CAREGIVER KNOWLEDGE AND ATTITUDES OF PRESCHOOL ORAL HEALTH AND EARLY CHILDHOOD CARIES (ECC)

Robert J Schroth 1,2, Douglas J Brothwell 1, Michael EK Moffatt 2,3,4

1Faculty of Dentistry, University of Manitoba, Canada
2Manitoba Institute of Child Health, Canada
3Faculty of Medicine, University of Manitoba, Canada
4Winnipeg Regional Health Authority, Canada

Received 30 September 2006; Accepted 15 January 2007

ABSTRACT

Objectives. Prevention strategies are integral to improving the oral health for young Aboriginal children. For such to be effective, it is important to understand the social value that parents and caregivers ascribe to primary teeth. The purpose of this paper is to report caregiver knowledge and attitudes toward preschool oral health and early childhood caries (ECC) from 4 communities in Manitoba.

Study Design. Cross-sectional study, including a retrospective interview with caregivers.

Methods. Children and their main caregivers served as the sample. Preschoolers underwent a comprehensive dental screening while caregivers completed a questionnaire that explored knowledge and attitudes toward preschool dental health. Caregiver responses were matched with findings from each child’s examination.

Results. A majority agreed that primary teeth were important, that dental disease could lead to health problems and that a first dental visit should be made by age 1. Caregivers of children with ECC were more likely to believe that caries could not affect a child’s health while those who believed primary teeth are important had children with significantly less decay.

Conclusions. Most caregivers believed that primary teeth are important and correctly responded to inquiries about knowledge and attitudes toward oral health. Attitudes on the importance of baby teeth and bottle feeding after one year of age, the effect of rotten teeth on childhood health and night-time nursing emerged as variables most associated with the absence/presence of ECC and deft rates. Incorporating such questioning into caries risk assessments may be a useful means to determine a child’s risk for ECC. (Int J Circumpolar Health 2007; 66(2) 153-167 )

Keywords: preschool child, early childhood caries, dental caries, oral health, Aboriginal, attitude to health
INTRODUCTION

Oral health is an integral component of preschool health and well-being. Unfortunately, many children are afflicted with dental caries at an early age, even those as young as 12 months. Decay at this age usually begins in the deciduous maxillary incisors but can later progress to involve primary molars and canines. Those affected often suffer from a reduced oral health-related quality of life when contrasted with their caries-free peers (1,2). Children with rampant dental caries may also have other associated health problems, ranging from local infections to oral pain that manifests as difficulty eating and sleeping, reduced growth and altered behavior (2,3). Primary tooth decay does not discriminate. It crosses ethnic and cultural groupings but is generally concentrated among disadvantaged populations (4-7). Furthermore, there is mounting evidence indicating that children who exhibit ECC are more likely to have an increased caries experience along the continuum of childhood (8-14).

Every effort must be made to reduce the morbidity associated with the most severe cases. Though rehabilitative dental treatment is known to improve the quality of life, including improving eating and sleeping habits and reducing pain (2,15-17), it often necessitates the concomitant use of general anesthesia. However, factors including the age of the child, the aggressiveness of the treatment approach taken, the provider’s competence and the child’s future oral hygiene habits must be considered prior to surgical intervention, as post-surgical relapse due to new or recurrent caries and restoration failure are significant problems (18-27). This is especially true when the entire primary dentition is not fully erupted (i.e., prior to the eruption of the deciduous second molars) (28,29). The treatment/restorative approach focuses on the disease rather than on prevention and addressing the underlying contributory causes of early childhood caries (ECC) for what is largely a preventable problem (24).

The term ECC was introduced in the 1990s in an attempt to focus attention on the multiple factors (i.e., socioeconomic, behavioral and psychosocial) (30) that contribute to caries at such early ages rather than ascribing sole causation to inappropriate feeding methods (i.e., bottle use and prolonged breastfeeding on demand). It assumes all previous terminology ascribed to primary tooth decay among those less than 72 months of age (def > 0) (31-34), including subgroups with minimal or isolated decay extending to those with rampant manifestations (4, 35-59) (Table I). The new standardized case definitions for ECC and its rampant subtype, severe early childhood

Table I. Previous used terms for ECC among infants and preschoolers.

| Term                                      |
|-------------------------------------------|
| Baby-bottle tooth decay (35-38)           |
| Baby-bottle syndrome (39)                 |
| Labial caries (40)                         |
| Circular caries (41)                       |
| Nursing-bottle mouth (42)                 |
| Milk-bottle caries (43)                    |
| Nursing caries (44-46,54)                 |
| Nursing-bottle caries (4,39)               |
| Nursing-bottle syndrome (47,48,55)        |
| Bottle-propping caries (49)               |
| Bottle-baby syndrome and bottle-mouth caries (50) |
| Rampant caries (51)                        |
| Melanodontie infantile/“les dents noire de tout-petits” (52,53) |
| Sucking-cup caries (58)                    |
| Sugared-tea caries (56)                    |
| Sweet-tea caries (57)                      |
| Sugar nursing-bottle syndrome (59)         |
Knowledge and attitudes of ECC

caries (S-ECC), will ultimately assist in facilitating research into preschool dental caries as past nomenclature and case definitions are fraught with inconsistency (31,34).

Effective prevention strategies are integral to improving the oral health quality of life for the very young. For such activities to be effective, it is important to understand the social value that parents, caregivers and communities ascribe to primary teeth. The purpose of this paper is to report findings from interviews with primary caregivers on their knowledge and attitudes toward preschool oral health and ECC from 4 communities in the Province of Manitoba, Canada, that took part in an epidemiological study of early childhood dental health (60). Two were on-reserve First Nations communities, while the other two were disadvantaged communities in urban centers with sizeable Aboriginal populations.

MATERIALS AND METHODS

As ECC is age specific, participation was restricted to those younger than 72 months of age. Children and their primary caregivers who participated in an institutional review board (IRB) approved study of the prevalence of ECC in 4 Manitoba communities served as the sample for this report (60). Informed consent was obtained from all caregivers prior to enrolment. The communities were South Point Douglas (Winnipeg), Thompson, Roseau River First Nation (Southern First Nation) and an anonymous Northern First Nation. The examinations and interviews occurred during late 2001 and early 2002.

Infants and preschoolers underwent a comprehensive dental screening performed by a calibrated dentist while a trained dental hygienist assisted caregivers in completing a questionnaire. The dental examination recorded the number of erupted, decayed, filled and extracted primary teeth. For the purposes of this investigation, ECC was defined as the presence of current or past primary caries experience (defs>0 or deft>0) (31). The proctored questionnaire, based on a previously published tool (61), explored family demographics, general child health, infant and child feeding practices and parental/caregiver knowledge and attitudes of childhood dental health. The section pertaining to knowledge and attitudes of oral health included but was not limited to such statements as whether baby teeth are important, the necessity of a first dental visit by 12 months of age, whether problems with the primary dentition could impact the permanent dentition and whether ECC could affect childhood health.

Statistical Analyses

Parent or caregiver responses were matched with findings from each child’s dental examination and all identifiers were removed from the data set. Study data were analyzed using SPSS (version 13.0) (SPSS Inc., Chicago, Ill.). Analyses included frequencies of responses to questions gleaning knowledge and attitudes, chi-square testing, Analysis of Variance (ANOVA), and t tests, with the presence/absence of ECC and mean deft as the main outcome variables. Chi-square analysis was performed to determine whether certain categories of knowledge or attitudes caregivers had about preschool oral health were significantly associated with the presence of caries (ECC). ANOVA was performed to evaluate whether there were significant differences in
the extent of decay, measured as mean deft, with these same statements while t tests were used to contrast deft scores of children between the agree and disagree caregiver groupings. Logistic and multiple regression analyses were also employed. Both backwards stepwise logistic regression and multiple regression analyses were performed using all 16 variables of interest. Data were coded so that the correct response (agree or disagree) for each independent variable served as the reference category while the other category was combined with the unsure group. A p value of 0.05 was selected to denote statistical significance.

RESULTS

A total of 408 primary caregiver-child pairs took part in the original study. Characteristics of the caregivers and preschool children appear in Table II. The majority of interviewed caregivers were mothers (85.3%) and the mean caregiver age was 29.0 ± 7.1 years. The mean age for children was 2.9 ± 1.7 years with no differences between the four sites (p=0.9). The relationship of the caregiver to the child did statistically differ by community (p<0.05) as fewer mothers were the main caregivers for children in the South Point Douglas area of Winnipeg where 10.4% of children were being cared for by a grandparent. There was also a statistically significant difference in the mean age of caregivers by community of residence: caregivers from Thompson were younger than those from Winnipeg and the Northern First Nation, which requested anonymity (p<0.001). There were no significant community differences in the number of males and females participating (p=0.8).

The interviewed questionnaire asked caregivers whether they agreed or disagreed with specific statements designed to glean knowledge and attitudes about the primary dentition of infants and preschoolers. Responses appear in Table III. It was apparent that most caregivers believed primary teeth were important (91.2%), that dental disease could lead to general health problems (87.5%), that a first dental visit should be made by age 1 (74.7%) and that fluoride toothpaste helps prevent decay (75.5%). However, only 161 caregivers

| Table II. Characteristics of primary caregiver and child. |
|-----------------------------------------------------------|
| Community                                                |
| Roseau River First Nation                                 |
| Winnipeg (South Point Douglas)                            |
| Thompson                                                 |
| Northern First Nation                                     |
| Total                                                     |
| Relationship to child                                     |
| Mother (%)                                                |
| 90 (83.3)                                                 |
| 52 (77.6)                                                 |
| 95 (90.5)                                                 |
| 111 (86.7)                                                |
| 348 (85.3)                                                |
| Father (%)                                                |
| 11 (10.2)                                                 |
| 7 (10.4)                                                  |
| 3 (2.9)                                                   |
| 7 (5.5)                                                   |
| 28 (6.9)                                                  |
| Grandparent (%)                                           |
| 2 (1.9)                                                   |
| 7 (10.4)                                                  |
| 3 (2.9)                                                   |
| 5 (3.9)                                                   |
| 17 (4.2)                                                  |
| Guardian/Foster parent (%)                                |
| 3 (2.8)                                                   |
| 0 (0.0)                                                   |
| 4 (3.8)                                                   |
| 5 (3.9)                                                   |
| 12 (2.9)                                                  |
| Other (%)                                                 |
| 2 (1.9)                                                   |
| 1 (1.5)                                                   |
| 0 (0.0)                                                   |
| 0 (0.0)                                                   |
| 3 (0.1)                                                   |
| Mean age of primary caregiver (years)                     |
| 28.6 ± 7.4                                                |
| 31.3 ± 7.6                                                |
| 27.0 ± 5.1                                                |
| 29.7 ± 7.7                                                |
| 29.0 ± 7.1                                                |
| Mean age of child (years)                                 |
| 2.9 ± 1.8                                                 |
| 3.0 ± 1.7                                                 |
| 2.8 ± 1.7                                                 |
| 2.8 ± 1.7                                                 |
| 2.9 ± 1.7                                                 |
| Male (%)                                                  |
| 51 (47.2)                                                 |
| 34 (50.7)                                                 |
| 48 (45.7)                                                 |
| 55 (43.0)                                                 |
| 188 (46.1)                                                |
(39.5%) believed that a mother’s diet during pregnancy could affect the development of the deciduous dentition.

There seemed to be a considerable number of respondents who reported that they were unsure whether to agree or disagree with the 16 statements assessing knowledge and attitudes about early childhood oral health. For instance, many caregivers were unsure whether prenatal diet could influence baby teeth. Furthermore, 75 caregivers (18.4%) were unsure that dentifrices containing fluoride could prevent tooth decay, although this fact is generally understood to be common knowledge given public exposure to media advertisements. This finding is in stark contrast to the relatively low number of caregivers who were unsure about the need for a first dental visit by the age of 1. Considering that this recommendation is not well established in dental circles, let alone the

| Statement                                                                 | Number of respondents who agreed (%) | Number of respondents who disagreed (%) | Number of respondents who were unsure (%) |
|--------------------------------------------------------------------------|--------------------------------------|----------------------------------------|------------------------------------------|
| Baby teeth are important                                                | 372 (91.2)                           | 17 (4.2)                               | 19 (4.6)                                 |
| Problems with baby teeth will affect adult teeth                        | 243 (59.6)                           | 78 (19.1)                              | 87 (21.3)                                |
| Rotten teeth could affect a child’s health                              | 357 (87.5)                           | 23 (5.6)                               | 28 (6.9)                                 |
| Babies without teeth need mouths cleaned                                | 326 (79.9)                           | 24 (5.9)                               | 58 (14.2)                                |
| Using fluoride toothpaste helps to prevent tooth decay                  | 308 (75.5)                           | 25 (6.1)                               | 75 (18.4)                                |
| Mother’s diet during pregnancy will affect baby’s teeth                 | 161 (39.5)                           | 82 (20.1)                              | 165 (40.4)                               |
| Good idea to give baby a bottle to comfort while teething               | 77 (18.9)                            | 263 (64.4)                             | 68 (16.7)                                |
| Frequently giving child pop is okay for child’s teeth                   | 18 (4.4)                             | 385 (94.4)                             | 5 (1.2)                                  |
| Frequently giving child juice is okay for child’s teeth                 | 159 (39.0)                           | 198 (48.5)                             | 51 (12.5)                                |
| Frequently feeding child milk or formula is okay for child’s teeth      | 304 (74.5)                           | 60 (14.7)                              | 44 (10.8)                                |
| Okay to let baby nurse in bed with mother all night                    | 102 (25.0)                           | 243 (59.6)                             | 63 (15.4)                                |
| As baby gets older and can hold a bottle easily, he/she should use bottle whenever he/she wants | 130 (31.8) | 252 (61.8) | 26 (6.4) |
| Okay to put baby to bed with a bottle                                  | 104 (25.5)                           | 286 (70.1)                             | 18 (4.4)                                 |
| Bottle feeding after child is 1-year-old is bad for his/her teeth       | 251 (61.5)                           | 101 (24.8)                             | 56 (13.7)                                |
| Breast feeding is important for the health of child’s teeth             | 307 (75.2)                           | 21 (5.2)                               | 80 (19.6)                                |
| Babies who do not have bottles will cry more                            | 88 (21.6)                            | 223 (54.6)                             | 97 (23.8)                                |
| Children should see dentist or dental therapist by first birthday       | 305 (74.7)                           | 48 (11.8)                              | 55 (13.5)                                |
Results of the chi-square analysis appear in Table IV. Children were more likely to have ECC if their caregiver disagreed that primary teeth were important; however, this relationship just failed to reach statistical significance (p=0.06, df=2). In addition, significantly more caregivers of children with ECC believed that caries could not affect a child’s health (78.3%) than caregivers of children who were free from decay (21.7%) (p=0.05, df=2; p=0.016, df=1 when the unsure category was excluded from the analysis).

Interestingly, primary caregivers of children with ECC were significantly more likely to disagree that comforting a baby with a bottle while teething was an acceptable practice (p=0.03, df=2; p=0.025, df=1). This may be because caregivers of children with ECC...
Knowledge and attitudes of ECC

may be more aware of the dangers that bottle contents and their misuse can pose to children’s teeth, perhaps because of repeated lecturing by professionals. In addition, caregivers of children with decay were significantly more likely to disagree that the practice of allowing an infant to nurse in bed all night was safe (p=0.01, df=2; p=0.004, df=1) and more apt to agree that bottle feeding beyond 12 months of age could harm primary teeth (p=0.002, df=2; p=0.054, df=1).

Results from ANOVA appear in Table V. Children whose caregivers believed that primary teeth are important had significantly fewer decayed teeth (mean deft 4.0 ± 5.0 vs. 6.4 ± 6.0, p=0.019). This finding is similar to the results of the chi-square test (Table IV). However, when the unsure category was removed, t testing revealed no significant difference in deft rates between caregivers who agreed or disagreed. Further, children belonging to caregivers who reported they disagreed with the statement that it is a good idea to give an infant the bottle to pacify her/him while teething had significantly higher mean deft scores (ANOVA mean deft 4.7 ± 5.1 vs. 3.1 ± 4.6, p=0.023) (t test p=0.011). This is also similar to the chi-square findings

Table IV continues from previous page

| Parent/Caregiver Knowledge of Oral Health | Caries Free (%) | ECC (%) | p value |
|-----------------------------------------|----------------|---------|---------|
| Frequently feeding child milk or formula is okay for child’s teeth | | | |
| Agree | 138 (45.4) | 166 (54.6) | p=0.69 df=2 |
| Disagree | 28 (46.7) | 32 (53.3) | p=0.86 df=1 |
| Unsure | 23 (52.3) | 21 (47.7) | |
| Okay to let baby nurse in bed with mother all night | | | |
| Agree | 59 (57.8) | 43 (42.2) | p=0.01 df=2 |
| Disagree | 90 (40.7) | 144 (59.3) | p=0.004 df=1 |
| Unsure | 31 (49.2) | 32 (50.8) | |
| As baby gets older and can hold a bottle easily, he/she should use bottle whenever he/she wants | | | |
| Agree | 61 (46.9) | 69 (53.1) | p=0.91 df=2 |
| Disagree | 117 (46.4) | 135 (53.6) | p=0.93 df=1 |
| Unsure | 11 (42.3) | 15 (57.7) | |
| Okay to put baby to bed with a bottle | | | |
| Agree | 55 (52.9) | 49 (47.1) | p=0.27 df=2 |
| Disagree | 127 (44.4) | 159 (55.6) | p=0.14 df=1 |
| Unsure | 7 (38.9) | 11 (61.1) | |
| Bottle feeding after child is 1-year-old is bad for his/her teeth | | | |
| Agree | 111 (45.1) | 150 (54.9) | p=0.002 df=2 |
| Disagree | 52 (51.5) | 49 (48.5) | p=0.054 df=1 |
| Unsure | 36 (64.3) | 20 (35.7) | |
| Breast feeding is important for the health of child’s teeth | | | |
| Agree | 139 (45.3) | 168 (54.7) | p=0.56 df=2 |
| Disagree | 12 (57.1) | 9 (42.9) | p=0.29 df=1 |
| Unsure | 38 (47.5) | 42 (52.5) | |
| Babies who do not have bottles will cry more | | | |
| Agree | 39 (44.3) | 49 (55.7) | p=0.91 df=2 |
| Disagree | 104 (46.6) | 119 (53.4) | p=0.71 df=1 |
| Unsure | 46 (47.4) | 51 (52.6) | |
| Children should see dentist or dental therapist by first birthday | | | |
| Agree | 135 (44.3) | 170 (55.7) | p=0.32 df=2 |
| Disagree | 24 (50.0) | 24 (50.0) | p=0.46 df=1 |
| Unsure | 30 (54.5) | 25 (45.5) | |

df=2 – compares ECC status between agree, disagree and unsure groups
df=1 – compares ECC status between agree and disagree groups only
Knowledge and attitudes of ECC

(Table IV) and may reflect the increased awareness of caregivers of children with caries. Similarly, children whose caregivers reported that they agreed that bottle feeding beyond 1 year of age could contribute to poor dental health had a higher mean deft score (4.8 ± 5.2 vs. 3.7 ± 4.8, p=0.0015), which could be a result of information they received from health professionals. However, this specific finding was confounded by the influence of the unsure category as t test analysis for mean deft between agree and disagree groups was not significant (p=0.24).

T tests contrasting the agree and disagree categories revealed that children whose caregiver disagreed that it was okay to put a baby to bed with a bottle had a higher mean deft score (p=0.014). This too may be due to counseling caregivers of children with ECC received from

| Parent/Caregiver Knowledge of Oral Health | Mean deft ± S.D. | p value |
|------------------------------------------|-----------------|---------|
| Baby teeth are important                 |                 |         |
| Agree                                    | 4.0 ± 4.9       | ANOVA p=0.019 |
| Disagree                                 | 6.4 ± 6.0       | t test p=0.168 |
| Unsure                                   | 6.4 ± 5.2       |         |
| Problems with baby teeth will affect adult teeth |         |         |
| Agree                                    | 4.0 ± 4.9       | ANOVA p=0.64 |
| Disagree                                 | 4.3 ± 4.9       | t test p=0.597 |
| Unsure                                   | 4.6 ± 5.3       |         |
| Rotten teeth could affect child's health |                 |         |
| Agree                                    | 4.1 ± 5.0       | ANOVA p=0.11 |
| Disagree                                 | 6.3 ± 4.8       | t test p=0.661 |
| Unsure                                   | 3.7 ± 4.7       |         |
| Babies without teeth need mouths cleaned |                 |         |
| Agree                                    | 4.4 ± 5.1       | ANOVA p=0.43 |
| Disagree                                 | 3.5 ± 4.3       | t test p=0.108 |
| Unsure                                   | 3.6 ± 4.5       |         |
| Using fluoride toothpaste helps to prevent tooth decay |         |         |
| Agree                                    | 4.2 ± 5.0       | ANOVA p=0.29 |
| Disagree                                 | 5.6 ± 5.2       | t test p=0.823 |
| Unsure                                   | 3.8 ± 4.7       |         |
| Mother's diet during pregnancy will affect baby's teeth |         |         |
| Agree                                    | 4.2 ± 4.9       | ANOVA p=0.29 |
| Disagree                                 | 4.9 ± 5.2       | t test p=0.338 |
| Unsure                                   | 3.9 ± 5.0       |         |
| Good idea to give baby a bottle to comfort while teething |         |         |
| Agree                                    | 3.1 ± 4.6       | ANOVA p=0.023 |
| Disagree                                 | 4.7 ± 5.1       | t test p=0.011 |
| Unsure                                   | 3.5 ± 4.6       |         |
| Frequently giving child pop is okay for child's teeth |         |         |
| Agree                                    | 4.3 ± 5.4       | ANOVA p=0.90 |
| Disagree                                 | 4.2 ± 5.0       | t test p=0.835 |
| Unsure                                   | 3.2 ± 5.2       |         |
| Frequently giving child juice is okay for child's teeth |         |         |
| Agree                                    | 4.2 ± 5.0       | ANOVA p=0.43 |
| Disagree                                 | 4.0 ± 4.8       | t test p=0.309 |
| Unsure                                   | 5.0 ± 5.6       |         |
| Frequently feeding child milk or formula is okay for child's teeth |         |         |
| Agree                                    | 4.1 ± 4.9       | ANOVA p=0.70 |
| Disagree                                 | 4.2 ± 4.8       | t test p=0.786 |
| Unsure                                   | 4.8 ± 5.9       |         |

Table V continues on next page
Knowledge and attitudes of ECC

Finally, children whose caregivers agreed that the first dental visit should occur by 12 months had higher mean deft scores than those from caregivers who disagreed (p=0.006). However, t tests revealed that the unsure group was responsible for the significant difference in the deft for the question regarding bottle feeding beyond 1 year of age (Table V).

Results of these regression analyses appear in Tables VI and VII.

Table V continues from previous page

| Parent/Caregiver Knowledge of Oral Health | Mean deft ± S.D. | p value |
|------------------------------------------|-----------------|---------|
| Okay to let baby nurse in bed with mother all night |                 |         |
| Agree                                    | 3.5 ± 5.0       | ANOVA p=0.12 |
| Disagree                                 | 4.6 ± 5.1       | t test p=0.232 |
| Unsure                                   | 3.8 ± 4.5       |         |
| As baby gets older and can hold a bottle easily, he/she should use bottle whenever he/she wants |                 |         |
| Agree                                    | 4.2 ± 5.2       | ANOVA p=0.88 |
| Disagree                                 | 4.1 ± 5.0       | t test p=0.692 |
| Unsure                                   | 4.7 ± 4.9       |         |
| Okay to put baby to bed with a bottle    |                 |         |
| Agree                                    | 3.4 ± 4.6       | ANOVA p=0.16 |
| Disagree                                 | 4.5 ± 5.1       | t test p=0.014 |
| Unsure                                   | 4.5 ± 4.2       |         |
| Bottle feeding after child is 1-year-old is bad for his/her teeth |                 |         |
| Agree                                    | 4.8 ± 5.2       | ANOVA p=0.0015 |
| Disagree                                 | 3.7 ± 4.8       | t test p=0.243 |
| Unsure                                   | 2.3 ± 3.9       |         |
| Breast feeding is important for the health of child's teeth |                 |         |
| Agree                                    | 4.3 ± 5.0       | ANOVA p=0.92 |
| Disagree                                 | 4.0 ± 5.5       | t test p=0.424 |
| Unsure                                   | 4.0 ± 4.8       |         |
| Babies who do not have bottles will cry more |                 |         |
| Agree                                    | 4.3 ± 5.0       | ANOVA p=0.95 |
| Disagree                                 | 4.2 ± 5.0       | t test p=0.664 |
| Unsure                                   | 4.1 ± 5.0       |         |
| Children should see dentist or dental therapist by first birthday |                 |         |
| Agree                                    | 4.5 ± 5.2       | ANOVA p=0.063 |
| Disagree                                 | 3.2 ± 4.2       | t test p=0.006 |
| Unsure                                   | 3.2 ± 4.5       |         |

ANOVA – compares deft between agree, disagree and unsure groups

Table VI. Logistic regression analysis for ECC.

| Variable                                                      | Regression Coefficient | Odds Ratio | p value |
|--------------------------------------------------------------|------------------------|------------|---------|
| Okay to let baby nurse in bed with mother all night          | -0.61                  | 0.55       | 0.018   |
| Rotten teeth could affect child's health                     | 1.47                   | 4.33       | 0.006   |
| Bottle feeding after child is 1-year-old is bad for his/her teeth | -0.36                 | 0.70       | 0.162   |

Table VII. Multiple regression analysis for deft.

| Variable                                                      | Regression Coefficient (± 95% CI) | p value |
|--------------------------------------------------------------|-----------------------------------|---------|
| Bottle feeding after child is 1-year-old is bad for his/her teeth | -1.21 (± 0.66)                    | <0.001  |
| Baby teeth are important                                      | 1.41 (± 1.04)                    | <0.01   |
DISCUSSION

Currently, there is no co-ordinated oral health promotion in the province of Manitoba targeting early childhood with the exception of the Manitoba Collaborative Project for the Prevention of Early Childhood Tooth Decay (Healthy Smile Happy Child) (60). Results from the baseline study conducted in 2001 are likely to assist in tailoring health promotion activities to high-risk populations throughout the province. However, it is crucial to discover basic caregiver knowledge and attitudes toward infant and preschool dental health and oral health quality of life if advancements are ever to be made.

According to responses in this study, the majority of caregivers believed that baby teeth are important and that primary tooth decay can impact childhood health. Many also responded appropriately to other questions intended to assess knowledge and attitudes surrounding infant and preschool dental health. Perhaps those caregivers who felt this way were more inclined to participate than those who held differing opinions. However, given that caregivers embraced the concept of a first dental visit by the child’s first birthday, such knowledge does not necessarily translate into behavioral practices that are likely to prevent ECC.

For example, while 74.7% of primary caregivers agreed with the importance of a first preventive dental visit by age 1, only 3.9% of children actually attended a dentist before this developmental milestone (62). Such a discrepancy raises concern over response bias in that participants may have responded accordingly to please the interviewer. Overall dental attendance was low as only 36.2% of infants and preschoolers had visited a dental professional, which is considerably less than reports for low-income preschool children in Washington state (63).

Caregiver responses to the question of whether bottle feeding beyond 12 months of age may pose harm to the primary dentition may be helpful in identifying children at increased risk for caries. For instance, those who disagreed with the practice may have been speaking from first-hand knowledge of the effects this behavioral practice may have. Another explanation may be that these guardians are biased because dental professionals may have repeatedly counseled them on the dire consequences of this practice. The same arguments likely hold for caregivers’ attitudes toward “all-night” or “ad libitum” breastfeeding practices in bed.

Certain attitudes and beliefs held by caregivers were significantly associated with both ECC and increased caries activity (deft) (Table IV and Table V). Responses to 2 different statements were significantly associated with the 2 main dental outcomes, mean deft and ECC: (1) it is a good idea to give a baby a bottle to comfort while teething and (2) bottle feeding after the child is 1 year old is bad for his/her teeth. Responses were similar for a third statement that baby teeth are important, but the relationship just failed to reach statistical significance with ECC.

Our results indicate that caregivers who believed that baby teeth are important were more likely to have children with better oral health (i.e., less decay) than those who thought otherwise. Unfortunately, caregivers of children with ECC were more likely to disagree that dental decay could affect a child’s overall health.

Three of the 4 variables identified as being significantly associated with ECC on bivariate analysis proved to be associated on backwards
stepwise logistic regression (Table VI). The associations between caregivers disagreeing with nursing throughout the night and increased likelihood of ECC and agreeing that bottle feeding beyond 1 year of age with increased risk for both ECC and increased deft scores are perhaps attributable to reinforcement from public health workers and the wider dental community. It may also be attributable to the previous terminology for ECC that implicated infant feeding practices (e.g., baby-bottle tooth decay, nursing caries).

Only 2 variables remained in the final multiple regression model for deft (Table VII): “baby teeth are important” and “bottle feeding after a child is 1 year old is bad for a child’s teeth.” It is apparent that those caregivers who recognize the importance of deciduous teeth are more likely to raise children with considerably less dental decay. This awareness and knowledge may be fostering better oral hygiene practices and reducing exposure to cavity-causing risk factors.

The only variable found to be significant or to approach the threshold of significance for both ECC and mean deft on bivariate analysis (and also multiple and logistic regression analyses) related to the potential harm of bottle feeding beyond the age of 1. However, one should not ignore the other variables found in Tables VI and VII. Considering that these relationships stood up to more rigorous statistical techniques, adding elements that assess parental opinions on such issues to a screening tool may give dental and health providers additional assistance in identifying children at risk for developing decay.

Further, brief questioning of caregivers to gain insight of their knowledge and attitudes toward early childhood oral health could also be integrated into caries risk assessment tools that have been recommended for infant dental assessments before 12 months of age by non-dental staff and dental professionals alike (64-66). Currently, such tools only evaluate clinical conditions, scan the environment and assess childhood health (66).

While using traditional health education as a means to reduce the incidence of caries or to change parenting behaviours that contribute to ECC have had limited results, especially among high-risk groups (67-69), new methodology—particularly the use of motivational interviewing and the use of community development approaches for health promotion—show promise or should be explored (38,70-76).

The manner in which populations view the caries process may also influence parental and caregiver attitudes and behaviors that affect childhood oral health. We already know that caregivers with lower levels of education may possess lower dental IQ scores and may not value the importance of deciduous teeth as much as their more educated counterparts (77).

Considering the limitations of traditional oral health promotion, the use of culturally appropriate or new methods of delivering and reinforcing anticipatory guidance may be a more promising vehicle to changing attitudes and behaviors about the primary dentition, especially among Aboriginal populations (78).

While this research gives a glimpse into the attitudes of primary caregivers from four Manitoba communities, there is an extreme need for complementary qualitative research exploring the themes underlying early childhood oral health. Qualitative research may uncover issues relating to parenting behaviors and views that could place a child at increased susceptibility for caries (79) and may be more
practical than quantitative questioning. They may provide an explanation for the paradoxical associations that have been found and perhaps explain why people are choosing “unsure” for some important questions whose answers ought to be common knowledge (e.g., the benefits of fluoride toothpaste). One possible means to reduce the number of unsure responses in future studies might be to increase the training of interviewers. Regardless, multidisciplinary approaches are needed to combat and improve preschool oral health (79). In addition, complementary multiple research methodologies (i.e., both quantitative and qualitative) are essential in better understanding why certain populations suffer from an increased prevalence of ECC. Community-based participatory research (CBPR) should be encouraged to help engage at-risk communities in developing research protocols to investigate the mysteries and attitudes contributing to suboptimal preschool oral health.

In areas of deprivation and limited access to dental care, alternatives to delivering oral health promotion and prevention must be explored. Perhaps the examples from the northwestern U.S. may give the necessary impetus to team with primary-care physicians as allies in the battle to improve early childhood oral health (80). Early identification of these high-risk preschool populations is essential so that proper preventive approaches can be implemented and anticipatory guidance can be used (81).

A key limitation of this study is that the interviews with primary caregivers were retrospective, as this data were from a previous cross-sectional study. The use of retrospective interviews to recall children’s past exposures and experiences continues to be a limitation for this form of research. Prospective studies beginning in utero are needed to properly assess the relationship between knowledge and attitudes and early childhood oral health. Such a design would also lend itself to studying ECC risk factors that might occur during pregnancy, including those that could alter the integrity of enamel. Furthermore, caution must be exercised in generalizing from these data to the participating communities and other Aboriginal residents in Manitoba as a whole, given that the proportion of potential participants who actually participated differed among the communities.

Conclusions

Overall, a majority of parents and caregivers believed that primary teeth were important and responded appropriately to other questions assessing knowledge and attitudes about early childhood oral health, yet they did not believe that prenatal diet could affect the primary dentition. Unfortunately, children were more likely to have ECC if caregivers did not agree that primary tooth decay could affect a child’s health. In addition, caregivers also believed that allowing an infant to nurse in bed all night was unsafe and agreed that bottle feeding beyond 1 year of age could be of detriment to the primary dentition. Paradoxical findings included higher deft scores among children whose caregivers did not condone the use of a bottle as a pacifier during teething, those who disagreed that putting a baby to bed with a bottle was okay and those who agreed with a first dental visit by 12 months of age. Three statements that emerged as being the most significantly associated with the presence and absence of
Knowledge and attitudes of ECC

ECC on logistic regression included “rotten teeth could affect a child’s health,” “okay to let baby nurse in bed with mother all night” and “bottle feeding after a child is one year old is bad for his/her teeth.” Attitudes toward two statements significantly associated with the mean deft score on multiple regression were “baby teeth are important” and “bottle feeding after a child is one year old is bad for his/her teeth.”

If oral health promotion efforts are to be effective in improving the oral health of young children, it is essential that there be a good understanding of parental and caregiver knowledge and attitudes. Such findings may help to guide and modify current and future oral health prevention activities.

Acknowledgements
Dr. Schroth is a Canadian Institutes of Health Research Strategic Training Fellow in the Canadian Child Health Clinician Scientist Program (www.cchcsp.ca/ Shared Partners: SickKids Foundation, Child and Family Research Institute/BC Children’s Hospital Foundation and the Manitoba Institute of Child Health – a division of the Children’s Hospital Foundation of Manitoba Inc.). The authors would like to recognize the other members of the Healthy Smile Happy Child steering committee. Thank you to Dr. Tom Hassard and Dr. Bob Tate for their biostatistical advice. Operating funds for the baseline study was obtained from the Children’s Hospital Foundation of Manitoba Inc.; the Winnipeg Foundation; Manitoba Health; and Health Canada, First Nations and Inuit Health Branch.

Thank you to Drs. H. Lawrence and J. Rogers for kindly allowing the use of their caregiver interview tool for the baseline study.

REFERENCES

1. Filstrup SL, Briskie D, da Fonseca M, Lawrence L, Wandera A, Inglehart MR. Early childhood caries and quality of life: child and parent perspectives. Pediatr Dent 2003;25:431-440.
2. Low W, Tan S, Schwartz S. The effect of severe caries on the quality of life in young children. Pediatr Dent 1999;21:325-326.
3. Acs G, Lodolini G, Kaminsky S, Cisneros GJ. Effect of nursing caries on body weight in a pediatric population. Pediatr Dent 1992;14:302-305.
4. Milnes AR. Description and epidemiology of nursing caries. J Public Health Dent 1996;56:38-50.
5. Downer MC. The 1993 national survey of children’s dental health. Br Dent J 1995;178:407-412.
6. Hallett KB, O’Rourke PK. Social and behavioural determinants of early childhood caries. Aust Dent J 2003;48:27-33.
7. Jose B, King NM. Early childhood caries lesions in preschool children in Kerala, India. Pediatr Dent 2003;25:594-600.
8. Li Y, Wang W. Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. J Dent Res 2002;81:561-566.
9. Kaste LM, Marianos D, Chang R, Phipps KR. The assessment of nursing caries and its relationship to high caries in the permanent dentition. J Public Health Dent 1992;52:64-68.
10. Johnsen DC, Gerstenmaier JH, DiSantis TA, Berkowitz RJ. Susceptibility of nursing-carries children to future approximal molar decay. Pediatr Dent 1986;8:168-170.
11. al Shalan TA, Erickson PR, Hardie NA. Primary incisor decay before age 4 as a risk factor for future dental caries. Pediatr Dent 1997;19:37-41.
12. Peretz B, Ram D, Azo E, Efrat Y. Preschool caries as an indicator of future caries: a longitudinal study. Pediatr Dent 2003;25:114-118.
13. Holbrook WP, de Soet JJ, de Graaff J. Prediction of dental caries in pre-school children. Caries Res 1993;27:424-430.
14. Sclovos S, Porter S, Kim SW. Future caries development in children with nursing bottle caries. J Pedod 1988;13:1-10.
15. Thomas CW, Primosch RE. Changes in incremental weight and well-being of children with rampant caries following complete dental rehabilitation. Pediatr Dent 2002;24:109-113.
16. Acs G, Shulman R, Ng MW, Chussid S. The effect of dental rehabilitation on the body weight of children with early childhood caries. Pediatr Dent 1999;21:109-113.
17. Acs G, Pretzer S, Foley M, Ng MW. Perceived outcomes and parental satisfaction following dental rehabilitation under general anesthesia. Pediatr Dent 2001;23:419-423.
18. Berkowitz RJ, Moss M, Billings RJ, Weinstein P. Clinical outcomes for nursing caries treated using general anesthesia. ASDC J Dent Child 1997;64:210-211, 228.
Knowledge and attitudes of ECC

19. Almeida AG, Roseman MM, Sheff M, Huntington N, Hughes CV. Future caries susceptibility in children with early childhood caries following treatment under general anesthesia. Pediatr Dent 2000;22:302-306.

20. Graves CE, Berkowitz RJ, Proskin HM, Chase I, Weinstein PS, Billings R. Clinical outcomes for early childhood caries: influence of aggressive dental surgery. J Dent Child (Chic) 2004;71:114-117.

21. Drummond BK, Davidson LE, Williams SM, Moffat AM, Ayers KM. Outcomes two, three and four years after comprehensive care under general anesthesia. N Z Dent J 2004;100:32-37.

22. First-ever surgeon general’s report on oral health identifies disparities. Public Health Rep 2000;115:112.

23. Tate AR, Ng MW, Needleman HL, Acs G. Failure rates of restorative procedures following dental rehabilitation under general anesthesia. Pediatr Dent 2002;24:69-71.

24. Eidelman E, Faibis S, Peretz B. A comparison of restorations for children with early childhood caries treated under general anesthesia or conscious sedation. Pediatr Dent 2000;22:33-37.

25. Legault JV, Diner MH, Auger R. Dental treatment of children in a general anesthesia clinic: review of 300 cases. J Can Dent Assoc 1972;38:221-224.

26. Sheehy E, Hirayama K, Tsamtsouris A. A survey of parents whose children had full-mouth rehabilitation under general anesthesia regarding subsequent preventive dental care. Pediatr Dent 1994;16:362-364.

27. Ng MW, Tate AR, Needleman HL, Acs G. The influence of medical history on restorative procedure failure rates following dental rehabilitation. Pediatr Dent 2001;23:487-490.

28. Sheller B, Williams BJ, Hays K, Mancl L. Reasons for repeat dental treatment under general anesthesia for the healthy child. Pediatr Dent 2003;25:546-552.

29. Worthen TB, Mueller W. Implications of parental compliance on decision making in care provided using general anesthesia in a low-income population. ASDC J Dent Child 2000;67:197-199, 161.

30. Reisine S, Douglass JM. Psychosocial and behavioral issues in early childhood caries. Community Dent Oral Epidemiol 1998;26:32-44.

31. Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. J Public Health Dent 1999;59:192-197.

32. Tinanoff N. The Early Childhood Caries Conference. October 18-19, 1997. ASDC J Dent Child 1997;64:376, 382.

33. Tinanoff N. The Early Childhood Caries Conference. October 18-19, 1997. Pediatr Dent 1997;19:453-454.

34. Definition of early childhood caries (ECC). Pediatr Dent 2005;27:13.

35. Arkin EB. The Healthy Mothers, Healthy Babies Coalition: four years of progress. Public Health Rep 1986;101:147-156.

36. Smith PJ, Moffatt ME. Baby-bottle tooth decay: are we on the right track? Int J Circumpolar Health 1998;57(Suppl 1):155-162.

37. Johnsen D, Nowjack-Raymer R. Baby bottle tooth decay (BBTD): issues, assessment, and an opportunity for the nutritionist. J Am Diet Assoc 1989;89:1112-1116.

38. Kelly M, Bruerd B. The prevalence of baby bottle tooth decay among two native American populations. J Public Health Dent 1987;47:94-97.

39. Currier GF, Glinka MP. The prevalence of nursing bottle caries or baby bottle syndrome in an inner city fluoridated community. Va Dent J 1977;54:9-19.

40. James PMC, Parfitt GJ, Falkner F. A study of the etiology of labial caries of the deciduous incisor teeth in small children. Br Dent J 1957;103:37-40.

41. Toth K, Szabo I. Dental conditions of preschool children (one to six years of age) in Szeged, Hungary. J Dent Res 1959;38:451-463.

42. Fass EN. Is bottle feeding of milk a factor in dental caries? J Dent Child 1962;29:245-251.

43. Kotelow LA. Breast feeding: a cause of dental caries in children. ASDC J Dent Child 1977;44:192-193.

44. Serwint JR, Mungo R, Negrete VF, Duggan AK, Korsch BM. Child-rearing practices and nursing caries. Pediatrics 1993;92:233-237.

45. Albert RJ, Cantin RL, Cross HG, Castaldi CR. Nursing caries in the Inuit children of the Keewatin. J Can Dent Assoc 1988;54:751-758.

46. Quartey J, Seidel S. Nursing caries and fluoride varnish. Tex Dent J 1998;115:14-17.

47. Derksen GD, Ponti P. Nursing bottle syndrome; prevalence and etiology in a non-fluoridated city. J Can Dent Assoc 1982;48:389-393.

48. Golnick AL, Mathewson RJ. Nursing bottle syndrome . . . more can be done. J Mich State Dent Soc 1967;49:261-264.

49. Shelton PG, Berkowitz RJ, Forrester DJ. Nursing bottle caries. Pediatrics 1977;59:777-778.

50. Ripa LW. Nursing habits and dental decay in infants: “nursing bottle caries.” ASDC J Dent Child 1978;45:274-275.

51. Dini EL, Holt RD, Bedi R. Caries and its association with infant feeding and oral health-related behaviours in 3-4-year-old Brazilian children. Community Dent Oral Epidemiol 2000;28:241-248.

52. Beltrami G. Les dents noires de tout-petits. Siecle Médical. 1932;1.4. In Beltrami G, Ed. La Mélandontie infantile: Marseille: Leconte 1952.

53. Tsamtsouris A, White GE. Nursing caries. J Pedod 1997;1:198-207.

54. Babeele K, Kaste LM, Husain J, Behbehani j, al Zaa’ibi F, Maher TC, Tavares M, Soparkar P, DePaola P. Severity of nursing-bottle syndrome and feeding patterns in Kuwait. Community Dent Oral Epidemiol 1989;17:237-239.
Knowledge and attitudes of ECC

56. Wetzel, WE. “Zuckertee-Karies” als Folge exzessiven Genusses von Fertigttees aus Saugerfläschchen. Quintessenz J 1984;14:227-228.
57. Wetzel, WE. “Zuckertee-Karies” eine neue Form der Milchzahnkaries bei Kleinkindern. Dtsch. Zahnarzt Z 1981;36:330-332.
58. Hunter B, Chadwick B, Hunter L, Treasure E, Chestnutt I. Sucking cup caries. Br Dent J 1999;187:179.
59. Wetzel, WE, Lehn, W, Grieb, A. Karotinikterus bei Kleinkindern mit “Zucker-Saugerflaschen-Syndrom.” Monatsschr. Kinderheilkd 1989;137:659-666.
60. Schroth RJ, Moore P, Brothwell DJ. Prevalence of early childhood caries in 4 Manitoba communities. J Can Dent Assoc 2005;71:567.
61. Lawrence HP, Romanetz, Rutherford L, Cappel L, Binguis D, Rogers JB. Effects of a community-based prenatal nutrition program on the oral health of Aboriginal preschool children in northern Ontario. Probe 2004;38:172-190.
62. Schroth RJ, Brothwell DJ, Kehler LM, Edwards JM, Mellon BA, Moffatt MEK. Determinants of early childhood caries in four Manitoba communities. Pediatr Child Health 2005;10 (Suppl B):31B.
63. Office of Maternal and Child Health, Washington State Department of Health. Smile Survey 2000. Available from: http://www.doh.wa.gov/Publicat/smilesurvey.pdf. Accessed March 6, 2005.
64. Policy on use of a caries-risk assessment tool (CAT) for infants, children, and adolescents. Pediatr Dent 2005;27:25-27.
65. Poland C, III, Hale KJ. Providing oral health to the little ones. J Indiana Dent Assoc 2003;82:8-14.
66. Hale KJ. Oral health risk assessment timing and establishment of the dental home. Pediatrics 2003;111:1113-1116.
67. Weinstein P. Public health issues in early childhood caries. Community Dent Oral Epidemiol 1998;26:84-90.
68. Sgan-Cohen HD, Mansbach IK, Haver D, Gofin R. Community-oriented oral health promotion for infants in Jerusalem: evaluation of a program trial. J Public Health Dent 2001;61:107-113.
69. Benitez C, O’Sullivan D, Tinianno N. Effect of a preventive approach for the treatment of nursing bottle caries. ASDC J Dent Child 1994;61:46-49.
70. Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children: one-year findings. J Am Dent Assoc 2004;135:731-738.
71. Harrison R, White L. A community-based approach to infant and child oral health promotion in a British Columbia First Nations community. Can J Community Dent 1997;12:7-14.
72. Harrison R. Oral health promotion for high-risk children: case studies from British Columbia. J Can Dent Assoc 2003;69:292-296.
73. Vachirarojipsan T, Shinada K, Kawaguchi Y, Laungwechakan P, Somkote T, Detsomboonrat P. Early childhood caries in children aged 6-19 months. Community Dent Oral Epidemiol 2004;32:133-142.
74. Bruerd B, Jones C. Preventing baby bottle tooth decay: eight-year results. Public Health Rep 1996;111:63-65.
75. Bruerd B, Kinney MB, Bothwell E. Preventing baby bottle tooth decay in American Indian and Alaska Native communities: a model for planning. Public Health Rep 1989;104:631-640.
76. Davies GM, Duxbury JT, Boothman NJ, Davies RM, Blinkhorn AS. A staged intervention dental health promotion programme to reduce early childhood caries. Community Dent Health 2005;22:118-122.
77. Faine MP, Oberg D. Snacking and oral health habits of Washington state WIC children and their caregivers. ASDC J Dent Child 1994;61:350-355.
78. Alsada LH, Sigal MJ, Limeback H, Fiege J, Kulkarni GV. Development and testing of an audio-visual aid for improving infant oral health through primary caregiver education. J Can Dent Assoc 2005;71:241.
79. Stevens A, Freeman R. The role of the mother-child interaction as a factor in nursing caries (ECC): a preliminary communication. Eur J Paediatr Dent 2004;5:81-85.
80. Mouradian WE, Berg JH, Somerman MJ. Addressing disparities through dental-medical collaborations, part I. The role of cultural competency in health disparities: training of primary care medical practitioners in children’s oral health. J Dent Educ 2003;67:860-868.
81. Winter GB. Caries in the preschool child. J Dent 1990;18:325-326.

Dr. Robert J. Schroth
Assistant Professor
CIHR Strategic Training Fellow in the
Canadian Child Health Clinician Scientist Program
Faculty of Dentistry, University of Manitoba
D341 – 780 Bannatyne Avenue
Winnipeg, MB R3E 0W2
CANADA
Email: umschrot@cc.umanitoba.ca