be generated in the epidemiology of animals and pests, creating more risks and uncertainties, which leads to a loss of assets and productivity in vast agricultural sectors, impacting global food security. Additionally, climate change can directly affect intertropical glaciers, generating a reduction in water availability and the generation of hydroelectric capacity in Bolivia, Peru, Colombia, and Ecuador. The reduction of water could lead to drastic changes in tropical forests turning them into savannas, as well as causing arid and semi-arid vegetation in the different territories (Claro, 2019). All these effects could directly and strongly affect the most vulnerable people since the production costs of different foods and products can rapidly increase in the event of a possible shortage of resources.

According to the outlook of nutritional food security in Latin America and the Caribbean in

2020, it is needed to be focused on new policies and investments to improve the food security system and avoid malnutrition in the different populations, especially in children under the age of 5 years. Additionally, political commitment and public attention are sought to face food and nutrition positively, as fundamental axes to guarantee a healthy life and promote well-being for all ages, becoming the roadmap that facilitates the rights and objectives of the 2030 agenda. One of the fundamental points is to seek the eradication of child malnutrition. To monitor the different forms of malnutrition, some indicators are considered, for example, growth retardation, lack of necessary nutrients, infections, and care practices (FAO, 2020).

Considering the Second International Conference on Nutrition held in Rome (FAO and Organización Mundial de la Salud, OMS, 2014), the prevalence of undernourishment has moderately decreased, but the absolute number of affected people remains unacceptably high worldwide: there were about 805 million people with chronic hunger by 2012-2014. Chronic malnutrition as measured by growth retardation has decreased, but 161 million children under the age of 5 years were affected by 2013. Acute malnutrition, on the other hand, affected 51 million children of the same age. Malnutrition has been the main cause of death for children between 2.5 and 5 years of age, contributing to about 45% of such deaths in 2013. More than 2000 million people have suffered from deficiencies of micronutrients, especially vitamin A, iodine, iron, and zinc. Overweight and obesity among children and old people have quickly increased in all regions: about 42 million children were affected by overweight in 2013, and 500 million adults presented obesity in 2010. Dietary risk factors linked to inadequate physical activity explain almost 10% of the global burden of morbidity and disability.

In 20 of 23 countries from Latin America and the Caribbean, the percentage of the undernourished population was reduced by 1990. The increasing of internal availability per inhabitant was a central factor that slightly compensated for the raising of inequalities in food access. Among the countries that suffered a deterioration in the undernourishment index, two Central American countries can be mentioned: Salvador and Guatemala. This is mainly caused by decreasing in the food supply per inhabitant as a result of the drop in internal production and ability to import. Slow growth

remains important in Central America. In Salvador, Guatemala, Honduras, and Nicaragua more than 20% of children 2.5 – 5 years of age were affected by this situation while Costa Rica was placed among the countries with close values or less than 5% (Comisión Económica para América Latina y El Caribe, CEPAL, 2004). Latin America and the Caribbean is the only region that achieved to reduce hungry, anticipating the food crisis since the availability of products (e.g., cereals), associated with climatology diversity, contributed significantly to access to food for the most vulnerable people, strengthening food and nutritional security in the region and becoming an important supplier of food worldwide (Food and Agriculture Organization of the United Nations, FAO, 2015). However, with the raising of food prices and subsequent economic crisis, this trend was reversed, which implicated that food security acquires importance in the political and social agenda of such countries. For a region that presents surplus in food availability, estimations from the United Nations Food and Agriculture Organization (FAO, 2012) showed that the undernourished population reached 52.5 million people, equivalent to 9% of the population and 600 thousand less than the value in 2009.

From 2010 to 2019, it is possible to visualize a decrease in hunger by 16.6%, being the lowest level since 2000; sixteen countries have reduced the prevalence moving towards the achievement of the objectives of the 2030 agenda. Among them, Honduras stands out with a decrease of 3.5 percentage points in its prevalence of undernourishment. República Dominicana reduced it by 3 percentage points and Ecuador by 2.9 points. During the same period, Bolivia, Colombia, and El Salvador also stand out, all of them with a reduction of 1.8 percentage points of their prevalence. During the last decades, malnutrition has shown a sustained low trend which would cause a real change in the nutritional, epidemiological, and demographic profile of these countries (FAO, 2020).

In Colombia, food security had an important role when the Political Constitution of 1991, article 44, included a balanced diet as a fundamental right for children (Constitución Política de Colombia, 1991); also, the articles 63, 64, and 65 were added to protect agricultural production and therefore the availability of food as government's duties (Constitución Política de Colombia, 1991; Posada, 2011). However, the non-fulfillment of these duties and deep social

inequality are a matter of concern (Álvarez and Pérez, 2013). The National Survey of Nutritional Situation ENSIN-2015 (Instituto Colombiano de Bienestar Familiar, ICBF, 2015), which is the statistical operation of national reference on the nutritional situation of the Colombian population, allows evaluating the advances and achievements in early childhood issues in the last 5 years. According to this survey, chronic malnutrition decreased from 13.2% in 2010 to 10.8% in 2015 for children under 5 years old. In 1990, one in four children suffered from chronic malnutrition, while it was only one in ten, by 2015. Colombia continues within the 5% goal established by the World Health Organization (WHO) on acute malnutrition or a weight-for-height indicator. In 2015, it reached 1.6%, higher than the 0.9% presented in 2010. Global malnutrition, which marks the weight for age, affects 3.7% of under-age in the country, less than half of the 1990 record when it affected 8.6% of children under 5 years of age.

The negative impact and long-term effect of an inadequate nutrition level on children have been pointed out by recent studies (Brazionis, Golley, Mittinty, Smithers, Emmett, Northstone, and Lynch, 2013; Dubois, Farmer, Girard, Peterson, and Tatone-Tokuda, 2007; Montañez, 2017; Noble, Houston, Brito, Bartsch, Kan, Kuperman, Akshoomoff, Amaral, Bloss, Libiger, Schork, Murray, Casey, Chang, Ernst, Frazier, Gruen, Kennedy, Van Zijl, and Sowell, 2015; Noble, 2017; Persaud, Maguire, Lebovic, Carsley, Khovratovich, Randall McCrindle, Parkin, and Birken, 2013; Silva, 2016; Volger, Sheng, Tong, Zhao, Fan, Zhang, Ge, Ho, Hays, and Yao, 2017). Early malnutrition decreases learning capabilities, school performance, economic productivity in adult life, and the ability to take care of new generations. Different factors such as production, availability, and transportation of food, water quality, economic resources, social and economic inequalities have shown an important influence on children nutrition level (Montañez, 2017; Noble, 2017; Noble et al., 2015; Silva, 2016). This issue traps people into a circle that keeps malnutrition and delays the development of countries. Characteristics of poor homes and their members have been strongly related to food security through family income, size, composition and type of home (i.e., whether there is a male or female as household head), education level of individuals and their job conditions, Dehollain, 1995).

Although food security became a major concern for nutrition security and health worldwide,

to the best of our knowledge, no study has deeply investigated the issue of food security in Pasto, Colombia. In the present study, socioeconomic factors, key of the nutritional system in homes with children between 2.5 to 5 years of age were considered, as the most vulnerable child population. For this purpose, an analytic and theoretical review was carried out to understand and recognize factors with direct influence on child development. Factors such as income, consumption, costs of food, accessibility, and education level were initially assessed, through a statistical analysis of data collected by a survey instrument. Data collection was conducted from October to November 2017. About 300 families located at 12 communes were initially surveyed in the urban area of Pasto city. Finally, some suggestions were stated to promote public policies on food security at national and probably at an international scale. An actual impact on homes is desired, seeking out better conditioning of children nutritional system from different economic compounds and their relationship with factors of high influence. This is proposed to provide the best conditions of physical and mental development for children in the range of age considered.

2. Methods

This study compiled available information and examined data collected from a questionnaire that was distributed to parents and caretakers. About 300 families, located at 12 communes from the urban area of Pasto city in Colombia, were randomly surveyed, as an initial approach. This location was chosen for demonstrative purposes of the methodological strategy implemented herein. The total sample size ($N = 300$) was computed by using random sampling for conglomerates and stratified for the urban area assessed. An acceptable accuracy represented by a relative standard error less than or equal to 5%, a prevalence of acute malnutrition of 4%, a loss percentage of 10%, and a confidence level of 95% were assumed to set such a sample size.

The population under study was about 17,652 boys and girls between the ages of 2.5 and 5 whose families resided in the urban area of Pasto, Colombia, and met the inclusion criteria established for the survey. Among the inclusion criteria, the following were considered: (a) Being between 2.5 and 5 years old since there exists a high incidence of nutritional factors on

the growth within these ages, and several of the basic neurocognitive and psychosocial functions are consolidated in the later development of the child. The choice of this age range highlights the fact that the youngest age or lower limit (2.5 years) often coincides with the beginning of the acquisition of motor, intellectual, and communication skills, and formally measurable characteristics. The highest age or upper limit (5 years) coincides with the stage prior to entering school. Before the process of school inclusion, it has been suggested to carry out studies at the development and adaptation level to detect problems of this nature and to generate intervention proposals (Martínez, 2014). (b) Having a continuous residence for at least two years in the urban area of Pasto, Colombia. (c) Voluntary participation and to sign the informed consent. On the other hand, having a physical and/or mental disability that prevents carrying out the previously established survey is considered within the exclusion criteria. Children with special pathologies or neurological pathologies present some degree of disability that would generate a selection bias due to malnutrition inherent to the underlying pathology.

A multistage sampling by conglomerates (communes) with a systematic sampling was designed to guarantee a representative and reliable measurement. This procedure allowed us to obtain a broad view and record information of different economic factors that affect the food security of children with ages between 2.5 and 5 years. As well as to conduct an analytical study with families that belonged to communes stratified according to the National Planning Department of Colombia (DNP). Among the factors assessed, the income, consumption, costs of food, accessibility, education level, productive activities, living conditions, and basic services were considered due to their relevant impact on the food and nutrition situation (Álvarez and Pérez, 2013; Lynch and Kaplan, 2000; Noble, 2017; Noble et al., 2015; Oh and Hong, 2003; Smith, Kassa, and Winters, 2017; Volger et al., 2017). Data collection was conducted from October to November 2017. This work was approved by the ethics committee of the Research Center from the Mariana University. Written informed consent was obtained from parents and caretakers to use the survey data. The statistical software Statistical Product and Service Solutions (SPSS) was used to perform the statistical analysis (i.e., univariate and bivariate analysis) and descriptive development of this work.

3. Results and discussion

3.1 Demographic aspects

Pasto city is the capital of the Nariño department. It is located in the southwest of Colombia. Twelve communes make up the city, which is placed at the foot of Galeras volcano whose summit rises 4,276 (14,029 ft.) meters above sea level. This city has 1,181 km², and the urban area corresponds to 14.7 km². The average temperature is 13.9 °C (57.02 °F). The urban population is 455,678 inhabitants integrated by 220,492 males and 235,186 females (Departamento Administrativo Nacional de Estadística, DANE, 2018).

From 300 individuals surveyed in this study, 150 children were males and the other 150 subjects corresponded to females with ages between 2.5 and 5 years. About 118 subjects or 39.3% of the surveyed population belonged to stratum 2 according to the socio-economic stratification system in Colombia. Considering stratum 3, only 87 subjects or 29% were identified while 64 subjects, or 21.3% belonged to stratum 1. The lowest participation was found with 5 subjects or 1.7% that belonged to stratum 5. The 8.7% remaining corresponded to individuals from stratum 4. The socio-economic stratification system classifies areas on a scale from 1 to 6 with 1 as the lowest income area and 6 as the highest one (Esbjörn and Fjalland-Pérez, 2012). It should be noted that no children in the range of age assessed herein were found in stratum 6.

3.2 Food availability and access

3.2.1 Sociodemographic factors and marketing centers

The access and availability of food for children directly depend on parents and mechanisms that are used to provide and keep a healthy and nutritive feeding. According to the univariate analysis, 161 families, corresponding to 53.7%, usually purchased food in marketplaces. About 70 families or 23.3% preferred neighborhood stores, and 64 families or 21.3% selected shopping centers; 5 families or 1.7% reported using another sort of mechanism.

Considering the bivariate analysis (Table 1), most of the surveyed families purchased food

in marketplaces. However, families whose income was greater than \$781,242 COP (> 1 MMW, monthly minimum wage), corresponding to 31.9% of surveyed subjects, purchased in shopping centers. On the other hand, families with only 1 MMW, corresponding to 29.4%, selected neighborhood stores. Most families whose income was not enough preferred marketplaces and neighborhood stores, considered as the second choice to purchase their food while families with enough income preferred marketplaces and shopping centers. Bearing in mind the Chi-square test, the null hypothesis 'Sociodemographic factors have no relation to the location where food is purchased' was rejected by the following factors: Income that families earn and whether this income is enough. A low p-value (<0.05) was computed for these factors; thus, the location where families purchased food was linked to their income and whether their wage was enough to supply their needs. Other sociodemographic factors such as economic activities that families develop and the time at which these activities are carried out, did not have a significant difference in relation to the location where food was purchased.

The above results showed that families can acceptably feed their children according to the different systems of local distribution, processing, and marketing available that cover the amount of demand related to family budget (United Nations, Committee on Economic, Social and Cultural Rights, 2001). Families were able to satisfy their needs based on the salary earned. Note that Pasto city is in a region whose adjacent municipalities have a climatology determined by elevation, which enables greater access and food availability at different seasons. Additionally, a significant number of families developed full-time commercial activities to keep a stable income.

Table 1
Sociodemographic factors and marketing centers

Factors	Purchase location									
	Shopping centers		Other		Marketplaces		Neighborhood stores		p-value	
	n	%	n	%	n	%	n	%		
Income earned by families	1 MMW	28	15	4	2.1	100	53.5	55	29.4	0.0001
	> 1 MMW	36	31.9	1	0.9	61	54	15	13.3	
Is the income enough to supply their needs?	No	21	14	1	0.7	83	55.3	45	30	0.002
	Yes	43	28.7	4	2.7	78	52	25	16.7	
Economic activities that families develop	Marketing of Goods,	10	13.9	2	2.8	39	54.2	21	29.2	0.525
	Services, provision,	47	23.5	3	1.5	108	54	42	21	
	production	7	25	0	0	14	50	7	25	
Time of economic activities	Hours	4	18.2	1	4.5	11	50	1	27.3	0.396
	Half time	19	25	2	2.6	35	46.1	20	26.3	
	Part time	3	8.3	0	0	22	61.1	11	30.6	
	Full time	38	22.9	2	1.2	93	56	33	19.9	

MMW = monthly minimum wage, n = sample size.

Source: this study

In Colombia, families are commonly structured by two or three children in homes of strata 1, 2, and 3 while one kid is usually raised by subjects of strata 4, 5, and 6 (Bushnell and Hudson, 2010), although some of the surveyed individuals belonged to low strata, parents or caretakers assured to have at least a high school education level. Families from higher strata than 3 claimed to gain a technical or professional degree. This would allow them to have better knowledge about not only the children's food and health care but how to avoid their malnutrition. Considering a higher academic level in the parents or relatives who take care of the children, better habits could be achieved with a higher quality of food, avoiding

risks in the child nutrition by presenting greater conditioning and/or knowledge regarding the combination of the different foods (e.g., cereals, meats, and legumes) to supply. In addition, better preparation of the food and better results in the development of the children in terms of their physical, psychological, and neuronal performance might be expected (ICBF, 2013).

Aspects related to food security and nutritional welfare such as food availability in local markets, capability to purchase food, and knowledge about nutritional requirements of children must be taken into account in order to provide and keep an acceptable system of feeding and nutrition for the population (Pelletier, Olson, and Frongillo, 2001).

3.2.2 Sociodemographic factors and purchasing power

About 112 families or 37.3% claimed a purchase capacity mainly reflected on the acquisition of food products whose supply was established through one kilogram (2.2 pounds) weight. On the other hand, 101 families or 33.7% usually purchased one-pound weight while 30 families or 10% purchased half a pound weight, and 12 families or 4% purchased only one and a half pounds. 45 families or 15% claimed a purchase capacity greater in terms of the above food products. For this initial analysis, which allows identifying the relationship between the evaluated factors and the acquisition of products, the purchasing frequency of food products is not in detail considered. A further description and analysis are subsequently carried out.

In respect of the bivariate analysis (Table 2), approximately 70 in 100 families whose income was greater than 1 MMW, commonly purchased one or more kilograms in weight among vegetables, fruits, cereals, and mixed products. One pound and one kilogram of fruits, vegetables, and cereals were purchased by 70 in 100 families that earned 1 MMW. 36% of the surveyed subjects that claimed their income was not enough, purchased one-pound weight of the above products. Families with enough income reported purchasing one-kilogram weight of food. Taking into account the Chi-square test, the null hypothesis

'Sociodemographic factors have no relation to the amount of purchased food' was rejected by the following factors: Income that families earn, economic activities that families develop, and time at which these activities are carried out. A low p-value (<0.05) was computed, showing the purchasing capacity, which is reflected in the acquisition of food products, was mainly linked to such factors. This suggests that families had a conditioned budget to acquire food and satisfy their basic needs.

Among the food of high consumption, mixed products were mainly selected by 221 families or 73.7% of surveyed subjects. These products represent healthy food and likely the most complex nutrition for children since fruits, vegetables, and cereals were included (Araújo, Mendonça, and Souza, 2018). Consumption of vegetables was reported by 44 families or 14.7% of surveyed subjects while fruits and cereals were reported by 28 families or 9.3%, and seven families or 2.3%, respectively. Complementary studies can be performed to examine the adequacy of dietary patterns and nutrient intake of children with ages between 2.5 and 5 years (Oh and Hong, 2003; Volger et al., 2017).

Table 2
Sociodemographic factors and purchasing power

Factors	Purchasing amount of vegetables, fruits, cereals, and mixed products										p-value	
	Half a pound	One pound		One and a half pound		One kilogram		More				
		N	%	n	%	n	%	n	%			
Income earned by families	1 MMW	25	13.4	77	41.2	7	3.7	58	31	20	10.7	0.0001
	> 1 MMW	5	4.4	24	21.2	5	4.4	54	47.8	25	22.1	
Is the income enough to supply their needs?	No	18	12	54	36	4	2.7	47	31.3	27	18	0.103
	Yes	12	8	47	31.3	8	5.3	65	43.3	18	12	

Economic activities that families develop	Marketing of Goods,	7	9.7	28	38.9	1	1.4	26	36.1	10	13.9	0.001
	services, provision,	21	10.5	61	30.5	10	5	77	38.5	31	15.5	
	production,	2	7.1	12	42.9	1	3.6	9	32.1	4	14.3	
Time of economic activities	Hours	2	9.1	7	31.8	2	9.1	7	31.8	4	18.2	0.008
	Half time	9	11.8	28	36.8	1	1.3	24	31.6	14	18.4	
	Part time	4	11.1	9	25	2	5.6	17	47.2	4	11.1	
	Full time	15	9	57	34.3	7	4.2	64	38.6	23	13.9	

MMW = monthly minimum wage, n = sample size

Source: this study

Through the bivariate analysis (Table 3) was observed that families with greater income than 1 MMW commonly purchased food every week and every 15 days. Families who claimed their income was not enough, purchased food daily and weekly. According to the Chi-square test, the null hypothesis 'Sociodemographic factors have no relation to the purchase frequency of food' was rejected by the following factors: Income that families earn and whether this income is enough to satisfy their needs. A low p-value (<0.05) was computed for such factors. Thus, the purchase frequency of food was linked to these factors evaluated. Regardless of the income earned, families weekly purchased food to meet the nutritional requirements of children. Families who earned a greater income than 1 MMW, purchased a high amount of food, which would allow extending the purchase frequency of required products. This is likely related to the low cost of products, making them accessible to the family budget, which enabled to acquire food in different amounts and locations (Hernández, 2006).

Economic accessibility implicates that personal or family financial costs associated with the acquisition of necessary food for an adequate diet must be at a certain level so that the provision and satisfaction of other basic needs are not threatened or in danger. This economic accessibility is applied to any type or right of acquisition to obtain food, and it is a measure of satisfaction for the enjoyment of the right to adequate food. Socially vulnerable groups such as people without land and other particularly

impoverished segments of the population can require special attention to satisfy their basic needs (Álvarez and Pérez, 2013; United Nations, Committee on Economic, Social and Cultural Rights, 2001) social and cultural rights. Ginebra}, 1999. In this study, the accessibility and availability of food to feed children from different communities of Pasto city were observed. Despite low income earned in low strata (i.e., 1 and 2), families were able to purchase food and nourish children. Additionally, different strategies were used to acquire products from the family basket even though the low income and purchasing power of Colombian currency. This can be attributed to the strong economic inequality in the country, which is mainly supported by the income earned (Vélez, Azevedo, and Posso-Suarez, 2011) de educación, de salud y TICs, y a niveles adecuados de nutrición, independientemente de las circunstancias menos favorables del hogar y del lugar que ellos habitan? Durante la última década Colombia logró importantes avances en varios Índices de Oportunidades Humanas, pero aún subsisten considerables brechas de oportunidades entre niños en circunstancias favorables y desfavorables. Las siete 05res brechas de oportunidades se dan en la culminación de educación primaria, media y secundaria a tiempo, en la Seguridad Alimentaria, en el acceso a Agua y Saneamiento, y en el acceso a Internet. En la comparación de regiones sobresalen los avances de la región Oriental (compuesta por los departamentos de Boyacá, Cundinamarca, Meta y Santanderes. Thus, unfavorable conditions are commonly

suffered by low-income families that seek out various economic alternatives to meet the nutritional requirements of children and other expenses.

Table 3

Sociodemographic factors and purchasing frequency of food products

Factors	Frequency								p-value	
	Daily		Weekly		Every15 days		Monthly			
	n	%	n	%	n	%	n	%		
Income earned by families	1 MMW	81	43.3	49	26.2	30	16	27	14.4	0.001
	> 1 MMW	24	21.2	49	43.4	25	22.1	15	13.3	
Is the income enough to supply their needs?	NO	63	42	42	28	20	13.3	25	16.7	0.008
	YES	42	28	56	37.3	35	23.3	17	11.3	

MMW = monthly minimum wage, n = sample size

Source: this study

Between 2002 and 2006, the Colombian government had various programs to strengthen food security, carried out within the framework of the national development plan as food assistance. Infant breakfast programs attended 322,052 children from 6 months to 5 years old, reaching 64% of coverage. School restaurants were benefited from food supplements with a coverage of 58%. For their part, 62,118 agricultural micro-entrepreneurs were benefited from employment generation through the Fondo de Financiamiento del Sector Agropecuario (FINAGRO). Quinoa production, for example, was supported in the department of Nariño. The participation of 4,510 young farmers with subsidies for employment was registered. The establishment of productive units for special populations and access to land with 3,595 hectares were adjudicated. Agricultural equipment and adaptation of productive land programs were also implemented (Fonseca and Villamarin, 2004). Although these programs are important and keep working nowadays, there have not been direct effects on poor families since their income remains at a low level in comparison to high-income families. However, among the mentioned programs, infant breakfast programs have strongly favored children 2.5 – 5 years of age, avoiding their chronic

malnutrition, at least in the location under evaluation. Furthermore, the lack of food products has not been reported in Pasto city due to agricultural growth and the variety of climates in the Andean region.

3.2.3 Sociodemographic factors and preferred food

Among the food of high consumption, protein-rich foods were remarkable. Chicken and meat were preferred, according to the univariable analysis. These products excelled with percentages of 48.7% and 43.7%, respectively. Fish and other types of protein-rich foods showed low consumption with 4% and 3.7%, respectively. Considering the bivariate analysis, all families selected chicken and meat regardless of the income earned and whether this income was enough (Table 4).

Table 4

Sociodemographic factors and protein-rich foods of high consumption

Factors	Protein-rich foods										p-value
	Meat		Fish		Chicken		Other				
	n	%	n	%	n	%	n	%	n	%	
Income earned by families	¹ MMW	84	44.9	6	3.2	90	48.1	7	3.7		0.803
	> 1 MMW	47	41.6	6	5.3	56	49.6	4	3.5		
Is the income enough to supply their needs?	No	68	45.3	4	2.7	71	47.3	7	4.7		0.484
	Yes	63	42	8	5.3	75	50	4	2.7		

MMW = monthly minimum wage, n = sample size

Source: this study.

Regarding the Chi-square test, the null hypothesis 'Sociodemographic factors have no relation to the protein-rich foods of high consumption' was accepted by the factors evaluated: Income that families earn and whether this income is enough to satisfy their needs. A p-value greater than 0.05 was computed. This showed that the consumption of meat, chicken, fish and other types of protein-rich foods were not related to such sociodemographic factors. On the other hand, considering the amount of protein-rich foods purchased, families whose income was greater than 1 MMW commonly purchased kilograms in weight while families that earned 1 MMW purchased pounds in weight. According to the bivariate analysis (Table 5) and the Chi-square test, the null hypothesis 'Sociodemographic factors have no relation to the amount of protein-rich foods purchased' was rejected by the factors: Income that families earn and whether this income is enough to satisfy their needs. A low p-value (<0.05) was computed, showing that the amount of purchased protein was linked to such factors.

Table 5

Sociodemographic factors and amount of protein-rich foods purchased

Factors	Amount of protein-rich foods purchased										p-value	
	Half a pound		One pound		One and a half pound		One kilogram		More			
	n	%	n	%	n	%	n	%	n	%		
Income earned by families	¹ MMW	25	13.4	95	50.8	12	6.4	47	25.1	8	4.3	0.0001
	> 1 MMW	8	7.1	24	21.2	13	11.5	54	47.8	14	12.4	
Is the income enough to supply their needs?	No	20	13.2	69	46	9	6	41	27.3	11	7.3	0.040
	Yes	13	8.7	50	33.3	16	10.3	60	40	11	7.3	

MMW = monthly minimum wage, n = sample size

Source: this study

When the purchase frequency was evaluated, 35% of surveyed subjects daily purchased protein-rich foods while 32.7% made it weekly. Families that purchased every 15 days and every month registered 18.3% and 14%, respectively. According to the bivariate analysis (Table 6), all families, regardless of the income earned and whether this income was enough, had a daily purchase frequency. Since the p-value was greater than 0.05, the purchase frequency of meat, chicken, fish, and other types of protein-rich foods was not linked to the income earned and whether this income was enough to satisfy their basic needs.

Table 6

Sociodemographic factors and purchase frequency of protein-rich foods

Factors	Frequency								p-value	
	Daily		Weekly		Every 15 days		Monthly			
	n	%	n	%	n	%	n	%		
Income earned by families	1 MMW	108	57.8	57	30.5	11	5.9	11	5.9	0.708
	> 1 MMW	63	55.8	40	35.4	6	5.3	4	3.5	
Is the income enough to supply their needs?	No	93	62	10	6.7	7	4.7	40	26.7	0.090
	Yes	78	52	5	3.3	10	6.7	57	38	

MMW = monthly minimum wage, n = sample size

Source: this study

Emphasizing on the preference of organic and inorganic food, 279 families or 93% of surveyed subjects preferred the first ones, while 21 families or 7% chose the second ones. Based on the bivariate analysis (Table 7), note that all families, regardless the income earned and whether this income was enough, preferred organic food. Again, a p-value greater than 0.05 was computed; therefore, there was not relationship between the preference of mentioned food and factors assessed.

Table 7

Sociodemographic factors and preference of food

Factors	Preference				p-value	
	Inorganic		Organic			
	n	%	n	%		
Income earned by families	1 MMW	16	8.6	171	91.4	0.129
	> 1 MMW	5	4.4	108	95.6	
Is the income enough to supply their needs?	No	14	9.3	136	90.7	0.087
	Yes	7	4.7	143	95.3	

MMW = monthly minimum wage, n = sample size

Source: this study

Based on the existence of the National Food and Nutrition Security Plan 2012-2019, which involves different action lines (e.g., food security, consumer protection through food quality and safety, prevention and control of micronutrient deficiency, prevention and treatment of infectious and parasitic diseases, promotion and support for breastfeeding, promotion of healthcare, nutrition and healthy lifestyles, research, and evaluation of nutritional and food topics, training of human resources in nutrition and food policies), its promotion and timely implementation are encouraged (Gobierno Nacional de la República de Colombia, 2013). Our results suggest that children did

not present malnutrition problems in the range of age assessed herein; organic products rich in essential nutrients that reinforce children's growth were mainly supplied. Surveyed subjects from strata 1 and 2 daily purchased food what would suggest the consumption of fresh food. People from high strata preferred to purchase every week and month. Additional evaluations, however, can be performed to identify the daily nutrient intake of children and to compare them with levels stated by recommended dietary allowances (Oh and Hong, 2003; Volger et al., 2017).

It is important to recognize the agricultural production in Colombia. Different products can be found in the Andean and Pacific regions. Departments such as Cundinamarca, Antioquia, Boyacá, Nariño, Huila, Tolima, Santander, for example, provide agricultural products to the whole country (Quiroga, López, and Gordillo, 2013). Since Pasto city is in the Andean region, food products of good quality are commonly provided. This feature and the high production level contribute to decreasing product prices. Hence, major accessibility can be expected, favoring the low-income populations and avoiding malnutrition. Furthermore, a favorable consumption of protein-rich foods (i.e., meat and chicken) was reported, which suggests the availability and good supply of livestock products in the region, complementing the nutritional requirements of children (Oh and Hong, 2003; Volger et al., 2017).

3.2.4 Sociodemographic factors and family income

Among surveyed subjects, families whose income was greater than 1 MMW corresponded to 113 individuals or 37.7% while families that earned 1 MMW accounted for 187 individuals, equivalent to 62.3%. On the other hand, 50% of surveyed families claimed satisfaction with their income earned while the other 50% was dissatisfied since their wage was not enough to cover and satisfy all their needs and expenses.

According to the bivariate analysis (Table 8), families that earned 1 MMW and more than this, and regardless of whether their income was enough, spent more than \$9000 COP on fruits, vegetables, and cereals. The null hypothesis of the Chi-square test 'Sociodemographic factors have no relation to the amount of money spent on food was accepted by the following factors: Income that families earn and whether this is enough to satisfy their needs. A p-value greater than 0.05 was computed, showing that the amount of money spent on food was not linked to such factors.

Table 8

Sociodemographic factors and money spent on food

Factors	Amount (COP)								p-value	
	\$1000 - 3000		\$3001 - 6000		\$6001 - 9000		More			
	n	%	n	%	n	%	n	%		
Income earned by families	1 MMW	31	16.6	36	19.3	51	27.3	69	36.9	0.435
	> 1 MMW	12	10.6	19	16.8	34	30.1	48	42.5	
Is the income enough to supply their needs?	No	26	17.3	25	16.7	39	26	60	40	0.393
	Yes	17	11.3	30	20	46	30.7	57	39	

MMW = monthly minimum wage, n = sample size

Source: this study.

Even though there exists a growing population with greater family income, a similar pattern of spending on products among families that earned 1 MMW and more than 1 MMW was observed. This behavior was shown in all communes of surveyed subjects regardless of their social stratification. A major demand of work, however, is needed to increase the family budget, which would allow to improve the consumption capacity of food products and promote a sustained economic growth (Smith et al., 2017). An adequate nutrition level guarantees that children have good health status and become the human capital who will ultimately contribute to the projection and development of any country in different economic activities through their physical and mental strength (Montañez,

2017; Noble, 2017; Noble et al., 2015; Ñustes and González, 2017). It is highlighted that the income level is directly associated with work, therefore, having a source of income through a productive economic activity is essential. This allows purchasing goods and services that meet the family and children basic needs (Cumbre Mundial sobre la Alimentación, 1999; Smith et al., 2017).

Given the macroeconomic policies, there is not true equity in terms of income distribution or national income; people located at the center of Colombia have a high-income level, exceeding one monthly minimum wage, while inhabitants located in Southern Colombia have an income that is mostly averaged at one monthly minimum wage with a little more, what generates a great social inequality (Álvarez and Pérez, 2013). Regarding this, it is needed to seek out better redistribution of economic sources so that greater solvency can be generated on population, as well as an improvement of the food condition and acquisition. Additionally, it is suggested to increase the coverage of production programs for self-consumption and food assistance for the most vulnerable territories, allowing families to be able to acquire foods that make up the family basket (Fonseca and Villamarin, 2004).

3.3 Costs of food

Interestingly, the cost of food products did not affect the consumers surveyed in this study. The product availability allowed to acquire food at low costs, which facilitated keeping an adequate diet for children. Cereals, fruits, vegetables, mixed products, meat, and chicken were preferred by surveyed families. Note that Pasto city has higher access to food than other municipalities located in the department of Nariño. Considering the food and nutrition situation in Nariño and Colombia, there exists a remarkable difference linked to food access, which makes it important to take action and implement policies according to the local needs that contribute to overcoming poverty and closing gaps (Araújo et al., 2018; Quiroga et al., 2013; Smith et al., 2017).

Taking into account the law of supply and demand in the market, it is needed to achieve a balance between the income and costs of different products in a view to make accessible goods and services to consumers and decrease the famine level. This means that prices must be flexible in such a way the income earned by individuals allows them to permanently maintain the consumption of food products.

3.4 Education level

Considering the education level of surveyed subjects, 109 females or 36.3% reported to reach secondary level. Undergraduate level was represented by 98 females; that is, 32.7%. There were two females or 0.7% without any education level. Technical education accounted for 59 individuals or 19.7%. Postgraduate education was registered by eight females or 2.7%, and only 24 females or 8% reached primary education level. Regarding the education level of males, 112 individuals or 37.3% stated to have secondary education while 81 males or 27% claimed to gain bachelor's degree. Only 2.3% or 7 individuals claimed to reach postgraduate education. 17.3% and 9% had technical and primary education, respectively. 7% did not have any education level. Allowing for the education level of caretakers, 103 individuals, corresponding to 34.3%, stated to have secondary education and three people or 1% claimed to gain postgraduate studies while 61 people or 20.3% did not have any education level. Undergraduate education was reported by 58 individuals or 19.3% while 42 individuals or 14% reached primary education. Only 33 individuals or 11% claimed to gain technical education. A significant percentage of people that obtained secondary education was observed. This suggests an acceptable preparation or basic knowledge regarding food handling and nutrition for children in the different communes of Pasto city.

The low education level of parents or caretakers, as consequence of poverty, is accompanied by occupational insertion in unfavorable conditions, in terms of stability and income level; this can negatively affect the school performance of children and their nutritional status. More highly educated individuals may be better able to stimulate their children's intellectual development, having better income that would allow to acquire better material sources such as healthy food and medical care (Noble et al., 2015). Malnutrition limits the intellectual potential of nations. The intellectual resources rather than the natural or physical resources are who ultimately determine the truly country power. No nation wishes to waste its greatest resource: the intellectual power of its people. Therefore, investment in both education and nutrition should be taken as a priority; this cannot be considered as a luxury (Oh and Hong, 2003).

Evaluating the low education level of surveyed subjects, at least favorable conditions in terms

of stability and income level were registered: a positive impact was generated on children's nutrition, and malnutrition was not identified that could compromise children's intellectual and physical development (Noble et al., 2015; Noble, 2017). Additionally, the education level of females with mother role, time spent on food preparation and their jobs, have shown an important impact on children diet. Interestingly, females with high education level seem to have a better capability of efficiently use resources linked to food in homes (Dehollain, 1995). Adult nutrition education focusing on practical nutrition knowledge can be a useful and important means of nutrition intervention for better household food situation and child nutrition among low-income urban families (Oh and Hong, 2003).

3.5 Productive activities of population

Different economic activities were carried out by surveyed subjects to supply food and meet the nutritional requirements of children in the range of age evaluated. 200 subjects claimed to conduct activities of services provision (e.g., kitchen assistant, babysitters, teachers, and other professions), corresponding to 66.7%. Marketing of goods (e.g., street vendors, store sellers, product distributors) included 72 surveyed families, corresponding to 24%. Only 28 families claimed to belong to the production area (e.g., artisan, bricklayer), corresponding to 9.3%. Productive development according to work schedules showed the following picture: 166 families or 55.35% worked full time. Half-time was reported by 76 families or 25.3% while part-time was registered by 36 families or 12%. A total of 22 families or 7.3% worked following a schedule in terms of hours per day.

According to the bivariate analysis (Table 9), service provision was the most relevant economic activity. A p-value greater than 0.05 was computed, showing that the economic activity was not linked to the income earned. Considering the productive development according to work schedules, full-time activities were mainly selected. A p-value greater than 0.05 showed that time spent on economic activities was not related to the income earned (Table 10). Note that most of the surveyed subject conducted economic activities concerning informal jobs.

Table 9

Sociodemographic factors and economic activity

Factors	Economic activity							p-value
	Marketing of goods		Services provision		Production			
	n	%	n	%	n	%		
Income that families earn	1 MMW	48	25.7	120	64.2	19	10.2	0.496
	> 1 MMW	24	21.2	80	70.8	9	8	

MMW = monthly minimum wage, n = sample size

Source: this study.

Table 10

Sociodemographic factors and work schedule

Factors	Time of economic activities								p-value	
	Hours		Half time		Part time		Full time			
	n	%	n	%	n	%	n	%		
Income that families earn	1 MMW	15	8	50	26.7	24	12.8	98	52.4	0.623
	> 1 MMW	7	6.2	26	23	12	10.6	68	60.2	

MMW = monthly minimum wage, n = sample size

Source: this study.

Regardless of the income earned, people had access to market, both financial and service provision, which allowed to provide food security to families in the location evaluated (Delgadillo, 2004). As early mentioned, the department of Nariño has a variety of climates and a rich hydrographic system that enable a constant production of food and permanent acquisition in Pasto city, particularly. This feature and its closeness to Ecuador also enable active commercialization of products that ensure the provision of food whenever is needed.

The marginality in food production has been the fundamental reason to define food insecurity in a certain agro-ecological zone, distorting the sense of food security since it is based on the production and income generation capacities that allow the acquisition of food and do not on the production of themselves, necessarily (Delgadillo, 2004). Although Pasto city did not show an outstanding productive marginality of food, children kept an adequate nutritional status. Additionally, its geographic location has facilitated the acquisition of products at a low price (e.g., cereals and articles from the family basket), taking into account the import and contraband activities performed on the border with Ecuador. Considering the economic opening and land distribution in Colombia, a decrease in production and harvest area of main transient and permanent crops have been reported in the later years (Álvarez and Pérez, 2013). This situation has led to import products for meeting the food demand of the population (Mejía, 2016).

3.6 Living conditions and basic services

Regarding this topic, overcrowding was not registered. According to the survey data, children under excellent health conditions were reported by 151 families, corresponding to 50.3%. Good health conditions were reported by 133 families or 44.3%, and regular health conditions were considered by 15 families or 5%. A single-family or 0.3% had a child under bad health status. Concerning basic services such as electric energy, natural gas, and water availability, 274 families or 91.3% graded them as good, 22 families or 7.3% assigned a regular grade, and 4 families or 1.3% graded them as bad services. In view of the affiliation system to entities providing healthcare services, it is important to keep children under good health status; 177 families or 59% belonged to the subsidized regime (i.e., healthcare service is subsidized by the state), 120 families or 40%

stated to be part of the contributory regime (that is, healthcare service is directly paid by each taxpayer), and three families or 1% did not state to have any sort of affiliation. This is likely due to ignorance, the lack of economic resources, or interest in wanting to belong to any affiliation system. The subsidized and contributory health care system is chosen according to the economic status of families.

The above results showed that the health status and basic services were predominant according to the location where children reside. Since satisfactory health conditions and good basic services were registered without overcrowding, the risk factor of diseases such as diarrhea or spreading of epidemics were minimized (Hernández, Rodríguez, Ferrer, and Trufero, 2000). This undoubtedly provides an appropriate environment that enables state a truly food security for individuals. On the other hand, belonging to an affiliation system ensures to keep a permanent medical and dental control that guarantees the welfare and health status of the children population.

Social security can be conceived as an important factor in the context of social protection, allowing to improve the life quality of human beings and especially children's life. Since healthcare is a right, parents and caretakers must provide children all attention and care through controls and medical treatment supplied by healthcare professionals. In Colombia, the health care system is based on Law 100 of 1993 as a social protection scheme, which is offered by the state to citizens through a group of public and private institutions (Leyes desde 1992, s. f.). As stated early, children belonged to subsidized or contributory health care system, where childhood care stands out for preventing diseases that cause incurable injuries, which should have an important effect on their health status and nutrition level.

Furthermore, it is highlighted that the public healthcare plan for collective interventions is in charge of the state and territorial entities, who become entities of promotion and diseases prevention for individuals from low strata (i.e., 1, 2, and 3), as stipulated by Resolution 425 of 2008 of the Colombian's Ministry of Protection, now the Ministry of Health and Social Protection. This provided the guarantee of social security for children in the range of age assessed.

4. Conclusions and implications

Compared to available information, the present study found that there was no direct relationship between the poverty level and food insecurity in Pasto city. Geographic location and cultural food practices can contribute to determining differences between study populations (Álvarez and Pérez, 2013; Smith et al., 2017; Volger et al., 2017). The complexity of the operational concept and definition of food insecurity has complicated the study of the 'food insecure' and efforts to determine clear policy directions. Previous findings on the prevalence and severity of food insecurity are inconsistent and often depend on the measure used. To overcome limitations in food security measurement, the Food and Agriculture Organization of the United Nations developed the Food Insecurity Experience Scale, which is the first survey protocol to measure people's direct experience of food insecurity on a global scale. Using this new measure, our study contributes to the understanding of the food insecure by examining the determinants of food insecurity within and across countries in Latin America and the Caribbean (LAC). Additional research, however, is needed to further characterize eating habits and nutritional intake in children, as well as to evaluate long-term effects on their health status, intellectual and physical development.

Considering that income level represents an important aspect of food security, families were able to provide food to children between 2.5 and 5 years old according to their family budget. About 1 MMW was earned by 187 families while an income greater than 1 MMW was earned by 113 families. This showed that Pasto city provides acceptable economic conditions to guarantee the food supply of families and children.

The cost of different products is another factor of great influence to establish an adequate intake of nutrients in children from different strata. Although food prices can daily change due to product availability, for instance, food products are constantly purchased in markets, as well as in neighborhood stores and shopping malls. Regarding the purchase frequency and purchased amount, families from strata 1, 2, and 3 usually purchased food daily in terms of kilograms as a measuring unit.

Food availability is an important element to achieve food security. Food products must

be constantly offered and provided to the population. Since malnutrition of children was not observed, satisfactory conditions were considered at least in 12 communes from the urban area of Pasto. This city is strategically located in the Andean region where all food types can be usually found. Different weathers determined by elevation (thermal floors) enable access and food availability during different seasons.

An acceptable preparation or basic knowledge regarding food handling and children's nutrition was found. Although some of the surveyed individuals belonged to low strata, they had secondary education levels. Adult education focusing on practical nutrition knowledge is essential to generate awareness, and therefore, to keep children well-fed and avoid malnutrition.

Favorable results regarding the children's nutrition level are also linked to different public policies issued by the state. This supports the information provided by the municipal food security plan, which was proposed by the Secretary of Rural Development for Pasto city. Guidelines have been established considering the FAO principles: Food availability obtained by internal production capacity, food access or ability to acquire food, use related to population conditions and consumption, and biological use. Additionally, complimentary topics such as education, healthcare, and production have been included. On the other hand, active participation of leaders from communes among institutional actors can be helpful to implement axes of the departmental and national policy of food security and nutrition, anticipating and responding to risk situations such as hunger, malnutrition, and related diseases.

Among the strategies to improve food security, the following suggestions are pointed out:

- Diversification of production is needed to make accessible products of great consumption at low prices, allowing better coverage and benefit to low-income families, mainly.
- Teaching campaigns launched by the Health Secretariat of Municipal Mayor's Office or responsible entities must be further promoted and supported to continuously ensure proper feeding. As well as promotion of education for the most vulnerable population is essential.
- Basic services of good quality such as electric energy, natural gas, and water

must be supplied to ensure family welfare. It is highlighted the people's right to have a proper level of life for themselves and their families, including feeding, dressing, proper housing, and continuously enhancing living conditions.

- It is important to implement and support projects that allow the reconditioning of income through partnership and cooperative development systems so that salaries can exceed minimum wages to purchase food within the family baskets and satisfy family needs. Long-term strategies that sustain household productive capacity and employment should be included.

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6. Competing financial interests

The authors of this article declare not to have any conflict of interest regarding the work presented.

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Contribución:

Gloria Córdoba: Principal Investigator. Writing of materials and methods. Results and Discussion. Preparation of tables.

John Fuertez: Drafting of the manuscript, participation in the analysis of results. Consolidation of references.

Jonier Martínez: Statistical data processing. Analysis and interpretation of results.

All authors participated in the preparation of the manuscript, read it and approved it.