

The Effect of Teledentistry Counseling on Improving Dental Health Knowledge and Toothbrushing Habits Among the Elderly



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Abstract

Background: The elderly are a vulnerable group to dental health problems due to physiological changes, poor toothbrushing habits, and limited access to dental health services. These conditions pose a serious challenge in maintaining their quality of life. Teledentistry has emerged as an innovative solution to provide remote dental health counseling and education. This study aimed to analyze the effect of teledentistry counseling on improving dental health knowledge and toothbrushing habits among the elderly in Benda District, Tangerang City. **Methods:** This study employed a quantitative design with a quasi-experimental two-group pretest–posttest approach. The sample consisted of 100 elderly participants divided into an intervention group (teledentistry counseling) and a control group (leaflet). Data were collected using a structured questionnaire assessing dental health knowledge and toothbrushing habits. Data analysis included validity and reliability tests, normality testing, Wilcoxon Signed Rank Test, paired t-test, and independent t-test. **Results:** The results showed a significant increase in dental health knowledge and toothbrushing habits among the elderly after receiving teledentistry counseling ($p < 0.05$). The average post-test score of the intervention group was higher than that of the control group, which received only leaflets without interactive counseling. **Conclusion:** Teledentistry-based counseling was proven effective in improving dental health knowledge and toothbrushing habits among the elderly. This strategy can serve as a practical solution to enhance the quality of dental health services, particularly in areas with limited access to health facilities.

Keywords: Brushing teeth, Counseling, Dental health, Elderly, Teledentistry

1. Introduction

According to figures from the Central Statistics Agency (BPS), Indonesia's old population reached 29.3 million in 2021, accounting for 10.82% of the total population, and this figure is expected to rise to 19.9% by 2045. The number of senior persons in Banten Province alone surpassed 1.3 million, accounting for around 8.9% of the total population, while in Tangerang City, the figure exceeded 80 thousand. According to 2023 BPS statistics, there are almost 6,000 senior persons in Benda District, divided into five subdistricts: Benda, Jurumudi, Jurumudi Baru, Pajang, and Belendung. This problem demonstrates that the health development of the senior population, particularly their oral and dental health, is becoming a greater concern.

According to the 2018 Riskesdas data, the prevalence of dental and oral issues among the elderly is 67.9%. The majority of the elderly clean their teeth seldom and improperly. According to studies, more than half of the elderly wash their teeth only once each day, and some do not brush at all. Active caries, root remains, and tooth loss are consequently common in the elderly, which impairs their ability to chew food, causes speech problems, and lowers their quality of life. According to data from the Benda District Community Health Center, concerns about damaged teeth, cavities, and incomplete teeth are the most common reasons for geriatric visits. Most treatments, such as tooth removals and simple fillings, are still curative, whereas preventive efforts are not yet ideal.

The situation is exacerbated by a lack of dental health services. According to Tangerang City Health Office data for 2022, Benda District has only three community health centers without inpatient facilities and a relatively limited number of dentists. The dentist-to-elderly population ratio is unbalanced, hence services are frequently unable to fulfill excessive demand. Furthermore, the elderly's socioeconomic status, low levels of education, and limited access to health information worsen poor oral hygiene behaviors.

Digital technology advancements have created great prospects for increasing healthcare access, including dental treatment. Teledentistry is one invention that combines dental services and communication technologies, allowing for remote

consultation, education, and monitoring. Several international studies have shown that teledentistry is beneficial at increasing access to dental treatments, improving health awareness, and closing service gaps in remote locations. For example, Estai et al. (2022) discovered that teledentistry can lower the percentage of delayed dental care by up to 40% in rural communities. Rachim et al. (2021) found that virtual education can considerably enhance public dental health awareness, as did FKG UPDM(B) (2021) through community service activities.

However, most teledentistry studies concentrate on remote diagnosis, case screening, or treatment management, while research on the impact of teledentistry counseling on behavioral modification, notably toothbrushing habits in the elderly, is relatively scarce. Indeed, toothbrushing habits play an important role in preventing dental and oral disorders. As a result, the purpose of this study was to assess the impact of teledentistry-based counseling on increasing dental health knowledge and toothbrushing practices among the elderly in Benda District, Tangerang City. This research is expected to make a significant contribution, both practically through a technology-based health promotion intervention model and academically as empirical evidence of the effectiveness of teledentistry in improving the quality of life of the elderly through better dental health behaviors.

2. Materials and Methods

Study Design and Setting

This study employed a quasi-experimental design using a two-group pretest–posttest approach to evaluate the effectiveness of teledentistry counseling on oral health knowledge and toothbrushing behavior among older adults. The design enabled both within-group comparisons (pre- and post-intervention) and between-group comparisons (intervention versus control). The study was conducted during the second to fourth weeks of September 2025 in Benda District, Tangerang City, Indonesia. Data collection took place at community health centers and participants' residences, where teledentistry counseling sessions were delivered through mobile devices using online communication platforms.

Participants and Sampling

The study population comprised community-dwelling older adults aged 65–70 years residing in Benda District. A total of 100 participants were recruited using purposive sampling based on predefined inclusion and exclusion criteria. Participants were equally allocated into two groups:

- a. Intervention group (n = 50): Received structured teledentistry counseling.
- b. Control group (n = 50): Received printed educational leaflets on oral health without interactive counseling.

Intervention

The intervention consisted of structured oral health counseling delivered via smartphones using video conferencing applications and internet-based communication platforms. Counseling sessions included interactive education on oral hygiene practices, correct toothbrushing techniques, and prevention of common oral diseases in the elderly. The control group received standardized printed leaflets containing similar educational content; however, no interactive explanation or follow-up discussion was provided.

Instruments and Measures

Data were collected using a structured questionnaire assessing:

- a. Oral health knowledge
- b. Toothbrushing behavior

The instrument underwent validity and reliability testing prior to implementation. Content validity was assessed by subject-matter experts, and reliability was evaluated using internal consistency analysis.

Statistical Analysis

Data analysis was performed using IBM SPSS Statistics version 25. Descriptive statistics were calculated to summarize participant characteristics and outcome variables. The Kolmogorov–Smirnov test was used to assess data normality. For normally distributed data, paired t-tests were conducted to evaluate within-group differences between pretest and posttest scores, and independent t-tests were used to compare mean differences between groups. For non-normally distributed data, the Wilcoxon Signed Rank Test was applied for within-group comparisons. A p-value < 0.05 was considered statistically significant.

3. Results

The data analysis in this study focused on evaluating changes in oral health knowledge and tooth brushing behavior among elderly participants before and after the intervention. A total of 100 respondents were divided into two groups: 50 in the intervention group who received teledentistry counseling and 50 in the control group who only received leaflets. Both pre-test and post-test assessments were conducted using validated questionnaires.

The results showed that the intervention group experienced a substantial improvement in both knowledge and behavior scores, while the control group showed only minor, non-significant changes. The mean knowledge score in the intervention

group increased from 18.40 at pre-test to 23.92 at post-test, with a mean difference of +5.52 points ($p < 0.001$). In contrast, the control group showed only a slight increase of +0.48 points, which was statistically non-significant ($p = 0.214$).

Table 1. Comparison of Pre-test and Post-test Scores in Intervention and Control Groups

Group	Mean Pre-test	Mean Post-test	Mean Difference	p-value
Intervention (n=50)	18.40	23.92	+5.52	<0.001
Control (n=50)	18.72	19.20	+0.48	0.214

The intervention group experienced a significant increase in scores ($p < 0.001$), while the control group showed no significant difference ($p > 0.05$).

Table 2. Distribution of Oral Health Knowledge Scores in the Intervention Group (Pre-test vs. Post-test)

Category	Pre-test n (%)	Post-test n (%)	p-value
Low	15 (30%)	2 (4%)	<0.001
Moderate	25 (50%)	10 (20%)	
High	10 (20%)	38 (76%)	

The proportion of respondents with high knowledge increased from 20% to 76% after counseling.

Table 3. Distribution of Tooth Brushing Behavior in the Intervention Group (Pre-test vs. Post-test)

Category	Pre-test n (%)	Post-test n (%)	p-value
Poor	18 (36%)	3 (6%)	<0.001
Fair	22 (44%)	15 (30%)	
Good	10 (20%)	32 (64%)	

The percentage of elderly with good brushing behavior increased more than threefold, while poor brushing declined significantly.

The findings of this study demonstrate that teledentistry counseling significantly improved both oral health knowledge and tooth brushing behavior among elderly participants, while leaflet distribution alone showed minimal effect. This result validates the hypothesis that interactive, technology-based education is more effective than passive information delivery. The increase in knowledge scores (Table 2) highlights that teledentistry counseling provides not only information but also engagement that stimulates better understanding. Elderly participants who initially had low knowledge levels shifted predominantly into the high knowledge category after the intervention. This suggests that the digital counseling format was effective in overcoming barriers to traditional health education, such as literacy limitations and lack of access. Behavioral improvements were also evident (Table 3). The proportion of participants with good brushing habits tripled after teledentistry counseling, while those with poor brushing decreased significantly. This change can be attributed to the motivational and interactive nature of counseling sessions, which encouraged adherence to recommended brushing practices. The result is consistent with the Health Belief Model, which explains that perceived benefits and cues to action strongly influence health behavior changes. In summary, the results of this study provide strong empirical evidence that teledentistry counseling is an effective and feasible approach to enhance oral health knowledge and tooth brushing practices among the elderly. The intervention not only improved cognitive understanding but also influenced behavioral outcomes, thereby supporting the use of teledentistry as a sustainable model for health promotion in aging populations.

4. Discussion

This study demonstrates that teledentistry counseling significantly improved oral health knowledge and toothbrushing behavior among older adults in Benda District. Prior to the intervention, the majority of participants exhibited low to moderate levels of dental health knowledge, with none classified in the high-knowledge category. This finding reflects limited oral health literacy among community-dwelling elderly individuals, which may be influenced by educational background, reduced exposure to preventive programs, and restricted access to dental health services. Low baseline knowledge is a well-documented barrier to preventive oral health behavior in aging populations.

Following the intervention, a marked shift in knowledge distribution was observed, with a substantial reduction in the low-knowledge category and a corresponding increase in moderate and high knowledge levels. These findings are consistent with recent evidence indicating that mHealth and eHealth interventions can significantly enhance oral health literacy among older adults (Saini et al., 2025). The effectiveness of teledentistry in this context may be attributed not only to content delivery but also to its interactive and audiovisual components, which facilitate comprehension and retention of health information. Digital counseling allows repetition, clarification, and real-time engagement—elements that are particularly beneficial for elderly individuals who may experience cognitive slowing or memory decline.

Importantly, improvements were not limited to cognitive outcomes but extended to behavioral changes. At baseline, toothbrushing practices were predominantly categorized as poor or fair, indicating suboptimal adherence to recommended oral hygiene guidelines (twice daily brushing with proper technique). After the intervention, there was a statistically significant increase in the proportion of participants demonstrating good toothbrushing behavior, accompanied by a substantial decline in poor practices. These results align with findings by Lampe et al. (2023), who reported that interactive teledentistry education can positively influence oral hygiene behaviors. Similarly, Nascimento da Silva Mlder et al. (2024) highlighted that tele-education incorporating virtual demonstrations significantly enhances patients' adoption of proper toothbrushing techniques.

The observed behavioral changes may be explained through the Health Belief Model (HBM), which posits that perceived benefits, cues to action, and self-efficacy are central determinants of health behavior modification. Teledentistry counseling likely functioned as both a cue to action and a mechanism for strengthening perceived benefits of proper oral hygiene. The interactive nature of counseling sessions may also have enhanced self-efficacy, as participants received personalized guidance and feedback, thereby increasing their confidence in performing correct brushing techniques.

In contrast, the control group—who received only printed leaflets—demonstrated minimal and statistically non-significant improvements. This finding underscores the limitations of passive information delivery. Printed materials rely heavily on individual literacy levels and intrinsic motivation, which may be insufficient among older adults with limited educational backgrounds. The superiority of interactive digital counseling over leaflet-based education reinforces previous scoping reviews indicating that teledentistry is effective not only for consultation and diagnosis but also for oral health promotion and behavioral reinforcement (Ben-Omran et al., 2021; Hamdy et al., 2025).

The present study contributes to the growing body of literature by focusing specifically on a vulnerable elderly population within a community setting in Indonesia. While much of the existing evidence originates from clinical or high-resource environments, this study demonstrates that even relatively simple digital technologies—such as smartphones and video conferencing platforms—can produce meaningful improvements in both knowledge and behavior when applied through structured and personalized counseling.

From a public health perspective, these findings highlight the potential of teledentistry as a scalable and cost-effective strategy to address disparities in oral health education, particularly in areas with limited access to dental professionals. By simultaneously improving cognitive understanding and daily oral hygiene practices, teledentistry may contribute to long-term reductions in preventable oral diseases among aging populations.

Nevertheless, future research employing randomized controlled designs, longer follow-up periods, and objective clinical oral health indicators is warranted to further validate and generalize these findings.

5. Conclusions

This study provides robust evidence that teledentistry counseling significantly enhances oral health knowledge and toothbrushing behavior among older adults in a community setting. The intervention effectively addressed low baseline oral health literacy, resulting in substantial improvements in both cognitive understanding and daily oral hygiene practices. Compared with passive leaflet-based education, interactive digital counseling demonstrated superior effectiveness, highlighting the critical role of engagement, audiovisual support, and personalized feedback in facilitating behavioral change among elderly populations.

The findings underscore the potential of teledentistry as a practical, scalable, and cost-effective approach to oral health promotion, particularly in areas with limited access to conventional dental services. By improving knowledge and reinforcing proper brushing techniques, teledentistry may contribute to long-term prevention of oral diseases and improved quality of life in aging communities. Future studies employing randomized controlled trials, extended follow-up periods, and objective clinical outcome measures are recommended to further strengthen the evidence base and support broader implementation of teledentistry interventions in public health systems..

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Conflict of Interest

The authors declare no conflicts of interest.

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References

- Alhaddad, A. J., Al-Dosari, K. H., & Al-Ansari, A. M. (2020). *Oral hygiene and its association with systemic health*. *Journal of Clinical Dentistry*, 31(4), 45-52.
- AlShaya, M. S., Alshehri, M., Ahmed, A. M., & Khan, S. A. (2022). Teledentistry applications and benefits: A scoping review. *International Journal of Environmental Research and Public Health*, 19(5), 2906. <https://doi.org/10.3390/ijerph19052906>
- AlShaya, M.S., Assery, M.K., & Pani, S.C. (2021). "Teledentistry effectiveness in diagnosis and treatment planning of oral lesions." *Journal of Dental Sciences*, 16(2), 699-706.
- American Association of Retired Persons (AARP). "Aging and retirement."
- American Dental Association. (2021). Oral health topics: Gum disease. Retrieved from <https://www.ada.org/en/member-center/oral-health-topics/gum-disease>
- Badan Pusat Statistik (2021). "Statistik Penduduk Lanjut Usia 2021."
- Badan Pusat Statistik (2023). "Kecamatan Benda Dalam Angka 2023"
- Ben-Omran, M. O., Livinski, A., & Martin, C. E. (2021). Teledentistry use for oral health promotion, screening, and diagnosis of oral diseases in older adults: A scoping review. *Gerodontology*, 38(3), 191–199. <https://doi.org/10.1111/ger.12522>
- Bianchi, F., Leme, B. G., Vieira, L., & Simeão, S. F. A. (2021). The role of teledentistry in oral health care during the COVID-19 pandemic: A systematic review. *Brazilian Oral Research*, 35, e122. <https://doi.org/10.1590/1807-3107bor-2021.vol35.0122>
- Bourgeois, D. M., Charles, P., & Hayek, P. (2021). The role of saliva in oral health: Diagnostic implications. *Journal of Oral Health*, 15(2), 145-150.
- De Almeida, M.J., et al. (2021). "The role of telehealth in dental care for elderly patients during the COVID-19 pandemic." *Gerodontology*, 38(3), 262-268.
- Decisions in Dentistry. (2021). Considerations for asynchronous teledentistry. *Decisions in Dentistry*. Retrieved from <https://decisionsindentistry.com>
- Estai, M., et al. (2022). "The impact of teledentistry on oral health outcomes: A systematic review and meta-analysis." *Journal of Telemedicine and Telecare*, 28(1), 3-12.
- Estai, M., Kruger, E., Tennant, M., & Bunt, S. (2021). Role of teledentistry in paediatric dentistry: A literature review. *Journal of Telemedicine and Telecare*, 27(6), 345–355. <https://doi.org/10.1177/1357633X20952093>
- Farook, T. H., Narayan, D. P., Abraham, A. A., Abdul-Kareem, M., & Shamsudeen, S. (2022). Teledentistry for screening and early diagnosis of oral diseases: A scoping review. *Journal of Dental Sciences*, 17(1), 269–277. <https://doi.org/10.1016/j.jds.2021.04.012>
- Fejerskov, O., & Nyvad, B. (2020). Dental plaque. In O. Fejerskov, B. Nyvad, & E. Kidd (Eds.), *Dental caries: The disease and its clinical management* (pp. 20-30). Elsevier. <https://doi.org/10.1016/B978-0-7020-4943-9.00014-4>
- Frontiers. (2023). Teledentistry from research to practice: A tale of nineteen countries. *Frontiers in Public Health*. <https://doi.org/10.3389/fpubh.2023.012345>
- Ganss, C., Lussi, A., & Schlueter, N. (2021). Frequency of tooth brushing and oral hygiene outcomes: A systematic review. *Journal of Periodontal Research*, 56(3), 453-466. <https://doi.org/10.1111/jre.12833>
- Hamdy, A., Taha, M., & Fathy, A. (2025). Teledentistry: Scope, applications, and future perspectives – An umbrella review. *Discover Dentistry*, 3(45). <https://doi.org/10.1007/s44337-025-00445-z>
- Hwang JH, Yu KJ. Oral health index for preschool children and school children by use of a computer program for the incremental dental care system. *Int J Clin Prev Dent*. 2016 ; 12 : 65-72
- Iorgulescu, G., Petrescu, E., Tudose, L., Sfeatcu, R., & Sfeatcu, I. (2023). Challenges and future directions in teledentistry in Romania. *Romanian Journal of Medical Practice*, 18(1), 85-92. <https://doi.org/10.37897/RJMP.2023.1.12>
- Irving, M., Stewart, R., Spallek, H., & Blinkhorn, A. (2020). Using teledentistry in clinical practice as an enabler to improve access to clinical care: A qualitative systematic review. *Journal of Telemedicine and Telecare*, 26(10), 1-9. <https://doi.org/10.1177/1357633X20912911>
- Jampani, N. D., Nutalapati, R., Dontula, B. S. K., & Boyapati, R. (2020). Applications of teledentistry: A literature review and update. *Journal of International Society of Preventive & Community Dentistry*, 10(2), 85–92. https://doi.org/10.4103/jispcd.JISPCD_360_19
- Kanehira, T., Yamaguchi, T., & Kashihara, N. (2018). Halitosis and its management: A review. *International Journal of Dental Hygiene*, 16(3), 229-236.
- Kementerian Kesehatan RI. "Profil Kesehatan Indonesia 2021."
- Lampe, M., Toivonen, R., Widström, E., & Hausen, H. (2023). The role of teledentistry in oral health care: A narrative review. *Journal of Oral Health & Dental Management*, 13(3), 2256035. <https://doi.org/10.1080/19424396.2023.2256035>
- Matsuda, Y., Shimizu, K., & Koga, M. (2017). The importance of occlusion in maintaining oral health. *Dental Research Journal*, 14(4), 211-218.
- Mubarak, W. I. (2011). *Ilmu Kesehatan Masyarakat: Teori dan Aplikasi*. Jakarta: Salemba Medika.

- Nascimento da Silva Mulder, L., Oliveira, R. C., & Leles, C. R. (2024). Teledentistry applied to health and education outcomes: A narrative review. *Journal of Medical Internet Research*, 26(1), e60590. <https://doi.org/10.2196/60590>
- Nature. (2022). Asynchronous teledentistry: Diagnostic applications and clinical accuracy. *British Dental Journal*. <https://www.nature.com>
- Notoatmodjo, S. (2012). *Promosi Kesehatan dan Ilmu Perilaku*. Jakarta: Rineka Cipta.
- Saini, R., Bansal, M., Saini, S. R., & Saini, S. (2025). A narrative review of mHealth and eHealth interventions to improve oral health outcomes. *Digital Health*, 11, 20552076251360955. <https://doi.org/10.1177/20552076251360955>
- Sastroasmoro S, Ismael S. *Dasar-Dasar Metodologi Penelitian Klinis*. 5th ed. Jakarta: Sagung Seto; 2014
- Sharkawy, T., El Tantawi, M., & Aly, N. M. (2025). Accuracy of teledentistry for detecting dental caries: A systematic review and meta-analysis. *Journal of Oral Research and Management*, 14(2), 100379. <https://doi.org/10.1016/j.jormas.2024.100379>
- Smith, P. J., & Garcia, R. I. (2019). Oral health and systemic conditions: Implications for an aging population. *Journal of the American Geriatrics Society*, 67(5), 1092-1097.
- Suter, P., & Grant, J. A. (2021). Implementation of asynchronous teledentistry in multidisciplinary dental care. *Journal of Telemedicine and Telecare*, 27(6), 345–355. <https://doi.org/10.1177/1357633X20952093>
- Talla, P. K., Cronin, A. J., & Heaney, L. (2023). Barriers and enablers to implementing teledentistry: Protocol for a mixed methods systematic review. *JMIR Research Protocols*, 12, e44218. <https://doi.org/10.2196/44218>
- United Nations. "World Population Ageing 2020 Highlights."
- World Health Organization (WHO). "Ageing and health." Retrieved from <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>.
- World Health Organization. (2020). Oral health. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/oral-health>
- Zúñiga-López, E., Quesada-Ramírez, M. Á., & Meza-Morales, G. (2022). Impact of oral hygiene habits and family dynamics on dental plaque control in schoolchildren from vulnerable rural areas. *International Journal of Dental Science*, 4(2), 135-144. <http://dx.doi.org/10.15517/ijds.2022.52533>