



Brief communication

Factors associated with overweight and obesity in children under 35 months, in El Salvador 2021

DOI: 10.5377/alerta.v9i3.22356

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Abstract

Introduction. Childhood overweight and obesity constitute a public health problem due to their immediate and long-term metabolic consequences. The prevalence of overweight and obesity among children and adolescents in Latin America and the Caribbean has increased in recent decades; it is estimated that approximately three out of every ten are overweight. **Objective.** Identify the factors associated with overweight and obesity in children under 35 months of age in El Salvador. **Methodology.** An analytical cross-sectional study using data from the 2021 El Salvador National Health Survey. **Results.** A total of 2027 children under 35 months of age were included. The highest proportion of overweight and obese children was observed in the 6- to 11-month age group (56.2 %). The absence of breastfeeding and the early introduction of sugar-sweetened beverages were significantly associated with excess weight (ORP 6.5; 95 % CI 4.2–10.1). **Conclusion.** The absence of breastfeeding and the early introduction of sugar-sweetened beverages are the main factors associated with overweight and obesity during early childhood, highlighting the need to strengthen interventions aimed at promoting breastfeeding and appropriate complementary feeding practices from the first months of life.

Keywords

Breast Feeding, Pediatric Obesity, Sugar-Sweetened Beverages.

Resumen

Introducción. El sobrepeso y la obesidad infantil constituyen un problema de salud pública, debido a sus repercusiones metabólicas inmediatas y a largo plazo. La prevalencia de sobrepeso y obesidad infantil y en adolescentes de América Latina y El Caribe ha incrementado en las últimas décadas; se estima que aproximadamente tres de cada diez presentan exceso de peso. **Objetivo.** Identificar los factores asociados con el sobrepeso y la obesidad en niños menores de 35 meses en El Salvador. **Metodología.** Estudio transversal analítico de la base de datos de la Encuesta Nacional de Salud de El Salvador 2021. **Resultados.** Se incluyeron 2027 niños menores de 35 meses. La mayor proporción de sobrepeso y obesidad se observó en el grupo de seis a 11 meses (56,2 %). La ausencia de lactancia materna y la introducción temprana de bebidas azucaradas mostraron una asociación significativa con el exceso de peso (ORP 6,5; CI 95 % 4,2-10,1). **Conclusión.** La ausencia de lactancia materna y la introducción precoz de bebidas azucaradas constituyen los principales factores asociados con el sobrepeso y la obesidad durante la primera infancia, lo que resalta la necesidad de fortalecer las intervenciones dirigidas a promover la lactancia materna y prácticas adecuadas de alimentación complementaria desde los primeros meses de vida.

Palabras clave

Lactancia Materna, Obesidad Infantil, Bebidas Azucaradas.

Introduction

Overweight and obesity in children under two years of age constitute a growing global public health problem. In Latin Ameri-

ca, several studies have documented that the absence of exclusive breastfeeding is associated with an increased risk of overweight and obesity in children under the age of two.^{1,2}



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Factores asociados al sobrepeso u obesidad en menores de 35 meses, en El Salvador 2021

Suggested citation:

Chirino Molina WY. Factors associated with overweight and obesity in children under 35 months, in El Salvador 2021. Alerta. 2026;9(3):255-263. DOI: 10.5377/alerta.v9i3.22356

Editor:

Veralís Morán.

Received:

June 18, 2024.

Accepted:

June 30, 2026.

Published:

July 31, 2026

Author contribution:

WYCM¹: study design, literature search, data collection, data or software management, data analysis, writing, revising, and editing.

Conflicts of interest:

No conflicts of interest.

Furthermore, evidence has shown that exclusive breastfeeding during the first six months and its continuation until age two act as an important factor in preventing the development of childhood obesity.^{3,4} Similarly, in Ecuador, an analysis of the 2018 National Health and Nutrition Survey revealed that early cessation of breastfeeding is associated with a higher body mass index in children under the age of two.³

The World Health Organization (WHO) point out that the consumption of sugar-sweetened beverages has been associated with an increased risk of overweight and obesity in childhood, due to that contain high levels of sodium, saturated fats, and added sugars, and are low in essential nutrients.^{5,6}

In El Salvador, the 2021 National Health Survey (NHS) revealed that the prevalence of overweight among children under five years of age reached 8.3 %, representing an increase from the 6.4 % reported in 2014. This indicated an upward trend in excess weight during early childhood. However, in El Salvador, there is limited recent evidence that comprehensively explores the factors associated with overweight and obesity. In this context, using data from the 2021 NHS enables a secondary analysis that contributes to the generation of evidence.⁷ Therefore, the objective of this study is to identify the factors associated with overweight and obesity in children under 35 months of age, based on the 2021 NHS in El Salvador.

Methodology

A cross-sectional analytical study was conducted based on data from the 2021 ENS in El Salvador.⁷ This population-based survey collected information from all 14 departments of El Salvador and included results from 16 500 households, providing nationwide representativeness. The Salvadoran health system organizes the country into five health regions: Western, Central, Paracentral, Eastern, and Metropolitan.

This study included records for children under 35 months of age with complete interviews and a valid nutritional status classification.

The following were considered independent variables: the child's age, sex, area of residence, department and health region, family structure, age of the primary caregiver, infant feeding practices, consumption of sugar-sweetened beverages, and access to technology at home. Family structure was classified as single-parent or two-parent households, depending on the presence of one or both parents in the home. The

caregiver age variable corresponded to the age of the person primarily responsible for the child's care, categorized as < 50 years and > 50 years or older.

Feeding practices included: exclusive breastfeeding (receiving only breast milk during the first six months),⁷ extended breastfeeding (receiving breast milk after six months along with other foods), infant formula feeding, and consumption of vegetables and sugary beverages, as reported in the survey.

The variable "access to technology" was defined as the availability in the household of at least one technological device for communication or information, such as a television, computer, mobile phone, or internet access, classified dichotomously as yes (presence of at least one device) or no (absence of all devices).

The dependent variable was nutritional status, assessed through direct measurement of weight and height performed during the survey using standardized anthropometric equipment.⁷ WHO growth standards were used, with indicators expressed as Z-scores.

Normal weight was defined as a weight value between -2 and +2 standard deviations (SD). A value greater than +2 SD was classified as overweight, and a value greater than +3 SD as obese.⁷ Children who were underweight or malnourished were excluded.

The database was provided by the Research Unit of the National Institute of Health (INS) in a linear format. Subsequently, the data were subsequently cleaned, consistency checks, and completeness assessments. A threshold of 20 % missing data per variable was applied to determine inclusion in the analysis; this criterion was applied at the variable level rather than at the level of individual observations. The variables excluded under this criterion were not related to the study's primary outcome or exposures, and their exclusion did not compromise the sample size or the objectives of the analysis.

Age was analyzed as a continuous variable; since it did not follow a normal distribution according to the Anderson-Darling test, it was described using the median and interquartile range. Bivariate analysis was performed using contingency tables, estimating prevalence odds ratios (POR) with 95 % confidence intervals and a significance level of $p < 0.05$. Logistic regression models were constructed, stratified by age groups (< 6 months, six - 11 months, 12-24 months, and 25-35 months), defined according to the biological and nutritional stages of early childhood. The

adjusted associations correspond to estimates obtained by including sociodemographic and feeding variables considered as potential confounding factors.

Variable selection for the multivariate model was based on epidemiological criteria and scientific evidence, which included relevant variables such as family structure, caregiver age, and feeding practices, regardless of their statistical significance in the bivariate analysis. The regression models, the independence of observations, the absence of multicollinearity among independent variables, and the stability of estimates were evaluated. The accuracy of the results was assessed using 95 % confidence intervals, and the model fit was evaluated using statistical tests.

Data processing was performed using Microsoft Excel 365 with the Real Statistics add-in for data cleaning and descriptive analysis, and EpiInfo version 7.2.4.0 for inferential analysis.

This study was conducted in accordance with the ethical guidelines of the Council for International Organizations of Medical Sciences (CIOMS). Only information contained in the existing database was used; it was anonymized and coded to ensure the confidentiality of each case. This study was approved by the INS Health Research Ethics Committee under approval number N°CEINS/2023/013.

Results

A total of 2027 records of children under 35 months of age were analyzed. Of the total, 50.12 % were male, and more than half were from urban areas (59.25 %). The median age was 22 months. The results showed that the first quartile was 14 months, the third quartile was 29 months, and the interquartile range was 15 months (Table 1).

Overweight or obesity was present in 56.2 % of children under six months of age, in

57.8 % of the six- to 11-month-old group, in 54.7 % of the 12- to 24-month-old group, and in 54.8 % of the 25- to 35-month-old group (Table 1).

In the bivariate analysis, children who were not breastfed before six months of age were found to have a statistically significant higher risk of becoming overweight or obese compared with those who were breastfed (ORP 32.97; 95 % CI 11.04-74.21). Infants under six months of age who were formula-fed had a higher risk of becoming overweight or obese compared to those who were not formula-fed (OR 6.21; 95 % CI 2.78-14.42). All of these results are statistically significant with a $p < 0.05$ (Table 2).

Not being breastfed is a statistically significant risk factor (ORP 9.71; 95 % CI 4.61-24.96) for being overweight or obese ($p < 0.05$) (Table 2).

Among children aged 12 to 24 months, having a caregiver over 50 years of age represents a risk (ORP 4.80; 95 % CI 1.75-13.20). It was observed that consumption of sugar-sweetened beverages increases the risk (ORP 2.43; 95 % CI 1.59-3.70). Likewise, the absence of breastfeeding increased the risk of becoming overweight or obese (ORP 13.39; 95 % CI 8.26-21.89). All of these results are statistically significant, with a p -value < 0.05 (Table 2).

In the 25-35-month age group, never having been breastfed at any stage of life (ORP 7.75; 95 % CI 5.12-11.79) and consumption of sugar-sweetened beverages (ORP 3.70; 95 % CI 2.49-5.47) increased the risk of being overweight. All of these results are statistically significant, with a $p < 0.05$ (Table 2).

Multivariate analysis stratified by age group showed that the not being of breastfed is associated with being overweight in the group under six months of age (ORP 21.29; 95 % CI 6.69-70.01); whereas, in the six- to 11-month-old group, not being of breastfed is associated with excess weight (ORP 9.12; 95 % CI 3.39-14.50).

Among children aged 12 to 24 months, the factors associated with the risk of being overweight were the absence of breastfeeding (ORP 11.06; 95 % CI 6.63-18.44) and consumption of sugar-sweetened beverages (ORP 1.83; 95 % CI 1.10-3.03). Finally, in the 25- to 35-month-old group, the absence of breastfeeding from birth (ORP 5.75; 95 % CI 3.64-9.09) and the consumption of sugar-sweetened beverages (ORP 3.82; 95 % CI 2.41-6.05) are associated with excess weight. All of these results are statistically significant, with a $p < 0.05$ (Table 3).

Discussion

This study identified various factors associated with overweight and obesity in children under 35 months of age in El Salvador, using a multivariate analysis stratified by age group. The results showed that both feeding practices during the first months of life and characteristics of the family environment play a decisive role in children's nutritional status.

Exclusive breastfeeding through six months of age has a protective effect against overweight and obesity, compared with infant formula feeding.^{8,9,10}

The prevalence of overweight and obesity among children under 24 months is consistent with findings observed over

Table 1. Characteristics by age group in the study population

Overweight/obesity				Normal weight		
Under six months N = 208						
Description	N = 32	%	Confidence intervals (95 %)	N = 176	%	Confidence intervals (95 %)
Sex						
Male	18	56.2	37.6-73.6	91	51.7	44.0-59.2
Female	14	43.7	26.3-62.3	85	48.3	40.7-55.9
Area						
Urban	21	65.6	46.8-81.4	99	56.25	48.5-63.7
Rural	11	34.3	18.5-53.1	77	43.75	36.3-51.4
Región						
Eastern	10	31.2	16.1-50.0	37	21.0	15.2-27.7
Paracentral	10	31.2	16.1-50.0	37	21.0	15.2-27.7
Central	7	21.8	9.2-39.9	23	13.0	8.4-18.9
West	3	9.3	1.9-25.0	49	27.8	21.3-35.0
Metropolitan	2	6.2	0.7-20.8	23	13.0	11.8-23.4
Mother lives in the household						
Yes	30	93.7	79.1-99.2	176	100.0	97.9-100
No	2	6.2	0.7-20.8	0	0.0	0
Single-parent household						
Yes	7	21.8	9.2-39.9	38	21.5	15.7-28.4
No	25	78.1	60.0-90.7	138	78.4	71.5-84.2
Caregiver aged ≥50 years						
Yes	2	6.2	0.7-20.8	0	0	0
No	30	93.7	79.1-99.2	176	100	97.9-100
Exclusive breastfeeding						
Yes	0	0	0	66	37.5	30.3-45.1
No	32	100	89.1-100	110	62.5	54.9-69.6
Breastfeeding						
Yes	16	50	31.8-68.1	171	97.1	93.5-99.0
No	16	50	31.8-68.2	5	2.84	0.93-6.5
Formula feeding						
Yes	21	65.6	46.8-81.4	41	23.3	17.2-30.2
No	11	34.3	18.5-53.1	135	76.7	69.7-82.7
Consumption of sugar-sweetened beverages						
Yes	29	90.6	74.9-98.0	40	22.7	16.7-29.6
No	3	9.3	1.9-25.0	136	77.2	70.3-83.2
Access to information						
Yes	32	100	89.1-100	168	95.4	91.2-98.0
No	0	0.0	0.0-10.8	8	4.5	1.9-8.7
Six to 11 months N= 221						
Description	N = 38	%	Confidence intervals (95 %)	N = 183	%	Confidence intervals (95 %)
Sex						
Male	16	42.1	26.4-57.7	92	50.2	43.1-57.4
Female	22	57.8	42.2-73.5	91	49.7	42.5-56.9
Area						
Urban	24	63.16	47.8-78.4	99	54.1	47.1-61.1
Rural	14	36.84	21.5-52.1	84	45.9	38.9-52.9

Region						
Paracentral	14	36.8	21.8-54.0	51	27.8	21.5-34.9
Eastern	8	21.0	9.5-37.3	43	23.5	17.5-30.3
Metropolitan	6	15.7	6.0-31.2	28	15.3	10.4-21.3
Central	5	13.1	4.4-28.0	26	14.2	9.5-20.1
West	5	13.1	4.4-28.0	35	19.3	13.7-25.5
Mother lives in the household						
Yes	36	94.7	86.8-100	182	99.45	97.5-100
No	2	5.26	0.00-13.1	1	0.55	0.2-46.0
Single-parent household						
Yes	13	34.2	19.16-49.26	43	23.5	16.7-30.2
No	25	65.7		140	76.5	69.7-83.2
Continued breastfeeding						
Yes	9	23.68	10.10-37.2	105	57.3	50.4-64.3
No	29	76.3	62.7-89.9	78	42.6	35.6-49.5
Received breast milk at any time						
No	18	47.4	31.8-63.4	14	7.7	4.5-12.4
Yes	20	52.6	36.6-68.2	169	92.3	87.6-95.5
Access to information						
Yes	36	94.7	82.2-99.3	178	97.2	93.7-99.1
No	2	5.2	0.6-17.7	5	2.7	0.8-6.2
12 to 24 months N= 727						
Description	N = 38	%	Confidence intervals (95 %)	N = 183	%	Confidence intervals (95 %)
Sex						
Male	58	54.7	44.7-64.4	308	49.6	45.6-53.5
Female	48	45.2	35.5-55.2	313	50.4	46.4-54.3
Area						
Urban	69	65.0	55.2-74.1	380	61.1	57.3-64.9
Rural	37	34.9	25.9-44.7	241	38.8	35.0-42.7
Region						
Eastern	34	32.0	23.3-41.8	160	25.7	22.4-29.3
West	27	25.4	17.5-34.8	128	20.6	17.6-23.9
Paracentral	19	17.9	11.1-26.5	150	24.1	20.9-27.6
Metropolitan	16	15.0	8.8-23.3	113	18.2	15.3-21.4
Central	10	9.4	4.6-16.6	70	11.2	9.0-14.0
Mother lives in the household						
Yes	98	92.4	85.6-96.6	610	98.2	96.8-99.0
No	8	7.5	3.31-14.3	11	1.7	0.9-3.1
Single-parent household						
Yes	25	23.5	15.8-32.8	143	23.0	19.8-26.5
No	81	76.4	67.1-84.1	478	76.9	73.5-80.1
Caregiver aged ≥50 years						
Yes	7	6.6	2.7-13.1	9	1.4	0.7-2.7
No	99	93.4	86.8-97.2	612	98.5	97.2-99.2
Continuous breastfeeding						
Yes	28	26.4	18.3-35.8	333	53.6	49.6-57.5
No	78	73.5	64.1-81.6	288	46.3	42.4-50.3
Received breast milk at any time						
No	55	51.9	42.1-61.6	46	7.4	5.4-9.8
Yes	51	48.1	38.4-57.9	575	92.6	90.2-94.6

Sugar-sweetened beverages						
Yes	40	37.7	28.5-47.7	41	6.6	4.8-8.8
No	66	62.3	52.3-71.5	580	93.4	91.2-95.2
Access to technology						
Yes	103	97.1	91.9-99.4	600	96.6	94.8-97.7
No	3	2.83	0.5-8.0	21	3.3	2.2-5.1
25-35 months N=871						
Description	N = 38	%	Confidence intervals (95 %)	N = 183	%	Confidence intervals (95 %)
Sex						
Male	68	54.8	45.6-63.7	365	48.8	45.2-52.4
Female	56	45.1	36.2-54.3	382	51.1	47.5-54.7
Area						
Urban	78	62.9	53.7-71.4	431	57.7	54.1-61.1
Rural	46	37.1	28.6-46.2	316	42.3	38.8-45.8
Region						
Eastern	48	38.7	30.1-47.8	233	31.1	27.9-34.6
Paracentral	28	22.8	15.5-30.9	159	21.2	18.5-24.3
West	20	16.1	10.1-23.8	168	22.4	19.6-25.6
Metropolitan	20	16.1	10.1-23.8	103	13.7	11.5-16.4
Central	8	6.4	2.83-12.3	84	11.2	9.1-13.7
Mother lives in the house- hold						
Yes	117	94.3	88.7-97.7	738	98.8	97.7-99.3
No	7	5.6	2.3-11.2	9	1.2	0.6-2.2
Single-parent household						
Yes	38	30.6	22.6-39.5	184	24.6	21.68-27.8
No	86	69.3	60.4-77.3	563	75.7	72.15-78.3
Caregiver over 50						
Yes	4	3.23	0.8-8.0	11	1.47	0.8-2.6
No	120	96.7	91.9-99.1	736	98.5	97.3-99.1
Received breast milk at any time						
No	64	51.6	42.4-60.6	90	12.05	9.91-14.5
Yes	60	48.3	39.32-57.5	657	87.95	85.4-90.0
Access to technology						
Yes	123	99.1	95.1-99.9	727	97.3	95.5-98.2
No	1	0.8	0.02-4.4	20	2.6	1.7-4.1

Table 2. Factors associated with overweight or obesity in children under 35 months of age

Variable	ORP	95 % CI	p
Single-parent household	1.01	0.38-2.46	1.00
Absence of breastfeeding*	32.97	11.04-74.21	< 0.01
Formula	6.21	2.78-14.42	< 0.01
Urban	1.48	0.67-3.36	0.42
Six to 11 months N = 221			
Single-parent household	1.68	0.77-3.57	0.20
Absence of breastfeeding*	9.71	4.61-24.96	< 0.01
Sugar-sweetened beverages	2.11	0.97-4.55	0.06
12 to 24 months N = 727			
Single-parent household	1.03	0.06-1.67	< 0.01
Caregiver over 50	4.80	1.75-13.20	< 0.01
Absence of breastfeeding*	13.39	8.26-21.89	< 0.01
Sugar-sweetened beverages	2.43	1.59-3.70	< 0.01
No vegetable consumption	1.62	1.02-2.59	0.04
25 to 35 months N = 871			
Single-parent household	1.35	0.88-2.04	0.18
Caregiver over 50	2.22	0.60-6.90	0.30
Absence of breastfeeding*	7.75	5.12-11.79	< 0.01
No vegetable consumption	1.82	1.13-2.99	0.01
Sugar-sweetened beverages	3.70	2.49-5.47	< 0.01

No breastfeeding since birth*

Table 3. Multivariate analysis of factors associated with overweight and obesity in children under 35 months of age

Variable	ORP	95% CI	p
Under 6 months N= 208			
Single-parent household	1.05	0.34-3.24	0.92
Urban	0.77	0.29-2.03	0.60
Absence of breastfeeding*	21.29	6.69-70.01	< 0.01
Formula feeding	3.03	1.14-7.74	0.02
Six to 11 months N= 221			
Sugar-sweetened beverages	1.04	0.44-2.69	0.84
Absence of breastfeeding*	9.12	3.39-14.50	< 0.01
Single-parent household	1.39	0.58-3.33	0.44
112 to 24 months N= 727			
Single-parent household	0.74	0.41-1.37	0.34
Caregiver over 50	2.78	0.78-9.85	0.11
Absence of breastfeeding*	11.06	6.63-18.44	< 0.01
Sugar-sweetened beverages	1.83	1.10-3.03	0.01
No vegetable consumption	1.42	0.82-2.47	0.20
25 to 35 months N= 871			
No breastfeeding	5.75	3.64-9.09	< 0.01
Single-parent household	1.04	0.65-1.67	0.84
No vegetable consumption	1.97	1.12-3.46	0.01
Caregiver aged ≥50 years	1.07	0.30-6.05	0.90
Sugar-sweetened beverages	3.82	2.41-6.05	< 0.01

No breastfeeding since birth*

a five-year period.^{11,12} Similarly, a cohort study in Spain shows that extended breastfeeding has a protective effect against overweight and obesity in childhood,¹³ as it has an optimal composition tailored to the child's needs, which promotes healthy growth patterns and prevents excessive weight gain. Furthermore, prolonging breastfeeding enhances its protective effect,¹⁴ due to its unique properties, such as reducing early exposure to sugary drinks and other unhealthy foods.¹⁵

The consumption of sugar-sweetened beverages remained a significant risk factor for overweight and obesity in children throughout the analysis. According to the U.S. Dietary Guidelines Advisory Committee, it is important to avoid the consumption of sugar-sweetened beverages in children under two years of age, as it is associated with a later risk of childhood overweight.¹⁶ Furthermore, it has been reported that the consumption of sugar-sweetened beverages during childhood is associated with a higher likelihood of obesity by age six;¹⁷ it also increases body mass index and waist circumference in children and adolescents.¹⁸

The absence of breastfeeding can negatively influence feeding practices and parenting styles. In China, it was shown that caregivers' behavior was associated with childhood overweight and obesity;¹⁹ furthermore, in another study, care provided by grandparents was associated with a 30 % increase in the risk of overweight and obesity in children.²⁰ Likewise, early feeding practices and the consumption of sugar-sweetened beverages,^{21,22,23} the family environment, and the type of caregiver play an essential role in the development of excess weight in children.²⁴

Conclusion

The absence of breastfeeding and the consumption of sugar-sweetened beverages were identified as the main factors associated with being overweight or obese in children under 35 months of age. These findings underscore the importance of promoting exclusive breastfeeding during the first six months of life and its continuation until age two, as well as regulating early exposure to unhealthy foods and beverages. They also reinforce the need to implement prevention policies and strategies targeting the family environment from the earliest years of life, with the goal of reducing childhood obesity and its long-term consequences. Interventions should go beyond the mother and include educational strategies aimed at other household

members, promoting harmony between nutritional practices and the prevention of excess weight in early childhood.

Funding

No external funds were received for this work.

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