

Research Article

Effectiveness of a Community-Based Educational Intervention on Dental Caries Preventive Behavior Among the Kolok Community in Bengkala Village, Bali

¹Yudha Rahina, ¹Ni Putu Idaryati, ¹I Nyoman Panji Triadnya Palgunadi, ³Komang Riska Cahyaningrum, ³Dentino Asmara Putra

¹Department of Dental Public Health and Preventive Dentistry, Faculty of Dentistry, Universitas Mahasaraswati Denpasar, Bali, Indonesia.

³Undergraduate Student, Faculty of Dentistry, Universitas Mahasaraswati Denpasar, Denpasar, Bali, Indonesia

Received date: March 16, 2026

Accepted date: July 18, 2026

Published date: August 12, 2026

KEYWORDS

Caries-preventive behavior,
deaf-mute community, face-to-
face education, knowledge



DOI: 10.46862/interdental.v22i2.13859

ABSTRACT

Introduction: The *Kolok* (deaf-mute) community in Bengkala Village has limited access to health information due to its unique local sign language, contributing to poor oral health knowledge and hygiene. This study aimed to evaluate the effectiveness of oral health education on caries-preventive behaviors among the *Kolok* community.

Materials and Methods: A pre-experimental pretest-posttest study involved 34 *Kolok* individuals aged 20–60 years, randomly selected. The intervention consisted of face-to-face oral health education assisted by a local interpreter and a toothbrushing calendar. Changes in oral health knowledge, preventive behaviors, and oral hygiene were assessed over two months using questionnaires and the Oral Hygiene Index Simplified (OHI-S). Data were analyzed using paired-sample *t*-tests, Wilcoxon signed-rank tests, independent-sample *t*-tests, and Mann-Whitney *U* tests.

Results and Discussion: Significant differences in knowledge and caries-preventive behaviors were found between groups after the intervention ($p < 0.05$). However, significant improvements occurred in the control group, while no significant changes were observed in the intervention group. Conversely, oral hygiene status significantly improved in the intervention group.

Conclusion: Face-to-face oral health education assisted by a local interpreter was not effective in improving oral health knowledge or caries-preventive behaviors. However, the toothbrushing calendar effectively improved oral hygiene and may contribute to caries prevention.

Corresponding Author:

Yudha Rahina

Department of Dental Public Health and Preventive Dentistry, Faculty of
Dentistry, Universitas Mahasaraswati Denpasar, Bali, Indonesia
Email: yudharahina@gmail.com

How to cite this article: Rahina Y, Idaryati NP, Palgunadi INPT, Ningrum KRC, Putra DA. Effectiveness of a Community-Based Educational Intervention on Dental Caries Preventive Behavior Among the Kolok Community in Bengkala Village, Bali. *Interdental Jurnal Kedokteran Gigi*. 2026;22(2):267-74. doi: 10.46862/interdental.v22i2.13859

Copyright: ©2026 [Yudha Rahina](#) This is an open access article distributed under the terms of the Creative Commons Attribution-ShareAlike 4.0 International License. Authors hold the copyright without restrictions and retain publishing rights without restrictions.

INTRODUCTION

Poor oral health conditions, including dental caries, periodontal disease, and inadequate oral hygiene, not only affect the health of the oral cavity but are also associated with general health through mechanisms such as chronic inflammation, bacteremia, and shared risk factors.¹ Dental caries is a chronic infectious disease caused by specific bacteria that metabolize dietary sugars to produce acids.² These acids gradually demineralize the tooth structure, including enamel and dentin, leading to the development of carious lesions.² Dental caries is progressive and develops slowly, typically characterized by the formation of cavities on the tooth surface.³ Dental caries affects individuals of all ages, from children to adults, across different countries, although the prevalence and experience of dental caries vary throughout the life course.⁴ Furthermore, previous studies have reported a significant association between dental caries status and oral health-related quality of life, indicating that higher caries experience is associated with poorer quality of life.⁵

Oral health has not yet become a major priority among the Indonesian population.⁶ Dental problems in the community are often neglected and receive limited attention.⁷ More than half of the Indonesian population (57.6%) report experiencing oral health problems, with dental caries being the most prevalent condition, affecting 88.8% of individuals.⁷ The prevalence of dental caries increases with age.⁷ These data indicate that the occurrence of dental caries in the community has not been adequately addressed, and existing preventive measures have not been sufficiently effective. Many people still believe that routine dental visits for preventive care are unnecessary.⁸ The low utilization of dental health services reflects that a large proportion of the population neglects dental examinations

and treatment despite the high prevalence of dental caries.⁷ Untreated dental caries can lead to pain, discomfort, difficulty eating, sleep disturbances, work absenteeism, and reduced work productivity among adults.⁹

Most members of the community still have a low level of oral health knowledge.¹⁰ Many individuals lack adequate understanding of proper oral hygiene practices and the transmission of dental infections.¹¹ Individuals with poor oral health knowledge tend to have a higher frequency of dental caries.¹² Therefore, oral health education plays an essential role in preventing dental caries and improving oral hygiene practices within the community.

Kolok is a local term used to describe individuals with speech and hearing impairments (deaf-mute). Bengkala is a village located in Buleleng Regency, Bali, which is known for having one of the largest deaf communities in the world, consisting of 41 individuals. This community tends to be relatively closed and uses a unique sign language known as *Kata Kolok*, which differs from commonly used sign languages.¹³ *Kata Kolok* is only used in Bengkala Village, and members of this community are generally unfamiliar with other sign languages. As a result, their access to external information, including oral health information, is limited.

A preliminary study indicated that the level of oral health knowledge within this community is low, with poor oral hygiene conditions and many untreated carious teeth. In addition, regular daily toothbrushing is not a common practice among community members. Communities with such conditions are highly vulnerable to poor oral and general health, as well as reduced quality of life.¹⁴ Oral hygiene practices are an important factor influencing the prevalence of dental caries. Therefore, caries prevention efforts should focus on improving oral

hygiene behavior and strengthening oral health education.¹⁵ This study aimed to assess the effectiveness of educational interventions in promoting caries prevention behavior among the *Kolok* community in Bengkala Village.

MATERIALS AND METHODS

An experimental study with a randomized pre-test–posttest group design was conducted among the *Kolok* community (community trial). The accessible population consisted of deaf-mute residents of Bengkala Village (N = 41). The sampling technique used was proportional random sampling with a proportion of 40%, resulting in 17 participants in the intervention group and 17 participants in the control group. Ethical approval for this study was obtained from the Ethics Committee of the Faculty of Dentistry, Universitas Mahasaraswati Denpasar (No. 03.0055/KEP-Unmas/X/2025).

Oral health education was delivered through face-to-face sessions with the assistance of a local interpreter and the use of posters. Posters were provided as standard educational material for both groups, while face-to-face education was delivered only to the intervention group. Dental caries prevention behavior was assessed based on toothbrushing practices. Participants in the intervention group were provided with a toothbrushing calendar scheduled for morning and evening brushing using fluoride toothpaste, whereas the control group received no calendar and continued their usual practices. The toothbrushing calendar was monitored for 21 days to help establish healthy habits.¹⁶

The Brush Day & Night program, conducted for 21 days, has been developed as an oral health education intervention aimed at promoting proper toothbrushing habits twice daily with fluoride toothpaste through repeated instruction and daily monitoring. The 21-day duration was selected

based on behavioral research indicating that repeated practice over this period can effectively support the formation of new habits.^{17,18} Changes in knowledge level were measured using questionnaires, while caries prevention behavior was assessed using both questionnaires and the Oral Hygiene Index–Simplified (OHI-S). The questionnaires used in this study had been tested and confirmed to be valid and reliable. The study was conducted over a period of two months. The collected data were analyzed using paired *t*-tests, Wilcoxon signed-rank tests, independent *t*-tests, and Mann–Whitney *U* tests.

RESULTS AND DISCUSSION

The demographic characteristics of the respondents are presented in Table 1. A total of 34 participants were included in this study, with an age range of 20–60 years. The mean age of the respondents was 47.15 years (SD ± 11.1). The number of male respondents was higher than that of female respondents. Most participants had no formal education (85.3%), while the remaining respondents had primary and secondary levels of education.

Table 1. Demographic characteristics of respondents

Characteristic	Category	n (%)
Age (years)	20–30	8 (23.5)
	31–40	10 (29.5)
	41–50	8 (23.5)
	51–60	8 (23.5)
Gender	Male	18 (52.9)
	Female	16 (47.1)
Education level	No formal education	29 (85.3)
	Primary	3 (8.8)
	Secondary	2 (5.9)

The knowledge levels of respondents in the intervention and control groups are presented in Table 2. In the intervention group, there was a shift from the poor to the fair knowledge category after treatment. However, the overall change was not

statistically significant. In contrast, the control group showed a significant improvement after receiving the standard intervention, with no

respondents remaining in the poor category and an increase in the proportion of respondents in the good knowledge category.

Table 2. Distribution of respondents' knowledge levels

Group	Criteria	Total (n)	Before n (%)	After n (%)	Δ n (%)	p
Intervention	Good	17	8 (47.06)	7 (41.18)	-1 (-5.88)	> 0.05*
	Fair		8 (47.06)	10 (58.82)	2 (11.76)	
	Poor		1 (5.88)	0 (0)	-1 (-5.88)	
Control	Good	17	8 (47.06)	11 (64.71)	3 (17.65)	< 0.05*
	Fair		9 (52.94)	6 (35.29)	-3 (-17.65)	
	Poor		0 (0)	0 (0)	0 (0)	
P			> 0.05**	< 0.05**		

Criteria: Good (6.5 – 10), Fair (3.5 – 6.4), Poor (0 – 3.4); n (number of samples); Δ (delta, pre-post difference);

*Paired sample *t*-test; **Independent sample *t*-test.

At baseline, no significant difference in knowledge levels was observed between the intervention and control groups. Most respondents in both groups had moderate knowledge levels. An increase in the good knowledge category was more evident in the control group than in the intervention group. After the intervention, a significant difference in knowledge levels was found between the two groups. A decrease in respondents' knowledge levels after receiving an intervention is rare. In a meta-analysis of 43 articles from 2015-2025, only two studies found a decrease in knowledge levels after an intervention.¹⁹

The increase in the proportion of respondents in the good knowledge category within the control group may be explained by the fact that most members of the *Kolok* community have no formal education and limited literacy skills. Consequently, some respondents tended to align their questionnaire responses with those of peers who were able to read and write, despite the assistance provided by local interpreters. This community also demonstrates a strong interdependence among its

members. Social support from peers may foster feelings of protection, acceptance, and belonging, thereby enhancing self-confidence and a sense of security while reducing psychosocial isolation.²⁰

A similar finding, in which a significant improvement in knowledge was observed in the control group rather than the intervention group, was reported in a study conducted in Ghana. The study, which investigated women's knowledge of cervical cancer screening, likewise demonstrated a significant increase in knowledge among participants in the control group. This phenomenon may be explained by the pre-test effect, in which respondents are motivated to seek additional information after participating in the pre-test.²¹ Another study has also reported significant increases in mean knowledge scores in control groups, possibly because participants in the control group had previously been exposed to oral health information.²² Furthermore, previous research has demonstrated improvements in oral health knowledge among children with hearing impairments following educational interventions.²³⁻²⁵

Table 3. Dental caries prevention behavior in respondents in the intervention and control groups before and after treatment

Group	Criteria	Total (n)	Before n (%)	After n (%)	Δ n (%)	P
Intervention	Good	17	13 (76.47)	13 (76.47)	0 (0)	> 0.05*
	Fair		4 (23.53)	4 (23.53)	0 (0)	
	Poor		0 (0)	0 (0)	0 (0)	
Control	Good	17	9 (52.94)	17 (100)	8 (17.65)	< 0.05*
	Fair		7 (41.18)	0 (0)	-3 (-17.65)	
	Poor		1(5.88)	0 (0)	0 (0)	
P			> 0.05**	> 0.05**		

Criteria: Good (7.6 – 11), Fair (3.8 – 7.5), Poor (0 – 3.7); n (number of sample); Δ (delta, pre-post difference); *Paired sample *t*-test; **Independent sample *t*-test.

After the intervention, most respondents demonstrated good oral health behavior, except for the intervention group, in which 23.53% of participants remained in the fair category (Table 3). No significant change was observed in the intervention group. In contrast, a significant improvement in behavior occurred in the control group, where respondents previously categorized as having poor or fair behavior shifted entirely to the good category. This finding differs from the other study, which reported a significant improvement in behavioral scores within the intervention group.²⁶

In many oral health behavior studies, although both intervention and control groups may show improvements from baseline, structured

intervention groups typically demonstrate greater behavioral improvement compared with standard control conditions.²⁷ In the present study, however, the control group exhibited greater behavioral improvement than the intervention group, while behavior in the intervention group remained relatively unchanged despite receiving the intervention. This outcome may partly be explained by the pre-test effect, in which participants modify their behavior after being exposed to baseline measurements.²⁰ In addition, better oral health behavior is often associated with increased knowledge, although it can also be influenced by other factors such as attitudes, environmental conditions, and personal experiences.²⁸

Table 4. Respondents' oral hygiene in the intervention and control groups before and after treatment

Group	Criteria	Total (n)	Before n (%)	After n (%)	Δ n (%)	P
Intervention	Good	17	2 (11.77)	5 (29.41)	+3 (+17.67)	< 0.05*
	Fair		10 (58.82)	10 (58.82)	0 (0)	
	Poor		5 (29.41)	2 (11.77)	-3 (-17.67)	
Control	Good	17	2 (11.77)	4 (23.53)	+2 (+11.77)	> 0.05*
	Fair		13 (76.46)	11 (64.70)	-2 (-11.77)	
	Poor		2 (11.77)	2 (11.77)	0 (0)	
P			> 0.05**	> 0.05**		

Criteria: Good (0 – 1.2), Fair (1.3 – 3.0), Poor (3.1 – 6.1); n (number of samples); Δ (delta, pre-post difference); *Wilcoxon test; **Mann-Whitney *U* test

Based on Table 4, the distribution of oral hygiene status in both groups showed changes after treatment. In the intervention group, the

proportion of respondents in the good category increased, while the poor category decreased. These findings indicate an improvement in oral hygiene

status, and statistical analysis confirmed a significant change. This suggests that the intervention was effective in influencing oral hygiene maintenance behavior. Oral health education interventions, particularly those combined with reinforcement of toothbrushing behavior, have been shown to improve oral hygiene practices and reduce plaque accumulation on tooth surfaces.²⁹ Furthermore, educational interventions focusing on toothbrushing behavior can increase the frequency of brushing twice daily and significantly improve oral hygiene status after the intervention period.³⁰

In the control group, changes in the distribution of oral hygiene categories were also observed after the observation period, despite the absence of a specific intervention. The proportion of respondents in the good category increased, while the fair category decreased. However, these changes were not statistically significant. This finding may be explained by the Hawthorne effect, where individuals modify their behavior because they are aware of being observed during a study.³¹

Overall, a descriptive improvement in oral hygiene status was observed in both groups. However, no statistically significant differences were found between the intervention and control groups before or after treatment. The intervention group showed a clearer improvement trend, particularly with an increase in the good category and a decrease in the poor category. This finding suggests that the intervention may not have been sufficiently strong to produce significant changes within a relatively short observation period and limited intervention duration.³² Nevertheless, it also indicates that oral health education and a 21-day toothbrushing program may still have the potential to improve oral hygiene maintenance behavior if implemented continuously. Behavioral

changes in health practices, including oral hygiene habits, generally require time, repeated reinforcement, and consistent environmental support.³³

Oral health education can improve public knowledge and awareness; however, behavioral change often requires a longer time and consistent reinforcement to produce meaningful improvements in oral hygiene practices.³⁴ In addition, behavior is influenced by several factors, including motivation, daily habits, and social support from the surrounding environment.³⁵⁻³⁷ Other factors that may affect the outcomes include a relatively small sample size³⁸ or suboptimal intensity of educational interventions.³⁹ The present study has several limitations, including a relatively small sample size, a short intervention period, and insufficient reinforcement of the educational intervention. Repeated educational sessions or reinforcement activities may have enhanced knowledge retention and improved the overall effectiveness of the intervention. For the *Kolok* community in Bengkala Village, communication methods that align with their cultural characteristics and local sign language are essential, along with more intensive and participatory educational approaches.

CONCLUSION

Face-to-face oral health education assisted by a local interpreter was not effective in significantly improving oral health knowledge and caries-preventive behaviors among the *Kolok* community. However, the toothbrushing calendar showed effectiveness in improving oral hygiene and supporting caries prevention. Nevertheless, this study highlights that oral health education still plays an important role in encouraging toothbrushing habits, which ultimately contribute to improvements in respondents' oral hygiene status as part of

behavioral change efforts for caries prevention among the *Kolok* community in Bengkala Village, Bali.

REFERENCES

1. Brower T. Systemic diseases linked to oral health: a review of the epidemiology of periodontal disease, poor oral hygiene, and tooth caries. *Dent Sci Innov Res.* 2025;4(1):1-3. DOI:10.61148/3065-7008/DSIR/051.
2. Rathee M, Sapra A. Dental caries. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023. PMID:31869163.
3. Mount GJ, Hume WR, editors. Preservation And Restoration of Tooth Structure. 2nd ed. Dental caries; The major cause of tooth damage, ed. McIntyre JM. Knowledge books and software: Queensland; 2005.
4. Nazir MA, Nemat F, Talal A, Ashraf MA, Ashraf MW, Almas K. Global caries experience in adults and elderly: relationship with country-level income and current tobacco smoking. *Pak J Public Health.* 2025;15(2):41-6. DOI:10.32413/pjph.v15i2.1571.
5. Amran R, Lisfrizal H, Ningrum V. Hubungan antara status karies dan kualitas hidup pasien di Klinik Bedah Mulut RSGM Baiturrahmah. *E-GiGi.* 2023;12(1):38-43. DOI:10.35790/eg.v12i1.48598.
6. Rahina Y, Wahyuni NPD, Astuti NKA, Ayu KV, Wedagama DM, Elang P. Dental health education for managing poor oral hygiene in middle-aged female patients. *Interdental J Kedokt Gigi.* 2024;20(3):363-9. DOI:10.46862/interdental.v20i3.8826.
7. Kementerian Kesehatan RI. Laporan nasional Riskesdas 2018. Jakarta: Lembaga Penerbit Badan Penelitian dan Pengembangan Kesehatan; 2019. p.197-200.
8. Rahina Y, Purnamasari CB, Muthiah NA. A community-based approach to self-prevention practices for periodontal disease among housewives in Derawan Island. *Interdental J Kedokt Gigi.* 2025;21(1):34-40. DOI:10.46862/interdental.v21i1.11340.
9. Hariyani N, Setyowati D, Sari MR, Maharani DA, Nair R, Sengupta K. Factors influencing the utilization of dental services in East Java, Indonesia. *F1000Res.* 2021;9:673. DOI:10.12688/f1000research.23698.2.
10. World Health Organization. Sugars and dental caries: WHO technical note. Geneva: World Health Organization; 2025.
11. Wiantari NP, Anggaraeni PI, Handoko SA. Gambaran perawatan pencabutan gigi dan tingkat pengetahuan masyarakat tentang kesehatan gigi dan mulut di wilayah kerja Puskesmas Mengwi II. *BDJ.* 2018;2(2):100-4. DOI:10.51559/bdj.v2i2.116.
12. Rahina Y, Dewi IGAACI, Pratama IAWAW, Duarsa P. Tingkat pengetahuan kesehatan gigi pada orang tua anak usia prasekolah. *Interdental J Kedokt Gigi.* 2019;15(2):60-6. DOI:10.46862/interdental.v15i2.593.
13. Desa Bengkala, Kecamatan Kubutambahan, Kabupaten Buleleng, Provinsi Bali. [Internet]. Available from: <https://bengkala-buleleng.desa.id/index.php/first/artikel/20>
14. Watt R, Venturelli R, Daly B. Understanding and tackling oral health inequalities in vulnerable adult populations: from the margins to the mainstream. *Br Dent J.* 2019;227:49-54. DOI:10.1038/s41415-019-0472-7.
15. Ulfah R, Utami NK. Hubungan pengetahuan dan perilaku orang tua dalam memelihara kesehatan gigi dengan karies gigi pada anak Taman Kanak-kanak. *An-Nadaa J Kesehat Masy.* 2020;7(2):146-50. DOI:10.31602/ann.v7i2.3927.
16. Rahina Y. Enhancing oral health awareness among the deaf community through dental health education in Bengkala Village, Bali. In: Proceedings of the International Conference Brawijaya Dentistry. Malang; 2023. p.69-75.
17. Putri SA, Amurwaningsih M, Shafia A. Description of primary school student behavior post the 21-day tooth brushing program (survey of students at SDN Bangetayu Wetan 01 Semarang City). *J Medali.* 2024;6(2):97-102. DOI:10.30659/medali.6.2.97-102.
18. Subekti A, Donasari EN, Sutomo B, Sukendro SJ. Pendampingan kegiatan menyikat gigi selama 7, 21, 35 hari oleh orang tua pada anak Pos PAUD Pandega Siwi Kelurahan Tlogosari Kecamatan Pedurungan Kota Semarang. *J Kesehat Gigi.* 2017;4(2). DOI:10.31983/jkg.v4i2.3199.
19. Fathaniard AH, Yang L, Sun J, Chen L, Wu J, Zhang L, et al. A meta-analysis of oral health interventions in children: impacts on knowledge, behaviour, and clinical outcomes. *Int Dent J.* 2026;76(2):109374. DOI:10.1016/j.identj.2025.109374.
20. Maullasari S. The role of social support to increase the confidence of the deaf in the Difabel Study Council. *J Adv Guidance Couns.* 2022;3(2):94-105. DOI:10.21580/jagc.0.0.0.5896.
21. Ebu NI, Amissah-Essel S, Asiedu C, Akaba S, Pereko KA. Impact of health education intervention on knowledge and perception of cervical cancer and screening for women in Ghana. *BMC Public Health.* 2019;19(1):1505. DOI:10.1186/s12889-019-7867-x.
22. Fariji AA, Dumilah R. The influence of problem-based learning models on mothers' knowledge and attitudes about baby care patterns. *J Ris Kesehat Poltekkes Depkes Bandung.* 2021;13(1):40-9. DOI:10.34011/juriskesbdg.v13i1.1826.
23. Mansoor S, Kristiani A, Sabilillah MF. Media PECS terhadap pengetahuan kesehatan gigi dan mulut penyandang tunarungu pada SLB Yayasan Bahagia Kota Tasikmalaya. *J Dent Hyg Ther.* 2022;3(2):105-9. DOI:10.36082/jdht.v3i2.623.
24. Deriaty T, Rachmawati A, Amalia Z. Sosialisasi pencegahan dan perawatan maloklusi gigi pada murid tuna rungu SLB-E Pembina Tingkat Provinsi Medan melalui video dengan bahasa isyarat. *TALENTA Conf Ser.* 2024;5(1):53-7. DOI:10.32734/anr.v5i1.2137.
25. Fageeh HN, Mansoor MA, Fageeh HI, Abdul HN, Khan H, Akkam A, et al. Teledentistry using a mobile app (Telesmile) to improve oral health among the visually impaired and hearing-impaired populations in Saudi Arabia: a randomized controlled study. *Front Oral Health.* 2024;5:1496222. DOI:10.3389/froh.2024.1496222.

26. Veriza E, Riyadi S, Seisaria W. Perbedaan penyuluhan kesehatan gigi menggunakan media gambar dengan video dalam meningkatkan perilaku menyikat gigi pada anak tunarungu di SLB Negeri 1 Kota Jambi. *J Dunia Kesmas*. 2020;9(4):457-62. DOI:10.33024/jdk.v9i4.2368.
27. Deepak S, Mishra G, Gupta VK, Kumar S. Impact of a novel oral health tracker cum motivator versus conventional education on oral health behavior among 10- to 15-year-old school children in Lucknow: a single-blinded, parallel design—a randomized controlled trial. *J Int Soc Prev Community Dent*. 2025;15(5):466-73. DOI:10.4103/jispcd.jispcd_102_25.
28. Yuniarti E, Darmawansyah D, Aprianti D. Hubungan tingkat pengetahuan dan sikap tentang kesehatan gigi dengan perilaku perawatan gigi anak usia sekolah dasar kelas V di SD Negeri 19 Kota Bengkulu tahun 2024. *J Multidisiplin*. 2025;2(1):51-60. DOI:10.70963/jm.v2i1.329.
29. Shirahmadi S, Bashirian S, Soltanian AR, Karimi-Shahjanjari A, Vahdatinia F. Effectiveness of theory-based educational interventions of promoting oral health among elementary school students. *BMC Public Health*. 2024;24:130. DOI:10.1186/s12889-023-17528-0.
30. Prihastuti R, Hinode D, Fukui M, Rodis OMM, Matsuka Y. Theory-based educational intervention on oral hygiene behavior among university students: a randomized controlled trial. *BDJ Open*. 2025;11:80. DOI:10.1038/s41405-025-00368-y.
31. Zhang T. The impact of observers on people's behavior. *Lecture Notes Educ Psychol Public Media*. 2024;50:243-8. DOI:10.54254/2753-7048/50/20240957.
32. Marashi SZ, Hidarnia A, Kazemi SS, Shakerinejad G. The effect of educational intervention based on self-efficacy theory on promoting adolescent oral health behaviors through mobile application: a randomized controlled trial study. *BMC Oral Health*. 2024;24:1283. DOI:10.1186/s12903-024-04970-8.
33. Peerbhay F, Mash R, Khan S. Effectiveness of oral health promotion in children and adolescents through behaviour change interventions: a scoping review. *PLoS One*. 2025;20(1):e0316702. DOI:10.1371/journal.pone.0316702.
34. Watt RG, Daly B, Allison P, Macpherson LMD, Venturelli R, Listl S, et al. Ending the neglect of global oral health: time for radical action. *Lancet*. 2019;394(10194):261-72. DOI:10.1016/S0140-6736(19)31133-X.
35. Liang Y, Cao S, Xu H, Wang S, Feng M, Wang J, et al. Apply the information-motivation-behavioral model to explore the relationship between oral health literacy and oral health behaviors among community-dwelling older adults. *BMC Public Health*. 2024;24(1):3169. DOI:10.1186/s12889-024-20697-1.
36. Jiang N, Shi H, Zhao J, Zhang Y, Wang T, Cao H, et al. Effects of social support on oral health behavior: serial multiple-mediator model. *Oral Dis*. 2024;30(2):681-7. DOI:10.1111/odi.14473.
37. Cimen E, Baser B. Effects of social media reminders on oral hygiene motivation with fixed orthodontic treatment: a randomized controlled trial. *BMC Oral Health*. 2025;25:1501. DOI:10.1186/s12903-025-06926-y.
38. Azam T, Goodwin M, Gomez J, Kitsaras G. Barriers and facilitators to achieving optimal oral health behaviours in university students. *BMC Public Health*. 2025;25:3883. DOI:10.1186/s12889-025-25042-8.
39. Jolfaei NA, Tahani B. Effect of oral health education based on COM-B model on improving the oral health behavior of preschool children. *J Educ Health Promot*. 2025;14:184. DOI:10.4103/jehp.jehp_655_24.