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The Impact of Cognitive Behavioural Therapy on Dental Anxiety in Children: A Clinical Trial

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ABSTRACT

Background: Dental anxiety is a common phenomenon experienced by children in the dental setting. Cognitive behavioral therapy (CBT) is a type of psychotherapeutic treatment that helps people learn how to identify and change the destructive or disturbing thought patterns that have a negative influence on their behavior and emotions. Though research has been done on CBT to allay dental anxiety but still its clinical applicability is less explored in dentistry.

Aim: To assess and evaluate the impact of a cognitive-behavioral intervention on dental anxiety in children.

Materials and methods: A total of thirty children, aged 7-10 years were included. The pre assessment anxiety and cooperation levels of the children were determined by using the Modified Child Dental Anxiety Scale (MCDAS), Venham child cooperation scale (VCCS), and Deepak-Parimala Children Perception. The intervention group (group 1) (N=15) received twenty-minute session of cognitive behavioral therapy while control group (group 2) didn't receive any CBT intervention. After CBT in group 1, Local anesthesia was administered in both the groups. Then, the respective measuring scales were again applied.

Results: There was a statistically significant difference in anxiety and cooperation levels measured by MCDAS scale, VCCS scale and Deepak-Parimala anxiety scale in intervention group as compared to control group.

Conclusion: Findings of our study suggests that CBT is an effective intervention for managing dental anxiety in paediatric patients during dental procedures.

Keywords: *Dental anxiety, Cognitive Behavioural Therapy, MCDAS scale, VCCS scale, Deepak-Parimala children perception scale*

1. INTRODUCTION

Dental anxiety (DA) often develops during childhood and is linked to poor oral health outcomes, including untreated cavities, missing teeth, and periodontal issues. These negative outcomes also encompass feelings of embarrassment about poor oral health, diminished self-confidence, and higher rates of skiving from work. DA is a prevalent phenomenon that ranks fifth among the most often feared situations for individuals. Anxious patients are estimated to need approximately 20% more chair time than non-anxious patients, leading to higher associated costs. Therefore, the initial step in managing paediatric dental patients with anxiety is to identify and measure their anxiety using accurate screening tools. There are various scales to detect and measure dental anxiety in children. The first method involves dental professionals observing children's behaviour and reactions during procedures, often using tools like the Venham Clinical Cooperation Rating Scale (VCCS) to evaluate their behaviour. The second method involves children self-reporting their dental anxiety levels using psychometric tools like the Modified Child Dental Anxiety Scale (MCDAS). Also, the Deepak-Parimala Anxiety Scale is the first of its kind, designed to measure children's perceptions for a better understanding of dental anxiety.

Paediatric dentistry commonly employs several methods to deal with dental anxiety, including non-pharmacological and pharmacological therapy. Basic behaviour guidance technique includes Positive pre-visit imagery, Direct observation, Tell-show-do technique, Ask tell ask, Voice control, Positive reinforcement, Distraction, Memory restructuring, Parental presence/absence, nitrous oxide sedation. Advanced behaviour guidance includes Protective stabilization, Sedation and General anaesthesia. But, they all have their own positive and negative outcomes with some limitations. However, a recent systematic review found that the quality of evidence supporting these commonly used methods in paediatric dentistry is low. As a result, it remains uncertain whether these strategies are effective enough in addressing behavioural problems.

Cognitive-behavioral therapy (CBT) is a modern psychological approach that focus on retraining methods and changing behavior through cognitive processes with aim to modify thought and behavioral patterns to influence a person's feelings and behavior. CBT has been used as a psychological intervention to correct day to day behavioral issues of children since long. It involves specific steps to help individuals identify, challenge, and change patterns of thinking and behavior. It works on increased activation of the ventrolateral prefrontal cortex (PFC) and lateral orbitofrontal cortex, suggesting that therapy changes the brain's processing of pain and anxiety. Though research has been done on CBT to allay dental anxiety but still its clinical applicability is less explored in dentistry. Keeping this in consideration, this study aimed to assess the effect of cognitive behavioral interventions on the dental anxiety level of 7–10-year-old dental patients undergoing endodontic treatment.

2. MATERIAL AND METHODS

This study was conducted at the Department of Pediatric and preventive dentistry, People's college of Dental Sciences and research, Bhopal. The study was approved by the Institutional Ethics Committee (PCDS/IEC/2024/4/239). A clinical trial was designed in which the intervention group (Group 1) received cognitive behavioral therapy for forty minutes before endodontic treatment while the control group (Group 2) underwent endodontic treatment with no prior intervention. The inclusion criteria were children aged 7-10 years old, presence of at least one primary molar requiring endodontic therapy under local anesthesia and presence of clinical dental anxiety according to the MCDAS scale. Exclusion criteria consisted of children with Mental disorders, Systemic conditions and genetic defects, History of previous dental treatment, Inability to learn and/or implement psychological relaxation techniques. The sample consisted of thirty eligible children presenting to the OPD of pediatric and preventive dentistry department of People's college of Dental Sciences, Bhopal. In the first session**,** Pretreatment assessment for both Intervention and Control groups were done by using the MCDAS questionnaire which was filled out by the children for measured Children's dental anxiety level. VCCS scale was used to evaluate and assess the scores of the clinical behavior and cooperation of children. Children perception towards dental fear and anxiety (DFA) and dental treatment was measured by using Deepak-Parimala's Scale.

Application of CBT in Intervention Group

The intervention group received cognitive behavioral intervention for forty minutes by dentist trained by physiotherapist. Intervention were as follows:

Step 1- Inhibition of thoughts:

After instructing the children on how to relax their bodies, they were taught to remove negative thoughts from their mind.

Step 2- Relaxation technique:

The relaxation technique involved practicing deep breathing based on Benson's relaxation method, along with progressively tensing and relaxing muscle groups to release tension. It also combined both breathing exercises and muscle relaxation for a more comprehensive approach, and incorporated mental imagery to enhance the calming effect.

Step 3- Breathing technique:

The children were asked to close their eyes, and take a slow, deep breath, allowing the air to fill their stomachs, causing it to

expand like a balloon. Afterward, they were instructed to gently press their hands on their stomachs and slowly release the air, helping them focus on their breath and encouraging relaxation.

Step 4- Progressive muscle relaxation:

Spaghetti hands: The children were told: "Relax your body, breathe as I taught you. Contract your muscles as strong as you can, count to 10, and then take a deep breath, hold your breath, and then release it while telling yourself to calm down. At the same time, quickly relax your muscles until your arms fall down". The children were then requested to close their eyes, breathe slowly, and then imagine a pleasant scene.

Iron feet: The children were requested to focus on their feet: "Stretch your feet, bend the big toe towards the head to tighten the muscles in the front of the leg. While the foot is stretched, lift it a few inches off the ground".

Contracting stomach like a stone: "Loosen and relax your hands and feet, now contract your stomach as if you are going to be punched in the stomach. Count to 10, breathe in, and then breathe out while repeating the word CALM, and relax your stomach".

After completion of CBT intervention, children were administered Local anaesthetic (LA) injection in intervention group.

Control group underwent with LA administration followed by endodontic therapy.

Post-treatment assessment for both Intervention and Control groups:

After completion of the LA procedure, the respective scales were measured again in both the groups and all the steps of the endodontic procedure were performed by paediatric dentist.

3. RESULTS

The sample consisted of thirty children with fifteen children in each intervention and control group. Both the groups are comparable in terms of age and gender distribution. A significant portion of the children in both groups (around 36.7%) had no previous dental visits, which could influence their anxiety levels. Half of the participants (50%) come from low-income families, while 36.7% come from middle-income families. Approximately 30% of the children have a comparable family history of anxiety, which could be an influential factor in their anxiety levels during treatment. The number of teeth treated during the endodontic procedures is fairly even between the two groups. Pre and post intervention of dental anxiety levels and the children's cooperation during the procedure were assessed using respective scales.

Anxiety assessment based on MCDAS score was comparable between the two groups at baseline (P=0.12). The mean MCDAS score decreased from 4.50 before the intervention to 2.50 after the intervention, with a mean difference of 2.00 (P = 0.002). In the non-CBT group, there was a slight increase in the mean MCDAS score from 3.00 to 3.20, but this change was not statistically significant (P = 0.45). Child perception about DFA based on Deepak-Parimala Anxiety scale found in CBT group was shown significant decrease in the anxiety scores from 13.80 before the intervention to 8.80 after the intervention (P < 0.000). In the non-CBT group, there was also a significant reduction in anxiety levels, with the mean score decreasing from 14.13 to 11.13 (P < 0.000). However, the reduction in the CBT group (7.20522) was much greater than that in the non-CBT group (4.41961) (Table no.1). Thus, we confirm that CBT was more effective in reducing anxiety levels compared to conventional methods.

Child cooperation and behaviour based on the VCCS score showed a significant reduction in the mean Venham score in the CBT group, from 3.00 before the intervention to 2.00 after the intervention. The change was statistically significant (P = 0.042). In the non-CBT group, the mean score showed a slight reduction from 3.00 to 2.80, but this change was not statistically significant (P = 0.458). Therefore, the Venham scale suggests that CBT improved children's behavior and cooperation during the endodontic treatment procedure.

Table No.1: Cooperation and anxiety assessment of children by MCDAS, VCCS and Deepak Parimala scale in Intervention and Control group

	MCDAS score			**VCCS score**			**Deepak Parimala Scale**		
	Before (Mean ± SD)	After (Mean± SD)	P value	Before (Mean ± SD)	After (Mean± SD)	P value	Before (Mean ± SD)	After (Mean± SD)	P value
Intervention group (With CBT) (n=15)	4.5 ± 1.96	2.5 ±2.17	0.002*	3 ± 1.73	2 ± 1.96	0.042*	13.8± 2.9	8.8 ± 2	0.000*
Control	4.2 ±	3.6 ±	0.458	3± 1.46	2.8± 2	0.458	14.1 ±	11.1 ±	0.000*

group (Without CBT) (n=15)	1.96	2.11	(NS)			(NS)	2.9	1.84	

.Discussion

Dental anxiety is a prevalent issue in dental settings, triggering emotional, cognitive, behavioural, and physical reactions in patients, which may deteriorate them from seeking necessary dental care. This study evaluated both dental anxiety and patient cooperation during anaesthetic injection and endodontic treatment, as assessing children's behaviour alone is insufficient to accurately determine their level of dental anxiety. In general, a child's behaviour and anxiety can be assessed through three methods: direct observation of their behavioural responses by dentist, questionnaires completed by parents and self-reports provided by the child.

The Modified Child Dental Anxiety Scale has psychrometric features such as reliability criteria and formulate validity that is appropriately utilized to identify dental anxiety level among the population. The scale consists of 8 questionnaires and five pictorial facial expressions. The question related to local anaesthesia (LA) and other dental processes that create anxiety and stress among the children including dental general anaesthesia (DGA) and relative analgesia (RA). To explore the cognitive component of Dental Fear and Anxiety (DFA) and to understand children's perceptions of their dental visit, dentist, and dental treatment, our study utilized the Deepak-Parimala Anxiety Scale, which is easy to administer and time-efficient. It consists of 5 pictograms and has two parts: Part A (Dental part) - contains 18 questions and 5 pictograms to elicit the answers while Part B (Cognitive part) - contains 9 questions, further subdivided into 3 categories and the given responses were recorded appropriately.[11]

Assessment of behaviour is the most important tool in the hands of the dentist. This helps the dentist to execute required treatment plan in the most appropriate manner in children. Venham et al. introduced and explored the use of 6-point cooperative behavioural scale also called uncooperative behaviour rating scale. The scale describes child's behaviour in details and provides more information about paediatric patients with negative and disruptive behaviour. It is a 6-point scale, with scale points anchored in objective, specific, and readily observable behaviour and classifies child's behaviour into six groups. The dentist indicates the patient's behaviour by picking a number from 0 to 5 according to the scale after the dental visit or at specific time spots of it. Venham et al. pointed out that the scale is a reliable and valid scale and provides interval level measurement.

To alleviate the child's dental fear and anxiety, various behavioral techniques have been applied. Cognitive behavioral therapy (CBT) is a type of psychotherapeutic treatment that helps people learn how to identify and change the destructive or disturbing thought patterns that have a negative influence on their behavior and emotions. CBT works on increased activation of the ventrolateral prefrontal cortex (PFC) and lateral orbitofrontal cortex, suggesting that therapy changes the brain's processing of pain and anxiety. A person's beliefs, appraisals, and expectancies regarding the consequences of an event and ability to deal with it are hypothesized to have an impact on functioning in two ways: A direct influence on mood (emotional arousal can affect muscle tension, hormonal factors, and neurotransmitters) and an indirect influence through their impact on coping efforts (e.g., use of medication to relieve symptoms). In our current study, we used a combination of interventions including Inhibition of thoughts, the Breathing technique, Benson's relaxation method, Progressive muscle relaxation techniques. This combination of interventions offers advantages such as simplicity in learning and not requiring advanced equipment.

Children aged 7–10 were selected for current study because they can reliably report their health-related issues and comprehend the questions in the questionnaire. Our study revealed a greater reduction in anxiety levels in the CBT group compared to the control group, based on the child's perception of anxiety as measured by the MCDAS and Deepak Parimala Anxiety Scale. This suggests that CBT is more effective in reducing anxiety than traditional approaches. Shokravi M et al. (2023) has also found similar results in their study. A Randomized control trial by S. Shahnavaz et al. (2016) showed that CBT, using the SCI-DA scale, can be effectively applied by parents of children aged 6–10 years diagnosed with intra-oral injection phobia and dental anxiety. Additionally, a study by Karin G. Berge (2017) found that scores on psychometric self-report scales for anxiety were significantly reduced. These results were consistent with the findings of our study.

In our current study, VCCS score was decreased significantly in intervention group as compared to control group which emphasizes the fact that CBT appears to be promising in improving clinical behaviour and cooperation of children with anxiety. Kebriaee et al (2015) evaluated the effects of cognitive behavioural interventions (playing in a playroom for 4 minutes and showing a film of a happy child receiving dental prophylaxis, Benson's respiration technique for 4 minutes and use of positive sentences for 8 minutes prior to treatment) on dental anxiety of 3 to 6.5-year-old children by using VCCS scale and they also reported a reduction in anxiety of children, which was similar to the present findings.

Progressive Muscle Relaxation (PMR) was successful in alleviating anxiety, with a long-lasting calming effect on children.

These findings were similar to those of studies by P. Sabherwal (2020) and Park et al. (2019), where the MCDAS and VCCS scales were also used. Berggren et al. (2000) found that relaxation therapies were effective in reducing dental anxiety among fearful patients, which is consistent with the findings of our study.

5.Conclusion

This study highlights the effectiveness of CBT in reducing dental anxiety and enhancing children's cooperation and behaviour. By addressing multiple facets of anxiety, including cognitive, emotional, behavioural, and physical responses, CBT proves to be a valuable method for both managing and treating dental anxiety. It allows dental professionals to better identify the specific causes of a child's anxiety, thus reducing unnecessary referrals for sedation or general anaesthesia based solely on behavioural issues.

Conflict of interest: Nil

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