

Effectiveness of Structured Visual Pedagogy in Improving Knowledge of Nursing Graduates Regarding Oral Healthcare of Children with Special Healthcare Needs: A Quasi-experimental Study

NEIL MAHENDRA GODBOLE¹, ADITI MATHUR², SUNNYPRIYATHAM TIRUPATHI³, KRISHNAPRIYA SUHAS NENE⁴, SNEHA MADHU NAIR⁵, PRACHI PATIL⁶



ABSTRACT

Introduction: Nurses are the primary contact for caregivers of Children with Special Healthcare Needs (CSHCN). Parent counselling and health screening programs are undertaken in which nurses play an important role. Along with this, it is also essential to have knowledge of oral health and the importance of maintaining oral hygiene, especially for CSHCN.

Aim: To evaluate the knowledge of nursing graduates regarding oral healthcare for CSHCN at baseline, one week and one month after a Structured Visual Pedagogy (SVP) intervention, and to compare their knowledge scores before and after the intervention.

Materials and Methods: This pretest-posttest quasi-experimental study was conducted at Dr. D. Y. Patil College of Nursing, Pune, Maharashtra, India, between February 2023 and June 2023, among 60 nursing graduates. An SVP was curated and delivered to the study population. It was an audio-video discussion-based intervention covering the various domains of oral healthcare for CSHCN, including their oral manifestations, barriers to oral hygiene maintenance, and their management through counselling and timely referrals. Participants completed a pre-validated questionnaire at

three intervals: before the intervention, one week after and one month after the intervention, and their knowledge was analysed. The data were analysed using International Business Machines (IBM) Statistical Package for Social Science (SPSS) software version 21.0, USA.

Results: The mean age of study group was 21 ± 0.85 years. Among the participants, 52 (86.6%) were females and 8 (13.4%) were males. Between the baseline and the first week of the SVP, as well as, between the baseline and the first month, nursing graduates' understanding of the oral health requirements of CSHCN increased. The mean knowledge score at the pre-intervention stage was 6.83 ± 2.35 ; at one week post-intervention, the mean knowledge score was 14.40 ± 1.50 ; and one month post-intervention, the mean knowledge score was 13.65 ± 1.40 . It was observed that there was a statistically significant increase in the mean knowledge score one week, as well as, one month post-intervention compared to the baseline (p -value < 0.05).

Conclusion: The SVP was highly effective among the nursing graduates, clearly highlighted its use as a training tool for nurses.

Keywords: Autism spectrum disorder, Good health, Special needs, Visual learning, Well-being

INTRODUCTION

The CSHCN have been defined by the American Academy of Paediatric Dentistry (AAPD) as any handicap or limiting condition that may be physical, developmental, mental, sensory, behavioural, cognitive, emotional, or otherwise that requires medical supervision, healthcare intervention, or the use of specialised services or programs [1]. These children often face challenges in maintaining proper oral hygiene due to physical limitations, sensory issues, and other developmental barriers. Consequently, they are more susceptible to oral health problems such as tooth decay, periodontal disease, decreased salivation, and dry mouth, which are often exacerbated by the medications they consume, frequently in syrup form with low pH [1,2].

The overall well-being and standard of living of CSHCN can be severely impacted by oral diseases [3]. Oral diseases significantly impact their overall well-being and quality of life. Frequent hospitalisations, destructive oral habits like bruxism, and reduced manual dexterity for maintaining oral hygiene further deteriorate their oral health. Additionally, numerous barriers limit their access to proper dental care, including limited parental awareness, financial constraints, and a shortage of dentists trained to handle their

specific needs. As a result, oral health in these children is often neglected, leading to unmet dental care needs, which are particularly significant among this vulnerable population [3,4]. Various barriers and limitations for these children that hamper access to proper dental services for these children, such as limited awareness among parents, accessibility issues, financial burdens, and limited availability of trained dentists to handle them [5].

Nursing graduates play a pivotal role in promoting health, delivering medical services, as well as, disseminating preventive information [6,7]. As primary healthcare providers who manage the health of CSHCN in a variety of settings, including homes, hospitals, special institutions and primary or community health centres, nursing graduates have the potential to significantly contribute to the promotion of dental health, the prevention of illness, and giving referrals [8]. Despite this, there is limited literature available regarding the knowledge of nursing graduates in oral hygiene care for CSHCN [1,2,5,7]. However, their role in training caregivers in oral health assessments and counselling them on dental care protocols for children with special healthcare needs is essential [7,8]. It is important to include oral health literacy pertaining to CSHCN among nursing graduates [9,10]. This will assist in addressing the

underlying factors that affect their general and oral health, including psychological, cultural and social factors [7,10].

The SVP is a behaviour management intervention technique commonly employed in paediatric dentistry [11]. It refers to the capacity to identify and comprehend concepts presented through observable actions or images, and it can be utilised to help the target population of healthcare workers develop and/or enhance particular talents. Visual Pedagogy (VP) has previously been used with CSHCN and has proven to be effective, particularly in children with autism [11,12]. The SVP used in the present study has been developed for nursing graduates in the form of an interactive educational tool that will aid in increasing their knowledge of oral healthcare among CSHCN and also meet the need for developing an education and motivation-based intervention for nursing graduates. Despite the critical role of nursing graduates in the care of CSHCN, there is a notable gap in the literature regarding their training in oral healthcare [1,2,5,7]. This study addresses this gap by introducing a novel SVP intervention to enhance the oral health knowledge of nursing graduates, thereby improving the oral health outcomes for CSHCN.

There is an ardent need to conduct more educational collaborations among nursing graduates and health specialists like pedodontists, paediatricians and psychiatrists to promote a multidisciplinary approach toward oral healthcare for CSHCN, which is still in its nascent stage in India [13,14]. Thus, the principal objective of the present study was to evaluate the knowledge of nursing graduates regarding the oral healthcare of CSHCN at baseline, one week, and one month after the SVP intervention as well as to compare their knowledge scores before and after the intervention.

MATERIALS AND METHODS

The present pretest-posttest quasi-experimental study was conducted among 60 nursing graduates from Dr. D. Y. Patil College of Nursing, Pune, Maharashtra, India, from February 2023 to June 2023. Study was conducted among those who had just passed their final year and had begun their internship at the same hospital. Permissions were obtained from the institutional ethical and scientific committees before initiating the study. Ethical clearance was obtained from the Institutional Ethics Review Board (IERB) of Dr. DY Patil Dental College and Hospital (IEC Approval No- DYPDCH/DPU/EC/582/135/2023). The study was also registered in the Clinical Trial Registry of India (CTRI/2024/04/064996).

Inclusion criteria: Nursing graduates who consented to participate in the study at all three intervals—before, 1 week after, and 1 month post-intervention were included in the study.

Exclusion criteria: Those who did not consent to participate were excluded from the study.

Sample size calculation: Using Open Epi Software, Version 3.01, with a 95% confidence interval and 80% power, the minimum sample size required was estimated to be 60 after applying the eligibility criteria and accounting for potential observer and instrumentation errors. Furthermore, participants were informed about the purpose of the study, and written informed consent was obtained. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparent and comprehensive reporting.

Study Procedure

An interactive form of SVP was developed, prevalidated by an expert panel of paediatric dentists, and delivered to nursing graduates in the form of a PowerPoint presentation by a postgraduate student of Paediatric Dentistry. It was customised to fulfill the need for an educational tool for nursing graduates. It consisted of topics covering various fields of special healthcare dentistry, pertaining to typical oral habits, oral manifestations of various systemic conditions, the adverse effects of taking sweetened medications, and the effects

of various medications on the oral cavity of CSHCN, among other topics. It also included the importance of parental counselling and oral hygiene maintenance for CSHCN.

The session lasted one hour and utilised images to illustrate specific oral manifestations of various systemic disorders. These included the oral healthcare needs of children with Autism Spectrum Disorder (ASD), Attention Deficit Hyperactive Disorder (ADHD), hearing and speech disabilities, visual impairment, cerebral palsy, intellectual disabilities and medically compromised children. Brief instructions were provided on how to examine their oral cavities while considering their specific clinical features. A question-and-answer session was conducted at the end of the SVP to clarify doubts among the nursing graduates. Some common questions from the nursing graduates included: “What methods can be used to avoid dental caries?”, “Why do caries occur more commonly in CSHCN?”, “How can we screen the oral cavity, and what should we look for in CSHCN?”, and “How can we counsel caregivers and motivate them to maintain oral hygiene?” A printed form of the same SVP was also given to them as a take-home message.

The questionnaire aimed to cover crucial parameters related to the knowledge and attitudes of nursing graduates concerning oral health, as well as, the obstacles that prevent them from managing the oral health problems of CSHCN. A preliminary exploratory study was conducted, utilising an open-ended questionnaire and one-on-one interviews with nursing graduates to identify relevant domains for the final questionnaire. This preliminary phase continued until domain saturation was achieved. Based on insights from this exploratory study and previous literature, a prefinal questionnaire comprising 26 questions was developed [1,2,5,9,15,16].

The questionnaire was self-developed by the investigators and reviewed and approved by the Review Board of Dr. D. Y. Patil Vidyapeeth University, which was constituted by an expert panel of paediatricians, paediatric dentists and nursing faculty. The considerations and suggestions provided by these experts were readily incorporated into the questionnaire to ensure its relevance and comprehensiveness. The questionnaire was structured in English, Hindi and Marathi languages and validated in all three languages. To validate the questionnaire, it underwent a thorough validation process involving content validation, during which the expert panel reviewed it to ensure comprehensive coverage of all relevant aspects of the topic; face validation, in which the clarity, readability, and relevance of the questions were evaluated by a small sample of nursing graduates similar to the study participants; and finally, construct validation, in which the questionnaire was assessed to ensure it accurately measured the intended concepts.

The prefinal questionnaire was pretested for face reliability and validity, resulting in a Cronbach's Alpha value of 0.84. Six questions with lower reliability scores and those deemed repetitive, were removed, yielding a final questionnaire of 20 closed-ended questions. The validated questionnaire was subsequently administered to nursing graduates who met the inclusion criteria, with incomplete questionnaires excluded from the analysis.

The reliability of the questionnaire was ensured through the preliminary exploratory study and expert reviews, achieving a Cronbach's Alpha value of 0.84. Face validity was established via expert reviews and pretesting with a small sample of the target population. The final questionnaire was structured to assess nursing graduates' understanding of the oral healthcare requirements of CSHCN.

There were a total of 20 questions in the questionnaire, of which questions 1-16 were knowledge-based, with a single correct answer. Hence, every correct answer carried one mark, while each wrong answer carried 0 marks. Q. 17, which evaluated the participants' sources of knowledge about CSHCN, was assessed separately as it did not have a single correct answer. Q.18-20 were perception-based, where there was no single correct answer. The scores for

these questions were evaluated by considering the percentage of variance and frequency of agreement among the participants at all three time intervals separately.

STATISTICAL ANALYSIS

The data was obtained and entered into Microsoft Excel version 13. It was analysed using IBM SPSS software version 21.0 (USA). For the categorical data from the questionnaire, the frequencies and percentages of the responses were noted. For continuous data, the mean and standard deviation was obtained. The mean knowledge scores (Q1-16) were compared at 3-time intervals using repeated measures Analysis of Variance (ANOVA). For perception-based questions (Q18-Q20), the frequencies and percentages of the questions were obtained at three different time intervals and evaluated using the Kruskal-Wallis test. All statistical tests were performed with a confidence interval of 95%, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

The study population consisted of 60 nursing graduates, aged 20-25 years, with a mean age of 21±0.85 years. Among the participants, 52 (86.6%) were females and 8 (13.4%) were males.

The mean knowledge score at the pre-intervention stage was 6.83±2.35. At one week post-intervention, the mean knowledge score increased to 14.40±1.50, and at one month post-intervention, it was 13.65±1.40, respectively [Table/Fig-1]. There was a statistically significant increase in the mean knowledge scores at both the one-week and one-month post-intervention stages compared to the baseline (p-value <0.001).

When comparing the mean knowledge scores from baseline to one week post-intervention and from baseline to one month post-intervention, a statistically significant increase was observed (p-value <0.001). It was also noted that there was a slight decrease in mean knowledge scores from one week to one month; however, this difference was not statistically significant (p-value >0.05) [Table/Fig-2].

increased to 60 (100%). This indicates an improvement in their perception of their role in managing the oral healthcare of CSHCN [Table/Fig-4].

Additionally, there was only 24 (40%) strong agreement before the intervention when asked if more educational interventions should be conducted. This figure increased to 47 (78.3%) one week post-intervention and further to 51 (85%) one month after the intervention (p-value <0.05) [Table/Fig-5]. The final question evaluated participants' willingness to engage in more interactive discussions. Initially, 59 (98.3%) strongly agreed before the intervention, while there was 60 (100%) agreement both one week and one month post-intervention. This difference was statistically significant (p-value=0.368) [Table/Fig-6].

DISCUSSION

The outcome of the study revealed that the SVP intervention significantly improved the knowledge of nursing graduates regarding the oral healthcare of CSHCN. The mean knowledge scores increased significantly post-intervention compared to the baseline. However, the slight decrease in knowledge scores from one week to one month post-intervention was not statistically significant, indicating that the knowledge gained was retained over time.

The current study aimed to evaluate the effect of an SVP among nursing graduates to improve their knowledge of oral healthcare for CSHCN. This is the first study of its kind that has used SVP as an educational tool to evaluate knowledge of oral healthcare among CSHCN for nursing graduates. The increase in the overall mean scores after the SVP was statistically significant compared to the baseline, indicating that the SVP was extremely effective. This finding is in agreement with a study conducted by Parish CL et al., which revealed a significant influence on nurses' perceived effectiveness in addressing the oral health needs of special needs children and their ability to secure timely dental appointments [15]. These results support the need to incorporate oral health education into nursing curricula.

To remove obstacles that prevent children with special needs from receiving dental care, Demattei RR et al., conducted an interventional

Time interval	N	Score			Std. Deviation	F	p-value
		Minimum	Maximum	Mean			
Pre-intervention	60	2.00	12.00	6.8333	2.35902	319.135	<0.001*
1 week post-intervention	60	9.00	16.00	14.4000	1.50929		
1 month post-intervention	60	10.00	16.00	13.6500	1.40006		

[Table/Fig-1]: Comparison of the total knowledge score at 3 different time intervals.
Std. Deviation: Standard deviation; F: Variance value. ANOVA test is used; *The p-value <0.05 was considered statistically significant

Dependent variable: Total knowledge score						
Tukey HSD						
(I) Time interval	(J) Time interval	Mean difference (I-J)	Std. Error	p-value	95% Confidence interval	
					Lower bound	Upper bound
Pre-intervention	1 week post-intervention	-.756667	0.33004	<0.001*	-8.3467	-6.7866
	1 month post-intervention	-6.81667	0.33004	<0.001*	-7.5967	-6.0366
1 week post-intervention	1 month post-intervention	.75000	0.33004	0.062	-.0301	1.5301

[Table/Fig-2]: Multiple comparisons of mean knowledge score from baseline to one week, baseline to one month and from one week to one month.
*p-value <0.05 Post-hoc comparison

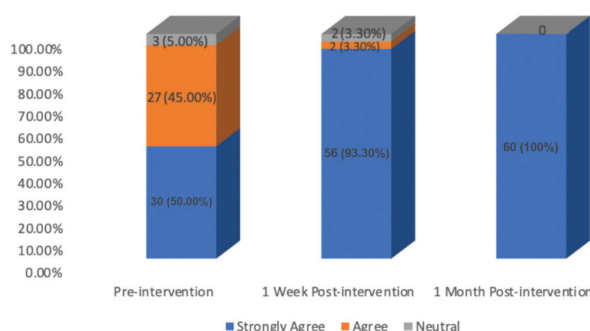
When evaluating the participants' sources of information regarding the oral healthcare of special children, 27 (45%) responded that their source was articles, followed by 19 (31.7%) participants who obtained knowledge from teachers/guides [Table/Fig-3].

When responses to the feedback-based questions (Q.18-20) were evaluated, several notable observations emerged. Regarding whether nurses can play a vital role in managing the oral healthcare needs of special children, only 30 (50%) of the participants strongly agreed at baseline. However, one week post-intervention, 56 (93.3%) showed strong agreement, and one month post-intervention, the number

Question	Source of information	Frequency (n)	Percentage (%)
Q17. What is your source of Information on Oral Healthcare needs of special children	Textbook	8	13.3
	Articles	27	45.0
	Teachers/guides	19	31.7
	Mass media	3	5.0
	No source of information	3	5.0
	Total	60	100.0

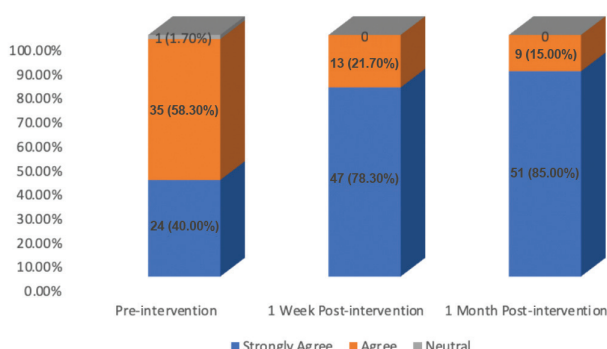
[Table/Fig-3]: Distribution of the participants according to the source of information regarding oral healthcare needs of special children.

Do you think nurses can play a vital role in managing the oral healthcare needs of special children?



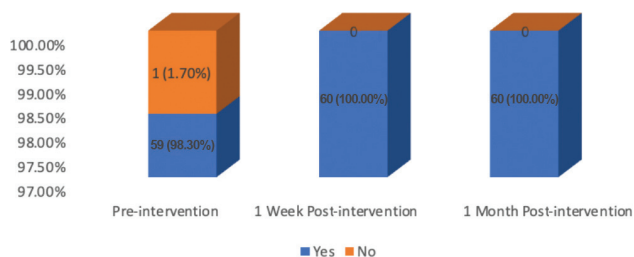
[Table/Fig-4]: Agreeability on whether nurses play a vital role in managing oral health of special children.

Do you think more educational interventions among nurses should be conducted on the knowledge of children with special health care needs?



[Table/Fig-5]: Agreeability on whether more educational interventions should be conducted among nurses for managing oral healthcare of special children.

Are you willing to learn more about the oral healthcare needs of special children through educational interventions and interactive discussions?



[Table/Fig-6]: Agreeability on willingness of participating in more such interactive discussions and collaborations.

A gap exists in providing healthcare to special needs children, as parents may hesitate to visit the dentist due to their children already undergoing medical treatment for systemic conditions [21]. To bridge this gap, nursing graduates should assume the role of counselling them on the importance of oral healthcare and undergoing regular oral assessments [21,22]. Theory-based educational interventions, especially those grounded in the Value-based (VP) approach for nurses, can increase awareness and knowledge and be effective in promoting oral health among the parents of CSHCN [23,24].

Nursing curricula that incorporate interprofessional education on oral healthcare will enhance the capacity and motivation of future nurse practitioners to provide routine nursing care that integrates evidence-based, effective oral healthcare for CSHCN [24]. For nursing graduates, this entails being able to conduct oral health screenings for CSHCN, ensuring daily oral care practices, and comprehending the variables influencing children's oral health and oral health-related quality of life [25]. Along with this, it entails provision of dental services from a dentist at the earliest in case any oral manifestations require immediate attention or treatment.

The most effective setting for oral health education and hands-on training to develop self-confidence, drive, expertise and knowledge is among future healthcare professionals, of which nurses are a huge part [25,26]. Authorities responsible for accrediting nursing education programs must develop criteria that encourage future health professionals, such as nursing graduates, to learn more about and practice oral healthcare for CSHCN.

The SVP used in the current study was developed, prevalidated and tailor-made to fit the needs of an educational intervention for nursing graduates. It was based on the concept of VP, which has previously been used for CSHCN to improve their cooperation while undergoing dental treatment in paediatric dental practice [27]. It has also been used to improve oral hygiene among children with ASD and ADHD [27,28]. Based on similar principles, this novel SVP technique used multiple visual aids with brief instructions pertaining to oral hygiene, common eating habits and typical oral manifestations frequently seen in CSHCN. It was a brief, easy-to-understand, cost-effective, convenient and easily reinforceable educational tool for nursing graduates, which proved to be extremely useful in evaluating and improving their knowledge of oral healthcare for CSHCN [29].

It has been noted through the SVP that when nursing graduates receive education on oral care, their knowledge and abilities to manage such patients increase significantly. Reinforcing the SVP among nursing graduates was extremely useful and shows tremendous future scope for interprofessional collaborations. Conducting more educational interventions on oral healthcare for CSHCN is beneficial not only to nurses but also to pedodontists, paediatricians and psychiatrists, who can work together to ultimately manage and provide optimal oral healthcare for specially abled children.

Despite the effectiveness of the SVP intervention, there was a slight decrease in knowledge retention from one week to one month post-intervention. This decrease, although not statistically significant, suggests the need for ongoing and continuous reinforcement of educational content. Theory-based educational interventions, especially those using VP, can effectively increase awareness and knowledge among nursing graduates and the parents of CSHCN. This indicates that refreshing existing knowledge and offering new knowledge to nursing graduates will probably improve the quality of oral care for these children [27,29-31]. Further studies are essential to determine the effectiveness of such VP-based interventions in different groups of primary healthcare workers.

Limitation(s)

One of the limitations was the small sample size, which can be increased for future studies to allow for better evaluation of results. Additionally, when certain new interventions are done, the retention of knowledge over a longer period of time and the need for

longitudinal survey-based study in 2012 based on a service-learning project among school nurses [16], wherein evidence-based behavioural interventions were deemed extremely useful and cost-effective. Bradshaw S et al., conducted a scoping review synthesising various interventions for caregivers of CSHCN and advocated for them to be extremely beneficial in targeting certain issues and outcomes across their child's condition trajectory [17].

Oral health literacy is now an upcoming issue that is important in promoting oral health [16,17]. Nowadays, nursing care is acknowledged as an increasingly complicated activity [15-17]. Being the sector that comes in frequently interacts with CSHCN, their caregivers and parents, nursing professionals have better access to primary healthcare workers for the oral healthcare of these children [18]. Given interprofessional support, nursing graduates can improve and maintain the oral health of CSHCN when immediate access to a paediatric dentist is not available [19]. Nursing graduates also play a vital role in child-parent counselling regarding diet, oral habits, medications, as well as, systemic disorders [18-20].

repeated reinforcement should also be considered, as these were shortcomings in the present study.

CONCLUSION(S)

The present study demonstrates that a SVP intervention significantly improved the knowledge of nursing graduates regarding oral healthcare for CSHCN after one week, as well as, one month after delivering the SVP. The key inference of the present study is that the SVP is a cost-effective, easy-to-understand, convenient and easily reinforceable educational tool that can enhance nursing graduates' ability to provide quality oral healthcare for CSHCN. Educational reinforcements and interprofessional collaborations are essential for sustaining knowledge and improving oral health outcomes for these vulnerable children. Enhancing the oral health knowledge of nursing graduates through SVP interventions can lead to significant improvements in the oral healthcare of CSHCN. Educational reinforcements and interprofessional collaborations are crucial for sustaining these improvements and ensuring comprehensive care for CSHCN.

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PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental College and Hospital, Pimpri, Pune, Maharashtra, India.
2. Associate Professor, Department of Paediatric Dentistry, Post Graduate Institute of Child Health, Noida, Uttar Pradesh, India.
3. Postgraduate Professor, Department of Paediatric and Preventive Dentistry, Saveetha Dental College and Hospital, Saveetha Institute of Medical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India; Ph.D. Scholar, Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental College and Hospital, Dr. D. Y. Patil Vidyapeeth, Pune, Maharashtra, India.
4. Associate Professor, Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental College and Hospital, Pimpri, Pune, Maharashtra, India.
5. Postgraduate Student, Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental College and Hospital, Pimpri, Pune, Maharashtra, India.
6. Postgraduate Student, Department of Paediatric and Preventive Dentistry, Dr. D. Y. Patil Dental College and Hospital, Pimpri, Pune, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Krishnapriya Suhas Nene,
Associate Professor, Department of Paediatric and Preventive Dentistry,
Dr. D. Y. Patil Dental College and Hospital, Sant Tukaram Nagar, Pimpri,
Pune-411018, Maharashtra, India.
E-mail: krishnapriya.nene@dpu.edu.in

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