

Efficacy of Visual Oral Health Reinforcement in Reducing Plaque Accumulation and Gingival Bleeding: A Pilot Randomized Controlled Trial

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Received on: 15 January 2023; Accepted on: 16 February 2023; Published on: 14 March 2024

ABSTRACT

Aim: To compare oral hygiene (OH) differences during verbal or video OH instructions with or without images displaying poor oral health consequences.

Materials and methods: Twenty-one healthy females (18–30 years) were randomly and equally divided into three intervention OH instruction groups: (1) verbal, (2) video-based, (3) video-based with image displaying the consequences of poor OH. Gingival bleeding on probing (BOP), gingival bleeding index (BI), and plaque score (PS) were assessed at baseline and after 4 weeks. Within- and between-group differences were assessed by non-parametric tests.

Results: Plaque score only showed a statistical group difference after follow-up [$H(2) = 9.214, p = 0.01$]. The *post hoc* test revealed that group III showed a significantly lower PS than groups I and II ($p = 0.04$ and $p = 0.017$, respectively). No differences were observed in PS between groups I and II. Group I showed no follow-up reduction in PS, BI, and BOP, while group II showed a statistically significant reduction in BI only after follow-up ($p = 0.028$). However, group III showed a statistically significant reduction in BOP and PS ($p = 0.023$ and $p = 0.045$, respectively) but not BI.

Conclusions: Verbal and video-alone OH instructions similarly affect gingival health, while participants who were exposed to images displaying the severe OH consequences had lower PS than verbal or video-alone groups.

Clinical significance: The mode of OH instructions is not influential for optimum oral health. However, employing visuals highlighting the severe consequences of poor OH leads to short-term reduction of plaque accumulation.

Keywords: Inflammation, Periodontal diseases, Periodontitis, Plaque index, Tooth plaque.

The Journal of Contemporary Dental Practice (2024): 10.5005/jp-journals-10024-3637

INTRODUCTION

It is well established through epidemiological studies that optimum oral hygiene (OH) is an imperative component for periodontal health.¹ Poor adherence to tooth brushing and flossing results in plaque and bacterial biofilm accumulation, resulting in gingival inflammation and dental demineralization. Poor OH can also lead to periodontal destruction, leading to tooth loss.² Adopting regular tooth brushing and flossing habits is vital to overcoming poor OH's consequences. However, influencing patients' adherence to optimum OH is challenging for the dental team. Thus, effective OH instructions are essential for the prevention and maintenance of oral health.

Traditionally, OH instructions were delivered to patients via one-to-one verbal communication or written leaflets. Over the years, several methods were introduced to increase OH adherence or motivation.^{3–10} Such strategies include customized one-to-one instructions aimed at improving deficient OH skills, video-taped instructions, or using visual aids to enhance oral health adherence.^{3–5,9–11}

Few studies have investigated the effect of educating patients about the poor OH consequences of OH.^{9,11} Walsh et al. investigated the influence of gingival bleeding in enforcing OH behavior in adults.¹¹ Specifically, they showed that patients who have gingivitis, when shown and taught that gingival bleeding is a sign of disease, can have better gingival health after 3 months of

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How to cite this article: Aleid AA, Alnowaiser A, AlSakakir A, et al. Efficacy of Visual Oral Health Reinforcement in Reducing Plaque Accumulation and Gingival Bleeding: A Pilot Randomized Controlled Trial. *J Contemp Dent Pract* 2024;25(2):186–190.

Source of support: Nil

Conflict of interest: None

follow-up compared to untaught gingivitis patients. Another study by Peng et al. compared the OH adherences of orthodontic patients who have been shown visuals depicting severe consequences of poor OH with or without using disclosing agents.⁹ They showed

that highlighting the severe consequences of poor OH with or without disclosing agent led to better gingival health after 6 months of follow-up compared to control patients that were given OH instructions only. Based on the results of previous studies, an interesting question arises: Is the mode of OH instructions enough to enhance patients' OH adherence, or should the consequences of poor OH be highlighted?

Despite the evolution in digital technology and the easiness of information access through mobile devices, its application in oral health education has not been thoroughly studied. A recent systematic review sought to compare computer-aided learning in oral health, highlighted the paucity of randomized controlled trials on this subject, and advocated for more studies.¹²

In this pilot study, we aimed to compare the differences in oral care during verbal or video OH instructions with or without images displaying the consequences of poor OH. The null hypothesis was that showing patients' digital images displaying the consequences of poor OH will not influence their OH adherence.

MATERIALS AND METHODS

This pilot study is a prospective, single-blinded, randomized clinical 3-arm parallel trial approved by the Committee of Research Ethics at Qassim University, Buraidah, Al Qassim, Saudi Arabia (#21-19-05). (#21-19-05). The study was registered on the ISRCTN registry with study registration number ISRCTN15502078 on 09/01/2024. This study was conducted according to the Consolidated Standards of Reporting Trials (CONSORT) guidelines.¹³ The study was conducted between 15 August and 20 October 2023.

Sample Size

Female patients between 18 and 30 years were recruited for this study. Participation in this experiment was voluntary, and the participants were entitled to leave the experiment at any time without the need to give a specific explanation. The study sample size was estimated using G*Power software (version 3.1.9.2; Heinrich Heine University Düsseldorf, Düsseldorf, Germany). To statistically detect more than 50% reduction in plaque index ($d = 1.3$; $\alpha = 0.05$; $\beta = 80\%$), we need to recruit seven participants in each group.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: The participants should have at least 20 natural teeth, be willing to participate in this study and sign the consent form. Exclusion criteria: Each participant should not be a student in medical or dental fields, under current dental or orthodontic treatment, active smoker, has acute or chronic immune disturbances, is currently pregnant, should not have any systemic diseases that could directly or indirectly inhibit optimum oral health maintenance, such as diabetes, known antibiotic treatments, and oral-related diseases such as periodontitis, and has insufficient Arabic language skills than can inhibit understanding the study goals and oral health instructions.

Study Sample Randomization

Using the randomization.com website, the principal investigator (N.A.) prepared a computer-generated random selection list with a 1:1:1 allocation ratio for the three intervention groups. Sealed opaque envelopes were prepared following the generated list to reduce the risk of concealing the group allocation to the examining dentists before recruiting the study participants. Trained and calibrated dentists (A.A.A., A.A.S., and W.A.) who were not involved

Table 1: Silness and Loe bleeding index¹⁵

Score	Definition
0	No bleeding on probing
1	A single bleeding point
2	Several bleeding points or thin line
3	Interdental space filled with blood

in generating the random list or creating the sealed envelope were responsible for recruiting the participants and collecting the oral health parameters. After ensuring the participation eligibility, each participant was allowed to draw an envelope to be assigned to one of the following three groups:

- *Group I:* Received verbal OH instructions only.
- *Group II:* Shown video-based OH instructions.
- *Group III:* Shown video-based OH instructions with images displaying the severe consequences of poor OH.

Outcome Measurements

The OH instructions involved information about biofilm accumulation and dietary suggestions, tooth brushing using the modified Bass technique, and dental flossing. These OH instructions were given to each participant at the baseline visit (verbally for group I and video-based for groups II and III). In addition, group III was also shown images displaying the severe consequences of poor OH.

Routine demographic data (age, tooth brushing habits, oral history, and previous and current medications) were collected at the baseline visit. The OH level of each participant was also assessed at baseline and after a 4-week follow-up using gingival bleeding on probing (BOP), gingival bleeding index (BI), and plaque score (PS), all assessed with Williams 14W Periodontal probe:

- Bleeding on probing: The percentage of teeth surface numbers free from bleeding—four surfaces per tooth.¹⁴
- Bleeding index: A Silness and Loe method was used, as described in Table 1.¹⁵
- Plaque score: A disclosing agent (GUM Red-Cote; Butler, Chicago, IL, USA) was used to calculate the PS. A modified O'Leary Index was used to define the number of surfaces free of plaque as a percentage of surfaces in the mouth—six surfaces per tooth.¹⁶

Statistics

Statistics were conducted using the Statistical Package for the Social Sciences (SPSS) (version 23.0; SPSS Inc, Chicago, IL, USA). The Kruskal–Wallis H test was used to investigate the group differences in oral health parameters at baseline and follow-up visits. The *post hoc* differences of a significant Kruskal–Wallis H test were investigated using pairwise comparison with Dunn–Bonferroni correction. The within-group differences in the oral health parameters from baseline to the follow-up visit were investigated using the Wilcoxon Matched Pairs Test. A p -value of less than 0.05 was considered statistically significant.

RESULTS

Twenty-one females were recruited for this study between 15 August and 20 October 2023 and divided into the three groups equally. All the participants were compliant and completed their follow-up visit. There were no statistically significant differences

between the groups on age distribution and baseline oral health parameters (Table 2).

Between-group Differences in Oral Health Parameters

The oral health parameters improved from baseline to follow-up for all the groups. A statistical group difference was observed on the PS after follow-up [$H(2) = 9.214, p = 0.01$]. The *post hoc* test revealed that group III showed a significantly lower PS than groups I and II ($p = 0.04$ and $p = 0.017$, respectively, Fig. 1). However, no differences were observed in PS between groups I and II (Table 3). The BOP and BI after follow-up also showed no group differences [$H(2) = 1.834, p = 0.4$ and $H(2) = 1.256, p = 0.534$, respectively].

Within-group Differences in Oral Health Parameters

For the within-group differences, group I showed no differences in the oral health parameters after follow-up. Group II showed a statistically significant reduction in BI after follow-up ($p = 0.028$) but not BOP or PS (Table 4). However, group III showed a statistically significant reduction in BOP and PS ($p = 0.023$ and $p = 0.045$, respectively) but not BI.

DISCUSSION

This pilot study investigated the differences in oral care during verbal or video OH instructions with or without images displaying the consequences of poor OH. It is well-known that oral care can

be influenced by socioeconomic factors, such as the country's economic circumstances, individual lifestyle and living situation, dental care accessibility, and people's perception of it.^{17,18} The baseline values for gingival bleeding and plaque accumulation in

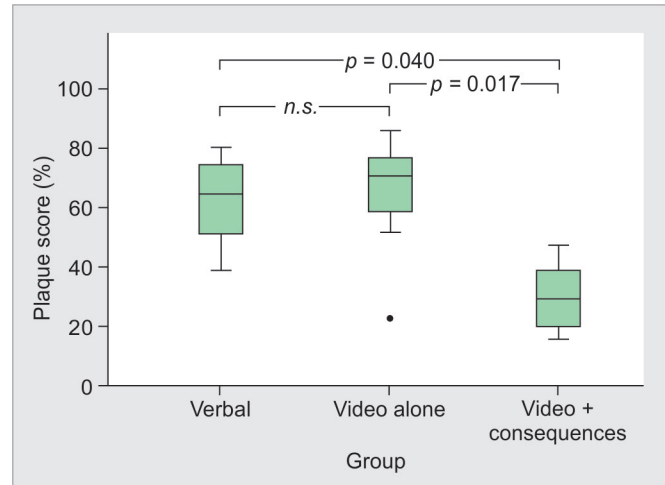


Fig. 1: Box plots (median values) of the PS percentages after 4 weeks of follow-up for groups I, II, and III. n.s., nonsignificant result

Table 2: Baseline characteristics of the enrolled female participants

Variable	Group I	Group II	Group III	p-value
n	7	7	7	-
Age*	24.37 (2.39)	24.35 (2.81)	23.5 (2.79)	0.713
BOP**	32.1 (31.1–47.9)	23.2 (20.7–39.9)	55.3 (21.5–68.5)	0.468
BI**	1 (1–2)	2 (1.5–2)	1 (0.5–2)	0.534
PS**	75 (59.05–81.9)	81.6 (74.1–87.135)	77.3 (28–89.65)	0.917

*Mean and standard deviation; **Median and interquartile range

Table 3: *Post hoc* (pairwise) comparison of plaque scores after 4 weeks of follow-up

Sample 1 × Sample 2	Test statistics	Std. error	Std. test statistics	p-value	Adjusted p-value
Group I × Group II	8.214	3.316	2.478	0.013	0.040
Group III × Group II	9.143	3.316	2.758	0.006	0.017
Group I × Group II	-0.929	3.316	-0.28	0.779	1

Table 4: Oral health parameters at baseline and after 4 weeks of follow-up

OH mode	Variable	Baseline*	4-week follow-up*	p-value
Group I	BOP	32.1 (31.1–47.9)	27 (22.1–33.95)	0.312
	BI	1 (1–2)	1 (1–1)	0.055
	PS	75 (59.05–81.9)	64.6 (51.2–74.65)	0.39
Group II	BOP	23.2 (20.7–39.9)	19.1 (17.25–29.5)	0.374
	BI	2 (1.5–2)	1 (1–1)	0.028
	PS	81.6 (74.1–87.135)	70.6 (58.65–76.75)	0.356
Group III	BOP	55.3 (21.5–68.5)	21.5 (19.5–23.2)	0.023
	BI	1 (0.5–2)	1 (0.5–1)	0.403
	PS	77.3 (28–89.65)	29.4 (20–39.2)	0.045

*Median (interquartile range)

the current study are higher than those of other studies but similar to others.^{5,19–21} The discrepancy between the different studies can be attributed to the ethnic differences in oral care awareness and to the method of calculating gingival bleeding and plaque accumulation.²²

This study showed that verbal and video-based OH instructions similarly influence gingival bleeding and plaque accumulation. Previous studies have investigated the effect of the mode of OH instructions on oral care.^{3–5,10,23,24} Specifically, they found that OH instructions given verbally, written, video-based, or with the help of an audio-visual PowerPoint presentation have similar effects on plaque and gingival bleeding in short- (up to 8 weeks) or long terms (up to 10 months).^{3–5,10,23} Those studies indicated that the mode of OH instruction is not crucially important for improving oral health. However, Ay et al. showed that demonstrating OH through an illustrated catalog and allowing the patient to practice can improve gingival health more than verbal OH instructions after 4 weeks of follow-up.²⁴

Motivating and influencing patients' behavior to ensure good compliance is complex and is affected by several factors, including psychological and sociodemographic traits.²⁵ Generally, healthcare practitioners do not stress out the complications of disease progression to patients.²⁶ In dental practice, most patients are unaware of the risk of chronic biofilm accumulation. The patients in the current study who were shown video-based OH instructions and visually informed about the consequences of poor OH showed lower PS after 4 weeks of follow-up than verbal or video OH instructions. This positive influence of the visual aids is consistent with previous studies.^{9,11,25} It indicates that educating patients about the severe consequences of poor OH should be implemented in routine clinical practice. However, the observed effect was consistent with previous studies that it is short-term, but long-term enhancement on OH adherence remains unclear.^{24,27,28} Previous studies have shown that periodic OH instructions could increase the patients' OH adherence over the long term.^{21,29,30} This could indicate that repeated exposure to visual aids about the consequences of poor OH may be necessary to ensure good oral care, especially in long-term treatments such as orthodontics.

Previous studies have also employed other methods to motivate patients to achieve good OH. For instance, Acharya et al. used a phase contrast microscope and biofilm disclosing agent to demonstrate the brushing technique in orthodontic patients, which showed a good effect on OH.⁸ Others used artificial intelligence driven remote monitoring technology (Dental Monitoring™ system) to examine patients' plaque accumulation using a disclosing agent, which showed inconsistent results.^{31,32} Those methods, although effective, are somewhat complicated and add further costs to primary healthcare clinics and might not be affordable to some communities.

In this pilot study, females were only recruited to prevent gender-related discrepancies in oral healthcare, as indicated in the literature that males are more likely to exhibit low OH awareness and inadequate maintenance than females.³³ In addition, baseline oral health parameters were somewhat high, which might have affected the outcome. Previous studies have shown that older adults have a higher risk of periodontal and oral diseases and have more active dental caries than young adults.^{34–36} However, this study recruited only healthy young adults. Thus, the applicability of this method needs further investigation in enhancing oral care

in older individuals as well as adolescents and children. The prime advantage of the investigated method in this study is its cost-effectiveness. However, its effect was investigated in the short term. Therefore, future studies should employ a higher sample size to further investigate the OH instructions with images displaying the consequences of poor oral care as a long-term OH maintenance tool.

CONCLUSIONS

This study showed that verbal and video-based OH instructions similarly affect gingival health. Further, employing visual aids highlighting the severe consequences of poor OH can lead to lower plaque accumulation in the short term (4 weeks). This study indicates that the mode of OH instructions is not influential for optimum oral health. However, employing visuals highlighting the severe consequences of poor OH leads to short-term reduction of plaque accumulation.

REFERENCES

1. Axelsson P, Nystrom B, Lindhe J. The long-term effect of a plaque control program on tooth mortality, caries and periodontal disease in adults. Results after 30 years of maintenance. *J Clin Periodontol* 2004;31(9):749–757. DOI: 10.1111/j.1600-051X.2004.00563.x.
2. Bakdash B. Oral hygiene and compliance as risk factors in periodontitis. *J Periodontol* 1994;65(5s):539–544. DOI: 10.1902/jop.1994.65.5s.539.
3. Lees A, Rock WP. A comparison between written, verbal, and videotape oral hygiene instruction for patients with fixed appliances. *J Orthod* 2000;27(4):323–328. DOI: 10.1093/ortho/27.4.323.
4. Lim LP, Davies WIR, Yuen KW, et al. Comparison of modes of oral hygiene instruction in improving gingival health. *J Clin Periodontol* 1996;23(7):693–697. DOI: 10.1111/j.1600-051x.1996.tb00595.x.
5. Williams K, Mithani S, Sadeghi G, et al. Effectiveness of oral hygiene instructions given in computer-assisted format vs a self-care instructor. *Dent J* 2018;6(1):2. DOI: 10.3390/dj6010002.
6. Moshkelgosha V, Mehrvarz S, Saki M, et al. Computer-based oral hygiene instruction vs verbal method in fixed orthodontic patients. *J Dent Biomater* 2017;4(1):353–360. PMID: 28959765.
7. Watt RG, Marinho VC. Does oral health promotion improve oral hygiene and gingival health? *Periodontol* 2000 2005;37(1):35–47. DOI: 10.1111/j.1600-0757.2004.03796.x.
8. Acharya S, Goyal A, Utreja AK, et al. Effect of three different motivational techniques on oral hygiene and gingival health of patients undergoing multibracketed orthodontics. *Angle Orthod* 2011;81(5):884–888. DOI: 10.2319/112210-680.1.
9. Peng Y, Wu R, Qu W, et al. Effect of visual method vs plaque disclosure in enhancing oral hygiene in adolescents and young adults: A single-blind randomized controlled trial. *Am J Orthod Dentofac Orthop* 2014;145(3):280–286. DOI: 10.1016/j.ajodo.2013.10.021.
10. Harnacke D, Beldoch M, Bohn GH, et al. Oral and written instruction of oral hygiene: A randomized trial. *J Periodontol* 2012;83(10):1206–1212. DOI: 10.1902/jop.2012.110550.
11. Walsh MM, Heckman BH, Moreau-Diettinger R. Use of gingival bleeding for reinforcement of oral home care behavior. *Community Dent Oral Epidemiol* 1985;13(3):133–135. DOI: 10.1111/j.1600-0528.1985.tb00427.x.
12. Ab Malik N, Zhang J, Lam OLT, et al. Effectiveness of computer-aided learning in oral health among patients and caregivers: A systematic review. *J Am Med Informatics Assoc* 2017;24(1):209–217. DOI: 10.1093/jamia/ocw045.
13. Schulz KF, Altman DG, Moher D. CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomised trials. *BMJ* 2010;340(mar23 1):c332–c332. Available from: <https://www.bmj.com/lookup/doi/10.1136/bmj.c332>.

14. Greenstein G. The role of bleeding upon probing in the diagnosis of periodontal disease: A literature review. *J Periodontol* 1984;55(12):684–688. Available from: <https://aap.onlinelibrary.wiley.com/doi/10.1902/jop.1984.55.12.684>.
15. Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 1964;22(4):121–135. DOI: 10.3109/00016356408993968.
16. O'Leary TJ, Drake RB, Naylor JE. The plaque control record. *J Periodontol* 1972;43(1):38–38. DOI: 10.1902/jop.1972.43.1.38.
17. Hosseinpour AR, Itani L, Petersen PE. Socio-economic inequality in oral healthcare coverage. *J Dent Res* 2012;91(3):275–281. DOI: 10.1177/0022034511432341.
18. World Health Organization. Oral health [Internet]. 2023 [cited 2022 Dec 23]. Available from: <https://www.who.int/news-room/fact-sheets/detail/oral-health>.
19. Broadbent JM, Thomson WM, Boyens J V, et al. Dental plaque and oral health during the first 32 years of life. *J Am Dent Assoc* 2011;142(4):415–426. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0002817714622455>.
20. Lalic M, Aleksic E, Gajic M, et al. Does oral health counseling effectively improve oral hygiene of orthodontic patients? *Eur J Paediatr Dent* 2012;13(3):181–186. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22971253>.
21. Rodrigues JA, dos Santos PA, Baseggio W, et al. Oral hygiene indirect instruction and periodic reinforcements: Effects on index plaque in school children. *J Clin Pediatr Dent* 2009;34(1):31–34. Available from: <https://meridian.allenpress.com/jcpd/article/34/1/31/78623/Oral-Hygiene-Indirect-Instruction-and-Periodic>.
22. Valdez R, Spinler K, Kofahl C, et al. Oral health literacy in migrant and ethnic minority populations: A systematic review. *J Immigr Minor Heal* 2022;24(4):1061–1080. Available from: <https://link.springer.com/10.1007/s10903-021-01266-9>.
23. Ali US, Sukhia RH, Fida M. A comparison of three different modalities in improving oral hygiene in adult orthodontic patients – An open label randomized controlled trial. *Int Orthod* 2022;20(3):100669. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1761722722000808>.
24. Ay ZY, Sayin MÖ, Özat Y, et al. Appropriate oral hygiene motivation method for patients with fixed appliances. *Angle Orthodontist* 2007;77(6):1085–1089. DOI: 10.2319/101806-428.1.
25. Taylor GH, Wilson SL, Sharp J. Medical, psychological, and socio-demographic factors associated with adherence to cardiac rehabilitation programs. *J Cardiovasc Nurs* 2011;26(3):202–209. Available from: <https://journals.lww.com/00005082-201105000-00007>.
26. Kasila K, Poskiparta M, Kettunen T, et al. Oral health counselling in changing schoolchildren's oral hygiene habits: A qualitative study. *Community Dent Oral Epidemiol* 2006;34(6):419–428. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/j.1600-0528.2006.00288.x>.
27. Gray D, McIntyre G. Does oral health promotion influence the oral hygiene and gingival health of patients undergoing fixed appliance orthodontic treatment? A systematic literature review. *J Orthod* 2008;35(4):262–269. DOI: 10.1179/14653120722770.
28. Ericsson JS, Östberg A, Wennström JL, et al. Oral health-related perceptions, attitudes, and behavior in relation to oral hygiene conditions in an adolescent population. *Eur J Oral Sci* 2012;120(4):335–341. DOI: 10.1111/j.1600-0722.2012.00970.x.
29. Marini I, Bortolotti F, Parenti SI, et al. Combined effects of repeated oral hygiene motivation and type of toothbrush on orthodontic patients: A blind randomized clinical trial. *Angle Orthod* 2014;84(5):896–901. DOI: 10.2319/112113-856.1.
30. Boyd RL. Longitudinal evaluation of a system for self-monitoring plaque control effectiveness in orthodontic patients. *J Clin Periodontol* 1983;10(4):380–388. Available from: <https://linkinghub.elsevier.com/retrieve/pii/000294169390012V>.
31. Sangalli L, Savoldi F, Dalessandri D, et al. Effects of remote digital monitoring on oral hygiene of orthodontic patients: A prospective study. *BMC Oral Health* 2021;21(1):435. Available from: <https://bmcoralhealth.biomedcentral.com/articles/10.1186/s12903-021-01793-9>.
32. Snider V, Homsy K, Kusnoto B, et al. Effectiveness of AI-driven remote monitoring technology in improving oral hygiene during orthodontic treatment. *Orthod Craniofac Res* 2023;26(S1):102–110. Available from: <https://onlinelibrary.wiley.com/doi/10.1111/ocr.12666>.
33. Lipsky MS, Su S, Crespo CJ, et al. Men and oral health: A review of sex and gender differences. *Am J Mens Health* 2021;15(3):155798–832110163. Available from: <http://journals.sagepub.com/doi/10.1177/15579883211016361>.
34. Chalmers JM. Geriatric oral health issues in Australia. *Int Dent J* 2001;51(3 Suppl):188–199. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11561878>.
35. Walls AW, Steele JG. Geriatric oral health issues in the United Kingdom. *Int Dent J* 2001;51(3 Suppl):183–187. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/11561877>.
36. Muller F, Shimazaki Y, Kahabuka F, et al. Oral health for an ageing population: The importance of a natural dentition in older adults. *Int Dent J* 2017;67(Suppl 2):7–13. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=29023743>.