

## ARTICLE INFO

Submitted: 09/05/2021

Accepted: 21/11/2021

Online: 23/06/2022

# Effectiveness of Oral Hygiene Instruction on the Periodontal Health Among Adults: A Systematic Review

Jia Le Chan, Basaruddin Ahmad, Sarliza Yasmin Sanusi, Mohd Zulkarnain Sinor\*

*School of Dental Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan, Malaysia*

\*Corresponding author: zulkarnainsinor@usm.my

**To cite this article:** Chan JL, Ahmad B, Sanusi SY, Sinor MZ (2022). Effectiveness of oral hygiene instruction on the periodontal health among adults: A systematic review. *Arch Orolfac Sci*, 17(1): 1–8. <https://doi.org/10.21315/aos2022.1701.RV01>

**To link to this article:** <https://doi.org/10.21315/aos2022.1701.RV01>

## ABSTRACT

Oral health professionals frequently provide oral hygiene instruction (OHI) during dental visits, yet the evidence for its effectiveness is inconclusive. The main objective of this study was to examine the evidence on the effectiveness of various oral hygiene teaching approaches on periodontal health in adults. The study searched the PubMed, Google Scholar and Scopus databases for reports published between January 2000 and June 2020 in the English language. The quality of the selected papers was evaluated using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines by two authors. Overall, five reports met the inclusion and exclusion criteria. The heterogeneity of outcome measurements across studies did not allow for direct comparison. Verbal and brochures were among the methods used in the studies. OHI was found to have short-term (up to 13 weeks) effects on dental plaque levels and/or gingiva bleeding. No significant differences were noted among the different oral hygiene methods affecting periodontal health. There is evidence that OHI is effective in reducing plaque and gingival bleeding scores in adult individuals, but it is still unclear if the effect continues beyond 13 weeks. No single method can be highlighted as the best medium of instruction.

**Keywords:** *Adults; effectiveness; oral hygiene instructions; periodontal health*

## INTRODUCTION

Dental caries and periodontal diseases are easily preventable but remain the most prevalent condition that burden individuals worldwide (Petersen *et al.*, 2005). Dental plaque is one of the direct determinants of the diseases (Marsh, 1994; 2004) and it can easily and effectively be removed by practicing good oral hygiene care daily, specifically by brushing and flossing the teeth (Kiger *et al.*, 1991; McCracken *et al.*, 2005). Poor oral health behaviour and inefficient

oral hygiene skills increase the risk of developing the diseases (van der Weijden & Hioe, 2005). Hence, individuals need to have adequate awareness of the correct techniques and skills to perform oral hygiene care to improve and/or maintain good oral health.

In a dental office, it is common for oral health professionals to include oral hygiene instruction (OHI) at the chairside during a dental visit as part of dental counselling, education and health promotion. Such practice has been effective in improving oral

hygiene behaviour and clinical outcomes (Axelsson & Lindhe, 1978; Clarkson *et al.*, 2009). OHI aims to increase knowledge, motivate self-efficacy and empower patients to plan a healthy oral health behaviour, and improve the skills of oral hygiene care. The OHI messages include the method, duration, and time of tooth brushing, use, and choice of the toothbrush and toothpaste (Ueno *et al.*, 2013) which are delivered through verbal and written instruction. While both methods have been shown to improve some clinical parameters such as plaque score and gingivitis (Lim *et al.*, 1996), the evidence for the effectiveness of OHI in the literature is still mixed. There are also conflicting conclusions regarding the effect of oral health promotion; some showing the benefits of intervention while others do not (Watt & Marinho, 2005; Nakre & Harikiran, 2013; Ghaffari *et al.*, 2018). A better understanding will help practitioners to use the most effective delivery methods in improving oral health of patients under their care. Thus, the objective of this study was to examine the evidence for the effectiveness of the delivery method of OHI to reduce plaque accumulation in adults.

## MATERIALS AND METHODS

### Search Strategy

This study had searched the electronic PubMed and Scopus databases using keywords (“effectiveness” OR “effect” OR “evaluation”) AND (“oral hygiene instructions” OR “oral hygiene educations” OR “dental hygiene educations”) AND (“oral health” OR “dental health” OR “periodontal health”) AND (“adults”) in the titles and abstracts. The literature search was carried out on articles published from January 2000 until and including June 2020.

### Selection Criteria/ Eligibility Criteria

Titles and abstracts searches were performed to find the eligible studies using the following inclusion and exclusion criteria.

### Inclusion criteria

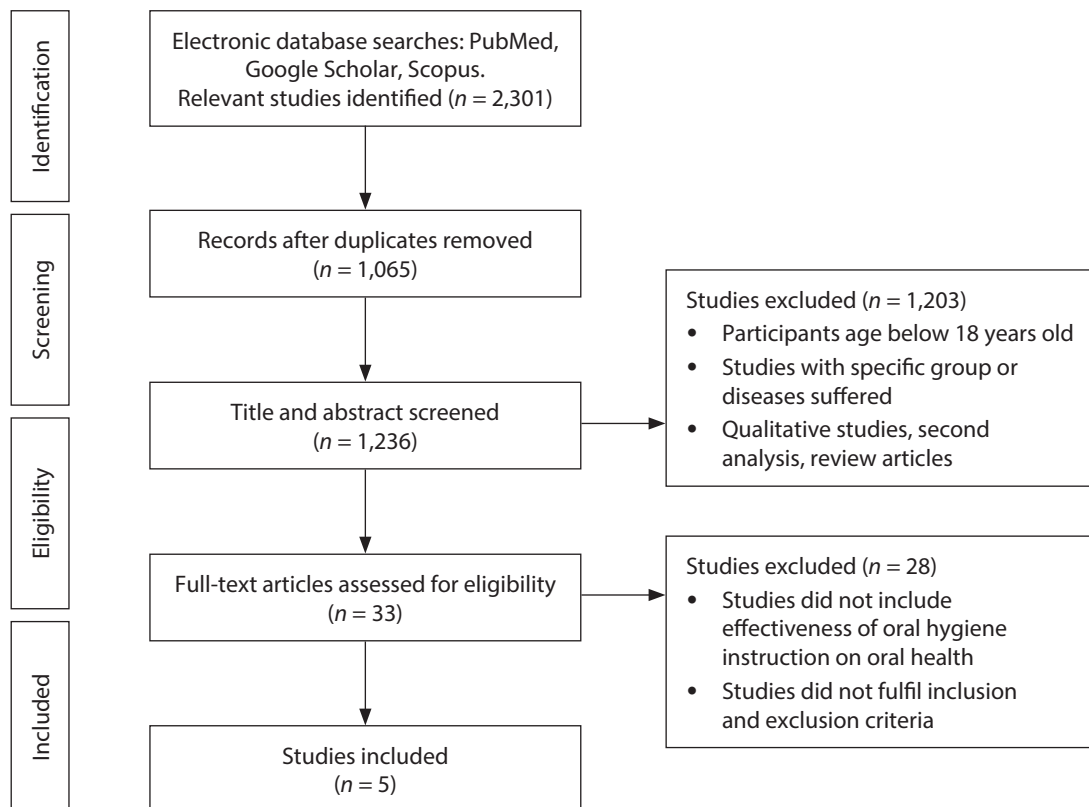
This study included pre-post intervention and clinical trials studies on adults over the age of 18-years-old published from January 2000 to June 2020 in the English language only. It was limited to study that objectively assessed the effectiveness of OHI on oral health and used oral hygiene and/or periodontal health indices as the outcome measure. Only quantitative studies that were accessible as a full original article were included. Studies that assessed medically healthy participants who received OHI in the study were included.

### Exclusion criteria

Studies using secondary data, review articles, focusing on specific oral hygiene techniques and/or tools, and those that did not examine the effect of OHI or interventions were excluded. Also excluded were studies that recruited participants with general health problems or undergoing orthodontic or prosthodontic treatment and prolonged medication for treatments of systemic diseases.

### Data Extraction and Management

Data extraction and management process are as shown in Fig. 1. The results of the literature search from each database were imported into Endnote X8 and then screened for duplicates. Then, the relevance of the articles to the investigation was examined by screening the information in the titles and abstracts according to the inclusion and exclusion criteria. The full texts of the articles were obtained if the abstracts and titles were relevant and then reviewed by two authors. Data were extracted from selected eligible studies, they included the basic information of the study (name of the first author, year and country), targeted study group information (age range and gender), duration, intervention details and oral health outcome measures (Table 1).



**Fig. 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of search results, study selection and inclusion process (Moher *et al.*, 2009).

## Study Quality Assessment

Quality assessment of the selected articles was carried out by two reviewers according to the PRISMA guidelines (Liberati *et al.*, 2009). The articles were first reviewed independently and then followed by a consolidated consensus in a meeting. The risk of bias was assessed using Grading of Recommendations, Assessment, Development and Evaluations (GRADE) (Guyatt *et al.*, 2011) and included those related to randomisation, blinding of participants and personnel, allocation concealment, assessment of incomplete outcome data and selective reporting of results. The quality criteria used was as follows: a clear description of the aims and objectives, study design, methods of allocation and interventions, validity and reliability of measures used, and a clear presentation of pre- and post-intervention outcome data for targeted groups. All articles

presented the information needed in the study and no additional information was requested from the authors.

## RESULTS

The search strategy returned 2,301 citations with the title and abstract screening processes excluded 1,236 reports based on the inclusion and exclusion criteria. A further 33 studies were excluded for not including the effectiveness of OHI and not fulfilling the inclusion and exclusion criteria after reviewing the full text (Fig. 1). From the five studies included in the review, four were controlled clinical studies and one was an uncontrolled clinical study (Nayak & Pralhad, 2016). All studies involved adults aged over 18 years old. One study was not a randomised trial (Ashruff, 2016). The duration of the studies ranged from 15 days to 13 weeks. All subjects in three studies

**Table 1** The included studies

Research study	Duration	Age (mean±SD) (years old)	Gender	Intervention	Outcome measures	Results
Schlueter <i>et al.</i> (2013)	5 weeks	26.6±4.5	Not specified	Group 1: Control (n = 33) Group 2: Verbal instruction (n = 32) Group 3: Verbal instruction supported by demonstration (n = 33)	Turesky Modified Quigley–Hein Plaque Index (T-QHI)	Statistically significant reduction of plaque score in all groups ( $p < 0.05$ ). No significant differences between groups.
Nayak & Pralhad (2016)	4 weeks	Not specified	Not specified	(n = 60) Group 1: Oral instructions Group 2: Written instructions Group 3: Oral individualised instructions	Silness & Loë Plaque Index	Statistically significant reduction of plaque score in Group 3 ( $p < 0.05$ ). No significant differences between groups.
Harnacke <i>et al.</i> (2012)	4 weeks	Group 1: 25.10±3.08 Group 2: 25.18±4.06 Group 3: 26.26±3.62 Group 4: 24.67±3.25	Male and female	(n = 83) Group 1: Written instruction Group 2: Standardised oral instruction Group 3: Individualised oral instruction Group 4: Control	T-QHI • Marginal Plaque Index (MPI) • Papillary Bleeding Index (PBI)	Non-statistically significant reduction of T-QHI and MPI in all groups ( $p > 0.05$ ). No significant differences between groups. PBI results showed significant differences between Groups 2 and 3, and Groups 3 and 4. ( $p < 0.05$ ). Significant reductions ( $p < 0.05$ ) over the trial period (more pronounced for G3).
Ashruff (2016)	15 days	Not specified	Not specified	(n = 30) Group 1: Instructions through videos Group 2: Oral instructions Group 3: Control	Simplified Oral Hygiene Index (OHI-5)	Statistically significant reduction of OHI-5 score in Group 1 ( $p < 0.05$ ). No significant differences between groups.
Ziebolz <i>et al.</i> (2009)	13 weeks	Group 1: 28.1 Group 2: 31.4 Group 3: 29.5 Group 4: 29.7	Male only	(n = 104) Group 1: Individual OHI Group 2: Group OHI Group 3: A combination of individual and group OHI Group 4: Control group	T-QHI • Approximal Plaque Index (API) • Gingival index (modified sulcus bleeding index, the modified SBI) • Periodontal index (CPITN)	Statistically significant reduction in all outcome measures in all groups ( $p < 0.001$ ). No significant differences between groups for any outcome measured.

(Ziebolz *et al.*, 2009; Harnacke *et al.*, 2012; Schlueter *et al.*, 2013) received a professional tooth cleaning at the start of the study to remove the supragingival plaque and calculus but in the other two studies (Ashruff, 2016; Nayak & Pralhad, 2016) no prophylaxis was performed before the study.

A range of outcome measures was used to assess the effect of oral health instruction. All studies had assessed at least one measure of plaque using a range of indices including the Quigley & Hein Plaque Index (1962) (Turesky modification, 1970), Silness & Løe Plaque Index, MPI, API and OHI-S. Two studies (Ziebolz *et al.*, 2009; Harnacke *et al.*, 2012) evaluated the periodontal status using the PBI, gingival index (modified sulcus bleeding index), and periodontal index (CPITN) (Table 1). Limited comparison between studies can be done because of the heterogeneity in the outcome measures that were used.

The method of delivery and content of OHI vary between the studies. There are four modes of delivery such as verbal only, verbal and demonstration, written, and video; and three types of presentations namely individual, group and mixed of individual and groups, were investigated. Except for Nayak & Pralhad (2016), other studies reported detailed information about the professional OHI provided to the intervention groups. Modified Bass tooth brushing technique and brushing sequence were included as part of the instructions in four studies. Instruction on the use of interdental cleaning aids was included in two of the studies (Ziebolz *et al.*, 2009; Harnacke *et al.*, 2012). Only one study included the theoretical background and motivation as part of the instruction (Ziebolz *et al.*, 2009).

All studies showed a reduction in the amount of plaque following OHI in both the intervention and control groups. However, there was no difference in plaque reduction between the intervention and control groups and between different interventions. For gingival bleeding (Ziebolz

*et al.*, 2009; Harnacke *et al.*, 2012), one study reported that a significant reduction in the intervention group compared to the control (Harnacke *et al.*, 2012) and in another (Ziebolz *et al.*, 2009), no difference was found between the groups despite a significant reduction post-intervention in both groups.

## DISCUSSION

This systematic review examined the evidence for the effect of prescribing OHI to reduce plaque accumulation and gingivitis. These results showed that there are a significant reduction in plaque accumulation and fewer gingival bleeding sites in all participants at the end of the study except in one study (Nayak & Pralhad, 2016). The studies provided evidence for short-term improvement up to 13 weeks after the intervention regardless of the mode and type of delivery, and content of instruction. The improvement is also observed in the control groups who received prophylaxis treatment without OHI. However, there was no evidence for the benefit of OHI interventions compared to the control. No group had a negative effect or worsened condition at the end of the study. The results are consistent with recent systematic reviews on the effect of oral health education programmes on the general population (Nakre & Harikiran, 2013; Ghaffari *et al.*, 2018) and another report on the effect of health promotion (Watt & Marinho, 2005). The latter reviewed the evidence from systematic reviews on the effectiveness of oral health promotion intervention in reducing plaque and gingival bleeding; they concluded although there is evidence for a short-term reduction in plaque levels and gingival bleeding, its long-term effect is still not clear. Evidence from a behavioural change intervention study suggests that short-term changes may not be sustainable in the long run unless there is a feasible adjustment in the social environment to maintain the new behaviours (Smedley & Syme, 2001). A one-year follow-up study showed that plaque and bleeding index



improve, worsen, or fluctuate throughout the observation period (Amoo-Achampong *et al.*, 2018). Although the evidence suggests that providing OHI intervention is not beneficial, a greater reduction in plaque and gingival bleeding is achievable if it is first combined with professional mechanical plaque removal (PMPR) and then followed by repeated instruction without additional PMPR (Needleman *et al.*, 2015).

The new evidence from the present study did not find oral health promotion via OHI having a clear clinical and public health benefit. However, this does not imply that oral health instruction has neither an effect nor importance. Studies investigating the effects of OHI on adults have a couple of major limitations. The first is that almost all adults, except for people from the remote areas of underdeveloped and developing countries, have seen a dentist at some point in their life and have some form of basic oral health education. Hence, there is likely a carry-over knowledge regarding oral health care in all study participants that influence the behaviour and outcomes of a study. The level of oral health knowledge of the participants before the study, and how much the intervention has increased the knowledge or motivated them leading to the improvement in the parameters, are neither known nor adjusted in any of the studies. Second, the improvement in all groups, including the controls, can be attributed to the Hawthorne effect (Feil *et al.*, 2002); whereby, the study participants were motivated to change their oral health behaviour after they are recruited into the study and adhere to good oral hygiene practice during the observation period. All study participants are likely to possess at least the basic oral health and oral hygiene care knowledge at their age and some may seek more information from the internet or friends. Interactions with colleagues and peer adults may positively influence an individual's oral hygiene measures (Choo *et al.*, 2001). The success of the intervention is dependent on the compliance with OHI and that varies between individuals, the

learning needs of each patient must be taken into account and the same approach cannot be applied in the same way to every patient (Friedman *et al.*, 2011). Other factors that may influence the success of oral health promotion include the character, values, personality, and interpersonal and communication skills of the dental professional, and the ability to build therapeutic alliances with patients (Kay *et al.*, 2016; Amoo-Achampong *et al.*, 2018).

Chairside instruction is perhaps the simplest and most widely used method to educate patients and it is usually very specific to an individual's oral health conditions and needs. It is usually carried out as a one-to-one communication compared to group instruction, which is not usually practical in dental clinics' environment. It is also not uncommon for the instruction to include demonstrations of oral hygiene care and return-demo; which can be an effective method for the patient (Theis & Johnson, 1995). Verbal instruction and written materials are also effective means that can increase knowledge but there is little evidence that they are effective in behaviour (Kay *et al.*, 2016). The use of media instructions in relaying the educational message is not uncommon and they are available as adjunct material that can be read or watch at the patients' own time. The use of video instruction in one study is found to be associated with plaque reduction (Ashruff, 2016).

## LIMITATION

A meta-analysis and longitudinal studies that account for the potential carry-over bias are recommended. Although the impact of OHI has been proven, there is still a need to conduct a meta-analysis and longitudinal studies on this subject. There were other limitations in the present study as it only includes articles published in the English language with varying sample sizes and follow-up periods.

## CONCLUSION

There is good evidence that OHI was effective in reducing plaque and gingival bleeding in adults up to 13 weeks. But it has no advantage over prophylaxis alone without OHI after that. Any form of modes of delivery and type of material used is just as effective. Future studies with a better quality of evaluation measures and longer follow-up periods are required to establish evidence-based conclusions.

## REFERENCES

- Amoo-Achampong F, Vitunac DE, Deeley K, Modesto A, Vieira AR (2018). Complex patterns of response to oral hygiene instructions: Longitudinal evaluation of periodontal patients. *BMC Oral Health*, **18**: 72. <https://doi.org/10.1186/s12903-018-0537-z>
- Ashruff F (2016). Impact of oral hygiene instructions in the maintenance of periodontal health of patients. *J Pharm Sci Res*, **8**(10): 1212–1214.
- Axelsson P, Lindhe J (1978). Effect of controlled oral hygiene procedures on caries and periodontal disease in adults. *J Clin Periodontol*, **5**(2): 133–151. <https://doi.org/10.1111/j.1600-051x.1978.tb01914.x>
- Choo A, Delac DM, Messer LB (2001). Oral hygiene measures and promotion: Review and considerations. *Aust Dent J*, **46**(3): 166–173. <https://doi.org/10.1111/j.1834-7819.2001.tb00277.x>
- Clarkson JE, Young L, Ramsay CR, Bonner BC, Bonetti D (2009). How to influence patient oral hygiene behavior effectively. *J Dent Res*, **88**(10): 933–937. <https://doi.org/10.1177/0022034509345627>
- Feil PH, Grauer JS, Gadbury-Amyot CC, Kula K, McCunniff MD (2002). Intentional use of the Hawthorne effect to improve oral hygiene compliance in orthodontic patients. *J Dent Educ*, **66**(10): 1129–1135.
- Friedman AJ, Cosby R, Boyko S, Hatton-Bauer J, Turnbull G (2011). Effective teaching strategies and methods of delivery for patient education: A systematic review and practice guideline recommendations. *J Cancer Educ*, **26**(1): 12–21. <https://doi.org/10.1007/s13187-010-0183-x>
- Ghaffari M, Rakhshanderou S, Ramezankhani A, Buunk-Werkhoven Y, Noroozi M, Armoon B (2018). Are educating and promoting interventions effective in oral health?: A systematic review. *Int J Dent Hyg*, **16**(1): 48–58. <https://doi.org/10.1111/idh.12305>
- Guyatt GH, Oxman AD, Kunz R, Atkins D, Brozek J, Vist G *et al.* (2011). GRADE guidelines: 2. Framing the question and deciding on important outcomes. *J Clin Epidemiol*, **64**(4): 395–400. <https://doi.org/10.1016/j.jclinepi.2010.09.012>
- Harnacke D, Beldoch M, Bohn GH, Seghaoui O, Hegel N, Deinzer R (2012). Oral and written instruction of oral hygiene: A randomized trial. *J Periodontol*, **83**(10): 1206–1212. <https://doi.org/10.1902/jop.2012.110550>
- Kay E, Vascott D, Hocking A, Nield H, Dorr C, Barrett H (2016). A review of approaches for dental practice teams for promoting oral health. *Community Dent Oral Epidemiol*, **44**(4): 313–330. <https://doi.org/10.1111/cdoe.12220>
- Kiger RD, Nylund K, Feller RP (1991). A comparison of proximal plaque removal using floss and interdental brushes. *J Clin Periodontol*, **18**(9): 681–684. <https://doi.org/10.1111/j.1600-051x.1991.tb00109.x>
- Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA *et al.* (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *BMJ*, **339**: b2700. <https://doi.org/10.1136/bmj.b2700>

- Lim LP, Davies WI, Yuen KW, Ma MH (1996). Comparison of modes of oral hygiene instruction in improving gingival health. *J Clin Periodontol*, **27**(3): 693–697. <https://doi.org/10.1111/j.1600-051x.1996.tb00595.x>
- Marsh PD (2004). Dental plaque as a microbial biofilm. *Caries Res*, **38**(3): 204–211. <https://doi.org/10.1159/000077756>
- Marsh PD (1994). Microbial ecology of dental plaque and its significance in health and disease. *Adv Dent Res*, **8**(2): 263–271. <https://doi.org/10.1177/08959374940080022001>
- McCracken G, Steen N, Preshaw P, Heasman L, Stacey F, Heasman PA (2005). The crossover design to evaluate the efficacy of plaque removal in tooth-brushing studies. *J Clin Periodontol*, **32**(11): 1157–1162. <https://doi.org/10.1111/j.1600-051X.2005.00843.x>
- Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*, **6**(7): e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Nakre PD, Harikiran AG (2013). Effectiveness of oral health education programs: A systematic review. *J Int Soc Prev Community Dent*, **3**(2): 103–115. <https://doi.org/10.4103/2231-0762.127810>
- Nayak SU, Pralhad S (2016). Evaluation of the effect of oral hygiene instructions on maintenance of gingival health. *World J Dent*, **7**(3): 123–125. <https://doi.org/10.5005/jp-journals-10015-1379>
- Needleman I, Nibali L, Di Iorio A (2015). Professional mechanical plaque removal for prevention of periodontal diseases in adults--systematic review update. *J Clin Periodontol*, **42**(Suppl 16): S12–S35. <https://doi.org/10.1111/jcpe.12341>
- Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C (2005). The global burden of oral diseases and risks to oral health. *Bull World Health Organ*, **83**(9): 661–669.
- Schlueter N, Klimek J, Ganss C (2013). Relationship between plaque score and video-monitored brushing performance after repeated instruction – a controlled, randomised clinical trial. *Clin Oral Investig*, **17**(2): 659–667. <https://doi.org/10.1007/s00784-012-0744-y>
- Smedley BD, Syme SL (2001). Promoting health: Intervention strategies from social and behavioral research. *Am J Health Promot*, **15**(3): 149–166. <https://doi.org/10.4278/0890-1171-15.3.149>
- Theis SL, Johnson JH (1995). Strategies for teaching patients: A meta-analysis. *Clin Nurse Spec*, **9**(2): 100–105, 120. <https://doi.org/10.1097/00002800-199503000-00010>
- Ueno M, Takeuchi S, Oshiro A, Kawaguchi Y (2013). Relationship between oral health literacy and oral health behaviors and clinical status in Japanese adults. *J Dent Sci*, **8**(2): 170–176. <https://doi.org/10.1016/j.jds.2012.09.012>
- van der Weijden GA, Hioe KP (2005). A systematic review of the effectiveness of self-performed mechanical plaque removal in adults with gingivitis using a manual toothbrush. *J Clin Periodontol*, **32**(Suppl 6): 214–228. <https://doi.org/10.1111/j.1600-051X.2005.00795.x>
- Watt RG, Marinho VC (2005). Does oral health promotion improve oral hygiene and gingival health? *Periodontol 2000*, **37**: 35–47. <https://doi.org/10.1111/j.1600-0757.2004.03796.x>
- Ziebolz D, Herz A, Brunner E, Homecker E, Mausberg RF (2009). Individual versus group oral hygiene instruction for adults. *Oral Health Prev Dent*, **7**(1): 93–99.