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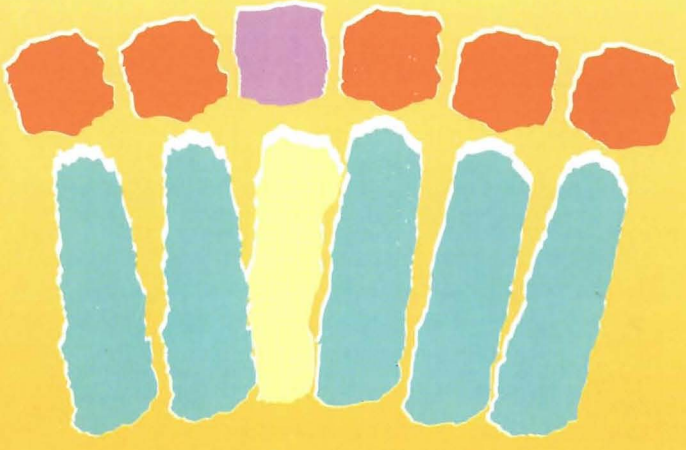
Stereotypes are impressions of whole groups of individuals. In a stereotype we mentally assign common characteristics to all members of a particular group. Examples of stereotypes are: "the British are reserved and formal," "Italians are emotional," "librarians are serious," "Jews are materialistic," "Teenagers are tactless," "women are more sensitive than men," "used-car salemen can't be trusted as far as you can throw them."

Stereotypes are based on a number of grouping principles. Notice in my examples that some group impressions were based upon nationality and others upon occupation, race, religion, sex, and age. Visible physical or behavioral characteristics play an important role in forming stereotypes. Thus we might form the stereotype that "redheads are hot-tempered" and "large muscular men are dumb 'jocks' and certainly not interested in poetry or intellectual pursuits."

—Stanley Coren



THERE IS ONLY ONE THING MORE POWERFUL
THAN LEARNING FROM EXPERIENCE AND THAT
IS NOT LEARNING FROM EXPERIENCE.

—Archibald MacLeish

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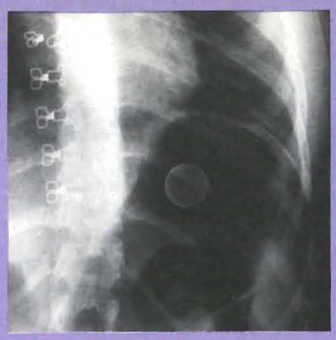
Some of the most pernicious barriers to the development of the talents of children are the prejudicial stereotypes inherent in our society.

Cover art and design by Sharlene Nowak-Stellmach

CLINIC



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For the busy reader

A survey of local anesthetic usage in pediatric patients by Florida dentists—page 401

It is important that current practices be surveyed and monitored at regular intervals, to assure that a justifiable range of standardized care becomes acceptable practice. Sedation and local anesthetic practices have been reasons for concern.

Principal author: Dr. Bobby Don Cheatham, University of Florida College of Dentistry, Department of Pediatric Dentistry, P.O. Box 100426, Gainesville, Florida 32610-0426.

Prevalence of hidden caries—page 408

A distinction is made between completely sound surfaces and surfaces containing areas of decalcification, in order to obtain a clearer picture of the prevalence of hidden caries, after a comparison with bitewing radiographs.

Principal author: Dr. K.L. Weerheijm, Department of Paediatric Dentistry ACTA, Louwesweg 1 postvak 5, 10066 EA Amsterdam, The Netherlands.

Management of aspiration and swallowing incidents: A review of the literature and report of case—page 413

Although many potentially dangerous effects of dental accidents are prevented by reflex action in the patient or quick response by the dental team, complications occur that endanger the well-being of the patient and create life-threatening emergencies.

Principal author: Dr. Timothy Durham, Adult General Dentistry, UNMC Hospital and Clinics, 600 South 42nd Street, Omaha, NE 68198-3030.

The oral effects of orotracheal intubation in prematurely born preschoolers—page 420

Orotracheal intubation and laryngoscopy appear to be associated with several oral developmental defects in children born prematurely. Included are enamel defects of the primary teeth, high palatal vault, palatal grooving and clefting, posterior crossbites, and speech impediments.

Principal author: Dr. Shahrbanoo Fadavi, Department of Pediatric Dentistry, MC 850, University of Illinois at Chicago, 801 South Paulina Street, Chicago, IL 60612.

Demographic and psychosocial characteristics of Western Pennsylvania school-age tobacco users—page 425

Tobacco products may be smoked, chewed, or inhaled. Cigarettes and cigars are smoked. There was a resurgence of the use of smokeless tobacco during the 1970s and 1980s. At a national consensus conference in 1986, it was estimated that of at least 10 million users, 3 million were less than 21 years old. Smokeless tobacco raises nicotine blood levels similar to cigarettes and increases the risk of oral cancer.

Principal author: Dr. Donald J. Rinchuse, Villawood Professional Center Pellis Road, Greensburg, PA 15601.

Gender differences in the characteristics of dental services provided for children—page 437

The increasing number of women in dental practice is expected to have a profound impact on dentistry and how it is practiced. The authors of this paper compare the characteristics of pediatric dental practice, between male and female dentists.

Principal author: Dr. Carole McKnight Hanes, Associate Professor, Department of Pediatric Dentistry, Medical College of Georgia, Augusta, GA 30912.

Children are expensive—page 444

The reality is that children are expensive, in emotional and economic terms. The author places some of the economic costs in perspective to allow individual families and society to understand just how expensive it is to rear our children.

Principal author: Dr. H. Barry Waldman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8883.

Problems your pediatric patients may face—page 450

The successful practitioner, particularly the pediatric dentist, needs to be concerned with more than just the numeric availability of one or two parents, the increasing involvement of women in the work force, and the great number of children being reared in conditions of poverty or near poverty. Increasingly the nature of the environment within which children are reared, how it affects children, and its impact on dental services must be considered.

Principal author: Dr. H. Barry Waldman, Department of Dental Health, School of Dental Medicine, State University of New York at Stony Brook, Stony Brook, NY 11794-8883.

Tuberculosis: revisited—page 455

Trends reflect increasing occurrence of TB in persons infected with HIV. Unless public health officials treat yet undiscovered TB, possibly as many as 100,000 cases, primarily among intravenous drug users and homeless people who carry it and HIV, TB may spread to many Americans who are not infected with HIV.

Principal author: Dr. Hashim S.M. Nainar, Department of Pediatric Dentistry, School of Dental Medicine, University of Connecticut Health Center, Farmington, CT 06030-1610.

CLINIC

A survey of local anesthetic usage in pediatric patients by Florida dentists

Bobby Don Cheatham, DDS
Robert E. Primosch, DDS, MS, MEd
Frank J. Courts, DDS, PhD

The dental profession in recent years has been faced with a variety of challenges. One such challenge is the continuing development of scientific justifications for common procedures and practices routinely performed in dental offices. There is a continuous need to survey and monitor practices, so that a justifiable range of standardized care becomes acceptable practice. One such recent need was to investigate the actual pediatric sedation practices of dentists.[1] Another concern is the practice of local anesthesia in the dental care of children.[2] Adverse reactions from local anesthetic agents in pediatric dental patients are well documented. Several investigators have reported cases of morbidity and mortality, in which toxic reactions turned a child's dental appointment into a real life emergency.[3,4] This concern raises the question of dosage in the dental setting; in particular, how to determine the safe and effective local anesthetic dose for pediatric dental patients. Anatomically, metabolically, and physiologically, children are different from adults, a difference that must be kept in mind, when administering local anesthetics. The recognition and understanding of these concerns among practicing dentists who routinely treat children are unknown. The purpose of this study was to survey dentists who routinely treat children, in order to determine their individual practice habits regarding local anesthetic usage.

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The authors would like to thank Ms. Susan Loffredo for her assistance in the preparation of this manuscript.

METHODS AND MATERIALS

A brief survey was mailed to dentists selected from the state of Florida who indicated that they routinely treated children in their dental practices. Survey questions covered the following areas:

- ☐ Choice of primary local anesthetic agent.
- ☐ Selected case scenarios to determine maximum dosage to be recommended for children with different age/weights.
- ☐ Practice of administering bilateral inferior alveolar nerve block and periodontal ligament (PDL) injections.
- ☐ Initial and supplemental volumes of local anesthetic and needle size (gauge) routinely used.
- ☐ Practice of multiple quadrant dentistry.
- ☐ Dental procedures where local anesthetic was not utilized.

RESULTS

Completed survey forms were returned by 117 dentists who routinely treated children in Florida. The number of years in practice ranged from one year to forty years,

with an average of 15.7 years in practice of those surveyed.

The rank ordering of primary anesthetic agent of choice was:

- ☐ Two percent lidocaine with 1:100,000 epinephrine (69 percent).
- ☐ Three percent mepivacaine without vasoconstrictor (11 percent).
- ☐ Two percent lidocaine without vasoconstrictor (8 percent).
- ☐ Two percent mepivacaine with 1:20,000 neocobefrin (8 percent).
- ☐ Other agents (4 percent).

Over 77 percent of the dentists surveyed used lidocaine as their agent of choice and selected local anesthetic agents that contained a vasoconstrictor.

The maximum recommended local anesthetic dosage to be administered for a healthy, nonsedated child was determined for the following age/weight scenarios:

- ☐ Two-year-old/13 kg.
- ☐ Five-year-old/20 kg.
- ☐ Ten-year-old/35 kg.

The practitioner was asked to respond, using either the maximum number of milligrams or cartridges of anesthetic recommended for each scenario. When the number of cartridges was given, it was converted to milligrams after adjustment for the concentration selected above, under primary agent of choice. A review of contemporary dental textbooks revealed a dosage range of 4.4 to 7.0 mg/kg as the maximum recommended dose of lidocaine for children.[5-8] The range and mean maximum dose selected by the surveyed dentists for each of the three age/weight scenarios are found in Table 1.

The recommended maximum dosage for mepivacaine was stated to range between 4.4 mg/kg to 6.6 mg/kg by the manufacturer.[5,9] Since lidocaine was the primary anesthetic agent used most often, its recommended maximum dosage levels ranging from 4.4 mg/kg to 7.0 mg/kg were utilized to compile a distribution graph from the responses below and above these maximum recommendations (Figure).[5,10] Seventy-two percent of the surveyed respondents selected < 4.4 mg/kg for the 35 kg child, while 19 percent indicated > 7.0 mg/kg for the 20 kg child, as did 20 percent for the 13 kg child.

As a method to reduce dosage, recent attention was given to alternate methods of local anesthesia, such as the periodontal ligament (PDL) injection. The conditions under which PDL injections were used by the surveyed practitioners are found in Table 2. Only 23 percent of those surveyed used this alternative as a primary injection technique, while 77 percent indicated they would use it only as a supplemental injection. Sixty-six percent of the practitioners used a local anesthetic with vasoconstrictor to perform this procedure. Fifty-seven percent of those using PDL injections indicated the use of a special pressure syringe as their choice for a delivery system.

The initial and supplemental volumes of local anesthetic given in administering an inferior alveolar nerve block was also revealed in the survey (Tables 3 and 4). Eighty-four percent of the respondents used between 0.91.8 ml of local anesthetic, or one-half to a full cartridge, as an initial dose, while 16 percent used less than 0.9 ml of local anesthetic as the initial dose. Nearly one-third of the practitioners administered a full cartridge of anesthetic to children for the initial injection. If the initial dose failed to anesthetize adequately, 23 percent used greater than 1.2 ml of additional local

Table 1 ☐ Range and mean dose (mg) and dosage (mg/kg) for the recommended maximum anesthestic delivered to children.

	Weight of the child		
Dose	13 kg	20 kg	35 kg
Mean	69.9 mg	96.5 mg	135 mg
	(5.4 mg/kg)	(4.8 mg/kg)	(3.8 mg/kg)
Range	12 - 252 mg	18 - 252 mg	36 - 252 mg
	(0.9 - 19.3 mg/kg)	(0.9 - 12.6 mg/kg)	(1 - 7.2 mg/kg)

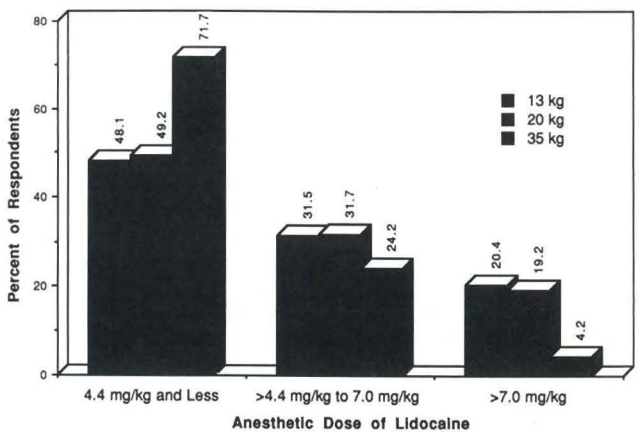

Figure. Distribution of respondents selecting below, within, and above the recommended maximum dosage range for lidocaine in three different scenarios based upon the child's weight.

Table 2 ☐ Do you believe PDL injection should be performed?

Use	Percent of respondents
supplemental injection technique	77
primary injection technique	23
with vasoconstrictor	66
without vasoconstrictor	34
with special syringe	57
with conventional syringe	43
on permanent teeth	66
on primary teeth	62

Table 3 ☐ Initial volume of local anesthetic routinely administered for inferior alveolar nerve block.

Initial volume	Percent of respondents
0.0-0.6 ml (< 1/3 cartridge)	1
0.6-0.9 ml (1/3-1/2 cartridge)	15
0.9-1.2 ml (1/2-2/3 cartridge)	25
1.2-1.5 ml (2/3-5/6 cartridge)	27
1.5-1.8 ml (5/6-1.0 cartridge)	32

Table 4 ☐ Supplemental volume of local anesthetic routinely administered, if initial dose is inadequate for inferior alveolar nerve block.

Supplemental volume	Percent of respondents
0.0-0.6 ml (< 1/3 cartridge)	11
0.6-0.9 ml (1/3-1/2 cartridge)	37
0.9-1.2 ml (1/2-2/3 cartridge)	29
1.2-1.5 ml (2/3-5/6 cartridge)	10
1.5-1.8 ml (5/6-1.0 cartridge)	13

Table 5 ☐ Selected procedures performed without the use of local anesthetic.

Procedure	Percent of respondents
Class I restorations	44
Class V restorations	42
Composite restorations	37
Extraction of mobile primary teeth	23
Pulpotomy	12
Class II restorations	3
Stainless steel crowns	1
Cyst aspiration	1
Discing of embrasures	1

anesthetic. Sixty-one percent of the respondents routinely utilized a 27 gauge needle for an inferior alveolar nerve block. Thirty-seven percent selected the 30 gauge, while only 3 percent indicated the use of a 25 gauge needle. Thirty percent of the respondents would administer bilateral inferior alveolar nerve blocks when indicated.

Table 5 demonstrates a rank order of procedures that would be performed by the surveyed practitioners, without the use of local anesthetic. The most popular procedures performed without local anesthesia involved Class I, V, and composite restorations, as well as extracting mobile primary teeth. The practitioners responded that in 76 percent of the appointments, used for restorative treatment ,only one quadrant of dentistry was completed, while 24 percent of the time, multiple quadrants were restored during a single appointment.

DISCUSSION

Nearly two million injections of local anesthetic are given daily in dental practices.[5] Between 2.5 to 10 percent of the patients receiving a local anesthetic experienced adverse reactions, which is ten times higher than the rate experienced in medicine for the same drugs.[11] Adherence to proper injection techniques, maximal dose calculations of local anesthetic, and attention to medical history will reduce the potential for these unwanted side effects.[12]

With so many different local anesthetic agents available, it can be difficult to select an ideal drug for a given patient. The duration of action, potency, mechanism of action, metabolism, and excretion must all be carefully considered to assure safe and effective local anesthesia. Ninety-six percent of the practitioners surveyed selected one of the amide local anesthetics, of which 2 percent lidocaine with 1:100,000 epinephrine was chosen most often (69 percent). The basis for this selection, is at best, speculative.

As seen in the Figure, there was a diversity of opinion on the recommended maximum dosage for each of the scenarios. Dosage selection by the respondents was not highly influenced by the weight or age of the child. Dosage was more often reported in terms of absolute number of cartridges of local anesthetic, independent of the child's age and weight. When translated into a dose per weight basis, the smaller child received a greater dose, while the larger child received a lesser dose. Although several investigators have demonstrated that plasma levels of a dosage based upon body weight, are not constant, suggestions were given by a drug manufacturer and a popular textbook to utilize Clark's rule (lbs./150 x maximum adult dose = recommended children's dose), when calculating the maximum recommended dose of local anesthetic for children.[5,13-15]

The fact that 77 percent of the dentists would use the PDL injection only as a supplemental technique of local anesthesia is in agreement with the recommendations published by the American Dental Association's Council on Dental Materials, Instruments and Equipment.[16] Recent literature indicates the following disadvantages of the PDL injection, however, as a primary technique:

- ☐ Depth of anesthesia is generally sufficient for both operative and endodontic procedures, but is unpredictable.
- ☐ Duration of anesthesia is also very unpredictable, in some cases is just a few minutes.
- ☐ Discomfort is minor during the PDL injection, in the posterior regions, but is more painful in anterior teeth.
- ☐ Postinjection discomfort is noticeable and tends to persist for several hours up to two days.[17,18]

Although some vascular changes occur in the periodontal tissues, these changes appear to normalize without sequelae.[19] Since enamel defects have been produced on developing permanent teeth underlying primary molars in monkeys receiving the injection, there is concern about performing this technique with primary teeth in young children.[20] The survey revealed that not many of the respondents shared this concern.

Fifty-seven percent of the practitioners used a special pressure syringe to deliver PDL injections. Studies have shown that when the special pressure syringe was compared for effectiveness to the standard syringe, no significant differences in success rates were found.[21,22] The majority of the respondents who used the PDL injection (66 percent) indicated that they would use a vasoconstrictor with the anesthetic agent. One study testing the effects of epinephrine on the duration of pulpal anesthesia suggested that the anesthesia present may be caused by solution pressure or ischemia created by the vasoconstrictor rather than the pharmacologic action of the anesthetic agent itself.[18] Anesthesia can be achieved by injecting epinephrine solution alone but not with saline as a control.[23,24] This conclusion was supported in a study completed on human mandibular premolars, in which the success rate of the PDL injection increased when epinephrine was included.[25]

Although contemporary textbooks recommended unilateral inferior alveolar nerve anesthesia, the numbers of those practitioners performing multiple quadrant restorative dentistry may influence the need to perform bilateral inferior alveolar block injections.[5,8,26] This was indicated from the surveyed respondents 30 percent of whom indicated use of bilateral inferior alveolar blocks. Most cited of the contraindications to bilateral nerve block was soft tissue trauma, and self-inflicted lip chewing, for example.

Although many of the surveyed dentists (37 percent) are using the 30 gauge needle for inferior alveolar nerve block injections, contemporary pediatric dental textbooks endorsed the use of the 25 and 27 gauge needles, due to the decreased ability to aspirate with a 30 gauge needle.[6-8,26] A study by Brownbill *et al* of 138 pediatric dental patients showed that the 30 gauge needle held the advantage of slightly lower pain scores.[27] Kuster and Udin investigated the potential frequency of accidental intravascular injection of local anesthetic in children as determined by positive aspiration of blood.[28] The incidence of positive aspiration was reported to be 3.1 percent for the inferior alveolar nerve block, when using a 27 gauge needle.

Local anesthetic toxicity usually is due to an inadvertent rapid intravenous injection or extravascular administration of an excessive dose. Even a single cartridge of local anesthetic can produce convulsions.[29] One possible explanation was retrograde intravascular flow following intra-arterial injection.[30] Aldrete and coworkers demonstrated that the pathway of reverse flow to the common carotid artery and then to the internal carotid artery may result in an evanescent high concentration of local anesthetic in the cerebral circulation.[31] If pressures exceeding those of the arteries are produced within the dental syringe in the process of

Two percent lidocaine with 1:100,000 epinephrine was chosen most often (69 percent).

injecting the anesthetic drug through a 27 gauge needle, the reverse carotid flow created for even a few seconds might be produced through a relatively small system of arteries.[32]

CNS toxicity following rapid intravenous administration is also related to the intrinsic anesthetic potency of the agent. Lidocaine, mepivacaine, and prilocaine are intermediate in anesthetic potency and convulsive activity, demonstrating CNS effects at blood levels of 5-10 μg/ml.[33-34] Munson and coworkers observed that the corresponding seizure dosages in monkeys were: lidocaine (14.2 mg/kg), prilocaine (18.1 mg/kg), and mepivacaine (18.8 mg/kg).[35] Morishima and Covino demonstrated that the mean dosage and blood concentration of lidocaine associated with seizures were 9.4 mg/kg and 15.2 μ/ml, respectively, in nonasphyxiated baboon fetuses.[36] Lidocaine seizure dosage in man has been shown to range between 6-8 mg/kg following the relatively rapid intravenous administration.[37] In 1982, the ADA Council on Dental Therapeutics stated that if sedative drugs were given, local anesthetic dosage should be reduced to prevent convulsive reactions.[38] A maximum local anesthetic dosage of 2 mg/lb (approximately one cartridge per 20 pounds) was recommended for sedated children, six years of age and younger. During the past decade, revision of a popular textbook on local anesthesia recommended reduction in the maximum dosage to 4.4 mg/kg (2 mg/lb), regardless of the vasoconstrictor concentration selected or sedated state of the patient.[5] The ADA Council on Dental Therapeutics no longer recommends adjusting anesthetic dosage based upon inclusion of a vasoconstrictor.

The finding in this survey that a majority (84 percent) of the dentists felt that 0.9-1.8 ml of local anesthetic should be administered as the initial volume is supported by a human study showing a significant difference in duration of permanent tooth anesthesia by increasing volume from 0.9 to 1.8 ml, but no difference was found in the effectiveness of anesthesia between 0.45 and 0.9 ml.[39] Nearly a third of the practitioners surveyed administered a full cartridge of anesthetic to children as the initial volume. This volume was above the recommendations of both a manufacturer and a popular textbook recommending 1.0 ml as the initial volume for inferior alveolar nerve block injections.[5,10] Far more important was the cumulative dose (mgs) to which these initial and supplemental volumes contribute, especially when multiple quadrants were being restored in a small child.

The inferior alveolar nerve block proved to be one of the most frustrating nerve block techniques with a reported 15 percent to 20 percent failure rate.[5] When administering an anesthetic solution for an inferior alveolar nerve block, it was attempted to place the solution near the mandibular foramen. There existed a progressive increase with age in the distance of the mandibular foramen above the occlusal plane due to greater posterior maxillary basal and alveolar bone growth. In children, the mandibular foramen was located near the height of the occlusal plane and moved posteriorly and slightly occlusally with age, averaging approximately 7 mm above the occlusal plane by adulthood.[40] If the first attempt at an inferior alveolar nerve block was unsuccessful, a second attempt should be made using a higher landmark for needle insertion.

Testing for adequate anesthesia following an inferior alveolar nerve block can be difficult. Most commonly, the dentist uses lip numbness as a subjective sign to indicate sufficient block of the ipsilateral inferior alveolar nerve. A study performed by Ellis and coworkers,indicated, however, the loss of gingival response to

Local anesthetic toxicity usually results from rapid intravenous injection or extravascular injection of an excessive dose.

stimulation (positive gingival test) was a more rapid sign of onset of anesthesia and a more reliable predictor of success than tongue and lip signs.[41]

In conclusion, an effort was made to elicit information in regard to selected habits of local anesthesia usage from a representative number of practicing dentists who treat children. The majority of those surveyed favored an amide local anesthetic with vasoconstrictor and indicated that they would use initial volumes that are within suggested guidelines (0.9-1.5 ml). Concern can be raised with the maximum dose that the smaller child could receive from the 19 percent of those surveyed who might deliver, however, beyond the maximum recommended dosage, especially when combined with the possibility of multiple quadrant therapy. If some of these practitioners are delivering such amounts, then blood levels achieved by the local anesthetic agent might manifest deleterious central nervous system effects. In a recently reported pediatric local anesthetic mortality case, the child received a dosage of 16.4 mg/kg of mepivacaine.[42] As observed in Table 1, there were some practitioners who indicated they might deliver as much as 19.3 mg/kg.

Largely due to a desire to assure rapid and effective anesthesia, the typical volume and concentration of local anesthetic agents selected for dental treatment is greater than necessary. There continues to be a need for a consensus guideline in everyday practice.[43] With concerns of potential toxicity in children, the adoption of alternative techniques that might reduce the chances of local anesthetic toxicity need to be explored. Volume and concentration reductions are two factors that should be considered.[39,44,45] Also, selective employment of intraligamentary injections and mandibular infiltrations may help reduce the amounts administered. Deriving safe pediatric dosages from adult dosage recommendations entails much more than simple mathematics in a standard formula. Dentists must be conservative with the anesthetic dosage administered to the pediatric dental patient until further studies can be performed to provide more insight into the establishment of safe and effective recommendations.

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DENTAL CARIES EXPERIENCE AND FEAR OF TREATMENT

In summary, this study shows that dental anxiety is a barrier to dental care for a small proportion of the secondary schoolchild population. The clinical status of the anxious children was not markedly worse than that of the remaining children but the anxious children displayed certain negative attitudes to dental health suggesting that their dental health will continue to deteriorate during adulthood. This study also indicates the same finding as the recent Adult Dental Health survey that fear as a barrier to dental care may be more associated with the treatment that people receive than with the disease level they experience.

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Prevalence of hidden caries

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Recent studies of the prevalence of occlusal caries showed that dentine lesions not detected clinically can be detected on bitewing radiographs.[1-3] The percentage of occlusal dentine lesions that are clinically undetected ranges from 1.4 percent (upper molars in 14 to 15-year-olds) to 50 percent (molars in 20-year-olds).[1,3]

The conditions under which the clinical examinations were conducted, the clinical evaluation criteria applied, and the ages of the groups examined, however, varied widely.

The concept 'clinically sound' has not yet been given a precise definition. In general, it is used to refer to occlusal surfaces that do not need any restorative intervention. This can include not only completely sound occlusal surfaces, but also occlusal surfaces in which carious deficiencies in the enamel can be detected. On the basis of the results of the studies mentioned above, the presence of hidden caries (in the sense of an occlusal surface that is judged clinically to be completely sound, but which shows a clear radiolucence on the bitewing) cannot be determined.

In the study conducted by Creanor, a distinction is made between enamel and dentine lesions.[1] This study was conducted, however, on teeth that had not been cleaned or dried. The presence of early signs of enamel caries in the teeth that were judged to be sound in the study mentioned above cannot be ruled out completely.

The objective of this study was to investigate how frequently occlusal dentine lesions are not detected in first and second molars by a clinical evaluation conducted under optimal conditions, although they can be detected on bitewings. For this purpose, a distinction will be made between completely sound surfaces, and surfaces containing areas of decalcification, with or without brown or white discoloration, in order to obtain a clearer picture of the prevalence of hidden caries after comparison with bitewing radiographs, and to enable the findings to be compared with findings reported in the literature.

MATERIAL AND METHODS

The study used the clinical and radiographic data on 359 patients (209 boys and 150 girls) of the paediatric dentistry department of the Academic Centre for Dentistry Amsterdam (ACTA) who took part in cariological research in 1986.[4] An important part of the dental care given to these patients (mean age 12.4 years, s.d. 2.7) consisted of prevention, and before the study they were given a check-up every six months, and where necessary, treated. Topical applications of fluoride were given systematically to these children. All patients were also

The help of dentist H. Mulder in the assessment of the radiographs is gratefully acknowledged.

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advised to use fluoride toothpaste and fluoride tablets at home.

The clinical evaluation took place after disclosure with erythrosine and professional cleaning. A probe was used to clean the fissures without applying pressure. After air-drying, the teeth were assessed by two experienced dentists, using only a mirror (The value of Cohen's kappa for inter-observer agreement regarding the occlusal surfaces of first and second permanent molars was 0.78).[5] The teeth to be assessed were illuminated by the operating lamp. The occlusal surfaces were judged according to the following criteria:

0 = sound (absence of any discoloration or decalcification)

1 = narrow dark line or decalcification in the fissure

2 = broad dark line or narrow dark line combined with a decalcification in the fissure

3 = dentine lesion

4 = restoration

5 = sealant

The scores 1 and 2 represent lesions limited to the enamel without clinical signs of dentine caries.

During the visit at which the clinical records were collected, bitewing radiographs (one on the left and one on the right side) were taken with a GE 1000-70 KV, 15 mA camera using Kodak DF 53/57 film in a film holder, and an object-film distance of 30 cm. All the films were processed and rinsed automatically. In 1992 two observers assessed the occlusal surfaces of the first and second permanent molars, using an X-ray viewer without magnification, according to the following criteria:

0 = no radiolucency visible in the dentine beneath the occlusal enamel

3 = a circumscribed radiolucency visible in the dentine beneath the occlusal enamel; only distinct radiolucencies were scored as 3

4 = a restoration

6 = no judgement can be made

The cases in which no judgement could be made included teeth with orthodontic bands and teeth that were insufficiently visible. Where the observers' opinions differed, agreement upon a common diagnosis was reached by discussion (The value of Cohen's kappa for inter-observer agreement was 0.98).[5]

Statistical analyses were performed using SPSS/PC + V2.0.[6] The differences between the number of decayed occlusal surfaces as established by the two methods of examination were tested by the McNemar test for differences between dependent proportions.[7] The chi-square test was used to calculate the differences between the upper and lower jaws and between first and second molar teeth. The chi-square test was also used to test whether the prevalence of clinically undetected dentine lesions differed between sealed and nonsealed teeth. The Mann-Whitney test was used to establish whether the DMFS score of children with hidden caries differed from the score of children from a random sample without hidden caries.

RESULTS

A total of 2268 permanent teeth (1416 first and 852 second molars) were judged clinically. Table 1 shows the data for the comparison between the clinical and radiographic observations for the whole group. The McNemar test yielded a z value of 17.54.[7] This z value is highly significant ($p<0.0001$). The proportions calculated were the percentages of decayed surfaces present in the untreated and the sealed surfaces (these surfaces are the outlined values in Table 1).

Fifteen percent of the clinically completely sound teeth showed radiolucencies on the bitewing radiographs (Table 1). Seventeen percent of the teeth with a small discoloration or decalcification showed a radiolucency, while a radiolucency was detected in 29 percent of the teeth where a discoloration was combined with a decalcification. Nineteen percent of the sealed teeth showed a radiolucency on the bitewing radiograph.

Table 2 shows the clinically undetected dentine lesions from Table 1, subdivided into superior, inferior, first and second molar teeth. Because there is no significant difference between the prevalence of clinically undetected dentine lesions in sealed teeth ($n=302$) and their prevalence in nonsealed teeth ($n=1238$), chi-square test $p\geq 20.05$, the calculations which follow have been carried out for the group as a whole ($n=1540$). No

Table 1 □ Clinical vs bite-wing judgement.

clinical judgement	bite-wing judgement				Row total
	0	3	4	6	
0	183	39		36	258
1	629	151		113	893
2	157	79		33	269
3	12	23		3	38
4			424	46	470
5	236	66	8*	30	340
column totals	1217	358	432	261	2268

* clinical not recorded PRR

significant difference was found between the upper and lower jaws and between first and second molar teeth ($p \geq 20.05$). If a distinction is made between first and second molars for each jaw, it appears that significantly more ($p < 0.001$) dentine lesions are not detected clinically in upper first molars than in lower first molars. For second molars, significantly more ($p < 0.001$) dentine lesions are not detected clinically in the lower jaw than in the upper Jaw.

Table 3 shows the clinically undetected dentine lesions subdivided according to age categories. It appears that the prevalence of clinically undetected dentine lesions is not distributed differently among the different age-groups ($p \geq 20.05$), in a significant way.

Table 4 shows the subdivision of clinically completely sound teeth into upper and lower and into first and second molars. No significant differences ($p \geq 20.05$) were found.

Table 5 shows the relationship between the clinical DMFS score and the prevalence of radiolucencies in clinically completely sound teeth. Although hidden caries is also found in patients with higher DMFS scores, it is significantly more frequently detected in dentitions with extremely low DMFS scores.

From Table 6 it is evident that the number of teeth with hidden caries is not selectively distributed across the population of individuals in whom this particular deficiency is found.

Table 2 ☐ Subdivision in type of molar concerning clinically undetected dentine lesions.

	M sup	M inf	M_1	M_2	M_1 sup	M_1 inf	M_2 sup	M_2 inf
x-ray 0 and clinical 0, 1, 2, 5	563	642	727	478	314	413	249	229
x-ray 3 and clinical 0, 1, 2, 5	162	173	192	143	118	74	44	99
n	725	815	919	621	432	487	293	328
significance	n.s.		n.s.		$p < 0.001$		$p < 0.001$	

Table 3 ☐ Division of clinically undetected dentine lesions among the age-groups.

	6,7,8 year	9,10,11 year	12,13,14 year	15,16,17,18 year	Row total
x-ray 0 and clinical 0, 1, 2, 5	82	306	439	378	1205
x-ray 3 and clinical 0, 1, 2, 5	23	96	124	92	335
Column total	105	402	563	470	1540

Table 4 ☐ Subdivision in type of molar concerning completely sound teeth.

	M sup	M inf	M_1	M_2
x-ray 0 and clinical 0	83	100	108	75
x-ray 3 and clinical 0	25	14	22	17
n	108	114	130	92
significance	n.s.		n.s.	

Table 5 ☐ Patients (n=27) with and without (n=27) hidden caries and their DMFS-score.

DMFS	0	1	2	3	4	5	>5
Patients with hidden caries	18	2	3		2	1	1
Patients without hidden caries	12	2	2		2		9

Table 6 ☐ Division of number of teeth (n=39) with hidden caries in 27 patients.

Number of teeth with hidden caries	1	2	3	4
Number of patients	20	4	1	2

DISCUSSION

The underestimate of the number of occlusal dentine lesions that are detected when evaluation is conducted only clinically, suggests that the diagnosis of occlusal caries has become more complex. One reason for this may be a decline in the progression of the lesion or masking of the lesion by the occlusal enamel, which may or may not be due to the effects of fluoride.

The results of this study showed that despite a thorough clinical examination in 15 percent of the teeth judged as completely sound (no signs of dentine or even enamel caries), distinct radiolucencies were detected on the radiographs. When the occlusal surfaces with clinically detected enamel caries were also taken into account, this percentage will be 19. If this result is corrected for the teeth that could not be evaluated radiographically, the percentage is 2.5 percent higher. Because here as well as in earlier studies only distinct radiolucencies as assessment-criteria on these bitewings have been used, it can be expected that the real percentage of hidden caries is even higher than calculated in this study.

As mentioned by Kidd *et al* operative intervention is necessary to evaluate the validity of this radiographic

diagnosis.[2] In earlier studies it is demonstrated that the chance of false positive interpretations is negligible, however, because in cases of distinct radiolucencies, as in this study, dentine caries was present upon opening in all cases.[8-10]

The percentages mentioned above are higher than the values reported by Creanor *et al* and Kidd *et al*.[1,2] Comparable percentages (when corrected for differences in the criteria used) were only found for the first lower molars in these two studies. We did not find such a preponderance for lower molars in the present study or in the study reported earlier.[3] No explanation could be found for this difference from the English studies mentioned above.[1,2] On the basis of the available data, it appears improbable that there is a preferred location for clinically undetected dentine lesions.

In the original study only the proximal surfaces of the bitewing images were judged.[11] It was not until the end of the 'eighties' that bitewings were automatically assessed for the appearance of occlusal dentine caries in the Department of Paediatric Dentistry. Because of this, the occlusal lesions without clinical signs were not treated during the cariological study.

The 15 percent of completely sound-looking teeth appears to represent the prevalence of hidden caries in this patient-group. Hidden caries was detected in 7.5 percent of the entire population. It may be appropriate to discriminate, therefore, between prevalence per molar and prevalence per person. The patients in the cariogenic study were chosen at random from among the patients of the Department of Paediatric Dentistry. It was possible, however, that patients treated in a dental school might be a selected group, produced firstly by extremely motivated parents who brought their children to a paediatric department, and secondly by general practitioners who referred a large number of young children with extensive caries. As reported by Wöltgens *et al*, the DMFS at the first visit (DMFS = 2.13, s.d. 2.36, without bitewings) of the patients who took part in the cariological study was comparable to the DMFS found in another study conducted on Dutch children of the same age at the same time.[12]

The children in the study group were using a large quantity of fluoride on a regular basis. Since fluoride could not be ruled out as a factor in the development of hidden caries, this should be taken into account when translating the 15 percent hidden caries to apply to the whole Dutch population of this age-group. On the other hand, the question arises as to whether there is any difference between the use of topical fluoride and fluoride toothpaste by young people from six to eighteen years old in the Dutch population as a whole, and the use of these products by the study-group. A new basic recommendation for fluoride use was drawn up in the Netherlands in 1988, because fluoride overdosing among the Dutch population was suspected.[13] At the present time, no arguments are available to support the assumption that our study-group is different from the Dutch population.

A prevalence of 15 percent hidden caries means that in dentitions without clinical signs even of occlusal enamel caries, and in the absence of adequate clinical occlusal diagnostic methods, bitewings are of great importance in the diagnosis. As sealant treatment of hidden caries is not recommended at present, this means that a bitewing is strongly advisable before application of the sealant; not only in cases of suspected occlusal surfaces, but also in cases of sound-looking surfaces, because hidden caries is found more frequently in dentitions with low DMFS scores.[14] This percentage seems to justify the American sealant treatment policy of sealing all occlusal surfaces soon after eruption. It also means that it is time for the Netherlands to reconsider the indications for sealing.[15] Because we are unable to judge

Nineteen percent of the sealed teeth showed a radiolucency on the bitewing radiograph.

the sound occlusal surfaces correctly, in the absence of dentine caries we have to treat the occlusal surfaces with a sealant as soon as possible after eruption. If teeth cannot be isolated completely, a glass ionomer sealant is indicated. This sealant can be replaced by a resin sealant if further eruption enables complete saliva isolation to be achieved.

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OPTIMAL LEVELS OF FLUORIDE FOR HOT, DRY CLIMATES

Reasons for the high prevalence of dental fluorosis in low/moderate fluoride areas in our rural children remain speculative. From infancy these children have consumed a lot of locally grown tea, which is a rich source of flouride. High sweat loss and high water intake may result in high serum F^- levels which contribute to dental fluorosis. We are examining the nutritional status of this study sample to assess the likelihood of under-nutrition influencing the metabolism of fluoride and thereby increasing the prevalence of dental fluorosis in rural communities in Sri Lanka, in a fashion similar to that reported in Thailand.

When recommending additional fluoride therapies the appropriate level of F^- ion in drinking water for hot, dry climates demands careful consideration. Further studies are needed to reexamine reasons for the severity of dental fluorosis seen in the tropics when low or moderate levels of fluoride are ingested. The factors that influence fluoride bio-availability in the tropics and sources other than drinking water — in particular tea drinking — which contribute to its supply are under investigation.

Warnakulasuriya, K. *et al*: Determining optimal levels of fluoride in drinking water for hot, dry climates — a case study in Sri Lanka. Community Dent Oral Epidemiol, 20:364-367, December 1992.

Management of aspiration and swallowing incidents: A review of the literature and report of case

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A potential risk associated with providing daily dental care is the aspiration or swallowing of foreign objects.[1] The literature states that a high percentage of aspirated or swallowed foreign objects have a direct or indirect dental origin.[2,3] These objects may include dental instruments, impression materials, dental cements, castings, prostheses, rubber dam clamps, extracted teeth, and orthodontic brackets or wires. While many incidents are avoided by reflex action in the patient and/or quick response of the dental team, complications occur which endanger the health of the patient and create life-threatening emergencies.[1,3-6] Proper management is required when these incidents arise to insure the health and safety of the patient, as well as protect the practitioner from potential litigation.[3,4]

Aspiration or swallowing incidents are more likely to occur when treating a dental population of young children and/or medically, mentally or physically handicapped patients. Many of these patients lack cooperative ability, communication skills or protective/oral reflexes (cough, gag, laryngeal, swallowing). Under these circumstances the use of restraints, sedation or general anesthesia may be indicated to assure successful completion of dental treatment. These factors, individually or in combination, place the patient at risk for aspiration and swallowing incidents.

This article presents a review of the literature on the prevention, signs and symptoms, management and documentation of aspirated or swallowed foreign objects as they apply to treating children and the medically, mentally or physically handicapped populations. A case report is provided that applies the principles outlined in the review of the literature.

REVIEW OF THE LITERATURE

Prevention

Prevention begins with the taking of good medical and dental histories and being attentive to the special considerations associated with these patient populations. Complex medical, mental or physical handicaps that include increased dental needs may predispose the patient to risk for aspiration or swallowing incidents. In addition, factors related to patient care that invite consideration include sedation, general anesthesia, local anesthetics, body and head positioning, loose teeth, four handed dentistry, removable appliances/prostheses, age, and instrument fatigue.

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The majority (80 percent) of incidents involving the aspiration or swallowing of foreign objects occur before the age of fifteen.[7] An accompanying medical, mental or physical handicap in this age group may serve to increase the risk of these incidents. Lack of oromuscular coordination, uncooperative behavior, and diminished protective/oral reflexes are not uncommon in these patients. Further management difficulties are encountered when there is a failure to respond to verbal commands and other forms of communication.

Due to these management difficulties, treatment cannot be accomplished in the traditional dental setting. Sedation or general anesthesia is then necessary. In an effort to gain control of patient risk factors, the practitioner encounters additional ones inherent to altering the patient's state of consciousness. Sedation and general anesthesia affect a multitude of body systems and increase the risk of aspiration or swallowing incidents.[4] This risk is a result of depressing the central nervous system (patient's state of consciousness) and altering reaction times and protective mechanisms.[1,8]

The use of sedation as a management technique may also be complicated by drug interactions, a lack of cooperative ability, decreased communication skills, the use of restraints, and emesis. These complications further potentiate aspiration or swallowing incidents, and will encourage the use of general anesthesia.

Any patient who has a pharmacologically altered state of consciousness through the use of deep sedation or general anesthesia must have a throat pack placed.[8] These treatment modalities impair the protective/oral reflexes and the throat pack is placed to prevent aspiration or swallowing of foreign objects.[2,8] The use of throat packs does not preclude the use of a rubber dam in these cases. Before the throat pack is removed, the oral cavity should be thoroughly examined, irrigated, and suctioned to remove any loose debris. The oral cavity should again be examined and suctioned following removal of the throat pack. This procedure assures removal of any fluid or debris, present in the oropharynx.

Local anesthesia, particularly mandibular block and palatal anesthesia, interferes with sensory and motor control of the pharynx, tongue, and palate.[6] This leaves the patient with an altered sensation, as objects enter the posterior aspect of the oral cavity, precipitating an aspiration or swallowing incident. The use of topical anesthetics also contribute to this alteration in sensory nerve function.

Body positioning of the patient is a controversial subject. Some individuals believe the supine position decreases the risk of aspiration or swallowing, while others believe the position promotes these incidents.[1,9,10] Initially, when patient position was changing from the sitting (erect) to the supine (reclined) position, reports of aspirated or swallowed dental objects were few.[1] The mechanical barrier of the tongue falling back against the posterior oropharynx seemed to offset the role of gravity. The literature now contains numerous references to aspirated or swallowed objects, when treatment is provided in the supine position.[1,3,11-13] While position does play a role, it is often mediated by associated factors, as well as the surprise onset of the object being "lost" or "dropped" into the oral cavity.

The use of four-handed dentistry and high-speed evacuation are the most effective means of preventing aspiration and swallowing incidents, when routinely used with a rubber dam and a properly fitting clamp.[1,6,9,10,12] Ligation of the clamp through the bow and perforations for the forceps provides a safety procedure, should the clamp fracture during use.[1,6,9] Unfortunately, the rubber dam does not prevent aspiration or swallowing of blood, emesis, or saliva, during the dental procedure.[8] Positioning the patient with the head turned to the side

Instruments, handpieces, and burs should be carefully examined for wear.

in which the operator is working will allow fluids and debris to pool in the vestibule. The fluid and debris can be easily removed with the high speed suction and further emphasizes the need for four-handed dentistry.[12] The use of a gauze shield or screen in the posterior portion of the oral cavity should be considered in addition to four-handed dentistry and high-speed suction, when a rubber dam is not utilized.[6,12]

Loose teeth, primary or permanent, should be checked or anticipated before procedures. Teeth can be easily dislodged, when placing a mouth gag or establishing an airway. Teeth may be quickly aspirated or swallowed under these circumstances.[2,8]

Dentures, flippers, orthodontic appliances and partial dentures contribute to aspiration and swallowing incidents, because of an alteration in the tactile sense of the palate.[2,7] This is more common in the geriatric population and contributes to the rise in aspiration and swallowing cases seen in this age-group.[2] A loose, dislodged or broken appliance/prosthesis can obstruct the airway or be swallowed. Dependent upon the degree of manifestation, patients with epilepsy, cerebral palsy, or motor deficits are predisposed to aspiration or swallowing incidents in the presence of a loose, dislodged or broken appliance/prosthesis. These appliances/prostheses should be removed during treatment and their construction thoughtfully considered in light of the patient's medical, mental and/or physical status. Due to size and shape, these items are likely to become lodged in constrictures or pockets within the upper airway or gastrointestinal tract and require removal through appropriate medical intervention.[13]

With the advent of critical focus upon asepsis techniques, instrument failure is a likely sequela. Repeated autoclaving, dry-heat applications or exposure to caustic cold sterilization and surface disinfectants increase the wear of instruments, handpieces, and burs. Failure of solder joints and bur disintegration are not uncommon or unexpected, in light of rigorous asepsis protocols. Before use, instruments, handpieces, and burs should be routinely examined for signs of wear or corrosion. Policies for one-time use or limited reuse of burs should be established. Purchasing of one piece instruments (i.e. plastic or stainless steel mirrors) should be investigated.

Signs and Symptoms

The practitioner should be attentive to the signs and symptoms associated with aspiration and swallowing incidents (Figures 1 and 2). Recognition insures proper management. When an object is displaced into the posterior aspect of the oral cavity, the patient will likely prevent aspiration or swallowing through the stimulation of protective reflexes.[4] In some cases, the patient may be unable to respond appropriately and the object is aspirated or swallowed. The practitioner must

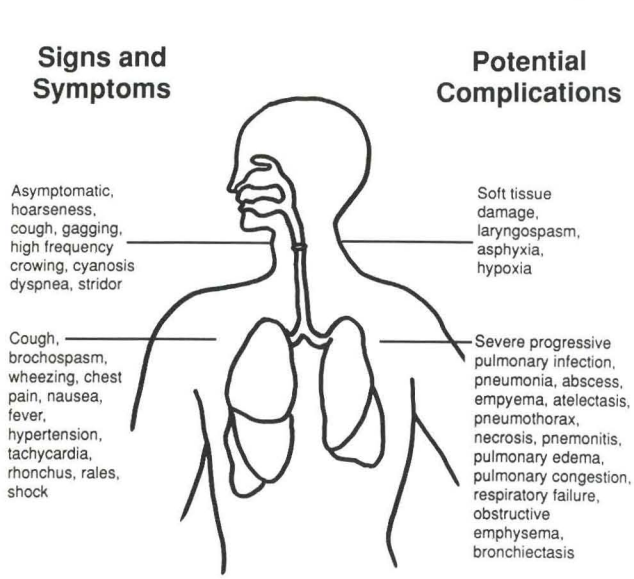

Figure 1. Signs and symptoms of aspiration incidents including possible complications.[1,3,5,7,8,12]

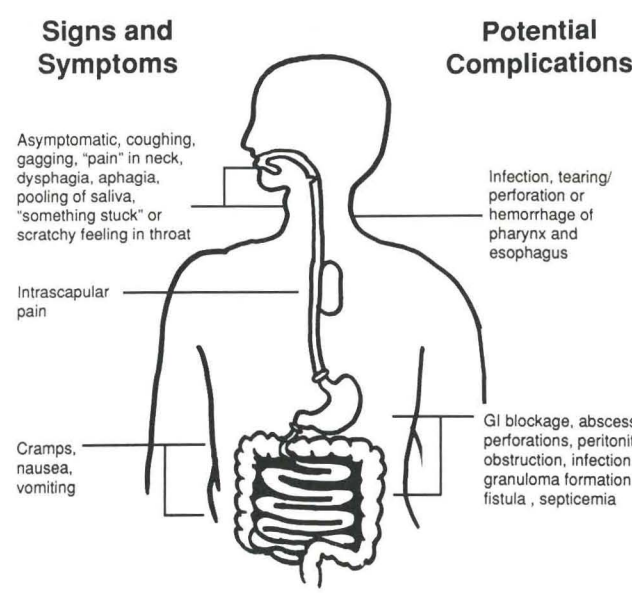

Figure 2. Signs and symptoms of swallowing incidents including possible complications.[1,3,5,7,12]

ascertain where the object is located. If the object cannot be located on the patient, within the suction filter or in the operatory, it must be assumed that it was aspirated or swallowed.[10] The patient, parent or caretaker must be notified of your suspicions, and if possible, the patient questioned as to their perceptions of the incident. The patient may have felt the object being aspirated or swallowed or may report a symptom. Subjective assessment with children or the medically, mentally or physically handicapped patients may not be reliable. It is the practitioner's role to investigate and initiate proper intervention strategies.

ASPIRATED OBJECTS

Foreign bodies that enter the respiratory tract will traverse by size. Larger objects will lodge at or near the vocal cords while smaller objects most often pass into the right bronchus due to it larger size and angulation.[4,7] Early signs and symptoms of aspiration include coughing, cyanosis (nail beds or mucosal membranes), dyspnea, gagging, hoarseness, stridor and wheezing.[3,8] Delayed signs and symptom include congestion, cyanosis, dyspnea, exhaustion, fever, hypertension, persistent fever, and tachycardia.[8] Many individuals may have no signs or symptoms of respiratory distress and the practitioner may develop a false sense of security.[1,8] At any point this asymptomatic state may evolve to one which is more emergent. Sitting upright, walking or riding in a car may dislodge the object and move it further down the respiratory tree causing acute signs and symptoms.[12]

SWALLOWED OBJECTS

Foreign bodies entering the gastrointestinal tract produce signs and symptoms including coughing, dysphagia, gagging, pain, excessive salivation, nausea or a sensation that an object is caught in the throat.[2,4] These signs and symptoms may not significantly differ from those associated with aspiration making clinical diagnosis difficult.[1] Depending on the size of the object, it will lodge in points of constricture. The majority of swallowed objects will pass through the GI tract within a few days without complication.[3,8] Sharp objects and patients with a history of obstructions or diverticulitis may have a more protracted course.[13]

Management

Successful management of any emergency includes a combination of preventive techniques, diagnosis of signs and symptoms and appropriate treatment.[3] In aspiration or swallowing incidents, medical consultation and radiographs are vital for confirmation and aid in planning intervention strategies. This is necessary even when the patient appears to be in no apparent distress.[10] The consultation for confirmation should be started immediately, with the use of the Emergency Medical System, if dictated by patient signs and symptoms (Figure 3).

NO SIGNS OF DISTRESS

If an object is thought to be aspirated or swallowed and the patient shows no signs or symptoms of distress, exhibits good air exchange, or reports minor symptoms such as a scratchy throat, the patient should be immediately assessed at a medical facility to confirm the position of the object.[1] The medical personnel should be informed as to the size, shape, and material of the object in question, as well as the time when the incident occurred.[8,10] A duplicate object may be sent with the patient. This information will assist the medical

The patient should be observed until the object is removed or expelled.

personnel in selection of the necessary radiographic technique to image the object.[8] The patient should be observed until the object is removed or expelled.[10]

OBSTRUCTED AIRWAY

The airway may be partially obstructed with good air exchange, partially obstructed with poor air exchange, or completely obstructed. The patient may move from the asymptomatic stage to complete obstruction without warning.

If a patient's airway is partially obstructed with good air exchange, the patient may attempt to dislodge the object by coughing or gagging. In this case, do not interfere with the patient's attempts to dislodge the object, as long as oxygenation of the tissues is assured. Encourage coughing while attempting to position the patient so that gravity will assist in the expulsion of the object.[1] This can be done by putting the patient in the Trendelenburg position and rotating the head to one side. Partial or complete obstruction may occur spontaneously or when intervention strategies are begun.[1] Immediate transport to a medical facility is indicated.[1] If the patient expels the object on their own, evaluation by medical personnel for soft tissue trauma and other potential complications is required.

If poor air-exchange follows aspiration, the patient will show signs of cyanosis (nail beds, lips and mucosal surfaces), ashen grey skin tones, weakened cough and respiratory distress.[1] Immediate aggressive chairside intervention is indicated. The emergency medical service system should be activated. The incident should be differentiated from other medical emergencies such as heart attack, seizure, or stroke.[1] Abdominal thrust are applied, followed by suction or finger sweep in an attempt to clear the airway.[14] These procedures may be repeated if not successful. If the object is expelled, medical consultation must be sought to ensure no complications occur.[1] If the object is not expelled, continued efforts should be made to clear the object, assist ventilation (ampule bag or mask with oxygen) and transport to a medical facility via the medical emergency service system.

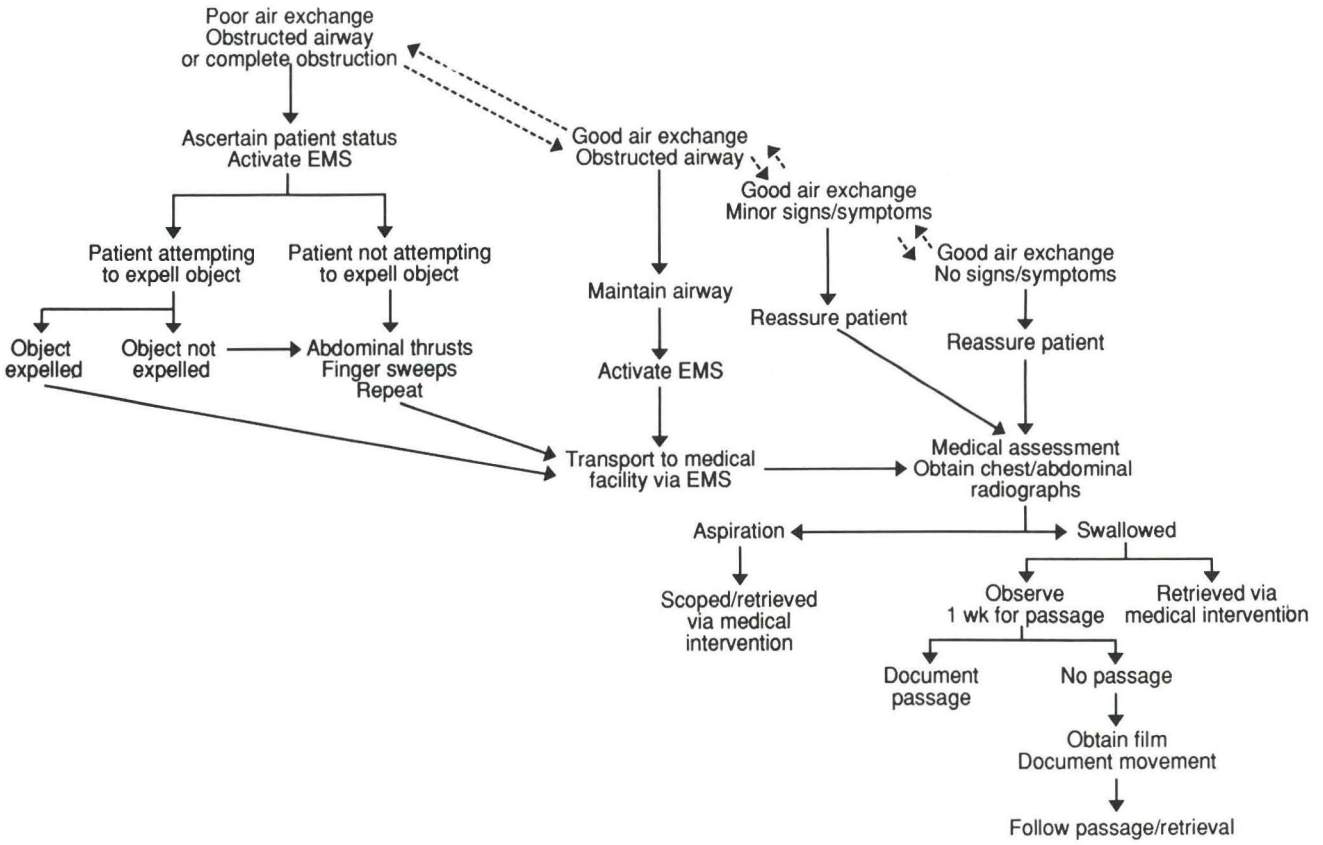

Figure 3. Management flow chart for aspiration and swallowing incidents.[1,11,13,14]

Complete obstruction follows a similar management technique. This is a life threatening crisis and ventilation is essential. As the patient loses consciousness, the musculature of the throat may relax, loosening the object and allowing ventilation. If the airway remains obstructed after all efforts have failed, emergency intervention by surgical means is necessary. Performing a cricothyrotomy or tracheotomy should be done only as a last resort and by individuals trained in the technique.[1]

Documentation

Documentation of these incidents should include date/time, the object involved, circumstances surrounding the incident, procedures being attempted, and intervention techniques used.[10] Further documentation should include notation of initial and follow-up medical care, copies of radiographic reports confirming the diagnosis and notation of removal/expulsion of the object.[10]

Dental offices must maintain a clinical procedures manual outlining management of such incidents.[2] In addition, these procedures should be reviewed and updated on a consistent basis.[8,10] This will assist in prompt diagnosis and intervention by the dental team.[1]

CASE REPORT

An eighteen-year-old female with mental retardation presented to the University of Nebraska Medical Center Pediatric Dental Clinic for an initial examination. The patient had been seen by a general dentist in the community but was referred to the University for care following an aborted attempt at oral sedation with hydroxyzine. Radiographs or previous history were not made available.

A thorough health history was taken revealing severe mental retardation with a general lack of communicative abilities. The patient was not taking medications and there were no reported allergies or sensitivities, except to those surrounding the attempted sedation with hydroxyzine.

After receiving informed consent for treatment, a cursory oral examination was accomplished with the use of a pediwrap, mouth prop, mirror, and explorer. Caries was detected on the occlusal surfaces of six posterior teeth and generalized plaque and calculus was observed. No radiographs were taken because of the patient's inability to cooperate.

The patient's behavior during the examination was uncooperative with excessive body movements, head movement, and vocalization. These management factors contributed to the difficulty in treating the patient and led to the suggestion of treatment in the University of Nebraska Medical Center Outpatient Surgical Center.

During the final phase of the examination, the solder joint connecting the mirror portion fractured and dislodged the mirror head into the oral cavity. Although the patient had been breathing heavily, no signs of respiratory distress were detected. A thorough examination of the area around the patient and the patient's oral cavity proved unsuccessful. Initial assessment indicated that the object had been aspirated or swallowed with good air exchange shown.

Due to these objective findings and the patient's inability to communicate about her status, medical intervention was deemed necessary. The patient was removed from restraints and immediately transferred to the University of Nebraska Medical Center Department of Emergency Medicine for examination. The incident was discussed with the patient's caretakers and mother.

The radiologist was advised of the size and shape of the mirror head. Chest and abdominal radiographs were obtained (Figures 4 and 5). Interpretation of the radiographs determined that it had entered the gastrointes-

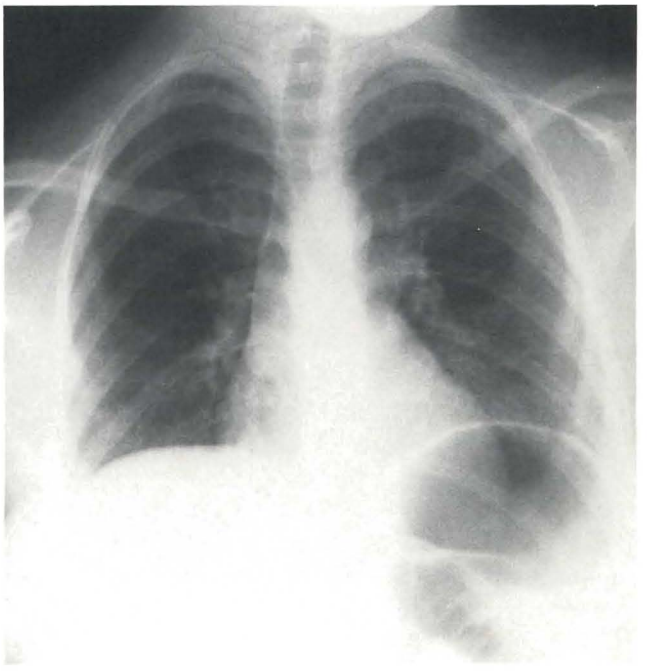

Figure 4. Chest radiograph with no signs of mirror.

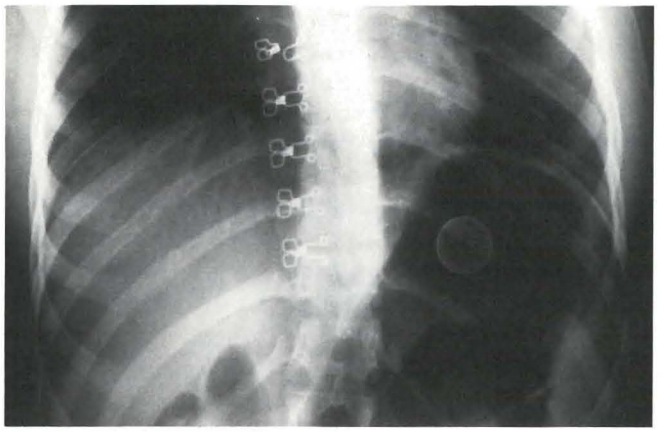

Figure 5. Abdominal radiograph with the mirror head located in the fundus of the stomach.

tinal tract and was located in the fundus of the stomach. No untoward responses were noted during the patient's stay in the Department of Emergency Medicine.

The patient's caretakers were instructed to use a high fiber diet, inspect the patient's stools for one week, and contact the Department of Pediatric Dentistry when the mirror head was expelled. The patient was to return for follow up treatment in one week, if the mirror had not be expelled.

On the fourth day following the dental visit, the mirror head was expelled without incident. The patient was scheduled for dental treatment, using general anesthesia. The patient was treated uneventfully in the Outpatient Surgical Center and placed on routine recall. All events were documented in the patient's medical and dental records noting procedures, management, disposition, and follow-up care.

SUMMARY

This article has reviewed aspiration and swallowing incidents in a dental environment with particular emphasis on the young child and the medically, physically and mentally handicapped patient. A thorough review of prevention, signs and symptoms, management and documentation of these incidents has been presented. This review was presented to reaffirm the potential of these incidents and strives to educate the practitioner who treats these special populations.

The case report applies reported guidelines for noting signs and symptoms, management and documentation. This case report also affirms the need to check all dental instruments before their use, as a safeguard against possible failure. Current policy for infection control maintains strict guidelines for asepsis. With the increasing use of steam autoclaving and cleansing products, an increased rate of failure may be seen in some instruments. Manufacturers should be contacted for instrument care and sterilization recommendations, as well as projected longevity of the instrument, if their sterilization procedures are followed. The economic implications of replacing instruments because of the protocol for maintaining asepsis will undoubtedly contribute to the rising cost of care.

Prevention has been the goal of dentistry for decades and dental emergencies are not excluded. Preparation for such incidents will prevent many incidents and allow for proper patient management should they occur.

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The oral effects of orotracheal intubation in prematurely born preschoolers

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Orotracheal intubation and laryngoscopy have been reported to be associated with several oral developmental defects in prematurely born children. These include enamel defects of the primary dentition, high palatal vault, palatal grooving and clefting, posterior crossbites and speech impediments.[1-8]

The prevalence of enamel defects in premature children for whom orotracheal intubation was used has been reported to range from 50 percent to 95 percent, with the principal defects localized in the primary maxillary incisors.[4-9] The frequency and severity of palatal grooving have been reported to be related to the duration of the intubation; and the prevalence of the palatal grooves has been reported to range between 39.5 percent and 87.5 percent depending on the duration of the intubation.[8] The study by Kopra *et al* reported a prevalence of 25 percent posterior crossbite in orally intubated, premature children.[5] The studies by Moylan *et al* and Kopra *et al* were conducted with infants with birth-weights greater than 1000 grams.[5,9]

The purposes of this study were:

- ☐ To compare the incidence of oral defects in very low birth-weight children (under 1000 grams) with the incidence in those with birth-weights above 1000 grams.
- ☐ To determine whether a relationship between the birth-weight and occurrence of defects exists.
- ☐ To determine whether a relationship between the period of intubation and occurrence of defects exists.

MATERIALS AND METHODS

Sample

The sample was drawn from very low and low birth-weight children cared for in the neonatal unit of the University of Illinois Hospital, during the period 1985-1990. Very low birth-weight was defined as 1000 grams or less for the purpose of this study. Subjects had to be intubated for at least twenty-four hours to qualify. Children with a history of craniofacial surgery, congenital abnormalities and syndromes were excluded from

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Table 1 ☐ Sample demographics.

	Mean ± SD	Median	Range
Birth weight (g)	1151 ± 418.3	1050	530–2263
Gest. age (weeks)	29.4 ± 3.4	29	24–38
Duration of intubation (days)	26 ± 24.5	20	1–90

the study. No child had undergone orthodontic therapy. Consent for participation was obtained from parents and the study was approved by the Institutional Review Board (IRB) of the University of Illinois at Chicago.

Fifty-two very low and low birth-weight preschool children, ages two to five years, met the criteria for the study. Their birth-weights ranged between 530 to 2268 grams, with a mean weight of 1151 grams (S.D. = ±418.3). The duration of intubation was from one to ninety days with a mean of thirty-six days (S.D. = ±22.5). A majority of these children had hyaline membrane disease and subsequently developed bronchopulmonary dysplasia, leading to lengthy intubation and hospitalization during their infancy. Table 1 shows the demographic distribution of the subjects studied.

Procedure

A clinical examination without radiographs was conducted to record enamel defects, while study models were used for palatal morphology and determination of crossbites. In addition, plaster casts from alginate impressions were made, using standardized techniques.

Palatal Morphology

Palatal morphology was evaluated for three factors: depth, symmetry, and presence of a palatal groove. The assessment of palatal dimensions was similar to that used by Shellhart *et al* and advocated by Klami and Horowitz.[10,11] An adjustable template was used for measurements. The depth of palate was measured from a line connecting right and left interproximal areas of the first and second primary molars, at the gingival margin, perpendicularly to the palate. Four examiners evaluated the casts for palatal depths. Furthermore, the plaster casts of forty-five normal birth-weight children with the same age-group as the low birth-weight children were analyzed as the control-group for palatal depth evaluation only. In order to standardize the examiners for this evaluation, the plaster casts of the forty-five normal birth-weight children were mixed with the study group; and the examiners did not know the identity of each group. Each examiner measured the palatal depth of each cast independently using the above technique. To determine the interexaminer reliability, a ttest was conducted. The test indicated that each examiner's measurements did not differ significantly from the sample mean ($\alpha = 0.01$).

The symmetrical and asymmetrical positionings of the dental arches were determined by measuring the distances between the antimere teeth measured between the crown tips of the canines, the mesiolingual cusps of the primary molars and the permanent first molars to the same reference point on the median palatal raphe.[12]

Palatal Groove

Lack of an available standard prompted the development of a system for this study. The specific criteria for determining the presence of palatal grooves were established by tracing the cross-sections of the plaster casts in a transverse direction (at the same location where the palatal depth was measured) and creating a matrix of severe (>5 mm depth), moderate (3-5 mm depth), mild (<3 mm depth) and no palatal grooves (O mm depth). Each examiner used these criteria at the time of rating. A flexible plastic ruler was used for measuring the palatal groove depth. Palatal groove was measured from the deepest point of the groove to an imaginary line crossing the palate. Two of the four examiners evaluated the plaster casts for palatal groove. If rating differed due to an examiner's placing of a palatal groove in a different severity category, repetition of the evaluation was done until agreement was reached. The assessment of the palatal shape and contour (palatal vault) was also established by taking cross-sections of the palate and creating a matrix of *very deep, deep, normal,* and *shallow or flat* palate. Each examiner was asked to rate the plaster casts according to these four criteria. If for any cast the rating was not consistent, the examiners were asked to reevaluate the cast until an agreement was reached.

Palatal depth, palatal groove and palatal vault

The palatal depth factor was measured on fifty-two plaster casts of very low and low birth-weight children

and compared with the measurements of the palatal depth of the casts of the forty-five children of normal birth-weight. The shape, architecture, and conformation of palate (palatal vault) were evaluated, using the criteria explained in the methodology.

Occlusion

The plaster casts were evaluated by the same two examiners for the presence or absence of posterior dental crossbites.

Enamel Defects

Two examiners evaluated the sample for developmental defects of dental enamel. The criteria for evaluation were adapted from the epidemiological index of developmental defects of dental enamel (DDE index) developed by the Commission on Oral Health, Research and Epidemiology Group of FDI. Each examiner independently evaluated each subject and discrepancies between examiners were rectified by reexamination and mutual agreement.

In order to identify any relationship between the prevalence of dental defects and the duration of intubation and/or birth-weight, three different statistical analyses were performed. These are:

- ☐ A correlation analysis between the prevalence of dental defects and birth-weight only.
- ☐ A correlation analysis between the prevalence of dental defects and duration of intubation only.
- ☐ A multiple correlation and linear regression analysis between the prevalence of dental defects and birth-weight and duration of intubation.

RESULTS

The mean palatal depth of the casts of the fifty-two low birth-weight intubated infants was 12.9± (1.92) mm. The mean for the normal birth-weight group (control group) was 11.4 (±2.16) mm. These data reveal that there were certain participants in the study-group that had nonsignificant palatal depth differences, compared with that in normal children. When a statistical t-test was conducted, it was found, however, that the difference between the mean palatal depths of the study-group and that of normal children was significant ($\alpha = 0.05$). This indicates that the palatal depths of the premature intubated children were statistically greater than those of nonintubated control-group.

The factors of palatal groove and palatal vault were only evaluated for very low and low birth-weight intubated children. The palatal groove was measured on the cross-sections of the casts using a flexible plastic ruler. Thirteen casts (25 percent) were found to have palatal grooving. Five casts with severe grooving, six with moderate, and two with mild grooving were identified, while thirty-nine casts had no sign of palatal groove formation (Table 2).

A total of thirty-six casts (70 percent) demonstrated a very characteristic high palatal vault (*very deep* and *deep palate*). Of thirty-six casts, sixteen were *very deep*

Table 2 ☐ Palatal measures.

Characteristics	Factor measured	Categories			
Palatal depth	Mean depth ± S.D. (mm)	Low B. W. 12.9 ± 1.92		Normal B. W. 11.4 ± 2.16	
Palatal groove	No. of subjects	With groove: Severe	Moderate	Mild	W/O Groove
		5	6	2	39
	% of total (Total = 52)	25%			75%
Palatal vault	No. of subjects	Very Deep	Deep	Normal	Flat/ Shallow
		16	20	13	3
	% of total (Total = 52)	69%		25%	6%
Occlusion	No. of posterior X-bites	Low B. W. 9		Normal B. W. 7	
	Totals	52		45	
	% of total	17%		15%	

Table 3 ☐ Distribution of oral defects in terms of duration of intubation and birth-weight.

Duration of intubation (Days)	Birth-weight (Grams)	Total samples	No. with defects	% with defects
1– 7	500– 999	2	2	100
1– 7	1000–1499	9	7	77.8
1– 7	1500–2268	5	3	60
8–30	500– 999	5	5	100
8–30	1000–1499	9	8	88.9
8–30	1500–2268	5	4	80
31–90	500– 999	13	13	100
31–90	1000–1499	3	2	66.7
31–90	1500–2268	1	0	0

Table 4 ☐ Multiple regression between percentage of oral defects and duration of intubation and birth-weight.

Variable	Regression coeff.	Standardized coeff.	Standard error	T	Probability
Duration of intub. (days)	−0.521	−0.426	0.265	−1.96	0.097
Birth-weight (g)	−0.047	−0.733	0.014	−3.38	0.015

Note: r = 0.85, Constant term = 149.3 ± 19.4

and twenty *deep*, as identified by the examiners. Only thirteen casts were identified as *normal* and three showed *shallow or flat palate* (Table 2).

Malocclusion

The presence of posterior crossbite was evaluated as indication of malocclusion. Nine very low and low birth-weight intubated children (17 percent) displayed a posterior crossbite involving one or more teeth; while seven (15 percent) of the normal weight group showed posterior crossbite (Table 2).

Enamel defect

Nineteen children (36 percent) showed developmental defects of dental enamel; 94.6 percent of which were located on the incisal one-half of the maxillary incisors, and only one (5.4 percent) involved the rest of the dentition. Developmental defects of enamel were not observed in any of the mandibular incisors. According to the DDE Index, of thirty-eight teeth with developmental defects in nineteen children, twenty teeth were yellowish brown opaque in color, eleven were classified as hypoplastic with missing enamel, and only seven were classified as having a combination of defects.[13]

The comparison of the effect of orotracheal intubation on oral structures of very low and low birth-weight children is shown in Figure 1. As shown, more cases of palatal grooving and higher palatal vault occurred in subjects with very low birth-weights.

The statistical analyses revealed a strong correlation (r = 0.95) between the birth-weight and the prevalence of oral/dental defects.

The correlation between the duration of intubation and the prevalence of defects was moderate (r = 0.65). The severity of palatal grooving and crossbite formation increased, moreover, with a prolonged duration of intubation. The correlation between crossbite development and duration of intubation was very strong (r = 0.95). The prevalence of palatal groove and duration of intubation also showed a strong correlation (r = 0.98).

Additionally, the data were arranged by intubation period and the birth-weight in various groups. Several groups were identified to consider the combination of short intubation period (1-7 days), intermediate (8-30 days), and long intubation period (31-90 days), with the three birth-weight groups as shown in Table 3. A multiple correlation and linear regression analysis was performed on different groups shown in Table 3. The multiple correlation between oral defect (dependent variable) and birth-weight and intubation period (independent variables) was strong (r = 0.85). The results are summarized in Table 4.

DISCUSSION

This study is in agreement with the previous studies, and supports the findings that orotracheal intubation is associated with irreversible iatrogenic effects, which include:

☐ Increase in enamel defects of the primary dentition.

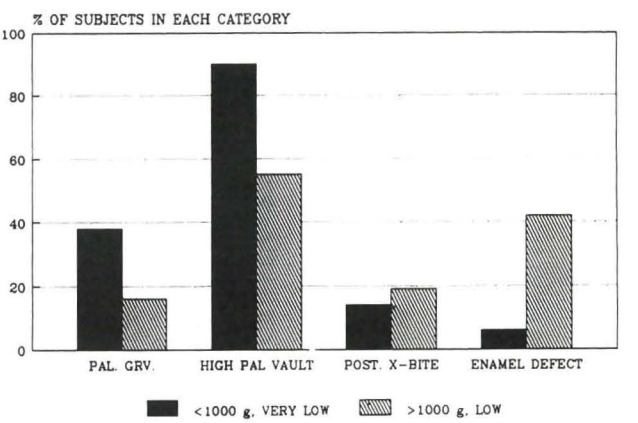

Figure. Summary of results by very low and low birth-weights.

☐ A higher palatal vault and grooving of the palate.
☐ Posterior crossbite.

Children with very low birth-weight developed more severe palatal groove and higher palatal vault. This indicates that the lower the baby's birth-weight, the greater the expected oral complications related to orotracheal intubation. This is in agreement with a previous study by the authors on premature infants.[14]

The duration of intubation is an important factor in the determination of the severity of the iatrogenic effects. Generally the prevalence of dental/oral defects increased with a longer use of orotracheal tubes. This finding is in agreement with Erenberg and Nowak's study.[15] Generally speaking, the prevalence of dental and oral defects (high palatal vault, palatal grooving, enamel defects and crossbite) increased with a longer duration of intubation and decreased with a greater birth-weight.

Seow *et al* demonstrated that 66 percent of teeth with enamel defects were maxillary left primary anterior teeth, compared with 33.9 percent of the right maxillary anterior teeth.[4] The increased prevalence of enamel defects on the left side was explained by relating it to the position of the laryngoscope during intubation. In our study, the right and left incisors equally demonstrated the presence of enamel defects. Furthermore, the prevalence of enamel defects did not differ for the three different weight-groups and different intubation-periods. Other investigators have suggested that enamel defects in premature children could be related to hypocalcemia and systemic factors. In this study, we did not find any enamel abnormalities in the mandibular incisors and the posterior teeth. This leads us to believe that local trauma from orotracheal intubation plays a stronger role in enamel developmental defects than do the hypocalcemia and prematurity.

In this study, 17 percent of children who were intubated as neonates were found to have a posterior crossbite involving one or more posterior teeth; and the control group showed a prevalence of 15 percent crossbite formation. This finding is lower than that reported by other investigators, where 25 percent of intubated children in a controlled study had crossbite formation.[5]

The mean palatal depth of intubated children was compared with that of normal birth-weight children. The palatal depth of very low and low birth-weight children was greater than that of normal birth-weight controls; and the difference was statistically significant at $\alpha = 0.05$.

CONCLUSIONS

Prolonged neonatal intubation leads to significant iatrogenic defects of oral and dental structures that persist until the age of five years in this group of children.

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Demographic and psychosocial characteristics of Western Pennsylvania school-age tobacco users

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Tobacco products may be smoked, chewed, or inhaled. Cigarettes and cigars are smoked, whereas smokeless tobacco is chewed or inhaled. Smokeless tobacco, which includes chewing tobacco and snuff, has been further divided into five categories. Regarding chewing tobacco:

- ☐ The leaves may be shredded into loose-leaves.
- ☐ Pressed into bricks or cakes known as plugs.
- ☐ Dried and twisted into rope-like strands called twists.

In contrast, snuff is made from powdered or finely cut tobacco leaves and may be classified as:

- ☐ Moist
- ☐ Dry

In the United States, both moist and dry snuff are "dipped," meaning that a small pinch of snuff is placed in the mouth between the lower lip or cheek and gum and mixes with saliva. The nicotine is then absorbed through the oral mucosa and into the bloodstream. In some other countries dry snuff is inhaled (sniffed), however, through the nose.[1]

Tobacco products in various forms have been used for more than 500 years.[2,3] The history of the use of smokeless tobacco dates back to the time of Columbus and his voyage to the Americas. Its use in the United States has been well documented since the period of the Revolutionary War. Although the use of smokeless tobacco declined in the 19th Century, largely because tobacco chewing was viewed as an unsanitary habit, at the dawn of the 20th Century in the United States smokeless tobacco was the most prevalent form of tobacco.[1,2,4] Consumption of chewing tobacco, however, declined from the beginning of this century to the early 1960s from 1.8 kg per person per year to 0.2 kg, respectively; whereas a less significant and later decline in the use of snuff was found.[4,5] In contrast, cigarette smoking rose from a per capita consumption of 150 cigarettes per person in 1910 to 4,200 by the mid 1960s.[5,6]

In the 1970s and 1980s, there was a resurgence in the use of smokeless tobacco, particularly moist snuff

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in the United States. A 55 percent increase in the sale of moist snuff was reported from 1978 (10.7 million kg) to 1984 (16.7 million kg) and sales of chewing tobacco increased from 36 million to 39 million kg and total annual sales of smokeless tobacco in the United States was close to $1 billion.[1,7,8]

In 1986, Dr. C. Everett Koop, Surgeon General of the Public Health Service, reported that there were about 6 million to at least 12 million persons in the United States who have used some type of smokeless tobacco in the past year. At the 1986 National Institute of Health Consensus Conference on smokeless tobacco, the panel estimated that at least 10 million Americans have used smokeless tobacco within the past year and 3 million of these users were less than twenty-one years old.

Numerous studies focusing on the incidence of smokeless tobacco usage have appeared in the literature since 1986. The interpretation of the results of these works and comparison among them are difficult, however, because of such factors as varying methodologies, operational definitions (i.e., amount of use, current use, former use, ever used, tried or previously used, occasional or regular use, duration of use), age, ethnicity, gender, geographic location, regional vs national data, sample size and selection, and so forth. The results of these prior studies regarding prevalence of tobacco use will be reviewed, therefore, but not be interpreted or compared.

In a study that looked at the incidence of smokeless tobacco usage in the United States according to state, twenty-five states and the District of Columbia were selected. Questions regarding current and former use were obtained by using the Behavioral Risk Factor Surveillance System (BRFSS), which employed monthly telephone interviews using random-digit dialing techniques to collect data. Data were analyzed according to age, race, and gender for subjects eighteen years and older in each state. In regard to the question of "ever use," the range varied from 4.9 percent in Rhode Island to 23.2 percent in West Virginia. The range for "current users" for prevalence of smokeless tobacco use, varied from a low of 0.4 percent in Massachusetts and New York to a high of 10.2 percent in West Virginia.[10]

Regional data from Madison, Wisconsin, involving a sample of 1,030 male representatives of grades 7 through 12 showed that occasional/regular use of smokeless tobacco increased from ages eleven to fifteen (age-group 11-13 = 19.4 percent, age-group 14-15 = 28.0 percent, age-group 16-18 = 26.6 percent).[11] Olds obtained 1,830 usable smokeless tobacco questionnaires from high school seniors from 108 different schools in the state of New York. The sample was largely white (74.9 percent) and male (55.4 percent). Regarding the males, 11.3 percent were current users and 52 percent of users started using smokeless tobacco prior to thirteen years of age. The predominant form of tobacco used by high school seniors in the state, however, was cigarettes (i.e., 23.5 percent).[12]

Looking at tobacco use among college students, (mean age = 20.8 years) in the United States, Glover *et al* received 5,894 usable responses (males = 2,888; females = 3,006) from students at seventy-two colleges and universities.[13] The overall prevalence of cigarette smoking was 14 percent and for smokeless tobacco was 12 percent. The data demonstrated that college students were more likely to switch from smokeless tobacco to cigarettes than the reverse pattern.

The potential carcinogenic effects of smokeless tobacco have received considerable attention in the medical and dental literature.[2,14,21] Chemical components of smokeless tobacco, which are chemical carcinogens, are nitrosamines, polonium 210, and the polycyclic aromatic hydrocarbons. After review of the literature and discussion by experts, the panel of the National Institute of Health Consensus Development Conference (January 13-15, 1986), concluded that "The public should be warned that the use of smokeless tobacco, particularly snuff, increases the risk of oral cancer."[1]

Other oral manifestations of smokeless tobacco use are an association with gingival recession, gingivitis, and oral leukoplakia.[1,22-39] In regard to enhancing or reducing dental caries, the smokeless tobacco research data are conflicting.[1]

Systemically, the use of smokeless tobacco can produce blood levels of nicotine similar to those of cigarette smoking. Smokeless tobacco use can cause both an alpha- and beta-adrenergic response, resulting in elevations of blood pressure, heart rate, certain blood lipids, and catecholamines.[40,41] Evaluation of data from various sources has resulted in the National Institute of Drug Abuse and the United States Public Health Service classifying nicotine as a dependence producing drug comparable to cocaine, morphine, and ethanol, and characterized by tolerance, physical dependence, and withdrawal symptoms.[1,6,42,43]

Considering all the harmful health effects of using smokeless tobacco, why have so many Americans, especially young males, been influenced to begin this habit? Research, which has attempted to answer this question, has shown that the most important factor that influences one to use smokeless tobacco was friends/

peer pressure, and a secondary factor was mass media advertising. Moreover, smokeless tobacco is perceived by users as less harmful than cigarettes and users are not aware of the health hazards of its use.[44,45]

The purpose of this investigation was to establish regional data concerning the prevalence of tobacco use, particularly among school students from grades 1 through 12. It was also the intent of this study to establish a "profile" of tobacco users by identifying their age, gender, and race, as well as determining the major psychosocial forces associated with tobacco use.

This investigation attempted to answer the following questions:

- ☐ What is the incidence of tobacco use in school-age students?
- ☐ Are age and gender associated with tobacco use?
- ☐ What are the major psychosocial forces associated with tobacco use?

METHOD

A 25-item tobacco usage questionnaire was formulated from an instrument originally developed by Guggenheimer *et al.*[44] The questionnaire evolved into its final form after repeated revisions by the research team. Several primary and secondary school teachers and ten school-age students (who were not part of the study) critiqued the questionnaire for form, content, wording, design, and relevance. The questionnaire was then presented to all students in grades 1 through 12 in one school district and who were judged by a group of teachers to be typical of those of Western Pennsylvania. Because the groups being compared (users vs nonusers) were identified after administration of the questionnaire, poststratification of the sample was employed (i.e., causal-comparative design).

Before administering the tobacco usage questionnaire, the individual classroom teachers attended a training session. The students were instructed:

- ☐ Not to identify themselves, i.e., do not place their names on the questionnaire.
- ☐ To complete the questionnaire honestly since their individual responses would be confidential.

The students had no previous knowledge of the intent of the study.

Chi-square tests ($P < 0.05$) were used to analyze the data statistically. "Tests for differences between uncorrelated proportions" ($P < 0.05$) were used as the posthoc analysis.

RESULTS

Sample

There were 2,189 subjects in the sample ranging in age from seven years, or younger, to sixteen years, or older. Four subjects (0.2 percent) were seven years of age, or younger; 2 subjects (O.l percent) were eight years of age; 119 subjects (5.4 percent) were nine years of age, 206 subjects (9.4 percent) were ten years of age; 191 subjects (8.7 percent) were eleven years of age; 267 subjects (12.2 percent) were twelve years of age; 280 subjects (12.8 percent) were thirteen years of age; 252 subjects (11.5 percent) were fourteen years of age; 263 subjects (12.0 percent) were fifteen years of age; and 605 subjects (27.6 percent) were sixteen years of age, or older (Table 1).

Ninety-eight percent (2,137 subjects) of the sample was caucasian, 1.3 percent was black and 1.7 percent was of other races. The sample was approximately equally divided in respect to gender. There were 1,091 males and 1,089 females; nine subjects did not respond to the question of gender.

Gingival recession, gingivitis, and oral leukoplakia are associated with the use of smokeless tobacco.

Table 1 ☐ Distribution of sample according to age.

Age (Years)	Number	Percent
7 or younger	4	0.2
8	2	0.1
9	119	5.4
10	206	9.4
11	191	8.7
12	267	12.2
13	280	12.8
14	252	11.5
15	263	12.0
16 or older	604	27.6
	1 missing*	
Total	2,189	100

*One student did not respond to the question of age.

Table 2 ☐ Tobacco usage among 2,189 students ranging in age from six years to sixteen plus years.*

Type of tobacco	Number that use tobacco		Percent
		359 former users	
Cigarettes	663		30.5
		304 current users	
		253 former users	
Snuff	426		19.9
		173 current users	
		213 former users	
Chew	344		16.1
		113 current users	
Total	1,433		

*Data does not discriminate between those that used multiple types of tobacco, but considers each type of tobacco individually.

Prevalence of Tobacco Use

Six-hundred sixty-three (663; 30.5 percent) of the 2,166 students who responded to the question of tobacco use reported that they were former or current cigarette smokers. Three-hundred fifty-nine (359; 16.6 percent) were former smokers and 304 (13.9 percent) currently smoked. Most of the current cigarette users (i.e., 217) smoked no more than ten cigarettes per day. One thousand five hundred three students (1,503; 69.4 percent) reported that they never smoked (Table 2).

For snuff, 426 (19.9 percent) of the students reported that they were former or current users. Two hundred fifty-three (253; 11.8 percent) of the students were former users, while 73 (8.1 percent) were current users. One thousand seven hundred twenty (1,720; 80.1 percent) of the students never used snuff (Table 2).

For chew tobacco, 344 (16.1 percent) of the students reported that they were former or current users. Two hundred thirty-one students (231; 10.8 percent) were former users, while 113 (5.3 percent) were current users. One thousand seven hundred ninety-one (1,791; 83.9 percent) never used chew tobacco (Table 2).

One hundred ninety-five (195) of the students reported using all forms of tobacco, i.e., cigarettes, snuff, and chew. One hundred one (101) of the students reported that they used both snuff and chew. Of those students who reported using smokeless tobacco and who responded to the question, "How often each day do, or did, you use snuff or chew?", 117 (28.5 percent) used smokeless tobacco once per day, 139 (33.9 percent) used smokeless tobacco two to four times per day, 74 (18.0 percent) used smokeless tobacco five to seven times per day, and 80 (19.5 percent) used smokeless tobacco more than eight times per day. Most of the smokeless tobacco users (155; 59.7 percent) used snuff or chew no more than fifteen minutes per each "dip;" 30.9 percent used smokeless tobacco ten minutes or less at each "dip."

The majority of the students who reported using smokeless tobacco (i.e., 258; 63.4 percent) used snuff or chew after school only. Nine students (2.2 percent) reported using chew or snuff before school only; 35 (8.6 percent) students reported using chew or snuff before and after school; and 56 (13.8 percent) students used chew or snuff before, during, and after school.

Two-hundred-twenty (220; 52 percent) of the students who reported using snuff or chew held the smokeless tobacco between lip and gum in front; 150 (35.5 percent) held the smokeless tobacco both in the front and on the side; and 49 (11.6 percent) held the smokeless tobacco between cheek and gum on the side.

Of those students who used smokeless tobacco, 295 (70.6 percent) noticed no changes in their mouths as a result of usage. Forty-six (46; 11.0 percent) smokeless tobacco users noticed only a roughness in their mouths; 27 (6.5 percent) users noticed only a soreness in their mouths; 26 (6.2 percent) users noticed only a whiteness in their mouths; and 9 (2.2 percent) users noticed both a roughness and a whiteness in their mouths.

The smokeless-tobacco users' responses to the query as to the main reason why they used snuff or chew were varied. Fifty-three (53; 12.8 percent) users reported, "I want to be like my friends;" 38 (9.2 percent) users reported that "it makes me feel good;" another 38 (8.2 percent) users reported, "I am nervous, tense, or have a problem." Most of the users (i.e., 253; 61.1 percent) reported, however, that there were other reasons for their usage, other than the six offered in the questionnaire. The smokeless tobacco users reported that they were influenced the most to use snuff or chew by their classmates' use of snuff and chew; i.e., 134

(34.4 percent) users reported this. One hundred thirteen (113; 29.0 percent) reported that older children's usage influenced their use and 68 (17.5 percent) of the users reported that older sibling usage influenced their use. TV advertisements, newspaper and magazine advertisements, famous people or sports heroes' endorsements, parents' usage, and adult usage were reported as less influential in causing smokeless tobacco usage. Two hundred sixty-one (261; 61.7 percent) of the smokeless tobacco users felt that using snuff or chew "does cause serious health problems such as cancer."

Age vs tobacco use

The findings for tobacco use were age-related and were consistent for the use of cigarettes, snuff, and chew. That is, there was significantly more use by the older students and less use by the younger students. For cigarettes, four of the 125 students (3.2 percent) nine years of age and younger smoked; while 135 of the 598 students (22.6 percent) sixteen years of age and older smoked. For snuff, two of 125 students (1.6 percent) nine years of age and younger snuffed; while eighty-one of the 598 students (13.9 percent) sixteen years of age and older snuffed. For chew, two of 125 students (1.6 percent) nine years of age and younger chewed, while fifty-four of 598 students (9.3 percent) sixteen years of age and older chewed (Table 3).

Gender vs tobacco use

There was a small but significant ($P < 0.047$) relation for cigarette use between males and females. One hundred thirty-one (131) of 1,079 males (12.1 percent) reported currently smoking cigarettes, while 171 of 1,081 females (15.8 percent) reported currently smoking cigarettes. Of the 302 current smokers, therefore, 56.6 percent were females. Both snuff and chew were predominately used by males. Of the 173 current snuff users, 165 (95.4 percent) were males. Of the 113 current chew users, 109 (96.5 percent) were males (Table 4).

Grade average vs tobacco use

Nine hundred eighty-eight (988; 45.2 percent) of the subjects reported that they were above average students; 663 (30.3 percent) reported being average students; 465 (21.2 percent) reported being excellent students; and 69 (3.2 percent) reported being below

Table 3 ☐ Age vs tobacco use.

Age (years)	Total number of Students	Number of students using tobacco according to tobacco type: Cigarettes	Snuff	Chew	Totals
9 or younger	125	4 (3.2%)	2 (1.6%)	2 (1.6%)	8
10	205	3 (1.5%)	2 (1.0%)	4 (1.9%)	9
11	188	4 (2.1%)	4 (2.1%)	2 (1.1%)	10
12	262	16 (6.1%)	12 (4.6%)	6 (2.3%)	34
13	277	30 (10.8%)	18 (6.5%)	11 (4.0%)	59
14	248	53 (21.4%)	16 (6.4%)	13 (5.3%)	82
15	263	59 (22.4%)	38 (14.8%)	21 (8.3%)	118
16 or older	598	135 (22.5%)	81 (13.9%)	54 (9.3%)	270
Totals	2,166	304	173	113	590
		$X^2 = 254.50^*$ df = 18	$X^2 = 115.72^*$ df = 18	$X^2 = 90.17^*$ df = 18	

*Significant at ($P < 0.001$)

Table 4 ☐ Gender vs tobacco use.

Gender	Total number of students	Number of students using tobacco according to tobacco use: Cigarettes	Snuff	Chew	Totals
Male	1079	131 (12.1%)	165 (15.3%)	109 (10.2%)	405
Female	1081	171 (15.8%)	8 (0.8%)	4 (0.4%)	183
Totals	2160	302	173	113	588
		$X^2 = 6.12^*$ df = 2	$X^2 = 358.10^*$ df = 2	$X^2 = 303.59^*$ df = 2	

*Significant at ($P < 0.001$)

average students. School grades versus tobacco use was consistent for all three types of tobacco, i.e., cigarettes, snuff, and chew. As grade average increased, tobacco use significantly decreased and vice versa. Of the 465 (21.2 percent) students with excellent grades, only eighteen (3.9 percent) smoked, while thirty (43.5 percent) of the sixty-nine (3.2 percent) with below average grades smoked. For snuff, only six (1.3 percent) of the 465 with excellent grades snuffed, while twenty-four (36.4 percent) of the sixty-nine students with below average grades snuffed. For chew, only four (0.9 percent) of the 465 students with excellent grades chewed, while fourteen (21.2 percent) of the sixty-nine students with below average grades chewed (Table 5).

Parent's use vs child's tobacco use

In general, most of the students reported that their parents did not use tobacco products. Fifty-five percent (55 percent) of the fathers did not use tobacco and 67.3 percent of the mothers did not use tobacco. For those parents who used tobacco, they predominately used cigarettes *vis-a-vis* smokeless tobacco. Thirty-five percent (35 percent) of the fathers and 31 percent of the mothers smoked. Approximately 9 percent of the fathers used smokeless tobacco products, while only 0.1 percent of the mothers used smokeless tobacco.

There was a significant relationship between the parents' use of tobacco (i.e, and form) and the child's use of cigarettes, snuff, and chew. That is, when the parents used tobacco, the child was more likely to smoke, snuff, or chew. When fathers used tobacco, 181 out of 972 (18.6 percent) of their children smoked cigarettes, while only 123 out of 1,194 (10.3 percent) of the children of nontobacco-using fathers smoked. For snuff, 104 out of 972 (10.8 percent) of the children of fathers who used tobacco snuffed, while only sixty-nine out of 1,194 (5.8 percent) of the children of fathers who were nontobacco users snuffed. For chew, seventy out of 972 (7.3 percent) of the children of fathers who used tobacco chewed, while only forty-three out of 1,194 (3.7 percent) of the children of fathers who were nontobacco users chewed (Table 6).

When mothers used tobacco, 149 out of 700 (21.3 percent) of their children smoked cigarettes, while only 155 out of 1,466 (10.6 percent) of the children of non-

Table 5 ☐ Grade average vs tobacco use.

Grades	Total number of students	Number of students using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
Excellent	465 (21.2%)	18 (3.9%)	6 (1.3%)	4 (0.9%)	28
Above average	988 (45.2%)	76 (7.8%)	48 (4.9%)	30 (3.1%)	154
Average	663 (30.3%)	180 (24.4%)	95 (14.8%)	65 (10.3%)	340
Below average	69 (3.2%)	30 (43.5%)	24 (36.4%)	14 (21.2%)	68
Totals	2185	304	173	113	590
		$X^2 = 325.60^*$ df = 6	$X^2 = 220.15^*$ df = 6	$X^2 = 190.97^*$ df = 6	

*Significant at ($P < 0.001$)

Table 6 ☐ Parents' use vs child's tobacco use.

Parents use	Total number of students	Number of offspring using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
Fathers:					
Use tobacco	972	181 (18.6%)	104 (10.8%)	70 (7.3%)	355
No tobacco use	1194	123 (10.3%)	69 (5.8%)	43 (3.7%)	235
Totals	2166	304	173	113	590
		$X^2 = 59.61^*$ df = 2	$X^2 = 28.13^*$ df = 2	$X^2 = 21.62^*$ df = 2	
Mother:					
Use tobacco	700	149 (21.3%)	76 (11.0%)	47 (6.8%)	272
No tobacco use	1466	155 (10.6%)	97 (6.7%)	66 (4.6%)	218
Totals	2166	304	173	113	590
		$X^2 = 54.74^*$ df = 2	$X^2 = 17.37^*$ df = 2	$X^2 = 14.28^*$ df = 2	

*Significant at ($P < 0.001$)

tobacco-using mothers smoked. For snuff, seventy-six out of 700 (11.0 percent) of the children of mothers who used tobacco snuffed, while only ninety-seven out of 1,466 (6.7 percent) of the children of mothers who were nontobacco users snuffed. For chew, forty-seven out of 700 (6.8 percent) of the children of mothers who used tobacco chewed, while only sixty-six out of 1,466 (4.8 percent) of the children of mothers who were nontobacco users chewed (Table 6).

Parent's education vs children's tobacco use

There was a significant relation between the students' tobacco use and the education of their parents. The less education their parents had, the more likely the students were to smoke, snuff, and chew and vice versa. Of the students with college-graduate fathers, 8.6 percent smoked, 4.7 percent snuffed, and 2.7 percent chewed. Of the students with fathers who did not finish high school, however, 27.5 percent smoked, 14.4 percent snuffed, and 8.8 percent chewed. Of the students with college-graduate mothers, 10.4 percent smoked, 5.2 percent snuffed, and 2.9 percent chewed. Of students with mothers who did not finish high school, however, 26.1 percent smoked, 17.9 percent snuffed, and 12.0 percent chewed (Table 7).

Family living condition of student vs tobacco use

One thousand seven hundred sixty-seven (1,767) of the 2,166 students (81.6 percent) reported living with both natural parents. Three hundred ninety-nine (399; 18.4 percent) of the students reported another family arrangement, such as mother only, father only, parent and step-parent, grandparent(s), foster parents, etc. It was found that children who reported living with both natural parents, *vis-a-vis* living in another family condition, were significantly less likely to be current cigarette smokers. Two hundred twenty-two (222) of 1,767 (12.6 percent) students living with both natural parents

Table 7 ☐ Parents' education vs children's tobacco use.

Parents education	Total number of students	Number of offspring using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
Father:					
Little high school	109	30 (27.5%)	15 (14.4%)	9 (8.8%)	54
High school	587	104 (17.7%)	60 (10.3%)	42 (7.2%)	206
Post-High school	377	56 (14.9%)	30 (8.1%)	17 (4.6%)	103
College grad	491	42 (8.6%)	23 (4.7%)	13 (2.7%)	78
Grad school	145	15 (5.4%)	8 (5.4%)	6 (4.1%)	29
Totals	1709	247	136	87	470
		$X^2 = 65.64^*$ df = 8	$X^2 = 31.30^*$ df = 8	$X^2 = 28.13^*$ df = 8	
Mother:					
Little high school	88	23 (26.1%)	15 (17.9%)	10 (12.0%)	48
High school	829	136 (16.3%)	67 (8.1%)	44 (5.4%)	247
Post-High school	392	52 (13.35%)	34 (8.7%)	24 (6.2%)	110
College grad	355	37 (10.4%)	18 (5.2%)	10 (2.9%)	65
Grad school	116	14 (12.1%)	7 (6.0%)	5 (4.3%)	26
Totals	1780	261	141	93	496
		$X^2 = 43.70^*$ df = 8	$X^2 = 34.41^*$ df = 8	$X^2 = 26.77^*$ df = 8	

*Significant at ($P < 0.001$)

Table 8 ☐ Family living condition of student vs tobacco use.

Living condition of student	Total number of students	Number of students using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
With both natural parents	1767 (81.6%)	222 (12.6%)	129 (7.4%)	83 (4.8%)	434
Other conditions	399 (18.4%)	82 (20.6%)	44 (11.2%)	30 (11.2%)	156
Totals	2166	304	173	113	590
		$X^2 = 29.24^*$ df = 2	$X^2 = 9.74+$ df = 2	$X^2 = 5.77+$ df = 2	

*Significant at ($P < 0.001$)
+Non-Significant at ($P < 0.05$)

currently smoked, while eighty-two of 389 (20.6 percent) students living in another family setting currently smoked. There was no significant relation between students' family setting and the students' use of snuff or chew (Table 8).

Sports participation vs tobacco use

One thousand eight hundred sixty-nine (1,869) of the 2,189 students (87.7 percent) reported regularly participating in some sport. There were significantly fewer smokers than non-smokers who participated in sports. Two hundred six (206) of the 1,869 students (11.0 percent) who participated in sports smoked, while eighty-four of the 263 students (31.9 percent) who did not participate in sports smoked. There was, however, no significant difference in the usage of snuff or chew and participation in sports in general (Table 9).

Parenthetically, there was a significant difference between the usage of smokeless tobacco and the particular sport played. For instance, those who participated in hockey, golf, wrestling, and boxing/karate had a significantly greater number of both snuff and chew users than those who did not participate in these sports. And, those who participated in football, tennis, racquetball, volleyball, and soccer, had significantly fewer users of both snuff and chew. For basketball, there were fewer snuff users, but there was no significant relationship for the use of chew. There was no significant relationship between smokeless tobacco use and participation in baseball/softball.

Health attitude toward smokeless tobacco

The majority of students (1,535; 71.5 percent) believed that smokeless tobacco was just as harmful as cigarettes. Three hundred twenty-one students (321; 14.9 percent) considered smokeless tobacco products more harmful than cigarettes; 243 students (11.3 percent) considered them less harmful than cigarettes, and fifty-two students (2.4 percent) considered them not harmful. The findings for those who use tobacco (i.e., cigarettes, snuff, and chew), *vis-a-vis* their health attitude toward smokeless tobacco, were significant and consistent for all three tobaccos. That is, those who currently use tobacco do not perceive snuff and chew to be harmful. Of interest, those who smoked believed smokeless tobacco was more harmful than cigarettes, while those who used snuff and chew believed smokeless tobacco was less harmful than cigarettes (Table 10).

DISCUSSION

In the present study, 30.5 percent (current and former

Table 9 ☐ Sports participation vs tobacco use.

Sports participation	Total number of students	Number of students using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
Yes	1869 (87.7%)	206 (11.0%)	150 (8.1%)	98 (5.3%)	454
No	263 (12.3%)	84 (31.9%)	21 (8.2%)	14 (5.5%)	119
Totals	2132	290	171	112	573
		$X^2 = 88.62$* df = 2	$X^2 = 2.24$+ df = 2	$X^2 = 2.68$+ df = 2	

*Significant at ($P < 0.001$)
+ Non-Significant at ($P < 0.05$)

Table 10 ☐ Health attitude toward smokeless tobacco of those who use tobacco.

Health attitude toward smokeless tobacco	Total number of students	Number of students using tobacco according to tobacco type			Totals
		Cigarettes	Snuff	Chew	
Not harmful	52 (2.4%)	19 (38.8%)	16 (30.8%)	16 (30.8%)	51
Less harmful than cigarettes	243 (11.3%)	34 (14.0%)	41 (17.1%)	32 (13.4%)	107
Just as harmful as cigarettes	1535 (71.5%)	180 (11.7%)	94 (6.1%)	53 (3.5%)	327
More harmful than cigarettes	321 (14.9%)	62 (19.3%)	22 (7.0%)	12 (3.8%)	96
Totals	2151	295	173	113	581
		$X^2 = 48.61$* df = 6	$X^2 = 152.67$* df = 6	$X^2 = 155.32$* df = 6	

*Significant at ($P < 0.001$)

users) school students smoked cigarettes. This study found that 15.8 percent of the sample who smoked were females, while 12.1 percent were males. Guggenheimer *et al*, whose sample was comparable in age and geographic location, presented findings somewhat different from those in the present study.[44] They found that 22 percent of the girls and 11 percent of the boys smoked. In the present study, the highest incidence of cigarette usage was at ages fifteen (22.4 percent) and sixteen or older [but still in high school] (22.5 percent). Whereas in Guggenheimer *et al*, the highest reported use of cigarettes was ages fourteen (twenty-three persons) and age fifteen (thirty-one persons). In the present study, there was a steady increase in the incidence of cigarette use from ages ten to sixteen or older as follows: Ages ten (1.5 percent), eleven (2.1 percent), twelve (6.1 percent), thirteen (10.8 percent), fourteen (21.4 percent), fifteen (22.4 percent), sixteen or older (22.5 percent). In Guggenheimer *et al*, however, there was an increase in cigarette use up to age fifteen and a decline to age eighteen (Table 3).

The present study found that 26 percent (males and females) of the subjects reported using smokeless tobacco, which is slightly lower than national data. From data obtained from twenty-five states and the District of Columbia, the median state prevalence of smokeless tobacco use for men (ever used) was 28.6 percent and for women it was 2.7 percent.[10]

Comparing this study, which was done in Westmoreland County, Pennsylvania, to one done in neighboring Allegheny County, Pennsylvania, there was less smokeless tobacco use in Westmoreland County (26 percent, males and females) than in Allegheny County (35 percent).[44] Only males reported using smokeless tobacco in Allegheny County, whereas in Westmoreland County, eight of the current 173 snuff users and four of the current 109 chew users were females. In the Guggenheimer *et al* study, there was reported an increase in smokeless tobacco use from ages twelve to fifteen and then a decline to age eighteen.[44] Whereas in the present study, there was a comparable and steady increase in snuff and chew use from ages nine or younger to sixteen or older, except for snuff use at age ten which was 0.6 percent less than at age nine or younger (Table 3).

In regard to the age distribution of the sample and smokeless tobacco use, the present study found a very similar trend as that reported by Jones and Moberg.[11] Jones and Moberg stratified the data from a sample of 1,030 males from Madison, Wisconsin, according to age-groups (eleven to thirteen, fourteen to fifteen, sixteen to eighteen). If data from the present study were extrapolated according to these age-groups, the comparative results are illustrated in Table 12. As shown, smokeless tobacco use in both studies increased from ages eleven to fifteen, but decreased from ages sixteen to eighteen. In contrast to the Wisconsin study, the present study included females in its sample; their smokeless tobacco use, however, was very minuscule.

The results of the Marty *et al* study of the prevalence of smokeless tobacco use among 901 students in two Arkansas communities in grades 10-12 are similar to the results of the present study.[46] For instance, Marty *et al* found that in grades 10, 11, and 12, the smokeless tobacco use was 13.8 percent, 20.6 percent, and 23.7 percent, respectively. If the data in the present study were arranged to correspond with their results, then age fifteen would correlate with grade 10 and showed a 23.1 percent use of smokeless tobacco; age sixteen or older would correlate with grades 11 and 12, and showed

Table 11 ☐ Profile of tobacco user from one school district in western Pennsylvania

Smoker	Smokeless tobacco user
16 years and older	16 years and older
Caucasian	Caucasian
Female	Male
Below average grades	Below average grades
Parents have no more than high school education	Parents have no more than high school education
Parents use tobacco	Parents use tobacco
Do not live with both natural parents	
Do not regularly participate in sports	Participate in hockey, golf, wrestling, boxing/karate
	Use two to four times per day
	Use less than 15 minutes per each dip
	Use after school
	Hold tobacco between lip and gum in the front of the mouth
	Have noticed no change in their mouth as a result of usage
	Use because want to be like their user friends
	Usage influenced by classmates, older students, and older siblings

Table 12 ☐ Percent smokeless tobacco use.

Age group	Wisconsin study	This study
11–13	19.4%	20.6%
14–15	28.0%	34.8%
16–18	26.0%	23.2%@

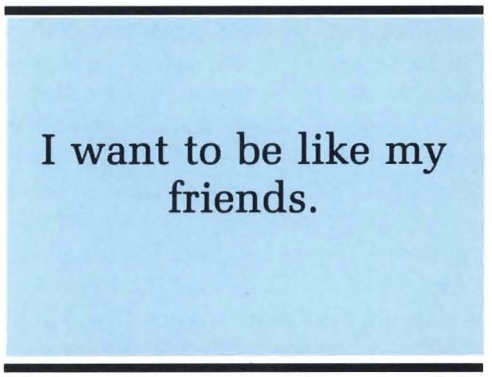
@Data were collected as 16 years of age or older, but students were all in high school.

a 23.2 percent use of smokeless tobacco. Thus, smokeless tobacco use in grades 11 and 12 in the Marty *et al* study and age sixteen and older in the present study correlates very well—23.7 percent and 23.2 percent, respectively.

Olds, in describing data obtained from 108 high schools in the state of New York, showed that smokeless tobacco use was highest before the age of thirteen.[12] Fifty-two percent of the users initiated the habit before this age. Olds also found that by the senior year in high school, smokeless tobacco use declined, while cigarette smoking increased to 23.5 percent. In the present study, however, smokeless tobacco prevalence and cigarette smoking both increased from 3.2 percent at age nine or younger to 23.2 percent at age sixteen or older, and 1.5 percent at age ten to 22.5 percent at age sixteen or older, respectively.

In the present study, the main reason given by the subjects for their use of smokeless tobacco was, "to be like friends." Other reasons for smokeless tobacco use cited by students were: "to feel good" and "felt nervous and tense." Peer influence was also found to be the main reason for smokeless tobacco use in other investigations.[44,45,47,48] After reviewing the literature, Koop stated that the main reason for boys using smokeless tobacco was their friends used it and offered it to them.[45] Similarly, Olds found that the most commonly cited reason for beginning the use of smokeless tobacco was peer influence.[12] Mass media advertisements or endorsements by famous people did not influence smokeless tobacco use in the study by Olds.[12] Guggenheimer *et al* also reported that mass media and other marketing efforts to promote smokeless tobacco had only minimal influence on subjects' usage.[44] Schroeder *et al* analyzed the effect that mass media/advertisement has on smokeless tobacco use.[48] They suggested that smokeless tobacco use is influenced by family and friends and its use is reinforced through passive communications of its harmlessness by athletes, coaches, and media advertisements during professional sports events. Studies have also identified several other secondary reasons for smokeless tobacco use such as: elicit a "buzz", like the taste, parental marital status, ethnicity, and mass media promotions.[44,45,47-49]

The present study found that the majority of subjects believed smokeless tobacco was a serious health problem and believed it was as harmful as cigarettes. Those students who currently used tobacco, however, did not consider smokeless tobacco as harmful. Schinke *et al* found that most youths found smokeless tobacco to be unhealthy and risky.[50] Smokers and smokeless tobacco



users were not inclined, however, to view the products they used as harmful. Likewise, Marty *et al* found that nonusers were more likely than users to perceive negative health consequences of smokeless tobacco. Contrary to that observation, Olds found that over 75 percent of the users agreed or strongly agreed that smokeless tobacco is harmful to their health.[12] The peculiarities of the Olds sample and their earlier health education could possibly account for the different findings in that study *vis-a-vis* the other reports.

A significant relationship was found in the present study between tobacco use and parents' education. That is, the less education parents had, the more likely the students were to smoke, snuff, and chew and vice versa. Further, this study found that tobacco use was significantly related to student grade average, i.e., as grade average decreased, tobacco use increased. Although there is little or no literature that specifically addresses the issue of tobacco use in relation to parents education, Jones and Moberg did find that smokeless tobacco use was associated with poor performance in school. In addition, Jones and Moberg and Gritz *et al* found that smokeless tobacco use was positively related to cigarette smoking and alcohol use.[11,51] Poulson *et al* also found a positive association between occasional alcohol use and smokeless tobacco use.[52]

The present study found that subjects were more likely to smoke when they lived in a family condition other than with their two natural parents. This finding did not hold true for subjects who used smokeless tobacco. Jones and Moberg and Elder *et al* found, however, that smokeless tobacco use was associated with parents not living together.[11,47]

Although the present study found a significant relationship between cigarette smoking and sports participation in general (i.e., fewer smokers participated in

sports), there was no such relationship for smokeless tobacco use. This study did, however, find a significant relationship between smokeless tobacco use and the particular sport placed; i.e., those who participated in hockey, golf, wrestling, and boxing/karate had a greater number of users, while those who participated in football, tennis, racquetball, volleyball, and soccer had fewer users. The relationship between the particular sport played and smokeless tobacco use for the present study could not be explained by such factors as team sport vs individual sport, or contact sport vs noncontact sport. Jones and Moberg, however, did find that smokeless tobacco use was negatively related to team sport participation.[11] In a sample of male college students, Lopez found that smokeless tobacco use was more prevalent among sport participants and was more specifically related to participation in baseball.[49]

Parenthetically, this present study found no relationship between smokeless tobacco use and participation in baseball. Perhaps the present study's combination of baseball/softball in the questionnaire could account for this. Possibly more females play softball and because females are less likely to use smokeless tobacco, this may have neutralized the effect that participation in baseball may have had on smokeless tobacco use.

Future studies should evaluate the specific health risks of smokeless tobacco use. Moreover, various behavioral modification and educational programs should be evaluated for their efficacy in reducing and eliminating tobacco use.

CONCLUSIONS

From a sample of 2,189 Western Pennsylvania school students in grades 1 through 12, the following conclusions were made concerning tobacco usage:

- ☐ Thirty percent (30 percent) of the subjects were former or current cigarette smokers.
- ☐ Smoking was more a female habit while smokeless tobacco was predominately a male habit.
- ☐ Approximately 20 percent of the subjects used snuff and approximately 16 percent used chew.
- ☐ Certain demographic and psychosocial factors were found associated with both the smoker and the smokeless tobacco user alike, i.e., sixteen years and older, Caucasian, below average grades, parents with no more than high school education, and parents used tobacco.
- ☐ Smokeless tobacco users participated in such sports as hockey, golf, wrestling, and boxing/karate.
- ☐ Smokeless tobacco usage was influenced by classmates, older students, and older siblings.
- ☐ Smokeless tobacco users reported that they used smokeless tobacco, because they wanted to be like their friends.

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'SPIT' TOBACCO MAY CAUSE CANCER SURGE

WASHINGTON—An increase in young people using smokeless tobacco could foreshadow an epidemic of oral cancer in coming decades, U.S. Surgeon General Antonia Novello said Thursday. "Spit" tobacco, a term for snuff and chewing tobacco, is "as dangerous and deadly as other tobacco products," she said. "I am deeply concerned by the attempts of the spit tobacco industry to downplay the health hazards." She also noted the "terrific connection between baseball and the use of spit tobacco" and urged major league baseball to curtail its use among players. Novello said that in 1991 nearly 20 percent of high school boys had used smokeless tobacco in the preceding 30 days.

From Chicago Tribune wires

Gender differences in the characteristics of dental services provided for children

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The profession of dentistry is being profoundly altered by a number of current issues, including the prevention of the transmission of infectious diseases, the decline in dental caries, and the increased focus on quality assurance for all health care. Another factor that may ultimately have the most profound impact on dentistry is the increasing number of female dental students and subsequently female dentists. Two recently published journals, have devoted entire sections to the topic of women in dentistry.[1-10] While the current percentage of dentists who are women is approximately 8 percent, the percentage of female dental students presently enrolled is approximately 30 percent.[3-11]. Obviously, dentistry is experiencing a significant change in the constituency of its professional personnel. There are a limited number of published surveys that are national in scope and that include both men and women as respondents.[8,12-14] The American Academy of Pediatric Dentistry (AAPD) survey is confined to pediatric dentists, the others deal largely with demographics and attitudinal questions regarding dentistry.[8,12-14] The purpose of this study was to compare the characteristics of the practice of dentistry for children, between male and female dentists.

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MATERIALS AND METHOD

With the intent of surveying children's dental services, questions regarding the characteristics of their dental practices, were mailed to a random sample of 2000 general dentists and 1000 pediatric dentists. The American Dental Association's Data Processing Service, which includes members and nonmembers was used as the source of the sample.

Questions regarding demographics, gender of dentist, length of time in practice, type of practice, age of patient population, types of services, management techniques for children, and changes in the character of the practice were included. This report is based on a secondary analysis of a cross-sectional survey that was designed primarily to evaluate dental services provided for children.

The results are reported as percentages of the men and women responding to the questionnaire.

RESULTS

There were 1154 respondents: 1141 usable, (39 percent) overall. Ninety-four respondents were women (8 percent) and 1047 respondents were men. Of the 94

responding women, 56 percent were general dentists and 43 percent were pediatric dentists, another 1 percent were dual trained in orthodontics and pediatric dentistry (Table 1). The percentage of women respondents (8 percent) is representative of the general population of dentists in the United States at the end of 1991.[1]5 It is not surprising that the percentage of female pediatric dentists closely corresponds to the number of female practitioners overall, in view of reports that indicate the two specialties most favored by women are pediatric dentistry and orthodontics.[1]6 Fifty-nine percent of the men were general dentists and 40 percent were pediatric dentists. Less than 2 percent of the men were trained in both orthodontics and pediatric dentistry. For discussion purposes the dual trained orthodontist/pediatric dentists will be considered with the pediatric dentists.

Chi square analysis was used for statistical comparison of the two groups. The data were analyzed by gender and practice type; due to the minimal numbers of females in some of the cells, statistical comparisons by practice type, however, were not appropriate.

Table 1 describes the percentage of men and women respondents in each age-category. The largest percentage of men were in the 40-49 year age-bracket, while the majority of women were in the 30-39-year category. There were no female respondents in the 60+ category, and only 7 percent of the male respondents were 60 or over.

In terms of the type of practice, 55 percent of the women who responded reported being in a solo practice compared to 74 percent of the men (Table 1). Thirty-eight percent of responding females were in group practices, while only 25 percent of the responding males were in group practices.

The greatest difference was in the length of time the respondents had been in practice. Seventy-two percent of the males responded that they had been in practice over ten years (Table 1). Only 27 percent of the females responded that they had been in practice over ten years. The highest percentage of female respondents reported being in practice two to five years (38 percent). For each of these practice characteristics there were statistically significant differences between the male and female respondents ($p < .0001$).

There were differences in the percentages of patients less than eighteen years of age treated by the respondents (Table 2). Forty-three percent of the male respondents reported that 50 to 100 percent of their patients were less than eighteen years old, while 47 percent of the female respondents reported the same age-distribution of patients. In response to the ques-

Table 1 ☐ Percent of respondents by practice characteristics.

Characteristics	Female(%) n=94	Male(%) n=1047	x^2	p-value
Practice Characteristics				
Practitioner type			0.367	0.832
general dentist	56	59		
pediatric dentist	43	40		
pediatric dentist/orthodontist	1	<2		
Practice type			23.5	0.0001*
solo practice	55	74		
group practice	38	25		
other (education, military, etc.)	7	1		
Age in years			63.9	0.0001*
<30	13	4		
30-39	63	31		
40-49	18	39		
50-59	6	20		
60+	0	7		
Length of time in practice			97.0	0.0001*
<2 years	6	3		
2-5 years	38	10		
6-10 years	29	15		
over 10	27	72		

*Statistically significant

The specialties most favored by women are pediatric dentistry and orthodontics.

Table 2 □ Percent of respondents by patient age.

	General & pediatric dentists by gender*		General dentists		Pediatric dentists	
Younger than 18 years old	Female(%) (94)	Male(%) (1047)	Female(%) (53)	Male(%) (597)	Female(%) (41)	Male(%) (426)
100%	18	11	0	0	42	25
75-99%	22	29	0	<1	51	68
50-74%	7	3	11	3	2	3
25-49%	20	24	32	40	5	1
1-24%	32	34	57	57	0	2
$x^2 = 12.0, p < 0.05$						
Younger than 4 years old						
100%	1	0	0	<1	21	<1
75-99%	0	1	0	<1	0	1
50-74%	10	2	0	0	22	4
25-49%	13	10	2	1	27	23
1-24%	72	73	91	75	49	71
0%	4	14	8	23	0	<1
$x^2 = 31.5, p < 0.001$						

*Statistical comparison by gender only

tion regarding the number of patients in the practice, less than four years of age, 3 percent of the male respondents indicated that 50 to 100 percent of their patient population was less than age four. Eleven percent of the female respondents reported that 50 to 100 percent of their patients were less than age four. Eighty-seven percent of the male respondents reported that 24 percent or fewer of their patient population were less than four years of age, while 76 percent of the female respondents indicated that same patient distribution. These patient distributions by age were significantly different ($p < .0001$). The data indicate that the pediatric dentists had a higher percentage of patients under four years of age than did general dentists, but for each group of practitioners, the females reported a higher percentage of patients under age four than was reported by the males (Table 2).

In evaluating the characteristics of the treatments provided, one of the major differences between the male and female respondents was the provision of comprehensive orthodontic therapy (Table 3). Twenty-nine percent of the responding males reported provision of comprehensive treatment, while only 16 percent of the female respondents indicated they provided comprehensive treatment. No statistical comparison was made between general dentists and pediatric dentists; the male pediatric dentists, however, were the group most frequently reporting the provision of orthodontic therapy (Table 4). There were slightly more male respondents who reported providing limited orthodontic care (eruption guidance, crossbite correction, etc.) than female respondents (63 percent vs. 56 percent, Table 3).

When asked questions about which specific treatments were employed, the responses were similar (Table 3). The male respondents were somewhat more likely to use composite resin on primary teeth with moderate occlusal caries than were the females (53 percent vs. 43 percent, $p < .045$). Another difference was that 65 percent of the male respondents reported that they did treat occlusal surfaces differently from when they started practicing, compared to 45 percent of the female respondents ($p < .002$).

There were differences in the use of restraints (Papoose Board® or Pedi-wrap®) between the two groups. The use of restraining devices was more frequently reported by the female respondents (40 percent vs. 30 percent) than by the male respondents (Table 5). Otherwise, there were more similarities than differences in the use of specific behavior management techniques based on gender (Table 5). Oral sedation was reportedly used by 48 percent of the females and 42 percent of the males. Approximately one-third of all the respondents reported using hand-over-mouth, with slightly less than one-third of all the respondents indicating the use of general anesthesia in the hospital.

DISCUSSION

The response rate overall (39 percent) for a once-mailed survey was comparable to other once-mailed surveys and included a representative sample of female dentists.[8,12,14]

AGE

The findings of this survey are in agreement with pre-

Table 3 ☐ Percent of respondents by treatment.

Characteristics	Female(%)	Male(%)	x^2	p-value
Treatment provided characteristics				
Parent/patient conferences				
parental conference to obtain informed consent	84	78	2.00	NS
patient/parent dental health ed.	94	89	1.60	NS
Procedures performed for children				
sealants	96	96	0.01	NS
composite/sealant	81	85	1.18	NS
class I amalgam	98	97	0.15	NS
class II amalgam	96	96	0.08	NS
class I composite resin	85	89	1.12	NS
class II composite resin	60	67	1.84	NS
strip crown	44	43	0.02	NS
stainless steel crown	89	88	0.16	NS
pulpotomy	96	93	0.90	NS
limited orthodontic care (eruption guidance)	56	63	1.78	NS
comprehensive orthodontic care (x-bite, etc.)	16	29	6.94	0.008*
Permanent teeth treated with occlusal sealant				
well-coalesced occlusal surface	33	28	1.25	NS
deep occlusal pits and fissures	95	95	0.03	NS
incipient occlusal caries	52	48	0.52	NS
moderate occlusal caries	2	3	0.38	NS
Primary teeth treated with composite				
incipient occlusal caries	62	58	0.44	NS
moderate occlusal caries	43	53	4.02	0.045*
deep occlusal caries	18	24	1.65	NS
interproximal caries on molars	13	17	1.30	NS
Treat children's occlusal surfaces differently than when you started practice	45	65	14.20	0.002*

*See Table 5 for percent of respondents by procedure and practice type

Table 4 ☐ Practice type percentages for procedures with statistical significance by gender.

Characteristics	General dentist (%) Female	General dentist (%) Male	Pediatric dentist (%) Female	Pediatric dentist (%) Male
Procedures performed for children				
Limited orthodontic care	40	43	78	93
Comprehensive orthodontic care	6	11	29	53
Comprehensive modified occlusal caries	40	50	46	58
Physical restraint with papoose board	6	3	85	69

Table 5 ☐ Percent of respondents by behavior management technics.

Characteristics	Female(%)	Male(%)	x^2	p-value
Behavior management characteristics				
Tell-Show-Do	99	97	0.864	NS
Voice control	92	92	0.088	NS
Hand over mouth	31	34	0.362	NS
Physical restraint with papoose board or pediwrap	40	30	4.350	0.047*
Inhalation sedation	66	58	2.170	NS
Oral sedation	48	42	1.360	NS
Intramuscular sedation	2	4	0.670	NS
Intravenous sedation	0	<1	0.826	NS
General anesthesia in office	0	<1	0.642	NS
General anesthesia OR	23	27	0.610	NS
General anesthesia in ambulatory surgery clinic	10	10	0.046	NS
Hypnosis	2	4	0.799	NS

*See Table 5 for percent of respondents by procedure and practice type

viously reported surveys regarding differences in the age of the practitioner and the type of practice for men and women.[8,17] The majority of male respondents were in the 40-49 age-bracket, compared to the women who were most frequently in the 30-39 age-bracket. This is similar to the findings of the AAPD survey of pediatric dentists, where the largest group of male respondents was over 40 years of age and the female respondents were typically younger than 40.[8] These percentages are similar to those of Price where 69 percent of her survey population graduated in 1980 or later and would likely fall, therefore, into the same age bracket.[17]

LENGTH OF TIME IN PRACTICE

The differences in age correlate with the results concerning length of time in practice (Table 1). The majority of male respondents (72 percent) had been in practice over 10 years, while only 27 percent of the female respondents had been in practice over 10 years. This difference in the length of time in practice may provide a partial explanation for the differences in age-distribution of their patient population (Table 2). There are some perceptions regarding dentists that are supported by the results of this survey. For example, the perception exists that as a dentist becomes busier in practice, there is a tendency to treat fewer children. Additionally, there is the perception that women are more caring, nurturing individuals, which may lead parents to seek a female dentist for their young children.[18]

PRACTICE CHARACTERISTICS

The difference in the length of time in practice between male and female respondents helps explain why more male respondents reported treating occlusal surfaces of permanent teeth differently at the present time than when they began practicing dentistry. The improvement in composite resin materials and bonding techniques over the past ten years is likely responsible for this change reported by those in practice at least 10 years.

Several previously published surveys have indicated that males were generally solo practitioners, while females tended to be salaried employees.[8,12,14,19]. The results of this survey also follow that trend. The majority of both male and female respondents were solo practitioners, which accounted for 74 percent of the men, but only 55 percent of the women (Table 1). This difference may relate to the differences in age as well as length of time in practice between the two groups. Possibly given time to become established, the percentage of women in solo practice may approximate the percentage of men. Other factors that may affect a woman's ability or desire to become a solo practitioner have been suggested: Among them are financial discrimination, family obligations, and perceptions and expectations of female dental students, regarding solo practice.[1] Based on the findings of this survey (over one-third of the responding females reported group-practices) dentistry appears likely to become less a cottage industry and more group-practice oriented.

In terms of treatment reported, the female respondents reported providing significantly less comprehensive orthodontic treatment than did the males (Table 3). This may relate largely to the length of time in practice. The male respondents had been in practice longer with more opportunity to take continuing education courses in orthodontics. The males, by virtue of their increased experience, may have improved their capability to provide comprehensive orthodontic ther-

Fifty-five percent of women responding were in solo practice compared to 74 percent of the men.

apy. The female respondents were more recent graduates. Their relative lack of clinical experience or possibly participation in a predoctoral orthodontic curriculum that emphasized recognition and referral may account, therefore, for the difference in the reported provision of comprehensive orthodontic therapy. Less than a third of either group, however, reported providing comprehensive orthodontic therapy.

The majority of both groups reported similar use of sealants (Table 3). Approximately a third of each group indicated they sealed well-coalesced occlusal surfaces of teeth. Virtually all respondents reported sealing deep occlusal pits and fissures, while approximately a half sealed incipient occlusal caries. Only a small percentage of both groups (2-3 percent) indicated the use of sealant for moderate occlusal caries. This finding seems to indicate a reasonably consistent and frequent use of sealants by the respondents.

Composite resins were also reportedly used to treat incipient occlusal lesions by the majority of male and female respondents (Table 3). More men reported the use of composite resin to treat moderate occlusal caries (53 percent vs. 43 percent) than women. This finding is consistent with and may be related to the finding that more male respondents had changed their treatment of the occlusal surfaces of permanent teeth over the course of their time in practice. Less than a fourth of either group used composite resins in situations where the carious lesion was extensive.

Another significant difference between the male and female respondents was in the use of physical restraints (Papoose Board®, Pedi-wrap®) ($p < .05$) as behavior management techniques (Table 5). Female respondents were more likely to use restraints than were the male respondents (40 percent vs. 30 percent). Ninety-two percent of the females reporting the use of restraints were pediatric dentists (Table 4). Male pediatric dentists comprised 95 percent of the males reporting the use of restraints. Pediatric dentists were far more likely to report the use of restraints, therefore, than were general dentists. For both groups females reported using restraints more often, however, than males.

The use of hand-over-mouth (HOM) was reported by approximately a third of the respondents, with the male pediatric dentists reporting the most frequent use of HOM. Other findings related to behavior management include the similarities reported by both sexes in the use of oral, intramuscular, and intravenous sedation. A higher percentage of pediatric dentists (male and female) reported the use of these management techniques, than did the general dentists. Neither group reported frequent use of intramuscular or intravenous sedation (4 percent or less, Table 5)

As previously reported there are differences in dental services provided for children between general dentists and pediatric dentists.[21] The present survey supports these findings. Children represent only a portion of the general dentists' patient pool, while comprising the majority of the patient base for the pediatric dentists, differences, therefore, are not surprising. What is of interest is that females of both practice types demonstrated similar trends for most of the practice characteristics.

CONCLUSIONS

There were differences in the practice characteristics of the responding male and female dentists. Female respondents were significantly younger, more likely to be employees, more likely to treat younger patients, less likely to do comprehensive orthodontic treatment and more likely to use physical restraining devices than their male counterparts. Conversely, male respondents were older, had been in practice longer, were more likely to be solo practitioners, reported performing more comprehensive orthodontic therapy and indicated they had changed the way they treated occlusal surfaces of permanent teeth from when they began practicing dentistry. These results support the contention that gender differences in the practice of dentistry do exist.[19,20] As the age and number of female practicing dentists increases, this type of survey should be repeated to determine which of the differences relate to practice type, practice philosophy or longevity in practice.

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SIDS AND SMOKING DURING PREGNANCY

Sudden infant death syndrome (SIDS) is associated with maternal smoking during pregnancy. However, the relationship between tobacco exposure during infancy and SIDS is unknown. The examination of infants whose mothers smoked only after pregnancy will help determine the relationship between passive cigarette exposure during infancy and SIDS risk. This case-control analysis used data on normal birth weight (≥2500 g) infants included in the National Maternal and Infant Health Survey, a nationally representative sample of approximately 10 000 births and 6000 infant deaths. Infants were assigned to one of three exposure groups: maternal smoking during both pregnancy and infancy (combined exposure), maternal smoking only during infancy (passive exposure), and no maternal smoking. SIDS death was determined from death certificate coding. Logistic regression was used to adjust for potentially confounding variables. Infants who died of SIDS were more likely to be exposed to maternal cigarette smoke than were surviving infants. Among black infants the odds ratio was 2.4 for passive exposure and 2.9 for combined exposure. Among white infants the odds ratio was 2.2 for passive exposure and 4.1 for combined exposure. After adjustment for demographic risk factors, the odds ratio for SIDS among normal birth weight infants was approximately 2 for passive exposure and 3 for combined exposure for both races. These data suggest that both intrauterine and passive tobacco exposure are associated with an increased risk of SIDS and are further inducement to encourage smoking cessation among pregnant women and families with children.

Schoendorf, K.C. *et al*: Relationship of sudden infant death syndrome to maternal smoking during and after pregnancy.
Pediatrics, 90:905-908, December 1992.

Children are expensive

H. Barry Waldman, BA, DDS, MPH, PhD

OLD JOKE

Question: When does life begin?

Response 1. At conception

Response 2. At birth

Response 3. When the kids get married and the dog dies.

NO JOKE

Question: How much does it cost to rear a child?

Answer: More than $100,000 and that is only the beginning.

It borders on the sacrilegious to place a price on a child. In most instances, the birth of child is the culmination of the most intimate of loving relationships between a husband and wife. It is the promise of the future. But for others, it is the time of misgiving, of fear, and economic despair. And if the child is of the "wrong sex," it is a time of destruction.

"...a 1991 census of India found 92.9 females for every 100 males in the population. In China: 93.8 females for every 100 males. What happened to the missing women? Many were routinely killed, others starved because priority is given to feeding males—the fate of as many as 100 million missing women in the world."[1]

The reality is that children are expensive—in both emotional and economic terms. Just how expensive it can be for individual families and society to rear our children may surprise many. Placing some of the economic costs in perspective will be the purpose of this presentation.*

USUAL COSTS

The scene on the television screen shows a father tenderly holding an infant.

Voice-over: "...and we need to plan for the college education of daddy's little dear."

Almost $25 thousand for food, $34 thousand for housing, $16 thousand for transportation, $7 thousand for medical care, and thousands more for clothing, cd's, movies, and, and, and—that's the price of "daddy's little darling" before he can plan for a college education. The total expenses of more than $100 thousand reflects a moderate cost level for an urban child at the end of the 1980s (Table 1, Figure 1).** A college education can add an additional annual average of $5 thousand in a public college to an average in excess of $12 thousand in a private institution (Table 2). (Note: In 1992-93, tuition and fees are more than $20 thousand at Yale, Princeton and Columbia Universities.)[3]

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* Emphasis will be upon the costs to individual families and for social service support programs that are established as an economic "safety-net" for families. A veritable infinite number of other programs exist to support the needs of children as they progress from conception to majority.

** These limited dollar figures in no way represent the costs associated with premature births, developmental disabilities and other special population difficulties.

Table 1 ☐ Estimated average cost of rearing a child from birth to age 18 in Midwestern urban and rural areas: 1989.[2]

	in 1989 standard dollars	
	Urban	Rural
Food	$24,269	$22,484
Clothing	6,922	6,446
Housing	34,100	32,004
Medical care	7,056	6,454
Education	2,208	2,208
Transportation	15,930	15,310
Other items*	14,570	12,932
Totals	$105,055	$97,838

* Includes personal care, recreation, reading and other miscellaneous expenditures.

Note: Estimates reflect moderate cost level for Midwest region. Midwest region estimates are used to approximate U.S. averages. Averages reflect cost of rearing a child in a husband-wife family with no more than five children. Day care and child care costs are not included.

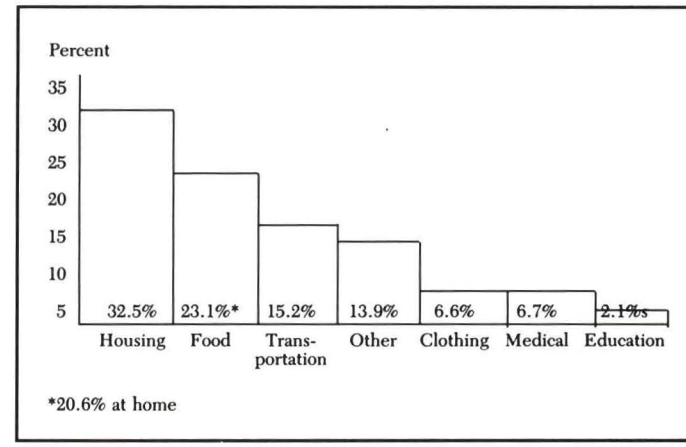

Figure. Percent distribution of estimated cost of rearing a child from birth to age 18 in a Midwestern urban area: 1989.[2]

Table 2 ☐ College costs: average charge for a full-time undergraduate student by type of college: (1989–90).[2]

	4 Year College		2 Year College	
	Public	Private	Public	Private
Tuition	$1,781	$8,446	$758	$5,324
Room & board	3,198	3,902		
Totals	4,979	12,348		

Table 3 ☐ Estimated annual average costs of rearing a child from birth to age 18 in a husband-wife family by family income and age of child (overall U.S.): 1990.[4]

	Family income		
Age	Less than $29,900	$29,900-$48,300	More than $48,300
0-2 yrs.	$4,330	$6,140	$8,770
3-5 yrs.	4,630	6,540	9,260
6-8 yrs.	4,620	6,500	9,130
9-11 yrs.	4,480	6,330	8,950
12-14 yrs.	5,150	7,050	9,780
15-17 yrs.	5,490	7,490	10,270
Totals	$86,100	$120,150	$168,480

By 1990, the cost of rearing children in a husband-wife family setting ranged from $86,000 to $120,000 to $168,000—with higher income families spending more money than other families. Annual expenses for children increased as the child grew from birth to majority (from as "little" as $4,330 to $10,270—depending on the income of the family) (Table 3). And further:

- ☐ In urban areas, costs per child generally are higher for children reared in the Western regions of the country, and lowest in the Southern region.
- ☐ Rearing children in rural areas is cheaper than rearing children in urban areas.
- ☐ In rural areas, housing, food, clothing education and child care are cheaper, while transportation and health care are more expensive (Table 4).
- ☐ Economics of scale are achieved with three or more children.[5]

Increasing numbers of children are reared, however, in single parent settings. (See following section) In single parent families, household expenses are shared among fewer members. As a result, variations in particular expense categories result in greater costs in rearing children, in both lower and higher income families—particularly in higher income families (Table 5).

It should be noted that none of the economic presentations include the costs related to childbirth and prenatal health care. In 1989, health care costs averaged $2,560 for a usual delivery and $4,270 for a cesarean delivery.[4]

Table 4 ☐ Estimated average cost of rearing a child from birth to age 18 in a husband-wife family by family income and region: 1990.[4]

	Cost of rearing a child					
	Urban				Rural	Total
Family Income	West	Northeast	South	Midwest	Nationwide	United States
Less than $29,900	$91,590	$90,180	$86,590	$84,870	$77,310	$86,100
$29,900-$48,300	124,530	123,780	122,280	118,410	110,880	120,150
More than $48,300	171,180	171,720	169,590	165,660	158,160	168,480

Table 5 ☐ Estimated average cost of rearing a child from birth to age 18 by family structure and family income: 1990.[4,6]

	Single-parent families		Husband-wife families		
	Less than $29,900	$29,900 or more	Less than $29,900	$29,900 to $48,300	More than $48,300
Food	$17,580	$26,400	$17,880	$22,350	$27,030
Clothing	6,720	9,120	7,960	9,990	12,090
Housing	29,850	59,340	29,250	39,540	60,420
Health care	2,850	6,210	4,170	5,370	6,660
Education, child care and other	11,310	30,360	12,780	21,210	33,540
Transportation	22,260	36,510	14,040	21,690	28,740
Totals	$90,570	$167,940	$86,100	$120,150	$168,480

NEW USUAL COSTS

"In part because of the continuing rise in out-of-wedlock childbearing, more than half of all children are likely to experience a period of living with a single parent during the 1990s, usually in reduced economic circumstance."[7]

Any attempt to consider the costs of rearing children must include consideration of the evolving structure of families and the increasing employment of women in the workforce. For example, in the final years of the 1980s:

- ☐ 12.9 million children lived in single parent families (18 percent of white children, 4 percent of black children, and 28 percent of Hispanic children†).
- ☐ One out of every five families with children was headed by a woman, two-thirds of whom were in the labor force.
- ☐ In husband-wife families, both parents were employed in 58 percent of the families and in an additional 4 percent of the families only the mother was employed.[2]††
- ☐ Regardless of the presence of children (even infants) women are more likely to work outside the home than to work solely as homemakers (Table 6).

By 1990, two-thirds of married women were participating in the paid labor market.[9]

Employed mothers must find child care arrangements for almost 30 million children less than 15 years of age (9 million of whom are less than five years of age (Table 7). Child care expenditures represent as much as a quarter of the salary of a mother whose income is below the poverty level, and 16 percent of the salary of a mother whose income is near the poverty level.[10]

SAFETY NETS

Poverty

In 1989, one out of every five children lived in poverty. The rate varied by race from 14 percent for white children to 35 percent for Hispanic and 43 percent for black. Child poverty is concentrated heavily in single parent families, most of which are headed by women. Fifty-seven percent of all children in poverty lived with

Table 6 ☐ Employment status of parents with children less than 18 years of age: 1988.[2]

	Number	Percent	
	(in millions)		
Total families	32.3		
Husband-wife families	24.6	100%	
Both employed			58.0%
Father only employed			34.0
Mother only employed			4.1
Female headed families	6.7	100%	
Mother in labor force			67.2
Male headed families	1.1	100%	
Father in labor force			90.2

Table 7 ☐ Child care arrangements used by employed mothers: 1987.[10]

Number of children (in millions)	Less than 5 years 9.1	5-14 years 19.7
Care in child's home	29.9%	13.5%
Care in another's home	35.6	5.4
Day/group care center	16.1	1.7
Nursery/preschool	8.3	0.6
Kindergarten/grade school	1.0	71.1
Child cares for self	0.3	4.1
Mother cares for child at work	8.9	3.6

†Hispanic children may be of any race.

††For an extended discussion of changing family structure, see a earlier presentation in the Journal of Dentistry for Children. ‡For an extended discussion of children living in poverty, see an earlier presentation in the Journal of Dentistry for Children.[11]

their single mothers.‡ Despite these high rates of poverty, most unmarried women with children are employed (86 percent of divorced women, 75 percent of separated women, and 70 percent of never-married women).

Child support

The particular difficulty faced by women in their attempt to receive child support from absent fathers has become the subject of any number of evening television news reports and newspaper articles. The problem has become so wide-spread that even federal and state tax agencies have been employed to redirect tax refunds to the needs of children. For example, despite court-ordered child-support judgements, almost a half of all women have received no payments or at best partial payments for the support of their children (Table 8).

Social service programs

An extensive series of federal, state, and local programs has been established to provide health, social service and financial assistance to children and their families to ensure the well-being of the children. For example:

- In 1990, the Aid to Families with Dependent Children (AFDC)‡‡ program (a federal-state effort) provided financial assistance to 7.8 million children (13.2 percent of all children less than 18 years of age) and 3.7 million adults. Since 1960, the number of children and the percent of all children covered by the AFDC program have continued to rise. Monthly assistance, current dollar payments have increased throughout the last 40 years (reaching $131 per recipient and $379 per family). In constant dollars (i.e. removing the effects of inflation) the average monthly payments have decreased, however, since 1970 (Table 9).

The AFDC program varies greatly from state to state, reflecting the size of the population, differences in cost of living, the economic condition within the state and

Table 8 ☐ Women receiving court-ordered, child-support payment from fathers: 1987.[2]

	Number	Percent
	(in millions)	
Total women with children from an absent father	9.4	100%
Payments not awarded	3.9	41.0
Payments awarded	5.5	59.0
Supposed to receive payments	4.8	100%
Received full amount	2.5	51.3
Received partial amount	1.2	24.9
Received NO payments	1.2	23.9

Table 9 ☐ Persons receiving Aid to Families with Dependent Children (AFDC): 1950-1990.[2]

	Number of recipients of AFDC payments		Percent of children under 18 receiving AFDC payments	Average monthly payment			
				Current dollars		Constant 1990 dollars	
Year	Total*	Children < 18 yrs.		Per family	Per recipient	Per family	Per recipient
	(in millions)						
1950	2.2	1.7	3.9%	$71	$21	$385	$114
1960	3.1	2.4	3.7	108	28	477	124
1970	9.7	7.0	10.5	190	50	640	168
1980	11.1	7.6	13.2	288	100	457	159
1990	11.5	7.8	13.2	379	131	379	131

* Total includes childrent and one or both parents or one caretaker other than a parent in families where the needs of such adults were considered in determining the amount of assistance.

‡‡The AFDC program (Aid to Families with Dependent Children) provides financial assistance to dependent children, including payments to meet the needs of the parent(s) or needy relatives with whom the child is living and the needs of any other individual living in the same home who is considered essential to the well-being of the child.[13]

Almost a half of all women have received no child support payments from absent fathers.

the support by state officials for the program. In 1989, 3.8 million families received funds under the AFDC program. The number of children receiving support ranged from 8,863 in the State of New Hampshire to 1.2 million in the State of California. The number of families receiving support ranged from 5,128 in the State of Wyoming to 611,988 in the State of California. The monthly support per recipient ranged from $31.89 in Puerto Rico to $235.72 in the State of Alaska (Table 10).

- ☐ In 1989, $13.7 billion were spent for Medicaid health services for AFDC recipients, (including more than 4.5 million children).[8,12]
- ☐ In 1990, 2.3 million children (1.7 million white, 0.5 million black and 0.2 million "other" children) received support under the Old Age Survivors Disability Insurance (OASDI) program, (i.e. the Social Security program). Support was provided to disabled children, and children of deceased and disabled workers. More than $12 billion in benefits were paid for the support of these children.[13]

YOUNG HUSBAND-WIFE FAMILIES

The economic status of young married couples with children often is limited. Consumer expenditure studies in the last years of the 1980s indicate that young couples with and without children had expenditures that were greater than their after-tax incomes. Young husbands and wives with children had less formal education, however, than couples without children, and as a consequence had lower incomes.[14]

TOTAL COSTS

"Even after throwing in $200 billion a year in local public school funding, the U.S. spent $4,500 apiece on its 64 million children in 1990—vs. $11,300 each on 31 million elderly."[15]

From the perspective of the pediatric dentist

Individual families and society in general make enormous investments and sacrifices for children. But the presentation of these cost figures for rearing children are more than an interesting opportunity with which to compare our own individual family's expenses to those of national or regional averages. For the pediatric dentist, (especially in this period of economic uncertainty in the early 1990s) these are competitive realities within which individual families and our society must make

Table 10 ☐ Political jurisdictions with the highest and lowest average monthly number of children and families receiving AFDC support and cash payments per recipient: 1989.[13]

	Political jurisdiction	Amount
Number of children	California	1,203,395
	New York	646,664
	Illinois	429,105
	North Dakota	10,253
	Wyoming	9,131
	New Hampshire	8,863
Number of families	California	611,988
	New York	337,708
	Ohio	222,074
	Idaho	6,156
	North Dakota	5,534
	Wyoming	5,128
Payment per recipient	Alaska	$235.72
	California	212.72
	Massachusetts	203.55
	Mississippi	$39.70
	Alabama	39.52
	Puerto Rico	31.89

In 1990
$4,500 spent on each of 64 million children; and
$11,300 on each of 31 million elderly.

health expenditure decisions. While pediatric dentists cannot make the competitive decisions for parents, an awareness of the enormity of the costs in rearing children should provide an appreciation of the dilemma faced by both single parent and husband-wife families as they attempt to meet the economic needs of their children as well as their own personal needs.

And there is more

"In order to care for children, current earnings and future career opportunities may be diminished due to less time in the labor force for one or both parents. Parental leisure time is likely reduced... Studies that have attempted to calculate these indirect costs have found that they often can exceed the direct expenses on a child."[4]

BUT THEY'RE WORTH IT!

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CHILD AND ADOLESCENT INJURY

Child mortality rates in the United States are higher than those in other industrialized nations similar to our own in culture and history. "This excess in mortality is not due to a difference in death rates from all natural causes; rather, all the excess mortality among U.S. children can be attributed to injury" (Rosenberg *et al*, 1990). A World Health Organization report for 1991 on international injury mortality rates per 100,000, including violence (ages 0-24) showed 43 for the United States, 33 for Canada, 31 for France, 26 for Federal Republic of Germany, and 21 for Great Britain.

About 75 percent of the U.S. child mortality due to injury is caused by unintentional injury (motor vehicle collisions are the leading cause of unintentional childhood death). The other 25 percent is caused by violence, including homicide and suicide.

Data book of child and adolescent injury. Washington: National Center for Education in Maternal and Child Health, 1991.

Tuberculosis: revisited

Hashim S.M. Nainar, BDS, MDSc

Recent reports indicate a resurgence of an old foe: tuberculosis (TB). In the period 1985-87, TB increased 6.3 percent among blacks and 12.7 percent among Hispanics; it decreased 4.8 percent, however, among non-Hispanic whites.[1] A pilot TB skin testing program for seventh and tenth grade students in Boston (Massachusetts) public schools in 1986-87 found 8.9 percent tuberculin positivity rate in tenth grade students and 5.1 percent in seventh graders.[2] Majority of the children who tested positive were born outside the United States.[2] According to Dixie E. Snider (Centers for Disease Control, Atlanta, GA), American-born children who are at high-risk for TB include blacks, hispanics and children of migrant farm workers, whether or not the latter are members of a minority group.[3] He also noted that among children younger than 15 years, approximately 82 percent of cases occur in minorities.[3]

Trends reflect increasing occurrence of TB in persons infected with human immunodeficiency virus (HIV).[4] Since the HIV infection status of TB patients is not available, the impact of HIV infection on TB morbidity is not known.[4] It has been stated that unless public health officials treat yet undiscovered TB, possibly as many as 100,000 cases, primarily among intravenous drug users and homeless people who carry both it and HIV, TB infection may spread to many Americans who are not infected with HIV.[3]

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The picture of TB has been complicated by two factors:

- ☐ Tuberculin skin testing currently is the only available method of identifying persons with latent Mycobacterium tuberculosis infection.[5] Advanced HIV infection can cause, however, a negative skin test.[3,8]
- ☐ Community outbreaks of multidrug-resistant TB have been reported in Mississippi, California, Montana, Nevada, Utah and North Carolina.[6] Although it was not conclusively established that all the patients were infected with the same strain of tubercle bacilli (because phage typing was not done), epidemiologic evidence and drug-resistance patterns suggested a link.[6]

CLINICAL FEATURES

TB is an infectious granulomatous bacterial disease commonly caused by the acid-fast bacillus Mycobacterium tuberculosis.[7,8] Pulmonary tuberculosis is the chief form, although infection may also occur through the intestinal tract, tonsils, and skin.[7] Clinical signs and symptoms of TB are often inconspicuous.[7] The patient may suffer episodic fever and chills, but easy fatigability and malaise are often the chief early features.[7] There may be a gradual weight loss accompanied by a persistent cough with or without hemoptysis.[7] The microorganisms may disseminate through the blood stream giving rise to miliary tuberculosis and widespread involvement of many organs.[7] Lymphatic dissemination is less extensive and gives rise to TB lymphadenitis or

scrofula.[7] Primary tuberculosis of the skin or lupus vulgaris may occur in either children or adults as a persistent disease, appearing as papular nodules that frequently ulcerate.[7] These nodules may occur anywhere, but are particularly common on the face.[7] TB lesions are uncommon in the oral cavity and are usually secondary to a pulmonary disease.[7]

RISK OF TRANSMISSION

Tuberculosis is transmitted primarily by airborne droplets; infection occurs when susceptible persons inhale infectious droplets produced by the exhalations of persons with respiratory tract tuberculosis[8] The risk for infection is directly related to duration and intensity of exposure to air contaminated with these droplets.[8] Because tubercle bacilli contaminate the anterior mouth surfaces of individuals with active pulmonary tuberculosis, dentists may be at high risk, working in a milieu containing tubercle bacilli.[9] This is true not only of droplets of sputum expelled from the oropharynx during coughing, but even if sufficient contact is made with fluids in the anterior mouth.[9] Historically, tuberculosis has been regarded as an occupational hazard for health-care workers; presently, however, persons who work with high-risk patients or in high-prevalence communities are still considered at risk for new infection.[8]

PREVENTION OF TRANSMISSION

Centers for Disease Control (CDC), Atlanta (GA) recommends early identification and treatment of persons with active tuberculosis and prevention of the spread of infectious droplet nuclei by source control methods and by reduction of microbial contamination of indoor air.[10] CDC also recommends surveillance for tuberculosis infection among health-care workers by routine, periodic tuberculin skin testing, and preventive therapy for health-care workers when indicated.[10] Immunization Practices Advisory Committee (ACIP) recommends Bacillus of Calmette and Guerin (BCG) vaccine for exposed tuberculin skin-test-negative infants and children; and for groups with an excessive rate of new infections (greater than one percent per year).[8] ACIP no longer recommends BCG vaccine for health-care workers and states that health-care workers should be protected by adequate surveillance by periodic tuberculin skin testing and isoniazid preventive therapy for all skin-test-positive health-care workers who are at high risk for developing disease.[8] These persons include recent skin-test converters and workers who are close contacts of TB patients or those who have medical conditions such as diabetes, renal failure, or immuno-suppression associated with therapy or disease.[8] BCG vaccine should be reserved for persons whose skin test is negative to 5 tuberculin units of purified protein derivative (PPD) tuberculin.[8]

Dentists may be at high risk of contracting tuberculosis.

In addition, in the dental office, the following precautions will be helpful:

- ☐ Routine use of Universal precautions including the use of gloves and masks, which are even otherwise mandatory.
- ☐ Routine use of rubber dam to minimize aerosol contamination and reduce the risk of droplet infection and also to reduce exposure to saliva.
- ☐ Routine use of disinfectant solutions for impressions, appliances, etc.
- ☐ Patients suspected of tuberculosis should be referred to a physician for evaluation.
- ☐ TB positive patients should be treated in consultation with a physician.
- ☐ Strict asepsis and isolation of operatory used for treatment of TB positive patients is essential.
- ☐ Additional protection such as disposable gowns and surgical caps may be used by the dental team while treating TB positive patients.
- ☐ Use of disposable tubes and masks for nitrous-oxide sedation to prevent patient-to-patient transfer. Possible use of airfilters in the nitrous-oxide sedation units needs to be explored.
- ☐ TB positive patients should be scheduled early in the morning or late in the afternoon to reduce the possibility of patient-to-patient transfer in the waiting area.

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COGNITIVE DEFICITS FROM LOW-LEVEL LEAD TOXICITY

Over the past fifteen years, knowledge of the spectrum of lead neurotoxicity has increased dramatically. Since 1979, when Needleman and colleagues showed that deciduous tooth lead levels were inversely related to intellectual performance and behavior in school-age children, many well-designed epidemiological studies have confirmed that low-level, subclinical lead exposure in early life is associated with decrements in childhood cognitive performance. These human findings cohere with substantial primate evidence, which consistently demonstrates measurable and long-lasting neurodevelopmental deficits from exposure to low levels of lead.

Bellinger and colleagues present strong evidence that subclinical, very low-level, lead burden in early life impacts later cognitive performance, that this effect results from lead rather than some other factor, and that the CDC's goal of reducing children's lead exposures to the lowest possible levels is appropriate. This longitudinal study presents results of the 10-year neuropsychological evaluation of a cohort of middle-class and upper-middle-class children with low life-time lead exposures. In the study population, mean blood lead levels collected between age 6 and 57 months ranged from 6.3 to 7.8 μg/dL; no blood lead levels exceeded 24 μg/dL; no blood lead levels exceeded 24 μg/dL. These blood lead levels are comparable with those of the general population.

Cummins, S.K. and Goldman, L.R.: Comments on low-level lead toxicity in children, in Pediatrics, 90:995-997, December 1992.

ABSTRACTS

Cheatham, B.D.; Primosch, R.E.; Courts, F.J.: A survey of local anesthetic usage in pediatric patients by Florida dentists. J Dent Child, 59:401-407, November-December 1992.

Local anesthetic toxicity in the child dental patient is a concern of the dental profession. A survey of 117 Florida dentists was conducted to determine their local anesthetic practices in treating children. Results indicated that a fifth of the respondents might use local anesthetic levels that could cause potential CNS toxicity in the smaller and younger children they treat. It is the responsibility of the dental profession to recognize the differences in treating this group of patients, and the serious consequences that might occur when maximum recommended levels of local anesthetic are exceeded.

Local anesthetic practices; CNS toxicity

Weerheijm, K.L.; Gruythuysen, R.J.M.; van Amerongen, W.E.: Prevalence of hidden caries. J Dent Child, 59:408-412, November-December 1992.

Clinical evaluations of the first and second permanent molars were compared with radiographic evaluations of the same teeth, for 359 patients (between six and eighteen years old) of the pediatric department of the Academic Centre for Dentistry Amsterdam (ACTA). The teeth were professionally cleaned and dried before the clinical evaluation. Despite the thorough examination, taking into account the fact that all discolorations and/or decalcifications were noted, 15 percent of the teeth that did not show signs of enamel caries clinically, showed a dentine lesion ont he bitewing radiograph. These 15 percent of teeth with hidden caries were found in 7.5 percent of the population studied. The absence of clinical signs of occlusal enamel caries or dentine caries does not guarantee a sound dentition. Sealant treatment of teeth that are sound (both clinically and radiographically) is justified, therefore, soon after tooth eruption.

Hidden caries; Permanent molars; Epidemiologic characteristics

Hodges, E.D.; Durham, T.M.; Stanley, R.T.: Management of aspiration and swallowing incidents: a review of the literature and report of case. J Dent Child, 59:413-419, November-December 1992.

A potential risk associated with providing daily dental care is the aspiration or swallowing of foreign objects. The literature states that a high percentage of aspirated or swallowed foreign objects have a direct or indirect dental origin. While many incidents are avoided by reflex action in the patient and/or quick response of the dental team, complications occur which endanger the health of the patient and create life threatening situations. Proper management must be accomplished when these incidents arise to insure the health and safety of the patient, as well as protect the practitioner from potential litigation.

This article presents a review of the literature on the prevention, management, and documentation of aspirated or swallowed foreign objects as they apply to treating children and the medically, mentally or physically handicapped populations. A case report is provided which applies the principles outlined in the review of the literature.

Foreign objects, aspiration, swallowing; Prevention; Management; Documentation

Rinchuse, Donald J.; Rinchuse, Daniel J.; Browdie, G.S. *et al*: Demographic and psychosocial characteristics of Western Pennsylvania school-age, tobacco users. J Dent Child, 59:425-436, November-December 1992.

A 25-item tobacco usage questionnaire was presented to 2,189 subjects in grades 1 through 12 in a school district in Western Pennsylvania. It was found that thirty percent (30 percent) of the subjects were former or current cigarette smokers. Approximately 20 percent of the subjects reported using snuff, while approximately 16 percent reported using chew. Use of smokeless tobacco was found to be associated with such variables as grade level, school grade-average, parents' education, parents' use of tobacco, peer tobacco usage, and participation in certain sports.

Smokeless tobacco: snuff, chew; Users, demographic distribution

Hanes, C.M.; Myers, D.R.; Dushku, J.C. *et al*: Gender differences in the characteristics of dental services provided by children. J Dent Child, 59:437-443, November-December 1992.

The purpose of this project was to describe the differences and similarities in the practice of dentistry for children by male and female dentists. A once-mailed survey with a series of questions regarding the characteristics of their dental practices was sent to a random sample of 3,000 dentists. There were 1,154 useable responses (39 percent). Approximately 8 percent of the respondents were women, which is representative of the percentage of female dentists practicing in the United States. Chi square analysis was employed.

There were differences in the practice characteristics of the male and female dentists responding to this survey. The female respondents were: significantly younger; had been in practice for a shorter period of time; more likely to

be employees rather than solo practitioners; more likely to treat younger patients; less likely to do comprehensive orthodontic treatment and more likely to use physical restraints than their male counterparts.

Pediatric dentistry; Male and female practitioners; Differences and similarities in practice patterns

Fadavi, S.; Adeni, S.; Dziedzic, K. *et al*: The oral effects of orotracheal intubation in prematurely born preschoolers. J Dent Child, 59:420-424, November-December 1992.

This cross-sectional study of fifty-two prematurely-born children, ages two to five years, evaluated the long-term effects of oral intubation at birth on palatal architecture, crossbite malocclusion, and enamel structure. Seventy percent showed a high palatal vault, with palatal grooving in 25 percent; 36 percent had enamel defects in the maxillary primary incisors; and 17 percent had posterior crossbites. The mean palatal depth was 12.9 mm, as compared to 11.4 mm for a group of 45 nonintubated, normal healthy children (the difference was significant at $\alpha = 0.05$). There are significant iatrogenic defects from prolonged neonatal intubation with this sample of preschoolers.

Oral intubation; Effects on oral structures

Waldman, H.B.: Children are expensive. J Dent Child, 59:444-449, November-December 1992.

Rearing children is not cheap. Family and socioeconomic costs are explored.

Rearing children; Cost

Nainar, H.S.M.: Tuberculosis: revisited. J Dent Child, 59:450-452, November-December 1992.

Recent upsurge of tuberculosis (TB) has been reviewed. Clinical features of TB have been briefly described along with possible risk of transmission. Methods for prevention of transmission have been reported, including suggestions pertaining to prevention in the dental office.

Tuberculosis; Transmission; Prevention

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