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Relationship Between Xerostomia and Gingival Condition in Young Adults

Section: D206

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**1. When was the work published?**

This study was published in the February 2015 edition of the *Journal of Periodontal Research*.

**2. What are the main points of the article? Write a 150-200 word summary of the article that accurately conveys the content of the article.**

This study aimed to see if there was a relationship of xerostomia with gingival condition in young adults as well, not just in elderly individuals as previous studies implied. More specifically, they hypothesized that xerostomia may negatively affect the gingival condition in young adults and that there were specific contributing factors, such as coffee/tea intake, that were related to xerostomia in systemically healthy young adults.

They gathered 2,077 healthy students in the range of 18-24 years of age. They assessed their gingival condition by checking for BOP and pocket depths $\geq $4 mm. In addition, each student was given a questionnaire that assessed additional factors such as oral hygiene habits, coffee/tea intake, information on dry mouth and nasal congestion. Upon gathering the data, they found that 8.8% responded that their mouths frequently or always felt dry. A correlation between BOP, dental plaque formation and xerostomia was found. There was no relationship found between xerostomia and PD of 4 mm or greater. The structural model indicated that xerostomia was related to dental plaque formation. However, the lower the level of plaque, the lower the % of BOP. They also found that xerostomia was associated with the intake of coffee/tea and nasal congestion with a p < 0.01. As a result, the researchers came to the conclusion that xerostomia did not directly cause gingival disease but it was the accumulation of dental plaque which was the contributing factor. Since xerostomia causes an increase in dental plaque formation, there was an indirect relationship to gingival disease and xerostomia. As a result, young adults with xerostomia should be considered at risk for gingivitis and therefore screened.

**3. Does the work meet the standards to be considered an appropriate/academic/scholarly source? Justify your choice.**

This study does meet the standards to be considered an appropriate scholarly source for a few reasons. Firstly, it is a journal article and journals represent the most current source of information in all disciplines. This article is also peer reviewed which is a critical indicator of quality. By having been peer reviewed, we the readers know that at least two or more experts in the field have critically evaluated it before publication. Since there is complete anonymity between the authors and reviewers in peer reviewed articles, bias was removed or minimized. The article was also accepted for publication in 2014, so it is current data and less than five years old, which is also an important factor when it comes to meeting standards. Lastly, the *Journal of Periodontal Research* is known to provide consistently high quality of scientific research so it is a reliable source.

**4. Are the qualifications of the author(s) appropriate for an academic article? Briefly describe the authors’ qualifications.**

Yes, all of the authors are affiliated with the dental and health departments of Okayama University in Japan. They have years of experience and have contributed to multiple research publications. S. Mizutani, D. Ekuni, T. Azuma, M. Yamane, T. Tomofuji, and K. Kataoka are all Dentists at the Department of Dentistry in Okayama University in Japan. Dr. Mizutani has been part of 46 other published articles and is also an educator and researcher at Tokushima University. Dr. Ekuni, DDS, Ph.D., is currently a lecturer at Okayama University. He was a Post-Doctoral Fellow in the Department of Oral Biological & Medical Sciences at the University of British Columbia, Vancouver, Canada. He is also a member of the International Associate for Dental Research and the Japanese Society of Periodontology. Dr. Tomofuji, DDS, Ph.D. is a Senior Assistant Professor in Okayama University Hospital. He was a Post-Doctoral Fellow at the Chonbuk National University, South Korea. He is a councilor of the Japanese Society for Dental Health and serves on the editorial board of Journal of Dental Health.

**5. Is the purpose clearly stated? Restate the purpose of the paper in your own words.**

Yes, the authors clearly stated the purpose of their study in the objective of the abstract, as well as in the introduction of the paper. The purpose of the study was to evaluate the relationship between xerostomia and gingival conditions. The researchers wanted to see whether or not xerostomia had an indirect or direct effect on gingival condition in young adults specifically, as opposed to only in older age groups as previous studies tested.

**6. Is the experimental design clearly described? Describe the design in your own words.**

In this study a retrospective cross sectional design was used. The researchers assessed the sample population in one set and time, which was on the Okayama University first year student health screening day. The data collected was based on conditions and oral health habits that had already occurred in the volunteers. As a result of using this design, there was no control group and no manipulated variables. Instead, the researchers accumulated data to see how many subjects were considered to be “xerostomic” at that moment, by using a Likert-type questionnaire. They divided the sample into three possible groups based on their answers. They then worked backwards to identify the causative factors of xerostomia, such as coffee/tea intake (via questionnaire) and the causative factors of gingival disease such as BOP, PI and PD’s by performing an oral exam. Pathway analysis was used to identify the connections between these variables to xerostomia and gingival conditions.

**7. Have the possible influences on the findings been identified and controls instituted? Describe and evaluate the use of controls and possible influences (spurious variables)**

The only controls implemented in this study, were to exclude any volunteers who were current smokers, had systemic disease, were taking medication, were age 25 or older or had provided incomplete data. This was done in order to minimize bias and exclude the possibility of volunteers being diagnosed with xerostomia or gingival disease due to other conditions, outside of the ones they were examining. It has been proven that certain systemic disease medications cause xerostomia, as well as does smoking. Placing controls on these variables by not including them in the study was successful. Other than the mentioned above, there were no other controls placed or variables manipulated, as it was a retrospective cross sectional study. The study failed to identify many other possible confounding variables that could have very well affected their results.

**8. Has the sample been appropriately selected (if applicable)? Describe the sample used in the study, and evaluate its appropriateness.**

The sample used in the study was a total of 2,077 systemically healthy first year students from Okayama University in Japan. Of the 2,077 volunteers, 1,202 were male and 875 female, all within 18-24 years of age. At the university, there were a total of 2,303 first year students that were initially going to be used for the study, but 128 were excluded due to factors that may have affected the results. Individuals who had a systemic condition, were smokers, age 25 or older, were taking medicine or did not provide full data on the questionnaires, were excluded from the study.

 The sample selection had both pros and cons. Although it was an acceptable number of subjects and a representative portion of the population that they wanted to test, it had some flaws. The researchers only provided the age range and sex of the subjects. The study did not provide race or ethnicity and they also had much more male subjects than females. They also only used first year students because it was mandatory by school policy, for each new student to undergo an overall health screening. It would have been more appropriate and random, had they used subjects from the entire university, regardless of whether or not they were first year students.

**9. Has the reliability and validity of the article been assessed? Evaluate, and state the test/diagnosis results.**

All examiners were part of the same institute and department at Okayama University. They each used the same questionnaires and performed the same oral examinations on each subject in the sample. A Xerostomia Inventory (XI) was developed to confirm the validity of the standard dry mouth questions subjects answered. To assess levels of dental plaque, Oral Hygiene Index- Simplified was used. Measurements during the oral exam were made using a Community Periodontal Index probe at six sites per tooth on ten specific teeth. Each examiner assessed the percentage of teeth that exhibited BOP and the severity of gingival disease was evaluated by the number of teeth that presented with PD’s of $\geq 4mm$. Intra-examiner and inter-examiner reliability was achieved for repeating probing pocket depths on the ten teeth and yielded a kappa statistic of more than 0.8. A k value greater than 0.7 is typically considered to be a good level of agreement amongst the examiners.

**10. Is the experimental therapy compared appropriately to the control therapy? Describe and evaluate the use of the control group.**

Since this was a retrospective study, there was no control group, manipulated variables, or experimental therapies provided. A path analysis was used which aimed to describe the magnitude of the relationship between xerostomia and gingival condition in young adults, using a specific set of variables as a guide.

**11. Is the investigation of sufficient duration? Evaluate, and explain your reasoning.**

No, I do not believe that the investigation in this study was of sufficient duration. Since the study used a cross-sectional design, they took only the data at that moment in time and generalized it to an entire population of young adults. In order for the investigation to be sufficient enough to generalize to a larger population, a longitudinal study would have been more informative and significant in this specific case. Had the study been performed over a longer duration, the researchers could have monitored changes in the gingival condition of the subjects, to help confirm that it was the specific factors they mentioned, which caused gingival disease and not directly the xerostomia. There were too many factors in the study that could constantly change, which require proper monitoring in order to make a claim such as xerostomia does not directly cause gingival disease. In order to see the cause and effect, there needs to be manipulation of some of these variables and this study was incapable of doing that in one day and time.

**12. Have the research questions or hypothesis been answered? Restate the research questions and/or hypotheses in your own words, and describe if or how they are answered.**

The hypothesis that xerostomia in young adults has a relationship and effect on gingival condition has been confirmed in the study. Furthermore, the belief that variables such as coffee/tea intake, nasal congestion and higher plaque formation may contribute to xerostomia has also been confirmed by finding a correlation between them. The correlations between each item asked in the dry mouth questionnaire and the XI were assed using the Mann-Whitney U-test with Bonferroni correction and yielded a p < 0.05/6, which indicated a significant difference. The questionnaire responses, age and oral conditions of the three groups were then compared using the chi-square test and Mann-Whitney U-test, resulting in a p < 0.05/3, indicating a significant difference.

Those subjects who indicated they consumed higher amounts of caffeine/tea or experienced nasal congestion, were more likely to report they had dry mouth more often. The results and data obtained revealed that xerostomia directly lead to a higher plaque accumulation, which then indirectly lead to a higher BOP percentage in the young adults. BOP is a sign of gingival inflammation and it was found in the subjects who presented with a higher plaque index. To support the findings even more, oral health behaviors indicated that subjects who had better oral hygiene habits, had a lower plaque index and lower BOP. This confirms that the variables are inversely related and that xerostomia does not directly cause gingival inflammation, rather it is indirectly related to it.

**13. Do the interpretations and conclusion logically follow the experimental finding?**

**Restate the conclusion, and explain if or how they follow the experimental findings.**

The interpretations and the conclusion do logically follow the experimental findings. The results revealed that xerostomia was indirectly related to gingival disease activity through the accumulation of dental plaque. This was consistent with the researcher’s original aim in proving that xerostomia and other variables must be present in order for there to be an effect on gingival health. These findings were valid by seeing that subjects from the sample who were in the xerostomic group, presented with larger accumulations of plaque. As a result, the higher plaque index also lead to data showing more %BOP. Therefore, it was not the xerostomia itself which directly caused the presence of gingival disease or inflammation. It was the plaque formation as a result of variables that caused xerostomia, which caused the gingival disease.

 The experimental findings also noted that the subjects who reported better oral health behavior presented with reduced levels of dental plaque and %BOP. Therefore, implementing good oral health habits and evaluating xerostomia could prevent periodontal disease such as gingivitis in young adults. The xerostomia risk factors assessed such as coffee/tea intake and nasal congestion, indicated that subjects who reported more intake and nasal congestion, also reported having more frequent dry mouth. All of the above findings indicate that it is necessary to test young adults as well, not only the elderly, for the possibility of gingivitis if there is evidence of dry mouth or xerostomic conditions.

**14. Do you agree or disagree with the article and findings? Explain why?**

I do agree with the findings of the study, in that xerostomia has an indirect effect on gingival health. Xerostomia or dry mouth is a condition in which salivary flow is normally decreased or the composition of salvia is changed. One of the functions of saliva is to protect the oral cavity and help clear biofilm and plaque. When there is an absence of saliva, it can cause an increase in plaque formation in the oral cavity. As a result, a higher plaque index may lead to bleeding upon probing and is more likely to result in gingivitis due to the increase of bacteria in the oral cavity. Oral hygiene care, systemic health and oral habits are all contributing factors which may affect the gingiva outside of xerostomia and vice versa. The results this study yielded evidence that xerostomia in of itself does not lead directly to gingival disease.

 However, I disagree with the choice of experimental design because it did not allow the researchers to monitor subjects over a longer duration or to manipulate variables. They had nothing to compare their findings to, except by mentioning previous studies, which did not all correlate with their findings either. There were too many confounds that did not have controls placed on them which are very likely to have a relationship with gingival disease and xerostomia. These variables should have been taken into consideration.

**15. What would you change in the article? Why? Think outside of the box. What would you add or delete.**

I think that the research had a few flaws especially in terms of the sample and survey used. For starters, there were more male than female volunteers, which could flaw the study because past research has proven that prevalence of xerostomia was lower in men than in women. Also, women may experience a difference in gingival health during menstruation due to a change in hormone levels and this was not taken into consideration. Another problem I found with the sample was the location where volunteers were found. The aim of the study was to examine the relationship between xerostomia and gingival condition in young adults, not just those which are first year university students.

It is not legitimate to generalize a relationship between the two variables by testing a sample size in one set environment at a specific time. Not all young adults attend a university in Japan. The cultural habits and ethnicity of volunteers could be confounding factors. What they could have done was perform the study in diverse areas on multiple occasions, with young adults using random selection. They also failed to ask the volunteers if any other recreational drugs were used outside of smoking. The study mentioned that caffeine was related to xerostomia and considered consumption of specifically 150 mL green tea or coffee only. However, there are plenty of other caffeinated drinks and teas that volunteers could have been consuming and that was not addressed on the survey given.

The fact that they mailed the questionnaire ahead of time to the students could also mean that students provided false information and there could have possibly been a Hawthorne effect. The students knew that they were going to undergo a health screening which included a dental exam. This may cause some validity issues in the study because it could be that some of the subjects altered their normal behaviors prior to the study. All of the above mentioned could be considered confounders and could have had an influence on the results. Not enough controls were placed on these variables I mentioned.