EGYPTIAN DENTAL JOURNAL
www.eda-egypt.org
VOL. 71, 53:63, JANUARY, 2025
PRINT ISSN 0070-9484 • ONLINE ISSN 2090-2360
ORTHODONTICS, PEDIATRIC AND PREVENTIVE DENTISTRY
Submit Date : 03-10-2024 • Accept Date : 29-10-2024 • Available online: 1-1-2025 • DOI : 10.21608/edj.2024.325742.3221

DIFFERENT METHODS FOR REDUCING BUCCAL INFILTRATION LOCAL ANESTHESIA INJECTION PAIN IN CHILDREN: A RANDOMIZED CONTROLLED TRIAL

Fatma Abdelgawad* *and* Nada Wassef*

ABSTRACT

Background/purpose: Local anesthesia is not a pleasant procedure for children and their parents. We aimed to assess the use of buzzy device (using vibration only or vibration-cold), precooling and topical anesthesia in reducing pain during needle pricking.

Materials and Methods: Children 6-12 years old, with maxillary tooth indicated for extraction were selected and randomly allocated to (group 1: buzzy device using vibration only), (group 2: buzzy device using vibration-cold), (group 3: precooling), (group 4: topical anesthetic gel). Wong Baker faces pain rating scale was used to record experience before and after injection. Pulse oximeter was used to record heart rate and oxygen saturation before the procedure, during and immediately after the needle injection. The sound-eye-motor scale was recorded during the procedure. Parents and children satisfaction were recorded. Results were collected and statistically analyzed.

Results: Intergroup comparisons showed that during injection, group (4) had a significantly higher pulse rate than group (2) (p=0.007). While after anesthesia, group (4) had significantly higher pulse rate than all other groups (p<0.001). For all other parameters, the difference was not statistically significant (p>0.05). Intragroup comparisons for group (4) showed that there was a significant increase of pulse rate during injection and after anesthesia (p<0.001), while group (2), showed a significant reduction in oxygen saturation during injection (p=0.003). Other comparisons were not statistically significant (p>0.05). Results of satisfaction questionnaires for children and parents showed no significant difference between different tested groups (p>0.05).

Conclusion: Vibration and cold is effective in reducing pain during buccal infiltration injection. Children and parents were satisfied.

KEYWORDS: Buzzy, vibration, precooling, topical anesthetic gel, local anesthesia, buccal infiltration, dental extraction

* Associate Professor, Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University, Egypt.

INTRODUCTION

Injection of dental anesthetics is one of the very irritating processes in the dental office. Topical anesthetics are essential measures in the dental office, especially in children. Unfortunately, topical anesthetics flavor may be unpleasant for some children.

Buzzy device is a useful method in distraction as Alanazi et al.,[1] confirmed that the use of cold combined with vibration compared to benzocaine gel showed higher patient acceptance and lower scores in Wong Baker scale.

In a systematic review by Ballard et al.,[2] they concluded that Buzzy device is promising in reducing pain resulting from needle injections. Also, Ghaderi et al.,[3] results showed that cooling of the site of injection prior to buccal infiltration lowered pain experienced by children.

Buzzy device (MMJ Labs, Atlanta, USA) is a small palm-sized appliance having the shape of a bee, that is used to reduce needle related pain. It was introduced by the pediatrician, Dr. Amy Baxter in 2009.[4] The device consists of a body in the shape of a bee that is powered by batteries and produces vibration and removable wings that contain non-toxic gel and can be frozen to produce cooling near the injection site.

Reduction in pain using the device can be explained based on several elucidations, including distraction and gate control theory and the descending inhibitory mechanism. Based on this theory, vibration is theorized to stimulate the A-beta fibers by blocking the (A-delta and C-fibers) which are afferent fibers sensitive to pain, leading to stimulating inhibitory interneuron, therefore there will be blocking of the pain signals transferred to the spinal cord.[5] In addition, the cold component will stimulate the C fibers, therefore thermal stimulus will be sent to the brain and additionally blocking the A-delta pain signal.[5,6]

Therefore, this study aims to assess the use of the Buzzy device (using vibration only and using vibration-cold), precooling and topical anesthetic gel on pain during buccal infiltration local anesthetic injection.

AIM OF THE STUDY

The aim of this study is to assess the use of buzzy device (using vibration only and using vibration-cold), precooling versus topical anesthetic gel in reducing pain during needle pricking.

MATERIALS AND METHODS:

Trial design and setting:

This is a randomized controlled trial with four parallel groups with allocation ratio 1:1:1:1 conducted in the post-graduate clinic, Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University. The research protocol was reviewed and approved by the Research Ethics Committee, Faculty of Dentistry, Cairo University, with number (28-7-21) in relation to the scientific content and compliance with the applicable regulations regarding the declaration of Helsinki for human subject research. It was registered on clinical trial.gov on 01/29/2024 with identifier NCT06290531. The study was reported following the CONSORT guidelines 2010.

Type of study:

A randomized controlled trial.

PICO:

P: Children receiving upper buccal infiltration local anesthetic injection.

I1: Buzzy device (vibration only)

I2: Buzzy device (vibration-cold)

I3: Precooling

C: Flavored Benzocaine topical anesthetic gel 20%

O1: Patient reported pain during needle pricking (Wong Baker faces pain rating scale)

O2: Child behavior during needle injection (Sound-eye-motor scale)

O3: Pulse rate (beats/minute)

O4: Oxygen saturation

O5: Child and parent satisfaction

Selection of participants:

Children with mixed dentition who had a maxillary primary molar or canine indicated for extraction and buccal infiltration anesthesia, were selected from children attending to the outpatient clinic, Pediatric Dentistry and Dental Public Health Department, Faculty of Dentistry, Cairo University. Assent was obtained verbally from children above 7 years of age and a written informed consent from their parents or guardians.

Eligibility criteria

Inclusion criteria:

- Children in the age range 6-12 years old.
- Mixed dentition stage.
- Cooperative children.
- Children indicated for extraction of a maxillary primary molar or canine.
- Healthy children.
- Parent or guardian agree to participate in the study.

Exclusion criteria:

- Tooth with pathologic mobility.
- Signs of acute or acute exacerbation of a chronic abscess.
- Children with special health care needs.

Sample size calculation:

Sample size was calculated using G-power software version 3.1.9.2. The estimated effect size was 0.4. The alpha error was 0.05 and power 90%. The total sample size was 96 participants (24 per group). The calculation was performed using G-power* software version (3.1.9.7).

Participant's randomization and allocation:

The children were randomly allocated either to one of the four groups using (http://www.random.org/) website for sequence generation and the sequence was concealed from the operator. The allocated sequences were kept in an 8-times folded paper in sealed opaque envelopes that were sequentially numbered. Upon signing the informed consent, the envelope was opened by the operator to find the allocated group after eligibility of the child and the parent/guardian sign the informed consent.

Blinding

Blinding was not feasible to apply for the participants, operator, and outcome assessor due to the nature of the study. It was performed to the statistician only.

Procedures:

After clinical examination, eligible children were randomly distributed to one of the four groups, as shown in the Consort flow diagram (Figure 1).

Each child received non-pharmacological behavioral management techniques including tell-show-do and non-verbal communication. For each child, the intervention was explained in understandable words.

Each child was provided a chart with Wong Baker faces pain rating scale [7] to record his experience before the buccal infiltration injection. Pulse oximeter was used to record the heart rate and oxygen saturation before the procedure.

Allocation of the patients:

Children received topical anesthetic gel flavored or buzzy device (using vibration only or vibration-cold) or precooling before the infiltration injection.

Group (1) Buzzy device (vibration only):

The device was explained to the child and a nurse was instructed to help stabilize the device on the cheek.

Group (2) Buzzy device (vibration-cold):

The device was explained to the child with attached frozen wings and a nurse was instructed to help stabilize the device on the cheek.

Group (3) Precooling:

The child was allowed to choose a fruit shaped ice cube, and it was placed by the operator intraorally at the injection site.

Group (4) Topical anesthesia:

Topical anesthetic gel, 20% benzocaine gel (Iolite gel, Dharma Research Inc., USA), was applied for one minute after drying the mucosa with cotton swab according to Ghaderi et al.[3]

- For all children, local anesthetic buccal injection was performed using a short needle (gauge 30) for the initial pricking and deposition of the articaine solution, Artinibsa 4% with epinephrine 1:100,000 (Artinibsa, Inibsa, Barcelona, Spain).
- Each child was provided a chart with Wong Baker faces pain rating scale[7] to record his experience after the buccal infiltration injection.
- Pulse oximeter was used to record the heart rate and oxygen saturation during the needle injection and after the end of the injection.
- Sound-eye-motor scale according to Ghaderi et al.,[3] was used to record the child's behavior during the needle injection.

Outcome Assessment

Primary outcome:

Patient reported pain before and after needle injection using (Wong Baker faces pain rating scale).[7]

Secondary outcome

Child behavior during needle injection using (Sound-eye-motor scale).[8]

Pulse rate measured by pulse oximeter (beats/minute).[1]

Oxygen saturation measured by pulse oximeter.[9]

Child and parent satisfaction.[10]

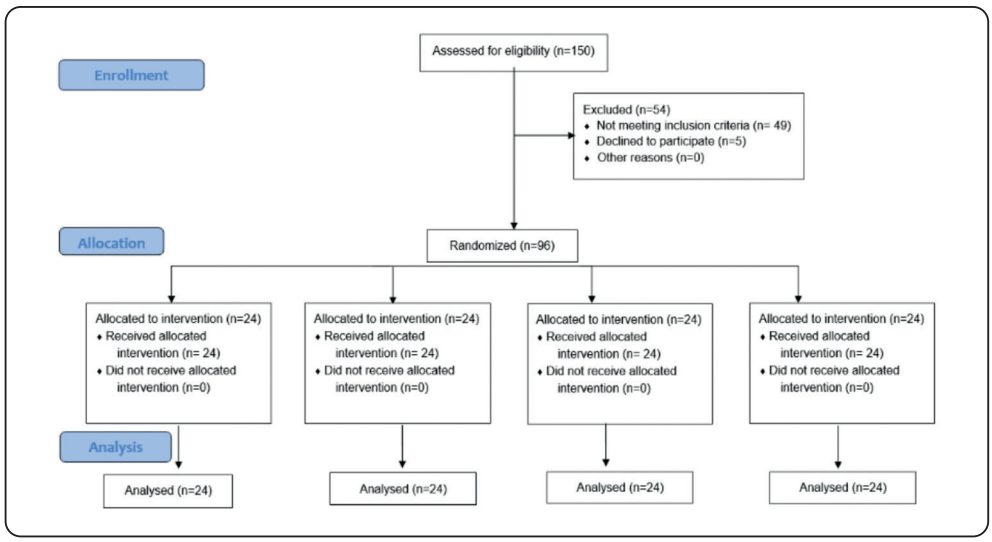

Fig. (1) The consort flow diagram

Statistical analysis

Categorical and ordinal data were presented as frequency and percentage values. Categorical data were analyzed using chi-square test. Numerical data were presented as mean and standard deviation values and were analyzed for normality by viewing the data distribution and by using Shapiro-Wilk's test. Age and pulse rate data were found to be normally distributed and were analyzed using one-way ANOVA followed by Tukey's post hoc test intergroup comparisons and repeated measures ANOVA followed by Bonferroni post hoc test for intragroup comparisons. Other numerical data were found to be non-parametric and were analyzed along with ordinal data using Kruskal-Wallis's test followed by Dunn's post hoc test for intergroup comparisons and using Friedman's test followed by Nemenyi's post hoc test for intragroup comparisons. Correlations were analyzed using Spearman's rank order correlation coefficient. Statistical analysis was performed with R statistical analysis software version 4.3.2 for Windows (R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.)

Null hypothesis:

There is no difference between vibration, vibration-cold, precooling, and topical anesthesia in reducing pain during buccal infiltration injection in children.

Post-operative care:

- The parent/caregiver and their child were instructed that the lip is numb for an hour and maybe more and this might lead to traumatic lip ulcer. If it occurs, palliative treatment will be performed.
- The child should bite on the cotton for an hour to prevent bleeding.
- The child is not allowed to eat on the extraction site on the day of extraction.
- The child is instructed to eat soft and cold food items.
- The child is not allowed to rinse his/her mouth post-operatively.
- If there was pain post-operatively, the parent/caregiver was instructed to provide analgesic to their child.

RESULTS

The trial was conducted on 96 children that were equally and randomly allocated to each of the four studied groups (i.e., 24 cases per group). Different demographic data and baseline characteristics are presented in table (1). There was no statistically significant difference between the tested groups regarding different baseline characteristics ($p>0.05$).

Results of inter and intragroup comparisons and summary statistics for different clinical parameters are presented in table (2). Results of intergroup comparisons showed that during injection, group 4 (topical anesthesia) had significantly higher pulse rate than group 2 (buzzy with vibration-cold) ($p=0.007$). While after anesthesia, group 4 (topical anesthesia) had significantly higher pulse rate than all other groups ($p<0.001$). For all other parameters, the difference was not statistically significant ($p>0.05$).

Results of intragroup comparisons for group 4 (topical anesthesia) showed that there was a statistically significant increase of pulse rate during injection and after anesthesia ($p<0.001$), while for group 2 (vibration-cold), they showed a significant reduction in oxygen saturation during injection ($p=0.003$). Other comparisons were not statistically significant ($p>0.05$).

Results of intergroup comparisons and summary statistics for satisfaction questionnaires for children and parents are presented in tables (3) and (4). Results showed for all questions in both questionnaires, there was no statistically significant difference between different tested groups ($p>0.05$).

TABLE (1) Intergroup comparisons of demographic data

Parameter		Group (1)	Group (2)	Group (3)	Group (4)	Test statistic	*p*-value
Gender [n (%)]	***Male***	16 (66.67%)	15 (62.50%)	9 (37.50%)	13 (54.17%)	**4.84**	**0.184**
	Female	8 (33.33%)	9 (37.50%)	15 (62.50%)	11 (45.83%)		
Age (Mean± SD) (years)		8.40±1.83	9.60±1.70	8.62±1.91	7.95±1.15	**0.35**	**0.792**
Dental history [n (%)]	***No previous history***	7 (29.17%)	4 (16.67%)	8 (33.33%)	5 (20.83%)	**2.22**	**0.528**
	Previous dental treatment	17 (70.83%)	20 (83.33%)	16 (66.67%)	19 (79.17%)		
DMF (Mean± SD)		1.38±1.69	2.21±1.47	1.83±1.71	1.83±1.40	**3.79**	**0.285**
def (Mean± SD)		5.96±3.16	5.04±3.57	5.71±3.54	6.62±2.68	**3.53**	**0.317**
Extracted primary tooth [n (%)]	***Canine***	0 (0.00%)	1 (3.57%)	0 (0.00%)	0 (0.00%)	**4.66**	**0.588**
	First molar	18 (60.00%)	15 (53.57%)	15 (57.69%)	18 (72.00%)		
	Second molar	12 (40.00%)	12 (42.86%)	11 (42.31%)	7 (28.00%)		

TABLE (2) Inter and intragroup comparisons of different clinical parameters.

Parameter	Interval	Group (1)	Group (2)	Group (3)	Group (4)	Test statistic	*p*-value
Wong Baker scale (Mean± SD)	***Before injection***	1.92±2.86^{Aa}	1.83±3.33^{Aa}	1.17±2.63^{Aa}	2.08±2.47^{Aa}	**3.76**	**0.289**
	After injection	1.17±1.17^{Aa}	1.08±1.44^{Aa}	1.17±1.66^{Aa}	1.50±2.06^{Aa}	**0.44**	**0.932**
	Test statistic	**65.00**	**51.00**	**42.00**	**77.00**		
	p-value	**0.437**	**0.361**	**0.831**	**0.341**		
Pulse rate (Mean± SD)	***Before injection***	96.04±10.07^{ABa}	93.96±16.24^{Aa}	98.12±9.94^{ABa}	99.75±13.76^{Ab}	**0.92**	**0.432**
	During injection	98.62±12.52^{ABa}	89.43±15.90^{Ba}	98.48±10.49^{ABa}	104.09±16.07^{Aa}	**4.27**	**0.007***
	After injection	97.61±11.87^{Ba}	91.26±14.37^{Ba}	99.50±10.15^{Ba}	110.22±12.14^{Aa}	**9.52**	**<0.001***
	Test statistic	**0.69**	**2.57**	**2.57**	**10.44**		
	p-value	**0.507**	**0.088**	**0.089**	**<0.001***		
Oxygen saturation (%) (Mean± SD)	***Before injection***	97.13±1.69^{Aa}	97.11±2.49^{Aa}	97.74±1.45^{Aa}	97.00±1.75^{Aa}	**2.60**	**0.457**
	During injection	95.64±3.76^{Aa}	91.68±8.11^{Ab}	93.86±6.71^{Aa}	93.21±5.12^{Aa}	**3.17**	**0.367**
	After injection	97.14±2.03^{Aa}	96.20±3.76^{Aab}	95.52±4.11^{Aa}	96.90±1.65^{Aa}	**1.25**	**0.740**
	Test statistic	**1.20**	**11.41**	**3.71**	**6.09**		
	p-value	**0.549**	**0.003***	**0.156**	**0.053**		
SEM (Mean± SD)		0.58±1.86^{A}	0.46±1.28^{A}	0.42±1.02^{A}	0.12±0.45^{A}	**1.91**	**0.592**

Values with different upper and lowercase superscript letters within the same horizontal row and vertical column respectively are significantly different, *Significant (p<0.05).

TABLE (3) Intergroup comparison of answers to parents' questionnaire.

Question	Answer	n (%)				Test statistic	*p*-value
		Group (1)	Group (2)	Group (3)	Group (4)		
Q1	*Strongly disagree*	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (4.17%)	**4.17**	**0.243**
	Disagree	2 (8.33%)	0 (0.00%)	0 (0.00%)	0 (0.00%)		
	No opinion	1 (4.17%)	1 (4.17%)	1 (4.17%)	0 (0.00%)		
	Agree	15 (62.50%)	11 (45.83%)	16 (66.67%)	15 (62.50%)		
	Strongly agree	6 (25.00%)	12 (50.00%)	7 (29.17%)	8 (33.33%)		
Q2	*Strongly disagree*	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**0.86**	**0.836**
	Disagree	1 (4.17%)	1 (4.17%)	0 (0.00%)	0 (0.00%)		
	No opinion	1 (4.17%)	1 (4.17%)	1 (4.17%)	0 (0.00%)		
	Agree	14 (58.33%)	11 (45.83%)	15 (62.50%)	15 (62.50%)		
	Strongly agree	8 (33.33%)	11 (45.83%)	8 (33.33%)	9 (37.50%)		
Q3	*Strongly disagree*	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**2.16**	**0.539**
	Disagree	1 (4.17%)	0 (0.00%)	0 (0.00%)	1 (4.17%)		
	No opinion	1 (4.17%)	1 (4.17%)	0 (0.00%)	0 (0.00%)		
	Agree	14 (58.33%)	11 (45.83%)	17 (70.83%)	13 (54.17%)		
	Strongly agree	8 (33.33%)	12 (50.00%)	7 (29.17%)	10 (41.67%)		
Q4	*Strongly disagree*	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	**3.48**	**0.323**
	Disagree	0 (0.00%)	1 (4.17%)	0 (0.00%)	0 (0.00%)		
	No opinion	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)		
	Agree	14 (58.33%)	10 (41.67%)	18 (75.00%)	14 (58.33%)		
	Strongly agree	10 (41.67%)	13 (54.17%)	6 (25.00%)	10 (41.67%)		
Q5	*Strongly disagree*	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (4.17%)	**5.68**	**0.128**
	Disagree	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (4.17%)		
	No opinion	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)		
	Agree	14 (58.33%)	10 (41.67%)	18 (75.00%)	13 (54.17%)		
	Strongly agree	10 (41.67%)	14 (58.33%)	6 (25.00%)	9 (37.50%)		

TABLE (4) Intergroup comparison of answers to children questionnaire.

Question	Answer	n (%)				Test statistic	*p*-value
		Group (1)	Group (2)	Group (3)	Group (4)		
Q1	***Negative***	2 (8.33%)	3 (12.50%)	5 (20.83%)	3 (12.50%)	**2.08**	**0.556**
	Neutral	1 (4.17%)	4 (16.67%)	0 (0.00%)	4 (16.67%)		
	Positive	21 (87.50%)	17 (70.83%)	19 (79.17%)	17 (70.83%)		
Q2	***Negative***	4 (16.67%)	8 (33.33%)	4 (16.67%)	8 (33.33%)	**4.87**	**0.128**
	Neutral	1 (4.17%)	2 (8.33%)	0 (0.00%)	1 (4.17%)		
	Positive	19 (79.17%)	14 (58.33%)	20 (83.33%)	15 (62.50%)		
Q3	***Negative***	4 (16.67%)	8 (33.33%)	3 (12.50%)	7 (29.17%)	**5.15**	**0.161**
	Neutral	1 (4.17%)	2 (8.33%)	1 (4.17%)	2 (8.33%)		
	Positive	19 (79.17%)	14 (58.33%)	20 (83.33%)	15 (62.50%)		
Q4	***Negative***	0 (0.00%)	1 (4.17%)	0 (0.00%)	2 (8.33%)	**1.46**	**0.692**
	Neutral	1 (4.17%)	2 (8.33%)	2 (8.33%)	1 (4.17%)		
	Positive	23 (95.83%)	21 (87.50%)	22 (91.67%)	21 (87.50%)		
Q5	***Negative***	0 (0.00%)	1 (4.17%)	0 (0.00%)	2 (8.33%)	**2.39**	**0.495**
	Neutral	1 (4.17%)	2 (8.33%)	2 (8.33%)	2 (8.33%)		
	Positive	23 (95.83%)	21 (87.50%)	22 (91.67%)	20 (83.33%)		
Q6	***Negative***	0 (0.00%)	1 (4.17%)	0 (0.00%)	2 (8.33%)	**1.46**	**0.692**
	Neutral	1 (4.17%)	2 (8.33%)	2 (8.33%)	1 (4.17%)		
	Positive	23 (95.83%)	21 (87.50%)	22 (91.67%)	21 (87.50%)		

Results of the associations between children gender and different measured clinical parameters presented in table (5) showed that for Wong Baker scale and pulse rate, the association was statistically significant with females having significantly higher values than males ($p<0.05$). However, for other measurements, the associations were not statistically significant ($p>0.05$).

Results of the correlations between children age and different measured clinical parameters presented in table (6) showed that for pulse rate, there was a moderate negative correlation with age that was statistically significant (rs=-0.312, $p<0.001$). For other parameters, the correlations were not statistically significant ($p>0.05$).

TABLE (5) Associations between clinical parameters and gender.

Parameter	Mean± SD		Test statistic	*p*-value
	Male	*Female*		
Wong Baker scale	1.23±2.22	1.81±2.37	3761.00	0.019*
Pulse rate	96.34±15.70	99.23±11.35	7915.00	0.025*
Oxygen saturation	95.91±4.43	95.43±4.51	8280.00	0.617
SEM	0.23±0.89	0.60±1.58	937.00	0.066

Significant (p<0.05).

TABLE (6) Correlations between clinical parameters and age.

Parameter	Correlation coefficient (95% CI)	Test statistic	*p*-value
Wong Baker scale	-0.086 (-0.225: 0.056)	1280897.67	0.236
Pulse rate	-0.312 (-0.414: -0.201)	4596091.92	<0.001*
Oxygen saturation	-0.062 (-0.183: 0.062)	2933479.00	0.328
SEM	-0.023 (-0.222: 0.178)	150812.21	0.825

Significant (p<0.05).

DISCUSSION

Children and their parents usually seek painless injections. Fear from local anesthetic injections may lead to difficulty in providing pleasant dental experience for the child and the dentist. The ultimate goal of pediatric dentistry is to provide painless local anesthetic injection. There are different modalities to decrease the effect of needle pricking such as vibration, cooling, and topical anesthetics.

According to the systematic review by Faghihian et al.,[11] it was concluded that buzzy device has promising effect in reducing pain during injection. They recommended the conduction of research with high quality to assess the effect of vibration and buzzy devices in decreasing pain in children.

The use of topical anesthetic gel is the most used method of providing painless injections,[12] thus, it was used as a comparator in this study. The use of precooling is considered an acceptable method for achieving painless needle prick.

Wong-Baker Faces pain rating scale was used as a valid tool for pain assessment by children before and after injection, it is considered as a subjective tool. The different methods used in this study did not show differences in the results of the scale.

Pulse oximeter is a non-invasive simple method. It is used to measure both the pulse rate and the oxygen saturation. IN et al.,[9] stated that dental procedures which provoke fear and anxiety may affect the pulse rate and oxygen saturation.

Buzzy (vibration-cold) showed lower pulse rate measures during and after injection indicating less pain experience by the children. This is consistent with Alanazi et al.,[1] who mentioned that the use of vibration and cold reduces the pain reaction. The results of the present study confirmed that the use of vibration and cold was accepted by the children as agreed by Tirupathi et al.[13]

It was observed that all children had normal oxygen saturation levels denoting no hypoxemia in accordance with Khanal et al.[14] There was a decrease in the oxygen saturation during and after the dental injection which is consistent with the results of. [9,14,15]

Females reported high measurement than males regarding the Wong-baker face pain scale and pulse rate similar to Khanal et al.,[14] as they mentioned that females had high pulse rate compared to males. Also, Shim et al.,[16] found that females have higher anxiety and fear levels that is related to dental pain level.

Children's age and pulse rate were correlated, thus, with increase in children's age the pulse rate decreases and this is in accordance with Achmad et al.,[17] and eventually the dental anxiety decreases similar to Al-Khotani et al.[18]

Regarding satisfaction questionnaires for children and parents, most of the children and their parents were satisfied with the dental treatment process similar to Tahmassebi et al.[10]

This trial is limited to children extracting their upper tooth using buccal infiltration and thus it was not experienced in nerve block injections or other types of injections. It is recommended that further studies can be conducted on other types of injections and on lower jaw for decreasing needle pain injections. One of the strengths is that this study is a randomized controlled trial conducted on children where limited articles are available in the dental literature concerning the use of buzzy device.

CONCLUSION

Buzzy device (vibration-cold) is effective in reducing pain during buccal infiltration injection and was accepted by the children and their parents.

Funding:

This study was self-funded.

Conflict of interest statement:

The authors declare no conflict of interest.

Acknowledgement

We would like to acknowledge all the children and their parents for their cooperation and participation.

REFERENCES

1. 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 Dent. 2019;20:79-84. doi:10.1007/s40368-018-0399-8
2. Ballard A, Khadra C, Adler S, Trottier ED, Le May S. Efficacy of the Buzzy Device for Pain Management During Needle-related Procedures: A Systematic Review and Meta-Analysis. Clin J Pain. 2019;35(6):532-43. doi:10.1097/AJP.0000000000000690
3. Ghaderi F, Banakar S, Rostami S. Effect of pre-cooling injection site on pain perception in pediatric dentistry: "A randomized clinical trial." Dent Res J (Isfahan). 2013;10(6):790. doi:10.4103/1735-3327.122486
4. Baxter AL, Cohen LL, McElvery HL, Lawson ML, von Baeyer CL. An integration of vibration and cold relieves venipuncture pain in a pediatric emergency department. Pediatr Emerg Care. 2011;27(12):1151-56. doi:10.1097/PEC.0B013E318237ACE4
5. Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965;150(3699):971-79. doi:10.1126/SCIENCE.150.3699.971 Cited in: Simoncini, E., Stiaccini, G., Morelli, E., Trentini, E., Peroni, D. G. & Cicco, M. Di (2023) The Effectiveness of the Buzzy Device in Reducing Pain in Children Undergoing Venipuncture A Single-Center Experience.

6. Nahra H, Plaghki L. Innocuous skin cooling modulates perception and neurophysiological correlates of brief CO2 laser stimuli in humans. Eur J Pain. 2005;9(5):521. doi:10.1016/J.EJPAIN.2004.11.007

7. Wong DL, Baker CM. Pain in children: comparison of assessment scales. Pediatr Nurs. 1988;14(1):9-17. Cited in: Cohen, L. L., Lemanek, K., Blount, R. L., Dahlquist, L. M., Lim, C. S., Palermo, T. M., McKenna, K. D. & Weiss, K. E. (2008) Evidence-Based Assessment of Pediatric Pain. Journal of Pediatric Psychology [Online], 33 (9) October, p. 939.

8. Wright G, Weinberger S, Marti R, Plotzke O. The effectiveness of infiltration anesthesia in the mandibular primary molar region . Pediatr Dent. 1991;13(5):278-83. https://pubmed.ncbi.nlm.nih.gov/1815200/.

9. In I-I, Bi M, Pu O. The Effect of Dental Operative Procedures on Peripheral Oxygen Saturation and Pulse Rate in Children in Benin-City, Nigeria. Ann Med Health Sci Res. 2018;8:74-78.

10. Tahmassebi JF, BaniHani A, Alzahrani F. Children and carer`s experience and satisfaction of two local anaesthetic techniques; for treatment of carious mandibular primary molars in children. J Dent Sci Oral Maxillofac Res. 2018;1(1):3-11. doi:10.30881/JDSOMR.00004

11. Faghihian R, Rastghalam N, Amrollahi N, Tarrahi MJ. Effect of vibration devices on pain associated with dental injections in children: A systematic review and meta-analysis. Aust Dent J. 2021;66(1):4-12. doi:10.1111/ADJ.12811

12. Dasarraju RK, SVSG N. Comparative efficacy of three topical anesthetics on 7-11-year-old children: a randomized clinical study. J Dent Anesth pain Med. 2020;20(1):29. doi:10.17245/JDAPM.2020.20. 1.29

13. Tirupathi SP, Nanda N, Pallepagu S, et al. The combined effect of extraoral vibratory stimulus and external cooling on pain perception during intra-oral local anesthesia administration in children: a systematic review and meta-analysis. J Dent Anesth Pain Med. 2022;22(2):87. doi:10.17245/JDAPM.2022.22.2.87

14. Khanal S, Shah P, Khapung A. Effect of Routine dental procedures on the pulse rate and peripheral oxygen saturation in pediatric patients. Nepal Med Coll J. 2023;25(3):251-58. doi:10.3126/NMCJ.V25I3. 58732

15. Kalra N, Sabherwal P, Tyagi R, Khatri A, Srivastava S. Relationship between subjective and objective measures of anticipatory anxiety prior to extraction procedures in 8- to 12-year-old children. J Dent Anesth Pain Med. 2021;21(2):119-28. doi:10.17245/jdapm.2021.21. 2.119

16. Shim Y-S, Kim A-H, Jeon E-Y, An S-Y. Dental fear & anxiety and dental pain in children and adolescents; a systemic review. J Dent Anesth Pain Med. 2015;15(2):2383-9309. doi:10.17245/jdapm.2015. 15.2.53

17. Achmad MH, Horax S, Rizki SS, et al. Pulse Rate Change After Childhood Anxiety Management with Modeling and Reinforcement Technique of Children's Dental Care. Pesqui Bras Odontopediatria Clin Integr. 2019;19:1-7. doi:10.4034/PBOCI.2019.191.97

18. Al-Khotani A, A'aziz Bello L, Christidis N. Effects of audiovisual distraction on children's behaviour during dental treatment: a randomized controlled clinical trial . Acta Odontol Scand. 2016;74(6):494-501. doi:10.1080/00016357.2016.1206211