

# Age-related Oral Changes and Their Impact on Oral Health-related Quality of Life among Frail Elderly Population: A Review

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## ABSTRACT

**Background:** In the present-day world, the aging elderly across the world are living longer. Most people are expected to live well into their sixties and even beyond. The increasing life expectancy of the aging population could be due to increased availability of healthcare facilities and improved quality care provided by them. Alongside increasing life expectancy, the individual's quality of life and also his/her oral health-related quality of life (OHR-QoL) are expected to improve so that they can enjoy their aging life.

**Aim and objective:** The aim of this review article is to highlight aging-related oral health changes and their impact on the individual's quality of life.

**Review results:** Age-related oral changes are seen in the tooth structure making the enamel more brittle resulting in severe attrition. Autoimmune diseases like Sjogren's syndrome are followed by decrease in the salivary gland function and the reason is unknown, and medications like antihypertensive and analgesics are associated with the decrease in salivary flow, which increases the patient's risk of developing dental caries, and also make the oral tissues more prone to mucosal infections. Edentulism has also been directly related to masticatory problems and nutritional problems. The studies reported on OHR-QoL of these frail elderly populations have shown lower scores.

**Conclusion:** It is important for health professionals, especially those dealing with these frail elderly populations, to have a better understanding of their dental needs and also understand the physiologic changes undergone by them. The health professionals should understand and comprehend the oral health challenges these vulnerable people face.

**Clinical significance:** Healthcare providers should conduct periodic oral examinations along with general examination and should avoid prescribing medications that have xerostomia as a side effect. The elderly individuals should be encouraged to keep their mouth moist using water or artificial saliva and maintain good oral and denture hygiene.

**Keywords:** Age-related oral changes, Geriatric oral health, Oral health, Quality of life.

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## INTRODUCTION

In the present-day world, the aging elderly population worldwide is living longer. Most of them are expected to live well into their sixties and even beyond. The WHO databank has made a remarkable statement that between the years 2015 and 2050, the proportion of the worldwide elderly population especially those aged 60 years and above is expected to nearly double in number from 12 to 22%. As stated in WHO news, developed countries as well as those in the developing phase are likelier to face a major challenge in ensuring good health of this aging population.<sup>1</sup>

The increasing life expectancy of this aging population could be the result of increased and better healthcare facilities. Along with increasing life expectancy, the individuals' quality of life and their oral health-related quality of life (OHR-QoL) are expected to improve such that they can enjoy their aging life. Hence, successful aging is dependent on preserving a good quality of life throughout.<sup>2-4</sup>

Aghamohamadi et al., Stewart Williams, and Yen et al. stated that with an increase in the life expectancy of the aging population, there are higher risks of major health issues with an increasing prevalence of disabilities and illnesses.<sup>5-7</sup> The aging phenomenon is also associated with an increase in the burden of chronic diseases, including oral diseases that are usually augmented with a decrease in the normal functioning of the body over time, loss of function, increased dependency on other individuals, isolation, disability, and reduction in quality of life.<sup>8-11</sup>

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Elderly people often tend to suffer from chronic illnesses and are often on daily medications. Most of these medications have hyposalivation as a common side effect. Dental caries and mucosal infections tend to increase with saliva secretion impairment and function, which can eventually result in various oral health-related complications.<sup>12,13</sup> Oral health issues in the aging population can increase difficulty levels in fulfilling even their day-to-day needs including chewing food, communication, general health issues, and adequate nutrition intake besides causing psychosocial distress, social distress, and lowered self-esteem.<sup>14,15</sup>

Every individual has the right to expect a good quality of life and aging elderly should have a better quality of life. Quality of life has been defined as the degree to which a human can enjoy important opportunities in his/her life; it emphasizes mainly on physical, social, and emotional factors after the treatment.<sup>16,17</sup> Oral health-related quality of life is a major component of quality of life, which is defined as a multidimensional assessment of the effects of oral functions on patient well-being.<sup>18-21</sup> Aging oral health problems like tooth decay, pain, and loss of tooth may have an effect on taste, chewing, speech, and masticatory efficiency will reduce about 15–16%, along with reduced temporomandibular joint movement.<sup>22</sup> The aim of this review article is to highlight aging-related oral changes and their impact on the individual's quality of life.

## AN INSIGHT INTO AGE-RELATED ORAL CHANGES IN THE ELDERLY POPULATION

The process of aging undergoes many physiological changes, which usually include reduced appetite, nutritional issues, and many dental issues like loss of teeth, difficulty in chewing and swallowing food, and is also associated with other related illnesses.<sup>23</sup>

### Age-related Changes in the Tooth Structure

Alongside the aging process, the tooth also undergoes certain gradual changes over the years, which are referred to as age-related changes. Due to the physiological wearing of the tooth surface, the tooth enamel is damaged and there is usually a lack of physiological turnover, but dentin and cementum continuously get deposited. The tooth enamel of the elderly individual becomes less permeable and more brittle due to ion-exchange mechanisms. Wearing and attrition of tooth structure are macroscopic changes that usually affect tooth form.<sup>24-26</sup>

There are also age-related dentinal changes, which include secondary dentine formation and dentine sclerosis that result in a reduced volume of the pulp chamber.<sup>27</sup> Along with this, there are other changes to the dental pulp, which include calcification of the dental pulp. These age-related physiological changes must be carefully differentiated from pathological changes, especially when they induce pain or hurt. These age-related physiological changes have to be carefully differentiated from that with the pathological changes, and that too when they induce pain or have a negative impact on the OHR-QoL of the elderly individuals.

The dental pulp calculi (DPC) can also be seen in the dental pulp, which is also referred to as pulp calcifications, pulp stones, denticles, and contribute to changes in the pulp chamber volume. Chronic irritation due to dental caries, deep dental restorations, or deleterious oral habits can lead to irritation of the pulp, which eventually leads to the formation of DPC.<sup>28-30</sup>

These age-related changes also lead to sclerosis of dentine tubules with a reduced volume of the pulp chamber, which in turn has been associated with a reduction in pulp sensitivity in elderly

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patients. Elderly patients have fewer nerve branches with greater mineralization of the dental pulp nerves, which usually weakens or delays responses to thermal stimuli thus increasing the chances of false-negative responses to pulp sensitivity tests during dental procedures.<sup>31-33</sup> Furthermore, the sclerosis of dentinal tubules during the aging process results in decreased and even diminished flow of dentinal fluids further decreasing sensitivity.

### Aging and Tooth Decay

Dental caries exists as a major issue in the field of dentistry affecting most individuals. This again is very common among the elderly population for some unknown reasons. Age-related salivary changes, a poor diet, and exposure of the root surfaces due to recession of the gingival tissues increase the risk of developing dental caries; these age-related changes can affect the OHR-QoL in the elderly.<sup>34,35</sup>

Autoimmune diseases like Sjogren's syndrome, medicines that have xerostomia as a side effect, and radiation therapy of the head and neck region usually lower salivary flow rate to concerning levels and increase the patient's risk of developing dental caries.<sup>36</sup> Over half of the elderly individuals aged 65 years and above have experienced root caries, and aging has shown a positive association with root caries prevalence.<sup>37,38</sup> Dental caries is one of the common oral health issues in the institutionalized elderly mainly because of their higher tendency to consume refined carbohydrates, sucrose in particular, and is more common in places like long-term care facilities.<sup>39-41</sup>

### Aging and Periodontal Diseases

Aging is a complex multifactorial process that can lead to an increase in susceptibility to chronic inflammatory diseases and microbial infections such as periodontitis.<sup>42</sup> Elderly individuals have higher levels of gram-negative bacilli such as *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Enterobacter* as compared to younger individuals.<sup>43</sup> There is abundant epidemiological evidence that has been reported in the literature confirming the prevalence and severity of periodontal diseases and proving their increase in rates with climbing age numbers.<sup>44,45</sup>

Changes in dietary practices and variations in salivary gland secretions may also affect the growth of microorganisms. The results of recent studies conducted by Kassebaum *et al.* globally to estimate the burden of severe periodontitis suggested that there is an increase in prevalence and severity rates of periodontal diseases, which are usually seen in the third and fourth decades of an individual's life. This could even remain stable during his/her older ages.<sup>46</sup>

### Aging and Edentulism

Having a good dentition is very much important for the well-being and better quality of life of an individual. Despite advances in preventive dental care, edentulism has still been reported as a major public health problem worldwide. Edentulism has been directly related to masticatory problems and nutritional problems.

Brown et al. and Polzer et al. proposed that edentulism can be one of the good mortality predictors.<sup>47,48</sup> Emami et al. associated the edentulism with impairments in quality of life, as it may lead to functional impairment.<sup>22</sup> Various studies reported from countries around the world have shown that the peak of incidence of severe tooth loss is around 65 years of age.<sup>49</sup>

Petersen et al. in their study have observed that elderly individuals with prostheses have denture stomatitis and traumatic oral ulcers, which get exacerbated due to unhealthy lifestyles, poor oral hygiene, excessive alcoholism, tobacco usage, and poor nutritional intake.<sup>50</sup> Studies have reported that edentulism and poor oral health have an impact on the quality of life of elderly individuals.<sup>51</sup>

### Aging and Dry Mouth

The increasing life expectancy of the elderly population has also increased the concern of dry mouth as a major health issue.<sup>50</sup> Xerostomia and salivary gland hypofunction are found to be highly prevalent in these vulnerable elderly population.<sup>52</sup> Leslie and Glaser reported that medications prescribed to the elderly have the potential to cause impairment in salivary flow with not much changes in the immunity level.<sup>53</sup>

Saliva plays a critical role in maintaining better oral health, which is directly related to adequate salivary flow. Saliva consists of chemicals that help in maintaining the oral cavity in a healthy state.<sup>54</sup> As individuals grow old, the immune system weakens leading to fewer antimicrobial immunoglobulins that are produced and found in saliva.<sup>55</sup>

Dry mouth will alter the quality of life due to difficulty in pronouncing the words, worsening the taste sensation and the person becomes more irritable, which would eventually affect an individual's quality of life.<sup>56</sup>

### Aging and Oral Mucosal Lesions

The oral mucosa has its protective functions and has a significant effect on the individual's general health. There is a decline in this protective function with growing age. This can eventually expose a person to a variety of chemicals and also make it easier for the pathogens to easily enter the oral cavity.<sup>57</sup>

The oral epithelium of the elderly is reported to become thinner with growing age and there is also a decrease in the synthesis of the collagen by connective tissue. This results in decreased tissue regeneration and resistance to disease-producing agents.<sup>57,58</sup> Studies by Mozafari et al., Rabiei et al., and Rekhi et al. have reported that oral mucosal conditions in older institutionalized residents are often poor.<sup>59–61</sup> Rekhi et al. reported similar findings with even more severe oral mucosal conditions that included erythematous and pseudomembranous candidiasis, traumatic oral ulcers, leukoplakia and erythroplakia, and lichen planus.<sup>62</sup>

### Aging and Oral Cancer

Globally, oral cancer is reported as a major threat to the health of the elderly population with commonly reported sites including the lips, floor of the oral cavity, and the pharynx. Oral cancer is reported as the eighth-most common type of cancer worldwide.<sup>63</sup> The risk of developing oral cancer tends to increase with growing age. The American Cancer Society (ACS) revealed that more than half of the total oral cancer patients reported are over the age of 65 years and above.<sup>64</sup>

There is reduction of mortality rates with individuals who are undergoing surgical treatments, radiotherapy, chemotherapy, and with advances in technology and treatment modalities for oral cancer. Treated or existing, cancer can bring about major anatomical changes in the oral cavity of the individual and can also lead to altered functions including the ability to speak, chew, and/or swallow substantially leading to impairment in the quality of life of cancer survivors.<sup>65</sup>

### Aging and Nutrition

A healthy diet and a comfortable lifestyle along with maintaining a healthy body weight are important for preserving better health among individuals of all age groups especially the aging population. Maintaining adequate nutritional intake has shown significant implications on the individual's health and well-being. This has also been associated with delaying and reducing the risk of developing a disease, maintaining functional independence, and eventually promoting better-quality living.<sup>66</sup>

The elderly population group has been identified as the higher-risk group for developing nutritional deficiencies. The dietary practices of the elderly individuals are often monotonous with minimal energy content, limited nutrients, and mineral content.<sup>67</sup> The poor oral health status affects masticatory functions and swallowing, thereby leading to severe nutritional and energy deficiencies making it a major risk factor for malnutrition.<sup>68</sup> Deficiency in mastication has also been correlated with tooth loss, reduced salivary secretions, decreased masticatory forces, and malocclusion.<sup>69</sup>

### Aging and Oral Health-related Quality of Life

Oral health-related quality of life is a multidimensional concept that has been used to assess an individual's comfort while eating, sleeping, and engaging in social interactions, self-esteem, and satisfaction concerning his/her oral health.<sup>70–72</sup> Therefore, OHR-QoL has been associated with functional factors, psychological factors, social factors, and experience of pain/discomfort by an individual.

There are good number of studies that have reported on OHR-QoL of these frail elderly population. A study conducted on South Korean elderly institutional residents reported an overall mean of the Oral Health Impact Profile (OHIP-14) score was 10.3, which suggests improving chewing ability will increase OHR-QoL among elderly.<sup>73</sup> Another study compared the OHIP-14 between older Canadian community and institutional residents, findings of which indicated that oral health and OHR-QoL of seniors in long-term care facilities was poor [5.71] and that of the community group was 4.75.<sup>74</sup> However, another study conducted on Maltese residents reported a lower (or better) OHIP-14 score of 3.8 among the residents.<sup>75</sup>

A study conducted among UK residents reported that elderly residents have faced more difficulties in eating with difficulty levels more prevalent among fully edentulous residents than among dentate/partially dentate elderly residents. Edentulous residents also reported other issues like difficulty to speak, smile, laugh, or even to show their teeth, which leads to more emotional problems.<sup>62</sup> A study conducted among Indian residents reported that fully or partially dentate residents have faced more difficulties and discomfort while chewing and swallowing food, while speaking, while eating in front of other people, greater sensitivity in their teeth, and also more limitations in the variety of foods and amount of food consumed.<sup>76</sup>

## Aging, Oral Health, Systemic Disease and Quality of Life

Poor oral hygiene is directly related to respiratory tract diseases because it is connected to the oropharyngeal region. The upper respiratory tract infections like chronic obstructive pulmonary disease and chronic bronchitis are associated with poor oral hygiene and studies have reported that periodontal diseases are associated with aspiration pneumonia and the streptococcus pneumonia were the common cause.<sup>77</sup>

Studies have suggested that there is association between poor oral hygiene and cardiovascular diseases (CVDs) among the elders. Josphipura et al. study showed that there is association between periodontitis and ischemic stroke. Lagervall et al. reported that CVD, diabetes, and rheumatoid diseases are associated with periodontal diseases among elderly.<sup>78,79</sup>

Ageing and tooth loss and edentulism are the risk factors for poor mental health as shown by a 6-year cohort study. Another study reported that poor oral hygiene among the elders leads to malnutrition and altered serum albumin level. Considering the relationship between poor and compromised oral health with systemic diseases, this could eventually affect the quality of life of the elderly.<sup>80</sup>

This paper intends to deliver a message to all health professionals to understand and deal with oral health challenges faced by this vulnerable section of the population and to also accept the challenges involved in identifying and recognizing risk factors that have been associated with compromised oral health.

### Recommendations for Healthcare Providers

Healthcare providers should:

- Conduct periodic oral examinations along with general examinations.
- Avoid prescribing medications that have xerostomia as a side effect or prescribe alternative medications that do not have xerostomia as a side effect.
- Encourage elderly individuals to keep their mouth moist using water or artificial saliva.
- Conduct oral health education and awareness programs for elderly and their care takers on regular basis.
- Encourage elderly individuals to maintain good oral and denture hygiene.
- Encourage caretakers of the elderly to consider performing oral hygiene and denture hygiene practices.
- Encourage elderly individuals to avoid more consumption of refined and carbohydrate-rich food.
- Encourage elderly individuals to utilize healthcare facilities periodically.

### CONCLUSION

With an increase in life expectancy of the aging population in both developing and developed countries, oral impairment and disability become an indispensable part of the aging process but this does not necessarily mean that it is fair enough for such problems to hurt the aging individuals' quality of life. The aging process usually includes an unpredictable series of fluctuating experiences in an individual's lifetime some of which could be worse and some better.

It is very much important for health professionals especially those dealing with these frail elderly populations to have a better

understanding of their dental needs and also to understand the physiologic changes these individuals are going through, and adopt and cope with adversity and maintain an overall sense of coherence. The health professionals have to be competent and prepared to deliver and render healthcare to the best of their capabilities so that elderly individuals need not compromise on their expectations, instead have a better and acceptable quality of life.

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