Early Childhood Caries and Access to Dental Care among Children of Portuguese-Speaking Immigrants in the City of Toronto

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ABSTRACT

Objective: To determine the influence of accessibility of dental services and other factors on the development of early childhood caries (ECC) among Toronto children 48 months of age or younger with at least one Portuguese-speaking immigrant parent.

Methods: This population-based case–control study involved 52 ECC cases and 52 controls (i.e., without ECC) identified from community centres, churches and drop-in centres by a process of network sampling. Caries status (dmft/s) was assessed by clinical examination. Access to dental care and risk factors for ECC were determined through a structured interview with the Portuguese-speaking parent.

Results: Forty (77%) of the children with ECC but only 28 (54%) of controls had never visited a dentist. Thirty (58%) mothers of children with ECC but only 13 (25%) mothers of controls had not visited a dentist in the previous year. Bivariate analyses revealed that low family income, no family dentist, no dental insurance, breastfeeding, increased frequency of daily snacks and low parental knowledge about harmful child feeding habits were associated with ECC. Non-European-born parents and parents who had immigrated in their 20s or at an older age were 2 to 4 times more likely to have a child with ECC than European parents and those who had immigrated at a younger age. Lack of insurance, no family dentist and frequency of snacks were factors remaining in the final logistic regression model for ECC.

Conclusions: The strongest predictors of ECC in this immigrant population, after adjustment for frequent snack consumption, were lack of dental care and lack of dental insurance. These findings support targeting resources to the prevention of ECC in children of new immigrants, who appear to experience barriers to accessing private dental care and who are exposed to many of the determinants of oral disease.

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Early childhood caries (ECC), both mild and severe,[1] affect the deciduous teeth of infants and toddlers. Those at high risk of ECC include children in developing countries, Canadian Aboriginal children and children of immigrant ethnic minorities in Canada.[2,3] Numerous studies have investigated the risk factors for ECC. Limited parental education, childhood poverty, a diet high in sugar, a relatively high frequency of snacks, ad lib bottle-feeding with sugary drinks and other inappropriate methods of feeding infants, insufficient exposure to fluoride, poor oral hygiene, episodic dental visits of parents and

their children, lack of professional advice on dental care, poor perinatal and prenatal health, and salivary and microbiological risk factors have all been implicated in the etiology of ECC.[4,5]

The mother's immigration status has also been identified as an important risk factor for ECC. Oral health surveys conducted in Canada have confirmed that children of immigrants and refugees have higher rates of caries and lower rates of dental visits than Canadian-born children.[6–10] For example, in an epidemiologic study of 19-month-old children in Edmonton, Alberta, a Canadian city with a diverse immigrant population and fluoridation of the water supply, children of foreign-born mothers were more likely to have ECC than children born to Canadian mothers.[8] Although the number of foreign-born mothers in that study was small, the results nonetheless indicate that a child whose mother was born outside Canada is at much greater risk for ECC than one whose mother was born within Canada. Cultural and language barriers that impede access to preventive oral health care information, as well as a lack of financial resources to pay for dental care, may explain these inequalities. In fact, it has been shown that recent immigrants underutilize the dental preventive services that are provided by the Canadian health care system. In a sample of 5,795 women 30–44 years old living in Quebec, only 55% of recent immigrants (who had lived in Canada for 10 years or less) used preventive services, whereas 69% of long-term immigrants (in Canada for more than 10 years) and 76% of non-immigrants did so.[11] The same study found that financial barriers partly explained the low percentage of recent immigrants using dental services.

The fact that new immigrants to Canada often fail to use the oral health care system is of concern, but lack of access to dental care for their young children is an even more worrying problem. Local public health departments in Ontario and other Canadian provinces provide a variety of dental public health programs to schoolchildren 4 to 14 years of age, including annual screening of various types, preventive services, dental health education and dental treatment for low-income families, but such programs are not generally offered to children younger than 4 years of age. As a result, many children with poor oral health will not receive treatment and will be disadvantaged relative to their Canadian-born classmates when they enter the school system. In a survey conducted in the city of North York, Ontario, which was undertaken to analyze the oral health status of adolescents aged 13 and 14 years according to place of birth and time since immigration, Canadian-born adolescents had better oral hygiene and less decay and had less need of dental services than their immigrant peers.[10] That study also revealed that Canadian-born children made more use of dental services.

Canada's population includes many immigrants who have settled into the larger urban centres. The city of Toronto, Ontario, had a population of more than 2.5 million in 2006, up from 2.48 million in 2001.[12] Figures from the 2001 Canadian census revealed that nearly half (49.4%) of Toronto residents were foreign-born, and almost all foreign-born residents (46.8% of the city's total population) still understood and spoke their native language at the time of the census.[13] Among the diverse immigrant groups making Toronto home, the Chinese and Portuguese communities are the largest (12% and 9% of the total population, respectively).[14] The Portuguese population of Toronto currently numbers around 160,000. The earliest immigrants in this group, who came to Toronto in growing numbers from the early 1950s until the mid-1970s, were primarily from mainland Portugal and the Azores Islands.[15] These immigrants settled in an area known as "Little Portugal," where they established businesses and set up social service networks for Portuguese speakers. More recently, Portuguese-speaking immigrants from Brazil, Angola and Mozambique have arrived in Toronto in smaller numbers, often under circumstances different from those of the immigrants who founded the community.[15]

Few studies have examined the question of access to dental services among recent immigrants and refugees to Canada, especially those from Portuguese-speaking countries. The current study was carried out to assess the level of access to dental care and other factors related to the development of ECC among immigrant children 48 months of age or younger, with at least one Portuguese-speaking immigrant parent, who reside in Toronto.

Methods

Ethics approval for the study was obtained from the University of Toronto Research Ethics Review Committee. The target population consisted of children 48 months of age or younger residing in Toronto who had at least one Portuguese-speaking parent who was originally from Portugal, Brazil, Angola, Mozambique or the Azores.

Random sampling was not possible because a sampling frame for Portuguese-speaking immigrants in Toronto does not exist. Consequently, a convenience sample was identified by means of networking techniques. These techniques involved identifying and contacting groups or organizations that included or served the Portuguese-speaking population, such as community centres, churches, drop-in centres and group meetings. A list of venues was compiled using local Portuguese, Brazilian and Angolan newspapers and the business section of the telephone directory. The cooperation of community centres and church officials was also sought and secured. The primary investigator (R.I.W.) attended meetings to describe the planned study to members of these communities and to distribute information leaflets. As

Table 1 Demographic characteristics of the study sample

Characteristics	No. (%) of children[a]		
	Cases[b] *n* = 52	Controls *n* = 52	*p* value
Sex of child			
Female	27 (52)	22 (42)	0.33[c]
Male	25 (48)	30 (58)	
Mean age (SD)			
Child (months)	32.7 (9)	32.0 (13)	0.77[d]
Mother (years)	32.0 (5)	30.3 (5)	0.08[d]
Father (years)	34.6 (6)	35.4 (6)	0.50[d]
Mother born in Canada			
Yes	3 (6)	7 (13)	0.18[c]
No	49 (94)	45 (87)	
Angola	11 (21)	0 (0)	
Azores	2 (4)	1 (2)	
Brazil	24 (46)	27 (52)	
Portugal	9 (17)	17 (33)	
Other[e]	3 (6)	0 (0)	
Father born in Canada			
Yes	5 (10)	11 (21)	0.10[c]
No	47 (90)	41 (79)	
Angola	12 (23)	0 (0)	
Brazil	24 (46)	21 (40)	
Portugal	10 (19)	19 (37)	
Other[f]	1 (2)	1 (2)	
Child born in Canada			
Yes	39 (75)	46 (88)	0.08[c]
No	13 (25)	6 (12)	
Angola	3 (6)	0 (0)	
Azores	1 (2)	0 (0)	
Brazil	6 (12)	5 (10)	
Portugal	2 (4)	1 (2)	
Other[g]	1 (2)	0 (0)	

SD = standard deviation.
[a]*Except where indicated otherwise.*
[b]*With early childhood caries.*
[c]*Obtained from* χ^2 *test.*
[d]*Obtained from* t*-test.*
[e]*Argentina, Germany or Poland.*
[f]*Germany or France.*
[g]*United States.*

a result of interviews given to Portuguese newspapers, a television channel and a magazine, some parents also approached the researcher by telephone, and 19 homes were visited in follow-up to these calls. Additional individuals were recruited by a snowball or referral technique.[16]

Before data collection, parents were asked to provide consent to participate in the study. Data were collected by interviewing the Portuguese-speaking parent and then performing a clinical oral examination of the child. The parent was interviewed by the primary investigator, who used a structured questionnaire[17] that had been translated into Portuguese. Each interview took about 15 minutes, and the interviews were conducted primarily with the mothers. The following categories of independent

Table 2 Access to dental care and dental visiting behaviour

Factor	No. (%) of children			
	Cases[a] *n* = 52	Controls *n* = 52	OR (95% CI)	*p* value
Without family dentist	28 (54)	8 (15)	6.42 (2.53–16.26)	< 0.001[b]
Without dental insurance	39 (75)	16 (31)	6.75 (2.85–16.00)	< 0.001[b]
Family income < $40,000/yr	32 (61)	15 (30)	3.73 (1.51–9.18)	0.004[b]
Child has never visited a dentist	40 (77)	28 (54)	2.86 (1.23–6.65)	0.013[b]
Child's first dental visit was not preventive	9 (17)	4 (8)	2.20 (0.27–17.92)	0.59[c]
Mother had no dental visit in the past year	30 (58)	13 (25)	4.10 (1.78–9.43)	0.001[b]
Father had no dental visit in the past year	32 (62)	24 (46)	1.87 (0.86–4.08)	0.12[b]
Sibling(s) had no dental visit in the past year	36 (69)	35 (67)	1.09 (0.48–2.50)	0.83[b]

OR = odds ratio, CI = confidence interval.
[a]*With early childhood caries.*
[b]*Obtained from χ^2 test.*
[c]*Obtained from Fisher's exact test.*

variables (risk factors and markers) were assessed by means of the questionnaire: oral hygiene history, access to dental care, medical history, dietary history, parental knowledge about child feeding practices associated with sleep and eating between meals, source of dental health information, and sociodemographic and family factors.

The children were examined by the same investigator, whose technique had been calibrated by a pediatric dentist according to established diagnostic criteria.[18,19] The oral examination took no more than 3 to 5 minutes; the child was asked to sit comfortably on a chair and was examined from the 12:00 position with an open-mouth posture; an artificial light source and tongue depressor were used when necessary. Children younger than 18 months were held on the parent's lap, knee-to-knee to the examiner. During the clinical examination, the decayed, missing and filled teeth/surfaces (dmft/s) index scores were recorded as oral health status variables.

Data were analyzed using SPSS version 12.0 (SPSS Inc., Chicago, Ill.). The univariate analyses generated the descriptive statistics; the bivariate analyses compared children with and without ECC and used the χ^2 test, Fisher's exact test and the *t*-test to test the significance of differences. Multivariate analysis consisted of logistic regression with a hierarchical approach. Variables that were significant at the bivariate level of analysis were entered in sequence into the logistic model. Access to dental care variables (specifically, no family dentist, no dental insurance, no dental visit by either the child or the parents in the past year) were hypothesized to be the main explanatory variables related to ECC in this immigrant population. All other significant factors were analyzed in separate logistic regression models for each category of independent variable. To create the final model, the variables from each model with a significant and independent effect were entered in blocks and analyzed to determine whether the variables for access to dental care were altered in a significant way by any of the other variables. Variables were then removed one by one, according to the level of significance, as determined by the Wald test ($p < 0.05$).

Results

Initially, 148 child–parent pairs were recruited for the study. Of these 148 children, 52 (35%) had ECC ("cases"). Among these children, the mean dmft score was 3.8 (standard deviation [SD] 2.4), the mean dmfs score was 8.8 (SD 7.3), and the mean decayed surface score ("untreated caries") was 8.0 (SD 6.8). Fifty-two children were randomly selected from the 96 children without ECC to serve as controls.

There were no significant differences between cases and controls in terms of the children's sex and age distribution, the mother's and father's ages, and the distributions of children and parents born in Canada (**Table 1**). Because the sample was composed of children with at least one Portuguese-speaking immigrant parent, **Table 1** also presents the countries of birth of both parents.

Of the total sample, 35% (36/104) of the families reported not having a family dentist. ECC children were more likely than controls to be from a family without a regular source of dental care and to be without dental insurance (**Table 2**). Families with a gross annual income less than $40,000 were almost 4 times more likely to have a child with ECC. When asked about the child's first dental visit, 68 (65%) of the parents reported that their child had never visited a dentist; a higher proportion of children with ECC than non-ECC children had not visited a dentist. Similarly, a higher proportion of mothers

Table 3 Child's dietary history and parental knowledge about child feeding practices

Factor	No. (%) of children			
	Cases[a] *n* = 52	Controls *n* = 52	OR (95% CI)	*p* value[b]
Child was breastfed	48 (92)	36 (69)	5.32 (1.64–17.24)	0.003
Child was bottle-fed	42 (81)	43 (83)	0.88 (0.33–2.38)	0.80
Child used sweetened soother	6 (12)	4 (8)	1.57 (0.42–5.91)	0.51
Child ate ≥ 2 snacks per day	43 (83)	32 (62)	2.99 (1.20–7.41)	0.016
Parental knowledge about harmful child feeding habits was poor[c]	29 (56)	16 (31)	2.84 (1.27–6.33)	0.010

OR = odds ratio, CI = confidence interval.
[a]*With early childhood caries.*
[b]*Obtained from χ^2 test.*
[c]*Low parental knowledge = more than 2 incorrect answers out of 7 questions; high parental knowledge = 2 or fewer incorrect answers out of 7 questions.*

Table 4 Sociodemographic and family factors

Factor	No. (%) of children			
	Cases[a] *n* = 52	Controls *n* = 52	OR (95% CI)	*p* value[b]
Mother's country of origin non-European (i.e., Brazil or Angola)	38 (73)	31 (60)	2.51 (1.11–5.71)	0.026
Father's country of origin non-European (i.e., Brazil or Angola)	37 (71)	22 (42)	3.37 (1.49–7.58)	0.003
Mother's age at immigration > 22 years	33 (63)	22 (42)	2.36 (1.03–5.40)	0.041
Father's age at immigration > 24 years	35 (67)	18 (35)	3.86 (1.58–9.44)	0.003
Mother's education high school or less	31 (60)	27 (52)	1.37 (0.63–2.97)	0.43
Father's education high school or less	35 (67)	30 (58)	1.61 (0.72–3.63)	0.25
Household size ≥ 4	33 (63)	29 (56)	1.38 (0.63–3.02)	0.42
Child first born or only child	23 (44)	27 (52)	0.73 (0.34–1.59)	0.43

OR = odds ratio, CI = confidence interval.
[a]*With early childhood caries.*
[b]*Obtained from χ^2 test.*

of children with ECC than mothers of controls had not visited a dentist in the previous year.

Cases and controls did not differ with respect to medical history and oral hygiene history. Almost all of the parents (91% [95/104]) reported brushing the child's teeth; the mean age at which brushing had been started was 12.3 months (SD 6.3). In addition, there was no statistically significant difference in the age at which brushing was started between children with ECC (mean 12.4 months, SD 6.8 months) and controls (mean 12.2 months, SD 5.8 months) (*t*-test, $p = 0.93$).

Variables related to dietary history assessed breast-feeding and bottle-feeding habits, use of a sweetened soother and the child's snacking habits. With respect to feeding habits, 92% (48/52) of ECC cases and 69% (36/52) of controls had been breastfed, and children who had been breastfed were 5.32 times more likely to have ECC than children who were not breastfed (**Table 3**). The age at which the mother had weaned the child from the breast was not significantly different between ECC cases (mean 11.3 months, SD 6.2 months) and controls (mean 9.0 months, SD 7.1 months) (*t*-test, $p = 0.15$). The mean age at which bottle-feeding started was 8.4 months (SD 6.3 months) for ECC cases and 3.4 months (SD 4.1 months) for controls (*t*-test, $p < 0.001$). The mean age at which bottle-feeding was stopped was 22.1 months (SD 15.5 months) for the children with ECC and 19.5 months (SD 7.3 months) for those without ECC (*t* test, $p = 0.64$). Finally, the frequency of snacks was significantly associated with ECC; children with ECC were 2.99 times more likely than controls to consume snacks frequently (i.e., at least 2 snacks per day).

Table 5 Logistic regression model for cases of early childhood caries (n = 104)

Predictor	Coefficient	Adjusted OR (95% CI)		p value
Constant	–2.22	NA	NA	NA
Method of dental payment (no insurance versus insurance)	1.58	4.87	(1.85–12.82)	0.001
Family dentist (no versus yes)	1.38	3.96	(1.34–11.70)	0.013
Frequency of snack consumption per day (≥ 2 versus < 2)	1.33	3.79	(1.32–10.83)	0.013

OR = odds ratio, CI = confidence interval, NA = not applicable.

Seven questions measured parental knowledge about harmful habits that could lead to poor oral health in their children (sleeping with a bottle of milk, juice, water, or sweetened water; sleeping with a sweetened soother or at the breast; eating between meals). Parents who answered 3 or more questions incorrectly (i.e., poor knowledge) were 2.84 times more likely to have a child with ECC (**Table 3**).

Parents who had received information from public health departments regarding preventive dental care, those who had attended prenatal classes where information was provided about child dental care and those who had received information on dental care from a family physician were less likely to have a child with ECC. Parents who received information from non-professional sources (such as family members and friends) had almost 3 times greater risk of having a child with ECC (odds ratio 2.83, 95% CI 0.99–8.06; p = 0.047 [χ^2 test]).

The mother's and father's countries of origin were significantly associated with the occurrence of ECC (**Table 4**). Children of mothers from non-European countries (Brazil and Angola) were 2.51 times more likely to have ECC, whereas children of fathers from these countries were 3.37 times more likely to have ECC. The age at which the parents had immigrated to Canada was another significant factor related to ECC. Children whose fathers came to Canada when they were > 24 years of age (mean age of immigration 23.8 yrs, SD 9.8 years) were 3.86 time more likely to have ECC than children whose fathers immigrated at a younger age. Similar results were found for mothers who immigrated after 22 years of age (mean age for mothers 21.9 years, SD 9.9 years).

The final multivariate logistic regression model contained the best predictors of ECC in this study population: family without dental insurance, lack of a family dentist and frequency of snack consumption (**Table 5**). The model's goodness of fit was good, as indicated by the likelihood ratio statistic, often referred to as –2log likelihood or deviance (–2log likelihood = 109.600, p < 0.001).

Discussion

The present study identified many of the known risk factors for ECC and confirmed the existence of barriers limiting access to dental care for young children born to Portuguese-speaking immigrants in Canada. New immigrants come to Canada every year from countries where the prevalence of ECC is high.[20–23] Following their arrival, these immigrants encounter a dental health care system that is predominantly private,[24] and some cannot access this care owing to a lack of financial resources or because they are not covered by dental insurance.[25]

This study showed that children in low-income households without dental insurance and without a family dentist were significantly more likely to be affected by ECC. Of the total sample, 35% of the parents reported not having a family dentist. The issue of access to dental care, particularly having a regular dental care provider, was as important for the child as it was for the parents who were interviewed for the study. Seventy-seven percent of children with ECC (but only 54% of controls) had never visited a dentist. Similarly, 58% of mothers of ECC cases (but only 25% of mothers of controls) had not visited a dentist in the previous year.

Dental insurance is an important factor in determining use of dental services, but the onset and severity of dental disease often force parents to take their children to an emergency clinic for dental care. Although the study reported here was not designed as a prevalence study, 35% of the children initially recruited (52/148) were identified as having ECC, a rate higher than that reported for 5-year-olds attending school in Toronto.[26] However, the oral health status of immigrants is not always worse than that of non-immigrants, nor is it always true that immigrants make less use of dental services. A recent study found that the prevalence of dental caries among 6- to 12-year-old Brazilian schoolchildren residing in Japan was lower than that of their Japanese counterparts,[27] although the median period for which the Brazilian schoolchildren had been in Japan was only 3 years. Even within Canada, secondary analysis of data derived from Statistics Canada's 1996–1997 National

Population Health Survey (NPHS) revealed that foreign-born people (all immigrant populations combined) were somewhat more likely than native-born Canadians to have visited a dentist within the previous year.[28] That study also found that higher levels of education, greater income adequacy and the presence of dental insurance were associated with greater use of dental services among Canadians aged 12 years and older, whereas increasing age was associated with lower use. However, 75.5% of the immigrant population taking part in the NPHS had been in Canada for 10 years or longer.

Parents' country of origin and their age at the time of immigration were also related to whether their children had ECC, albeit at the bivariate level of analysis only. Children of parents from non-European countries (Brazil and Angola) were 2.5–3.5 times more likely to have ECC than children born to European parents. Changing patterns of immigration may explain this result. In addition, parents who immigrated to Canada when they were in their 20s or older were 2–4 times more likely to have a child with ECC than parents who immigrated at a younger age. This may be due to the time it takes to acclimate to a new environment and to become aware of various social services and benefits, including those that are part of the health care system.[29] Moreover, a person who immigrated as a child would have had exposure to positive oral health messages at school, but this would not be the case for someone who immigrated as an adult and who may be forced to work 2 jobs to make ends meet. Older immigrants may find it difficult to adapt to their new surroundings and may place a low priority on oral health relative to more immediate problems related to resettlement. Immigrant families who have been in the country for longer periods are more likely to be financially better off, as they will have had more time to settle in and overcome the initial trials of immigration. The findings of this study support this hypothesis, as low family income was significantly associated with ECC. Contrary to expectation, however, the level of education of the parents and its relation to the risk of the child having ECC did not reach statistical significance.

Another unexpected finding was that children who had been breastfed were 5.3 times more likely to have ECC than children who had not been breastfed, but the mean age at which the mother had weaned the child from the breast was not significantly different between cases (11.3 months) and controls (9.0 months). Dietary habits and feeding practices have long been assumed to play a primary role in the development of ECC. The recommended age for weaning is a topic that is still debated by pediatricians, nurses and nutritionists, and dental studies have not convincingly demonstrated that at-will breastfeeding after the age of 12 months and at night can be a predisposing factor for ECC.[30] In addition, most children can begin to eat solid foods at about 8 months, but if the food is prechewed by the mother, early implantation of *Streptococcus mutans* into the child's mouth may occur.[31] Aside from the controversy surrounding prolonged breastfeeding and its relation to ECC, specific cultural beliefs about breastfeeding were not examined in the current study. At present, the influence of this practice on the development of ECC remains unclear, and both quantitative and qualitative studies addressing this issue are needed.

Daily frequency of snacks was also an important risk factor for ECC in this study. Consumption of snacks is one of the strongest factors in the occurrence of ECC in the developing world,[32,33] and its important role in the etiology of dental caries was confirmed in the multivariate analysis in this study.

When relating parents' knowledge about harmful child feeding habits to the occurrence of ECC, we found that lower parental knowledge of these habits was associated with higher likelihood that their children would have ECC, a result that agrees with other studies.[34,35] Health professionals can advise parents about child dental care and feeding practices; however, loss of work days to visit the dentist, as well as language and economic limitations, act as barriers to recent immigrants in obtaining dental care and preventive advice.[35]

There is also a need for studies to identify values and beliefs related to oral health and dental care use among immigrants and refugees; such studies would allow for a better understanding of the risk factors for ECC specific to these groups. In addition, dental treatment and preventive programs incorporating the cultural and linguistic needs of new immigrants are needed to ensure continued access to care and maintenance of oral health. Some of these barriers may be overcome if more health professionals who are able to speak the languages of these new immigrants can provide information through community centres, churches, English-as-a-second-language classes for newcomers[36] and other settings where immigrants may congregate. A "one-size-fits-all" approach to delivering dental health programs in an increasingly diverse population will not bridge the gap between new immigrants and local services. Instead, a cross-cultural approach may help to improve the oral health care situation of new immigrants and their children and reduce oral health inequalities, particularly in the larger urban areas in Canada where immigrants are settling.

We conclude that young children of immigrants from Portugal, Brazil, Angola and the Azores residing in Toronto have difficulty in obtaining dental care primarily because of lack of dental insurance and lack of a family dentist, each being an important risk factor for ECC in this study. These findings support targeting resources for the primary and secondary prevention of ECC among children of new immigrants, who currently experience

barriers to accessing private dental care and who are exposed to many of the determinants of oral disease.

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