International Journal of Contemporary Pediatrics
Naidu SY et al. Int J Contemp Pediatr. 2023 Jun;10(6):798-805
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20231481

Original Research Article

Comparative evaluation of pain perception in pediatric patients during administration of local anesthesia with and without three preanesthetic procedure-Buzzy system, topical anesthesia and precooling agent

Srinivas Y. Naidu*, Neena Indavara Eregowda, Poornima Parameshwarappa, Mallikarjuna Kenchappa, Roopa Korishettar, Kavya Rani B. S.

Department of Pediatric and Preventive Dentistry, College of Dental Sciences, Davangere, Karnataka, India

Received: 13 March 2023
Revised: 12 April 2023
Accepted: 18 April 2023

***Correspondence:**
Dr. Srinivas Y. Naidu,
E-mail: srinu12nov1995@gmail.com

ABSTRACT

Background: Pain management in paediatric dental care is a critical aspect of anxiety, which is frequently related to the induction of pain and exacerbates pain perception local anaesthetics are used to relieve and prevent pain. However, the administration of these drugs causes fear and anxiety in patients. As a result, there is an urgent need to develop methods for reducing pain during injection. Aim and objectives were to evaluate and compare the pain perception in pediatric patients by comparing different local anesthesia delivery system before local anesthesia (preanesthetic procedure) using Buzzy system, topical anesthesia and precooling agent with conventional technique.
Methods: A total of 140 children aged between 8-13 years visiting department taken for study. Patients indicated for invasive procedure and requiring administration of LA taken for study. The blood pressure, oxygen saturation, Wong Baker pain rating scale and FLACC scale was recorded in patients before and after administration of LA. Groups are, group A conventional syringe technique without any preanesthetic procedure. Group B: Buzzy system group C: Topical anesthetic gel (Progel B-20% benzocaine), group D: Precooling agent (flouron-1,1,1,2 tetraflouroethane). Obtained data statistically analysed by using one way ANOVA and paired t test in SPSS software 21.0.
Results: Statistically significant results were obtained in intergroup comparison where group B buzzy system found to be effective compared to another group. In intra group, comparison, there was statistically significant in all 4 groups.
Conclusions: Buzzy system can be used as a preanesthetic medication to decrease the pain perception in children during administration of local anesthetic.

Keywords: Buzzy system, Topical anesthesia, Precooling agent, Blood pressure, Oxygen saturation

INTRODUCTION

Fear and anxiety are prevalent in dentistry, particularly in children and adolescents. It's a common reaction to a stressful situation. It's critical to understand that while terms like "fear," "anxiety," and "phobia" have similar and overlapping connotations, they're not the same.[1] 'Fear' is sometimes thought to be a necessary and unavoidable feeling, enhancing the 'fight or flight' response in times of danger,[2] whereas 'anxiety' is a reaction to an unknown danger.[3]

Dental fear is common unpleasant emotional response to specific scary stimuli encountered in dental care scenarios.[4] Dental anxiety-excessive, irrational, negative emotional state experienced by dental patients e. g., fear can be triggered by sight of needle/sound of drilling.[5,6]

Aim and objectives

Comparative evaluation of pain perception in pediatric patients during administration of local anesthesia with and without 3 preanesthetic procedure-Buzzy system,

topical anesthesia and precooling agent. Present comparative study was carried out, with the following objectives: To evaluate pain perception in pediatric patients by comparing different local anesthesia delivery system before local anesthesia (preanesthetic procedure) using Buzzy system, topical anesthesia and precooling agent with conventional technique and to compare pain perception in pediatric patients by comparing different local anesthesia delivery system before local anesthesia (preanesthetic procedure) using Buzzy system, topical anesthesia, precooling agent with conventional technique.

METHOD

This study was conducted in the department of pediatric and preventive dentistry, college of dental sciences, Davangere, Karnataka.

Source of data

A total of 140 children, aged between 8-13 years were taken from the department of pediatric and preventive dentistry at college of dental sciences, Davangere, Karnataka, India. The patients who are indicated for invasive procedure and require administration of local anesthesia were taken for the study. Patient and their parents were informed about the objective of the study and the methodology to be employed. Written informed consent were obtained from the parent/guardian.

Ethical clearance obtained from institutional review board of college for study (Ref CODS/2065/2020-21).

Materials and equipment required (Figure 1 and 2)

Two percentages lignocaine with 1:1,00,000 adrenaline, 2 ml conventional syringe (unolok syringe 2 ml/27 gauge), Buzzy system, pre cooling agent (flouron-1,1,1,2 tetrafluoroethene), topical anesthetic gel (Progel B-20% Benzocaine), sterile gloves, mouth mask, pulse oximeter, digital sphygmomanometer, sterile cotton, Wong Baker faces pain rating scale (WBFPRS) (Figure 3). Face, leg, activity, cry, consolability scale (FLACC) (Figure 4).[7-13]

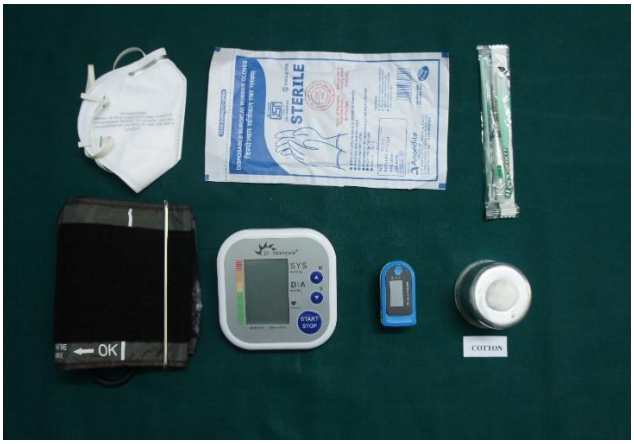

Figure 1: Armamentarium.

Figure 2: Materials.

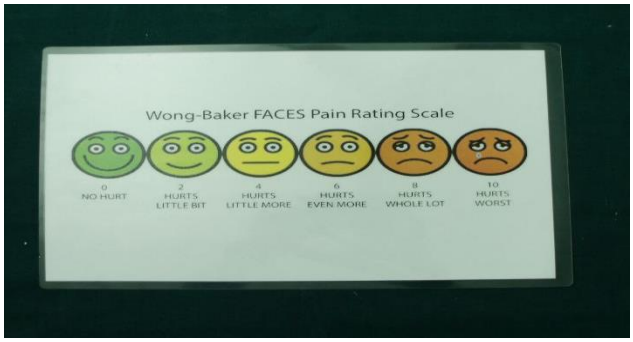

Figure 3: WBFPRS.

FLACC	SCORE 0	SCORE 1	SCORE 2
FACE	No particular expression or smile	Occasional grimace or frown, withdrawn, uninterested	Frequent to constant quivering chin, clenched jaw
LEGS	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
ACTIVITY	Lying quietly, normal position, moves easily	Squirming, shifting, back and forth, tense	Arched, rigid or jerking
CRY	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
CONSOLABILITY	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Figure 4: FLACC scale.

Selection criteria

Inclusion criteria[8]

Cooperative children, children requiring administration of LA for dental treatment and children with proper parental/guardian/patient consent were included in study.

Exclusion criteria[8]

Healthy children with no systemic illness, allergies etc., children with behavioral management problem, children with known allergy to local anesthetic agents, children below 8 years of age and children taking analgesics were excluded from study.

Type of the study was *in vivo* comparative study.

Duration of the study was from June -November 2022

Procedure

Group A: Conventional syringe technique without any preanesthetic procedure (Control group)

The child was seated on the dental chair. The readings from pulse oximeter and blood pressure were recorded (Figure 5 and 6). FLACC scale was recorded and child was asked to choose a face from WBFPRS before the procedure (Figure 7). And then lignocaine 2% with 1:1,00,000 adrenaline was injected with conventional syringe at site of injection. Recordings recorded again after administration of LA (Figure 8).

Figure 5: Recording blood pressure.

Figure 6: Recording of oxygen saturation.

Figure 7: Recording of WBFPRS.

Figure 8: Placement of Buzzy system.

Group B: Preanesthetic procedure-Buzzy system was given before local anesthesia (Study group)

The child was seated in the dental chair, and the device was explained to the child in simple terms before allowing the child to play with Buzzy. The frozen wing was attached to the device, and buzzy was placed extra orally above the area/cheek where the local anaesthetic would be administered. The oxygen saturation and blood pressure readings (Figure 5 and 6) The FLACC scale was also recorded. The child was asked to choose a face from WBFPRS on how he/she feels. The LA lignocaine 2 percent with 1:1,00,000 adrenaline was then injected using a standard syringe. All of the readings were rerecorded at this point.

Group C: Preanesthetic medication-topical anesthesia (Progel B-20% benzocaine) was given before local anesthesia (Study group)

Same as group A and B, the readings were recorded before procedure and the topical anesthetic gel (Progel B-20% benzocaine) was applied on the site of injection and then LA lignocaine 2% with 1:1,00,000 adrenaline was injected with conventional syringe. After the procedure, the oxygen saturation, blood pressure and FLACC scale was recorded and patient was asked to choose a face from WBFPRS.

Group D: Preanesthetic medication-precooling agent (flouron-1,1,1,2 tetraflouroethane) was given before local anesthesia (Study group)

Same as the other group, the readings were recorded before the procedure. The precooling agent (flouron-1,1,1,2 tetraflouroethane) was placed on the site of injection before administration of LA and then lignocaine 2% with 1:1,00,000 adrenaline was injected with conventional syringe. After the procedure, the readings were taken from pulse oximeter, sphygmomanometer and FLACC scale were recorded. The patient is instructed to select a face from the WBFPRS.

Statistical analysis

The data obtained was subjected to statistical analysis. The results were determined using paired sample T test followed by ANOVA, A p value less than 0.05 was considered as statistically significant. The data was subjected to statistical analysis using SPSS 21.0 software.

RESULTS

A total of 140 children aged between 8-13 years visiting the department were taken for the study. The patients indicated for invasive procedure and requiring administration of local anesthesia were taken for the study. The blood pressure, oxygen saturation, WBFPRS and FLACC scale were recorded in the patients before and after the administration of local anesthesia.

Table 1 explains the comparison of blood pressure and oxygen saturation between the groups before and after intervention. The p value obtained when systolic and diastolic blood pressure before intervention was compared between group A, B, C and D was 0.033 and 0.000 respectively which is less than 0.05 found to be statistically significant. The p value obtained when systolic and diastolic blood pressure after intervention was compared between group A, B, C and D was 0.001 and 0.076 respectively. The systolic blood pressure after intervention was found to be statistically significant. When PRS was compared between the groups before and after intervention between the groups A, B, C And D, the p=0.012 for before and 0.000 after the intervention, found to be statistically significant.

In Table 2 pain rating scale was highest that is score 10 in group C that 28.9 %, followed by score 8 is in group A and group B 27.7%. In Table 3 least pai rating scale was found in group B and C, results statistically significant.

Table 4, explains FLACC score before and after intervention within groups. The result was found to be statistically significant. whereas Table 5, explains FLACC score shows intra group comparisons within the group, found to be statistically insignificant.

Table 1: Comparison of blood pressure and oxygen saturation between the groups before and after intervention.

Variables	Group A conventional	Group B Buzzy system	Group C topical anesthetic gel	Group D precooling agent	P value
Before_systolic_BP	110.64±8.78	105.67±9.323	107.47±6.609	110.11±7.218	0.033
Before_dystolic_BP	75.64±3.399	72.17±5.848	71.89±3.379	76.17±3.88	0.000
Before_SpO_2	97.47±2.42	97.94±0.583	97.94±0.333	98.08±0.77	0.219
Before_PRS	9.28±0.974	8.61±1.498	9.44±0.909	9.28±1.085	0.012
After_systolic_BP	115.83±5.158	116.75±6.04	116.61±4.818	120.08±1.873	0.001
After_dystolic_BP	77.47±2.883	76.33±10.513	78.5±3.55	79.78±1.072	0.076
After_SpO_2	98.11±0.622	98.47±1.055	98.64±0.487	98.36±0.639	0.023
After_PRS	7.56±1.858	0.33±0.756	1.67±1.621	1.78±1.775	0.000

Table 2: Comparison of pain rating scale between the groups before intervention.

Variables		Groups, n (%)				P value
		Group A conventional	Group B buzzy system	Group C topical anesthetic gel	Group D precooling agent	
Before_PRS	6	0	6 (85.7)	0	1 (14.3)	0.010
	8	13 (27.7)	13 (27.7)	10 (21.3)	11 (23.4)	
	10	23 (25.6)	17 (18.9)	26 (28.9)	24 (26.7)	

Table 3: Comparison of pain rating scale between the groups before intervention.

Variables		Group, n (%)				P value
		Group A conventional	Group B buzzy system	Group C topical anesthetic gel	Group D precooling agent	
After_PRS	0	0	30 (53.6)	13 (23.2)	13 (23.2)	0.000
	2	0	6 (15)	18 (45)	16 (40)	
	4	4 (30.8)	0	3 (23.1)	6 (46.2)	
	6	8 (80)	0	2 (20)	0	
	8	16 (94.1)	0	0	1 (5.9)	
	10	8 (100)	0	0	0	

Table 4: FLACC score before and after intervention.

Variables		N	Mean	Std. Deviation	P value
FLACC_score_before	Group A conventional	35	6.74	1.221	0.000
	Group B buzzy system	35	6.69	1.132	
	Group C preanesthetic gel	35	5.71	1.202	
	Group D precooling agent	35	5.80	1.052	
	Total	140	6.24	1.239	
FLACC_score_after	Group A conventional	35	5.09	1.222	0.000
	Group B buzzy system	35	1.51	0.853	
	Group C preanesthetic gel	35	3.23	1.003	
	Group D precooling agent	35	2.31	0.993	
	Total	140	3.04	1.677	

Table 5: Intragroup comparison of FLACC score.

Paired samples statistics		Mean	N	Std. deviation	Std. error mean	P value
Group 1	FLACC_score_before	6.74	35	1.221	0.206	0.069
	FLACC_score_after	5.09	35	1.222	0.206	
Group 2	FLACC_score_before	6.69	35	1.132	0.191	0.196
	FLACC_score_after	1.51	35	0.853	0.144	
Group 3	FLACC_score_before	5.71	35	1.202	0.203	0.146
	FLACC_score_after	3.23	35	1.003	0.169	
Group 4	FLACC_score_before	5.80	35	1.052	0.178	0.439
	FLACC_score_after	2.31	35	0.993	0.168	

DISCUSSION

Dental anxiety in childhood can have a negative impact on a child's perception of dentists and significantly reduce the dental experience. To improve the delivery of dental care to uncooperative paediatric patients, it is necessary to identify the characteristics that put these children at a higher risk of being anxious in dental settings.[14] Treating such anxious patients is stressful for the dentist because of decreased cooperation, which necessitates more time and resources for treatment, resulting in an unpleasant experience for both the patient and the dentist.[15]

According to Agras et al it is the fifth most common cause of anxiety.[16] Overwhelming and irrational fear of dentistry associated with devastating feelings of hypertension, terror, trepidation, and unease is referred to as "Odontophobia," and it has been classified as a specific phobia by the diagnostic and statistical manual of mental disorders (DSM)-IV and the international statistical classification of diseases and related health problems (ICD)-10.[17]

Broadly, depending on the dentist's expertise and experience, the degree of dental anxiety, patient characteristics, and clinical situations, dental anxiety can be managed using psychotherapeutic interventions, pharmacological interventions/ a combination of both.[17] Establishing a trusting relationship, good communication skills, empathy, careful treatment, and some basic non-pharmacological approaches can help children with low or moderate fear or anxiety, even if it is a very small part of it, in a very small part of it, in a very small part of it, in a very small part of it, in a very small part of it, in a very small (e.g., behavioural guidance techniques, nitrous oxide sedation, intravenous sedation, and general anaesthesia).[18,19]

Preoperative anxiety in children has been observed to manifest in a variety of ways, with many children appearing fearful and agitated, breathing deeply, shivering, crying, and ceasing to speak or play. Children may express their displeasure, fight, or flee, which can be emotionally traumatic for both the child and the parents.[20]

One of the primary functions of psychology is to provide objective measures for evaluating a psychological response. Given this, the measurement of physiological function plays an important role in the field of behavioural assessment.[17] The psychophysiological responses produced by anxiety are associated in general with an increase in the activity of the sympathetic branch of the autonomic nervous system. The cardiovascular system (increased blood pressure and pulse rate), the sweat glands (increased sweat production and electrical conductivity of the skin), the muscles (increased muscle tone, spasmodic movements, etc.), the respiratory system (sighs, feeling breathless, etc.), and the digestive system all undergo changes (dry mouth, constipation, etc.) All of the physiological parameters described above can be used to assess a patient's anxiety, but they all necessitate a monitoring team, financial investment, and additional time in the dental clinic. For this reason, these types of measure are not commonly used in dental clinics. Thus, subjective measures can be used as an alternative to objective physiological scales.[17,21]

In the present study, a method that combines both cooling and vibration together by providing external cold and vibration via buzzy. The gate control theory (Melzack and Wall, 1965) may provide an explanation for the effect of cold stimulation and vibration. According to this theory, pain is transmitted from the peripheral nervous system to the central nervous system, where it is modulated by a gating system in the spinal cord's dorsal horn. Fast non-noxious motion nerves (a-β) block afferent pain-receptive nerves (a-delta fibres carrying acute pain and unmyelinated slower C fibres carrying chronic pain messages). Prolonged exposure to cold stimulates C fibres and may block a-delta pain signals. Cold also increase the activation of supraspinal mechanisms, raising the body's overall pain threshold.[8,22]

Precooling is also called cryoanesthesia, the application of cold to a specific area of the body in order to prevent the transmission of painful impulses through the nerves. It can be caused by either the use of refrigerant sprays or the use of ice.[23] There is a lot of apprehension and apprehension.[24] A new cryoanesthetic agent, 1,1,1,2-tetraflouroethane was used in the current study. With an average onset time of 10-15 s, it has a faster and deeper cooling action to improve efficacy.[1]

Topical anaesthesia, also known as surface anaesthesia, is only effective up to a few millimetres (2-3 mm) on the surface of the mucosa. Topical anaesthetic efficacy is determined by factors such as composition (simple or compounded preparation), concentration, and contact (type and duration).[9,23] Most of the studies show 20% benzocaine to be better than other agents for gingival anesthesia in children.[24]

The scores were recorded twice, once before and once after the administration of LA. This was done to assess pain from the child's perspective. The result was also statistically significant when intergroup comparison was performed. In intragroup comparison, the results were statistically significant in group B but statistically insignificant in group A, group C and group D which could be attributed to the child's tendency to choose faces with higher scale scores during the procedure due to discomfort and pain.

A studies done by by Alanazi et al, Hegde et al, Tung et al and Raslan et al showed the same results where there was a significant change in the pain rating scale which is similar to the current study.[25-28] On the contrary, Elbay et al showed contradictory results.[29]

The rationale for using the FLACC scale was based on evidence from previous studies that demonstrated the scale's reliability and validity in quantifying pain in young, cognitively intact children. Each of the five categories (F) face, (L) Legs, (A) activity, (C)cry and (C) consolability is scored from 0-2 which results in a total score between zero and ten

The FLACC scale results obtained were highest in group A conventional and lowest in group B that is buzzy group. The study showed statistically significant and result inferring that using buzzy system which has both external vibrating and cooling agent is better than conventional technique. A similar study done by Hassanein et al, Alanzi et al and Raslan et al showed similar results.[25,28,30] However, a study conducted by Elbay et al showed contradicting study with the current study where there was a negative correlation found on the FLACC scale between age and pain scores during injection.[31]

Considering all of the results of the current study, the buzzy system, which includes both vibration and cooling, significantly decreased anxiety and fear in children, as well as pain perception. Furthermore, the precooling agent and topical anaesthetic gel used in the current study also reduced pain perception. Thus, the buzzy system, precooling agent and preanesthetic gel was found to be helpful in pain management by alleviating pain in children during administration of local anesthesia. Therefore, these preanesthetic medications can be used in clinical practice, allowing the dentist to provide more effective and efficient treatment while also establishing a positive relationship with the children.

Limitations

The buzzy system can be applied extra-orally only. it cannot be applied intraorally. So, the study cannot be applied to situations where greater palatin.

CONCLUSION

The study concluded that pain perception was reduced by using buzzy system, topical anesthesia and precooling agent during the administration local anesthesia in pediatric patients. The comparison of the results concluded that buzzy system can be used for the reduction of pain perception. and also, other medication like topical anasthesia and precooling agent can be employed during the administration of local anesthesia in pediatric patients. Thereby, the study implied that addition of preanesthetic agent like buzzy system which has both external vibration and cooling agent can be used for the alleviation of pain perception in children as they reduce anxiety in children during administration of local anesthesia given during various dental procedures.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Yon MJ, Chen KJ, Gao SS, Duangthip D, Lo EC, Chu CH. An introduction to assessing dental fear and anxiety in children. InHealthcare. 2020;8(2):86.

2. Chapman HR, Kirby-Turner NC. Dental fear in children–a proposed model. Bri Dental J. 1999;187(8):408-12.
3. Armfield JM. Towards a better understanding of dental anxiety and fear: Cognitions vs. experiences. Eur J Oral Sci. 2010;118(3):259-64.
4. Cianetti S, Lombardo G, Lupatelli E, Pagano S, Abraha I, Montedori A et al. Dental fear/anxiety among children and adolescents. A systematic review. Eur J Paediatr Dent. 2017;18(2):121-30.
5. Gao X, Hamzah SH, Yiu CK, McGrath C, King NM. Dental fear and anxiety in children and adolescents: qualitative study using YouTube. J Med Internet Res. 2013;15(2):e29.
6. Aminabadi NA, Ghoreishizadeh A, Ghoreishizadeh M, Oskouei SG. Can drawing be considered a projective measure for children's distress in paediatric dentistry? Int J Paediatr Dentistry. 2011;21(1):1-2.
7. Bilsin E, Güngörmüş Z, Güngörmüş M. The efficacy of external cooling and vibration on decreasing the pain of local anesthesia injections during dental treatment in children: a randomized controlled study. J Peri Anesthesia Nursing. 2020;35(1):44-7.
8. Suohu T, Sharma S, Marwah N, Mishra P. A Comparative Evaluation of Pain Perception and Comfort of a Patient Using Conventional Syringe and Buzzy System. Int J Clin Pediatr Dentistr. 2020;13(1):27.
9. Hameed NN, Sargod SS, Bhat SS, Hegde SK, Bava MM. Effectiveness of precooling the injection site using tetrafluorethane on pain perception in children. J Indian Society Pedodontics Preventive Dentistry. 2018;36(3):29
10. Mohiuddin I, Setty JV, Srinivasan I, Desai JA. Topical application of local anaesthetic gel vs ice in pediatric patients for infiltration anaesthesia. J Evolution Med Dental Sci. 2015;4(74):12934-41.
11. Langthasa M, Yeluri R, Jain AA, Munshi AK. Comparison of the pain perception in children using comfort control syringe and a conventional injection technique during pediatric dental procedures. J Indian Society Pedodontics Preventive Dentistr. 2012;30(4):323.
12. Voepel-Lewis T, Shayevitz JR, Malviya S. The FLACC: a behavioral scale for scoring postoperative pain in young children. Pediatr Nurs. 1997;23(3):293-7.
13. Wong DL, Baker CM. Pain in children: comparison of assessment scales. Pediatr Nurs. 1988;14(1):9-17.
14. Majstorovic M, Morse DE, Do D, Lim LL, Herman NG, Moursi AM. Indicators of dental anxiety in children just prior to treatment. J Clin Pediatr Dentistry. 2014;39(1):12-7.
15. Brahm CO, Lundgren J, Carlsson SG, Nilsson P, Corbeil J, Hägglin C. Dentists' views on fearful patients. Problems and promises. Swedish Dental J. 2012;36(2):79-89.
16. Agras S, Sylvester D, Oliveau D. The epidemiology of common fears and phobia. Comprehensive Psychiatr. 1969;10(2):151-6.
17. Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. Clinical, cosmetic and investigational dentistry. Dentistry. 2016;8:35.
18. Stouthard ME, Hoogstraten J. Ratings of fears associated with twelve dental situations. J Dental Res. 1987;66(6):1175-8.
19. Asl AN, Shokravi M, Jamali Z, Shirazi S. Barriers and drawbacks of the assessment of dental fear, dental anxiety and dental phobia in children: a critical literature review. J Clin Pediatr Dentistr. 2017;41(6):399-423.
20. Lee J, Lee J, Lim H, Son JS, Lee JR, Kim DC et al. Cartoon distraction alleviates anxiety in children during induction of anesthesia. Anesthesia Analgesia. 2012;115(5):1168-73.
21. AI LR. Objective and subjective measures for assessing anxiety in paediatric dental patients. Eur J Paediatr Dentistr. 2011;12(4):239-44.
22. Yilmaz G, Alemdar DK. Using Buzzy, Shotblocker, and bubble blowing in a pediatric emergency department to reduce the pain and fear caused by intramuscular injection: A randomized controlled trial. J Emergency Nursing. 2019;45(5):502-11.
23. Tirupathi S, Rajasekhar S. Topical Anesthesia in Pediatric Dentistry: An Update. Dent. 2022;15(2):240-5.
24. Sharma N, Thosar N, Baliga S, Rathi N. Precooling Agent: A Boon to Local Anesthetics. Int J Development Res. 2017;7(11):17193-7.
25. Alanazi KJ, Pani S, AlGhanim N. Efficacy of external cold and a vibrating device in reducing discomfort of dental injections in children: a split mouth randomised crossover study. Eur Arch Paediatr Dentistr. 2019;20(2):79-84.
26. Hegde KM, Srinivasan I, Melwani A, Radhakrishna S. Effect of vibration during local anesthesia administration on pain, anxiety, and behavior of pediatric patients aged 6–11 years: A crossover split-mouth study. J Dental Anesthesia Pain Med. 2019;19(3):143-9.
27. Tung J, Carillo C, Udin R, Wilson M, Tanbonliong T. Clinical performance of the DentalVibe® injection system on pain perception during local anesthesia in children. J Dentistry Children. 2018;85(2):51-7.
28. Raslan N, Masri R. A randomized clinical trial to compare pain levels during three types of oral anesthetic injections and the effect of Dentalvibe® on injection pain in children. Int J Paediatr Dentistr. 2018;28(1):102-10.
29. Aminah M, Nagar P, Singh P, Bharti M. Comparison of topical anesthetic gel, pre-cooling, vibration and buffered local anaesthesia on the pain perception of pediatric patients during the administration of local anaesthesia in routine dental procedures. Int J Contemp Med Res. 2017;4(2):400-3.

30. Hassanein PH, Khalil A, Talaat DM. Pain assessment during mandibular nerve block injection with the aid of dental vibe tool in pediatric dental patients: a randomized clinical trial. Quintessence Int. 2020;51(4).
31. Elbay M, Yıldırım S, Uğurluel C, Kaya C, Baydemir C. Comparison of injection pain caused by the DentalVibe Injection System versus a traditional syringe for inferior alveolar nerve block anaesthesia in paediatric patients. Eur J Paediatr Dentistr. 2015;16(2):123-8.

Cite this article as: Naidu SY, Eregowda NI, Parameshwarappa P, Kenchappa M, Korishettar R, Bs KR. Comparative evaluation of pain perception in pediatric patients during administration of local anesthesia with and without three preanesthetic procedure-Buzzy system, topical anesthesia and precooling agent. Int J Contemp Pediatr 2023;10:798-805.