

**Geriatric Periodontology**

<sup>1</sup>Dr Akansha Sharma, Post-graduate, Dept.of Periodontology, Subharti Dental College and Hospital, Swami Vivekanand Subharti University,Meerut(UP),India

<sup>2</sup>Dr Amit Wadhawan, Professor, Dept.of Periodontology, Subharti Dental College and Hospital, Swami Vivekanand Subharti University,Meerut(UP),India

<sup>3</sup>Dr Soundarya Singh, Lecturer, Dept.of Periodontology, Subharti Dental College and Hospital, Swami Vivekanand Subharti University,Meerut(UP),India

**Corresponding Author:** Dr Akansha Sharma, Post-graduate, Dept.of Periodontology, Subharti Dental College and Hospital, Swami Vivekanand Subharti University, Meerut(UP),India

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**Abstract**

Oral health is of major concern along with the general health of an individual. But maintaining oral health is very difficult as the age progresses. Also, some elderly people have physical/or mental issues that call for particular interest in dental office. The prevalence of periodontal diseases and tissue destruction increases with age. It is mainly due to inadequate oral care. But providing appropriate periodontal therapy, elderly patients can have favourable treatment outcomes compared to younger individuals.

**Keywords:** Aging, Geriatric, Periodontal health

**Introduction**

The world’s population is aging. In 2010, approximately 524 million people are 65 years of age or above. By 2050, that number will reach 1.5 billion. For the first time in history, we are now at an inflection point where the

number of older adults ( $\geq 65$  years of age) is greater than the number of young children ( $< 5$  years of age). The large rise in older people (85 years and above) and also in number of centenarians evident in this demographic shift.<sup>1</sup>

Aging is a natural phenomenon that leads to a decline in physiological function in older adults and is associated with the predisposition to multiple oral and systemic pathologies.<sup>2</sup> The immune system is a major player in this global anti-aging response.<sup>3</sup>

Care for these patients in the dental office may, in the future, include basic health evaluations and a broad discussion of risk reduction for oral and systemic disease.<sup>2</sup>

Poor periodontal health, along with its increased prevalence and severity, have long been associated with more advanced age, whereby this oral condition affects the majority of the adult population, with an estimated 10-15% developing severe periodontitis.<sup>4</sup> The etiology of

periodontal disease is associated with tissue damage, which is primarily initiated by an excessive immune response by the host to sub gingival pathogens.<sup>5</sup>

A number of these disorders, in particular cardiovascular disease and diabetes mellitus have been associated with periodontal disease and older patients seen in dental office will often present with one or more non-communicable chronic diseases.<sup>6</sup>

In elderly people, oral health contributes significantly towards quality of life thus; poor oral health and loss of teeth not only adversely affect the dietary intake, nutritional status and phonetics, but also compromise the general health.<sup>7</sup>

### **About Geriatrics**

“Geriatric Dentistry is the provision of dental care for adult persons with one or more chronic debilitating, physical or mental illness with associated medication and psychosocial problems”. A geriatric patient is an older adult who is frail, dependent, or both and requires health and social support services to attain an optimal level of physical, and social functioning.<sup>8</sup>

### **Demographic Aspect of Aging**

The increase in the elderly population presents unique challenges to the health care system. Eighty percent of those over 65 report one or more chronic conditions and 20% are limited in their ability to take care of themselves.<sup>9</sup> Chronic disease starts earlier in India. While in developed countries the average age for the onset of non-infectious disease is 55 or older, in India there is premature onset at around the age of 45 years.<sup>10</sup>

### **Immunity in Geriatrics**

Elderly people lose manual ability as a result of arthritis, injury, stroke, aging itself, etc., and accordingly, are likely to have poor oral hygiene. Dental disease in elderly people may also have medical consequences. Both dental caries and periodontal disease present a microbial challenge to

the host that involves an immune response. Host-microbial outcomes may differ significantly from what is seen in younger individuals, because of a concomitant senescence of immunity that occurs with the aging process.<sup>11</sup>

Schmucker et al<sup>12</sup> in his study on mucosal immunity suggested that the major issues remaining to be resolved include:

- 1) How aging impairs the secretory immune response.
- 2) Whether or not immunosenescence predisposes elderly people to infectious diseases.
- 3) Whether immunodeficiency associated with aging might be reversible.

### **Age Related Changes in Oral Health**

#### **Oral Mucosa**

Clinically, the oral mucosa in many healthy older persons is identical to that of younger ones. Constant irritation to the oral mucosa in the form of trauma like cheek biting, diseases like lichen planus, habits like smoking, and salivary disorders can bring about alteration in the clinical appearance of oral mucosa.<sup>13</sup>

#### **Dentition**

The consequent changes that take place in dental tissues after teeth development are referred to as age changes. Most of the tissues have a physiological turnover of their components but however, some tissues do not exhibit any turnover such as the enamel.<sup>14</sup>

Cementum formation continues throughout life, but there is reduction in rate with age. Root surface caries and coronal caries have increased prevalence in the old-age population. The mean numbers of decayed and filled coronal surfaces range from 22 to 35 in developed countries, as indicated by different surveys done by Locker.<sup>15</sup>

#### **Salivary Glands**

Dry mouth, which is reported in approximately 30% of population aged 65 years and above, is the most common

complaint in older people. Persons suffering from dryness of mouth are likely to experience several oral problems, including higher incidence of dental caries.<sup>16</sup> Most of the older adults take at least one medication that causes salivary dysfunction resulting in drug-induced xerostomia. The drugs mostly responsible for dry mouth are tricyclic antidepressants, antipsychotics, atropines, beta-blockers, and antihistamines. Smoking is another major risk factor for dry mouth.<sup>17</sup>

### **Taste and Smell**

As the age advances, there occurs an alteration in smell and taste function, which results in diminished taste recognition and enjoyment. Olfaction undergoes age related changes, while gustatory function remains intact in healthy older adults.<sup>18</sup> Decreased smell and taste results in appetite suppression resulting in weight loss, malnutrition, impaired immunity, and deterioration in medical conditions. Nutritional problems are important sequelae from smell and taste disorders, such conditions may be responsible for a high degree of anxiety and depression in the elderly person.<sup>19</sup>

### **Masticatory Function**

Effective mastication and appropriate nutritional intake are essential components of healthy aging. Mastication is dependent upon the function of the dentition, Temporomandibular joint and muscles of mastication. Dental disease and loss of teeth are not part of normal aging, but if this occurs, or there has been inadequate restoration of the dentition, or the person is functioning with a poorly fitting and improperly functioning removable denture, the result can be poor masticatory function.<sup>20</sup>

A reduction in masticatory muscle activity (specifically maximum contraction of the masseter and temporalis muscles) was observed for healthy older adults (60–75

years of age) compared with young adults (23–30 years of age) during chewing of harder, but not softer foods.<sup>21</sup>

### **The Periodontium**

Periodontitis increases steadily from 30 to 80 years of age. In older adults, the risk factors for periodontitis are the same as for younger individuals. Risk factors may be more prominent in older individuals, who may be less able to remove plaque deposits as a result of reduced dexterity, have diminished visual acuity or an increased risk of developing contributing conditions such as diabetes mellitus.<sup>22</sup>

### **The Aging Periodontium**

The tissues that invest and support the teeth are called the PERIODONTIUM. The most important tissue types forming part of the periodontium are: epithelium, connective tissue, cementum and bone. Changes in each of these tissues occur with aging.<sup>23</sup>

### **Changes that have been observed in aging periodontium**

- Diminished keratinization.
- Reduced or an unchanged amount of stippling.
- Increased width of attached gingiva.
- Decreased connective tissue cellularity.
- A greater amount of intercellular substances.
- An increase or no change in mitotic index of gingival epithelium.
- Thinning of oral epithelium or no change in width.
- Atrophy of connective tissue with loss of elasticity.
- A decrease in number of protein bound hexoses and mucoproteins in connective tissue.
- An increase in number of mast cells.
- In addition to being less dense, the bone is often more brittle.

Lamina dura of the alveolar bone is often lost and the cortical bone at the angle of the angle of the mandible thinner.

Increased porosity of bone with aging which is mainly due to increase in vascular spaces.

- Lacunar volume increased despite an reduction in number of lacunae in the bone.
- Diffuse calcifications were found in bony canals, but the lacunae were filled with a glycoprotein material staining differently from that in young bone and there was a decrease in number of osteocytes and osteones.
- Increased thickness of cementum is demonstrated.

**Epithelium:** Changes in the oral epithelium relate to a thinning of the epithelium were studied by Shklar G<sup>24</sup> and diminished keratinization was studied by Papic M and Glickman I.<sup>25</sup>

According to Meyer et al<sup>26</sup> the mitotic activity increases with increasing age. Whereas a decrease in the mitotic activity with age was also demonstrated by Sharav Y.<sup>27</sup>

**Connective tissue:** According to Klingsberg J and Butcher E<sup>28</sup>, the irregular to finely textured prepubertal connective tissue shows a gradual transition with age to a more dense, coarsely textured tissue in the higher age groups and found reduction in organic matrix production with advancing age. Levy et al<sup>29</sup> demonstrated a loss of acid mucopolysaccharides in the periodontal ligament with increasing age.

**Cementum:** With age, the cementum increases in width. Zander HA and Hurzeler B<sup>30</sup> found that there is a tendency towards greater cemental apposition in the apical region of the tooth and later it was studied by Ive JC et al.<sup>31</sup> In a study of human teeth, areas of post and active resorption increased with age.

**Bone:** With increasing age, the periodontal surfaces of the alveolar bone become jagged and that collagen fibers insert less regularly into the bone. There is an increase in the number of interstitial lamellae and the number of cells in the estrogenic layer decreases with age.

**Width of periodontal ligament space with age:** With increasing age, fewer teeth are present; the forces acting on the remaining teeth may increase. This could explain an increasing width of the periodontal ligament space with age and decrease in masticatory forces with increase in age. Helkimo F et al<sup>32</sup> stated that there is decrease in the periodontal ligament space with age.

**Physiological versus pathological apical migration of the epithelium:** As age advances, a gradual physiological recession of the gingiva occurs concomitantly with an apical migration of the epithelium. According to Mazeland GRJ<sup>33</sup> and Ainamo et al<sup>34</sup>, If no gingival recessions are present, it has been noted that the gingival width increases with age, On the basis of these results, it is likely that in a healthy periodontium the junctional epithelium remains at the cement enamel junction and the gingival width increases with age due to eruption of teeth.

#### **Systemic Diseases in Geriatrics**

**Periodontal Disease and Aspiration Pneumonia:** The leading cause of death among nursing home patients and the second most common cause for hospitalization in this population is nursing home acquired pneumonia, caused by gram negative bacilli. Limeback H<sup>35</sup> was the first to note a relationship between poor oral hygiene and aspiration pneumonia among elderly residents of chronic care facilities. Finegold SM<sup>36</sup> specified several prominent periodontal pathogens (including *Bacteroides* and *Fusobacterium* species) among “anaerobic bacteria that are most important as causes” of aspiration pneumonia.

**Periodontal Disease and Diabetes:** The incidence of type II Diabetes Mellitus is increasing, perhaps as a result of changes in life style and dietary habits leading to obesity. The prevalence of diagnosed and undiagnosed diabetes mellitus in older subjects approaches 20%. patients with diabetes mellitus are likely to develop the long term complications were studied by Persson RE et al.<sup>37</sup> People

with diabetes are more likely to have periodontal disease than people without diabetes, to the extent that periodontitis has been considered as 6<sup>th</sup> addition to the 5 complications of diabetes (i.e. peripheral neuropathy, retinal degeneration, renal insufficiency, atherosclerosis and microangiopathy).<sup>38</sup> Diabetes is a strong risk factor for bone loss caused by periodontitis. Salvi GE et al<sup>39</sup> documented that type 2 diabetic inflammatory response includes exaggerated secretion of several inflammatory mediators, IL-1 $\beta$ , PGE<sub>2</sub> and TNF- $\alpha$ , in response to the presence of gram negative cell wall lip polysaccharides, with consequent extensive tissue lysis.

**Osteoporosis and Periodontal Disease:** Changes in alveolar bone height are associated with systemic changes in bone tissues and osteoporosis in postmenopausal women. The diagnosis of osteopenia and osteoporosis is made using bone density measurements was told by Klemmetti E et al.<sup>40</sup>

According to the World Health Organization's (WHO) recommended criteria for osteoporosis and reduced bone mineral density (BMD), 56% of women 50 years of age and older had a reduced level of bone density, with 16% of these meeting the criteria for osteoporosis, whereas 18% of men demonstrated reduced BMD.

**Cardiovascular Diseases and periodontal Disease:** An association between periodontitis and cardiovascular diseases has been demonstrated. The shared etiology may be found in commonality of pathogens involved in periodontitis and cardiovascular diseases. Pathogens associated with P. gingival is, Eikenella corrodens, Prevotella intermedia and Streptococcus sanguis share the ability to invade human coronary endothelial cells was studied by Dorn BR.<sup>41</sup>

#### **Smoking and Periodontal Disease**

Smoking has an impact on alveolar bone loss and a dose response curve appears to exist between smoking habits

and severity of periodontitis, this relationship disappears when one controls for current oral hygiene levels. Thus oral hygiene may have a dominating impact on the susceptibility to periodontitis, with smoking as a factor that partially contributes to the elevated risk of the disease.

#### **The Microbiology Of Periodontitis In Geriatrics**

There is an important difference between periodontitis and the other infectious diseases mentioned. While mumps and rubella heal spontaneously, periodontal disease may at best stop progressing further. Thus, an adolescent affected by juvenile periodontitis will also be a periodontal patient as an adult and the disease will influence dental conditions even five or six decades later.<sup>42</sup>

#### **Plaque development in the older adult**

Holm-Pedersen et al.<sup>43</sup> studied the development of plaque and gingivitis during a 21 day period of no oral hygiene in dental students aged 20-24 years and adults aged between 65 and 78 years. Higher Plaque Index scores were recorded in the older subjects and the development of gingivitis was more rapid and more severe.

Van der Velden et al,<sup>44</sup> studied the development of experimental gingivitis in subjects with a history of periodontal disease. In this study it was found that the younger subjects developed inflammation more rapidly than the older subjects. The prevalence of A. actinomycetemcomitans appeared to be age related and decreases with age.

According to Rodenburg et al.<sup>45</sup> The prevalence of P. gingival is increased with age. In the refractory patient group, no relation to age was found. The organism was detected in 85% of localised juvenile periodontitis.

#### **Peri-Implant Microbiota**

Microbiological studies have shown that there is a marked difference in the composition of the peri-implant microbiota between implants with deep and shallow pockets Pockets 5 or more mm deep can be viewed as

protected habitats for putative pathogens and are a sign of peri-implantitis. In edentulous patients, the microbiota developing on successfully integrating one-stage transmucosal titanium implants was found to be very similar to the mucosal microbiota on the adjacent alveolar ridge.<sup>46</sup>

Koka et al<sup>47</sup> investigated osseointegrated implants in partially edentulous patients, reported colonization with periodontal organisms such as *P.gingivalis*, *P. Intermedia* and *F. nucleatum* already within 14 to 28 days after second stage surgery of Branemark implants.

### **Treatment of Periodontal Disease in Older Adults**

Locker et al<sup>48</sup> in his Epidemiological data reveal that the prevalence and severity of chronic periodontal disease increase with age. This observation has primarily been interpreted as an accumulated effect due to lack of adequate periodontal care.

### **Goal of periodontal therapy in older adults**

Regardless of age the aim of the periodontal therapy is to prevent progression of periodontal disease. Periodontal treatment needs may vary depending on the general goals of dental therapy. These goals as defined by the patient, the therapist and national or local health authorities may not always correspond.<sup>49</sup>

### **Surgical periodontal therapy**

The main objective of surgical periodontal therapy is to contribute to the long-term preservation of the periodontium by facilitating plaque removal and plaque control. An additional aim may be the regeneration of periodontal support. Age is not a contraindication to periodontal surgery, and the healing obtained following therapy is not different in older adults as compared with younger individuals.<sup>50</sup>

### **Supportive periodontal therapy**

Supportive periodontal therapy is a significant component in the treatment of the periodontitis patient. Kerry<sup>51</sup>

described three therapeutic objectives of supportive periodontal treatment:

- To prevent the progression and recurrence of periodontal disease among patients who have previously been treated for periodontitis;
- To reduce the incidence of tooth loss;
- To increase the probability of recognizing and treating other diseases or conditions found within the oral cavity.

### **Geriatric Pharmacology**

Medication used by older adults as would be expected from the prevalence of chronic disease in their population, older adults are heavy consumers of prescription medicines. According to estimates from the Medicare Current Beneficiary Survey, more than 70% of Medicare beneficiaries take at least one chronic medication and nearly one third take at least three chronic medications.<sup>52</sup>

The most frequently prescribed medications that may have an impact on dental treatment in older patients include cardiovascular drugs, anti-inflammatory agents, gastrointestinal agents, psychotropic agents, and endocrine agents. The elderly are especially susceptible to several drug interactions with antibiotics.

Antibiotics such as erythromycin, tetracycline, and metronidazole, which can increase the anticoagulant effect of warfarin and cause bleeding, should be avoided when possible.

### **Conclusion**

Rising number of older individuals with dental care needs will become a major concern to society and it's care providers. To manage the health care needs of the elderly, coordination between medical and dental care providers will become necessary. The aging and diversity of the Indian population are placing new demands on the oral health profession. In order to adapt to the changing dental needs of older adults, innovation in area of education,

policy, workplace must be ensured for better oral health population.

By looking at the past, analyzing strategies that are currently working and planning for the future, we, as dental professionals, can strive for a healthier generation of older Indians. If we ignore the trends and warning signs, we will remain in a perpetual state of decay. The success we desire for the future begins with what we know today and what is taught and passed to the future generations of dental providers.

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