

THE EFFECTIVENESS OF SALVADORA PERSICA IN TREATING DENTURE STOMATITIS – CLINICAL CASE REPORT

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ABSTRACT

Salvadora Persica (miswak stick) has been widely used as an aid for oral hygiene in dentate patient. Due to the fact that there is no side effect of using miswak stick as cleaning aids on teeth but it has been never introduced to edentulous patient as an oral aid for denture and oral care, this study introduced a new approach in edentulous patient the role of miswak stick. This approach may prevent the incidence of denture stomatitis in complete denture wearer. Study aimed to share the clinical finding of two (2) patients aged 35 and 65-years-old who were wearing denture and affected by denture stomatitis. Both patients were introduced with the miswak stick as an oral hygiene tools on the edentulous mucosa. After 12 weeks, postoperative assessment (clinical and photographic) were evaluated and analyzed by comparing the mapping of denture stomatitis inflammation surface area using ImageJ FIJI software and the inflammation clinical presentation. The results showed the inflammation surface area has reduced by 22.74% to 49.59%, respectively. Within the limitation of the study, the use of the miswak stick helps the reduction of the inflammation caused by denture stomatitis. Therefore, miswak stick can be introduced as one of oral hygiene aid for edentulous arch.

Keywords: *Salvadora Persica*, miswak, denture stomatitis, denture, oral hygiene

INTRODUCTION

Denture stomatitis is also known as chronic atrophic candidosis which characterized by patchy to diffuse inflammation on the mucosa in contact with denture fitting surface (Gendreau & Loewy, 2011). It is associated with palatal inflammatory papillary hyperplasia and angular stomatitis (Basker & Davenport, 2002) that is commonly affects maxillary denture-bearing area and does not extend beyond the borders of the dentures. This common oral lesion affects about one third of denture wearers (Zississ *et al*, 2006) and mainly among female compared to male (Santos *et la*, 2010). Its aetiology is multifactorial which include poor denture hygiene, colonization of *Candida albicans*, denture materials, denture trauma and ill-fitting denture (Gendreau & Loewy, 2011, Pattanaik *et al*, 2010, Coco *et al*, 2008).

As first line management of denture stomatitis, enhancement of denture hygiene is suggested to reduce the pathogeny of the dental biofilm and reported to be effective as compared to topical or systemic antifungal (de Souza *et al.*, 2015) as the compliance and duration of topical antifungal by elderly patient, appears to be not effective. Oral hygiene and denture hygiene are essential to prevent plaque accumulation, malodour, poor aesthetics and prevent formation of various oral mucosal lesion (Webb *et al*, 2005, Wu *et al*, 2001). Routine denture cleansing includes both mechanical and chemical cleaning methods to remove plaque because chemical method alone is not adequate. Denture should also be removed during sleep to reduce the time of oral mucosa to be in contact with denture as denture may harbour *Candida albicans* (Azad *et al*, 2015, de Souza *et al*, 2015,

Shigli, 2009, Webb *et al*, 2005). This can reduce the fungal counts intraorally and allows beneficial effects to saliva to take accounts (de Souza *et al*, 2015, Webb *et al*, 2005).

Miswak stick (*Salvadora Persica*) is one of the earliest and most widely used mechanical oral cleaning aids since ancient times. In 1987, the World Health Organization encouraged the developing nations to use miswak for oral hygiene because of tradition, availability and low cost (Halawany, 2012), even though little scientific attention has been paid to its oral health beneficial effects. Recently, studies have concluded that *Salvadora Persica* or its extract has therapeutic effect on candidal infection. The work of Noumi *et. al* showed that diluted acetone and alcoholic extract of dry *Salvadora Persica* has anti-fungal activity against *C. albicans*, *C. glabrata*, *C. parapsilosis* strains while methanol and ethyl acetate extracts of dry *Salvadora Persica* stems only active on one *C. albicans* isolate (Tanaka *et al*, 1998, Kabawat *et al*, 2014). Although various types of miswak sticks have been used as oral cleansing for teeth, but until now, there is few available data concerning the use of *Salvadora Persica* as an oral aid in the reduction of denture stomatitis in edentulous patient. Therefore, the objective of the study was to assess the effectiveness of the miswak stick as an oral aid in edentulous patients who wear denture which act as an alternative treatment for denture stomatitis. Two patients in this study were diagnosed with denture stomatitis had been clinically tested by using miswak stick as oral and denture cleansing. As *Salvadora Persica* has showed to have an antifungal therapeutic effect on candida strains that is the aetiology of denture stomatitis this study aimed to prove that *Salvadora Persica* can help in the reduction of denture stomatitis in edentulous patient.

CASE SERIES

An informed signed consent was obtained from both patient and ethical approval was obtained from the institutional ethical committee of Universiti Sains Islam Malaysia (USIM) before treatment started. The intervention was given to both patients. Apart from the usual denture hygiene habits, patients were taught how to use the miswak stick. A clinician demonstrated the cleaning and brushing part to the patient on the first visit. The patients will use the miswak stick to brush the denture surface and the edentulous area including palate, buccal mucosa and tongue. The patients were given a review appointment (second visit) after 1 week and they need to demonstrate the miswak stick use prior to another recall for review after 12 weeks (third visit). During the third visit, post-clinical assessment and photographic evaluation were conducted by two calibrated clinicians as the final assessment. The mapping of the photographic image was analyzed using ImageJ FIJI to assess the inflammation area. The software was automatically measured the irregular surface area of the denture stomatitis on scanned and set scaled pre- and post-clinical photographs of both patients. The measured mapping area and denture stomatitis conditions were compared.

CASE 1

A 35-year-old lady presented to the Department of Prosthodontic, Faculty of Dentistry, Universiti Sains Islam Malaysia (USIM) complaining of difficulty during eating due to her severely decayed upper right and left teeth. She requested to remove the teeth and construct a new upper partial denture. She was diagnosed with anemia and sinusitis in 2016 and had follow-ups in a private clinic.

Upon oral examination, the patient presented with a severe inflammation and redness of the oral mucous membrane beneath the upper partial denture. The inflamed area was extended posteriorly until distal of upper right first molar to upper left first molar which classified as Newton's classification Class II which is generalized diffused erythematous on the anterior of palate (*Figure 1*). Patient exhibit good denture hygiene but upon assessment of the denture it has poor extension.

After the introduction of miswak stick, the appearance of the affected mucosa has changed to a mild petechial hemorrhage (pin-point bleeding) on the anterior palate (*Figure 2*). The inflammation area was reduced as compared to the previous assessment. Mapping of the denture stomatitis inflammation changed from 452.737mm to 349.792mm measured by ImageJ FIJI (*Figure 3*). The total reduction of inflammation area was 22.74%.

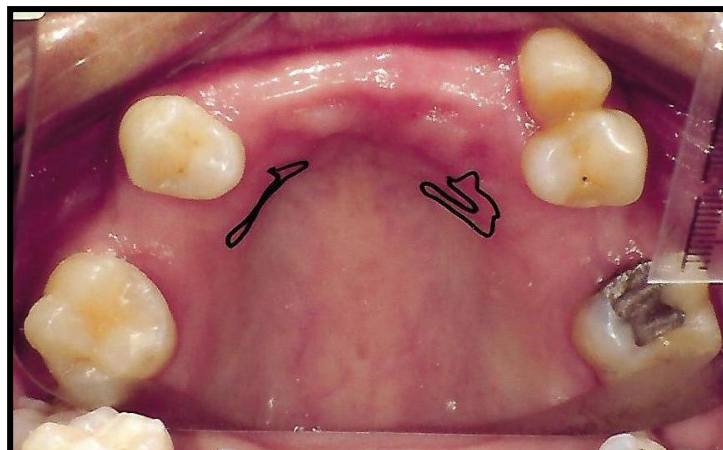
Figure 1: The pre-assessment photo of patient case 1 who has upper partial denture showing the denture induce stomatitis lesion at the denture bearing area on upper arch.



Figure 2: Post assessment after 12 weeks photo showing that the inflammation area of denture stomatitis has been reduced.



Figure 3: The mapping of denture stomatitis inflammation area during post assessment using ImageJ Fiji software.



CASE 2

A 56-year-old lady came to Department of Prosthodontic, Faculty of Dentistry, Universiti Sains Islam Malaysia (USIM) requested a new set of complete denture. The present denture was constructed 5 years ago which is loosed and the acrylic denture teeth has been wearing off and appeared short. Patient was unhappy with the aesthetic of the denture. Patient manifested good general health status without any history of hospitalization.

Intra-oral examination showed that patient has generalized type I denture-induced stomatitis. The palate appeared inflamed and red on the anterior as well as the posterior palate. There was presence of multiple pin-point erythema surrounded the palate (*Figure 4*). During the first visit, patient was advised to practice a good denture hygiene habits by removing the denture at night, use denture cleanser and brush the denture and palate by using miswak stick.

On final assessment, the condition of the denture stomatitis had shown a significant reduction of inflammation. The inflamed palate was healing and the redness was reduced. The previously type I denture stomatitis at the anterior 1/3 of palate was completely healed and cleared. The sign of denture stomatitis at the posterior 2/3 of palate was also improved (*Figure 5*). The edentulous area and oral mucosa were not presented with any ulceration. Patient also informed that she did not have any discomfort or abrasion on oral mucosa and edentulous area when using miswak stick for cleaning and brushing aids. Patient was advised to continue using miswak stick to clean the oral cavity and denture. Mapping of the inflammation changed from 427.813mm to 215.6195mm as measured by the ImageJ FIJI (*Figure 6*). The total percentage area of reduction was 49.59%.

Figure 4: The pre-assessment photo of patient case 2 who is complete edentulous upper arch showing the denture induce stomatitis lesion at the anterior palatal rugae and posterior palatal region extending to the soft palate area.

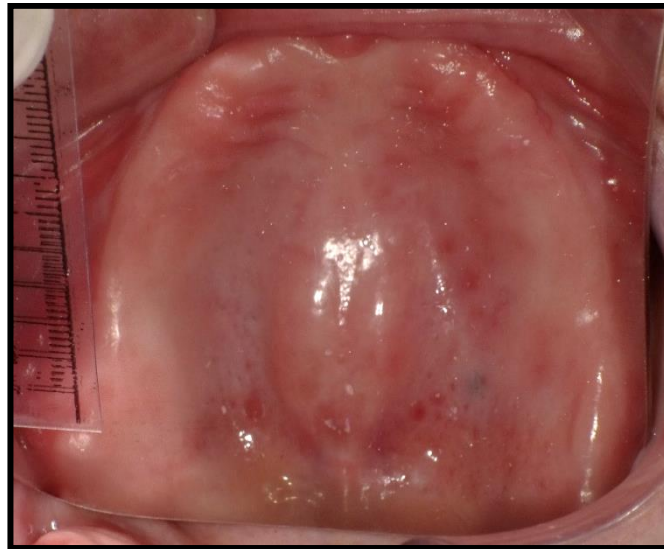


Figure 5: Photo of post assessment after 12 weeks showing that the inflammation area of denture stomatitis has been resolved and anterior region and reduced at posterior palatal region.

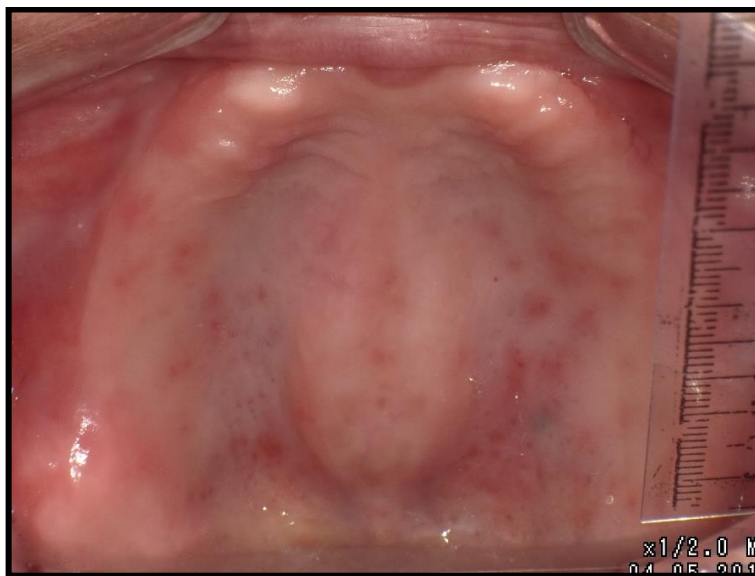
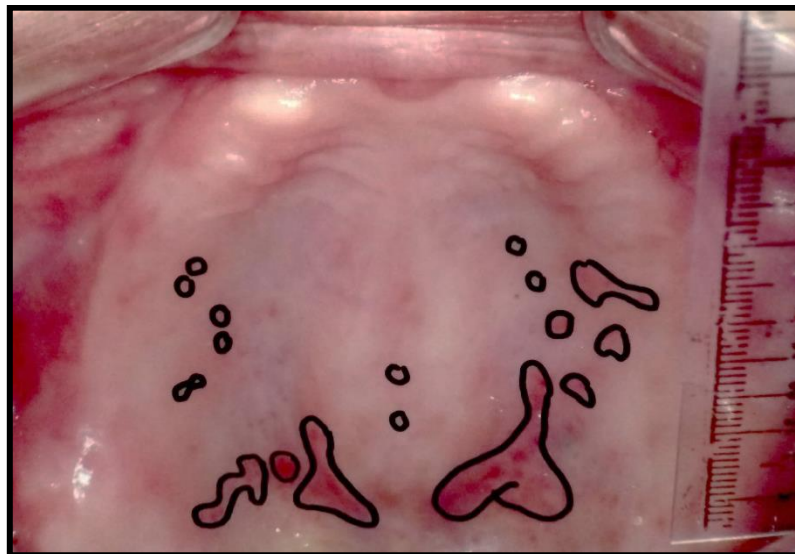


Figure 6: The mapping of denture stomatitis inflammation area during post assessment using ImageJ Fiji software.



DISCUSSION

The diagnosis of denture induced stomatitis is mainly formulated by oral examination. The microbiologically tested of the *Candida* species in the laboratory is the supplemental aids to facilitate the diagnosis of the condition. Due to this, study can be improved by performing the laboratory test for further research.

Inadequate denture cleaning and continuous denture wearing may influence establishment of biofilm and denture plaque accumulation. Studies reported that high plaque accumulation was associated with severe denture stomatitis patients (Gendreau & Loewy, 2011, Zissis et al, 2006). This is due to plaque accumulation that leads to colonization of *Candida albicans*, as there is correlation between poor hygiene and susceptibility of *Candida albicans* (Gendreau & Loewy, 2011, Coco et al,2008). As a result, most guidelines for managing denture stomatitis have been developed based on the etiologies of the condition which may be due to poor denture hygiene and ill-fitting denture (Gendreau & Loewy, 2011) or due to the infection from *Candidas*. However, currently, there is no universal standard treatment specific for denture stomatitis. Study had tried to introduce *Salvadora Persica* as oral aids to clean the oral mucosa surface as it has been proven that it promotes the mechanical and chemical approach for oral hygiene care on teeth. Thus, this study proved that it also can prevent and treat denture stomatitis effectively.

Various study showed that most of the denture wearers use toothbrush and water alone to clean their denture (Noumi et al, 2010, Neini et al, 2014) and some even used toothpaste to clean their denture. However the use of toothpaste may cause abrasion to the denture surface which may give undesirable effect on aesthetics and biological (Neini et al, 2014). The introduction of miswak stick as an oral aid in edentulous patients is considered as a new intervention for cleaning of the oral mucosa and denture especially in patients with denture stomatitis. The miswak stick has been used for over 7000 years ago. It was well-documented as a traditional and natural alternative to the modern toothbrush which was also reputed for multiple medicinal benefits (Halawany,2012,Tanaka et al, 1998, Kabawat et al,2014). The reduction of the inflammation area on both patients may benefit from mechanical brushing using miswak stick which would increase blood microcirculation (Tanaka et al, 1998). Kabawat found that palatal brushing is effective in reducing denture stomatitis (Kabawat et al,2014).

Salvadora Persica was known to have anti-microbial effect that not only can prevent dental caries from occurring but also reversing the condition. It is also effective as a natural toothbrush for cleaning as they contained antifungal activity which may help to control the candida infection (Kabawat et al, 2014). By brushing the denture-fitting surface with miswak, the biofilm adherence to the denture surface could be reduced. This may benefit from the chemical content of *Salvadora Persica* such as salvadorine, and the essential oils that contains BITC and benzyl nitrile. The work of Noumi et al., found that diluted acetone extract on dry *Salvadora Persica* has antifungal activity against *C.albicans*, *C. glabrata* and *C. parapsilosis* strains while methanol and ethyl acetate extracts of dry *Salvadora Persica* stems only active on *Candida Albicans* isolate (Tanaka et al, 1998). The inhibition activity of candida both on the mucosa and denture-fitting surface helps to reduce the inflammation that caused denture stomatitis.

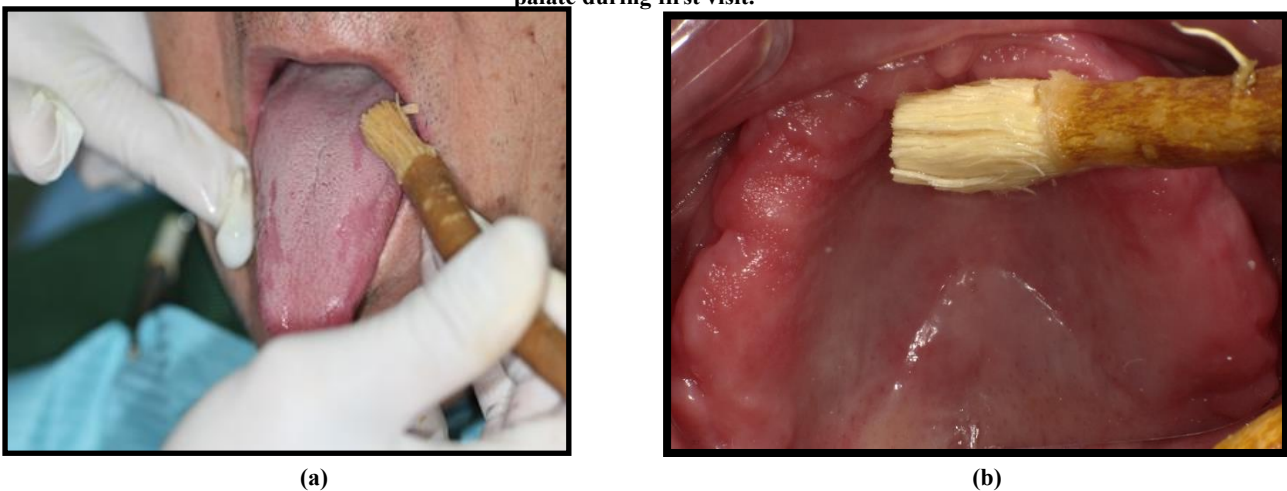
In this study, the improvement in patients' oral condition might be due to several factors. Firstly, emphasize on proper denture and oral hygiene care were given and patients were reviewed for a few visit. This increases the patients' knowledge and attitude towards the importance of proper hygiene care on denture and oral mucosa, and indirectly will improve the inflammation.

Secondly, the use of *Salvadora Persica* also plays an important role. *Salvadora Persica* has been shown to be effective against *Candida Albicans*, the main species involved in denture stomatitis. The extract of *Salvadora Persica* showed the highest antifungal activity on *Candida Albicans* with significant reduction of inflammation observed in the patient's oral mucosa. In both patients, the palate appeared to be less inflamed compared to the pre-operative assessment and improved from generalized to

localized condition. Moreover, both patients were shown to have more than 20% reduction in the mapping of denture stomatitis inflammation area. Therefore, it can be suggested that *Salvadora Persica* has the potential to be used to eliminate candida albicans' colonization on the oral mucosa of denture wearers.

The techniques for using miswak sticks to clean their oral mucosa surfaces was demonstrated prior to the study, as shown in Figure 7(a) and Figure 7(b). The outer layer of the miswak sticks must be peeled off, to expose the inner fibers or bristles which contain the therapeutic effect mediums (Noumi et al, 2010, Nacini et al, 2014, Azad et al ,2015). The bristles or fibers need to be softened with tap water prior to use and brushing movement is carried out with the brush perpendicular to the mucosa surface. Both patients reported that the miswak sticks are easy to be used to clean their dentures and oral mucosal surfaces, namely the palate and tongue. Miswak sticks only need tap water for cleaning and softening of the bristles, making the storage and cleaning process convenient for the patients. The patients also claimed that they never experienced any problem and side effects such as ulcer, sores, inflammation and severe pain from using the miswak sticks.

Figure 7 (a&b): Picture show the techniques that has been shown to patient on how to use miswak stick on the tongue and palate during first visit.



CONCLUSION

Salvadora Persica has been commercially used as an aid for oral hygiene care. The acceptance of miswak stick is broad due to the fact that a part of Islam's religious practice recommends it specifically as a tooth-cleaner. There are available literatures that report on its antibacterial and antifungal activity against oral microbes.

In this case reports, both patients showed improvement and reduction in inflammation area after 12 weeks of cleaning the affected area with miswak stick. Proper oral hygiene care also played an important role in the success of this treatment. With this clinical observation, the authors recommend regular usage of miswak stick on denture wearers for prevention and treatment of denture stomatitis. The use of miswak stick can be considered as an oral aid in edentulous patient as it is effective, inexpensive, and commonly available and contain beneficial medical properties.

However, further clinical and pharmacological studies are needed to scientifically prove that the extract of *Salvadora Persica* is effective against *Candida albicans* in treating denture stomatitis.

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REFERENCES

- Azad AA, Butt MM, Ahmed A, Malik AS. (2015). Denture Hygiene Habits Among Edentulous Patients Seen At Armed Forces Institute of Dentistry , Rawalpindi. Pakistan. *Oral Dent J.* 35(4):735–7.
- Basker RM, Davenport JC (2002). Prosthetic Treatment of the Edentulous Patient. 4th ed. Oxford: Blackwell Munksgaard.
- Coco BJ, Bagg J, Cross LJ, Jose A, Cross J, Ramage G. (2008). Mixed *Candida albicans* and *Candida glabrata* populations associated with the pathogenesis of denture stomatitis. *Oral Microbiol Immunol.* 23(5):377–83.
- de Souza, R. F., Khiyani, M. F., Chaves, C. A., Feine, J., Barbeau, J., Fuentes, R., ... & Emami, E. (2017). Improving practice guidelines for the treatment of denture-related erythematous stomatitis: a study protocol for a randomized controlled trial. *Trials*, 18(1), 211.
- Dos Santos, C. M., Hilgert, J. B., Padilha, D. M. P., & Hugo, F. N. (2010). Denture stomatitis and its risk indicators in south Brazilian older adults. *Gerodontology*, 27(2), 134-140.
- Gendreau, L., & Loewy, Z. G. (2011). Epidemiology and etiology of denture stomatitis. *Journal of Prosthodontics*, 20(4), 251-260.

- Halawany, H. S. (2012). A review on miswak (*Salvadora persica*) and its effect on various aspects of oral health. *The Saudi dental journal*, 24(2), 63-69.
- Kabawat M, de Souza RF, Badaró MM, de Koninck L, Barbeau J, Rompré P et al. (2014). Phase 1 clinical trial on the effect of palatal brushing on denture stomatitis. *Int J Prosthodont*. 27:311-9.
- Naeini, A., Naderi, N. J., & Shokri, H. (2014). Analysis and in vitro anti-Candida antifungal activity of *Cuminum cyminum* and *Salvadora persica* herbs extracts against pathogenic *Candida* strains. *Journal de Mycologie Médicale/Journal of Medical Mycology*, 24(1), 13-18.
- Noumi, E., Snoussi, M., Hajlaoui, H., Valentin, E., & Bakhrouf, A. (2010). Antifungal properties of *Salvadora persica* and *Juglans regia* L. extracts against oral *Candida* strains. *European journal of clinical microbiology & infectious diseases*, 29(1), 81.
- Pattanaik, S., Vikas, B. V. J., Pattanaik, B., Sahu, S., & Lodam, S. (2010). Denture stomatitis: a literature review. *Journal of Indian Academy of Oral Medicine and Radiology*, 22(3), 136.
- Shigli, K. (2009). Aftercare of the complete denture patient. *Journal of Prosthodontics*, 18(8), 688-693.
- Tanaka, M., Hanioka, T., Kishimoto, M., & Shizukuishi, S. (1998). Effect of mechanical toothbrush stimulation on gingival microcirculatory functions in inflamed gingiva of dogs. *Journal of clinical periodontology*, 25(7), 561-565.
- Webb, B. C., Thomas, C. J., & Whittle, T. (2005). A 2-year study of *Candida*-associated denture stomatitis treatment in aged care subjects. *Gerodontology*, 22(3), 168-176.
- Wu, C. D., Darout, I. A., & Skaug, N. (2001). Chewing sticks: timeless natural toothbrushes for oral cleansing. *Journal of periodontal research*, 36(5), 275-284.
- Zissis, A., Yannikakis, S., & Harrison, A. (2006). Comparison of denture stomatitis prevalence in 2 population groups. *International Journal of Prosthodontics*, 19(6).