ScientificScholar®
Knowledge is power
Publisher of Scientific Journals

www.ajohas.com

Asian Journal of Oral Health and Allied Sciences

Short Communication

Streamlining pediatric dental care through digitization: A short communication

Darshan Das[1], Meenakshi Upadhyay[1], Anshika Dixit[1], Diksha Shukla[1]

[1]Department of Pediatric Dentistry, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India.

***Corresponding author:**
Darshan Das,
Department of Pediatric Dentistry, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India.

darshandas10@gmail.com

Received: 09 June 2025
Accepted: 10 August 2025
Published: 11 September 2025

DOI
10.25259/AJOHAS_16_2025

Quick Response Code:

ABSTRACT

Digitization is revolutionizing pediatric dentistry by enhancing the quality and efficiency of dental care for children. The integration of advanced technologies such as intraoral scanning, 3D printing, and computer-aided design/computer-aided manufacturing systems has significantly improved diagnostic precision, treatment planning, and overall patient experience. These tools offer greater comfort for young patients, reduce chair time, and facilitate clearer communication through visual aids, benefiting both dentists and families. In addition, digital tools support better education and engagement, encouraging positive attitudes toward dental visits. This short communication highlights the transformative impact of digitization in pediatric dentistry.

Keywords: 3D-printing, Computer-aided design/computer-aided manufacturing, Digital impression, Intraoral scanner, Pediatric dentistry

INTRODUCTION

Digital technology has significantly transformed pediatric dentistry, enhancing clinical efficiency, patient comfort, and treatment outcomes. Traditional methods often posed challenges such as multiple appointments, patient discomfort, and longer chair-side time, which in turn affect the child's attitude toward dental care. With the advent of digital tools, modern pediatric dental care now offers more accurate diagnoses, faster treatment procedures, and interactive educational tools. This short communication provides an overview of the role of digitization in pediatric dentistry and explores its potential future implications.[1]

VARIOUS APPLICATIONS OF DIGITIZATION IN PEDIATRIC DENTISTRY

Digital dentistry has revolutionized pediatric dental care in ways that are both extensive and significant; among the key advancements are:

Diagnostic enhancements

Digital radiography allows for immediate image acquisition, reducing patient discomfort and radiation exposure. Alongside its ability to detect cavities and assess dental growth, it surpasses traditional radiographs in evaluating the overall condition of the teeth.[2]

Patient anxiety

Virtual reality and augmented reality, in the form of audio–visual aids, help distract patients during treatment procedures. Furthermore, various gamification and interactive apps help in educating children about oral health in a fun way.[2]

Restorative dentistry

Computer-aided design and computer-aided manufacturing (CAD/CAM) technology made enormous improvements to overcome the disadvantages of preformed zirconia crowns. They enhanced their accuracy, mechanical strength, reduced procedural time, and increased restoration longevity, making them a viable and durable alternative in suitable cases.[3]

Digital intraoral camera and digital impressions

Intraoral cameras provide high-resolution images that enhance the visualization of oral conditions and engage young patients by showing them what the dentist sees. They have further improved patient comfort by simplifying the impression-making process, especially for children, reducing delays and common errors associated with traditional methods.[1,3]

Space maintainers

In recent years, 3D printing technology has been used to create Band and Loop space maintainers in pediatric patients. Removable space maintainers can also be produced in pediatric cases using CAD-CAM technology with polyetheretherketone (PEEK) material after capturing digital impressions through the intraoral scanning (IOS).[1,3]

CAD-COMPUTER-AIDED TECHNOFACTURING (CAT) DIGITAL AUTOMATIC METAL-FREE FIXED APPLIANCE

ZeroExpander® is a preprogrammed, fixed, metal-free automatic maxillary expansion device developed through a fully digital CAD-CAT workflow. It is fabricated using advanced biocompatible technopolymers, specifically PEEK and Polyamide 12 (PA12), and is intended for the correction of maxillary constriction in pediatric patients during the deciduous and mixed dentition phases. In a clinical study, a ZeroExpander® constructed from PEEK was utilized for a patient in the deciduous dentition stage, while a PA12-based device was employed in a case involving mixed dentition. Both cases demonstrated successful outcomes in achieving palatal expansion, underscoring the efficacy of this innovative, fully digitalized approach.[4]

Myofunctional appliance

Fabricating myofunctional appliances via CAD/CAM is often challenging due to the need for periodic activation. However, Rolf Fränkel's FR3 appliance requires minimal activation apart from its protrusion ring. FR3 is designed to influence maxillary and mandibular growth, potentially reducing the need for orthognathic surgery. A study by Roser *et al*. found that CAD/CAM-fabricated FR3 appliances exhibited superior mechanical properties compared to their conventionally made counterparts.[5]

Prosthesis for cleft lip and cleft palate patients

Conventional impression-making for feeding appliances in infants with cleft lip and palate (CLCP) poses risks of aspiration and airway obstruction. Digital IOS offers a safer and faster alternative to traditional alginate impressions in infants with CLCP, reducing the risk of aspiration and airway obstruction.[1]

Dental and maxillofacial trauma

In pediatric patients with maxillofacial trauma and malocclusion, treatment planning must consider ongoing growth and tooth development. A study reported the successful use of CAD/CAM and 3D printing to guide bite plane positioning in the surgical management of mandibular fractures. Custom-made splints made using digitally scanned information from a cone-beam computed tomography scan can be possible in the future, and hence will enable the fabrication of customized splints.[1]

Dental educational purposes

Several studies have highlighted the educational benefits of 3D dental models. Models based on patient radiographs enhance the understanding of lesion depth and tooth morphology, making digital technologies such as scanning, CAD/CAM, and 3D printing valuable tools in dental education.[2]

FUTURE PERSPECTIVES

Digital dentistry holds great potential in pediatric care, offering personalized, minimally invasive treatments through technologies such as IOS, CAD/CAM, 3D printing, and AI diagnostics. It will also see a further reduction in the turnaround time needed to provide various aspects of dental care. Future advancements, including AR-based learning, teledentistry, and advanced 3D printing, will enhance prevention and patient engagement.[1]

Limitations and challenges

However, while early outcomes are promising, further research is needed to establish standardized protocols, long-term effectiveness, and broader clinical applications in diverse pediatric populations.[1,2]

CONCLUSION

The continuous advancement in digital technologies is proving to be highly beneficial and offering improved accuracy, comfort, and efficiency. Providing cost-effective, accessible, and user-friendly digital solutions is crucial for broad implementation and enhanced pediatric oral health outcomes.[1,2]

Ethical approval: Institutional Review Board approval is not required.
Declaration of patient consent: Patient's consent not required as there are no patients in this study.
Financial support and sponsorship: Nil.
Conflicts of interest: There are no conflicts of interest.
Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Khan MK. Modern digital pediatric dentistry with the advent of intraoral sensors, computer-aided design/computer-aided manufacturing, and three-dimensional printing technologies: A comprehensive review. J Dent Res Rev 2022;9:195-201.
2. Bellapukonda PK, Koyyalamudi AS, Madhuri CH, Yenni M, Apoorva G, Mohan AP. Digitalization of pediatric dentistry: A review. Acad J Med 2024;7:6-10.
3. Gaurav G, Gupta RK, Priyanka G, Neelja G. Digital impressions and immediate chairside zirconia crowns in paediatric dentistry: A case report. Inter Ped Dent Open Acc J 2021;5:443-6.
4. Beretta M, Gianolio A, Mangano A, Paglia M, Colombo S, Cirulli N. ZeroExpander: Metal-free automatic palatal expansion for special-needs patients. Eur J Paediatr Dent 2021;22:151-4.
5. Roser C, Hodecker LD, Koebel C, Lux CJ, Ruckes D, Rues S, *et al*. Mechanical properties of CAD/CAM-fabricated in comparison to conventionally fabricated functional regulator 3 appliances. Sci Rep 2021;11:14719.

How to cite this article: Das D, Upadhyay M, Dixit A, Shukla D. Streamlining pediatric dental care through digitization: A short communication. Asian J Oral Health Allied Sci. 2025;15:17. doi: 10.25259/AJOHAS_16_2025