

Research Article

Sugar Consumption and Breastfeeding Practices in Children from Mexico and Bolivia

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Abstract

Dental caries remains a public health problem, with sugar consumption from an early age being the main associated factor. Although the WHO recommends delaying its introduction into the diet until after two years of age, this guideline does not appear to be followed.

This study aimed to examine sugar consumption, dietary habits and breastfeeding patterns among infants in Mexico and Bolivia.

A cross-sectional study was conducted involving 555 children aged 12-35 months, comprising 294 from Bolivia and 261 from Mexico, as part of a complementary study by the Dental Caries Research Observatory of the Latin American Region (OICAL). The mothers of the participating children were interviewed and a food frequency questionnaire, previously validated in various Latin American countries and utilized in OICAL, was administered. Additional data on breastfeeding and the introduction of sugary foods and beverages were collected. Statistical analysis included Chi-square test for qualitative variables. The Mann-Whitney test was used to examine the association between total breastfeeding duration and the age of introduction of sugary foods. Poisson regression calculated mean ratios adjusted to 95% confidence.

The mean age of introduction of sugary foods and beverages was 9.7 months (95% CI 9.3-9.9) and 9.9 months (95% CI 9.4-10.3), respectively, with a significant difference observed between countries ($p < 0.001$). The average daily frequency of sugary foods and beverages for both groups was 3.1 times per day (95% CI 2.9-3.3), with no significant difference detected. Breastfeeding duration ranged from 16.2 to 17.7 months and was practiced by 78.7% of children over 12 months, with 46.3% of these children receiving breastfeeding on demand and sleeping next to their mothers throughout the night.

It was concluded that most infants in both countries initiate consumption of sugary products during the first year of life and a high daily frequency of consumption was also observed.

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Introduction

Infant and child nutrition is fundamental; the first two years of life are especially important, as optimal nutrition during this period reduces infant morbidity and mortality rates, as well as the risk of developing chronic diseases. Additionally, it improves overall development, as mentioned by the World Health Organization (WHO) [1]. A lack of a sufficient, varied and nutritious diet is associated with more than half of all child deaths worldwide, regardless of the degree of malnutrition, since three-quarters of the children who die from related causes are only slightly or moderately malnourished [2].

Children's diets should include nutrient-rich foods according to their age, sex, physical activity and health status. Within the family diet, children should consume only a limited number of foods and drinks containing added (free) sugars, sweeteners and salt. Having this type of dietary model at home is helpful for children to adopt it by example [3].

Free sugars are defined as all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates [4]. The WHO suggests that sugar intake should be less than 10% of total energy intake, based on the dose-response relationship between sugar consumption and the incidence of dental caries studied by Sheiham [5]. Similarly, the WHO recommends that children under 24 months of age should not consume any free sugars at all, corresponding to the first 1,000 days of life (270 days of intrauterine life, plus 365 days of the first year and another 365 days of the second year) [6].

In Mexico, dietary and physical activity guidelines recommend limiting or eliminating the consumption of sugars and sweeteners for children aged 6 to 23 months in order to prevent malnutrition and chronic diet-related diseases [3]. Global morbidity data from 2017 indicate that oral diseases affect 3.5 billion people, with the majority living in low-income countries. Moreover, dental caries is found to be very common, with an estimated 2 billion people suffering from caries in permanent teeth and over 514 million children affected by caries in their primary teeth [7].

Dental caries is a multifactorial disease. The main risk factors for its onset include diet (excessive intake of free sugars and carbohydrates), reduced saliva production in the oral cavity, limited exposure to fluoride and high concentrations of cariogenic bacteria. The development and progression of caries lesions are also associated with individual social, economic and behavioral factors. It is considered a sugar-dependent disease that causes the destruction of dental tissue due to the presence of organic acids produced in the dental biofilm. This is combined with an imbalance in the demineralization process, which over time promotes the proliferation of acid-resistant cariogenic bacteria, most notably *Streptococcus mutans* and *Lactobacillus* species [4,8,9,11,12].

It is important to recognize that today's diet includes an increasingly wide range of fermentable carbohydrates, as well as synthetic carbohydrates such as oligofructose, sucralose and glucose, which add to the associated risk factors [10,13]. The risk of a given food can be evaluated by examining the relationship between the characteristics of the food itself and personal factors related to the consumer. High-risk food characteristics include sugar content and the product's adherence to teeth. Consumer-related factors include frequency of consumption, drinking and chewing habits, chewing and swallowing efficiency, saliva flow and composition, presence of cariogenic dental plaque, oral hygiene and fluoride use [14].

In Mexico, several measures have been implemented to reduce sugar consumption, such as a tax on sugary beverages and high-calorie foods, along with the use of octagonal warning labels on packaging since 2020. There are also restrictions on the broadcast times for advertising these products on television and radio and front-of-package labeling with nutritional information is required [4].

In Bolivia, government regulation has established the Healthy Eating Implementation Law, which promotes, among other things, the availability and promotion of healthy foods in both public and private institutions, such as schools. It also mandates product labeling to indicate high contents of sugar, saturated fats and sodium [15].

This multicenter study, using standardized data from children under 3 years of age, was conducted with the aim of understanding population behavior regarding sugar consumption in order to inform public policy in Latin American countries. This study investigated the dietary practices of children aged 12 to 35 months in Mexico and Bolivia, following the format of a

study conducted in 10 Latin American countries with the aim of increasing regional data. The emphasis was on developing strategies to prevent and control Early Childhood Caries, which should focus on family and community behaviors and their modification.

Ethical Statement

This multicenter study was approved by the Research Ethics Committee of the Universidad San Martín de Porres in Lima, Peru, with the Act N°0812-2017-D-FO-USMP of December 12, 2017 and subsequently reviewed and approved by the Ethics Committees of the participating universities. Parents or caregivers received prior information about the study and their approval to conduct the survey was obtained through the signing of an informed consent form.

Material and Methods

Study Design and Participants

This cross-sectional study was conducted to contribute data on food frequency and the consumption of sugary foods and beverages to the Latin American Region Dental Caries Research Observatory (OICAL), focusing on children residing in Mexico and Bolivia.

To achieve this, 13 pediatric dentists from both countries (6 in Mexico and 7 in Bolivia) were trained using the same methodology and instrument developed by OICAL [16,17]. Training sessions were led by an OICAL project coordinator (RV) and conducted virtually in four sessions to ensure correct usage and completion of the questionnaire.

The study was carried out in 2021, at the end of the COVID-19 pandemic, during which some restrictions were still in place. As a result, the training sessions were held online and mothers/caregivers were mostly recruited from public health services.

Data Collection

The standardized/validated instrument used for collecting data on dietary practices was also employed in a previous OICAL project conducted in 10 Latin American countries [17]. The questionnaire included questions regarding breastfeeding (duration and frequency), as well as the age of introduction and frequency of consumption of sugary foods and beverages.

Closed-ended questions specifically addressed the following items: sugary products added to milk (in a bottle or cup) such as sugar or chocolate (including brand-name products, for example); sweetened beverages (tea, artificial juices, flavored powdered drinks, dairy beverages, sodas); and sugary foods such as cookies, cakes, candies, chocolate, honey and ice cream.

Additionally, open-ended questions were included to allow mothers or caregivers to describe foods or beverages not listed in the instrument. At the end of the questionnaire, participants were shown a color chart displaying the most popular sugary foods and beverages available in local markets, intended as a memory aid to help facilitate accurate responses.

Data collection was carried out by local interviewers (6 in Mexico and 7 in Bolivia). A total of 555 children aged 12 to 35 months were included in the study, with 294 from Bolivia and 261 from Mexico. The sample was non-probabilistic and based on convenience, considering only the child's age and enrollment in the public healthcare system in peri-urban regions.

Data Analysis

The collected data were processed using an Excel database and later analyzed with SPSS software, version 29.0. Frequencies were calculated for qualitative variables, and measures of central tendency were calculated for quantitative variables with 95% confidence intervals.

Differences in dietary practices between countries were assessed using the Chi-square test for qualitative variables. Differences in age between countries were assessed using t test since there was normality in the data. To analyze the association between the total duration of breastfeeding and the age of introduction of sugary foods and beverages, the Mann-Whitney test and Poisson regression were used, with 95% confidence intervals.

Results

The final study sample consisted of 555 children aged 12 to 35 months, with 294 children from Bolivia (53%) and 261 from Mexico (47%). A total of 175 children outside this age range were excluded from the sample. The mean age was 23.9 months (SD 7.5). Age groups were distributed as follows: 252 children aged 1 year (12 to 23 months) and 303 children aged 2 years (24 to 35 months).

The prevalence of Breastfeeding (BF) among children over 12 months was high in both groups, with 83.3% in Bolivia and 73.6% in Mexico, yielding an overall mean of 78.7%, with no statistically significant differences. When BF was analyzed by age group (12-23 months and 24-35 months), the average values were 45.8% and 24.5%, respectively. The mean duration of breastfeeding was 16.9 months and breastfeeding continued beyond 18 months in 43.1% of children, with no significant differences between countries. The higher daily frequency in Bolivia was 4-6 times/day in 54.7%; while in Mexico, the higher value was ≥ 7 times/day in 42.5% of children; these differences were statistically significant ($p < 0.001$). An additional variable included in this study was breastfeeding on demand, associated with co-sleeping (i.e., the child sleeps beside the mother throughout the night). Results showed notable values, with an overall mean of 46.3%. The frequency was 58.5% for Bolivian children and 32.6% for Mexican children, revealing significant differences between the two countries. Notably, only 2.7% of Bolivian children and 11.5% of Mexican children slept separately from their mothers (Table 1).

Variable	Total	Bolivia	Mexico	p-value*
	(n=555)	(n=294)	(n=261)	
Age (months)				
Mean (SD)	23.9 (7.5)	22.8 (7.5)	25.2 (7.3)	<0.001
BF 12 months (%)	(78.7)	(83.3)	(73.6)	0.005
BF (%)				
12-23 months	(45.8)	(53.4)	(37.2)	<0.001
24-35 months	(24.5)	(22.1)	(27.2)	0.16
BF duration (months)				
Mean (SD)	16.9 (8.7)	17.2 (8.0)	16.7 (9.3)	0.507
(95% CI)	(16.2-17.7)	(16.3-18.2)	(15.5-17.8)	
> 18 months (%)	(43.1)	(40.8)	(45.6)	0.26
BF daily frequency				
1 a 3	31.3	(28.4)	(35.6)	0.25
4 a 6	42.6	(54.7)	(21.8)	<0.001
≥ 7	26.4	(16.9)	(42.5)	<0.001
BF on demand / Mother bed sharing (%)				
Yes, all night	46.3	(58.5)	(32.6)	0.003
Yes, partially	7.9	(11.2)	(4.2)	0.007
No, sleep in his own crib/room all night	6.8	(2.7)	(11.5)	<0.001
Sometimes	1.3	(1.0)	(1.5)	0.28
Confidence Interval (CI)				
*Chi-square test for qualitative outcomes; t test for age and Mann-Whitney test for total duration of Breastfeeding (BF).				

Table 1: Prevalence, duration and frequency of Breastfeeding (BF) in 12 to 35 months old Mexican and Bolivian children.

Table 2 shows that the introduction of sweetened beverages occurred at a mean age of 9.9 months (95% CI: 9.4-10.3). In Mexico,

artificially sweetened juice (with added sugar) was the most frequently consumed (41.4%), followed by natural juice (free sugars) at 27.2%. In Bolivia, the most commonly introduced beverages were lacteous drinks/yogurt (27.2%) and tea, mate or herbal infusions (25.2%). A significant difference in the consumption of sugary beverages was found between the two countries ($p < 0.001$).

The mean age of introduction for sweet foods was 9.7 months (95% CI: 9.3-9.9), also showing a statistically significant difference ($p < 0.001$). Regarding the most commonly introduced types of sweet foods, cakes/pastries/pancakes (39.1%) and cookies (24.1%) were most frequently reported in Mexico, whereas fruit puree / baby food (49.7%) and jelly (16.7%) were more common in Bolivia.

Variable	Total (n=555)	Bolivia (n=294)	Mexico (n=261)	p-value*
Introduction of sugary beverage: age (months)				<0.001
Mean (SD)	9.9 (3.8)	9.1 (2.4)	10.8 (4.9)	
(95% CI)	(9.4-10.3)	(8.6-9.5)	(10.2-11.5)	
Type of sugary beverage introduced				
Artificial juice	(25.6)	(11.6)	(41.4)	<0.001
Natural fruit juice	(19.5)	(12.6)	(27.2)	<0.001
Tea, mates or infusion	(17.8)	(25.2)	(9.6)	<0.001
Lacteous drink / yogurt	(17.7)	(27.2)	(6.9)	<0.001
Soda	(7.2)	(9.2)	(5.0)	0.04
Other	(4.1)	(4.0)	(4.2)	0.32
Introduction of sugary snacks: age (months)				<0.001
Mean (SD)	9.7 (3.8)	8.7 (2.1)	10.7 (4.9)	
(95% CI)	(9.3-9.9)	(8.4-8.9)	(10.1-11.4)	
Introduction of sugary snacks: type				
Fruit puree / baby food	(28.1)	(49.7)	(3.8)	<0.001
Cake / pastries / pancake	(23.6)	(9.9)	(39.1)	<0.001
Cookie	(16.2)	(9.2)	(24.1)	<0.001
Jelly	(12.1)	(16.7)	(6.9)	<0.001
Candy / lollipop	(5.2)	(1.7)	(9.2)	<0.001
Fruit	(5.0)	(5.8)	(4.2)	0.40
Chocolate	(4.5)	(3.4)	(5.7)	0.04
Ice cream	(1.3)	(0.7)	(1.9)	0.19
Confidence Interval (CI)				
*Chi-square test				

Table 2: Age of introduction and type of sugary beverages and foods in 12 to 35 months old Mexican and Bolivian children.

When evaluating daily frequency of sweet beverage and food consumption via bottle or cup (Table 3), it was observed that bottle use was reported in 52.7% of cases in Bolivia and 36.8% in Mexico, with an overall average of 45.2%, showing significant differences ($p < 0.001$). The average frequency of sweet beverages consumed via bottle per day was 1.1, also showing significant differences between countries ($p < 0.001$). Cups were used to serve sweetened beverages on an average of 77.5% of children across both countries, with no significant differences observed. The mean frequency of sweet beverage consumption via cup was 1.3 times per day, with country-level variations: 1.4 in Bolivian children and 1.7 in Mexican children, a statistically significant difference. The frequency of daily sweet food consumption showed no significant differences. Finally, the overall mean daily

frequency of sweet food and beverage consumption was 3.1 (95% CI: 2.9-3.3), with frequencies of 2 to 4 times per day being the most common, averaging 42.3% across both groups (42.9% in Bolivia and 41.8% in Mexico), with no significant differences observed. However, when evaluating consumption greater than 4 times per day, significant differences were found ($p < 0.001$), with 30.1% of Mexican children and 16.9% of Bolivian children falling into this category.

Variable	Total (n=555)	Bolivia (n=294)	Mexico (n=261)	p-value*
Sweet drink in bottle				<0.001
Yes (%)	(45.2)	(52.7)	(36.8)	
Sweet drink in bottle/day frequency				<0.001
Mean	1.1	1.2	1.6	
(95% CI)	(0.9-1.3)	(1.1-1.3)	(1.4-1.8)	
Sweet drink in cup				0.02
Yes (%)	(77.5)	(72.4)	(83.1)	
Sweet drink in cup/day frequency				<0.001
Mean	1.3	1.4	1.7	
(95% CI)	(1.2-1.4)	(1.2-1.6)	(1.4-2.0)	
Sweet food/day frequency				0.21
Mean	0.9	0.8	0.7	
(95% CI)	(0.8-1.0)	(0.6-1.0)	(0.6-0.8)	
Sweet drink and food/day frequency				0.09
Mean	3.1	3.0	3.2	
(95% CI)	(2.9-3.3)	(2.8-3.2)	(3.1-3.3)	
Sweet drink and food/day frequency				
< 2	(35.3)	(41.2)	(28.9)	<0.001
2 a 4	(42.3)	(42.9)	(41.8)	0.66
> 4	(23.0)	(16.9)	(30.1)	<0.001
Confidence Interval (CI)				
*Chi-square test				

Table 3: Sweet beverage and food consumption in bottle or cup by 12 to 35 months old Mexican and Bolivian children.

Table 4 highlights an unusual aspect of sugar consumption involving the use of pacifiers with honey. Results showed that the use of pacifiers had an overall prevalence of 23.6% among children in both countries, with reports of use extending slightly beyond 12 months of age. Regarding the type of pacifier used, common pacifiers were more frequently reported in Bolivia (23.8%), while pacifiers containing honey inside the nipple (a manufactured product available in the Mexican market) were used by 11.5% of children in Mexico. Both cases showed statistically significant differences. It is important to note that this product, which incorporates honey within the nipple of the pacifier, has only been observed for sale in Mexico, typically found in baby product sections of pharmacies and supermarkets. The frequency of pacifier use was more prevalent during the day and also reported as a method to help children sleep at night.

Variable	Total (n=555)	Bolivia (n=294)	Mexico (n=261)	p-value*
Pacifier use (%)	23.6	25.5	21.5	0.26
Pacifiers use up to age (months)				
Mean (SD)	12.5 (7.6)	13.1 (6.1)	11.8 (9.3)	0.34
Pacifier type (%)				
Common pacifier	16.9	23.8	9.2	<0.001
Made with honey pacifier**	6.3	1.7	11.5	<0.001
Both types	0.4	0.0	0.8	n.a.
Frequency of use (%)				
Only in the day	9.5	11.9	6.9	0.045
Just for sleeping at night	9.5	8.8	10.3	0.55
During day and night	4.5	4.8	4.2	0.76
Confidence Interval (CI) *Chi-square test **the product contains honey inside the nipple Not applicable (n.a.)				

Table 4: Prevalence of pacifier use and its association with products containing honey in 12 to 35 months old Mexican and Bolivian children.

Finally, Table 5 showed no correlation between breastfeeding and the delayed introduction of sugary liquids or foods.

Variable	Age (months)			Crude analysis			Adjusted analysis**		
	Mean	(95%CI)	p-value*	MR	(95%CI)	p-value*	MR	(95%CI)	p-value*
Introduction of sugary drinks									
BF duration									
≤6 months	10.04	(8.82-11.25)	0.99						
>6 months	10.03	(9.62-10.43)		1.00	(0.55-1.52)	0.63	1.04	(0.97-1.10)	0.28
Introduction of sugary foods									
BF duration									
≤6 months	9.94	(8.75-11.13)	0.51						
>6 months	9.60	(9.25-9.95)		0.96	(0.93-1.02)	0.51	1.01	(0.94-1.07)	0.94
Confidence Interval (CI) * Mann-Whitney; ** Adjusted by gender, age and country									

Table 5: Mean (95%CI) age and Mean Ratio (MR) for the introduction of sugary drinks and foods according to duration of total Breastfeeding (BF).

Discussion

According to the World Health Organization (WHO), Mexico ranks first in childhood obesity, with 44% of children aged 6 to 23 months affected [18]. Eating behaviors established during the first year of life lay the foundation for lifelong dietary habits and preferences, as well as nutrition-related health outcomes. The consumption of free sugars in the diets of infants and young children leads to early habituation to added sweet flavors, potentially causing aversion to unsweetened foods. Moreover, it promotes the development of cariogenic biofilm [19,20].

Delaying the introduction of sugary foods and beverages can be achieved through the implementation of healthy eating guidelines. Studies have found that children whose mothers received such dietary counseling had 40% lower consumption of sweets (candies, soft drinks, snacks and chocolate) during the first year of life [21].

Based on the above and considering that sugar plays a significant and direct role as a causal agent of dental caries, modulating associated factors such as the dental biofilm [19,20,22]. It is essential for healthcare professionals to be aware of children's dietary practices when addressing Early Childhood Caries (ECC). This awareness should focus on two key aspects: the age at which sugar is introduced into the diet and the frequency of its consumption [22-24]. More recent studies also suggest that the amount of sugar consumed daily should be an additional factor taken into account when making dietary recommendations [18].

Taking this important aspect into consideration, the aim and most relevant finding of this study was to identify that the introduction of sugary foods and beverages occurs at a very early age in both countries and continues at a high frequency up to 35 months. The data obtained showed that the mean age in both countries was 9 months, which is consistent with the results reported in the 10-country regional study [17].

Regarding the types of sugary liquids introduced early, the results showed that artificially flavored juices in Mexico (41.4%) and dairy drinks or yogurt in Bolivia (27.2%) were the most prevalent, which is consistent with the findings reported by Feldens, et al., 2023. In terms of feeding methods, bottle use showed a mean prevalence of 45.2%, while the use of a cup was significantly higher, at 77.5%. Regarding solid foods, sweet porridges or purées were the most frequently consumed sweet foods in Bolivia (49.7%), similar to the data reported in Colombia (35.5%). In contrast, cakes or pastries were most commonly consumed in Mexico (39.1%), a pattern also observed in Peru (25.0%). It is worth noting that in seven Latin American countries, the most frequently reported first sweet food was cookies [17]. These foods are considered cariogenic not only because of their sugar content, but also due to their texture, which allows them to remain in the oral cavity and plaque retention areas for extended periods, even after brushing teeth, especially if oral hygiene is not performed properly [25].

Considering that a major shared risk factor for other Noncommunicable Chronic Diseases (NCDs) is the consumption of free sugars (including added sugar, sugar in honey and even natural fruit juices), the early introduction of sugar into the daily diets of very young children is concerning [18,20]. Additionally, systematic reviews have shown a strong association between higher sugar intake and increased risk of cardiovascular diseases, diabetes, obesity and dental caries [18]. Scientific evidence has led the World Health Organization (WHO) to make greater efforts to promote healthy dietary practices, advocating for the postponement of sugar introduction until after the second year of life and for the reduction of daily sugar consumption [26,27]. Regarding the types of sugary liquids introduced early, the results showed that artificially flavored juices in Mexico (41.4%) and dairy drinks or yogurt in Bolivia (27.2%) were the most prevalent, which is consistent with the findings reported by Feldens, et al., 2023. In terms of feeding methods, bottle use showed a mean prevalence of 45.2%, while the use of a cup was significantly higher, at 77.5%.

Regarding solid foods, sweet porridges or purées were the most frequently consumed sweet foods in Bolivia (49.7%), similar to the data reported in Colombia (35.5%). In contrast, cakes or pastries were most commonly consumed in Mexico (39.1%), a pattern also observed in Peru (25.0%). It is worth noting that in seven Latin American countries, the most frequently reported first sweet food was cookies [17]. These foods are considered cariogenic not only because of their sugar content, but also due to their texture, which allows them to remain in the oral cavity and plaque retention areas for extended periods, even after brushing teeth, especially if oral hygiene is not performed properly [25].

Knowledge of breastfeeding habits is another important factor to consider when assessing dietary patterns during infancy. The data show the high prevalence of breastfeeding in the studied population from both countries. This study revealed that 78.7% of children continued breastfeeding at 12 months, with Bolivia showing the highest value (83.3%), compared to Mexico (73.6%). When analyzing the data at 18 months, the average was 43.1%; however, Mexico showed a higher value (45.6%) compared to Bolivia (40.8%). Statistically significant differences were only observed between 12 and 23 months.

When comparing these results with those reported in the previous study of the 10 Latin American countries, it is evident that both Bolivia and Mexico exhibited higher values at 12 and 18 months. These values were higher than those reported at 12 months

in Peru (79.2%), Costa Rica (73.3%) and Colombia (72.3%) and at 18 months in Chile (38.1%), Peru (36.4%) and Venezuela (34.8%) [17]. This information suggests that most children in the region are exposed to this important factor that promotes health from an early age [28,29]. While breastfeeding has been shown to be not only the best method of infant feeding during early childhood, it also provides multiple benefits for both the mother and the baby. The World Health Organization (WHO) and UNICEF recommend exclusive breastfeeding during the first 6 months of life, with continued breastfeeding alongside complementary foods up to 2 years of age [28]. Unlike the previously mentioned Latin American study, which found a two-month delay in the introduction of sugary foods and/or beverages among children who continued breastfeeding after 6 months, the present study did not observe this difference. However, as noted by the authors of that study, it is not possible to determine whether such a delay has any clinical impact in terms of disease [17]. It is important to highlight that this study incorporated additional questions that were not included in the study by Feldens, et al., particularly regarding nighttime breastfeeding on demand. This was considered relevant given that a high percentage of children in Latin America continue to sleep with their mothers up to 35 months of age. Considering this cultural aspect, it was deemed important to assess this practice. Birth cohort studies in various communities around the world have shown that a diet high in sugars capable of promoting cariogenic biofilm, in combination with high-frequency breastfeeding between 12 and 18 months of age, is a risk factor for early childhood caries specially when it occurs at night [10,30-33]. The results of this study showed that this practice was present in 58.5% of Bolivian children and 32.6% of Mexican children, indicating that it is a common habit in the population. It therefore requires greater attention in maternal and child health programs, with the aim of educating parents to establish proper hygiene and dietary habits from an early age. It is essential to further investigate these types of practices in future research, as their prevalence may vary depending on cultural and individual factors in each country. The implementation of effective maternal and child preventive promotion programs must be based on local data and evidence. Studies conducted in Anglo-Saxon or Asian countries may offer valuable experiences, but they do not necessarily provide protocols that are fully adaptable to the socio-cultural reality of Latin American countries. Thus, a better understanding of local dietary frequency habits is necessary to develop measures that can have a real and positive impact. Regarding breastfeeding frequency, this study found a high frequency in both countries: in Bolivia, the most common frequency was 4 to 6 times per day (54.7%), while in Mexico, more than 7 times per day was reported by 42.5% of participants. Similar findings have been reported in other Latin American countries, where over 30% of children aged 1 to 3 years breastfeed more than 7 times per day [17].

A strength of these findings is the suggestion to implement informational and educational interventions during pregnancy, with the aim of promoting exclusive breastfeeding up to six months and reduce high-frequency breastfeeding to about 2 to 3 times per day after the child reaches 12 months of age. This measure could contribute to reducing the risk of dental caries and improving dietary diversity, particularly increasing the intake of vegetables, which is crucial for healthy growth and development during the early years of life [10,26,30].

An additional finding in this study was related to the use of pacifiers, as it was discovered that pacifiers containing honey inside the nipple are sold on the Mexican market, specifically in the baby products section of pharmacies and supermarkets. This prompted the need to investigate the issue further, leading to the inclusion of new questions in the original questionnaire [17]. It was found that 25.5% of children in Bolivia used pacifiers, with 23.8% using conventional pacifiers. In Mexico, 21.5% of children used pacifiers, but notably, 11.5% used honey-filled pacifiers, most commonly at night for sleep. This is a significant finding that should be considered in Mexico as an industry-facilitated risk factor, highlighting the need to raise awareness among parents. The average age of pacifier use in both countries was just over 12 months, an age at which most children already have erupted incisors.

Measures and Recommendations to Reduce Sugar Intake

Strategies aimed at reducing sugar consumption at both the individual and population levels are crucial for preventing and reducing not only dental caries but also other Noncommunicable Chronic Diseases (NCDs) that may negatively impact children's health and quality of life [34-36].

More than 40 countries have already adopted policies to increase taxes on sugar-sweetened products, with evidence showing an impact in reducing consumption [37]. A notable example is Mexico, which increased the price of sugary beverages by 10% and, after one year of implementation, saw a 12% reduction in their consumption—this effect was even more pronounced in low-income communities [38-40].

Other population-level efforts, such as informative front-of-package labeling (octagonal warnings) indicating high sugar content in products, aim to ensure consumers are aware of the nutritional content of the foods they purchase. These policies have been implemented in several countries across the region, including both Mexico and Bolivia [4,15]. The efforts are evident, but based on the results obtained, these measures are not being respected in many Latin American countries, showing that the introduction of sugar in the diet occurs at very early ages. The findings of Feldens, et al., along with those from the present study, show that in the 12 countries in the region where data on sugar introduction was collected, the average age was 9 months far from the WHO's recommendations to delay sugar introduction after the second year of life [38,41]. In the region's culture, sugar is often synonymous with love and affection; it is introduced into a child's diet by parents, grandparents, uncles and others and holds various social meanings. It is frequently used as a gesture of love, gratitude, apology or as a reward for good behavior, especially in young children. It is not only offered by family members, teachers and even pediatricians may include it. Additionally, we are constantly exposed to advertising that associates sugary foods and drinks with happiness and enjoyment, making it even more difficult for the population to maintain a healthy daily diet. However, if interventions start at a very young age, the possibility of reducing high sugar consumption and frequency is achievable.

This is demonstrated by a study conducted by the Brazilian Ministry of Health, which developed recommendations through a Food Guide for children under two years of age. The outcomes were positive, as clinical evaluations showed that delaying the introduction of sugar was associated with a reduction in the prevalence of early childhood caries [34,42]. It must be emphasized that in addition to population-level efforts and measures, individual-level actions must also be reinforced. It is crucial to emphasize the importance of training healthcare professionals in infant feeding guidelines, they should incorporate the evaluation of young patients' diets into their care protocols, providing appropriate guidance to caregivers and, whenever possible, ensuring proper follow-up and monitoring.

Finally, it is important to emphasize that the development of this study aligns with the strategic framework of World Health Organization (WHO) initiatives, such as the Nurturing Care for Early Childhood Development campaign [43]. This campaign underscores the urgent need for governments and communities to intensify their efforts in prioritizing the health and well-being of mothers and children. The data and insights presented in this study are consistent with the objectives and priorities outlined in this line of work.

Conclusion

This study revealed an early introduction of sugary foods and beverages, as well as a high frequency of consumption during early childhood in both countries. Breastfeeding duration of more than 6 months was high, but no evidence was found that it contributed to delaying the introduction of sugary products. It is necessary that, in addition to the current population-level efforts to reduce high sugar consumption, complementary actions at the individual level be taken by healthcare professionals, with the goal of educating and promoting healthy dietary habits from early childhood.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Consent to Participate

Informed consent was also obtained from each subject who participated in the study.

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Data Availability

Data is available for the journal. Informed consents were not necessary for this paper.

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Author's Contribution

RV conceived the project and provided training to participants from both countries; MM, MC, AS, BP, AD, AC gathered the data (Mexico); LZ, CJ, RB, EL, JO, CM, RP, gathered the data (Bolivia); DZ managed and compiled the databases of both countries; JM processed the data and created tables presented; all authors critically revised and approved the final manuscript.

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