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Original Article

The Impact of Oral Health Education via Telegram and Traditional Methods on Parental Knowledge, Attitudes, and Practices, and the Oral Health Status of 6-12-year-olds in Tehran, Iran: A Three-Month Follow-Up Trial in 2023

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Abstract

Background: Virtual interventions have demonstrated positive outcomes by promoting equitable access to care. We compared the impact of oral health education through Telegram social media versus traditional methods on parents' knowledge, attitudes, and practices, as well as the oral health status of children.

Methods: This randomized controlled trial involved parents and their 6- to 12-year-old children referring to the School of Dentistry from January to March 2023. Participants were randomly assigned to social media education or received a printed booklet (traditional education). Parents completed a questionnaire, and children underwent clinical examinations before and after the three-month follow-up. Statistical analysis was performed using independent samples t-test and repeated measures ANOVA.

Results: Among 51 participants, 28 (54.90%) were males. In both groups, Plaque Index (before 1.466 ± 0.632, after 0.538 ± 0.514, $P<0.001$ in the virtual education group and before 1.056 ± 0.575, after 0.663 ± 0.470, $P<0.001$ in the traditional education group) and the Gingival Index (before 0.486 ± 0.513, after 0.146 ± 0.414, $P<0.001$ in the virtual education group and before 0.244 ± 0.324, after 0.139 ± 0.256, $P=0.004$ in the traditional education group) decreased significantly following the intervention.

A comparison of knowledge scores (before 7.769 ± 2.672, after 9.423 ± 3.689, $P=0.012$ in the virtual education group, and before 8.640 ± 2.498, after 11.400 ± 3.027, $P=0.024$ in the traditional education group) revealed significant improvements. Attitude scores (before 21.230 ± 4.563, after 22.500 ± 5.232, $P=0.027$ in the virtual education group and before 20.240 ± 4.892, after 22.920 ± 3.904, $P=0.009$ in the traditional education group) revealed significant improvements. Changes in the outcomes were not associated with the children's age or gender.

Conclusion: Compared to the virtual education method, knowledge scores were higher in the traditional education group after the intervention. Given that both interventions improved children's oral health status and enhanced parents' perspectives about pediatric oral health, both methods are recommended to be used based on the context and available resources.

Keywords: Social media, Health knowledge, Attitude, Child

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Introduction

Oral health encompasses the conditions of the mouth, teeth, and orofacial tissues that allow people to carry out fundamental activities such as eating, breathing, and speaking. In addition, oral health contributes to psychosocial aspects such as self-esteem, well-being, and the capacity to interact socially and work without pain, discomfort, or embarrassment.[1] In 2016, the FDI World Dental Federation expanded the concept of oral health by describing it as a multifaceted and dynamic state that includes the ability to taste, chew, swallow, smile, communicate effectively, and express emotions.[2] Oral health is also widely recognized as a key element of general health.[3,4] Growing evidence has demonstrated significant associations between oral diseases and a variety of systemic conditions, such as cardiovascular diseases, diabetes mellitus, gastrointestinal disorders, stroke, metabolic syndrome, obesity, and adverse pregnancy outcomes.[5,6] Despite its substantial influence on

general health and quality of life, oral health care remains insufficiently prioritized in many healthcare systems.[7,8]

In children, oral health problems remain a major public health concern. In many industrialized Western countries, the prevalence of dental caries among children has significantly decreased. However, this has led to a polarization of caries distribution, with 75% of caries found in just 27% of children.[9] This polarization is strongly associated with socioeconomic deprivation.

Given increasing pressure on healthcare resources, it is crucial to assess whether certain aspects of oral health promotion—such as oral health education—can add value by improving oral health outcomes and reducing disparities. Reviews published over the past decade have concluded that oral health education can lead to short-term improvements in knowledge, better oral hygiene behaviors, and improved oral health status.[10]

Various virtual interventions in oral health have demonstrated positive outcomes across different populations, particularly by promoting equitable access to care in underserved, rural, and remote areas.[7,11-14] Therefore, mHealth appears to be an effective strategy for encouraging behavioral changes in the management of chronic diseases, including oral diseases such as dental caries, which are closely linked to social and economic inequalities. A systematic review reported that mobile health strategies can serve as a complementary tool in improving oral hygiene, especially in managing gingivitis and enhancing oral health knowledge.[15]

One of the most widely used mobile-based technologies is social media, which is currently used by over 2.82 billion individuals worldwide.[16] Social media platforms serve as online spaces where users come together to share information, knowledge, and opinions.[17] Because parents and caregivers play a key role in shaping children's oral health behaviors, parent-centered digital education can be a practical approach to improving children's oral health outcomes.

Recent studies have shown that virtual approaches can play an effective role in oral health education. Zolfaghari reported short-term improvements after simple and gamified smartphone applications by mothers of preschool children.[18] However, because both study arms were app-based, the study did not provide a direct comparison with routine conventional education. Sarwer-Foner also found benefits in oral-hygiene outcomes, but their trial compared conventional education with a combined conventional-plus-virtual approach in students aged 10–17 years, which limits inference on parent-centered education and on the independent effect of a standalone virtual method.[19] Therefore, direct parent-focused comparisons of a virtual platform versus a conventional educational method remain limited.

Although virtual education has shown promising results, direct comparisons between a virtual platform and conventional education are still limited. In contexts where Telegram is widely accessible, this comparison has clear practical value for real-world program planning.

Therefore, the present study aimed to compare the impacts of oral health education delivered via Telegram versus traditional methods on improving parental knowledge, attitude, and practice (KAP), as well as children's oral health status.

Methods

Trial design

This single-blind, parallel, and randomized controlled study was conducted with an allocation ratio of 1: 1 from January to March 2023. The participants were 60 parents and their 6- to 12-year-old children referring to the Pediatric Department of the International Campus of Tehran University of Medical Sciences.

Study Population, inclusion and exclusion criteria

All participants were enrolled in the study according to the inclusion and exclusion criteria. Inclusion criteria: Iranian parent–child pairs were eligible if the child was 6–12 years old, the parent provided written informed consent and was able to complete the KAP questionnaire, had access to Telegram to receive educational content, and if both baseline and post-intervention assessments (questionnaire and clinical oral examination) could be performed.

Exclusion criterion: Participants were excluded if they did not complete both baseline and post-intervention assessments (questionnaire and clinical oral examination) within the predefined follow-up window, or if their records were incomplete. Children with severe health conditions such as heart disease, cancer, or disabilities affecting oral hygiene were excluded.

Randomization and blinding

One of the authors (SZM) enrolled participants and randomly assigned them to the virtual group and the traditional group using block randomization to ensure similar group size. Matching was not carried out as proper randomization may balance both known and unknown confounding factors. The allocation process was based on the inclusion and exclusion criteria. The statistical analyst was blinded to the group assignments.

Sample Size Calculation and Sampling Method

Based on the findings of Shirmohammadi et al.,[20] the sample size was calculated using the two-sample t-test in PASS version 11 software, considering a significance level of $\alpha = 0.05$, a power of $1-\beta = 0.80$, and a standard deviation of 4.7 for the knowledge score. To detect a clinically meaningful difference of 4 points between groups, at least 23 participants were needed in each group. Considering a 20% potential dropout rate, the initial sample size was increased to 29 participants per group. The required sample size for attitude and practice outcomes was smaller than this value. Therefore, the final sample size was determined based on the knowledge outcome. Therefore, 30 participants were ultimately considered for each group ($n = 30$ per group) at the start of the trial.

Data Collection

Data were collected using a validated questionnaire previously employed in similar studies.[21] The questionnaire consisted of four sections: 1) Parental knowledge about children's oral health (15 items); 2) Parental attitude (8 items); 3) Parental self-reported practices concerning children's oral health (12 items); 4) Demographic information including children's age, gender, and parents' educational level. A separate section was included to document the child's oral health status using the Plaque Index (PI) and Gingival Index (GI). Initially, before the intervention, parents completed the questionnaire, and the children underwent a dental examination. The oral health status was recorded. Three months after the start of the intervention, a second round of data collection was conducted using the same questionnaire and a follow-up dental examination. The content validity and internal consistency of this questionnaire had been confirmed in previous studies, and the same validated instrument was used at baseline and follow-up in the present study.

Research tools

Scoring of the KAP questionnaire was as follows: In the knowledge section, each correct response was scored as 1 and incorrect/"I don't know" responses as 0 (total score: 0–15). Attitude items were scored on a 5-point Likert scale from 0 (strongly disagree) to 4 (strongly agree) (total score: 0–32). Practice items were scored according to the predefined response options, with a total practice score ranging from 0 to 20. Higher scores indicated better knowledge, more favorable attitude, and better oral health practices.

Procedure

At baseline, parents responded to a validated questionnaire (Supplementary file). Following the interview, the children underwent a clinical oral examination. Dental plaque was measured based on the Plaque Index (Silness-Löe),[22] using a disposable dental explorer and mirror. Each of four surfaces (buccal, lingual, mesial, and distal) of designated teeth was scored from 0 to 3:

- 0 = No plaque
- 1 = Thin plaque layer only detectable by probe or disclosing agent
- 2 = Moderate plaque visible to the naked eye
- 3 = Abundant plaque and debris along gingival margin

The scores were averaged across the four surfaces, and then across all teeth to obtain a child's mean plaque index.

Gingival Index: Scored from 0 to 3 based on the inflammation severity [23]:

- 0 = No inflammation
- 1 = Mild inflammation
- 2 = Moderate inflammation
- 3 = Severe inflammation

Mean scores were calculated per child.

Intervention

In the virtual group, parents received educational content via the Telegram messaging platform based on the best available evidence and instructional design principles.[24] Topics included oral health and hygiene for children, fluoride toothpaste use, healthy diet, regular dental visits, and videos demonstrating proper brushing techniques and appropriate toothpaste amounts by age. In addition, to promote healthy behaviors, weekly reminder messages were sent at 9:00 PM throughout the 6-week intervention to prompt parents to brush their child's teeth. A support phone number was also shared for any questions or assistance. In the control group, parents received a printed booklet with the same educational content and were also given oral explanations on topics like brushing techniques, fluoride toothpaste, healthy diet, and regular dental checkups. After 6 weeks, parents were invited to the dental clinic for a follow-up examination and were offered a package of a free toothbrush and toothpaste, or free fluoride therapy. During this visit, the questionnaire was re-administered, and children were re-examined.

Data Analysis

Data analysis was performed using Statistical package for the social sciences (SPSS) software. For quantitative variables, means and standard deviations were reported. For qualitative variables, frequencies and percentages were used. Details of scoring are provided in the Research Tools section.

An independent samples t-test was used to compare differences between intervention and control groups at each time point, a paired-samples t-test was used to compare pre- and post-intervention scores within each group, and repeated measures ANOVA was used to assess the effect of variables such as child age, child gender, and parents' education on changes in outcomes. The significance level was set at $P < 0.05$. All efficacy analyses were conducted using a per-protocol approach, including only participants who completed both baseline and follow-up assessments.

Results

Initially, 30 participants were enrolled in each group. However, four participants in the virtual education group and five in the traditional education group did not return for follow-up examination and were excluded from the study. Ultimately, 51 participants completed the study, with 26 in the virtual education group and 25 in the traditional education group (Figure 1). Among the children, 28 (54.90%) were males. The mean age was 9.38 ± 2.14 years in the virtual group (range 6–12) and 8.20 ± 1.78 years in the traditional education group (range 6–12) (Table 1).

According to Table 2, PI and GI decreased significantly after the educational intervention in both the virtual and traditional groups ($P < 0.05$). This decrease was greater in the virtual group than in the traditional group.

Table 3 presents within-group comparisons of knowledge, attitude, and practice scores before and after the intervention, showing significant improvements in all three domains in both groups. However, the increase in practice scores in the virtual education group did not

Table 1. Participant enrollment, retention, and baseline characteristics in virtual and traditional education groups

Category	Virtual education group	Traditional education group	Total
Initially enrolled	30	30	60
Lost to follow-up*	4	5	9
Completed the study	26	25	51
Males	14 (53.8%)	14 (56%)	28(54.9%)
Mean age (±SD)	9.38±2.14	8.20±1.78	8.79±1.96
Age range (year)	6-12	6-12	6-12

*Loss to follow-up was because of school examination time, according to the parents' reports.

Table 2. Comparison of mean values of the gingival index (GI) and plaque index (PI) before and after the educational intervention in children visiting the Pediatric Dentistry Department of International Campus, separated by the virtual and traditional education groups (N=51)

Groups	Index	Mean ± SD	*P*-value
Virtual education	Plaque index-Before	1.466±0.632	<0.001
	Plaque index-After	0.538±0.514	
	Gingival index-Before	0.486±0.513	<0.001
	Gingival index-After	0.146±0.414	
Traditional education	Plaque index-Before	1.056±0.575	<0.001
	Plaque index-After	0.663±0.470	
	Gingival index-Before	0.244±0.324	0.004
	Gingival index-After	0.139±0.256	

Statistical analysis by paired t-test.

reach statistical significance ($P=0.093$), whereas all other increases were statistically significant ($P<0.05$).

There was no statistically significant difference between the PI and GI of the groups in baseline and later in follow-up. Regarding KAP measures, Table 4 compares knowledge, practice, and attitude scores between the two groups before the intervention as well as after the intervention. According to Table 4, while no significant differences were found between the groups in any of the KAP measures before the intervention, only the knowledge score showed a statistically significant difference between the two groups after the intervention ($P=0.042$).

Analysis of potential effect modifiers by Repeated Measures ANOVA —including the child's age, gender— showed that none of these variables had a statistically significant influence on the observed changes in outcome measures.

Discussion

In the present study, we compared virtual parental education with conventional education over a 3-month follow-up. Overall, both approaches improved children's oral health indicators (PI and GI) compared with baseline. Parental knowledge and attitude also increased from baseline. Taken together, these findings suggest that both methods are useful, with Telegram offering an advantage mainly for improving parental knowledge. Parental practice showed clear improvement in the conventional education group, while there was less change in practice in the virtual education group. Overall, both educational approaches were beneficial over time.

Social media is currently one of the most effective tools for disseminating health-related information, and its impact on public health has been widely studied. In a systematic review published from 2006 to 2020, Chen and Wang showed that social media is used for multiple health purposes by health institutions, professionals, and the public, and they also pointed to a key gap: the impact of social media interventions still needs stronger evaluation.[25] Our study addresses that gap in a focused way by testing a virtual parent education model and assessing its effects on both behavioral and clinical outcomes over a 25-month

Table 3. Comparative analysis of knowledge, practice, and attitude scores in parents visiting the Pediatric Dentistry Department of the International Campus of Dental School, across two time points—before and after the educational intervention—separated by the virtual and traditional education groups (n=51)

Group	Index	Mean±SD	*P*-value
Virtual Education	Knowledge - Before	7.769±2.672	0.012
	Knowledge - After	9.423±3.689	
	Practice - Before	9.346±3.440	0.093
	Practice - After	10.615±4.578	
	Attitude - Before	21.230±4.563	0.027
	Attitude - After	22.500±5.232	
Traditional Education	Knowledge - Before	8.640±2.498	0.024
	Knowledge - After	11.400±3.027	
	Practice - Before	10.160±2.794	<0.001
	Practice - After	11.320±3.287	
	Attitude - Before	20.240±4.892	0.009
	Attitude - After	22.920±3.904	

Statistical analysis by paired t-test.

Table 4. Comparison of Knowledge, Practice, and Attitude Scores of Parents Visiting the Pediatric Dentistry Department of International Campus, Before and After the Educational Intervention, by Group (Virtual vs. traditional Education; n=51)

Time	Measure	Group	N	Mean±SD	*P*-value
Before Intervention	Knowledge	Virtual Education	26	7.769±2.672	0.236
		Traditional Education	25	8.640±2.498	
	Practice	Virtual Education	26	9.346±3.440	0.359
		Traditional Education	25	10.160±2.794	
	Attitude	Virtual Education	26	21.230±4.563	0.458
		Traditional Education	25	20.240±4.892	
After Intervention	Knowledge	Virtual Education	26	9.423±3.689	0.042
		Traditional Education	25	11.400±3.027	
	Practice	Virtual Education	26	10.615±4.578	0.532
		Traditional Education	25	11.320±3.287	
	Attitude	Virtual Education	26	22.500±5.232	0.750
		Traditional Education	25	22.920±3.904	

Statistical analysis by t-test.

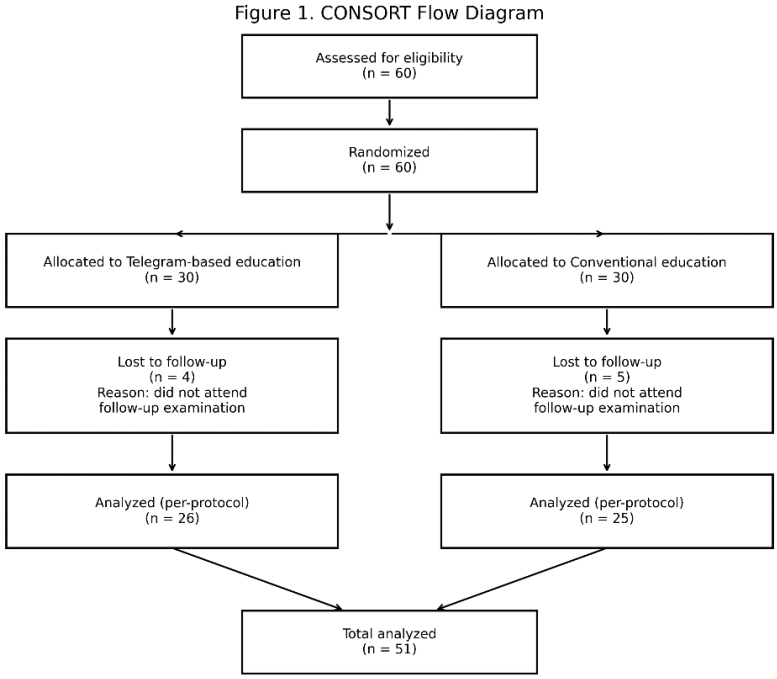

Figure 1. CONSORT flow diagram of participant enrollment, allocation, follow-up, and analysis

follow-up period.

Parents, guardians, and caregivers play a key role in shaping oral health behaviors in children.[26] Today, the use of social media to disseminate and access information about oral health among children and their parents is on the rise. Maintaining good oral health depends on daily habits such as brushing, flossing, and mouth rinsing, often carried out with parental assistance.[14] In line with this parent-centered pathway, our findings showed improvements in children's oral health indices and parental KAP at follow-up after the educational interventions.

It is unlikely that the risk of childhood dental caries can be reduced unless oral-hygiene routines are established in daily life. Because these routines are largely shaped at home, children's oral health is closely linked to parents' knowledge and attitudes, as reported in previous studies.[27] With broader access to social media, parent-focused education can help correct misconceptions and reinforce healthy daily practices. In the same direction, our findings showed that plaque index and gingival inflammation improved after the intervention in both the virtual and traditional education groups. Overall, these results support the use of both delivery methods for improving children's oral health over time.

Comprehensive reviews have indicated that internet-based interventions used for oral health promotion have been effective in managing dental discomfort, improving oral hygiene, increasing orthodontic treatment adherence, and raising awareness about dental caries and its consequences on children's overall health.[28] A study in India showed a statistically significant improvement in children's oral health knowledge following the use of video-based educational tools.[29] Another study by Palin-Palokas et al. demonstrated a relationship between social media use and the prevalence of dental caries among children aged 12 to 15 years.[30] They found that caries experience was often influenced by behaviors such as brushing, dietary habits, sugary drink and medication syrup consumption, dental visits, fluoride exposure, and the parent-child relationship. Children in disadvantaged areas were more likely to develop caries, with this association becoming more pronounced after adjusting for social media and internet use.

In a study by Scribante in 2021, the impact of verbal oral hygiene instructions versus Instagram posts was assessed among young orthodontic patients. The study found no significant differences in plaque and gingival scores between the two groups.[31] However, a systematic review and meta-analysis in 2019 indicated that traditional oral hygiene instructions were more effective than virtual interventions in improving oral health outcomes. These findings underscore the need for high-quality research to assess disparities and compare the performance of different social media platforms in enhancing children's oral health.[14] A study conducted in Jakarta reported that 93.7% of individuals used the internet to search for oral health information, highlighting the growing importance of social media as a source of health information in vulnerable age groups.

Therefore, there is a need to shift from traditional education methods toward a modern model of oral healthcare education consisted of virtual and traditional methods, which is community-based and patient-centered, while also emphasizing prevention. New interventions should empower entire communities—including mothers, teachers, and families—to adopt and adapt to social media platforms for improving children's oral health.

Study Limitations

- Some parents were reluctant to return for the follow-up examination. However, this was mitigated by offering

incentives such as an oral hygiene kit (toothbrush and toothpaste) and free fluoride varnish application.
- Due to internet filtering and connection speed issues, access to specific mobile apps may have been limited. This factor should be further investigated in future studies.
- Another limitation of this study was the relatively short follow-up period (3 months). In addition, the educational intervention was delivered over a short duration, which may have limited the long-term sustainability of behavioral changes.
- The sample size was relatively small (60 at baseline, 51 in final analysis), and participants were recruited from a single center.
- Data collection relied on a self-reported parental questionnaire and examiner-dependent clinical indices, which may introduce response bias and measurement variability.

Conclusion

The present study showed that the knowledge and attitude index increased after the intervention in both groups, with knowledge scores being better in the traditional group.

However, the study demonstrated that both the dental plaque index and the gingival inflammation index, as outcomes, improved in both the virtual and traditional education groups after the intervention, with no difference between the two groups. This suggests that education, delivered through any platform, can have profound positive effects on improving children's oral health.

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Authors' Contribution

Conceptualization: Mahdia Gholami, Maedeh Bonabi, and Simin Z. Mohebbi.
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Competing Interests

Authors declare no competing interests.

Data Availability Statement

The dataset used and/or analyzed during the present study is available from the corresponding author upon reasonable request.

Ethical Approval

The study was approved by the Ethics Committee of Tehran University of Medical Sciences (Ethical code: IR.TUMS.DENTISTRY.REC.1402.053). All personal data were handled confidentially and anonymously.
Participation was voluntary, and all parents provided written informed consent. Data confidentiality was ensured; only the research team had access to the data. All questionnaires were anonymized, and participants were identified using the last three digits of their phone numbers. All participants were fully informed and joined the study by choice.

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Supplementary Files

Oral Health Knowledge, Attitude, and Practice Questionnaire.

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