10.21608/ADJC.2023.218006.1343 Advanced Dental Journal
Volume 6 (2024) | Issue 2| Pages 358-364

Original Article

Evaluation of the efficacy of sweet-tasting solution in reducing the discomfort and unpleasantness experienced while taking radiographs in children between 8-12 years old.

Sumeet Sharad Tanurkar[1], Vikram Jhamb[1], Shitalkiran D.P.[1], Nasrin Gori[1]

[1]Department of Pediatric and Preventive Dentistry,College of dental science,Bhavnagar,Gujarat.

Email: dr.vikramjhamb@gmail.com

Submitted: 17-06-2023
Accepted: 03-09-2023

Abstract

Aim: The study aimed to evaluate the efficacy of sweet tasting solution in reducing the discomfort, unpleasantness caused while taking radiographs in children between 8-12 years old.

Subjects and methods: A total of 40 children aged between 8-12 years age range who needed the radiographic diagnosis for any further dental treatment have been included in this study. The sample of 40 children was divided into two groups: Group 1- in which distraction was done with the use of a sweetening solution and Group 2- in which no distraction was used i.e., Without the use of the sweetening solution. A sweetening agent (xylitol) was used in a solution form in 30% concentration used in this research. The application of the xylitol sweetening agent was done on the radiographic sensor sleeve by dipping the radiographic sleeve in the sweetening solution. The response of children were recorded by the VAS scale (Visio analogue scale) for evaluation of unpleasantness while taking intraoral radiographs with and without use of sweetening agent. The anxiety was evaluated before and after the use of the sweetening agent by recording the pulse rate with the help of a pulse oximeter. The collected data were tabulated and statistically analysed.

Results: The intergroup comparison of VAS scale scores and Pulse Rate scores between the 2 groups were evaluated. This comparison showed statistically significant differences between the 2 groups (p-value <0.05). Thus, group 1 in which the sweetening agent was used showed statistically significant results as compared to group 2 where sweetening agent was not used. The result showed that less anxiety, discomfort and unpleasantness in group 1 where sweetening agent used as compared to group II where no sweetening agent was used.

Conclusion: The study concluded that a 30% xylitol solution is significantly efficient in minimizing the discomfort and unpleasantness while taking intraoral radiographs in 8 to 12-year-old children.

Keywords: Dental Anxiety, Taste Distraction Technique, Xylitol, Dental Radiography.

Introduction

Fear and phobia cause individuals to refrain from getting dental care. It is a reasonably common issue in dental offices. Dental anxiety can be managed using psychotherapeutic interventions or a pharmacological intervention, or a combination of both, depending on the level of anxiety, patient characteristics and clinical situations (Appukuttan, 2016). The literature describes an array of fear management techniques, and the American Academy of Pediatric Dentistry (AAPD) describes basic concepts as communication, tell-show does, voice control, nonverbal communication, positive reinforcement, distraction and parental absence or presence, and advanced behaviour guidance as protective stabilisation, sedation and general anaesthesia (AAPD, 2015). Getting children to cooperate can be a challenge, therefore for a better outcome, age-appropriate distraction techniques could be needed, distraction techniques involve audio-visual distractions, visual distractions and taste distractions (Martin V, 2013). Taste distraction reveals the mind to new stimuli, exacerbating it to become distracted and focus on the new stimuli, resulting in less pain and anxiety (Tyagi et al., 2022) Dental radiography is a useful diagnostic aid in oral examination of children. In many cases the radiographic findings add important information (Espelid, Mejàre, Weerheijm, 2003). The most common routine investigation in the dental profession is intraoral periapical radiography. It aids the dentist in diagnosing the issue and thus giving adequate dental care. Poor radiographic outcomes can influence both the diagnosis and the treatment protocol that must be followed (Monika, Astuti and mulyani, 2020). Xylitol which is a polyol pentanol that occurs widely in nature is used originally to sweeten a number of sugar-free products and is most frequently used in chewing gum (Burt 2006). The caries inhibitory effect of xylitol is related to the inability of cariogenic bacteria to ferment it, therefore plaque bacteria do not proliferate, enamel demineralization is prevented and remineralization is enhanced. Recent caries researches showed that xylitol, has a well-documented inhibitory effect against dental caries (Isokangas et al., 1989). Some studies suggest that xylitol reduces the ability of MS to adhere, making it more easily removed from plaque (Soderling et al., 1987). In addition to its antibacterial effect, chewing gum containing xylitol has also a salivary stimulating effect that leads to an increased salivary buffering capacity and clearance of fermentable carbohydrates (Bar 1988).

In this present study xylitol was used as a sweetening agent on the radiographic sleeve for evaluation of efficacy in reducing the discomfort and unpleasantness while taking radiographs in children between 8-12 years age group. As there were no studies done previously in medical literature.

Subjects and Methods

This was a randomized controlled study which was reported according to CONSORT guidelines (Fig. 1). Our study was registered with the registration number in the Clinical Trials Registry-India (CTRI), CTRI/2022/08/044857.The study was carried out for 6 months duration. Children who require RVG (radiographs) as a diagnostic aid for future treatment, Children with no previous dental treatment experience and those who have proper consent were included in the study. Children with any medical and physical compromised disabilities, Children who do not require X-ray as a diagnostic aid and Children with no proper consent and who were not willing to take part in study were excluded. A convenience sample size of 40 children aged 8 to 12 years was used for this in vivo, an experimental study. The 40 samples were split into groups—the group I and group II—each containing 20 samples. The present study included children who presented to the Department of Pediatric and Preventive Dentistry, for dental treatment and required a radiographic diagnosis. The institutional ethical committee (CODS/IEC/159/2022) granted ethical approval and study conducted with

written parental consent and informed consent obtained for each participant. Group I Was taken as an intervention group in which distraction was done with the use of a sweetening solution. Group II Was a taken as a control group in which no distraction was used i.e., Without the use of the sweetening solution.

After taking proper consent and giving proper instruction to the parents of the children for the proposed study, A sweetening agent (xylitol Fig2-a) was used in a solution form in 30% concentration (by mixing 300gm powder in 1 litre of drinking water) in the patient who needed radiographic procedure for the further diagnosis or treatment. Application of xylitol sweetening agent was done on the radiographic sensor sleeve by dipping radiographic sleeve in 30% xylitol sweetening solution. The solution was freshly prepared every time before application. The response of children were recorded by the VAS scale (Visio analogue scale- fig.1) while taking radiograph with use of sweetening agent and also after without using sweetening agent on radiographic sleeve. While taking radiographs, the VAS scale was used to record pain, discomfort and unpleasantness. The patient is allowed to rinse their mouth with normal drinking (tap)water after using a sweetening agent. Anxiety levels were measured using pulse oximeter (fig 2-c), pulse rate is assessed before and after using sweetening agent and anxiety was assessed using VAS (visio analogue scale) scale before and after use of sweetening agent.

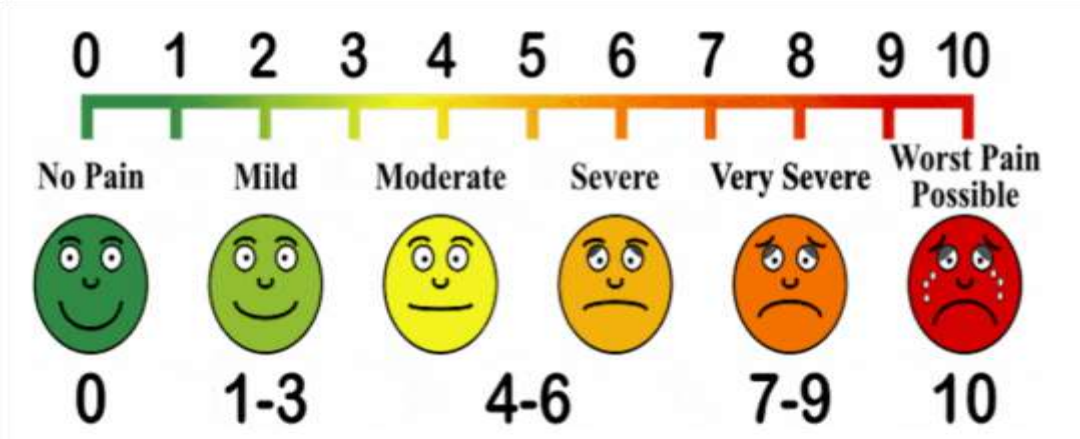

Fig 1: VAS Scale (Visio Analogue Scale).

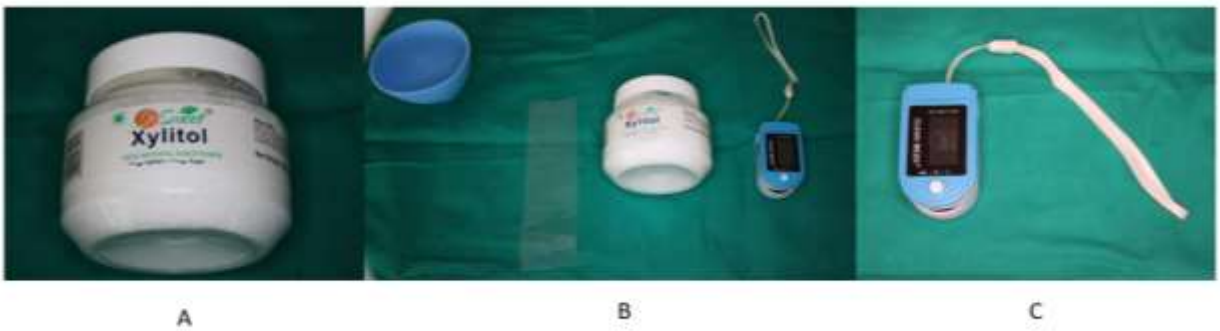

Fig 2: -A- Sweetening agent, B- Armamentarium (rubber bowl, Radiographic sleeve, Xylitol, Pulse oximeter), C- Pulse oximeter.

Ethical considerations

According to the Helsinki Declaration of 1964 and revised in 2013, the trial investigation received ethical clearance approval from the institutional ethical committee (IEC) CODS/IEC/161/2022. After obtaining the parents' written consent, the study proceeded further.

Participants

Forty children aged between 8 and 10 years who presented to the pediatric and preventive dentistry outpatient department were enrolled in the present study.

Study size

When comparing two mean formulas with 80% power and a 95% confidence interval, a sample size of 40 was obtained.

Statistical methods

Microsoft Excel 2009 was used to tabulate the data, and IBM Corp.'s Statistical Package for Social Sciences (SPSS) was utilized for statistical analysis (v.21.0). For each parameter evaluated during the study, descriptive and frequency statistics were run. To find out if there were any major differences between the two groups, an independent samples t-test, and an unpaired t-test were run. At 95% confidence intervals, In the study, a p-value of less than 0.05 was deemed to be statistically important.

Results

The intergroup comparison of VAS scale and Pulse Rate scores between the two groups was assessed. The difference between the two groups was statistically significant (p-value 0.05) in this comparison. As a result, when compared to group 2, in which sweetening agent was not used, group 1 produced statistically significant results. Group with a sweetening agent showed less anxiety, discomfort and unpleasantness in comparison to the group where no sweetening solution was used. It showed the descriptive statistics about the VAS scale scores in which the minimum score was 2 when using a sweetening agent and the maximum vas score was 5 and in group 2 without using sweetening solution the minimum score was 3 and the maximum vas score was 6. It showed the descriptive statistics about the pulse rate scores in group 1 where the minimum score was 92 bpm when using a sweetening agent and the maximum pulse rate score recorded was 100 bpm. And group 2 which was without using sweetening solution the minimum score recorded was 81 bpm and the maximum pulse rate score was 107 bpm.

Intergroup comparison of VAS scale scores between 2 groups was performed using independent samples t-test/Unpaired t-test. This comparison showed statistically significant differences between the 2 groups (p value <0.05) shown in table 1 and same comparison of pulse oximeter scores were shown in table 2. Thus, group 1 showed statistically significant better results as compared to group 2. (Table 1)

Table 1: Intergroup comparison of VAS scale scores between 2 groups

	Groups	N	Mean	t	df	p value
VAS scale scores	**Group 1**	20	3.5500	5.832	38	0.000*
	Group 2	20	4.9500			

Table 2: Intergroup comparison of Pulse rate between 2 groups

	Groups	N	Mean	t	df	p value
Pulse rate	**Group 1**	20	97.1500	.665	38	0.05*
	Group 2	20	98.3000			

*p value <0.05 highly significant

Discussion

According to a 2013 study by Chiri et al., the role of dental radiography includes assisting dentists in conducting examinations, establishing diagnoses, as well as arranging appropriate care management (Chiri et al., 2017). Periapical radiographic techniques are routinely used in the area of dental radiology. According to Gupta et al. (2017), periapical radiography provides an overview of the teeth and surrounding alveolar bone, which can aid in the diagnosis of various dental abnormalities such as caries, periapical abscesses and periodontal bone loss (Gupta et al., 2017). So, the radiography has very much importance in the daily routine dental life and practice.

The goal of this study was to check how effective a sweet-tasting solution was at relieving the discomfort and unpleasantness caused by radiographs in children aged between 8 to 12. Result showed that children felt less anxiety and discomfort by using xylitol sweetening solution, which is similar to a study carried out by Faezeh Ghaderi, Mahboobe Ahmadbeigi, Mehrdad Vossoughi and Ahmadreza Sardarian, who used 30% sucrose as a sweetening agent at the time of dental injections and hereby found that Mean VAS (28.30 ± 6.43) and SEM (2.14 ± 0.78) were lower on the test side than on the control side (45.80 ± 7.17 and 2.95 ± 1.00). It was concluded that the sweetening agent can be used in the reduction of anxiety and that a A higher BMI was linked to a decrease in analgesic action, whereas the individual's sweetness increased reduction in pain. This result is impacted by the child's sweet taste choice and BMI (Gupta et al., 2014).

In another study done by A P W Monika, Eha Renwi Astuti, Sri Wigati Mardi Mulyani, where lollipops were used as a taste distraction before taking periapical radiographs in children 7-12 years old at Hospital of Universitas Airlangga, Surabaya and got a positive result as there were significant variations in quality evaluation results between periapical radiographs taken by using lollipops and without assistive devices (p-value 0.008) and they concluded that making periapical radiography without a holder makes visualization of imaginary lines dividing the angle between the dental axis and periapical film more difficult whereas in the method of using a lollipop tool, lollipop sticks can visualize the angulation of the film, hence the visualization of angular dividing lines between the film and the dental axis is easier. Thus, the periapical radiograph quality of maxillary anterior teeth in children made using lollipops is much reliable than radiographic results made without using aids (Monika, Astuti and mulyani, 2020).

Parimala Tyagi et al. conducted a significant evaluation of taste distraction versus visual distraction. The purpose of the study was to compare visual and taste distraction techniques in children undergoing intraoral periapical radiography. In this study, the investigator used simple random sampling and the lottery method to randomly assign 60 children to three groups. Group A was taken as a conventional radiography group (n = 20), Group B was taken as a lollipop taste distraction group (n = 20), and Group C was taken as a projector visual

distraction group (n = 20). The mean age of conventional, taste distraction and visual distraction was 6.950 1.669, 7.400 1.818, and 7.200 1.673, respectively with p = 0.935, the gender distribution was found to be equal between the groups. The study found that the visual distraction technique reduced anxiety the most (mean difference), followed by the taste distraction technique and no distraction technique. They concluded that environmental distractions such as visual and taste distraction techniques, provide a positive environment and thus help to reduce anxiety in children (Tyagi et al., 2022)

In our study we used xylitol as a sweetening agent for taste distraction. As xylitol is cariostatic and has anti-cariogenic properties which help in the prevention of dental caries (Imfeld, 1993). It is as sweet as sucrose and can be found in fruits and vegetables such as fruits and berries (Fitch and keim, 2012). None of the dominant bacteria in plaque on the teeth produce acid from xylitol, and its presence in dental plaque decrease production of acid from glucose in vivo (Waler and rolla, 1983).Xylitol is an effective flavour enhancer of tablets and syrups and has the property of masking the unpleasant taste of some active ingredients in pharmaceutical formulations (Roe,Sheskey and Quinn, 2009).

Conclusion:

It can be concluded that a 30% xylitol solution is more effective in reducing discomfort and unpleasantness and it is usable in 8 to 12-year-old children while taking intraoral radiographs.

Conflict of Interest:
The authors declare no conflict of interest.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethics:
This study protocol was approved by the institutional ethical committee (IEC) faculty of dentistry on: 23/07/2022 approval number: the institutional ethical committee (IEC) CODS/IEC/161/2022.

References

Appukuttan, D.P., 2016. Strategies to manage patients with dental anxiety and dental phobia: literature review. Clinical, cosmetic and investigational dentistry, pp.35-50.

Bär, A., 1988. Caries prevention with xylitol. Sociological and Medical Aspects of Nutrition, 55, pp.183-209.

Burt, B.A., 2006. The use of sorbitol-and xylitol-sweetened chewing gum in caries control. The Journal of the American Dental Association, 137(2), pp.190-196.

Chiri R, Awan S, Archibald S dan Abbort PV. (2013).Parental knowledge and attitudes toward dental radiography for children. Australian Dental Journal. hal.163. [accessed 12 December 2022], available from http://onlinelibrary.wiley.com/doi/10.1111/adj. 120 41/pdf

Espelid, I., Mejàre, I. and Weerheijm, K., 2003. EAPD guidelines for use of radiographs in children. European Journal of Paediatric Dentistry, 4, pp.40-48.

Fitch, C. and Keim, K.S., 2012. Position of the Academy of Nutrition and Dietetics: use of nutritive and nonnutritive sweeteners. Journal of the Academy of Nutrition and Dietetics, 112(5), pp.739-758.

Ghaderi, F., Ahmadbeigi, M., Vossoughi, M. and Sardarian, A., 2021. The efficacy of administrating a sweet-tasting solution for reducing the pain related to dental injections in children: A randomized controlled trial. International Journal of Paediatric Dentistry, 31(2), pp.184-190.

Gupta, A., Devi, P., Srivastava, R. and Jyoti, B., 2014. Intra oral periapical radiography-basics yet intrigue: A review. Bangladesh Journal of Dental Research & Education, 4(2), pp.83-87.

Imfeld, T., 1993. Efficacy of sweeteners and sugar substitutes in caries prevention. Caries Research, 27, pp.50-50.

Isokangas, P., Tiekso, J., Alanen, P. and Mäkinen, K.K., 1989. Long-term effect of xylitol chewing gum on dental caries. Community Dentistry and Oral Epidemiology, 17(4), pp.200-203.

Martin, V., 2013. Using distraction techniques with children. Nursing2022, 43(11), p.68.

Monika, A.P.W., Astuti, E.R. and Mulyani, S.W.M., 2020. The quality of the lollipops use in the making of the anterior upper teeth periapical radiography of in paediatric patients. EurAsian Journal of BioSciences, 14, pp.4049-4053.

Rowe, R.C., Sheskey, P. and Quinn, M., 2009. Handbook of pharmaceutical excipients. Libros Digitales-Pharmaceutical Press.

Söderling, E., Alaräisänen, L., Scheinin, A. and Mäkinen, K.K., 1987. Effect of xylitol and sorbitol on polysaccharide production by and adhesive properties of Streptococcus mutans. Caries Research, 21(2), pp.109-116.

Subcommittee, C.A.C.B.M. and American Academy of Pediatric Dentistry, 2015. Guideline on behavior guidance for the pediatric dental patient. Pediatric dentistry, 37(5), pp.57-70.

Tyagi, P., Mali, S., Rathi, S.V., Agrawal, N., Kumar, A. and Abraham, J.M., 2022. Comparative Evaluation of Visual and Taste Distraction Techniques using RMS Pictorial Scale in making of Periapical Radiographs. Journal of South Asian Association of Pediatric Dentistry, 5(1), pp.32-37..

WALER, S.M. and RÖLLA, G., 1983. Effect of xylitol on dental plaque in vivo during carbohydrate challenge. European Journal of Oral Sciences, 91(4), pp.256-259.