Original article

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Consumption of ultra-processed foods among children aged 6 to 23 months as per the Second National Survey on Nutrition and Health of Argentina

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ABSTRACT

Introduction. The availability of data on the consumption of ultra-processed foods among children is important for planning public policies.

Objectives. To describe the prevalence of consumption of ultra-processed foods in children under 2 years of age and identify associated factors. To describe the proportion that ultra-processed foods represent out of the total number of foods consumed in a day.

Methods. Secondary analysis of data from children aged 6–23 months with at least a 24-hour recall of food consumption based on the Second National Survey on Nutrition and Health of Argentina (2018). The following primary variables were studied: "consumption of ultra-processed foods" (according to the NOVA system) categorized into yes/no and "proportion of ultra-processed out of total foods consumed." The following associated factors were studied: breastfeeding, sex, age, and number of non-ultra-processed foods consumed. A multivariate logistic regression model was developed and an expansion factor was applied to weight the data.

Results. A total of 4224 children were included (weighed: 908 104). The prevalence of ultra-processed food consumption was 90.8% (95% CI: 89.5–92) and was associated with an older age (OR: 3.21, 95% CI: 2.28–4.52) and the number of non-ultra-processed foods consumed (OR: 1.17, 95% CI: 1.13–1.23). Ultra-processed foods accounted for a median 20% (IQR: 12.5–28.6%) of all foods consumed in a day.

Conclusions. This study highlights the high penetration of ultra-processed foods in complementary feeding.

Keywords: *food consumption; ultra-processed foods; nutritional surveys; infant nutrition; infant.*

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INTRODUCTION

The consumption of ultra-processed foods (UPFs) according to the NOVA classification (a system that groups foods based on the purpose and extent of food processing) has increased at the expense of the consumption of unprocessed or minimally processed foods.[1–5] UPFs are industrial formulations with high addictive power, low nutritional quality, and high energy density, which increase the risk for obesity, other chronic non-communicable diseases (NCDs), and early mortality.[1,2,4–6] Obese children are likely to become obese adults and suffer NCDs.[1,7] The World Health Organization (WHO) recommends increasing the consumption of unprocessed or minimally processed foods to fight obesity.[7]

The high consumption of UPFs as of 2 years of age has been documented.[1,2,8–10] However, it is important to have information about their consumption in children under 2 years of age because this is a valuable period for the development of eating habits.[11–13] In Argentina, the recommendation is to start complementary feeding (CF) at 6 months of age, transitioning from exclusive breastfeeding or formula feeding to family foods.[11-13] The Dietary Guidelines for the Argentinean Children Population, partially updated in 2021, fail to mention the NOVA system.[13,14] A 2022 review of dietary guidelines from 106 countries revealed that the term "ultra-processed foods" was mentioned only by 7 countries.[15] The UNICEF and the WHO established an indicator to assess CF called "consumption of unhealthy foods," which consists of the percentage of children who consumed (regardless of the quantity) foods that should be avoided from a list of foods, such as candies and cookies (considered UPFs by the NOVA system).[16] In turn, the Pan American Health Organization states that a dietary quality indicator is the percentage that UPFs represent out of the total calorie intake.[2]

The available evidence indicates that UPFs have also penetrated the feeding of children under 2 years of age. In 4 cross-sectional studies from Brazil, the prevalence of consumption observed was between 74% and 94%;[17–20] a study from China reported a prevalence of 73.8%;[21] and the European Childhood Obesity Project (ECOP) cohort showed that 68%[22] consumed industrial foods. The Pelotas study (Brazil) found that instant noodles, consumed by 29.6% of the cohort, and yogurt, consumed by 88.3%, were the least and most consumed UPFs, respectively.[23] In Bogotá, it was observed that 49.7% of children under 6 months of age who were members of a food assistance program received candies, sugary drinks, cold cuts, and packaged foods, among others.[24] According to cross-sectional studies conducted in Brazil[17,20] and the ECOP,[22] in children younger than 2 years, a higher consumption of UPFs was associated with an older age. In 3 other studies carried out in Brazil, a higher consumption of UPFs was associated with not being breastfed at the time of those studies.[18,19,25] In Argentina, a study from 2005 that included 601 children under 1 year of age seen at healthcare centers in the city of Cordoba recorded a 20.7% consumption of store-bought juice as of 6 months of age.[26] A secondary analysis of the First National Survey on Nutrition and Health (ENNyS1) of Argentina (2005) revealed that between 19% and 33% of the total calorie intake corresponded to UPFs in children under 24 months of age.[27] Another study conducted in Argentina in 2009 in 714 children under 2 years of age in the provinces of Mendoza, San Juan, and San Luis revealed that 45.9% of them drank sugary beverages.[11]

The Second National Survey on Nutrition and Health (ENNyS2) of Argentina was carried out in 2018–2019.[28] The analysis of those data will provide information on UPF consumption. The objective of this study was to estimate the prevalence of UPF consumption and to identify factors associated with their consumption in children aged 6 to 23 months who participated in the ENNyS2. In turn, we aimed to describe the proportion that UPFs represent out of the total number of foods consumed in a day.

METHODS

Secondary data analysis of the population aged 6 to 23 months who participated in the ENNyS2. The ENNyS2 is a cross-sectional study of adults and children that administered a survey to residents of private households in urban areas of 5000 or more inhabitants in Argentina.[28] It used a stratified and multistage probability sampling technique with independent representativeness at a national level for the different age groups.[28] The estimated sample size for children younger than 24 months was 7200, but only 5763 were surveyed. Food and beverage consumption data were collected by trained nutritionists using a 24-hour recall (24HR) interview and a multi-step methodology. In a subgroup, an additional 24HR interview was conducted on a day not consecutive to the previous one.[28]

The current study included infants aged between 6 and up to 24 months who had at least 1 24HR interview. The database was analyzed for extreme values (greater than 3 standard deviations [SD] for the number of foods consumed in a day), which were removed. Data on consumption were averaged for those with 2 24HR interviews. All reported foods and beverages were classified independently by 2 nutritionists according to the NOVA system. Disagreements were resolved by a third party (*Supplementary material*).

Variables

"UPF consumption" was categorized into "yes" when the 24HR recorded any UP food or beverage according to the NOVA system and as "no" when none belonged to that category.[5] Formula milks for infants up to 12 months of age and oral or enteral nutritional supplements, which are classified as UPF according to the NOVA system, were not taken into account for the analysis because it was considered that their consumption could be due to medical prescription. The "proportion of UPFs out of the of total foods consumed" was estimated as the percentage that the number of UPFs consumed represented out of the total number of foods consumed in a day. The "number of non-UPFs consumed" was the sum of the total non-UPFs consumed during a day. Breastfeeding was categorized into "yes" or "no." "Yes" was selected when the caregiver answered yes to the ENNyS2 question: "Is the child currently breastfeeding?" Sex and age (6 to up to 12 months old and 12 to up to 24 months old) were also included as variables.

Analysis

Categorical variables were reported as absolute and relative frequencies, while quantitative variables, as mean and SD or as median and interquartile range (IQR) based on whether they had or not a normal distribution, respectively. The outcome variable was UPF consumption with its prevalence and 95% confidence interval (CI). A bivariate logistic regression analysis was done to assess the association with breastfeeding, age, sex, and the number of non-UPFs consumed. Compliance with the linearity assumption was assessed to include the continuous variable. Variables with a significance level of $p < 0.25$ with the Rao-Scott (F-based) test and sex by epidemiological criterion were selected for their inclusion in the multivariate model. The model assessed the contribution of each variable using the adjusted Wald test (significance $p < 0.05$ to be maintained in the final model). The odds ratio (OR) and 95% CI were reported. Standard errors were estimated using Binder›s linear estimator. The overall adequacy of the model was assessed with the Hosmer-Lemeshow test extension for surveys with complex sample design (significance $p < 0.05$). The R software was used. Due to the complex sample design, observations were weighted with the expansion factor provided by the database.[29,30]

Ethical considerations

An assessment by an ethics committee was not necessary because data were obtained from the anonymized database of the Ministry of Health of Argentina, which is publicly accessible.[28,29]

RESULTS

A total of 4224 children (*Figure 1*), which corresponded to a weighted sample size of 908 104, were included in the study. Most of the children included in the sample were 1 year or older (63.3%) and were males (53.9%). Data on breastfeeding were available for 94.58% of children; 63.2% reported being breastfed (*Table 1*). The sample's daily average consumption was 14.3 foods (SD: 5.9), with a minimum of 1 food and a maximum of 32 foods.

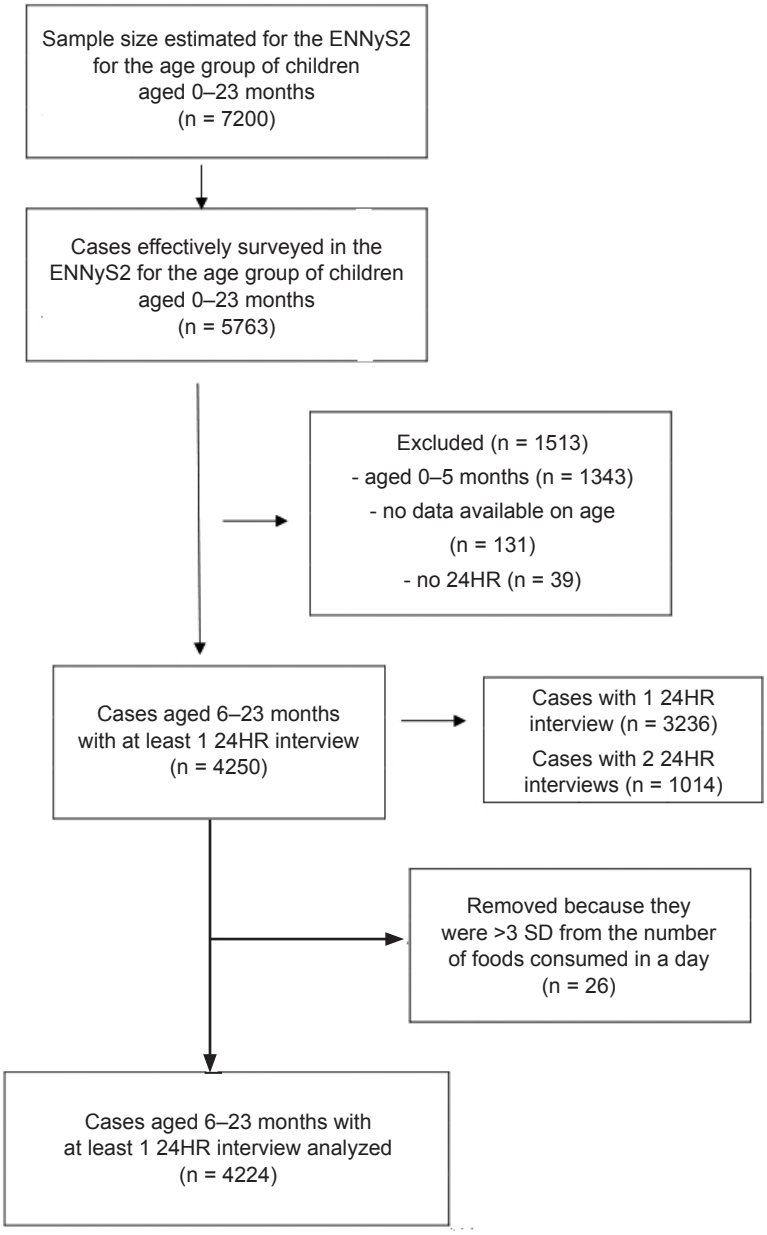
The median number of UPFs consumed was 3 (IQR: 1–4). In some children, consumption was null and, in others, a maximum of 15 UPFs per day was recorded.

A total of 90.8% of the sample reported the consumption of UPFs (95% CI: 89.5–92) (*Table 2*). The median proportion of UPFs out of the total number of UPFs consumed in a day was 20% (IQR: 12.5–28.6%), with a maximum of up to 85.7%.

Table 3 shows the results of the bivariate and multivariate logistic regression analyses between UPF consumption and breastfeeding, age, sex, and the number of non-UPFs consumed.

The analysis adjusted for age, sex, and number of non-UPFs consumed did not find any difference in the consumption of UPFs between those who were breastfed (89.1%) and those who were not (93.3%). UPF consumption was lower in children up to 12 months old (81.6%) compared to older children (96.1%). The latter showed an OR for UPF consumption of 3.21 (95% CI: 2.28–4.52) adjusted for the other variables.

Figure 1. Flow chart of sample selection



ENNyS2: Second National Survey on Nutrition and Health. 24HR: 24-hour recall. SD: standard deviation.

Table 1. Description of the weighted sample of children aged 6 to up to 24 months (n = 4224) with at least 1 24-hour recall interview

Variables	Categories	N[a]	%
Age (months old)	6 to up to 12	333 403	36.7
	12 to up to 24	574 701	63.3
Sex	Female	418 552	46.1
	Male	489 552	53.9
Breastfeeding	No	316 007	36.8
	Yes	542 899	63.2

Weighted sample size (total = 908 104). There were 858 906 children with data on breastfeeding.

Table 2. Prevalence of consumption of ultra-processed foods in the weighted sample of children aged 6 to up to 24 months (n = 4224) with at least 1 24-hour recall interview

Consumption of ultra-processed foods		
N[a]	%	(95% CI)
Yes	824 584	90.8 (89.5–92)
No	83 520	9.2 (8.1–10.5)

Weighted sample = 908 104. CI: confidence interval.

Table 3. Consumption of ultra-processed foods and associated variables. Bivariate and multivariate logistic regression analyses

VARIABLE		CONSUMPTION OF UPFs N	%	CRUDE OR (95% CI)	*p* value	ADJUSTED OR (95% CI)	*p* value
Breastfeeding	NO	294 670	93.25	reference		reference	
	YES	483 951	89.14	0.59 (0.38–0.90)	0.016*	0.72 (0.47–1.11)	0.139
Age (months old)	6 to < 12	272 327	81.68	reference		reference	
	12 to < 24	552 257	96.09	5.49 (4.05–7.44)	0.000*	3.21 (2.28–4.52)	0.000*
Sex	Female	380 450	90.90	reference		reference	
	Male	444 134	90.72	0.98 (0.75–1.27)	0.88	0.95 (0.71–1.28)	0.739
Number of non-UPFs consumed		NA	NA	1.25	0.000* (1.19–1.30)	1.17 (1.13–1.23)	0.000*

*UPFs: ultra-processed foods; category: Yes. OR: adjusted odds ratio with multiple logistic regression for breastfeeding, age, sex, and number of non-ultra-processed foods consumed, as applicable. N: weighted sample. CI: confidence interval. * Statistically significant p < 0.05. NA: not applicable because it is a continuous variable.*

Regardless of breastfeeding, age, and sex, for the number of non-UPFs consumed, the OR for UPF consumption was 1.17 (95% CI: 1.13–1.23), which means that, for each non-UPF consumed, the UPF consumption OR increases (*Table 3*). No association was observed between sex and UPF consumption. The final model showed a good overall adequacy (Hosmer-Lemeshow test $p = 0.31$).

DISCUSSION

According to this study, the consumption of at least some UPFs in the previous day was reported in most children (90.8%), even in those under 1 year of age (81.6%). In half of the study population, the consumption of UPFs in the previous day accounted for 20% or more of the total foods consumed.

Such consumption of UPFs is similar to the 90.6% observed in a sample of 1604 children under 2 years of age in Alagoas (Brazil), who were members of a state conditional cash transfer program, and to the 94% observed in another sample of 231 children attending public healthcare facilities in the city of Viçosa (Brazil).[19,20] However, it is higher than that reported in other contemporary studies conducted in Brazil, such as in the cities of Piracicaba and Montes Claros, with a prevalence of 79.4% and 74.3%, respectively.[17,18] In Shijiazhuang (China), a study carried out in children under 24 months of age attending clinics for vaccination found a prevalence of UPF consumption of 73.8%.[21] These cross-sectional studies used the NOVA system, but assessed UPF consumption by inquiring about the intake of a limited list of foods, such as soft drinks and snacks (among others). This differs from our study, which classified all foods reported in the 24HR interview; the discrepancy observed in terms of prevalence may be due to this.

In relation to children younger than 1 year, the prevalence of UPF consumption of 81.6% was higher than the 43.1% found in a sample of 161 children attending healthcare centers in São Paulo (Brazil).[31]

Other data from Argentina show the presence of some UPFs in the diet of children younger than 2 years, such as store-bought juices[26] and other sugary beverages.[11] According to the ENNyS1, between 19% and 33% of the total calorie intake in children younger than 24 months corresponded to UPFs.[27]

This study observed that the consumption of UPFs in those who were breastfed, compared to those who were not, was similar –as adjusted for age, sex, and number of non-UPFs consumed (89.1% versus 93.3%)–. This differs from other studies conducted in different countries in children of the same age group between 2019 and 2021, where breastfeeding was associated with a lower consumption.[18–20,22,25,32] Differences may be due to the number of UPFs considered or the population assessed.

Sex was not associated, but the ECOP found that girls consumed fewer industrial foods compared to boys.[22]

In addition, the studies agree that UPF consumption is associated with age;[17-19,22,25] this study found that it was higher in children as of 1 year old compared to younger children, regardless of the rest of the study variables. Such increase as of 1 year old may be due to the recommendations of several dietary guidelines, including those proposed in Argentina,[14] to share the family diet and to the increase in apparent consumption of UPFs in Argentine tables inferred from household expenditures.[33] Similarly, this study observed that, for every additional non-UPF reported in the 24HR interview, the OR of UPF consumption increased by 17%.

These data depict the deep penetration of UPFs into the diet at an early age. Baby and follow-on formulas were not taken into account because, in some cases, their consumption could be due to medical prescription, although other difficulties in the continuation of breastfeeding have been mentioned in the ENNyS2 as causes of discontinuation.[10] Future studies may analyze the percentage that UPFs represent out of the total calorie intake to compare it with the results of the ENNyS1. This was not possible in this study because the data on the chemical composition of the foods included in the 24HR interviews were not available at that time.

One of the strengths of this study is that the data were obtained from the ENNyS2, a nationally representative sample that used the 24HR methodology.[28] Unlike other studies that assessed the consumption of UPFs using food lists,[17–19,21] in this study, all the foods reported were categorized according to the NOVA system, which made it possible to establish the proportion of UPFs.

CONCLUSIONS

This study describes a high prevalence of UPF consumption that occurs from the beginning of CF, increases significantly as of 1 year old and as the number of non-UPFs consumed in a day increases.

These are important results for the development of public policies and for optimizing CF recommendations by health care teams. These findings may be complemented with studies on other aspects addressed in the ENNyS2. ■

Supplementary material available at: https://www.sap.org.ar/docs/publicaciones/archivosarg/2024/10050_AO_Armani_Anexo.pdf

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