Oral health condition of children who attended University Dental Services in Porto Alegre (Brazil) and Córdoba (Argentina)

Carletto-Körber FPM, Figueiredo MC, Giménez MG, Martínez J, Cornejo LS

ABSTRACT

Objective: To compare the oral health condition of children in relation to social, demographic and cultural maternal and perinatal aspects. Methods: Dental clinical examinations were performed on 92 children aged ≤3. They attended the Dental Clinic of the School of Dentistry, UNC Córdoba, Argentina (n=32), and the Infant Clinic, School of Dentistry, UFRG Porto Alegre-Brazil (n=60). The mothers signed a written informed consent. A semi-structured interview designed ad hoc was conducted with mothers or companions of the child to consider social, demographic and cultural aspects, oral hygiene habits, gestation, diet and type of delivery and lactation. Pearson-Fisher Chi2 test was applied to evaluate the significance ($p < 0.05$) differences between cohorts. The importance of various factors in relation to caries experience and cohort was evaluated using binary logistic regression. RESULTS: The reason why patients seek consultation was significantly different between cohorts: 100% preventive in Argentina versus 8.3% in Brazil ($p < 0.001$), also considering caries experience ($p < 0.05$). The binary logistic regression model showed that cohort and caries-free variables were the factors most significantly associated with caries experience. Mother's low educational level, cariogenic diet in the baby and type of delivery indicate greater cariogenic risk. Regarding cohorts, the following factors appear as statistically significant: hygiene, age, baby's diet and type of delivery. CONCLUSION: Mothers' educational level and the baby's cariogenic diet show increased risk of caries activity for both cohorts. Oral hygiene, baby's diet and type of delivery differ significantly between cohorts.

Keywords: oral health, preschoolers, Latin America.

1 Associate Professor, Children and Adolescents Care, Pediatric Dentistry "A". School of Dentistry. Universidad Nacional de Córdoba, Argentina.

2 Associate Professor. School of Dentistry, Universidade Federal do Rio Grande do Sul\UFRGS, Brazil.

3 Maternity and Neonatal University Hospital. School of Medical Sciences. Universidad Nacional de Córdoba, Argentina.

4 Maternity and Neonatal University Hospital. School of Medical Sciences. Universidad Nacional de Córdoba, Argentina.

5 School of Dentistry. Universidad Nacional de Córdoba, Argentina.

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INTRODUCTION

Dental caries and gingivitis are diseases that allow us to assess the oral health conditions of a given population. They can be influenced by the different biological and sociocultural factors of the individuals [1].

Parents' habits and knowledge about oral health have been observed to have an impact on their children's oral health [2, 3]. Findings also show that a low socioeconomic status in the household [4, 5] and parents' unfavorable oral health habits [1, 6] may contribute to the development of dental caries. In addition, the mother's beliefs, habits and behavior and the environment where the child is raised may favor microbial colonization in the child's oral cavity.

A newborn's oral cavity is basically free of microorganisms. Soon after birth, numerous bacteria begin to colonize the mouth. Dental eruption provides a surface for *Streptococcus mutans* colonization, a microorganism that is closely linked to caries risk. Frequent contact between the mother and the child may cause early colonization and bacteria transmission [7]. Several studies agree that the mother is the child's primary source of infection through cariogenic bacteria [8-10]. Among the many factors that affect oral health in early childhood, the relevance of mother (caregiver) to child transmission and *S. mutans* genetic similarity have been shown [11], as well as their correlation to knowledge, attitudes and socioeconomic status [12]. In addition, children with a record of caries in early childhood are more prone to future decay of their permanent teeth [13].

As oral hygiene and its quality have also been addressed as key factors for oral health care, it is important to provide the population with information about healthy practices regarding adult and child dental caries.

This work compares the oral health condition of children under the age of three, who attended University Dental Services in Porto Alegre (Brazil) and Córdoba (Argentina), and the potential correlation with social, demographic, cultural, maternal and perinatal aspects.

MATERIALS AND METHODS

Population and sample under study

A cross-sectional analytical study was conducted based on clinical-dental indicators and their potential correlation with oral health risk indicators. The population studied was a group of 92 children under the age of three who attended the University Dental Services, Infant Dental Clinic (n=60) in Porto Alegre (Brazil) and a Dental Clinic (n=32) in Córdoba (Argentina) for care. These services have no connection to others in

the public or private sectors and are the only ones within their area of coverage that provide comprehensive mother-child oral health care.

The mothers signed a written informed consent to participate together with their children in the study. A semi-structured interview designed ad hoc was conducted with mothers or companions of the child to consider social, demographic and cultural aspects, oral hygiene habits, gestation, diet, type of delivery and lactation.

Dental clinical examination

The children were examined at the offices of the University Dental Services, Dentistry Clinic of the School of Dentistry, Universidad Nacional de Córdoba (UNC) and at the Infant Clinic, School of Dentistry of the Universidade Federal do Rio Grande do Sul (UFRGS). A disposable examination kit (mirror, tweezers and sickle probe) was used following the standard physical-visual exam procedure. Each child's caries experience in primary dentition was expressed through the DMFT index WHO standards [(14)].

Statistical analysis

InfoStat 2003 for Windows was used to statistically process the data. Mean and median ± EE were used for the descriptive analysis of quantitative variables. Relative frequencies expressed as percentages were calculated for the categorical variables. Pearson-Fisher Chi2 test was applied to evaluate the significance of the differences between cohorts, based on the nature of the variable, with a significance value of $p<0.05$. A binary logistic regression model was used to determine the correlation and relevance of the different factors regarding caries experience and cohort. The most relevant variables were entered into the model. Categorical variables were either transformed into dichotomous variables or different categories were grouped to include them in the model without losing statistical power, as shown in Table 1. Odds ratios were calculated for each factor.

Table 1: Variable classification

Variables	**Categories**
Age	• <2 y/o • ≥2 or over
Mother's educational level	• Illiterate / Elementary school • Secondary

	• Higher education / University
Type of delivery	• Natural (vaginal) • Assisted (caesarean section; forceps) • Preterm

RESULTS

We studied 92 children under the age of three. We identified two cohorts based on country of residence. The Brazil cohort: 60 children who live in Porto Alegre, Rio Grande do Sul or nearby communities (F: 48.3%; M: 51.7%), and the Argentina cohort: 32 children who live in Córdoba or nearby. (F: 65.6%; M: 34.4%). The mean age of Brazilian children was 27.0±10.8 months, while in Argentina it was 15.4±6.8 months. These differences turned out to be significant (ANOVA $p<0.001$).

The reason why both cohorts sought consultation is shown in Table 2. In Argentina, 100% of the cases were for preventive care, while in Brazil only 8.3% of the children sought preventive care and over half, 56.7%, needed caries treatment. (Pearson Chi^2 test: $p<0.001$).

Table 2: Cohort vs. reasons for consultation. Case recount and percentage

Reason for consultation	**Cohort**		Total
	Córdoba	Brazil	
Preventive care	32 **100.0%**	5 **8.3%**	37 40.2%
Caries	0 0.0%	34 56.7%	34 37.0%

In terms of caries experience (table 3), significant differences were found between the cohorts (Fisher: $p=0.015$; $p<0.05$): Brazilian children showed a higher percentage of caries activity (38.3%) than Argentinean children (12.5%).

Table 3: Cohort vs. with caries experience. Case recount and percentage

Caries experience	**Cohort**		Total
	Córdoba	Brazil	
With no activity	28 **87.5%**	37 **61.7%**	65 70.7%
With activity	4 **12.5%**	23 **38.3%**	27 29.3%

Although differences between cohorts were not significant for the caries-free variable (table 4) (Fisher: p=0.178; p>0.05), Brazilian children (96.7%) showed a higher percentage in the category that presented no etiological factors than children in Córdoba (87.5%).

Table 4: Cohort vs. caries-free Case recount and percentage.

Caries-free	**Cohort**		Total
	Córdoba	Brazil	
With no etiological factors	28 **87.5%**	58 **96.7%**	86 93.5%
With etiological factors	4 **12.5%**	2 **3.3%**	6 6.5%

In terms of healthy and risky oral health habits, we observed that (table 5) the percentage of children who use pacifiers is higher in the Argentinean cohort (46.9%) than in the Brazilian cohort (31.7%). The differences were not statistically significant (Fisher: p=0.177; p>0.05). Children in Argentina do not have oral hygiene habits, which made the difference with the Brazilian cohort significant (Pearson Chi^2: p<0.001). Therefore, we found the same results with the use of toothpaste, use of fluoride, daily brushing frequency and time.

Table 5: Cohort vs. healthy and risky oral health habits. Case recount and percentage

Healthy and risky oral health habits		**Cohort**		**Total**	**Chi^2 *(p-value)***
		Córdoba	Brazil		
Use of pacifier	**Does not** use	17 **53.1%**	41 **68.3%**	58 63.0%	p=0.177
	Does use	15 **46.9%**	19 **31.7%**	34 37.0%	
Daily brushing frequency	**Does not** brush	32 **100.0%**	3 **5.0%**	35 38.0%	p<0.001
	1 time	0 **0.0%**	14 **23.3%**	14 15.2%	
	2 or more times	0 **0.0%**	43 **71.7%**	43 46.8%	

Table 6 shows the factors associated to caries experience in a decreasing order of significance. OR were calculated for each factor identifying in each case the reference

category considered in relation to the risk of cariogenic activity. The cohort and caries-free variables were the most relevant ones.

Table 6: Factors associated to “Caries experience”; Risk Category; Wald statistical value; Level of significance (p-value; Exp. (B) or Odds ratio (OR) and OR confidence interval.

Factors	**Ref. Risk Category**	**Wald statistical value**	**Sig.** *(p-value)*	**Exp.(B)** OR	**C.I. 95% for EXP(B)**	
					Lower	**Higher**
Cohort	Brazil	6.128	0.013	10.389	1.628	66.285
Caries-free	With Etiol. Factors	4.658	0.031	15.672	1.288	190.735
Mother’s educational level	Illiterate / Elementary	2.538	0.111	2.631	0.800	8.649
Baby’s diet	Cariogenic	2.520	0.112	2.524	0.805	7.919
Pacifier	Uses pacifier	1.143	0.285	1.987	0.564	6.994
Age group	2 y/o and over	1.002	0.317	1.817	0.564	5.850
Delivery	Assisted / preterm	0.848	0.357	1.720	0.542	5.456
Milk	Only breast milk	0.426	*0.514*	1.245	0.644	2.408
Biological mother’s diet	Non Cariogenic	0.167	*0.683*	1.253	0.424	3.702
Gender	Male	0.000	*0.992*	1.006	0.346	2.923

Factor significance in relation to cohort is shown in table 7. The variables “frequency of brushing”, “time of brushing”, “use of toothpaste”, and “use of fluoride” were omitted when implementing the model as we had already established that percentage differences between cohorts are very statistically significant. The variables “age” (months), “baby’s diet” and “type of delivery” also showed significant differences between cohorts.

Table 7: The variables associated to “Cohort”; Risk Category; Wald Statistical Value; Significance Level (p-value; Exp.(B) or Odds ratio (OR) and OR confidence interval.

Factors	**Ref. Risk Category**	**Wald statistical value**	**Sig.** *(p-value)*	**Exp.(B)** OR	**C.I. 95% for EXP(B)**	
					Lower	**Higher**
Age group	2 and over	12.032	*0.001*	10.198	2.746	37.878
Baby’s diet	Non Cariogenic	5.001	*0.025*	4.308	1.198	15.498
Delivery	Assisted / preterm	4.496	*0.034*	4.950	1.129	21.713
Mother’s educational level	Illiterate / Elementary	3.820	*0.051*	4.464	0.996	20.010
Caries experience	**With** activity	3.417	*0.065*	3.981	0.920	17.228
Biological mother’s diet	Non Cariogenic	2.408	*0.121*	2.697	0.770	9.444
Gender	Male	1.038	*0.308*	1.916	0.549	6.692

Milk	Only breast milk	0.761	*0.383*	1.731	0.505	5.936
Pacifier	Uses pacifier	0.032	*0.858*	1.131	0.292	4.382

In general, mother's educational level (table 8) was similar for both cohorts, with no significant differences (Pearson Chi^2 Test: p=0.138; p>0.05). However, a significant difference was found (p<0.05) in the higher education / University level.

Table 8: Cohort vs. Mother's educational level. Case recount and percentage

Educational level (mother)	**Cohort**		Total
	Córdoba	Brazil	
Illiterate	0 **0.0%**	2 **3.3%**	2 2.2%
Elementary / primary school	9 **28.1%**	21 **35.0%**	30 32.6%
Secondary / middle school	16 **50.0%**	33 **55.0%**	49 53.3%
Tertiary / Higher education	7 **21.9%**	4 **6.7%**	11 12.0%

Significant discrepancies were observed between cohorts when considering the baby's caregiver (table 9) (Pearson Chi^2 Test: p=0.026; p<0.05), particularly when considering the categories: mother exclusively and shared mother/grandparents (Z tests; p<0.05).

Table 9: Cohort vs. baby's caregiver. Case recount and percentage

Baby's caregiver	**Cohort**		Total
	Córdoba	Brazil	
Mother	20 **62.5%**	49 **81.7%**	69 75.0%
Mother and father	5 **15.6%**	7 **11.7%**	12 13.0%
Mother and grandmother/father	6 **18.8%**	1 **1.7%**	7 7.6%
Father	0 **0.0%**	2 **3.3%**	2 2.2%
Grandparents	0 **0.0%**	1 **1.7%**	1 1.1%
Aunt	1 **3.1%**	0 **0.0%**	1 1.1%

Although some differences were found between cohorts regarding the father's occupation, these were not significant (Pearson Chi^2 Test: p=0.309; p>0.05). In

addition, the mother's occupation did not show significant differences between cohorts either.

As shown in table 10, all the children in Argentina developed in a normal pregnancy, while in Brazil, 88.3% did, although the differences are not significant (Fisher: p=0.091; p>0.05).

Table 10: Cohort vs. pregnancy. Case recount and percentage

Pregnancy	**Cohort**		Total
	Córdoba	Brazil	
Normal	32 **100.0%**	53 **88.3%**	85 92.7%
Risk	0 **0.0%**	7 **11.7%**	7 7.6%

The differences between cohorts were significant when considering the variable "type of delivery" (table 11), as 87.5% of the children in Córdoba were born through normal delivery, a much higher percentage than the one observed in Porto Alegre, Brazil (56.7%). In this cohort, caesarean sections accounted for 33% (one third) of the children (Pearson Chi^2Test: p=0.014; p<0.05).

Table 11: Cohort vs. Type of delivery. Case recount and percentage

Type of delivery	**Cohort**		Total
	Córdoba	Brazil	
Natural	28 **87.5%**	34 **56.7%**	62 67.4%
Caesarean section	3 **9.4%**	20 **33.3%**	23 25.0%
Forceps	1 **3.1%**	1 **1.7%**	2 2.2%
Preterm	0 **0.0%**	5 **8.3%**	5 5.4%

Regarding mother and infant's diet (table 12), more children were breast-fed in Brazil (70%) than in Córdoba (53.1%) (Pearson Chi^2 Test: p<0.05). Over half the mothers in Argentina consumed cariogenic foods during pregnancy, while this percentage was lower in Brazil (36.7%). The differences were not statistically significant (Chi^2 test; Fisher's exact test: p=0.184; p>0.05). Statistically significant

differences were found in the baby's diet category (Fisher: p=0.022 p<0.05). Over half the children in the cohort in Córdoba had a cariogenic diet (53.1%), compared to only 26.7% of the children in Brazil.

Table 12: Cohort vs. Mother and infant's diet. Case recount and percentage

Mother and infant's diet		Cohort		Total	Chi² *(p-value)*
		Córdoba	Brazil		
Breast	Milk	17	42	59	p<0.05
		53.1%	**70.0%**	64.1%	
	Breast milk and substitutes	8	0	8	
		25.0%	**0.0%**	8.7%	
	substitute	7	18	25	
		21.9%	**30.0%**	27.2%	
Biological mother's diet	Cariogenic	17	22	39	p=0.184
		53.1%	**36.7%**	42.4%	
	Non Cariogenic	15	38	53	
		46.9%	**63.3%**	57.6%	
Baby's diet	Cariogenic	17	16	33	p<0.05
		53.1%	**26.7%**	35.9%	
	Non Cariogenic	15	44	59	
		46.9%	**73.3%**	64.1%	

DISCUSSION

Dental medicine for babies has officially become a worldwide trend in dental care in early childhood, thanks to the development of education programs, the implementation of preventive measures and caries control, primary care and age-specific curative treatments [15]. In addition, oral care can contribute to preserving primary dentition and promoting the child's wellbeing [3, 4, 16].

This study presents the data of children who attended the University Dental Services of the Dental Clinic of UNC School of Dentistry and the Infant Dental Clinic of the UFRGS School of Dentistry. The oldest children were three years old. This is consistent with earlier studies conducted by Figueiredo et al. [16] in 2008 and Emerim et al. [17] in 2012, which show a philosophical shift in Pediatric Dentistry. These data show an evolution in the principles of care at University Dental Services, as they reveal a move towards the guidelines of the American Academy of Pediatric Dentistry (AAPD), which recommend the first visit to the Pediatric Dentist should take place between the eruption of the first primary tooth and the child's first year of life [18]. The first appointments of the children of the Argentinean cohort took place at a mean age of

15.4 ± 6.8 months old. The reasons why patients sought consultation on 100% of the cases was preventive care.

A key aspect for dental care programs in early childhood is education and awareness raising among parents regarding their children's oral health, as family members play a major role in developing the child's eating and oral hygiene habits [19, 20, 21].

Health habits can apply to all household members, as once parents become more aware, they turn into change agents in favor of oral and overall health. Working with family members is important because humans are social beings subject to biological, psychological and social hazards, and within this context, a person's family determines their behavior, has an influence on decision-making and helps develop habits. In 2008, Fracasso et al. [22] reinforced this concept when they observed the influence the mother figure has on the oral health condition of children. We must remember this, as the mothers in this study were the main responsible figure at the infants' appointments in Brazil and Argentina. Another important finding was the significant correlation between the assisted delivery type and the children's caries risk category, confirming the findings of Benites et al., [23], who observed that women who had had a vaginal delivery and described a non-cariogenic diet by breastfeeding their children for a longer period tend to have a lower caries incidence.

In addition, diet and nutrition are vital for the physical and psychological development of children from conception; these factors are directly connected to the oral cavity from odontogenesis to the development of oral pathologies. Studies conducted by Adair et al. [3] have shown the influence carbohydrates, especially sugars, have on the occurrence of carious lesions. Poor eating habits, such as the intake of sugary substances in the baby's bottle, are closely tied to early *Streptococcus mutans* colonization, one of the main cariogenic bacteria in the oral cavity [7-10].

The information in this study reinforces the correlation between inadequate eating habits and carious lesions, as both children from Argentina and Brazil with caries experience followed a cariogenic diet: over half the children in the Córdoba cohort and 30% in the Porto Alegre cohort.

These findings reinforce the multifactorial etiology of caries, where the joint action of several etiological factors is needed, that is, a cariogenic diet, poor oral hygiene, susceptible host and *Streptococcus mutans* oral infection: together they create an environment that promotes the development of carious lesions [7-10]. Regarding healthy habits and oral health risk, we observed that children in Argentina do not have oral hygiene habits, and there was a significant difference with the Brazilian cohort.

Therefore, we found the same results with the use of toothpaste, use of fluoride, daily brushing frequency and time.

These findings allow us to stress the importance of sociocultural aspects in the dental care practices of babies, and it also reinforces the need of Latin American children and their parents for access to oral health care programs from the first year of the child's life. In addition, it warns about the need for these programs to collect epidemiological information for the timely identification of oral habits in early childhood, assessment and counselling for parents, as early diagnosis of new carious lesions is essential to establish oral health promotion efforts.

Finally, this study clearly proves that when working in the field of dental medicine for infants, clinicians establish a link between the scientific community and the population under study, which goes beyond the geographical borders of the countries involved, fostering knowledge exchange between both sides.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Fabiana Carletto-Körber: fabianacarletto@hotmail.com