

Development and Testing of an Audio-visual Aid for Improving Infant Oral Health through Primary Caregiver Education

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A b s t r a c t

Purpose: To create and test an audio-visual (AV) aid for providing anticipatory guidance on infant oral health to caregivers.

Methods: A DVD-video containing evidence-based information about infant oral health care and prevention in accordance with the American Academy of Pediatric Dentistry guidelines has been developed (www.utoronto.ca/dentistry/newsresources/kids/). It contains comprehensive anticipatory guidance in the areas of pregnancy, oral development, teething, diet and nutrition, oral hygiene, fluoride use, acquisition of oral bacteria, feeding and oral habits, causes and sequelae of early childhood caries, trauma prevention, early dental visits and regular dental visits. A questionnaire was developed to test the knowledge of expectant and young mothers (n = 11) and early childhood educators (n = 16) before and after viewing the video.

Results: A significant lack of knowledge about infant oral health was indicated by the proportion of "I don't know" (22%) and incorrect (19%) responses to the questionnaire before the viewing. Significant improvement in knowledge (32%; range -3% to 57%; $p < 0.001$) was indicated by the proportion of correct responses (91%) following a single viewing of the AV aid.

Conclusion: This AV aid promises to be an effective tool in providing anticipatory guidance regarding infant oral health in high-risk populations. Unlike existing educational materials, this aid provides a comprehensive, self-directed, evidence-based approach to the promotion of infant oral health. Widespread application of this prevention protocol has the potential to result in greater awareness, increased use of dental services and reduced incidence of preventable oral disease in the target populations.

MeSH Key Words: audiovisual aids; oral health; parents/education

© J Can Dent Assoc 2005; 71(4):241
This article has been peer reviewed.

Dental care is the most common unmet health care need of children in North America. Lack of dental care is a disadvantage mainly among children from poor and visible minority families and those who lack dental insurance or access to oral care or have special health care needs. The disparity in oral health care places more than 52% of children at risk for untreated oral disease and poorer oral health outcomes.¹⁻³

Dental caries constitutes one of the most prevalent chronic diseases among North American children, affecting

5 to 8 times as many children as asthma.³ It is a significant public health problem with a possibly increasing prevalence.⁴⁻⁸ Moreover, treatment of early childhood caries (ECC) is difficult and expensive and often requires significant public resources, such as hospitals, physicians and nurses.⁹ Better knowledge of the causes of ECC and effective strategies for prevention should result in reductions in disease complications and treatment cost.¹⁰ It is incumbent on professionals to focus on oral health prevention through education and awareness campaigns

Table 1 Average proportion of correct and “I don’t know” responses (n = 27) before and after viewing the AV aid

Response	Before; % (range)	After; % (range)	Improvement; % (range)
Correct	59 (35–85)	91 (73–100)	32 (-3–57) ^a
I don’t know	22 (0–46)	1 (0–8)	21 (0–46)

^ap < 0.001

directed at immediate caregivers of infants and children at risk.

Many of the oral diseases and conditions affecting children are almost entirely preventable. Prevention is possible and effective through early measures, such as awareness campaigns and examinations.^{11–14} Programs to educate and promote preventive measures have been shown to increase knowledge and the ability to recall information related to health^{14,15} and to improve general health. Nevertheless, for preventive education to be effective, the health messages must be persuasive enough to result in behavioural changes.¹³ Introducing dental health messages as part of “well-baby care” and counselling caregivers throughout the infancy and toddler stages may have a reasonable chance of success in helping parents adopt healthy habits before negative ones become established.¹⁶

Currently, no studies have documented the availability or effectiveness of a universally applicable model for prevention through anticipatory guidance. Because most people use audio-visual (AV) media, such as television, as the primary mode of obtaining information, developing an AV aid to deliver infant oral health information and instructions is potentially beneficial. An AV aid can be employed to provide preventive education in a stress-free environment, targeting those responsible for the direct care of infants and ensuring delivery of the relevant information to those who would benefit from and be interested in this specific information. Using age-appropriate anticipatory guidance based on specific developmental milestones focuses the attention of caregivers by providing concise and practical messages related to the specific needs and expectations for children under their care. Although hearing the information will add knowledge, delivering that information, coupled with visual examples, at the right time gives a clearer picture of the behaviours needed and the predictable consequences of neglect when negative behaviours are sustained over prolonged periods. This in turn is expected to provide stronger motives for behavioural changes.

The aims of this study were to create and test an AV aid for educating and raising awareness of overall oral health of infants and young children among their primary caregivers. The primary purpose of the AV aid is to prevent common dental diseases and to increase public awareness of the importance of early intervention in this respect.

Methods

To determine what information the AV aid should contain, we conducted interviews of young and expectant parents at an inner-city community centre in Toronto to ascertain the level of knowledge of infant oral health among high-risk populations. An interactive educational DVD-video containing evidence-based information about infant oral health care and prevention was then developed.¹⁷ The early childhood oral health information was based on anticipatory guidance in accordance with the University of Toronto’s faculty of dentistry guidelines, those of the American Academy of Pediatric Dentistry and information gathered from the parent interviews. The target audiences for the AV aid are future parents, expectant parents and parents or primary caregivers of infants and young children. Comprehensive anticipatory guidance in all areas related to infant oral health, namely, pregnancy, oral and dental development, teething, diet and nutrition, oral hygiene, appropriate use of fluoride, acquisition of oral bacteria, feeding and oral habits, ECC causes and sequelae, trauma prevention and early and regular dental visits, is presented in the DVD-video (**Appendix 1**).

A survey with 26 key questions covering the basic information in the AV aid was developed to test the audience’s knowledge before and after viewing the video (**Appendix 2**). The questionnaire was structured in a multiple-choice format for simplicity and consistency. For each question, the option “I don’t know” was provided to assess lack of knowledge and to discourage guessing.

Testing of the AV aid for its effectiveness in delivering the information was performed on groups of expectant and young mothers (n = 11) and on a group of early childhood educators (n = 16). Participants answered the questionnaire before and after viewing the AV aid. Differences in mean results before and after viewing were calculated for individual questions and for the questionnaire as a whole. Paired t-tests and McNemar’s test for correlated proportions were performed to determine the significance of the differences.

Results

The pilot study revealed a relative lack of knowledge and misconceptions about infant oral health. It also demonstrated a need for preventive oral health education programs directed at new and expectant parents and caregivers. As part of the pilot study, the community centre

visits permitted examination of the participants' children ($n = 108$; age range, 2 months to 7 years) to motivate parents to participate in the interviews.

The completed video "Baby Oral Health: Pregnancy through Childhood"¹⁷ is 17 minutes long and contains 12 sections on various subjects related to infant oral development and oral health promotion (Appendix 1).

The questionnaire results were evaluated on an individual basis and summarized for the whole group to check the effectiveness of the educational material presented in the video (Table 1). Answers provided before viewing the video revealed a lack of knowledge about infant oral health, as evidenced by the proportion of "I don't know" (22%) and incorrect (19%) responses. Significant improvement (32%; range, -3% to 57%; $p < 0.001$) in knowledge was achieved as assessed by the proportion of correct responses following a single viewing of the video.

Discussion

Monthly visits to the community centre during 2003 were useful in providing a forum in which to examine children and provide preventive oral health education to parents. Of the children examined, 25% were deemed to need immediate dental care based on a cursory visual examination, which was performed at the preventive screening session during the pilot study. The reasons for referral included the need for a more comprehensive examination and sanative care, dental caries, dental abscess, dental trauma, malocclusion and oral habits, abnormal pattern of primary teeth eruption, as well as systemic conditions such as ectodermal dysplasia. This confirmed that a need exists for early oral health intervention in the target population.

There are few, if any, AV aids regarding infant oral health promotion directed at the lay public. The few existing AV materials focus mainly on dental caries and lack the comprehensive approach to oral health promotion taken in this study. In contrast to printed aids, our AV aid provides a comprehensive, self-directed, evidence-based approach to the promotion of infant oral health. It is unique in that it uses anticipatory guidance to focus the attention of young parents and direct caregivers on positive behaviours. It also promotes a broad approach to achieving overall oral health by preventing negative behaviours in a timely fashion. The presentation is kept short while covering all topics relevant to the oral health of infants and children. It also makes use of simple language to maintain audience attention and interest and to be as broad reaching as possible.

The AV aid emphasizes the importance of a healthy pregnancy to the oral and dental health of the infant by informing the target audience about the timing of the development of primary teeth, the importance of a healthy diet and the negative effects of nonprescription drugs, smoking and alcoholic drinks. The literature has demonstrated a

relation between smoking during pregnancy and low birth weight and between smoking in the household and increased risk of caries in children of those households.¹⁸ Congenital malformations that have been linked to the use of certain drugs and alcoholic drinks during pregnancy¹⁹ are also highlighted.

The growth and development of baby teeth are illustrated with emphasis on the pattern of eruption, normal number of baby teeth, presence of primary spacing and close proximity to the underlying developing permanent teeth. Most laypersons do not appreciate the fact that permanent tooth development commences at or slightly before birth. Advice is provided for the management of teething, which is of significant concern to many parents. The importance of a healthy diet and nutrition in keeping with the Canadian Health and Food Group Recommendations²⁰ is stressed. The role of cariogenic food types in caries development is also illustrated. Proper oral hygiene practices are presented, starting with cleaning of edentulous alveolar ridges in infants with gauze to familiarize them with mouth-cleaning routines and to reduce the level of oral microorganisms. The position and techniques for infant oral hygiene are demonstrated. Also, facts regarding dental plaque are explained and visually reinforced with images of plaque on primary teeth after the application of a disclosing dye.

The importance and appropriate use of fluoride are presented. Advice is provided regarding the appropriate timing of fluoride introduction in young children to maximize the preventive aspects while reducing the chances of fluoride toxicity.²⁰⁻²³ The audience is informed about the availability of fluoride in drinking water and advised to seek professional consultation when the local water supply is not fluoridated.

The transmission and acquisition of oral bacteria and the concept of this as an infectious disease is introduced. The audience is shown how practices such as kissing and sharing of eating utensils can promote caregiver-to-child transmission of oral bacteria. Parents and caregivers are also advised about the importance of maintaining their own good level of oral hygiene to minimize or delay the chance of their children being infected.

Night bottle-feeding and prolonged ad-lib breastfeeding, especially at night, with lack of appropriate oral hygiene are identified as major causes of early childhood caries. Weaning to a sipping or regular cup is advised by 12 months of age. The audience is warned that ad-lib drinking from a sipping cup can also place the child at risk for dental caries. The causes of ECC, complications and the complexity and cost of treatment are graphically shown to increase the impact and retention of the information.

A short segment of the video deals with oral habits and their role in normal development, including the timing and need for intervention to prevent the development of

permanent dental and skeletal effects. Specific measures for the prevention of orofacial trauma are presented as an integral part of overall prevention. Emphasis is placed on home safety, use of appropriate car seats and protection during sports and outdoor play. Consequences of injuries to the oral region and primary teeth are shown.

As an essential part of oral health prevention, the importance of having a “dental home” for young children is explained. The rationale for and nature of the early first dental visit is explained and illustrated as it pertains to improving general health. The knee-to-knee examination position is shown as one approach that can be used when dealing with difficult young children.

Although this AV aid was designed for self-directed, interactive education with distinct “chapters,” we found that it is most effective when administered by a health professional in a directed learning setting. The educator can pause the video between segments to review material and address questions that might be raised. Audience participation can also be enhanced by inviting parents to relate their own experiences and expectations for their children.

Both the pilot study and the pre-viewing questionnaire confirmed that there was a substantial lack of basic knowledge about infant oral health, not only among mothers in the high-risk group, but also among the educators. In contrast to the mothers, most of the educators had no children of their own. This suggests that simply having children and parenting does not improve knowledge in this area. In addition, although the level of education among the educators was higher than among the mothers, they showed no difference in knowledge of infant oral health before viewing the video. This confirmed the need to educate not only the populations at high risk, but also those who are directly responsible for care of infants and young children. Therefore, the developed and validated AV material is beneficial as a method of early intervention to introduce anticipatory guidance to those working in the field of early childhood care as well as future, expectant and new mothers.

The greatest improvement in knowledge was in learning that the bacteria causing dental caries are transmitted from mother to child. Only 2 participants (7.4%) responded correctly to this question before viewing the video compared with 100% correct responses after. The next highest improvement was regarding the role of breastfeeding in the development of dental caries: from 14.8% correct responses before to 88.9% after the viewing. Improvement was also noticed regarding knowledge of the increased risk to children of having a high rate of caries if their mothers have active caries or high bacterial colonization: only 5 participants (18.5%) responded correctly before viewing compared with 85.2% after. Other areas where a significant improvement occurred were knowledge about the duration

of tooth brushing, the timing of the first dental visit, when to start brushing baby teeth and frequency of teeth brushing.

The AV aid is in English, which was the second language of all participating new mothers. Despite this, the mothers’ scores improved considerably after they viewed the video. We expect that translating this AV aid into different languages commonly spoken in the high-risk communities will maximize its benefits and ensure that the right messages reach the target populations without language barriers. It may also result in greater awareness, increased use of dental services and reduced incidence of preventable oral disease in the target populations. Widespread application of this prevention protocol can also be beneficial when used by prenatal parenting centres, maternity centres, pediatricians and family physicians as part of comprehensive child health promotion programs.

Conclusions

1. There is substantial lack of basic knowledge regarding infant oral health.
2. The AV aid is an effective tool in providing anticipatory guidance for infant oral health in high-risk populations.
3. Unlike already existing educational materials, this AV aid provides a comprehensive, self-directed, evidence-based approach to the promotion of infant oral health.
4. Widespread application of this prevention protocol is expected to result in greater awareness, increased use of dental services and reduced incidence of preventable oral disease in the target populations. ♦

Acknowledgements: Growing Together Community Centre staff, the Dentistry Canada Fund, Michelle Gurevich, Dr. David Kenny, Donna Hennyey, Daniella Remy, Rite Bauer, all volunteers, colleagues and families who participated in videorecording, testing and script translations. This research was supported in part by the Dentistry Canada Fund.



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The authors have no declared financial interests.

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Appendix 1 Contents of the AV aid “Baby Oral Health: Pregnancy through Childhood”

- 1. The role of a healthy pregnancy in the development of baby teeth**
 - Early development of baby teeth during pregnancy
 - Role of a healthy pregnancy in the normal development of baby teeth
 - Keeping doctor’s appointments to avoid complications throughout pregnancy
 - Having healthy snacks and regular meals to get the essential nutrients and extra calories needed; importance of calcium-rich diet to mother and baby
 - Avoiding harmful substances including nonprescribed drugs, smoking and alcoholic drinks, which may cause birth defects
- 2. Stages of development of baby teeth**
 - Normal sequence, number and timing of development and eruption
 - Teething facts and myths
 - Baby teeth spacing that is normal and beneficial for normal alignment of adult teeth
 - Development of permanent teeth just beneath baby teeth
- 3. Healthy nutrition for healthy baby teeth**
 - Importance of a balanced diet; review of recommended food guide
 - Role of carbohydrates as the major cariogenic type of food
 - Elimination of candies, sugary juices and pop drinks from the infant diet
- 4. Oral hygiene**
 - Wiping the gums after each feeding with clean damp cloth or gauze
 - Brushing after each meal or snack when first tooth erupts
 - Demonstration of dental plaque using dye
 - Flossing between tight contacts
- 5. Benefits and proper use of fluoride**
 - Fluoridated drinking water and its role in preventing decay
 - Consulting the child’s dentist if living in nonfluoridated area
 - Use of fluoridated toothpastes in very small amounts after 2 years of age, or whenever the child can spit
 - Avoiding ingestion to prevent toxicity and fluorosis
- 6. Source of bacteria in the mouth**
 - Cariogenic bacteria transmission, mainly from mother to the infant
 - Process of caries
 - Consequences of caries for general health and permanent dentition
- 7. Night feeding habits**
 - Not giving bottled milk or breast milk during sleep time; giving water bottle instead
 - Bottle weaning to a regular or sipping cup by 12 months of age
 - Discouraging use of ad-lib sipping cup
- 8. Early baby tooth decay**
 - Causes and consequences
 - Treatment difficulty and expense
- 9. Oral habits**
 - Role of mouth in infant’s exploration of the environment
 - Pacifier use: safety, hygiene and effect on normal occlusion
 - Effect of thumb-sucking on infant’s teeth
 - Timing for breaking oral habits
- 10. Prevention of injuries (home, play area and car safety)**
 - Prevention of car accidents by the proper use of safety seats
 - Danger of baby walker, bath seats or defective play pens
 - Safety in sports and outdoor play
 - Procedure in case of avulsed baby teeth; need for extraction by the dentist
- 11. The baby’s first dental visit**
 - Timing and importance of first dental visit
 - Knee-to-knee position
- 12. Regular dental visits**
 - Importance of keeping good oral health
 - Detecting and managing early dental problems



Appendix 2 Questionnaire to test participants' knowledge of aspects of infant oral health before and after viewing the AV aid

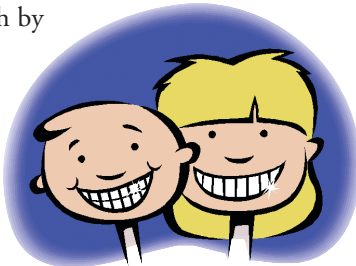
Please read and answer the following questions by circling one correct answer:

- Q1: Good health during pregnancy is important for healthy baby teeth; it can be achieved by:
- a) A healthy and balanced diet
 - b) Avoiding unprescribed medicines, drugs, and alcoholic drinks
 - c) Regular doctor visits throughout pregnancy
 - d) All of the above
 - e) I don't know

- Q2: When does the first baby tooth appear in the child's mouth?
- a) Between ages 6 months and 9 months
 - b) By age 18 months
 - c) I don't know



- Q3: Your child will have a complete set of 20 baby teeth by the age of:
- a) 2-3 years
 - b) 4-5 years
 - c) I don't know



- Q4: An unhealthy diet can affect a child's baby and adult teeth.
- a) Yes
 - b) No
 - c) I don't know

- Q5: The main types of food that can cause tooth decay are:
- a) Foods with sugar and starchy foods
 - b) Meat and fish
 - c) Fruits and vegetables
 - d) I don't know

- Q6: Cleaning your baby's mouth after each feeding should begin even before teeth erupt.
- a) True
 - b) False
 - c) I don't know

- Q7: When should you start brushing your baby's teeth?
- a) Once the first baby tooth appears in the mouth
 - b) At 1 year of age
 - c) At 1½ years of age
 - d) Once the baby starts walking
 - e) I don't know

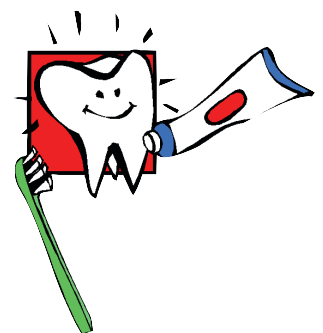
- Q8: How often should you brush your baby's teeth?
- a) Baby teeth do not need to be brushed as frequently as adult teeth
 - b) Once a day
 - c) Twice a day
 - d) After each meal or snack
 - e) I don't know

- Q9: How long should you brush your child's teeth?
- a) 15-30 seconds, depending on the child's age
 - b) 1 minute, depending on the toothbrush
 - c) As long as is necessary to remove all the plaque
 - d) I don't know



- Q10: Fluoride is important for preventing cavities in teeth.
- a) True
 - b) False
 - c) I don't know

- Q11: You should start using toothpaste with fluoride for cleaning your child's teeth:
- a) Once the first tooth appears in the mouth
 - b) After all baby teeth have erupted
 - c) After 2 years of age or whenever the child can spit
 - d) I don't know



Q12: The amount of toothpaste one should use for brushing a child's teeth should be about the size of:

- a) A grain of salt
- b) A small pea
- c) A small grape
- d) A strip as big as the head of the toothbrush
- e) I don't know



Q13: Swallowing of toothpaste can be harmful to a child's health.

- a) True
- b) False
- c) I don't know

Q14: Fluoride in drinking water is the main source of fluoride intake during development of teeth.

- a) True
- b) False
- c) I don't know

Q15: Tooth decay is caused by bacteria that are transmitted from mother to child by kissing or sharing feeding utensils.

- a) True
- b) False
- c) I don't know

Q16: Children are more likely to have decayed teeth if their mother has decayed teeth, as she transfers the germs to her baby's mouth.

- a) True
- b) False
- c) I don't know

Q17: The main cause of early baby tooth decay is the nighttime or bedtime feeding using bottled milk, juice or breast milk.

- a) True
- b) False
- c) I don't know



Q18: Weaning from a baby bottle to a sipping cup should be planned when the child is:

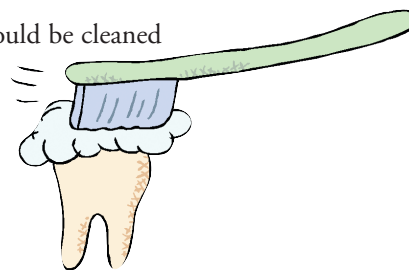
- a) 2½ years old
- b) 1 year old
- c) I don't know

Q19: Breastfeeding can cause baby tooth decay.

- a) True
- b) False
- c) I don't know

Q20: The child's teeth should be cleaned at least twice a day; the most important cleaning time is after last feeding at night.

- a) True
- b) False
- c) I don't know



Q21: It is not necessary to fix cavities in baby teeth.

- a) True
- b) False
- c) I don't know



Q22: Oral habits, such as thumb sucking and use of a pacifier, can affect the baby's teeth and jaws resulting in open bite and crooked teeth if continued for prolonged periods beyond age 4.

- a) True
- b) False
- c) I don't know



Q23: A safe home environment can be assured by the use of:

- a) Safety gates on stairs
- b) Safety locks on cabinets containing cleaners, chemicals and drugs
- c) Safety plugs on electricity outlets
- d) All of the above
- e) I don't know

Q24: Accidents and injuries to the mouth and teeth can be prevented by the proper use of car seats according to the child's weight, and proper sport safety protection.

- a) True
- b) False
- c) I don't know

Q25: When should you take your child to the dentist for his/her first dental visit?

- a) When the first tooth appears or no later than the child's first birthday
- b) At 2 years of age
- c) At 3 years of age
- d) At 4 years of age
- e) I don't know.

Q26: Regular dental visits can prevent problems in your child's teeth and mouth.

- a) True
- b) False
- c) I don't know

