

Oral Mucosal Lesions in Geriatric Population: A Clinician's Perspective

Ravleen Nagi¹, N Rakesh², Tarun Vyas³, Esha Rani⁴

Author's Affiliation: ¹Associate Professor, ⁴Postgraduate Student, Department of Oral Medicine and Radiology, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana 134118, India. ²Associate Dean (Research), Department of Oral Medicine and Radiology, Faculty of Dental Sciences, MS Ramaiah University of Applied Sciences, Bangalore, Karnataka 560054, India. ³Reader, Department of Oral Medicine and Radiology, RR Dental College and Hospital, Udaipur, Rajasthan 313015, India.

Corresponding Author: Ravleen Nagi, Associate Professor, Department of Oral Medicine and Radiology, Swami Devi Dyal Hospital and Dental College, Panchkula, Haryana 134118, India.

E-mail: ravleennagi@yahoo.in

How to cite this article:

Ravleen Nagi, N Rakesh, Tarun Vyas, et. al., Oral Mucosal Lesions in Geriatric Population: A Clinician's Perspective. Indian J Dent Educ. 2020;13(4):167-173.

Abstract

Ageing is a natural phenomenon, and is associated with an increase in incidence of oral mucosal lesions (OMLs) such as candidiasis, candida associated denture stomatitis, oral lichen planus, viral infections and oral cancer that have profound impact on the quality of life of an individual. Moreover, elderly population suffer from chronic diseases, adverse drug reactions of medications, and polypharmacy may worsen the oral health care. Geriatric population living in remote areas, have limited access to dental health care centres and require personalized care. Reinforcement of optimal oral hygiene should be a goal and to achieve this dentist should educate and increase awareness among geriatric population about association between oral and systemic health. This review highlights the oral mucosal changes prevalent in the geriatric population and preventive measures that should be adopted for healthy ageing.

Keywords: Age; Geriatric; Oral mucosa; Oral health; Pharmacotherapy.

Introduction

Aging is a natural physiological process, and prevalence of chronic dental conditions increases as the life span of an individual decreases.¹ According to World Health Organization (WHO) survey reports, approximately 600 million are aged 60 years and above, and by 2050, developing countries like India might face a major demographic underway, that is proportion of older people may become more than any other age group. It has been estimated that around 2 billion people, particularly in developing countries would age rapidly and will suffer from high levels of disability.² In 2002, WHO introduced the concept of "Active Ageing" that is reduction of risk factors of chronic dental diseases,

and implementation of preventive strategies result in healthy ageing with less morbidity and disability.³ Douglass proposed the terminologies to describe geriatric population as:

- i) old age reflects social constructs of chronologic age;
- ii) frail elderly refers to older individuals with physical and functional impairment,
- iii) vulnerable older individuals are at risk of morbidity and mortality within two years;
- iv) oldest old refers to upper age group 75 to 90 years; and
- v) successful aging refers to decline in physical and mental function with chronologic age.⁴

It is well established fact that oral health reflects the overall systemic health, and reinforcement of oral health is cornerstone towards optimal health of an individual. The common dental problems observed in older age include progressive edentulism resulting in decrease in masticatory efficiency, temporomandibular joint disorders, chronic oro facial pain, periodontal disease, root caries, oral mucosal lesions, and oral cancer etc, eventually affecting quality of life of patients.⁵ Studies have shown that older individuals with cognitive impairment have poorer oral health manifested as decrease in number of teeth, increase in rate of dental caries, gingival recession, and oral infections.⁶ Therefore, maintenance of adequate oral hygiene becomes difficult for the patient and severe complications of dental diseases places dentists in a challenging position to effectively treat such diseases. Moreover, severity of symptoms of pain and/or burning sensation due to oral mucosal lesions (OMLs) such as erythematous candidiasis, denture stomatitis, erosive or erythematous oral lichen planus, non-homogeneous leukoplakia, oral cancer, and potentially adverse reactions due to inappropriate medications in older age is more than normal individuals.⁷ Geriatric population living in remote areas, have limited access to dental health care centres and need personalized care. To the above consideration, this review aims to discuss age related oral mucosal lesions prevalent in geriatric population and preventive strategies essential for healthy ageing.

Oral Mucosal Lesions in Geriatric Population

Fungal infections

Increase of opportunistic fungal infections in older age has become an issue of health concern. Literature has suggested that immune dysregulation, prolonged broad spectrum antibiotic use, topical or systemic steroids, steroid inhaler use, immunosuppressants or chemotherapeutic agents, and xerostomia as a result of diabetes mellitus or as a side effect of medications increases susceptibility of older age to invasive fungal infections. In addition, majority of older patients are denture wearers and are more vulnerable to denture associated candidal infection i.e., denture stomatitis.⁸ Increase in rate of hospitalization has been observed for older individuals which increases risk of nosocomial and opportunistic fungal infections.⁹ Researchers have investigated that saliva plays a key role in decreasing colonization of candida species due to cleansing action, and presence of antimicrobial defensive molecules such as lysozyme, lactoferrin,

and immunoglobulin IgA decreases the adherence of microorganisms to the oral mucosal surfaces.⁸

Candidiasis

Candida albicans (*C. albicans*) is the main fungal pathogen causing blood stream infections, but infections with non *albicans* candida species such as *C. glabrata*, *C. parapsilosis*, *C. tropicalis* and *C. krusei* are also prevalent. The most common opportunistic infection is candidiasis that can present as acute pseudomembranous candidiasis (oral thrush), acute atrophic candidiasis, chronic hyperplastic candidiasis (candidal leukoplakia), candida associated denture stomatitis and angular cheilitis.⁸ Pseudomembranous candidiasis manifest as thick white curd like plaques on the buccal mucosa removable by gauze or tongue blade. Lesions are usually asymptomatic, but patient may complain of localized soreness, and dysphagia on involvement of oropharynx, that is oropharyngeal candidiasis. Acute erythematous candidiasis, particularly associated with antibiotic or steroid inhaler use present as diffuse erythematous area on hard palate or dorsum of tongue. Denture stomatitis account for 8.4% of OMLs in older individuals characterized by erythema and inflammation of denture bearing surfaces. Patient may complain of local soreness, burning sensation, or taste alterations. Common risk factors of denture stomatitis in older age are poor oral and denture hygiene, trauma due to ill-fitting dentures, nocturnal denture wearing, smoking, and decreased salivary production.^{8,9} In 1962, Newton proposed a classification for denture stomatitis as: punctiform hyperaemia (class I), diffuse hyperaemia (class II), and granular hyperaemia (class III). Granular type of denture stomatitis seen as nodular appearance of central area of hard palate is more prevalent in older age group. Angular cheilitis appears as an erythematous fissure at the corners of the mouth linked with *C. albicans* and staphylococcus aureus co-infection.¹⁰

Presumptive diagnosis based on the history and clinical examination is sufficient to diagnose a patient with oral candidiasis, but for confirmatory diagnosis swab should be taken from affected region for microscopy or culture that reveals the presence of candidal hyphae, suggestive of candida species infection. Moreover, differential culture media such as HiChrome agar and automated VITEK 2 system enables identification of non *albicans* candida species.^{8,9} Topical and systemic antifungals are the mainstay of treatment of oral candidiasis. Topical antifungals such as nystatin and clotrimazole in

form of oral suspension or troches are prescribed for 7 to 14 days and continued for two weeks after regression of lesions. For denture stomatitis, topical antifungal should be applied to both denture base and oral mucosa and patients should be advised to discontinue wearing of dentures at night, to soak them in solutions containing chlorhexidine or sodium hypochlorite and to regularly clean their dentures with tooth brush.¹⁰ Recently studies have found high sensitivity of locally administered probiotics in the inhibition of candida colonization, but further clinical trials should be conducted to validate the effectiveness of probiotics.¹¹

Candidal leukoplakia (chronic hyperplastic candidiasis)

Chronic hyperplastic candidiasis or candidal leukoplakia appears as well demarcated, non-scrapable raised white patches intermixed with erythematous areas, bearing resemblance to speckled leukoplakia. Chronic hyperplastic candidiasis can occur at any age; and is often seen in smokers and denture wearers.¹² It has been suggested that lesion appears as if candida has been superimposed over pre-existing leukoplakia and elderly people diagnosed histopathologically as oral leukoplakia with an epithelial dysplasia are at higher risk to develop candidal infection. Lesions are usually asymptomatic, and regress after smoking cessation and treatment with an appropriate antifungal therapy.^{12,13}

Deep fungal infections

Fungal pathogens such as *Aspergillus fumigatus*, *Cryptococcus neoformans*, *Histoplasma capsulatum*, *Blastomyces dermatitidis*, and *Zygomycetes* class can cause invasive deep fungal infections in elderly. Chronic progressive disseminated histoplasmosis occurs with more severity in elderly characterized by severe immunosuppression and defect in cell mediated immunity. Patients should be examined for pancytopenia, and painful ulcerative, erosive and nodular lesions on the palate, tongue and the lips.¹⁴ Chest radiograph reveals diffuse cavitory pulmonary infiltrates, indicative of severe pulmonary infection. Besides histoplasmosis, blastomycosis and coccidiomycosis are other deep mycotic infections prevalent in older age due to immune dysfunction. Superficial mucocutaneous ulcerations, granulomatous, or verrucous like lesions are oral manifestations commonly observed. Diagnosis of deep mycotic infections is based on the history, clinical examination, fungal culture,

microscopic and serological evaluation. Promising modalities such as polymerase chain reaction (PCR) and western blot have been introduced to detect antibodies, still biopsy should be considered for oral deep seated fungal infections.¹⁵ Azole antifungals are routinely prescribed by dentists to treat oral fungal infections which include nystatin, clotrimazole, fluconazole, itraconazole, and ketoconazole. Fluconazole tablets 200-400mg for 7 to 14 days remains a first line treatment for oropharyngeal candidiasis, histoplasmosis and blastomycosis and clinical signs get improved within 3-5 days. Another triazole, itraconazole capsules have been found to have broad spectrum of activity and less toxicity for the treatment of oropharyngeal candidiasis.¹⁴

Oral ulcerations

Oral ulcerations, particularly traumatic and recurrent aphthous ulcerations occur commonly in the geriatric population. Aphthous ulcerations are non-traumatic ulcerations observed in the elderly, which may occur due to an underlying systemic disease such as inflammatory bowel disease, or Bechet's disease, vitamin deficiency, and psychological stress.¹ Clinically, aphthous ulcers are shallow, round to oval, with a necrotic centre and are surrounded by an erythematous halo. Minor aphthous ulcers are less than 5 mm in diameter, and heal without scarring within 10-14 days, major aphthous ulcers are over 1 cm in diameter and heal after 6 weeks, and lastly herpetiform ulcers occur commonly on the palate in a cluster of 100 multiple small ulcers, that coalesce to form larger irregular ulcers. In elderly, aphthous ulcers are recurrent, more painful and take longer time to heal.^{16,17} Diagnosis is based on history, thorough clinical evaluation, haematological investigations should be advised for a patient suspected to be anaemic, and biopsy should be performed for a persistent, non-healing ulcer. Topical anaesthetic gels are mainstay of treatment to reduce pain or discomfort, for a larger persistent or recurrent ulcers corticosteroids should be preferred and chlorhexidine mouth rinses may be used that reduces the inflammation associated with an ulcer.¹⁷

Traumatic ulcerations are commonly found in elderly population due to high incidence of traumatic injury due to ill-fitting prosthesis, fractured teeth, sharp edges of attrited or abraded teeth and motor dysfunction. Traumatic ulcers may be regular or irregular, well to ill defined, appear as shallow ulcerations with a necrotic centre and surrounded by a peripheral erythema. Management

of traumatic ulcer necessitates identification of an underlying cause, and removal of an etiologic factor. Topical anaesthetic gels should be prescribed for alleviation of pain, and if resolution does not occur within two weeks, then biopsy should be considered.^{1,16}

Oral lichen planus

Oral lichen planus (OLP) is an immune mediated mucocutaneous disease characterized by T cell mediated chronic inflammatory response. OLP is usually seen affecting elderly adults, predominantly females between 50 to 60 years of age. Aetiology of OLP is still not completely understood, although idiopathic but drugs such as antihypertensives, antimalarials, non-steroidal anti-inflammatory drugs, beta blockers and angiotensin converting enzyme inhibitors, contact allergic reaction to dental or restorative materials and psychological stress has been documented to play an important role towards its occurrence. OLP lesions present as reticular, atrophic /erythematous, erosive /ulcerative and bullous forms.¹⁸ Reticular OLP manifest as bilateral, symmetrical white lace like radiating pattern on the buccal mucosa, tongue and gingiva whereas erosive and atrophic OLP occur as reddish areas with peripheral striae on the buccal mucosa and tongue. Reticular OLP is usually asymptomatic while atrophic and erosive OLP are associated with clinical symptoms of pain and/or burning sensation to spicy foods. Gingival lesions appear as desquamative gingivitis, are more painful and affects oral hygiene of a patient. Moreover, diabetes mellitus and hypertension are more prevalent in older people, and medications taken predisposes the patient to develop OLP lesions, triad termed as "Grin spans Syndrome."¹⁹ Diagnosis of OLP lesions is based on the clinical appearance which is characteristic, and biopsy should be preferred in suspicious lesions difficult to diagnose and differentiate from other similar appearing conditions such as discoid lupus erythematosus and graft versus host disease. Asymptomatic OLP lesions require observation and regular follow up, and antioxidants such as soft gel lycopene capsules 8 mg should be given to scavenge free radicals. Symptomatic OLP lesions should be managed by topical steroids, tacrolimus and antiseptic mouthwashes.^{18,19}

Oral Cancer

Oral cancer is one of the commonest cancer prevalent in South East Asian regions, and around one third of oral cancer cases in the world have been

reported to occur in India. According to survey reports, it has been estimated that incidence of oral cancer in India will increase from one million in 2012 to 1.7 million in 2035.²⁰ Demographic data has revealed that incidence of oral cancer has been found to increase with an age, most of oral cancer cases have been observed between 50 and 70 years of age, with an average age of 60 years which has raised a concern for oral health care in geriatric population. In India, majority of oral cancer cases have been reported in males due to more consumption of tobacco and alcohol and buccal mucosa, gingiva tongue, floor of the mouth, lips and posterior oropharynx are frequently involved intraoral sites. Clinically, lesions present as painful, large irregular ulcerations with raised margins or ulcero proliferative growth that metastasize to involve regional lymph nodes and distant tissues and organs. Early detection of suspicious oral precancerous lesions is paramount for optimal health of an individual but geriatric population suffer from delay in diagnosis due to limited access to oral health care facilities and lack of awareness about deleterious effects of tobacco use.²¹ Therefore, personalized care should be provided to geriatric patients by telehealth services and they should be counselled to make quit attempts for timely prevention of oral cancer development.

Vesiculobullous lesions

Pemphigus vulgaris, cicatricial or mucous membrane pemphigoid (MMP) and bullous pemphigoid are autoimmune vesiculobullous disorders in which autoantibodies are directed towards desmoglein -1 and -3 proteins involved in cell to cell adhesion in pemphigus vulgaris and towards hemidesmosomal proteins, BP 180 and 230 in epithelial basement membrane junction in case of pemphigoid. Pemphigus vulgaris occur in elderly individuals after fifth and sixth decades of life and is characterized by an intraepithelial bulla that rupture to form large, irregular painful ulcers. Drug induced pemphigus has been reported to occur due to intake of thiol drugs (captopril, penicillamine), antibiotics (penicillins, cephalosporins, vancomycin), antihypertensive drugs (enalapril, lisinopril), and piroxicam. MMP has predilection towards elderly women above 65 years of age. MMP has been observed to involve oral mucosa, eyes and skin, although cutaneous lesions are less frequent. Ocular involvement in severe cases may result in symblepharon, a pathological condition in which palpebral and bulbar conjunctiva form an abnormal adhesion to each other and patient suffers from blindness.²² Contrary to pemphigus,

bullae in MMP are subepithelial, thick walled and not easily rupture. Biopsy and direct immunofluorescence tests should be performed for proper diagnosis of both vesiculobullous lesions. Patients should be advised to maintain meticulous oral hygiene and medications such as topical and systemic corticosteroids should be prescribed for symptomatic relief.²³

Viral infections

Recurrent herpes labialis and herpes zoster (HZ) or shingles can cause severe vesiculobullous ulcerations in the elderly. Herpes simplex virus causes recurrent infection "herpes labialis" characterized by vesicular eruptions primarily on the lips, and vesicles rupture, ulcerate and eventually crusts. Herpes zoster or shingles occur as a painful, unilateral, dermatomal vesicular rash along the distribution of the trigeminal nerve. Intraorally, painful unilateral ulcerations are observed on the palate suggestive of involvement of maxillary division of trigeminal nerve.²⁴ It has been reported that HZ risk increases above 60 years of age and risk is 50% more in people above 85 years of age. Postherpetic neuralgia is a major complication of HZ in post-menopausal women above 50 years of age characterized by burning, aching or throbbing pain that may persist for more than 3 months; thereby affecting quality of life. Management of viral infections require topical or systemic antiviral drugs, particularly acyclovir. In case of herpes labialis, topical antivirals should be applied before the lesion ulcerates and crusts. Topical application of lidocaine or capsaicin has been found to provide symptomatic relief in post herpetic neuralgia. Advisory Committee on Immunization Practices has recommended varicella zoster virus vaccine to reduce the occurrence of shingles in adults above 60 years and clinical trials have found satisfactory outcomes in reduction of severity of pain associated with HZ and post herpetic neuralgia.^{24,25}

Xerostomia or oral dryness

Xerostomia or dry mouth is commonly reported subjective symptom by the elderly population indicative of salivary gland hypofunction. As the age advances, salivary gland parenchyma is replaced by a fibrous tissue and undergoes fatty degeneration that affects both quality and quantity of saliva. Moreover, systemic diseases, use of medications and radiation therapy for treatment of malignant diseases increases the risk of salivary gland hypofunction. Thorough clinical assessment is required to elucidate the signs of

hyposalivation such as dry, cracked lips and dry oral mucosa. As a result, patients become more susceptible to develop candidiasis, dental caries, periodontal diseases, aphthous ulceration, angular cheilitis, and taste alterations.^{26,27} Management of elderly patients with clinical signs of xerostomia require multimodal approach. Symptomatic treatment such as frequent sipping of water, use of sugar free chewing gums and salivary substitutes should be advised. Pharmacological agents such as pilocarpine 5-10 mg and cevimeline 30-45 mg three times a day could be used to increase unstimulated saliva production especially for hyposalivation due to irradiation of head and neck cancer.²⁶

Burning Mouth Syndrome

Burning mouth syndrome (BMS) is chronic painful condition of oral mucosa prevalent in middle aged and elderly females in comparison to males; female to male ratio has been reported to vary from 3:1 to 16:1, due to hormonal alterations in females. Psychogenic stress has been considered as a main causative factor for the onset of intractable pain experienced in BMS. Patient often complains of burning sensation of oral mucosa that increases in intensity during the day, and reduces on eating or drinking.²⁸ Management of BMS in elderly patients is a challenge, tricyclic antidepressants are first line treatment option, but side effects of reduced salivation and cardiotoxicity limits its use in people older than 65 years. Benzodiazepines such as diazepam and clonazepam are alternative drugs, but in elderly they should be prescribed with caution due to an associated risk of cognitive impairment. Currently, cognitive behavioural therapy is gaining popularity for alleviation of pain related catastrophizing.²⁸

Geriatric Pharmacotherapy

In older age, pharmacokinetics and pharmacodynamics of several drugs prescribed routinely in dental practice such as antibiotics, analgesics, muscle relaxants, etc gets altered. Pharmacokinetic activity refers to gastrointestinal (GI) absorption, distribution, biotransformation, and elimination of a drug whereas pharmacodynamics refers to biochemical and physiological changes produced by the drug, that include drug receptor interaction, dose response relationship, signal transduction, protein transcription and cellular response.²⁹ Moreover, polypharmacy increases the risk of adverse drug reactions and drug interactions in geriatric patients above 65 years of age. Beers Criteria for potentially inappropriate medication

Table 1: Summarizes commonly prescribed medications in dental practice and associated adverse drug events in geriatric population.

Drug	Mechanism of Action	Indications	Adverse Drug Reactions
Non-steroidal Anti-inflammatory Drugs (NSAIDs) Ibuprofen, ketoprofen, meloxicam, piroxicam, celecoxib, diclofenac	Analgesic and anti-inflammatory actions by inhibition of synthesis of prostaglandins via cyclooxygenase enzymes (COX 1 and 2)	Pain resulting from odontogenic infections, trauma, acute dental pain, TMJ pain and chronic myofascial pain	Long term use could result in increase in risk of gastric ulcers, GI bleeding, renal dysfunction, and cardiovascular events such as myocardial infarction and stroke
Tricyclic antidepressants (TCA) Amitriptyline nortriptyline, imipramine	Inhibit presynaptic reuptake of serotonin and noradrenaline from the synaptic cleft, antagonization of sodium channels and voltage dependent calcium channels	Chronic neuropathic pain, persistent dentoalveolar pain, post herpetic neuralgia, atypical facial pain and burning mouth syndrome	Long term use should be avoided due to the potent anticholinergic, hypotensive and sedative effects. They can exert cardiovascular toxicity that is ventricular arrhythmias, xerostomia, urine retention, weight gain, blurred vision, muscle weakness and cognitive impairment
Benzodiazepines Diazepam, clonazepam	Sedative, hypnotic, anticonvulsant and anxiolytic effects by enhancement of GABA neurotransmitter	Burning mouth syndrome, TMJ disorders, and muscle spasms	Should be avoided in patients above 65 years due side effects such as cognitive impairment, delirium, fatigue, dizziness, mental cloudiness and high incidence of physical dependence
Skeletal Muscle Relaxants Cyclobenzaprine, metaxalone, methocarbamol, carisoprodol	Alter CNS conductivity both on the brain stem and the spinal cord	Muscle spasms, TMJ pain, regional myofascial pain, tension type headaches	Should be avoided above 65 years due to CNS depression, sedation anticholinergic, and increase in risk of falls and fractures

TMJ; temporomandibular joint, CNS; central nervous system; GABA; gamma-aminobutyric acid.

use in older adults above 65 years was developed by Mark Beers in 1991 with a goal to improve medication selection and to avoid adverse drug events in older adults.³⁰ In dentistry, antibiotics that include amoxicillin, doxycycline, ciprofloxacin, azithromycin, clindamycin, sulfamethoxazole and trimethoprim are commonly prescribed to reduce the orofacial infections, but antimicrobial resistance has been documented as a major concern in elderly patients. Table 1 summarizes commonly prescribed medications in dental practice and associated adverse drug events.²⁹

Conclusion

Oral health status evaluation in geriatric population needs special attention due to increase in prevalence of various oral mucosal lesions with advancing age that have significant impact on daily functional activities of an individual. Personalized oral health care should be extended to geriatric patients by telehealth services, caution should be taken while prescribing medications to oldest old patients to prevent adverse drug events, and potential benefits should outweigh the risks during prescription of drugs for symptomatic treatment of dental diseases.

References

1. Shah N. Geriatric oral health issues in India. *Int Dent J* 2001; 51:212- 8.
2. World Health Organization The World Health Report 2003. Shaping the Future. Geneva, Switzerland:WHO; 2003.
3. WHO, Active Aging: A Policy Framework, WHO, Geneva, Switzerland, 2002.
4. Douglas CW, Jiménez MC. Our Current Geriatric Population Demographic and Oral Health Care Utilization.
5. Miura H, Tano R. Recent measures in geriatric oral health care in Japan. *J Natl Inst Public Health* 2019;68:8-166.
6. Zuluaga DJM, Montoya JAG, Contreras CI, Herrera RR. Association between oral health, cognitive impairment and oral health-related quality of life. *Gerodontology* 2011;29:667-7.
7. Espinoza I, Rojas R, Aranda W, Gamonal J. Prevalence of oral mucosal lesions in elderly people in Santiago, Chile. *J Oral Pathol Med* 2003; 32: 571-15.
8. Paillaud E, Merlier I, Dupeyron C, Scherman E, Poupon J, Bories P-N. Oral candidiasis and nutritional deficiencies in elderly hospitalised patients. *Br J Nutr* 2004; 92: 861-67.

9. Grimoud AM, Lodter JP, Marty N, Andrieu S, Bocquet H, Linas MD, et al. Improved oral hygiene and *Candida* species colonization level in geriatric patients. *Oral Dis* 2005; 11: 163–69.
10. Barbeau J, Séguin J, Goulet JP, de Koninck L, Avon SL, Lalonde B, et al. Reassessing the presence of *Candida albicans* in denture related stomatitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003;95:51–9.
11. Hatakka K, Ahola AJ, Yli-Knuutila H, Richardson M, Poussa T, Meurmann JH, et al. Probiotics reduce the prevalence of oral candida in the elderly—a randomized controlled trial. *J Dent Res* 2007; 86: 125–30.
12. Sitheequ MAM, Samaranayake LP. Chronic hyperplastic candidosis/candidiasis (candidal leukoplakia). *Crit Rev Oral Biol Med* 2003; 14: 253–67.
13. Sharma A. Oral candidiasis : An opportunistic infection: A review. *Int J App Dent Sci* 2019;5:23-7.
14. Muzyka BC, Glick M. A review of oral fungal infections and appropriate therapy. *J Am Dent Assoc* 1995;126:63–72.
15. O’Shaughnessy EM, Shea YM, Witebsky FG. Laboratory diagnosis of invasive mycoses. *Infect Dis Clin North Am* 2003;17:135–58.
16. Razak PA, Richard KMJ, Thankachan RP, Hafiz KAA, Kumar KN, Sameer KM. Geriatric oral health : a review article. *J Int Oral Health* 2014; 6: 110-6.
17. Barrons RW. Treatment strategies for recurrent oral aphthous ulcers. *Am J Health Syst Pharm* 2001 ;58:41-50.
18. Green JG, Cohen DM. Management of a common oral lesion of the elderly. *Geriatrics* 1987;42:53-5.
19. Oral lichen planus: controversies surrounding malignant transformation. *Oral Dis* 2008; 14: 229–43.
20. Varshitha A. Prevalence of Oral Cancer in India. *J Pharm Sci Res* 2015;7:845-8.
21. Liu W, Shi LJ, Wu L, Feng JQ, Yang Xi, Li J, et al. Oral Cancer Development in Patients with Leukoplakia – Clinicopathological Factors Affecting Outcome. *PloS One* 2012;7:34773.
22. Kershenovich R, Hodak E, Mimouni D. Diagnosis and classification of pemphigus and bullous pemphigoid. *Autoimmun Rev* 2014;13:477-81.
23. Rashid H, Lamberts A, Diercks GFH, Pas HH, Meijer JM, Bolling MC, et al. Oral Lesions in Autoimmune Bullous Diseases: An Overview of Clinical Characteristics and Diagnostic Algorithm. *Am J Clin Dermatol* 2019;20:847-61.
24. Sciubba JJ. Herpes simplex and aphthous ulcerations: presentation, diagnosis and management—an update. *Gen Dent* 2003; 51: 510–16.
25. Jackson JL, Gibbons R, Meyer G, Inouye L. The effect of treating herpes zoster with oral acyclovir in preventing postherpetic neuralgia. A meta-analysis. *Arch Intern Med* 1997; 157: 909–12.
26. Ouanaunou A. Xerostomia in the Geriatric Patient: Causes, Oral Manifestations, and Treatment. *Compend Contin Educ Dent* 2016;37:306-11.
27. Scully C, Felix DH. Oral medicine – update for the dental practitioner: dry mouth and disorders of salivation. *Br Dent J* 2005; 199: 423–2.
28. Asplund R. Nocturia and the burning mouth syndrome (BMS) in the elderly. *Arch Gerontol Geriatr* 2005;41:255-60
29. Farag A, Desai B. Potentially inappropriate medications in geriatric population: a clinical update for oral medicine and orofacial pain practitioners. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2017;124:600–8.
30. Radcliff S, Yue JR, Rocco G, et al. American Geriatrics Society 2015 updated beers criteria for potentially inappropriate medication use in older adults. *J Am Geriatr Soc.* 2015;63:2227- 46.