

## CJDH STUDENT ESSAY AWARD

In 2016, the editorial board of the *Canadian Journal of Dental Hygiene* launched an essay award competition for dental hygiene students in their 2nd, 3rd or 4th year of a Canadian diploma or baccalaureate program. This competition, proudly sponsored by PHILIPS Sonicare, encourages students to develop a love for writing and research and to recognize the possibilities that such endeavours offer for personal and professional growth. The editorial board is delighted to publish the winning entry from its inaugural competition. The essay below ably addresses the Canadian Dental Hygienists Association's 2015–2018 dental hygiene research agenda category of "risk assessment and management."

# Implications of xerostomia and caries in community-dwelling older adults

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## INTRODUCTION

Aging refers to the biological changes that occur over a life time.<sup>1</sup> The health-related changes that people experience as they grow older can be correlated to the cumulative trauma on the cells and molecules over time.<sup>1</sup> In recent years, there has been an increasing number of studies examining the health care of elderly people due to their ever-growing demands for health care services. In Canada, the population of older adults (ages 65 and older) increased by 29.1% between 2006 and 2011, making it the most rapidly growing population group in the country.<sup>2</sup> In fact, there are more Canadians over 65 years of age than under 14 years of age for the first time in history.<sup>3</sup> This increase in the population of older adults necessitates that health care professionals respond to the needs of Canada's aging population. The health and socioeconomic status of older adults, as well as their diverse cultural and educational backgrounds must be considered when providing oral care.<sup>4</sup> Furthermore, 80% of elderly people are living in private homes in urban areas (community dwelling) while the remainder live in health care-related facilities.<sup>4,5</sup> As a result, oral health care professionals need to provide individualized care for a diverse population of older adults, each with unique health needs.

Generally speaking, the ability of the body to respond to environmental stimuli and maintain optimal health declines as individuals grow older.<sup>6</sup> In recent years, life expectancy has increased along with improvements in general well-being, due in large part to medical advancements.<sup>4,7</sup> However, having a longer life implies that the likelihood of developing chronic diseases increases over an individual's life span.<sup>4</sup> Some of the chronic diseases that are commonly seen in older adults include cardiovascular diseases, chronic pulmonary obstructive disease, pneumonia, arthritis, and diabetes mellitus.<sup>4,6,8</sup>

There are physiological changes related to aging, including changes in oral health and immune functions, which increase the risk of developing acute and chronic diseases.<sup>6</sup> Many changes to oral health are associated with systemic diseases and the medications prescribed for the treatment of these diseases.<sup>6</sup> Frequently, oral health takes a back seat to other health concerns that are viewed as more important. However, oral health is crucial for quality of life (QOL) in that it plays a role in nutrition, socialization, emotional state, daily functioning, and life satisfaction.<sup>9</sup> People are now keeping their teeth longer, which thereby decreases edentulism rates for this age group.<sup>8</sup> However, longer retention of the dentition is not the only factor that determines older adults' oral health-related quality of life (OHRQOL).<sup>8</sup> Reduced salivary flow (hyposalivation) can also influence the OHRQOL among older adults.<sup>8</sup> The reduction in salivary flow negatively impacts the oral mucosa as it can lead to difficulty swallowing, chewing, speaking, and oral discomfort.<sup>7</sup> In addition to its effect on daily functioning, hyposalivation increases the risk of developing oral diseases, such as candidiasis, and for those retaining their teeth, periodontal diseases and caries.<sup>7,10</sup>

To improve the QOL of community-dwelling older adult clients, oral health care professionals should focus on early intervention.<sup>8</sup> Using age-specific assessment tools will facilitate the provision of quality oral health care services for the members of this age group.<sup>7</sup> Comprehensive examination tools should include all factors that apply to older adults, as they have different needs compared to other age groups.

This essay reviews the literature on oral health-related changes associated with aging among community-dwelling older adults ages 65 to 75. Specifically, the essay focuses on salivary flow changes, caries risk, and assessment tools

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that can be adapted in practice to facilitate the prevention and early detection of oral conditions that may impact QOL. A search was conducted on PubMed and in the American Dental Association Center for Evidence-Based Dentistry database (<http://ebd.ada.org/en/evidence/evidence-by-topic>) for studies and publications that provide evidence of oral health changes among community-dwelling older adults and their implications for dental hygiene practice.

### AGING AND SALIVARY FLOW

Saliva is essential for speech, chewing, and digestion.<sup>6,7</sup> It plays a vital role in maintaining the integrity of the oral cavity by providing lubrication as well as antimicrobial effects.<sup>6,7,11</sup> Additionally, saliva helps to maintain the stability of the dentition by remineralizing enamel through provision of minerals such as calcium and phosphate ions.<sup>11</sup> A decrease in salivary flow can affect oral health and QOL as it can increase the risk of caries, periodontal diseases, and candidiasis, and lead to discomfort and difficulty chewing and swallowing.<sup>6-8,11,12</sup> A decline in the cellular functions that occurs as part of the aging process can impact the quality and quantity of saliva.<sup>6,11,13</sup> Among community-dwelling older adults, reduction of salivary flow (hyposalivation) is one of the factors that negatively influences their OHRQOL.

According to a literature review and a cross-sectional study there are significant reductions in the whole saliva, submandibular, and sublingual salivary flow rates among older adults compared to younger individuals.<sup>11,14</sup> These changes were thought to be associated with a decrease in the function of the salivary gland. Reductions in both stimulated and unstimulated whole saliva, as well as submandibular and sublingual salivary flow rates, were found to be related to the process of aging.<sup>11</sup> A cross-sectional study on 540 adults also reported age-related changes in salivary flow among older adults.<sup>14</sup> Another cross-sectional study found that, in comparison to young and middle-aged adults, older adults have lower stimulated salivary flow rates.<sup>15</sup> These results support the hypotheses that salivary flow decreases as a consequence of aging and that age-related hyposalivation is one of the factors contributing to xerostomia among older adults.<sup>11,14,15</sup>

In addition to the impact of aging on salivary flow, there is strong evidence that hyposalivation leading to xerostomia is secondary to systemic conditions and the medications used to treat them.<sup>8</sup> Older adults are more likely to be taking multiple medications compared to the rest of the population.<sup>13,16,17</sup> Xerostomia has been reported as a side effect of systemic medications. A cross-sectional study found that the prevalence of xerostomia among the participants who were taking at least one medication was 28%, compared to 7.5% for those who were not taking medications.<sup>18</sup> In that study, medication exposure was deemed to have a stronger association to xerostomia than age or gender.<sup>18</sup> This finding was confirmed in another

cross-sectional study on the impact of medication on salivary flow among older adults, which contributes to the feeling of dryness in their mouth.<sup>18,19</sup> Age, gender, and edentulism appear to have less of an effect on xerostomia than medications.<sup>19</sup> Furthermore, a longitudinal study found that exposure to aspirin and antidiuretics contributes to xerostomia.<sup>20</sup> In addition, anticholinergic agents were found to be associated with xerostomia.<sup>13,16</sup>

When examining the evidence in the literature, there are conflicting findings regarding whether or not salivary flow decreases with age alone. As noted earlier, there are factors other than the aging process that are significantly associated with a dry mouth. Medication is strongly associated with these changes, more so than the process of aging alone. Individuals who are on medications are more likely to experience reduction in salivary flow, which contributes to xerostomia.<sup>18,19</sup> Regardless of the cause, the significant reduction in the salivary flow found in older adults contributes to a decline in their quality of life.<sup>11-20</sup> In order to pinpoint the impact of aging on salivary flow among community-dwelling older adults, more research is needed.

The number of older adults who experience dry mouth is steadily increasing as a consequence of improved life expectancy. This situation puts more demand on oral health professionals as they need to respond to an increasing number of clients with dry mouth. Effective assessment and management should be adapted for older adult clients to ensure enhancement of their QOL.<sup>21,22</sup>

### AGING AND CARIES RISK

An issue that is gaining more attention in the literature is the prevalence of caries among older adults. According to the Public Health Agency of Canada, "96% of adults have had a history of cavities."<sup>23</sup> The presence of caries is one of the factors that contributes to the decline in QOL for this age group. Some of the risk factors associated with caries development include history of caries, presence of plaque, gingival recession, systemic diseases, salivary flow, fluoride sources, acid challenge, and smoking.<sup>8,24-27</sup> The presence of these factors may not only increase the individual's caries risk but also affect the health of the periodontium in general. It is important for oral health professionals to be aware of all the factors that contribute to an increased caries risk among older adults. Emphasis on prevention and early detection is essential in order to maintain or improve QOL.

A literature review revealed that older adults are a more caries-active group compared to adolescents.<sup>24</sup> The explanation given was that older adults tend to develop more caries due to the use of prosthodontic appliances. Specifically, the use of a partial denture was reported to have caused the difference in caries incidence between adolescents and older adults.<sup>24</sup> This study found, moreover, that older adults experience more coronal caries than root surface caries.<sup>24</sup>

In contrast, many other studies report a higher prevalence of root surface caries among older adults.<sup>25-29</sup> Furthermore, a longitudinal study concluded that there is a high prevalence of root caries among older individuals living independently.<sup>25</sup> In particular, it was reported that 53.3% of the study participants had at least one filled or root surface with a carious lesion, and 25.7% had at least one root caries.<sup>25</sup> Another study found that older adults have a higher risk of developing root surface caries due to significant gingival recession found in this age group.<sup>26</sup> International studies of the incidence and prevalence of root surface caries in countries such as India, Sri Lanka, China, and Sweden also support these findings.<sup>27-30</sup> Specifically, these studies indicate that the risk of root caries increases with age in the presence of predisposing factors such as hyposalivation, recession, and plaque.<sup>28-30</sup> This being said, the presence of multiple predisposing factors determines the likelihood of caries development among older adults.

There is strong evidence documenting the high prevalence of root surface caries in older adults. However, the prevalence of root caries is not a consequence of aging alone. In addition to the predisposing factors mentioned earlier, other factors such as cumulative damage to the periodontium may contribute to root caries.<sup>6,20</sup> The use of appropriate assessment tools will allow early detection of oral conditions found in the older population.

**ASSESSMENT TOOLS**

Older adults have different human needs deficits from the rest of the population. The use of a comprehensive oral health assessment tool will allow clinicians to provide care

specific to each client’s needs provided that the clinicians consider the client’s systemic health and the factors that may affect their QOL.

The Geriatric Oral Health Assessment Index (GOHAI) is an assessment tool designed for geriatric clients “to assess oral health status on two-levels: the patient level and the population level.”<sup>31</sup> It can be used by both dental and non-dental health care providers to facilitate the assessment of older adults’ QOL and the need for referral to other health professionals such as dietitians, speech language pathologists, and medical doctors.<sup>31</sup> According to a cross-sectional study, in comparison to the Oral Health Impact Profile (OHIP), the GOHAI was found to have more sensitivity in terms of assessing the impact of occlusal and masticatory forces on the participants’ QOL.<sup>32</sup> Additionally, several cross-sectional studies also favoured the GOHAI over the OHIP because of its sensitivity in assessing decayed, missing and filled (DMF) teeth as well as the need for dental care.<sup>33,34</sup> Although both GOHAI and OHIP were found to be valid and reliable assessment tools when used in community-dwelling older adults, the GOHAI provides more comprehensive assessment findings than the OHIP.<sup>32-34</sup> Specifically, it measures the person’s ability to chew and swallow, any concerns with teeth or dentures in relation to speech, psychosocial limitations, pain, and discomfort.<sup>31</sup> GOHAI facilitates the gathering of data on physiological, functional, psychological, and social symptoms that impact QOL (Table 1). With the information gathered through this assessment tool, clinicians can make decisions that may include referral to specialists.

Table 1. Geriatric Oral Health Assessment Index (GOHAI)

Item	1	2	3
In the past three months...	(always, often)	(sometimes, seldom)	(never)
How often did you limit the kinds or amounts of food you eat because of problems with your teeth or dentures?			
How often did you have trouble biting or chewing any kinds of food, such as firm meat or apples?			
How often were you able to swallow comfortably?			
How often have your teeth or dentures prevented you from speaking the way you wanted?			
How often were you able to eat anything without feeling discomfort?			
How often did you limit contacts with people because of the condition of your teeth or dentures?			
How often were you pleased or happy with the looks of your teeth and gums, or dentures?			
How often did you use medication to relieve pain or discomfort from around your mouth?			
How often were you worried or concerned about the problems with your teeth, gums, or dentures?			
How often did you feel nervous or self-conscious because of problems with your teeth, gums, or dentures?			
How often did you feel uncomfortable eating in front of people because of problems with your teeth or dentures?			
How often were your teeth or gums sensitive to hot, cold, or sweets?			

Source: Atchinson K, Dolan T. Development of the Geriatric Oral Health Assessment Index.<sup>31</sup>

### CLINICAL IMPLICATIONS FOR THE DENTAL HYGIENIST

Oral health professionals should aim for disease prevention and management.<sup>5</sup> Utilization of a comprehensive assessment tool will allow early detection of oral health-related problems among older adults. The use of age-specific assessment tools such as the GOHAI can guide the decision-making process when planning needed care. Improving QOL for older adults can be challenging due to the heterogeneity of the members of this age group. Each individual is different. The factors that determine a client's health should be considered critically by dental hygienists when building client-specific care plans. In addition, the presence of multiple factors such as medication use, systemic health conditions, gingival recession, history of caries, and hyposalivation should always be given consideration when providing care for older adults. For instance, the prevention of caries can be facilitated by managing the factors associated with it through oral health education, use of a saliva substitute or stimulator for clients with xerostomia, in-office and at-home fluoride applications, and nutritional counselling for those who have a high-sugar diet.<sup>13,20,35</sup>

Based on the 2010 Canadian Health Measures Survey results, 53% of Canadians ages 60 to 79 years do not have any dental insurance.<sup>23</sup> Having no dental insurance may act as a barrier to oral care for older adults in need. Cost-effective interventions should be used to ensure that their QOL does not decline due to financial barriers. For example, the atraumatic restorative treatment (ART) technique can be a cost-effective caries management intervention for community-dwelling older adults who are having financial difficulties as it offers a temporary and sometimes permanent solution to active caries. ART involves the removal of the infected carious tooth structure with hand instruments and the application of a highly viscous fluoride-releasing glass-ionomer in the cavity.<sup>36,37</sup> This approach is widely used for the management of caries in children, clients with anxiety, and those with special needs.<sup>37</sup> Using ART could facilitate the management of carious lesions among older adults, especially since it does not require a large quantity of dental materials, equipment or extensive training to achieve acceptable results.

Another cost-effective intervention that can be used with older adults is silver diamine fluoride (SDF). The silver component works as an antimicrobial agent while the fluoride functions as a remineralizing agent.<sup>38</sup> SDF is

effective in the management of both carious lesions and dentin hypersensitivity.<sup>38</sup> It was reported to be effective in arresting root surface caries in older adults.<sup>39,40</sup> It was also found to be most effective in preventing new and arresting current root caries when applied annually.<sup>39</sup> In fact, it was approved by the Food and Drug Administration (FDA) and made available in the United States in April 2015, and has now been approved for use in Canada by Health Canada.<sup>40,41</sup> SDF can potentially facilitate caries prevention and management in Canadian older adults in a cost-effective manner. However, the side effects of SDF include darkening of carious lesions and a metallic or bitter taste in the mouth.<sup>38</sup> Clinicians need to inform their clients of the advantages and disadvantages of SDF and make decisions with the clients' best interest in mind.

### CONCLUSION

Oral health changes in older adults affect their QOL. The process of aging is associated with a decline in cellular functions. However, many of the reported oral health changes seen in older adults are secondary to systemic diseases and the medications used to treat them. In particular, there are inconsistencies in the explanations for the prevalence of hyposalivation and xerostomia in older adults. Furthermore, there is strong evidence that supports the high prevalence of root surface caries among older adults. Nevertheless, the changes in the oral health of older adults significantly alter their QOL, and it is the oral health professional's role to help their clients improve their QOL. There is a pressing need to focus on the prevention of oral diseases now that people have a higher life expectancy and are retaining their teeth longer. The etiology of age-related oral health changes and their management should be given more attention in the literature. Overall, oral health professionals play a vital role in helping older adults to achieve their optimal well-being and maintain their QOL through the prevention and management of oral-systemic conditions.

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