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The Use of a Self-Designed Dental Storybook as a Dental Anxiety Reduction Medium Among Paediatric Patients: A Randomized Controlled Clinical Trial

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Abstract

Background: *Dental anxiety is a major obstacle to children receiving dental care, which can increase their fear. It is of the utmost importance to manage patients with dental anxiety or dental fear in a manner that complements their conflicts. A pediatric dentist's role is to perform effective treatment using various non-pharmacological behavior management techniques.* ***Aims:*** *Aim of this study is to evaluate the effectiveness of a self-designed dental storybook in reducing dental anxiety among children between 5-9 years.* ***Materials and Methods:*** *The study was conducted on 54 children aged 5-9 years. Children were randomly allocated into two groups, namely, Control group (did not receive story book) and Intervention group (received story book). Research was carried out in two dental visits (screening and examination visit and preventive and restorative treatment) wherein, before and after intervention, Venham Clinical Anxiety Scale (VCAS), Facial Image Scale (FIS), and Frankel's Behavior Rating Scale (FBRS) were recorded. The data were statistically analyzed using Wilcoxon signed rank test, applied and tabulated using the SPSS software version 25.0.* ***Results:*** *The intervention group showed significantly lower anxiety and more cooperative behavior during treatment than the control group.* ***Conclusion:*** *Self-designed dental storybook as an adjuvant was found to be promising behavior modification technique for 5-9 year old children.*

Keywords: *Dental anxiety, Behavior management, Venham clinical anxiety scale, Facial Image Scale, Frankl's behavior rating scale, Story book*

1. Introduction

Dental anxiety is a significant social problem among children. It can be defined as a non-specific feeling of apprehension requiring no prior experience of the situation anticipated [1]. Anxiety is an emotional state commonly referred as fear of unknown. It is often expressed as an unpleasant feeling that precedes the actual interaction with the threatening stimuli [2]. It is essential to address dental anxiety or phobia in patients by providing a calming atmosphere and introducing them to positive dental information, such as pictures or stories about enjoyable dental activities, to help children feel more relaxed and prepared for their dental visits.

The first dental experience is vital in determining a child's attitude toward dentistry and the outcome of their dental treatment [2]. It is essential to modify a person's pre-existing beliefs about dental care or particular treatment methods in order to achieve a more desirable result. People of different ages demonstrate various levels of cognitive and/or perceptual abilities, verbal and nonverbal communication abilities, and social interaction. Therefore, various non-pharmacological techniques are employed depending on these factors. They can be telling-show-do, distraction, desensitization, modeling, etc. A method of managing behavior that is based on Bandura's social learning theory

suggests that people learn by observing, copying, and modeling. This includes providing the pediatric patient with information about the procedure beforehand, which can reduce their discomfort and pain.

Patients who belong to the rural areas in developing countries have little or no knowledge regarding the dental procedure, and hence, they should be provided a book, based on an explanation of the dental procedure for their better understanding and knowledge [8]. Studies have been conducted on a range of behavioral interventions, including social stories, visual pedagogy, and comic strips, which are often used to create a desired behavior or prepare a child for a new experience. These interventions have been found to be cost-effective and easy to use, in addition to other communication-aided approaches such as applied behavioral analysis, visual pedagogies, pictorial or iconic images, and audio-visual aids [14].

Gray and Garand [12] suggested that stories should be written from the child's point of view and printed in a size that is suitable for the child, so that they can better comprehend the dentist's perspective and connect with them more easily. Fox and Newton [8] exposed children to positive images of dental related materials, and they reported a reduction in dental anxiety among British children. Moura et al. [9] found that showing an audio-visual book to children before their dental appointments resulted in a significant decrease in their anxiety levels.

The American Academy of Pediatric Dentistry recommended focusing more on nonpharmacological intervention of behavior modification techniques [21]. Therefore, this study evaluated the effectiveness of a specially designed dental storybook in reducing dental anxiety and improving behavior among children during examination and treatment plan visits, followed by a restorative dental visit.

2. Materials and Methods

Study Design and Ethical Approval

This study was conducted in the Department of Pediatric and Preventive Dentistry, People's Dental Academy, Bhopal, Madhya Pradesh. The research was initiated after obtaining approval from the Institutional Ethical Committee (IEC/2023/700/06).

Participant Screening and Eligibility Assessment

The present study was conducted on 54 Children aged 5–9 years who met the inclusion criteria. The inclusion criteria were: medically fit children with ASA I (normal healthy patients) according to the American Society of Anesthesiologists Classification, children/parents able to read and understand English/Hindi, children in need of restorative treatment that would require local anesthesia. The exclusion criteria were children with previous dental experiences, children with special needs, children with a complete audiovisual impairment, children with learning difficulties or mental retardation, conditions requiring emergency dental treatment (abscess, draining sinus, cellulitis) and need for pharmacological management to cooperate. All participants were free to withdraw from the study at any time without affecting the dental treatment.

Study Procedure

The study comprised of two visits: (1) screening and examination, (2) restorative treatment, which were performed by a trained pediatric dentistry resident, with the length of dental treatment for both groups being set at 20 minutes.

Screening and Examination Visit

A simple oral examination was performed to assess whether the child was suitable for the study. The children were selected during this visit. Suitable children's parents/guardians were given consent. Demographical information was collected from the parents/guardians.

A complete medical and dental history was obtained from parents/guardians. Each child underwent extraoral and intraoral examinations, preventive measures, radiographs if needed, and fluoride therapy. A plan for treatment was then created for each child. During this visit, the tell-show-do technique of psychological behavior management was employed to familiarize the child with dental procedures. At the end of the visit, the child's baseline anxiety was assessed using the Venham clinical anxiety scale (VCAS) and Facial Image Scale (FIS). Children's behavior was assessed using

the Frankl's behavior rating scale (FBRS). The investigator was tasked with giving the intervention group the storybook and instructing the parents to read it to their children, to get the children ready for their upcoming dental visits.

Treatment Visit

In this visit, children received restorations that required the administration of local anesthesia (2% lidocaine with 1:100,000 epinephrine). At the end of the visit, both anxiety levels and behavior were assessed using the same scales: VCAS, FIS and FBRS. Parents were allowed to be present in the dental office during all visits, providing basic behavior guidance, with visits occurring once a week. At the end of the study, those children who required additional treatment were scheduled with the same dentist.

Story Book Intervention

The storybook was designed to help children become familiar with dental visits by using a specific color scheme and cartoon characters to build the narrative and titled as 'My First Dental Visit' (Figure 1). The book describes and explains the various stages and peripherals attached to the first dental visit, including an examination [1]. The story is written in simple Hindi and English and explain the dentist and dental assistant's roles, the instruments and their uses, and the clinic.

Figure 1. The cover of book entitled "My First Dental Visit"

Statistical Analysis

Data were entered in Microsoft Excel spreadsheet and data were analyzed using statistical package of social sciences 25.0 software (SPSS Inc., Chicago, USA). The data were analyzed using Wilcoxon signed rank test. For all statistical purposes, a p-value of ≤0.05 was considered significant.

3. Results and Discussion

The study included 54 children however 3 children were excluded as they did not report for second dental visit. Figure 2 is a flow chart of the children who participated during each trial phase: enrolment, allocation, first visit, second visit and analysis.

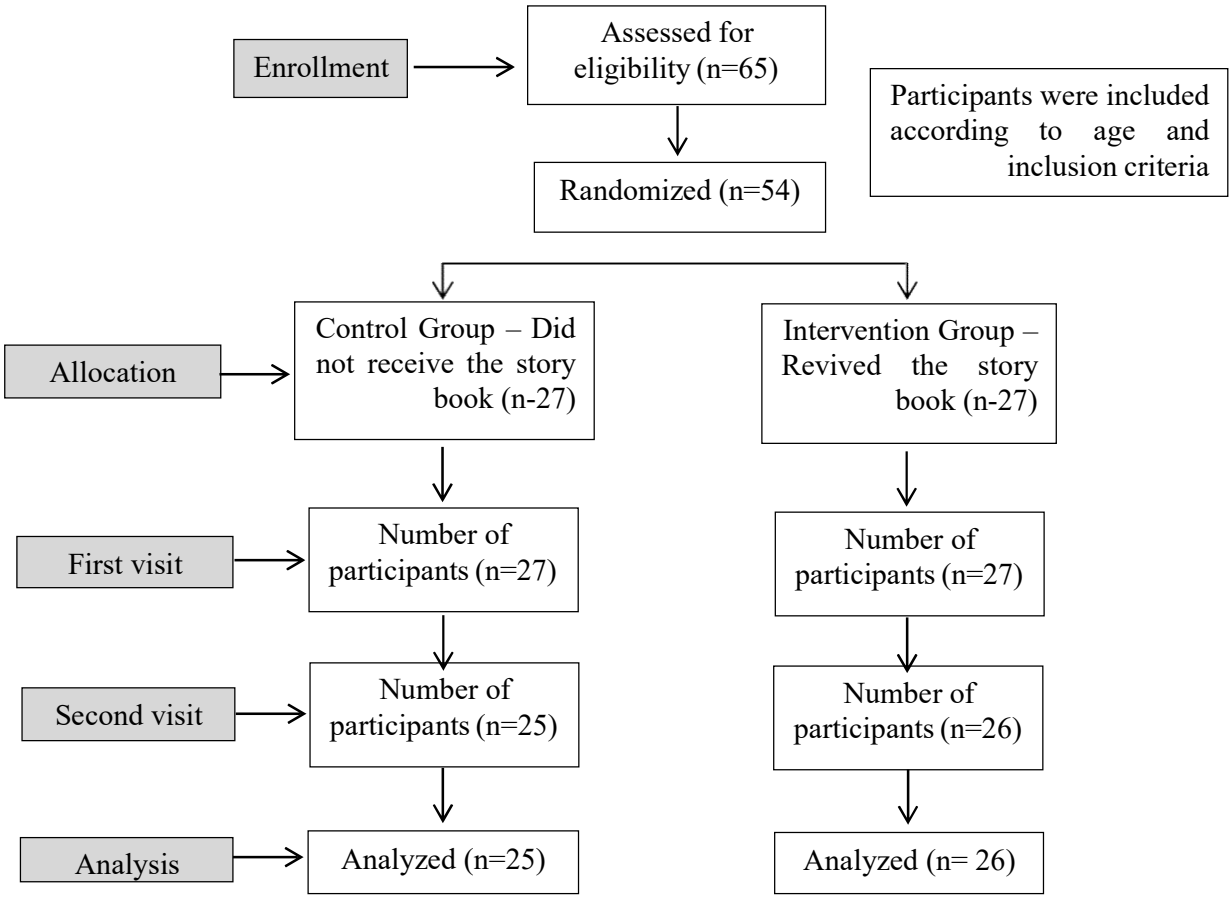

Figure 2: CONSORT flow diagram. CONSORT – consolidated standards of reporting trial

In the present study for the assessment of anxiety, the mean anxiety scores were compared before and after intervention among control and intervention groups. The mean anxiety score (VCAS) for control group was 1.62 before (minimum-0, maximum-4) and after second visit the mean score was 1.48 (minimum-0,maximum-4).the mean negative rank was 7.31 before and positive was 6.50 and the difference was not statistically significant (p-0.317). But for intervention group the mean score was 1.00 (maximum-3, minimum-0) before and 0.25 (maximum-2, minimum-0) after the intervention. The mean negative rank was 9.00 and positive was 0.00 and the difference was statistically highly significant (p-0.000).

When we compare anxiety according to Facial Image Scale (FIS), The mean anxiety score (FIS) for control group was 2.59 before (minimum-0, maximum-6), and after second visit the mean score was 2.14 (minimum-0, maximum-6). The mean negative rank was 5.50 before and positive was 5.50 and the difference was not statistically significant (p-0.06). For intervention group the mean score was 1.96 (maximum-6, minimum-0) before and 0.66 (maximum-4, minimum-0) after the intervention. The mean negative rank was 8.50 and positive was 0.00 and the difference was statistically highly significant (p-0.000).

In the present study the behavior was assessed according to Frankl's behavior rating scale (FBRS). The mean behavior score for control group was 2.59 before (minimum-1, maximum-4) and after second visit the mean score was 2.62 (minimum-2, maximum-4). The mean negative rank was 7.0 before and positive was 7.00 and the difference was not statistically significant (p-0.782). For intervention group the mean score was 3.03 (maximum-4, minimum-2) before and 3.51 (maximum-4,

minimum-3) after the intervention. The mean negative rank was 0.00 and positive was 7.00 and the difference was statistically highly significant (p-0.000). (Table 1& 2)

Table 1- Comparison of mean score of Venham clinical anxiety scale, Facial Image Scale and Frankl's behavior rating scale among Control and Intervention groups.

Study groups	N		Venham Clinical Anxiety Scale (VCAS)			Facial Image Scale (FIS)			Frankl's Behavior Rating Scale (FBRS)		
			Mean ± SD	Minimum Score	Maximum Score	Mean ± SD	Minimum Score	Maximum Score	Mean ± SD	Minimum Score	Maximum Score
Control Group	27	Before Intervention	1.62±1.21	0.0	4.0	2.59±1.64	0.0	6.0	2.59±0.79	1.0	4.0
	25	After Intervention	1.48±0.89	0.0	4.0	2.14±1.35	0.0	6.0	2.62±0.74	2.0	4.0
Intervention Group	27	Before Intervention	1.00±0.87	0.0	3.0	1.96±1.72	0.0	6.0	3.03±0.70	2.0	4.0
	26	After Intervention	0.25±0.52	0.0	2.0	0.66±1.10	0.0	4.0	3.51±0.50	3.0	4.0

SD- Standard Deviation, n-Number of subjects

Table 2- : Comparison of mean rank of anxiety scores and behavior score after intervention among control and intervention groups.

After Intervention	Type	Venham clinical anxiety scale (VCAS)			Facial Image Scale (FIS)			Frankl's behavior rating scale (FBRS)		
		n	Mean rank	P*-value	N	Mean rank	P*-value	n	Mean rank	P*-value
Control Group	Negative rank	8	7.31	0.317	8	5.50	0.06	6	7.00	0.782
	Positive rank	5	6.50		2	5.50		7	7.00	
	Ties	14			17			14		
Intervention Group	Negative rank	17	9.00	0.000**	16	8.50	0.000**	0	0.00	0.000**
	Positive rank	0	00		0	0.00		13	7.00	
	Ties	10			11			14		

*P≤0.05=Wilcoxon signed-rank test; ** statistically highly significant

Anxiety is an emotional state commonly referred as fear of unknown. It is often expressed as an unpleasant feeling that precedes the actual interaction with the threatening stimuli [2]. According to Agras *et al*. [10], anxiety associated with dental appointments and procedures is the fifth most common cause of anxiety, with a substantially higher frequency among children. According to literature reported by Chhabra N, Chhabra A, and Walia G, the prevalence of dental anxiety was 7.9%, 7.1%, and 6.6% in children aged 5, 6, and 7 respectively and decreased as age increased [22].

It is essential to comprehend the dental fear and apprehension of young children in order to reduce their fear and anxiety before and during dental procedures, as well as to manage their behavior during the treatment. Assess the effectiveness of a specially designed storybook that portrays dentistry in a positive light in reducing dental anxiety among children prior to their dental visits.

It is important to tailor behavior management strategies to the specific needs of each child. Most behavior management techniques require an understanding of the cognitive, emotional, and social development of the child [2]. It is essential that any behavioral management strategy be implemented with empathy and care for the child's wellbeing. This research sought to investigate the effectiveness of a self-designed dental storybook as a behavior management tool to reduce dental anxiety in 5-9 year-old children using a psychological approach.

The study revealed a substantial distinction in the total anxiety levels between the intervention and control groups. Kids in the intervention group experienced a visible decrease in their anxiety levels during the treatment sessions compared to the control group. Aminabadi et al. [16] investigated the effects of having a parent read a story with pictures to children, and found that it had a positive impact on cognitive development and growth, as well as reducing situational anxiety and perception of pain during dental treatment.

Moura et al. [9] and Elicherla et al [24]. both conducted studies that showed a decrease in anxiety levels among children when exposed to a playful tool (audiovisual book) and a smartphone application (Little Lovely Dentist) respectively, prior to their dental visits. Deshpande et al. [11] created a self-made pictorial flashcard in the form of a dental Pictionary based on substitute words, and found that the children's anxiety levels decreased significantly in the study. However, having prior knowledge about dental care had no effect on dental anxiety in Nigerian children, and a study involving viewing leaflets with positive dental information yielded similar results.

This study evaluated the effectiveness of a custom-made dental storybook in reducing dental fear and improving behavior in children during examination and treatment planning appointments, followed by a restorative dental appointment. Alsaadoon et al. [1], and Deshapande et al. [2] conducted a study where difference in anxiety levels and behavior changes were examined after several dental appointments as well and similar conclusions were obtained.

The present study utilized Facial Image Scale (FIS) and Venham clinical anxiety scale to measure and analyze anxiety levels and Frankel behavior rating scale for behavior. Buchanan and Niven's [23] study found FIS to be a reliable way to assess dental anxiety in children, while Krishnappa et al. [17] determined that both scales are valid for assessing dental anxiety in a clinical setting. Results showed a significant decrease in anxiety in both groups, with FIS demonstrating highly significant changes in anxiety and Venham clinical anxiety scale showing significant differences.

It can be concluded from this study that dental storybooks have a positive effect on children and can be used as an effective tool to reduce dental anxiety.

4. Conclusion

It Self-designed storybook can serve as a relatively simple and effective tool when used before dental procedures. Dental storybooks help children to become familiar with the dentist and dental treatment before their visit, and appears to be successful in reducing fear and improving conduct during dental care. It helped to encourage patients to become more aware of their children's dental health and motivated them to start taking care of it.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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