ORIGINAL RESEARCH

Effect of Bubble Breath Play Therapy in Anxiety Levels and Pain Perception in Children Receiving Local Anesthesia: A Randomized Clinical Trial

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Abstract

Aim and objectives: The objective of the study was to evaluate the effect of breathing exercise with and without bubble breath play therapy (BBPT) on pain perception and anxiety levels during local anesthesia administration in children aged between 6 and 11 years.

Materials and methods: Total 36 children were selected and randomly allocated between two experimental groups and a control group. Group A: BBPT, group B: diaphragmatic breathing exercises (DBE), and group C: conventional techniques. The effectiveness of breathing exercise, BBPT, and behavior management technique in reducing anxiety levels and pain perception was assessed before intervention, after intervention, during local anesthetic (LA) administration, and after treatment using the animated visual pain rating scale (VPRS), pulse rate, oxygen saturation, Frankl's scale, FLACC (face, legs, activity, cry, consolability) scale, and relaxation measurement scale (RMS).

Results: There were no significant differences found between the two intervention groups (group A and group B). Both intervention groups significantly reduced dental pain and anxiety in children.

Conclusion: BBPT is found to be a simple relaxation and distraction method, which can be considered fun and enhances rapport between doctor and children during treatment. The use of such a technique to relieve the pain and anxiety associated with even a brief painful procedure should be encouraged.

Keywords: Behavior management, Behavior management techniques, Bubble breath play therapy, Dental anxiety.

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Introduction

Pediatric dentistry primarily aims to offer preventive and thorough dental care for children from childhood through adolescence. The success of a dental treatment for a child and promoting a positive attitude toward dental care relies on the clinician's expertise and understanding.[1] In pediatric dentistry, it is important for the clinician to have knowledge of child behavior and techniques for managing behavior. Effective behavior management techniques are crucial for success in child dentistry.[1,2] Without proper management of behavior, performing a successful dental procedure on an uncooperative child would be difficult.[2]

Dental anxiety in children often leads to missed appointments and prolonged duration for treatment. This could be a reason for dental neglect in children. There are numerous reasons for the child to develop dental anxiety.[3] The sharp instruments (e.g., explorer, probe), noise and vibrations produced by the airotor, pain due to local anesthesia administration, could induce objective fear in children. Psychological approaches are most commonly used to help the child cope with dental stress and anxiety. Techniques such as tell-show-do, modeling, distraction, and reinforcement are widely used by the dentist to manage the child in the dental office.[4]

In the field of psychotherapy, play therapy is frequently employed by clinicians as a therapeutic intervention aimed at aiding children in coping with and addressing challenging or distressing circumstances.[5] Enhancing the rapport between the dentist and young patients fosters emotional regulation in a positive manner. Furthermore, the bubble breath play toy has been recognized as a beneficial relaxation training tool, aiding in the reduction of excessive neural activity in children and facilitating the development of healthier coping mechanisms.[5–7]

Therefore, this current clinical research was carried out to assess the impact of utilizing bubble breath play therapy (BBPT) in alleviating dental anxiety in pediatric patients, necessitating the use of local anesthesia prior to commencing the dental procedure.

Materials and Methods

Prior to participating in the study, the parent/guardian provided written consent after receiving information regarding the study's purpose and procedures. The ethical clearance for the study was obtained by the Institutional Ethics and Review Committee.

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A total of 42 children belonging to the age-group 6–11 years and fulfilling the inclusion criteria were selected for the study.

The selected participants were randomly allocated to the two experimental groups and a control group.

Group A (BBPT): breathing exercise with BBPT.

Group B [diaphragmatic breathing exercises (DBE)]: breathing exercise without BBPT.

Group C (control group): conventional behavior management techniques.

Participant Preparation

Group A (BBPT)

In the BBPT group, the initial approach involved facilitating the child's engagement with bubble breath play materials. In addition, we incorporated a mindfulness breathing technique into the intervention, instructing the child to inhale deeply and exhale slowly and rhythmically while blowing a bubble to their fullest capacity. The child was instructed to engage in deliberate, slow practice for approximately 5 minutes. Subsequently, we instructed the child to carefully monitor their breathing rhythm. We then directed the child to maintain consistent breathing patterns throughout the dental procedure.

Group B (DBE)

The child was instructed to adopt a comfortable and relaxed sitting position. One hand was positioned on the upper chest area, while the other hand was placed just beneath the rib cage. This enabled the child to perceive the movement of the diaphragm while inhaling and exhaling. The researcher initiated the session by instructing the children in the practice of deep breathing, which involves taking deep breaths from the abdomen and slowly exhaling. The participant was directed to inhale gradually through the nostrils, causing the abdomen to expand against their hand, resulting in the hand rising. The hand should maintain stillness on the child's chest.

Group C (Conventional Method)

The children were treated without breathing exercises. The children were treated with conventional behavior management techniques like tell-show-do, modeling, and distractions.

Clinical Assessment

RMS Pictorial Scale

Children belonging to the intervention groups (groups A and B) were assessed before breathing exercise and after the procedure using the relaxation measurement (RMS) pictorial scale.

Pulse Rate and Oxygen Saturation

Pulse rate and oxygen saturation of the children were checked using a pulse oximeter, wherein the ideal pulse rate is 60–100 beats per minute and the ideal oxygen saturation is between 96 and 99%. Pulse rate and oxygen saturation of group I were checked before BBPT, after BBPT, before the procedure, and after the procedure. Whereas pulse rate of group II was checked before breathing exercise and after the procedure.

Frankl's Behavior Rating Scale

Behavior of the children in group I was assessed before BBPT and after the procedure, whereas in group II, they were assessed before breathing exercise and after the procedure.

FLACC Scale

Pain was assessed through observation of five categories, including face, legs, activity, cry, and consolability, during the procedure in both groups.

Animated Visual Pain Rating Scale

The animated visual pain rating scale (VPRS) has five animated emoji face graphic exchange formats that depicted a range of feelings from very happy/laughing to very unhappy/sad and crying (most positive to most negative feelings). The children were asked to select one of these animated emojis that best suited their feelings at that moment. It was assessed after the procedure in both groups.

Statistical Analysis

All data were analyzed using Statistical Package for the Social Sciences (SPSS), version 20 (SPSS Inc., Chicago, IL, USA). The level of significance was set at 5% ($p < 0.05$). The differences in the mean anxiety at the first and second visit between the groups were compared using the Mann–Whitney *U* test, and intragroup comparisons were done using the Wilcoxon signed-rank test. Intergroup comparisons of the pulse rate at the three different time intervals were done using the repeated measures ANOVA. Intergroup comparison of behavior at the time of injection and the outcomes of the pain scale [FLACC (face, legs, activity, cry, consolability)] was done using Pearson's Chi-squared test. Intergroup comparison of the outcomes of the novel animated pain rating scale was done using the Mann–Whitney *U* test.

Results

A total of 24 (57%) boys and 18 (43%) girls participated in the study. The mean age of the participants was 8.2 years. The mean and standard deviation values are given in Tables 1 to 5. Before the intervention, no significant differences were found between the three groups.

Pulse Rate and Oxygen Saturation

Pulse rate and oxygen saturation measured at various time intervals did not show significant results in the two experimental groups. However, both groups demonstrated significantly better results than the control group.

Table 1: Comparison of pulse rate, oxygen saturation, and RMS scale between the groups recorded after intervention

		Mean	*Standard deviation*	*t*	*Sig.*
Pulse rate	Group A	76.4167	7.35414	0.053	0.782 (NS)
	Group B	76.2500	8.13662		
Oxygen saturation	Group A	95.7500	2.92715	1.184	0.249 (NS)
	Group B	93.7500	5.06548		
RMS scale	Group A	1.6700	0.49200	3.043	0.030 (S)
	Group B	1.9200	0.66900		

Table 2: Pulse rate, oxygen saturation, and FLACC values during LA administration

		Mean	*Standard deviation*	*F*	*Sig.*
Pulse rate	Group A	77.5833	7.02539	0.579	0.566 (NS)
	Group B	80.2500	8.32439		
	Group C	81.0000	9.04534		
Oxygen saturation	Group A	94.7500	4.55522	0.662	0.523 (NS)
	Group B	92.5833	6.44499		
	Group C	91.8333	7.90665		
FLACC	Group A	1.7500	1.86474	0.6219	0.005 (HS)
	Group B	1.4167	1.08362		
	Group C	3.7500	2.13733		

Table 3: Comparison of pulse rate, oxygen saturation, and FLACC between the groups during LA administration

						95% CI	
			Mean difference	*Std. error*	*Sig.*	*Lower bound*	*Upper bound*
Pulse rate	Group A	Group B	–0.66667	3.33725	0.706 (NS)	–10.8556	5.5222
		Group C	–3.41667	3.33725	0.567 (NS)	–11.6056	4.7722
	Group B	Group C	–0.75000	3.33725	0.973 (NS)	–8.9389	7.4389
Oxygen saturation	Group A	Group B	2.16667	2.63315	0.692 (NS)	–4.2946	8.6279
		Group C	2.91667	2.63315	0.516 (NS)	–3.5446	9.3779
	Group B	Group C	0.75000	2.63315	0.956 (NS)	–5.7112	7.2112
FLACC	Group A	Group B	0.33333	0.71569	0.888 (NS)	–1.4228	2.0895
		Group C	–2.00000	0.71569	0.023 (S)	–3.7561	–0.2439
	Group B	Group C	–2.33333	0.71569	0.007 (HS)	–4.0895	–0.5772

Table 4: Animated VPRS, pulse rate, oxygen saturation, and Frankl's behavior rating values after treatment

		Mean	*Standard deviation*	*F*	*Sig.*
Animated VPRS	Group A	2.0833	0.79296	5.395	0.009 (HS)
	Group B	1.9167	0.66856		
	Group C	2.8333	0.71774		
Pulse rate	Group A	75.3333	6.47138	7.029	0.003 (HS)
	Group B	74.5000	6.52965		
	Group C	86.2500	11.64728		
Oxygen saturation	Group A	91.0000	8.79049	0.128	0.880 (NS)
	Group B	92.6667	6.30055		
	Group C	92.0833	9.15978		
Frankl's behavior	Group A	3.0833	0.66856	4.042	0.027 (S)
	Group B	2.7500	0.62158		
	Group C	2.3333	0.65134		

Table 5: Intergroup comparison of animated VPRS, pulse rate, oxygen saturation, and Frankl's behavior rating values after treatment

						95% CI	
			Mean difference	*Std. error*	*Sig.*	*Lower bound*	*Upper bound*
Animated VPRS	Group A	Group B	0.16667	0.29729	0.842 (NS)	–0.5628	0.8962
		Group C	–0.75000	0.29729	0.043 (S)	–1.4795	–0.0205
	Group B	Group C	–0.91667	0.29729	0.011 (S)	–1.6462	–0.1872
Pulse rate	Group A	Group B	0.83333	3.49741	0.969 (NS)	–7.7486	9.4153
		Group C	–10.9167	3.49741	0.010 (S)	–19.4986	–2.3347
	Group B	Group C	–11.7500	3.49741	0.005 (HS)	–20.3319	–3.1681
Oxygen saturation	Group A	Group B	–1.66667	3.34059	0.872 (NS)	–9.8638	6.5304
		Group C	–1.08333	3.34059	0.944 (NS)	–9.2804	7.1138
	Group B	Group C	0.58333	3.34059	0.983 (NS)	–7.6138	8.7804
Frankl's behavior	Group A	Group B	0.33333	0.26432	0.427 (NS)	–0.3153	0.9819
		Group C	0.75000	0.26432	0.021 (S)	0.1014	1.3986
	Group B	Group C	0.41667	0.26432	0.270 (NS)	–0.2319	1.0653

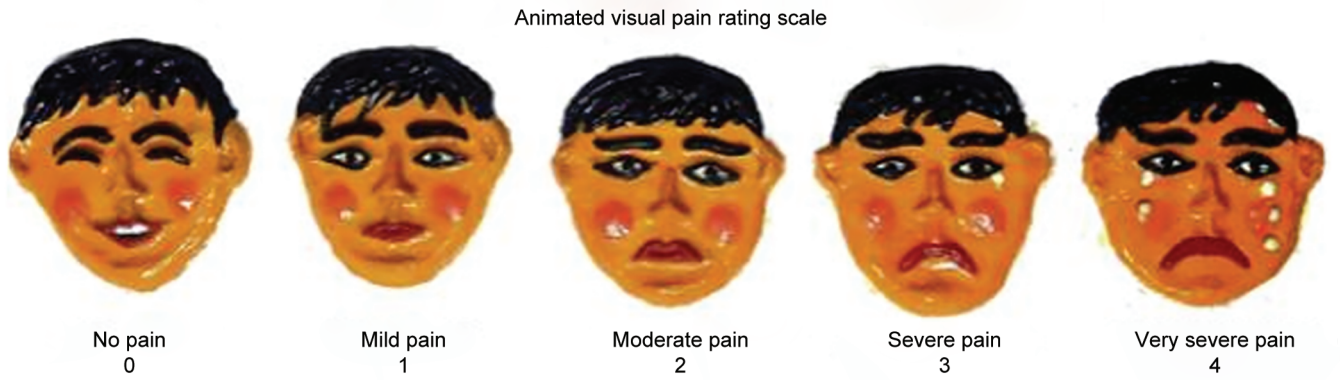

Fig. 1: Animated VPRS

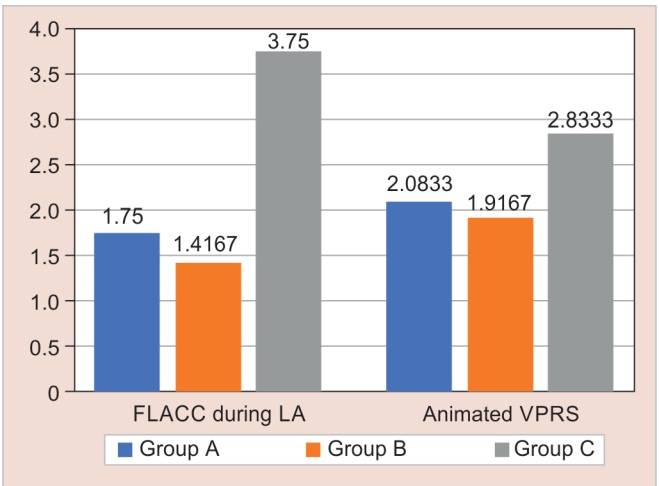

Fig. 2: Comparison of FLACC and animated VPRS between the groups

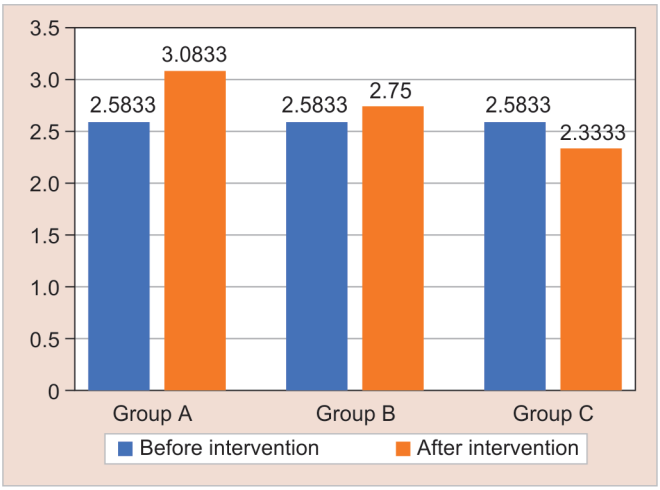

Fig. 4: Comparison of Frankl's behavior rating values among the groups

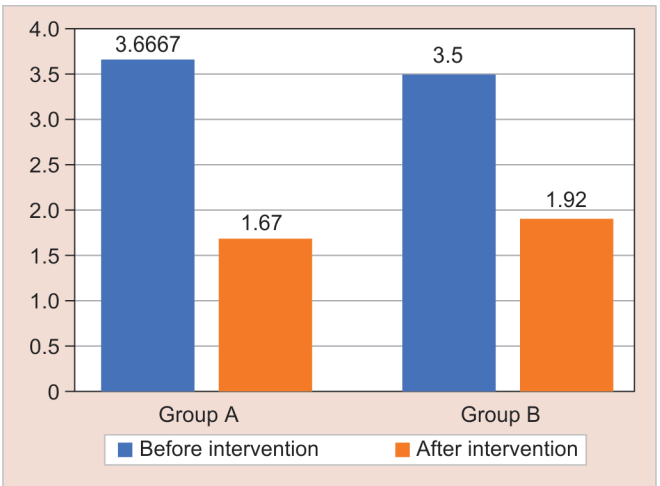

Fig. 3: Comparison of RMS scale between the test groups (groups A and B)

Both intervention techniques significantly reduced the child's dental fear before starting the procedure when recorded using the RMS pictorial scale (Fig. 1, Fig. 2 and Fig. 3). During local anesthetic (LA) administration, FLACC scoring (Fig. 3) was significantly different between groups A and C, and highly significant differences were observed between groups B and C. Statistically significant differences were found in animated VPRS (Fig. 3) between groups A and C, and between groups B and C. After treatment, no significant result was obtained between the experimental groups. However, both groups significantly reduced the child's pain perception compared to the control group.

Frankle's Behavior Rating

The number of children exhibiting positive behavior after treatment was higher in group A, followed by group B (Fig. 4). In the control group, the tendency of the child's behavior shifted from positive to negative after the treatment.

Discussion

Dental phobia poses a significant obstacle in the field of pediatric dentistry. Patients who are feeling anxious tend to expect to feel more pain than they end up actually experiencing. The adverse effects of dental fear and anxiety result in uncooperative behavior in children, lack of responsiveness, and diminished satisfaction with dental procedures.[8] The presence of dental anxiety in children can create a challenging atmosphere for collaborative work between the child and the dentist. However, behavior management techniques have been shown to effectively address and manage dental anxiety in pediatric patients.[9,10]

Numerous strategies for behavioral management have been suggested in order to assist children in conquering their dental phobias and anxieties, as well as to enhance their conduct throughout dental procedures.[11–13] Research has demonstrated

the efficacy of mindful DBE in reducing anxiety levels among both adults and children.[8]

Diaphragmatic breathing exercises are distinguished by increased levels of both inhalation and exhalation. There are several advantages of DBE for an individual. It alleviates stress and anxiety while enhancing cardiovascular health indicators. It lowers the heart rate and blood pressure by enhancing parasympathetic activity and reducing sympathetic tone in blood vessels.[14] Additionally, it diminishes the production of stress hormones like epinephrine and cortisol, while also assisting in maintaining a physiological equilibrium within an individual.[15]

In this research, participants were taught about the respiratory exercise utilizing the bubble breath play toy, which was then compared to the traditional breathing technique. BBPT is a simple relaxation technique that is viewed as enjoyable and fosters nonintimidating communication between the child and dentist. In both the experimental groups, before commencing the dental procedure, the children were directed to place one hand on their abdomen and the other hand on their chest while seated in the dental chair. At the same time, the children were directed to close their eyes and concentrate solely on the movements of their diaphragm.

Omidpanah et al.[16] showed that the topical anesthetic agent is equally effective to BBPT in reducing the pain associated with local anesthetic (LA) administration. BBPT effectively mitigated the stress and anxiety associated with being hospitalized.[17] In another clinical trial, DBE was taught to the children through the use of pinwheels as a teaching tool. Research indicated that utilizing pinwheel breathing exercises and DBE notably decreased levels of dental anxiety when administering local anesthesia.[18] An additional research project conducted a comparison between various forms of play therapy (specifically, picking up sticks, bubble blowing, and building blocks) and traditional physiotherapy in hospitalized children following surgery. It was determined that both play therapy and physiotherapy were successful in decreasing pain and anxiety levels.[19]

The findings of this research align with the previous study carried out by Azher et al. The dental fear and anxiety levels of pediatric patients receiving local anesthesia were evaluated. In the aforementioned research, the intervention known as BBPT was thoroughly explained to both the parents and child during the initial visit. During this visit, instructions regarding the therapy were provided to both the child and parents. Subsequently, the treatment was administered during the second visit.[20]

In contrast to traditional DBE methods, children in the BBPT are taught breathing exercises in an engaging and enjoyable manner. BBPT offers several benefits, such as functioning as a form of play therapy that helps to relax and distract children from the dental environment, thereby maintaining physiological equilibrium through the reduction of stress-inducing hormones.

Conclusion

This research demonstrates that both BBPT and DBE yield comparable efficacy in children for decreasing anxiety levels during the administration of local anesthesia. BBPT may serve as a creative and alternate nonpharmacological approach for managing behaviors in children, with the potential to alleviate stress and anxiety.

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References

1. National Commission on Recognition of Dental Specialties and Certifying Boards. Specialty Definitions. Pediatric Dent. 2018. Available at: https:// ncrdscb.ada.org/recognized-dental-specialties. [Accessed September 7, 2023].
2. Saxena P, Gupta SK, Newaskar V, et al. Advances in dental local anesthesia techniques and devices: an update. Natl J Maxillofac Surg 2013;4(1):19–24. DOI: 10.4103/0975-5950.117873
3. Shrimahalakshmi, Chowdhary N, Rajasekaran S. Awareness and clinical application of chemo mechanical caries removal agent among general dentists and dental specialists in the era of Covid-19 pandemic: a questionnaire survey. Int J Dent Oral Sci 2021;8(9):4284–4291. DOI: 10.19070/2377-8075-21000872
4. Marwah N. Textbook of Pediatric Dentistry. JP Medical Ltd; 2018.
5. Perry BD. Applying principles of neurodevelopment to clinical work with maltreated and traumatized children: the neurosequential model of therapeutics. In: NB Webb (Ed.), Working with Traumatized Youth in Child Welfare. New York, NY: Guilford Press; 2006. pp. 27–52.
6. Siegel DJ. The Mindful Therapist: A Clinician's Guide to Mindsight and Neural Integration. New York, NY: Norton; 2010.
7. Kiran SD, Vithalani A, Sharma DJ, et al. Evaluation of the efficacy of play therapy among children undergoing dental procedure through drawings assessed by graphological method: a clinical study. Int J Clin Pediatr Dent 2018;11(5):412–416. DOI: 10.5005/jp-journals-10005-1549
8. Clinton V, Swenseth M, Carlson SE. Do mindful breathing exercises benefit reading comprehension? A brief report. J Cogn Enhanc 2018;2:305–310. DOI: 10.1007/s41465-018-0067-2
9. Mendoza-Mendoza A, Perea MB, Yañez-Vico RM, et al. Dental fear in children: the role of previous negative dental experiences. Clin Oral Investig 2015;19:745–751. DOI: 10.1007/s00784-014-1380-5
10. Klingberg G, Berggren U, Carlsson SG, et al. Child dental fear: cause-related factors and clinical effects. Eur J Oral Sci 1995;103(6):405–412. DOI: 10.1111/j.1600-0722.1995.tb01865.x
11. Roberts JF, Curzon MEJ, Koch G, et al. Behaviour management techniques in paediatric dentistry. Eur Arch Paediatr Dent 2010;11:166–174. DOI: 10.1007/BF03262738
12. Strøm K, Rønneberg A, Skaare AB, et al. Dentists' use of behavioural management techniques and their attitudes towards treating paediatric patients with dental anxiety. Eur Arch Paediatr Dent 2015;16:349–355. DOI: 10.1007/s40368-014-0169-1
13. Nath SK, Goswami P, Mahalakshmi S, et al. Comparative evaluation of effect of TENS on controlling pain associated with orthodontic separator placement—a clinical study. J Pharm Bioallied Sci 2024;16(Suppl 1):S577–S579. DOI: 10.4103/jpbs.jpbs_871_23
14. Naik GS, Gaur GS, Pal GK. Effect of modified slow breathing exercise on perceived stress and basal cardiovascular parameters. Int J Yoga 2018;11(1):53–58. DOI: 10.4103/ijoy.IJOY_41_16
15. Örün D, Karaca S, Arıkan Ş. The effect of breathing exercise on stress hormones. Cyprus J Med Sci 2021;6(1):22–27. DOI: 10.4274/cjms.2021.2020.2390
16. Omidpanah N, Shahrzad N, Safari R. The effect of topical anesthetic gel versus relaxation exercise in controlling the pain of anterior maxillary injection. Open Dent J 2020;14:752–756. DOI: 10.2174/1874210602014010752
17. Hidajaturrokhmah NY, Madeira A, Dingle K. Giving super bubbles play therapy to reducing anxiety in children due to hospitalization at Gambiran hospital, Kediri city. J Nurs Pract 2022;5(2):239–247. DOI: 10.30994/jnp.v5i2.216
18. Bargale S, Khandelwal JR, Dave BH, et al. Comparative evaluation of effect of two relaxation breathing exercises on anxiety during buccal infiltration anesthesia in children aged 6–12 years: a randomized clinical study. J Indian Soc Pedod Prev Dent 2021;39(3):284–290. DOI: 10.4103/jisppd.jisppd_501_20
19. Deshpande R, Shah MR. Effectiveness of play therapy on pain and anxiety in children post surgery. Int J Health Sci Res 2019;9(4):84–89.
20. Azher U, Srinath SK, Nayak M. Effectiveness of bubble breath play therapy in the dental management of anxious children: a pilot study. J Contemp Dent Pract 2020;21(1):17–21.