Comparison of Submandibular/ Sublingual Salivary Flow Rates in Children and Adolescents

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ABSTRACT

Purpose: This study compared age related changes in submandibular/sublingual salivary flow rates in children and adolescents.

Methods: Twenty-nine children between the ages of 5 and 14 years were evaluated. A group of adults ages 18 to 39 years were also evaluated. No subject was taking medication which could have affected salivary flow rate. Salivary flow was stimulated using a single application of 3% citric acid during a 5-minute test period. A group of 12 children ages 5 to 9 years was compared to a group of 16 adolescents ages 10 to 14 years.

Results: Analysis using a Wilcoxon Rank Sum Test with a .05 level used for significance showed that the salivary flow rates of the 2 groups were not significantly different.

Conclusions: No significant difference was found between the stimulated submandibular salivary flow rates of children ages 5 to 9 years and 10 to 14 years. (*J Dent Child*. 2004;71:38-40)

KEYWORDS: SALIVA, SUBMANDIBULAR, SECRETORY RATE, CHILDREN

It has become important when treating pediatric dental patients to perform a risk assessment regarding each patient's probability of experiencing dental caries in the future. Two risk factors, which are often cited, but not researched in depth in pediatric patients are the quality and quantity of an individual's saliva. Specific properties of saliva, such as flow rate, pH, buffering capacity, and bacterial counts, are important in determining the oral health of individuals of all ages. Numerous studies have been conducted on the changes in these properties, which occur with aging. The majority of studies evaluating changes in salivary flow rates have concentrated on individuals older than 18 years. Several early studies included children in their samples. For example, when comparing parotid flow rates, Becks and Wainwright[1] and Lourie[2] studied subjects ages 5 through 9, and 3 through 14 years respectively. Becks and Wainwright[1] found that the salivary flow rate for children 5 through 9 years old was lower than the rate for 10- to 14-year-old children. Lourie,[2] however, found the opposite to be true, with the flow rate being greater in children ages 5 through 9 when compared to the 10 through 14 years group. Neither study specifically compared these age groups statistically, but the data, which is presented, is contradictory.

More recently, studies comparing whole salivary secretion rates have targeted young children and adolescents. Bagesund[3] and Kavanagh[4] calculated flow rates in adolescents ranging in age from 7 to 27, however, no comparison of age subgroups was made. Watanabe[5,6] has extensively studied whole salivary flow rates in 5-year-old children, but the values obtained have not been compared to other age groups. Soderling et al[7] looked at whole salivary flow rates and concluded that 15-year-old children have a significantly higher flow rate than 10-year-old children, but there is no difference in the flow rate of 15- and 17-year-old children. Finally, an extensive study performed by Bretz[8] evaluated unstimulated flow rates for whole saliva, and involved 447 children from 7 different sites. This study found that the flow rate in adolescents ages 8 to 12 was significantly higher than children ages 4 to 7 years.

Authors have also investigated flow rates from individual salivary glands, such as the parotid and submandibular. Tylenda et al[9] used the term "submandibular saliva" to describe the secretions that were submandibular/sublingual saliva due to the fact that the submandibular and sublingual gland ducts were either in close proximity or fused .[10]

As is the case with whole saliva, most of the research evaluating age-related changes in submandibular salivary flow rates

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has been carried out using adults as subjects. In 1973, Blomfield[11] reported submandibular salivary flow rates for a control group of subjects ages 5 to 18 in a study evaluating the effects of cystic fibrosis on saliva. No breakdown of the sample into smaller age groups was available. Twetman et al[12] published submandibular salivary flow rates in children between the ages of 10 and 12 as part of a study measuring fluoride concentration in saliva, but no comparison to other groups was made.

In spite of the volumes of literature published on the topic of saliva, little exists on the topic of age-related changes in submandibular flow rates in children younger than 10 years. As the dental profession evaluates risk factors and their effects on dental caries, it is important to investigate each factor since this will shape future preventive and restorative strategies. This study measured the submandibular flow rate of children between the ages of 5 and 9 and compared it to the flow rate of adolescents ages 10 to 14. A sample of adult subjects was included for comparison with other submandibular salivary flow rate studies.

METHODS

Twenty-nine children between the ages of 5 and 14 with a median age of 10 were included in this study. A group of 21 middle-aged subjects, ages 18 to 39, was also evaluated for comparison with previous studies. All subjects were healthy and none were taking medications that could affect salivary flow rates. Written informed consent was obtained from a parent, guardian, or subject of legal age. Oral consent was also obtained from all minors before saliva collection. All patients rinsed their mouths with tap water and expectorated before the collection procedure. Salivary flow was stimulated with a single application of 3% citric acid, which was painted onto the dorsal surface of the tongue with a cotton swab. Wharton's duct was isolated in a manner similar to that used by Fox.[13] Dri-angles (Dental Health Products, Inc., Youngstown, NY) were placed to cover Stenson's duct on each side and a cotton roll was placed in the vestibule anterior to the lower incisors. Secretions were collected for a 5-minute period using sterile polyethylene pipettes. All collections were performed between the hours of 10 AM and 4:30 PM with the majority occurring between 10 AM and 12:45 PM. The salivary flow rates obtained were values for 5 minutes from 2 glands. To obtain a measurement of flow rate in mL/min/gland these values would have to be divided by 10. The flow rates for the 2 young age groups were compared using a Wilcoxon Rank Sum Test with a .05 probability level used for significance.

RESULTS

The mean flow rates and standard deviations were calculated for 49 subjects. The values obtained for the 3 groups of subjects are listed in Table 1.

One subject in the young age group did not have a measurable amount of saliva in the 5-minute collection period. This subject was not included in the calculation of the mean or statistical analysis.

Table 1. Mean Submandibular Salivary Flow Rates

Age (years)	Number	Mean ± S.D. (mL/5 min.)
5-9	12	1.40 ± 0.95
10-14	16	1.25 ± 0.96
18-39	21	1.90 ± 1.13

There was no statistically significant difference found between the 5 to 9 group and 10 to 14 age group (P=.37, >.05).

DISCUSSION

This study concluded there is no difference in the stimulated submandibular salivary flow rates of 2 groups of young individuals. This contradicts previous studies that found differences in salivary flow rates between these age groups. Numerous factors may explain this contradiction. This study evaluated submandibular saliva, whereas previous studies evaluated either whole or parotid saliva. Variations in collection techniques, saliva stimulation, fasting requirements, and time of day of collection all could have caused differences in results. The current study did not require that patients fast for a standard period of time prior to collection of saliva.

The mean flow rate for middle-aged subjects was similar to the unstimulated value obtained by Tylenda et al[9] for a comparable age group. The stimulated value obtained by Tylenda et al[9] was 2 to 3 times greater than the unstimulated value.

This discrepancy was due to the fact that the stimulus in that study was applied every 30 seconds, while in the current study the stimulus was only applied once. Therefore, the single application of citric acid used in this study may not have greatly increased salivary flow.

Future studies need to be performed on the salivary flow rates of children. Both whole saliva and single gland flow rates need to be evaluated further using a standard collection regimen.

CONCLUSIONS

This study concluded there is no statistically significant difference between the stimulated submandibular salivary flow rates for 2 groups of children ages 5 to 9 and 10 to 14 years.

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