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ORIGINAL RESEARCH

Comparison of Oral Hygiene Through Teledentistry and Face-to-Face Tools: An Exploratory Study

Marília Goulardins Gomes[1], DDS, MSc, PhD(c), Ana Paula Dias Moreno[1], DDS, PhD, Fernanda Campos de Almeida Carrer[2], DDS, PhD, Fernanda Souza Liévana[1], DDS, PhD, Mary Caroline Skelton-Macedo[3], DDS, PhD, Ricardo Zorzetto Nicoliello Vêncio[4], PhD, Isabella Silva Catananti[1], DDS and Andiara De Rossi[1], DDS, MSc, PhD

[1]University of São Paulo, School of Dentistry of Ribeirão Preto, Department of Pediatric Dentistry, University of São Paulo – School of Dentistry of Ribeirão Preto, Brazil; [2]University of São Paulo, School of Dentistry of São Paulo, Department of Community Dentistry Education, University of São Paulo – School of Dentistry of Ribeirão Preto, Brazil; [3]University of São Paulo, School of Dentistry of São Paulo, Department of Dentistry, University of São Paulo – School of Dentistry of Ribeirão Preto, Brazil; [4]University of São Paulo, Faculty of Philosophy, Sciences and Letters, Department of Computing and Mathematics, University of São Paulo – School of Dentistry of Ribeirão Preto, Brazil

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Corresponding Author: Marília Goulardins Gomes, Email: m_goulardins@usp.br

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Abstract

Background: Teledentistry reduces waiting times and transportation costs. Beyond its value in emergency situations, teledentistry is a scalable strategy to expand access to oral health education and preventive care. During the coronavirus disease 2019 pandemic, teledentistry was an essential tool that minimized disruptions in dental care and promoted oral health education remotely.
Aim: In this study the authors conducted an exploratory evaluation of the effectiveness of virtual platforms and face-to-face consultations to improve oral hygiene of children in Brazil under emergency and routine care.
Methods: A randomized controlled trial was conducted with 30 children aged 6 to 10 years and their guardians. Three groups based on oral hygiene options were evaluated: (1) WhatsApp, (2) V4H (Video for Health), and (3) face-to-face. Oral hygiene was assessed using the visible plaque index, brushing time, brushing method, flossing, toothpaste use, and adult supervision. Statistical analysis included Mann–Whitney, Spearman's, Wilcoxon, Kruskal–Wallis exact tests.
Results: The children's mean age was 7.8 ± 1.5 years. All methods significantly reduced the plaque index and improved brushing habits ($p < 0.05$). There were no significant differences between the remote and face-to-face methods ($p > 0.05$). Guardians' involvement contributed to positive outcomes in children's oral health.
Conclusions: The study suggests that teledentistry is as effective as face-to-face consultations in improving children's oral hygiene and may be integrated into routine dental care as a complementary strategy for oral health education, expanding access and supporting preventive practices beyond pandemic-related restrictions.

Plain Language Summary

Dental care presents a risk of cross-infection due to the spread of infectious diseases through airborne droplets. During the COVID-19 pandemic, dental services were reduced or suspended, highlighting the need for alternative ways to provide oral health education. However, challenges related to access, transportation, and continuity of care were present before the pandemic and remain relevant. Teledentistry uses digital tools, such as mobile applications and video calls, to provide oral health guidance without requiring in-person visits. This study evaluated whether remote education is as effective as traditional face-to-face guidance to improve children's oral hygiene. Thirty children aged six to ten years and their caregivers were divided into three groups and assessed and compared before and after the interventions:

- WhatsApp guidance
- A video-based health platform
- In-person consultations

Oral hygiene habits and dental plaque levels were assessed before and after the interventions. All groups showed improvements in oral hygiene, with reduced dental plaque and better brushing habits. No differences were found between remote and in-person methods. These findings suggest that teledentistry is an effective and accessible strategy to support oral health education and preventive care in routine practice.

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Although the pandemic context intensified these challenges, barriers related to access, transportation, and continuity of pediatric dental care were already present in routine clinical practice, reinforcing the need for alternative strategies for oral health education and monitoring.[1]

Considering that parents and caregivers are responsible for children's oral health care, the need for effective methods for education, monitoring, and motivation to promote correct brushing practices became particularly evident.[2] Strengthening the knowledge and skills of parents and caregivers contributes to the prevention of oral diseases and the preservation of children's health,[3] reducing inequalities in pediatric dental care.[4]

To address interruptions in dental services and reinforce oral health education for families, both during public health emergencies and in routine care, remote methods have been increasingly explored.[2] Technologies such as mobile applications and digital communication platforms have emerged as promising tools in oral health education.[5] Teledentistry has been applied in public dental health services to reduce waiting times and transportation-related costs[3,6] and enables guidance, monitoring, and follow-up through remote assistance using digital technologies instead of exclusive face-to-face contact.[7,8]

Current evidence supports teledentistry as an effective approach for dental referrals, treatment planning, patient compliance, and treatment feasibility.[9] These characteristics make teledentistry a potentially sustainable strategy for expanding access to preventive dental care, particularly for populations facing logistical or geographic barriers.

Teledentistry offers benefits for both patients and dental professionals. Patients may receive timely guidance without the need for immediate in-person appointments, while dentists can perform monitoring, collaborate with specialists, and provide expert recommendations more efficiently.[5]

A recent randomized clinical trial demonstrated that the use of information and communication technologies through digital platforms may help address the repressed demand for primary dental care within the Brazilian Unified Health System.[10]

Despite the growing availability of mobile applications and digital platforms for oral health, there remains a lack of clinical trials comparing the effectiveness of remote and face-to-face educational interventions. The objective here is to address this gap by directly comparing virtual health platforms, mobile phone applications, and face-to-face tools in improving children's oral hygiene. The underlying premise is that teledentistry resources may support oral hygiene guidance for children and caregivers as part of routine dental care, reducing the need for continuous in-person appointments without compromising clinical outcomes.

Methods

Study Population

This study included a convenience sample of 30 child–parent dyads (children aged 6–10 years) recruited from a public pediatric dental clinic during the COVID-19 pandemic. Although recruitment occurred during a public health emergency, the study was designed to evaluate teleorientation strategies applicable to emergency contexts and routine pediatric dental care. A convenience sampling strategy was adopted due to pandemic-related restrictions, participant accessibility, and the feasibility of conducting the study under these circumstances.

From 600 eligible dental records at the Pediatric Dentistry Clinic of a public university, telephone contact was established with 100 patients. Of these, 60 met the inclusion criteria and were invited to participate. Among those invited, 42 initially agreed to participate (70%). During the study period, 12 participants (29%) withdrew, resulting in a final sample of 30 child–parent dyads completed the research protocol.

The final sample included 10 participants per group, totaling 30 individuals. This sample size provided 80% statistical power ($\beta = 0.20$) at a 5% significance level ($\alpha = 0.05$) to detect large effects ($f = 0.60$) in between-group comparisons and medium effects ($dz = 0.50$) in within-time comparisons. Additionally, this sample size ensured 80% power to detect large effects ($w = 0.57$) in association analyses between variables. Calculations were performed using R and G*Power software, following Prajapati et al.[10]

Eligibility

Eligible participants were pediatric patients and their legal guardians who provided informed consent, had complete medical records, owned a smartphone with internet access, and were able to install and use the WhatsApp and V4H (Video for Health) applications. Children presenting with pain, spontaneous dental sensitivity, motor impairments, or systemic health conditions that could interfere with study participation were excluded.

Intervention

The intervention modalities are defined and illustrated in Figure 1. The comparison between WhatsApp and V4H (Video

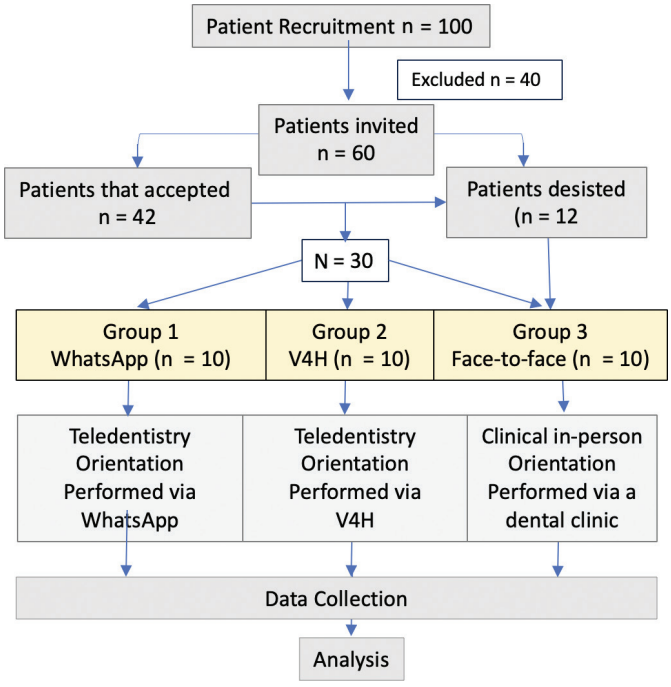

Fig. 1. Flowchart summarizing the study process. Group 1 (G1): Teleorientation via video call using WhatsApp. Group 2 (G2): Teleorientation using the V4H (Video for Health) platform. Group 3 (G3): Face-to-face oral hygiene guidance conducted at the university dental clinic.

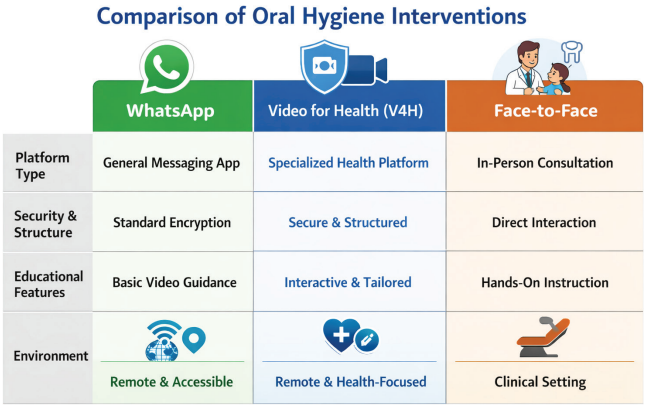

Fig. 2. Comparison of the characteristics of the three oral hygiene education interventions—WhatsApp, V4H (Video for Health), and face-to-face—regarding platform design, communication security, educational features, and delivery environment.

for Health) was designed to explore whether a health-specific digital platform, developed within an academic environment, would offer advantages in usability, didactic structure, and perceived communication safety compared with a general-purpose messaging application (Figure 2).

Ethical Approval

Ethical approval was obtained from the Ethics Committee for Research Involving Human Beings of a public university (CAAE 39685920.7.0000.5419). All legal guardians provided written informed consent, and children provided assent prior to participation. The study was also registered in Clinical Trials (Unique Protocol ID: CAAE 39685920.7.0000.5419).

Data Security and Documentation

For data communication and sharing, the standard WhatsApp application with end-to-end encryption was used. The V4H (Video for Health) platform, developed by a public university and based on synchronous telehealth videocommunication resources,[11] was specifically designed for telehealth purposes and provides a secure, structured environment for health-related videoconferencing and educational communication between professionals and patients.

All questionnaires were completed in real time during the teleorientation sessions. Multimedia data, including photographs and videos, were securely stored on an encrypted online platform (Google Drive), accessible only to the research team.

Data Collection Instruments and Interventions

Participants were randomly assigned to three intervention groups (n = 10 per group), with a follow-up period of 2 months. Guardians and children allocated to the face-to-face group underwent prior screening for COVID-19 symptoms and temperature measurement. All members of the research team completed biosafety training and followed institutional biosafety protocols.

Oral Hygiene Educational Content

Oral hygiene guidance was standardized according to the recommendations of the American Academy of Pediatric Dentistry (2018). The educational content addressed hand hygiene prior to brushing; appropriate brushing environment (mirror and adult supervision); toothbrushing techniques adapted to the child's motor skills; brushing frequency; toothbrush characteristics (size, soft bristles, rounded ends); fluoride toothpaste type and quantity; flossing methods (manual or device-assisted); tongue cleaning; rinsing instructions; toothbrush storage; and replacement and disinfection procedures (0.12% chlorhexidine digluconate).

Families were encouraged to ask questions to address individual oral hygiene needs. Importantly, identical educational content was delivered across all three groups, with the only difference being the mode of communication.

Evaluation Instruments

Q1 and Q2 refer to the first two quarters of the fiscal or calendar year, and "Supplementary Files A and B" often refer to accompanying documentation or data files.

To train caregivers to prepare self-reports and understand oral health, two questionnaires (Q1 and Q2; Supplementary Files A and B) were developed, pretested, and validated using a checklist for questionnaire development and analysis[12] as a reference." Acceptability, clarity, and comprehension were assessed during pretesting.

Q1 was administered at baseline to collect sociodemographic data and information on oral hygiene habits. Q2 was applied post-intervention and was based on the Literacy Adult Questionnaire[13–15] and the Pediatric Dental Health Behavior Questionnaire (PDHBQ)[16] to assess changes in children's brushing behavior and caregivers' understanding of oral health needs. Participant satisfaction was assessed using the Facial Image Scale.[17]

A video-based toothbrushing assessment was used by the guardians. Each received standardized instructions via WhatsApp on how to record videos of the child's complete toothbrushing routine. Videos were analyzed by two calibrated examiners using the Tooth Brushing Observation System (TBOS), which evaluates caregiver–child interaction and brushing acceptance through video observation.[18]

Assessment

Assessment parameters included brushing duration, rinsing behavior, brushing location, toothpaste quantity, toothbrush condition and storage, flossing use, brushing technique, time distribution across dental surfaces, and consistency with questionnaire responses.

Visible Plaque Index Assessment

Each participant received a kit containing a toothbrush, dentifrice, dental floss, and plaque-disclosing tablets (Eviplac, Biodinâmica). Two frontal photographs of the child's smile were obtained at baseline and post-intervention.

Two calibrated examiners assessed plaque accumulation using the Simplified Oral Hygiene Index of Greene and Vermillion.[19,20] The six upper and lower anterior teeth were evaluated under standardized conditions using a 32-inch monitor.

Video as an Educational Reinforcement Tool

One week after the intervention, all families received a personalized reinforcement video prepared by a calibrated operator, reinforcing the oral hygiene instructions previously provided.

Intervention Workflow

A 12-step intervention was used and is listed here.

- *Step 1:* Initial telephone contact and explanation of the study.
- *Step 2:* Delivery of informed consent, assent, and baseline questionnaire (Q1) via WhatsApp.
- *Step 3:* Guidance for recording a video of the child's complete toothbrushing routine.
- *Step 4:* Guidance for taking a photograph of the child's smile after brushing with plaque-disclosing tablets.
- *Step 5:* Evaluation of videos and photographs by two calibrated examiners.
- *Step 6:* Randomization of participants into three groups (G1, G2, G3).
- *Step 7: D*elivery of standardized oral hygiene guidance according to group *allocation*.
- *Step 8: Re*inforcement of oral hygiene instructions 4 weeks after the initial *session.*
- *Step 9: A*dministration of the post-intervention questionnaire (Q2).
- *Step 10: C*ollection of post-intervention videos and photographs.
- *Step 11:* Delivery of personalized reinforcement videos.

Reliability Assessment

A pilot study was conducted to calibrate the proposed methodology. Six children participated, and inter-examiner agreement was assessed using the kappa index ($\kappa = 0.7143$). Pilot participants were excluded from the final sample.

Statistical Analysis

Descriptive and exploratory analyses were performed for all variables. Mann–Whitney, Spearman's correlation, Wilcoxon, Kruskal–Wallis, and Fisher's exact tests were applied using SPSS 22.0 (SPSS Inc., Chicago, Illinois, USA). Statistical significance was set at $p < 0.05$.

Results

The cohort consisted of 30 children with a mean age of 7.8 ± 1.5 years, comprising 67% females ($n = 20$) and 33% males ($n = 10$). Additionally, 97% of the guardians were female, with a mean age of 37 ± 10 years. Most had at least a high school education. (73%), and 77% of the participants were responsible for up to two children.

According to the photo and video analyses, there was no significant difference between the sexes in the plaque index ($p > 0.05$). Additionally, there was no significant correlation between age and the plaque index in the age range between 6 and 10 years.

Plaque index evaluated before and after the oral hygiene instructions according to age: before the instructions ($r = –0.1454$; $p = 0.4434$) and after the instructions ($r = –0.3386$; $p = 0.0671$).

In the three groups evaluated, the plaque index significantly decreased after the instructions ($p < 0.05$), with no significant difference among the groups. Before oral hygiene guidance, the highest index observed was score 3 (abundant presence of dental biofilm accounting for more than 2/3 of the surface). After guidance, the highest index observed was score 2 (presence of dental biofilm in the cervical and middle thirds), as shown in Table 1 and Figure 3.

Table 1. Median, lower, and upper values of the dental plaque index as a function of group and time.

Group	Guidance: median (range)		
	Before	After	*P*-value
Face-to-face	2.5 (1; 3)	2 (0; 2)	0.017
WhatsApp	2 (1; 3)	1 (0; 2)	0.431
VH4 platform	3 (2; 3)	2 (1; 2)	0.007
P-value	0.0787	0.1843	

0: No debris or stain present; 1: Soft debris covering not more than one-third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered; 2: Soft debris covering more than one-third but not more than two-thirds of the exposed tooth surface; 3. Soft debris covering more than two-thirds of the exposed tooth surface.

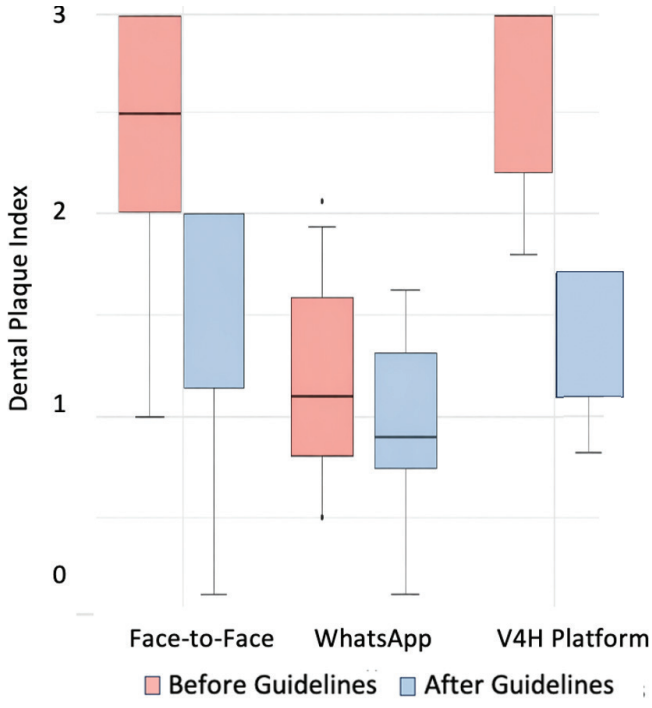

Fig. 3. Box plot of plaque index as a function of group and time.

The brushing time (Table 2 and Figure 4) increased significantly in all groups ($p < 0.05$), with no significant difference among them ($p > 0.05$).

There was no significant association between categorical oral hygiene variables and groups ($p > 0.05$), as shown in Table 3. For before and after guidance, in all cases, there was parent-child interaction; and all the children used toothpaste. Additionally, in all cases, the location was suitable. In the face-to-face group, one child did not brush well before, but after guidance, all the children accepted it.

Before guidance, no child used dental floss. After the guidance, 80%, 60%, and 30% of the face-to-face, WhatsApp, and VH4 groups, respectively, started to floss.

The adequate amount of toothpaste use increased considerably from 20%, 60%, and 40% to 100%, 90%, and 80% after oral hygiene guidance in the face-to-face, WhatsApp, and VH4 groups, respectively.

Table 2. Median, lower, and upper toothbrushing time (minutes) as a function of group and time.

Group	Guidance: (minutes) median (range)		*p*-value
	Before	After	
Face-to-face	2.5 (1; 3)	2 (0; 2)	0.017
WhatsApp	2 (1; 3)	1 (0; 2)	0.431
VH4 platform	3 (2; 3)	2 (1; 2)	0.007
P-value	0.0787	0.1843	

Additionally, for toothbrushing alterations in different areas, 80% to 60% of the participants in the face-to-face group fell, 100% to 80% of the participants in the WhatsApp group fell, and 100% to 50% of the participants in the VH4 group fell after guidance. All brushed areas increased from 30%, 20%, and 10% before guidance to 60%, 50%, and 60% after guidance in the face-to-face, WhatsApp, and VH4 groups, respectively.

Changes in categorical oral hygiene behaviors before and after guidance are summarized in Tables 4 and 5.

After the intervention, initiation of dental flossing was observed in 80.0% of children in the face-to-face group, 60.0% in the WhatsApp group, and 30.0% in the V4H (Video for Health) group. Improvements were also observed in the adequate amount of toothpaste used and in brushing all dental areas across the three intervention groups.

Table 5 summarizes the overall number and percentage of oral hygiene items that improved after guidance. Considering the 10 evaluated outcomes, the mean percentage of improvement was 40% in the face-to-face group, 29% in the WhatsApp group, and 35% in the V4H (Video for Health) group, with no statistically significant differences among groups ($p = 0.1$).

Questionnaires 1 and 2: Analysis of Responses

When questioned before the instructions (Table 6), all guardians answered that they thought it was important to brush their teeth. The majority (77%) answered that the children's teeth were brushed at least twice a day, and 43% of the children used dental floss. Nevertheless, 37% of those responsible before the guidelines did not help or found difficulties helping the child brush, and 57% believed that the child's brushing time was sufficient. In most cases, it was the child who placed the toothpaste (73%), and 67% went to the dentist that year.

Regarding access to dental treatment, 73% answered that it is easy to access. In addition, 97% of the children had toothbrushes.

After receiving oral hygiene guidance, all the guardians stated they were capable of supporting the child to have better oral hygiene. Additionally, 70% of the children brushed their teeth 2 to 5 times a day in the last week, and 26% brushed their teeth more than five times a day. Notably, 74% of the participants were satisfied with the child's oral health, and 93% thought it was important to use dental floss. All the children and 96% of the guardians liked participating in the project, but 26% had difficulties accessing the internet (Table 7).

When asked about suggestions or complaints, most praised the project, with the following statements (Table 8): "It was very good to participate in a video call, and my daughters truly enjoyed participating:" "Great project," "I wish they had this help more often," "I loved the patience and explanation. Grade 1000," "I'm just grateful for this opportunity," "I want to say hello to the dentist; she was very attentive, even by a video my son was able to understand and perform the correct way of brushing," among others. For the suggestions, "I wish it would happen more often."

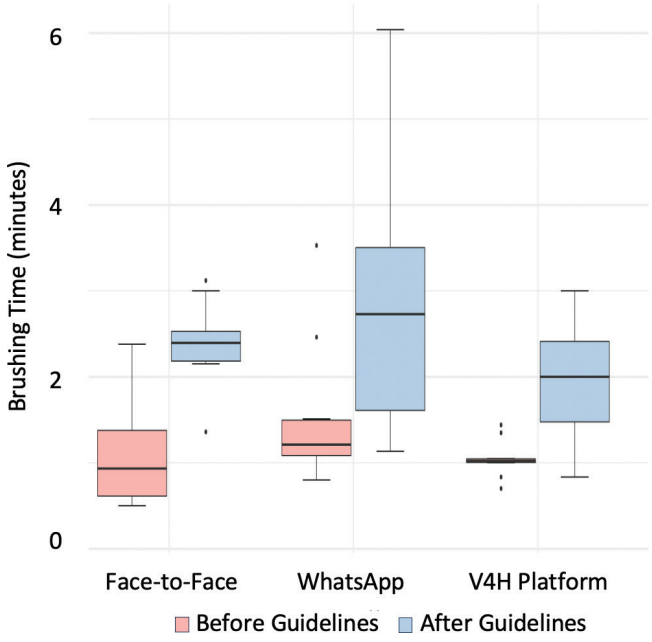

Fig. 4. Box plot of brushing time (minutes) as a function of group and time.

Discussion

The findings of this study reinforce the effectiveness of teledentistry as a tool for promoting children's oral health, supporting previous research indicating that dental telehealth can enhance adherence, monitoring, and oral health education.[21] Although this study was conducted during the COVID-19 pandemic, the results extend beyond this context and support the role of teledentistry as a complementary strategy to expand access to oral health education and preventive care during routine, non-pandemic periods. In this sense, teledentistry should not be viewed solely as an emergency solution, but rather as an integrated component of contemporary dental care delivery models.

Previous reports from public health services and clinical settings have similarly demonstrated the potential of teledentistry to maintain continuity of care, support professional–patient communication, and expand access to preventive oral health services, including pediatric populations.[22,23,24,25]

Improvements in oral hygiene habits and the Visible Plaque Index suggest that structured, repeated, and reinforced instructions contribute significantly to behavioral change, aligning with evidence that frequent and consistent educational interventions increase knowledge retention and practical implementation by caregivers.[26] These benefits are particularly relevant in pediatric populations, in which caregiver engagement and continuity of guidance are critical for sustained oral hygiene practices.

Table 3. Frequency (1%) of variables related to oral hygiene assessed as a function of group and time. Percentages in relation to the number of children in each group (n = 10).

Variable	Group	Time			
		Before orientation		After orientation	
		No	Yes	No	Yes
Responsible/child Interaction	Face-to-face	0 (0%)	10 (100%)	0 (0,0%)	10 (100%)
	WhatsApp	0 (0%)	10 (100%)	0 (0,0%)	10 (100%)
	VH4 Platform	0 (0%)	10 (100%)	0 (0,0%)	10 (100%)
	p-value	-		-	
Brushing acceptance	Face-to-face	1 (10%)	9 (90%)	0 (0,0%)	10 (100%)
	WhatsApp	0 (0%)	10 (100%)	0 (0,0%)	10 (100%)
	VH4 Platform	0 (0%)	10 (100%)	0 (0,0%)	10 (100%)
	p-value	p = 1.0		-	
Flossed	Face-to-face	10 (100%)	0 (0,0%)	2 (20%)	8 (80%)
	WhatsApp	10 (100%)	0 (0,0%)	4 (40%)	6 (60%)
	VH4 Platform	10 (100%)	0 (0,0%)	7 (70%)	3 (30%)
	p-value	-		p = 0.1	
Spat out the toothpaste	Face-to-face	0 (0%)	10 (100%)	0 (0%)	10 (100%)
	WhatsApp	0 (0%)	10 (100%)	0 (0%)	10 (100%)
	VH4 Platform	0 (0%)	10 (100%)	0 (0%)	10 (100%)
	p-value	-		-	
Adequate amount of toothpaste	Face-to-face	8 (80%)	2 (20%)	0 (0%)	10 (100%)
	WhatsApp	4 (40%)	6 (60%)	1 (10%)	9 (90%)
	VH4 Platform	6 (60%)	4 (40%)	2 (20%)	8 (80%)
	p-value	p = 0.2		p = 0.8	
Switching between areas	Face-to-face	2 (20%)	8 (80%)	4 (40%)	6 (60%)
	WhatsApp	0 (0%)	10 (100%)	2 (20%)	8 (80%)
	VH4 Platform	0 (0%)	10 (100%)	5 (50%)	5 (50%)
	p-value	p = 0.3		p = 0.5	
Suitable place	Face-to-face	0 (0%)	10 (100%)	0 (0%)	10 (100%)
	WhatsApp	0 (%)	10 (100%)	0 (0%)	10 (100%)
	VH4 Platform	0 (0%)	10 (100%)	0 (0%)	10 (100%)
	p-value	-		-	
Brushed all areas	Face-to-face	7 (70%)	3 (30%)	4 (40,0%)	6 (60%)
	WhatsApp	8 (80%)	2 (20%)	5 (50,0%)	5 (50%)
	VH4 Platform	9 (90%)	1 (10%)	4 (40,0%)	6 (60%)
	p-value	p = 0.8		p = 1	

Table 4. Improvements in categorical oral hygiene variables after guidance, according to intervention group (n = 10 per group).

Variable	Face-to-face *n* (%)	WhatsApp *n* (%)	Video for Health *n* (%)
Responsible/child interaction	10 (100%)	10 (100%)	10 (100%)
Toothbrushing acceptance	1 (10%)	0 (0%)	0 (0%)
Flossing	8 (80%)	6 (60%)	3 (30%)
Spat out toothpaste	0 (0%)	0 (0%)	0 (0%)
Adequate amount of toothpaste	8 (80%)	3 (30%)	5 (50%)
Switching between areas	4 (40%)	3 (30%)	5 (50%)
Suitable place	0 (0%)	0 (0%)	0 (0%)
Brushed all areas	4 (40%)	3 (30%)	5 (50%)

Values on the table represent the number and percentage of children who showed improvement after guidance. Percentages were calculated based on the number of children in each group (n = 10).

Table 5. Number and percentage of oral hygiene items that improved after guidance among the 10 items evaluated, depending on the group.

Group	Number of items with improvement		Percentage of items with improvement	
	Mean (SD)	Median (min-max)	Mean (SD)	Median (min-max)
Face-to-face	4.0 (1.2)	4 (2-6)	40 (11.6)	40 (20-60)
WhatsApp	2.9 (1.5)	3 (1-6)	29 (15.2)	30 (10-60)
VH4 Platform	3.5 (1.2)	4 (2-5)	35 (11.8)	40. (20-50)

P = 0.1. [1]Dental plaque index, brushing time, responsible/child interaction, brushing acceptance, flossing, spitting toothpaste, adequate amount of toothpaste, switching between areas, suitable place, brushing all areas.

Comparisons between different digital platforms revealed important nuances in engagement. WhatsApp, being widely accessible and integrated into daily routines, facilitated

Table 6. Descriptive analysis of the responses of those responsible for the children who participated in the project, before guidance on oral hygiene (n = 30).

Variable	Category	n (%)
Importance of toothbrushing	No	0 (0)
	Yes	30 (100)
Daily toothbrushing frequency	Once a day	7 (23)
	≥ 2 times a day	23 (77)
Child uses dental floss	No	17 (57)
	Yes	13 (43)
Helping the child with toothbrushing	Does not help	3 (10)
	Finds it difficult	8 (27)
	Finds it easy	19 (63)
Perceived toothbrushing time	Very short	5 (17)
	Short	8 (27)
	Sufficient	17 (57)
Uses toothpaste	No	0 (0)
	Yes	30 (100)
Person who applies the toothpaste	Child	22 (73)
	Caregiver	8 (27)
Child's last dental visit	Never	1 (3)
	More than one year ago	9 (30)
	During the current year	20 (67)
Access to dental care	Never sought care	3 (10)
	No	5 (17)
	Yes	22 (73)
Toothbrush used exclusively by the child	No	1 (3.3)
	Yes	29 (97)

Table 7. Descriptive analysis of the responses from those responsible for the children who participated in the project, after guidance on oral hygiene (n = 27).

Variable	Category	Frequency (%)
Guardian feels capable to help the child with oral health	No	0 (0%)
	Yes	27 (100%)
Child's toothbrushing frequency in the last week	None	1 (4%)
	2 to 5 times	19 (70)
	More than 5 times	7 (26%)
Guardian is happy with the child's oral health	Don't know	3 (11%)
	No	4 (15%)
	Yes	20 (74%)
Tootbrushing is important	No	0 (0%)
	Yes	27 (100%)
Dental floss application is important	No	2 (7%)
	Yes	25 (93%)
Clear understanding of toothbrushing guidance	No	0 (0%)
	Yes	27 (100%)
Internet access issues	No	20 (74%)
	Yes	7 (26%)
The child liked being part of the project	No	0 (0%)
	Yes	27 (100%)
Guardian's opinion about to participating in the project	Very difficult	1 (4%)
	Yes	26 (96.3%)

Table 8. Descriptive analysis of each child's guardian who participated in the project, after oral health guidance (n = 27).

Variable	Category	n (%)
Importance of toothbrushing	No	0 (0.0)
	Yes	30 (100)
Daily toothbrushing frequency	Once a day	7 (23)
	≥ 2 Times daily	23 (77)

easier access and immediate interaction, whereas V4H (Video for Health), although providing specific monitoring functionalities, required greater effort to access and use. This difference might have influenced caregiver adherence and perception, highlighting that platform choice should consider usability, accessibility, and user context.[21] User engagement is recognized as a critical determinant of success in digital health interventions, and educational technologies that incorporate behavior-change strategies and interactive communication resources tend to improve participation and adherence.[27,28] Such findings suggest that, in real-world settings, simpler and more familiar communication tools may enhance adherence, while more structured health-specific platforms may offer advantages in data security and clinical monitoring, albeit with potential barriers related to usability.

These findings are consistent with previous evidence suggesting that remote educational strategies can contribute positively to oral health promotion and preventive care when adapted to the needs and preferences of patients and caregivers.[29,30]

The results also emphasize the importance of educational content design. Personalized materials, video demonstrations, and step-by-step instructions enhanced understanding and engagement, corroborating prior findings that multimodal strategies maximize learning in oral health.[13] The possibility of reinforcement between in-person and virtual sessions contributed to habit consolidation and improved caregivers' perception of the importance of toothbrushing and flossing, reinforcing the value of hybrid care models. In addition, caregiver health literacy has been associated with children's oral health outcomes and may influence the adoption and maintenance of preventive oral hygiene behaviors over time.[31]

Regarding access to dental care, although 73% of caregivers reported easy access to dental services, approximately one quarter of participants experienced some level of difficulty. While specific barriers were not directly assessed in this study, previous literature suggests that such difficulties may be related to factors such as transportation challenges, appointment availability, time constraints of caregivers, and indirect costs associated with dental visits.[32] Even in contexts where access is generally perceived as adequate, teledentistry may function as a supportive tool to mitigate these barriers, facilitating continuity of care, follow-up, and preventive guidance without replacing necessary face-to-face treatment.[33,34]

Limitations

Despite positive outcomes, the small sample size (n = 30) and limited socioeconomic diversity restrict generalizability. Furthermore, the study did not assess long-term effects,

preventing conclusions about habit maintenance. Future research should include larger, more diverse populations and longer follow-up periods, also evaluating the impact of instruction frequency and user interaction with different digital platforms on clinical and behavioral outcomes.

Conclusion

In summary, the results suggest that children's oral health education delivered via teledentistry—whether through virtual platforms or mobile applications—significantly improves knowledge and hygiene habits comparably to in-person care, while offering additional advantages in accessibility, flexibility, and continuity of guidance that remain relevant beyond pandemic circumstances.

Teledentistry, via virtual platforms or mobile applications, is effective in improving children's oral hygiene knowledge and habits, with outcomes comparable to in-person care. More accessible platforms, such as WhatsApp, enhance caregiver engagement. Structured educational reinforcement promoted consistent behavioral changes, reflected in increased flossing, brushing acceptance, and Visible Plaque Index improvements. Future studies should assess long-term effects and include more diverse populations.

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Conflicts of Interests

The authors declare no conflicts of interest related to this study.

Data Availability Statement (DAS), Data Sharing, Reproducibility, and Data Repositories

The data that supporting findings of this study are available from the corresponding author upon reasonable request.

Application of AI-Generated Text or Related Technology

The authors declare that no artificial intelligence (AI)-generated text or related technologies were used in the preparation of this manuscript.

Contributions

M.G.G., A.D.R., F.C.A.C., M.C.S.M., R.Z.N.V., and I.S.C. conceived the study. M.G.G., F.S.L., A.P.D.M., and I.S.C. collected the data. M.G.G. and A.D.R. analyzed the data. M.G.G. and A.D.R. led the writing of the manuscript. All authors reviewed and approved the final version of the manuscript.

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