

Research article

Visual Health Literacy Strategies in Pediatric Dentistry: A Cross-Sectional Evaluation of Preventive Oral Health Communication During a Community Outreach Initiative

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Email: wafatalha@yahoo.com**Abstract**

Oral health literacy plays an important role in promoting preventive oral health behaviors and effective communication in pediatric dentistry. Visual communication strategies have the potential to improve the accessibility, comprehension, and engagement of oral health information; however, evidence regarding their perceived effectiveness in community-based pediatric oral health promotion remains limited. This cross-sectional questionnaire-based study evaluated student presenters' perceptions of visual health literacy strategies implemented during a Pediatric Dentistry Poster Forum conducted as a community outreach initiative at the University of Tripoli, Libya. Fourth-year undergraduate dental students developed and presented visual educational materials addressing common pediatric oral health conditions and preventive topics. Upon completion of the event, 178 student presenters completed a structured electronic questionnaire assessing perceptions of visual health literacy, communication effectiveness, misconception resolution, audience engagement, information retention, and practical application. Data were analyzed using descriptive statistics, Cronbach's alpha coefficient, and Pearson's chi-square tests. The mean participant age was 24.3 ± 1.1 years, and 78.7% were female. Participants reported highly favorable perceptions of the visual communication materials, with 69.1% indicating that the posters provided accurate and up-to-date information, 71.9% agreeing that the information was presented clearly and concisely, and 66.9% reporting that the materials were easy to understand. Overall, 67.4% perceived the posters as effective in addressing common misconceptions related to pediatric oral health, while 97.2% agreed that interactive elements, including games and quizzes, enhanced audience engagement. Positive perceptions were also observed for information retention and practical application, with 65.7% reporting improved recall of information and 62.4% indicating that the knowledge gained could be applied to real-life situations. Nearly all participants (99.4%) recommended the future use of similar visual communication strategies in pediatric dentistry settings. No statistically significant associations were found between poster topic category and perceived communication outcomes ($p > 0.05$). The questionnaire demonstrated good internal consistency (Cronbach's $\alpha = 0.822$). From the perspective of student presenters, visual health literacy strategies were perceived as effective adjuncts for communicating preventive oral health information during community-based pediatric dentistry outreach activities. Although these findings reflect presenter perceptions rather than direct outcomes among children and caregivers, they support further investigation of visual communication strategies as tools for strengthening oral health literacy and preventive oral health promotion in pediatric dentistry.

Keywords. Pediatric Dentistry, Oral Health Literacy, Visual Communication, Health Promotion.

Introduction

Oral health literacy is widely acknowledged as a key factor influencing oral health outcomes and the appropriate use of dental services. It encompasses an individual's capacity to access, comprehend, evaluate, and apply oral health information when making informed decisions related to oral healthcare. Within pediatric dentistry, oral health literacy assumes particular importance because children depend largely on parents and caregivers to interpret oral health information, adopt preventive practices, and make decisions about seeking dental care. Previous studies have shown that inadequate oral health literacy is associated with lower oral health knowledge, reduced use of preventive dental services, delayed utilization of dental care, and poorer oral health outcomes in children [1,2]. Accordingly, improving the clarity and accessibility of oral health information has become a central objective of preventive pediatric dental care.

Effective communication is essential to the delivery of high-quality pediatric dental care. Nevertheless, explaining oral health information to children and their caregivers can be challenging because many preventive and therapeutic concepts involve complex terminology and must be communicated in ways that accommodate different levels of health literacy and comprehension. In addition, communication within pediatric dentistry commonly involves a three-way interaction between the dentist, the child, and the caregiver, which may further complicate the effective exchange of information [3,4]. Stowers et al. [4] reported that misunderstandings related to oral health literacy are frequently encountered in pediatric dental practice, underscoring the need for communication strategies that improve understanding and minimize the potential for misinterpretation. Given the pivotal role of caregivers in supporting children's oral health, identifying communication approaches that facilitate the delivery and understanding of preventive oral health information remains an important priority in pediatric dentistry.

Visual communication strategies have received increasing attention as effective approaches for enhancing health literacy and supporting patient education. Educational resources such as posters, infographics, illustrations, and other graphic-

based materials can facilitate comprehension by presenting information in formats that are easier to interpret and retain than text alone. Evidence from health literacy research indicates that visual educational interventions can improve understanding of health information while reducing communication barriers among individuals with diverse literacy skills [5]. In pediatric dentistry, these strategies may be especially beneficial because they simplify complex oral health concepts, promote caregiver understanding, and encourage children's engagement. Furthermore, incorporating interactive elements, such as games, quizzes, and guided discussions, into visual educational materials may further increase participation and reinforce key preventive oral health messages.

Beyond enhancing communication, visual educational strategies may also help address common misconceptions related to pediatric oral health. Misunderstandings about fluoride use, early childhood caries, dietary habits, traumatic dental injuries, and the importance of primary teeth continue to influence caregivers' preventive practices and decisions regarding when to seek dental care [6,7]. Consequently, communication approaches that improve understanding and correct inaccurate beliefs may play an important role in strengthening oral health promotion and encouraging preventive dental behaviors. Despite the growing emphasis on oral health literacy and patient-centered communication, evidence regarding the perceived effectiveness of visual health literacy strategies implemented within community-based pediatric oral health promotion initiatives remains limited.

Although visual educational materials are widely incorporated into oral health promotion initiatives, evidence supporting their perceived effectiveness as visual health literacy tools in pediatric dentistry remains limited. Moreover, few studies have evaluated the use of visual communication strategies across a broad range of pediatric oral health topics within community-based outreach programs. Therefore, the present study aimed to evaluate the perceived effectiveness of visual health literacy strategies implemented during a community-based pediatric oral health promotion initiative. Specifically, it examined student presenters' perceptions of the accessibility, clarity, communication effectiveness, engagement potential, misconception resolution, information retention, and practical value of the visual educational materials used throughout the outreach activity. The findings are expected to contribute to a better understanding of how visual communication strategies may support oral health literacy and strengthen preventive oral health promotion in pediatric dentistry.

Materials and Methods

Study Design

A cross-sectional questionnaire-based study was undertaken to assess the perceived effectiveness of visual health literacy strategies implemented as part of a community-based pediatric oral health promotion initiative. The study focused on student presenters' evaluations of the visual educational materials, specifically their perceived accessibility, clarity, communication effectiveness, audience engagement, and overall usefulness in delivering preventive oral health messages within a pediatric dentistry context.

Study Setting

The study was conducted during a Pediatric Dentistry Poster Forum organized by the Department of Pediatric Dentistry, Faculty of Oral and Dental Surgery, University of Tripoli, Libya, in September 2024. The forum was designed as a community outreach initiative to promote oral health awareness among children and their caregivers through the use of visually supported educational strategies. During the event, educational posters covering common pediatric oral health conditions and preventive practices were presented and explained through guided face-to-face interactions. To further enhance participant engagement and reinforce key preventive messages, the outreach activity also incorporated interactive educational components, including games, quizzes, and discussion-based sessions.

Community Outreach Participants

The community outreach activity involved 110 children from diverse age groups and community backgrounds, some of whom attended with their parents or legal guardians. Participants were recruited through collaboration with local educational and community organizations, including Al-Marfa Primary School (n = 10), Scout groups (n = 60), and the Jeel Youth Foundation (n = 40). These attendees represented the intended beneficiaries of the oral health promotion initiative and provided the real-world setting in which the visual communication strategies were implemented and evaluated by the student presenters.

Poster Development and Communication Strategy

The educational posters were developed by fourth-year undergraduate dental students under the supervision of faculty members from the Department of Pediatric Dentistry. Poster topics were selected to address common pediatric oral health conditions and key preventive concepts that require effective communication with children and caregivers in both routine clinical practice and community outreach settings. The topics included early childhood caries (ECC), oral hygiene practices, fluoride use and caries prevention, traumatic dental injuries, molar-incisor hypomineralization (MIH), preservation of the first permanent molar, dietary influences on oral health, and interceptive orthodontics with emphasis on crossbite management. Poster content was prepared in English using evidence-based scientific information, whereas presentations during the outreach event were delivered verbally in Arabic using age-appropriate language tailored to

children and caregivers. This bilingual communication approach was intended to enhance the accessibility of oral health information and facilitate effective knowledge translation across a diverse audience.

Study Population

The study population comprised 178 fourth-year undergraduate dental students who participated in the preparation, presentation, and delivery of oral health education during the Pediatric Dentistry Poster Forum. Following completion of the outreach activity, all student presenters were invited to complete a structured electronic questionnaire evaluating the perceived effectiveness of the visual communication materials. Student presenters were selected because they were actively involved in designing the posters, delivering oral health messages, and interacting directly with children and caregivers throughout the event, enabling them to provide informed assessments of the materials' clarity, communication effectiveness, audience engagement, and practical value. The study did not assess the perceptions, knowledge, or behavioral outcomes of the children or caregivers who attended the outreach activity.

Questionnaire Development and Outcome Measures

A structured, self-administered electronic questionnaire was developed specifically for this study to assess student presenters' perceptions of the visual communication materials used during the Pediatric Dentistry Poster Forum. The questionnaire included demographic items and evaluation questions organized into five domains: (1) visual health literacy and accessibility, (2) oral health communication effectiveness, (3) preventive oral health communication and misconception resolution, (4) audience engagement and interactive communication, and (5) information retention and practical application. In addition, participants evaluated the overall usefulness of the visual communication materials and their potential for future implementation in pediatric dentistry settings. The draft questionnaire was reviewed by faculty members in the Department of Pediatric Dentistry to enhance the clarity, relevance, and comprehensibility of the questionnaire items before administration. A pilot evaluation was subsequently conducted with five undergraduate dental students to assess the questionnaire's clarity, feasibility, and usability. Because only minor editorial refinements were required, the pilot participants were retained and included in the final study sample. Feedback obtained during pilot testing was incorporated into the final questionnaire before data collection. Responses were recorded using four-point Likert-scale categories, with response wording adapted to the content of individual items.

Ethical Considerations

Participation in the study was voluntary, and all questionnaire responses were anonymized before analysis. To protect participant confidentiality and privacy, personal identifiers, including names, email addresses, and timestamps, were removed from the dataset prior to data analysis. As the study collected anonymized educational feedback from student presenters without involving identifiable clinical or patient data, formal ethical approval was not required. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participant characteristics and questionnaire responses and are presented as frequencies, percentages, means, and standard deviations, as appropriate. Associations between categorical variables were examined using Pearson's chi-square test, while Fisher's exact test was considered when the assumptions required for the chi-square test were not satisfied. All statistical tests were two-tailed, and statistical significance was established at $p < 0.05$. For descriptive reporting, positive responses were defined as the combined categories "Yes, to some extent" and "Yes, definitely." For multi-item domains, the corresponding value represents the arithmetic mean of the "Yes, definitely" percentages across the relevant questionnaire items. The overall study design and workflow are illustrated in Figure 1. For the graphical presentation in Figure 2, the percentage selecting "Yes, definitely" was reported separately.

Results

Participant Characteristics

A total of 178 student presenters completed the questionnaire and were included in the analysis. Female participants comprised the majority of the study population (78.7%, $n = 140$), whereas males accounted for 21.3% ($n = 38$). The mean age of the participants was 24.3 ± 1.1 years, with an age range of 22–29 years (Table 1).

Table 1. Demographic Characteristics of Study Participants (N = 178)

Variable	Category	n	%
Sex	Female	140	78.7
	Male	38	21.3
Age (years)	Mean $\pm$ SD	24.3 ± 1.1	
	Range	22–29	

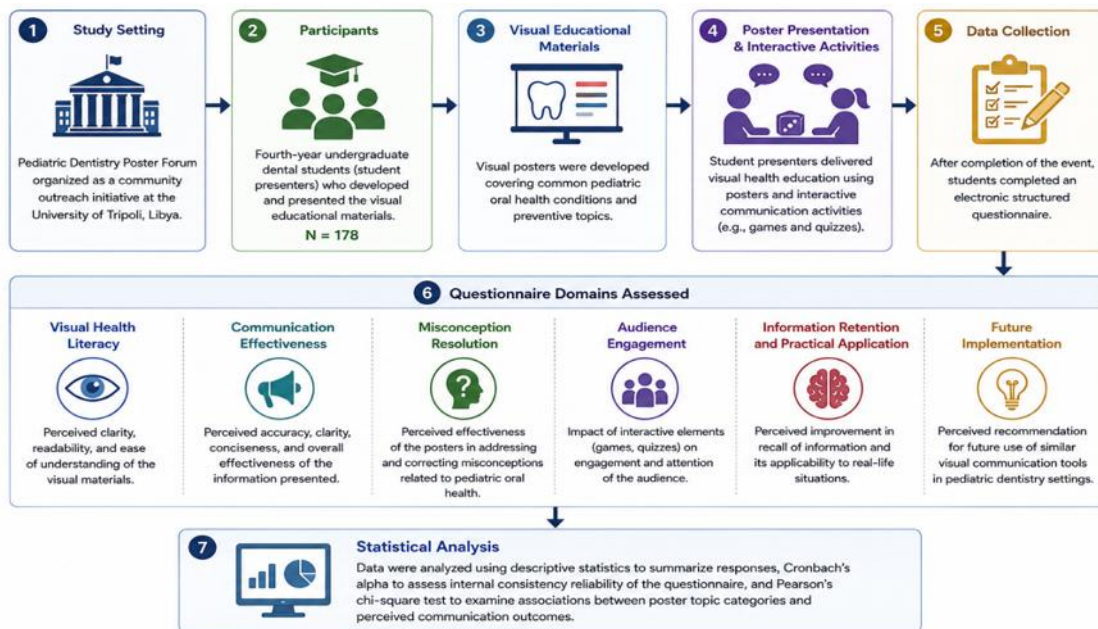


Figure 1. Study workflow for the evaluation of visual health literacy strategies during a pediatric dentistry community outreach initiative.

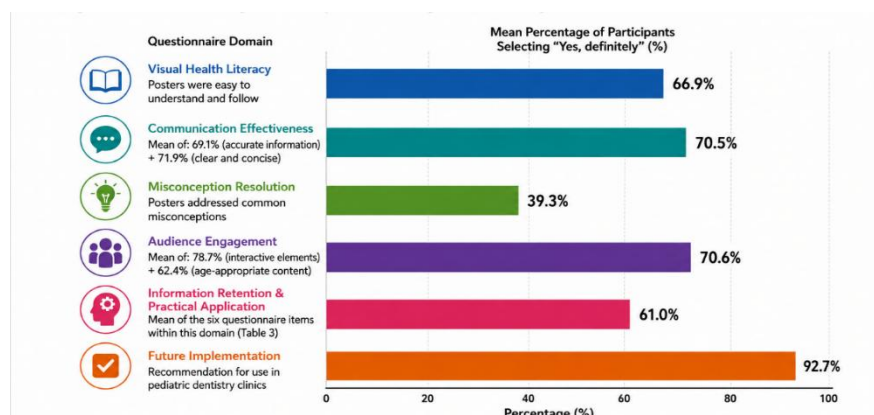


Figure 2. Percentage of participants selecting "Yes, definitely" across questionnaire domains and outcomes (N = 178). For multi-item domains, values represent the mean percentage of "Yes, definitely" responses across the corresponding questionnaire items. Communication Effectiveness was calculated as the mean of the accuracy/up-to-date information (69.1%) and clarity/conciseness (71.9%) items, yielding 70.5%. Information Retention and Practical Application represents the mean of the six items reported in Table 3 (61.0%).

Reliability of the Questionnaire

The internal consistency of the questionnaire was evaluated using Cronbach's alpha coefficient. The overall Cronbach's alpha value was 0.822, indicating good internal consistency and demonstrating that the questionnaire provided reliable measurements of participants' perceptions regarding the visual communication materials.

Visual Health Literacy and Oral Health Communication Outcomes

Student presenters reported consistently positive perceptions across all evaluated domains of visual health communication (Table 2). Within the domains of visual health literacy and communication effectiveness, most participants agreed that the posters provided accurate and up-to-date information, presented content in a clear and concise manner, and were easy to understand. For the Communication Effectiveness domain, the mean percentage of participants selecting "Yes, definitely" across the two corresponding items—accuracy and currency of information (69.1%) and clarity and conciseness of presentation (71.9%)—was 70.5%. Regarding preventive oral health communication, 67.4% of respondents agreed that the posters effectively addressed common misconceptions related to pediatric dentistry. Interactive features, including games and quizzes, were also viewed favorably, and most participants considered the posters appropriate and relevant for the intended audience. The strongest level of agreement was observed for future implementation, with 99.4% of respondents recommending the use of similar visual communication materials in pediatric dentistry clinics. Figure 2 summarizes the percentage of "Yes, definitely" responses for single-item outcomes and the mean percentage across items for multi-item domains.

Table 2. Visual Health Literacy and Oral Health Communication Outcomes (N = 178)

Evaluation Item	No, not at all n (%)	No, not really n (%)	Yes, to some extent n (%)	Yes, definitely n (%)
Posters provided accurate and up-to-date information	0 (0.0)	4 (2.2)	51 (28.7)	123 (69.1)
Information was presented in a clear and concise manner	0 (0.0)	2 (1.1)	48 (27.0)	128 (71.9)
Posters were easy to understand and follow	0 (0.0)	8 (4.5)	51 (28.7)	119 (66.9)
Posters addressed common misconceptions or concerns related to pediatric dentistry	41 (23.0)	17 (9.6)	50 (28.1)	70 (39.3)
Posters included interactive elements (e.g., games and quizzes)	1 (0.6)	4 (2.2)	33 (18.5)	140 (78.7)
Posters were age-appropriate and relevant to the target audience	1 (0.6)	9 (5.1)	57 (32.0)	111 (62.4)
Recommendation for use in pediatric dentistry clinics	0 (0.0)	1 (0.6)	12 (6.7)	165 (92.7)

Information Retention and Practical Application

Student presenters also expressed favorable perceptions regarding the role of the visual communication materials in supporting information retention and the practical application of oral health concepts (Table 3). Considering the “Yes, definitely” response category, 71.3% of respondents indicated that the posters made the subject matter easier to understand, while 65.7% reported that the visual materials helped them remember the information more effectively. Additionally, 62.9% indicated that the posters improved their overall understanding of the topics presented. The practical value of the materials was further reflected by 62.4% of participants, who indicated that the information could be applied to real-life situations. Furthermore, 47.8% reported that the posters encouraged them to ask additional questions, and 55.6% indicated that the visual materials stimulated greater interest in the topics presented.

Table 3. Information Retention and Practical Application of Visual Communication Materials (N = 178)

Evaluation Item	No, not at all n (%)	No, not really n (%)	Yes, to some extent n (%)	Yes, definitely n (%)
Posters made the subject matter easier to understand	1 (0.6)	2 (1.1)	48 (27.1)	127 (71.3)
Posters helped remember information better	0 (0.0)	6 (3.4)	55 (30.9)	117 (65.7)
Posters encouraged participants to ask more questions	0 (0.0)	19 (10.7)	74 (41.6)	85 (47.8)
Posters improved overall understanding of the topic	0 (0.0)	5 (2.8)	61 (34.3)	112 (62.9)
Posters helped apply concepts to real-life situations	0 (0.0)	9 (5.1)	58 (32.6)	111 (62.4)
Posters stimulated further interest in the topic	1 (0.6)	11 (6.2)	67 (37.6)	99 (55.6)
Mean (%)	0.2	4.9	34.0	61.0

Note: Mean values represent the average percentage across all questionnaire items included in the Information Retention and Practical Application domain.

Association Between Poster Topic Category and Communication Outcomes

Pearson's chi-square analyses were performed to determine whether selected communication outcomes varied according to poster topic category (Table 4). No statistically significant association was identified between poster topic category and participants' perceptions of misconception resolution ($\chi^2 = 3.05$, $p = 0.384$). Likewise, perceptions of the ease of understanding the posters ($\chi^2 = 2.37$, $p = 0.668$) and recommendations for the future use of visual communication materials in pediatric dentistry clinics ($\chi^2 = 1.79$, $p = 0.774$) did not differ significantly across the various poster topics. These findings indicate that the visual communication strategies were perceived positively regardless of the pediatric oral health topic presented, suggesting consistently favorable perceptions across the range of educational themes included in the outreach initiative.

Table 4. Association Between Poster Topic Category and Selected Communication Outcomes

Outcome	Statistical test	χ^2	p-value	Interpretation
Misconception resolution	Pearson's chi-square	3.05	0.384	Not significant
Ease of understanding	Pearson's chi-square	2.37	0.668	Not significant

Recommendation for future implementation	Pearson's chi-square	1.79	0.774	Not significant
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Pearson's chi-square test was used to assess associations between categorical variables. All statistical tests were two-sided, and statistical significance was defined as $p < 0.05$.

Discussion

The present study examined student presenters' perceptions of visual health literacy strategies implemented during a community-based pediatric oral health promotion initiative. Overall, participants expressed highly positive views regarding the clarity, accessibility, communication effectiveness, engagement potential, and practical value of the visual educational materials. One of the most notable findings was the near-universal recommendation for incorporating similar visual communication tools into future pediatric dentistry practice, reflecting strong acceptance of this educational approach. These observations are particularly meaningful in light of the growing emphasis on oral health literacy as an essential component of effective communication in pediatric dental care. Previous studies have shown that pediatric dentists frequently encounter communication difficulties and oral health literacy-related misunderstandings that may hinder parents' comprehension of preventive and therapeutic oral health information [4]. In addition, parental awareness and oral health knowledge have consistently been recognized as important determinants of children's oral health outcomes and the utilization of preventive dental services [1,2,6]. Collectively, these findings suggest that visual communication strategies may serve as valuable adjuncts for strengthening oral health communication and supporting preventive oral health promotion in pediatric dentistry. It should be noted, however, that the present findings represent the perceptions of the student presenters who developed and delivered the educational materials rather than direct evaluations from the children and caregivers who participated in the outreach activity.

A key finding of the present study was the consistently favorable evaluation of the visual communication materials in terms of information accuracy, clarity, readability, and ease of understanding. Participants perceived the posters as effective tools for conveying preventive oral health information, indicating that visual presentation may facilitate the communication of complex concepts encountered in pediatric dentistry. This observation is particularly relevant because communication in pediatric dental care often involves a triadic interaction among the dentist, the child, and the caregiver, making the delivery of clear and comprehensible health information more challenging [3]. Moreover, misunderstandings associated with limited oral health literacy remain common in pediatric dental practice, highlighting the need for communication strategies that enhance message accessibility and reduce the likelihood of misinterpretation [4]. These findings are consistent with the systematic review and meta-analysis by Galmarini et al. [5] which demonstrated that visual-based educational interventions improve comprehension of health-related information more effectively than conventional educational approaches. By simplifying complex information and reducing cognitive demands, visual communication may facilitate information processing and improve understanding among individuals with varying levels of health literacy. Collectively, these findings support the integration of visual educational materials as practical adjuncts to conventional verbal counseling and reinforce their potential contribution to improving oral health literacy among children and their caregivers.

Another important finding of the present study was the positive perception that the visual educational materials helped address common misconceptions and concerns related to pediatric oral health. Misunderstandings regarding the importance of primary teeth, fluoride use, dietary practices, traumatic dental injuries, and the value of preventive dental visits continue to represent barriers to appropriate oral health behaviors and timely utilization of dental services. Doğan et al. [6] identified persistent deficiencies in parental awareness of preventive pediatric dentistry, particularly with respect to fluoride applications, fissure sealants, and the recommended timing of the first dental visit. Similarly, Detsomboonrat et al. [7] reported that many caregivers underestimate the importance of primary teeth and often delay seeking dental care until symptoms become evident. These findings are further supported by broader evidence demonstrating that limited parental oral health literacy is associated with poorer oral health knowledge, less favorable preventive beliefs, and greater barriers to accessing dental care [1]. Likewise, Alzahrani et al. [2] highlighted the close relationship between parental oral health literacy, children's oral health outcomes, and the adoption of preventive oral health behaviors. Viewed together, this evidence suggests that visual communication strategies may help overcome important oral health literacy gaps by correcting misconceptions and promoting informed decision-making among caregivers. Given the central role of parents and caregivers in maintaining children's oral health, educational approaches that enhance understanding and encourage evidence-based preventive practices may contribute meaningfully to improving pediatric oral health.

The findings also suggest that integrating interactive educational components with visual communication materials may enhance audience engagement during pediatric oral health promotion activities. Student presenters perceived that games, quizzes, and discussion-based activities increased audience participation and stimulated greater interest in the educational content. Active engagement is particularly important because meaningful learning and sustained behavior change are less likely to result from passive information delivery alone. Yuan et al. [8] emphasized that effective oral health promotion depends on the active involvement of both children and caregivers and highlighted the value of communication approaches that encourage participation and dialogue. Similarly, Chen et al. [9], in a systematic review of gamification in children's oral health management, reported that gamified interventions incorporating mobile applications, augmented reality, reward systems, progress tracking, and interactive feedback have the potential to enhance children's oral health knowledge, engagement, oral hygiene behaviors, and adherence to recommended oral hygiene practices. In addition,

Peerbhay et al. [10] concluded that successful oral health promotion programs for children and adolescents should integrate practical toothbrushing activities, gamification, audiovisual educational resources, and repeated reinforcement to optimize learning and encourage positive behavioral outcomes. Taken together, these findings support the favorable engagement outcomes observed in the present study and suggest that combining visual educational materials with interactive communication strategies may strengthen participation, maintain audience interest, and reinforce key preventive oral health messages in pediatric dentistry.

The present findings further indicate that visual communication strategies may support information retention and facilitate the practical application of preventive oral health concepts. Student presenters perceived that the posters improved understanding of the educational content, reinforced recall of key messages, and encouraged the application of oral health knowledge in everyday situations. These observations are consistent with the systematic review and meta-analysis by Galmarini et al. [5], which demonstrated that visual-based educational interventions enhance comprehension and understanding of health-related information more effectively than conventional educational methods. Likewise, Algarni et al. [11] reported that video-based patient education resulted in superior long-term information recall and better denture hygiene maintenance than verbal or audio instruction, illustrating the broader educational benefits of multimedia communication strategies. Although that study involved adult dental patients rather than pediatric populations, its findings provide indirect support for the value of multimedia educational approaches in reinforcing learning and promoting adherence to recommended oral health practices. Similarly, Nabirye et al. [12] found that graduate students regarded videos and well-illustrated learning materials as valuable complements to traditional teaching methods and emphasized their role in improving learner interest, understanding, and knowledge retention. Although conducted in a health professions education setting rather than pediatric dentistry, these findings reinforce the broader educational value of visual learning resources. Collectively, the available evidence suggests that visual communication strategies may extend beyond improving immediate comprehension by strengthening knowledge retention and facilitating the practical application of preventive oral health information. This interpretation is consistent with the favorable perceptions reported by the student presenters in the present study.

The findings of the present study have several practical implications for pediatric dentistry. Communication challenges related to limited oral health literacy, parental misconceptions, and differences in caregiver knowledge are frequently encountered in everyday clinical practice [4]. Incorporating visual communication materials into routine patient education may complement conventional verbal counseling by presenting preventive oral health information in a clear, accessible, and memorable format. Such resources may be particularly useful when discussing topics including early childhood caries, fluoride use, traumatic dental injuries, oral hygiene practices, dietary counseling, and other common pediatric oral health concerns. More broadly, these findings are consistent with recommendations advocating the integration of oral health promotion into wider child health systems and community-based preventive services [13]. Similarly, El-Yousfi et al. [14] highlighted the important contribution of community-based health professionals in providing early oral health guidance, reinforcing preventive messages, and facilitating timely referral to dental services. The very high level of support for future implementation observed among participants suggests that visual health literacy strategies may be readily incorporated into pediatric dentistry clinics, school-based oral health programs, and community outreach initiatives. Furthermore, the absence of significant differences across poster topic categories indicates that the perceived effectiveness of the visual communication approach was consistent across a broad range of pediatric oral health topics, supporting its potential versatility and scalability in both clinical and community settings.

Several strengths of the present study should be highlighted. First, the visual communication strategies were evaluated within a real-world community outreach initiative rather than a simulated educational environment, enhancing the practical relevance and ecological validity of the findings. In addition, the intervention addressed a broad range of clinically relevant pediatric oral health topics while combining visual educational materials with interactive communication techniques, thereby providing a comprehensive approach to preventive oral health promotion. The bilingual communication strategy further improved the accessibility of oral health information and facilitated effective knowledge translation among participants with diverse linguistic backgrounds. Furthermore, the questionnaire demonstrated good internal consistency (Cronbach's $\alpha = 0.822$), supporting the reliability of the collected data.

Nevertheless, several limitations should be considered when interpreting these findings. The study was conducted at a single academic institution using a convenience sample of undergraduate dental students, which may limit the generalizability of the results to other educational environments and healthcare settings. In addition, the cross-sectional design precludes the assessment of temporal relationships, long-term knowledge retention, and sustained changes in oral health behaviors. Because the findings were based on self-reported perceptions, they are also susceptible to response bias, including the potential influence of social desirability and professional engagement, as participants evaluated educational materials that they had personally developed and presented. Moreover, the study assessed the perceptions of student presenters rather than those of the children and caregivers who represented the intended target audience. Consequently, the findings primarily reflect presenters' evaluations of communication effectiveness rather than direct recipient experiences. Although the questionnaire demonstrated good internal consistency, its psychometric evaluation was limited to expert review, pilot testing, and internal consistency assessment. Future studies should therefore include comprehensive construct validation and factor analysis to further establish the instrument's measurement properties. Additional research should also incorporate parent- and child-centered outcome measures, objective assessments of

knowledge acquisition, and longitudinal follow-up to determine whether favorable perceptions of visual communication strategies translate into sustained improvements in oral health literacy, preventive behaviors, and clinical oral health outcomes.

Conclusion

Visual health literacy strategies were perceived by student presenters as valuable communication tools for delivering preventive oral health information during a community-based pediatric dentistry outreach initiative. Although the findings reflect presenters' perceptions rather than direct outcomes among children and caregivers, they suggest that visual educational materials may enhance the communication of preventive oral health messages and support oral health promotion activities. These findings provide a rationale for further investigation of visual communication strategies in pediatric dentistry. Future research should evaluate their effectiveness in improving caregiver understanding, child engagement, knowledge acquisition, preventive oral health behaviors, and long-term oral health literacy outcomes.

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