

ASSESSMENT OF ANXIETY LEVELS IN CHILDREN RECEIVING DENTAL TREATMENT USING RUBBER DAM- A RANDOMIZED CONTROL TRIAL

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ABSTRACT

Isolation is the major thing in the quality of treatment. But often clinicians consider rubber dam use can cause anxiety and fear evoking stimuli that may hamper their rapport with the child and thereby affect the quality of treatment. This creates a reluctance among practitioners to use rubber dams in the pediatric population. The aim of the study was to assess the anxiety levels in children in the age group of 6 to 10 years undergoing dental treatment with or without a rubber dam using the Animoji scale.

This study was conducted on 48 children in the age group of 6 - 10 years, divided into two groups: group 1 (cotton roll isolation) and group 2 (rubber dam isolation). Anxiety levels were assessed using an animoji (animated emoji) scale which has a scale of score 1 to score 5 (very happy to very unhappy). The obtained data were statistically analyzed using SPSS (Statistical Package for Social Sciences) Version 24.0 (IBM Corporation, Chicago, USA). Descriptive and analytical statistics were done. The independent t-test was performed to know the differences between the two groups. The result proved that by comparing group 1 and group 2 there was no statistically significant difference between the two different groups $p > 0.05$. This study concludes that the use of rubber dams does not create a significant rise in anxiety levels in children. Thus considering the advantages of rubber dams they should be used in Pediatric dentistry in an attempt to provide quality dental treatment for children.

Key words: Rubber dam, Anxiety, Animated emoji scale, Children.

Introduction

Child's uncooperativeness in dentistry has been theorized in various aspects. Dental Fear and dental anxiety are utilized as early indications of dental phobia, an over-the-top or absurd dread or nervousness that directly impacts day-by-day living and results in delayed dental procedure [1]. Dental tension and dread in youngsters has been perceived in numerous nations as a general well-being predicament and has been learned finally [2-4]. In the late 1960s, Norman Corah built up the Dental Anxiety Scale (DAS), giving an arranging guideline to inspect this issue [5]. Dental anxiety indicates a condition of trepidation that something awful will occur corresponding to dental treatment, combined with a feeling of losing control. Dental fear speaks to an extreme sort of dental anxiety and is described by stamped and industrious nervousness in connection either to detectable circumstances/objects (e.g., drilling, infusions) or to dental circumstances. Henry Lauth researched whether these patients' fear was identified with the nature and the attributes of dental consideration [6], while Elliot Gale inferred that clinicians expected to evaluate the circumstance of the patient, instead of real agony under any conditions while surveying dental fear [7-9]. Moore *et al.* thought about the general segment patterns and their connection to the

components and degrees of Dental fear [10-12]. Regardless of the incredible advancement in dental well-being through dentistry, most young people can show an incredible dread of dental treatment [13]. Holtzman *et al.* found that patients because of a paranoid fear of dental treatment missed appointments multiple times [14]. Also, numerous specialists have explained that the dread of dental treatment in children may bring board troubles at the time of treatment [15-17], especially infusion, penetrating, and extraction, which have appeared to convey the most negative passionate burdens [18, 19]. In an investigation of youngsters' maturity in 5 to 11 years by Milgrom *et al.*, he proposed that molding is a significant supporter of dental fear in youth and immaturity [20]. Predominance evaluations of adolescent dental fear fluctuate impressively, from 3% to 43% in various populations [21].

Children develop anxiety especially when they encounter sophisticated tools. Hence creating uneasiness amongst Dentist to use rubber dam isolation in children because it develops anxiety and this leads to destruction in the relationship with the child. Clinician believes that using rubber dams causes an increase in the time of the treatment. However, some authors have reported that patients believe that the procedure takes place outside of their oral cavity so

even children withstands long hours of treatments immediately the rubber dam has been placed [22]. One of the reasons for using a rubber dam is to improve patient safety and treatment outcome and field of view, as well as improve patient comfort during treatment. Another important aspect in the context of the covid 19 pandemic, rubber dam reduces 70% droplets or aerosols infected by the patient's saliva or blood for 1 minute [23].

An ideal anxiety scale is required which is feasible to adopt on a clinical basis clinically, less time-consuming, pleasing, ability to use in younger children that possess limited cognitive and linguistic skills, and include a scoring system. Based on the above points mentioned, we used a new anxiety scale which is the animated emoji scale (animoji), that contains motion and emotions as animoji [24]. This was adopted by considering today's generation's attraction towards multimedia, and their inclination for motion pictures on electronic devices rather than still cartoons on paper. Keeping this in mind, the study was planned to assess the anxiety levels in children having dental procedure with the presence of a rubber dam and without it by using an animoji scale. The null hypothesis is that there is no difference between the anxiety level among children with or without using a rubber dam.

Materials and Methods

Study design

The study was carried out in the Department of Pediatric and Preventive Dentistry, Saveetha Dental College and Hospitals, in a university hospital setting in Chennai, India. This randomized double-blinded clinical controlled study protocol was approved by the Institutional Review Board (IHEC/SDC/UG-1721/19/PEDO/568).

Sample size estimation

The sample size was calculated with G-Power software version 3.0.10 with a power of 95 percent and a High-intensity alpha error of 0.05. Through a simple random sampling method, eighty participants were initially selected who required pit and fissure sealants in the first dental visit. After considering the inclusion and exclusion criteria thirtytwo participants were eliminated from the study Finally Forty-eight children in the age group of 6 to 10 years reported with their parents, with informed consent who fulfilled the inclusion and exclusion criteria and formed the sample for this study.

Inclusion criteria

- Children in the age group of 6 - 10 years
- Children who had to undergo pit and fissure sealant application were selected.
- Patients with completely erupted lower permanent molars were included
- Children with first dental visit were considered after oral prophylaxis

Exclusion criteria

- Children who had other dental issues like pulpitis and its sequelae.
- Children with a history of pain or phobia were eliminated
- Children with systemic conditions.
- Special children and medically compromised children
- Children who are allergic to latex and on significant medication were excluded.
- Children with Frankel's negative and negative rating has been eliminated
- Participants with anxiety disorders were eliminated from the study.
- Participants who had altered heart rates and blood pressure before the beginning of the procedure were eliminated.

The selected participants were divided into two groups; Group 1: Children, who have to undergo pit and fissure sealant, were done on cotton roll isolation method. Group 2: Children, who have to undergo pit and fissure sealant, were done on rubber dam isolation.

Procedure

Forty-eight children in the age group of 6 to 10 years reported with their parents, with informed consent who fulfilled the inclusion and exclusion criteria and formed the sample for this study (**Figure 1**). Participants who displayed negative behavior during oral prophylaxis were eliminated. All participants' vital signs (heart rate, blood pressure) were checked before and after the intervention. In Group 1, teeth were isolated with buccal and lingual cotton rolls and in Group 2, isolation was done using rubber dams. Pit and sealant application was done. After the completion of the procedure, the anxiety was assessed for the children using the animoji scale. The Animated Emoji scale scored from 1 (very happy emoji) to 5 (very unhappy emoji) (**Figure 2**) which was given by Shetty *et al.* [24] and was used in this present study. This animoji scale has 5 graphic interchange formats of animated emoji faces which presents various feelings starting from very happy/laughing to very unhappy/sad and crying (most positive to most negative feelings). The child was instructed to select one of mentioned animated emojis played on the video on an electronic display which suited best with their feelings at present. After the selection of the animated emojis, the vital sign was taken to reconfirm the scale. All the participants were treated by a single operator. One examiner was assigned to take the reading of the scale for each participant and the reading was transferred to a data analyzer where both were blinded from the study in order to eliminate operator bias.

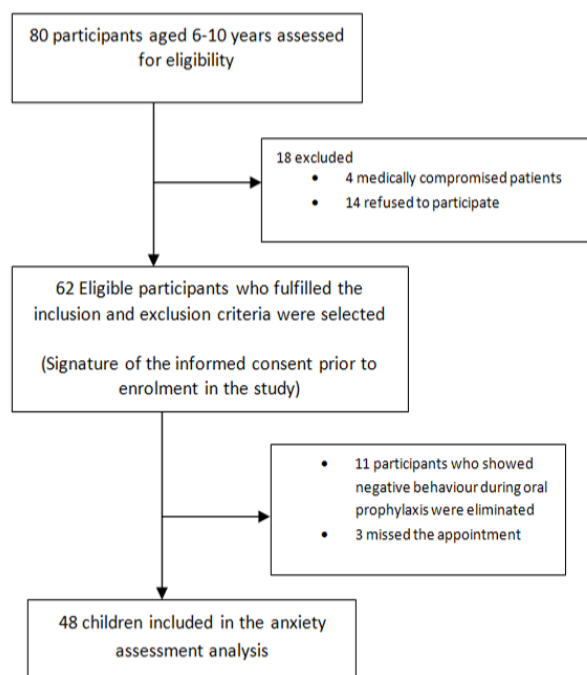


Figure 1. Flow diagram showing patients selection for the study

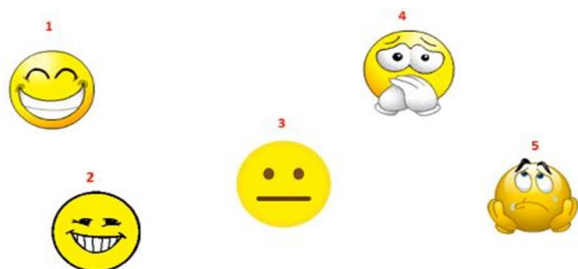


Figure 2. Animoji scale representing score 1 to score 5 (very happy to very unhappy)

Statistical test

The obtained data were statistically analyzed using SPSS(Statistical Package for Social Sciences) Version 24.0 (IBM Corporation, Chicago, USA). Descriptive and analytical statistics were done. The independent t-test was performed to compare the anxiety level between the two groups. The level of significance was kept at $p < 0.05$.

Results and Discussion

Among the 48 children enrolled, 24 (50%) were male and 24 (50%) were female. A comparison of anxiety score distribution between the two groups was represented (**Table 1**), in the cotton roll group there were 87.5% of subjects with a score of 1, and only 12.5% of subjects with a score of 2. In the rubber dam group there were 79.2% of subjects with a score of 1 and 20.8% of subjects with a score of 2, showing a maximum number of individuals had chosen a score of 1 (very happy) no statistically significant difference existed in anxiety scores among the two groups with a t value, 0.763 and p value 0.449($p > 0.05$) (**Figure 3**). When comparing the anxiety scores based on gender, in the cotton roll group, least anxiety scores were noticed for both males and females with scores 1 (84.6%) and score 2 (15.4%) in the case of male participants and score 1(90.9%) and score 2(9.1%) for females participants which proves that there is no statistically significant difference with chi-square value, 0.216 and p value 0.642 indicating $p > 0.05$. In the case of the rubber dam group, 30.8 % of the females scored anxiety scale as score 2 and 69.2 % as score 1 and among males, maximum subjects scored 1 (90.9%) except one participant with a score of 2 (9.1%) but the chi-square test proved there is no statistically significant difference when compared among gender with p value 0.193 ($p > 0.05$) (**Table 2**). As far as age is concerned, the association of anxiety was determined in which the results proved there was no significant association both the groups, in the cotton roll group, among 6 to 8 yrs of age, score 1 (81.25%) and scored 2 (18.95%) and participants among 9 to 10 yrs of age group, all the subjects gave an anxiety score of 1(100%) i.e very happy score but there were no statistically significant difference, chi-square value 1.174 and p value 0.190 ($p > 0.05$). Among the rubber dam group, subjects with 6 to 8 yrs of age, score 1 (84.62%) and score 2 (15.38%) and in the age group of 9 to 10 yrs maximum individuals scored as score 1(90.90%) i.e very happy score and the remaining with score 2 (9.1%) but there was no statistically significant difference with chi-square value 0.216 and p value 0.642 ($p > 0.05$) (**Table 3**). Hence the null hypothesis was proven giving results with no significant difference in anxiety levels between the two groups.

Table 1. Comparison of anxiety score distribution between the two groups

Group	Score 1	Score 2	95 CI	SE	t value	P value#
Cotton roll (n=24)	87.5 %	12.5%	-0.303	0.136	0.109	0.763
Rubber dam (n=24)	79.20%	20.80%	-0.303	0.136		

#p value was derived from an independent t-test significant at the level of 0.05

Table 2. Comparison of anxiety score between gender

Groups	Gender	Score 1 n (%)	Score 2 n (%)	Total	x ² value	P- value#
Cotton roll	Male	11(84.6%)	2(15.4%)	13(100%)	0.216	0.642
	Female	10(90.9%)	1(9.1%)	11(100%)		
Rubber dam	Male	10(90.9%)	1(9.1%)	11(100%)	1.698	0.193
	Female	9(69.2%)	4(30.8%)	13(100%)		

#P-value derived from chi-square test

Table 3. Comparison of anxiety score between age groups

Groups	Age group	Score 1 n (%)	Score 2 n (%)	Total	x ² value	P- value#
Cotton roll	6 to 8 years	13(81.25%)	3(18.95%)	16(100)	1.174	0.190
	9 to 10 years	8(100%)	0(0%)	8(100)		
Rubber dam	6 to 8 years	11(84.62%)	2(15.38%)	13(100)	0.216	0.642
	9 to 10 years	10(90.90%)	1(9.1%)	11(100)		

#P-value derived from chi-square test

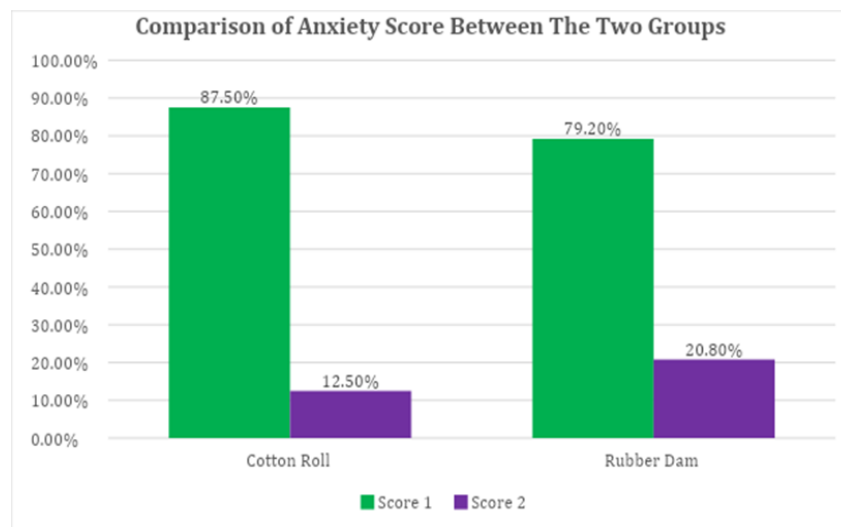


Figure 3. Comparison of anxiety score distribution between the two groups

Isolation is the major thing in the quality of treatment. Adequate isolation of the working environment is a very crucial requirement to ensure the restoration's long-term survival. among the needs for using a rubber dam, together with patient safety and improvement of management outcomes and field of vision, is to improve patient comfortability on the course of treatment. there was a study that reported a significantly improved retention rate of fissure sealants after 1 year when using a rubber dam in comparison to relative isolation [25]. Besides isolation, several additional advantages for the use of rubber dams have been reported in the literature: protection from aspiration, a clean working field, protection of the soft tissue, and reduction of infectious pathogens in the aerosol [26-28]. Based on the other authors, patients believe that the procedure is being carried out

outside of their oral cavity so even children withstand longer treatments immediately the rubber dam has been applied [29]. Time savings have also been reported if used by experienced persons as the change of cotton rolls can be omitted. The nature and quality of restoration depend on the isolation of the place of operation as the materials being employed are hydrophobic [30].

Al-Sabri *et al.* in their investigation inferred that there will be insufficient utilization of rubber dams among dental students and also it necessitates for the enhancement in their discernment for the utilization of rubber dams [31]. Leal *et al.* discovered that different dental instruments counting rubber dams made critical tension levels in children. This can explain the hesitance of dental specialists' utilization of

rubber dams in pediatric dentistry [32]. This raises a question to formulate this present study. In this examination of the present study, no noteworthy contrast was found in the anxiety levels of the Children towards the use of the rubber dam, meaning the isolation of the rubber dam was found less stressful for children and adolescents. This is in accordance with the study conducted by Amman *et al.* and Vijaynath *et al.* [29, 33]. However Vijaynath *et al.* used FLACC (face, leg, activity, cry, consolability) scale and facial image scale to objectively and subjectively analyze the stress levels of the children respectively [33]. Anupam Saha *et al.* in their investigation discovered the dental nervousness of children with the age group of two-seven years indicated moderately less tension levels when contrasted with children in older age groups [34]. Md Arshid Khanday *et al.* stated that children showed less stress when the rubber dam was used as an isolation technique [35]. Also Vanh e *et al.* revealed that use of the rubber dam allows reducing the stress in young patients during dental care which was in accordance with our study [36]. Another research done by Dhani Kapur *et al.* concluded that isolation with rubber dams caused less stress in patients as compared to cotton rolls and saliva ejector [37]. Brandstetter M. observed reduced heart and circulation parameters in dentists working with rubber dams and interpreted their findings as relaxation [38]. McKay *et al.* described that the use of Rubber dam appears acceptable physically and psychologically to most pediatric patients, however, visibility of the Rubber dam to others was a potential concern to some children [39]. Another study done by Ibtesam Orafi *et al.*, the Participant showed a positive attitude towards the Rubber dam [40]. The dental anxiety during the application of rubber dam, our results proved that 6 to 8 years were recorded with mild anxiety when compared to 9 to 10 year old which is in accordance with the study done by Ramona Vlad *et al.* where high prevalence of dental anxiety were found among children aged 6 to 9 years [41]. Anxiety caused due to rubber dam application based on gender, current study results proved females participants gave a score 2 which shows they were mild anxious when compared to males which is in line with the study done by Ann E Gaber *et al.* [42] in which the results proved girls are more dentally anxious than boys also another study done by Ramona Vlad *et al.* [41, 43] proved girls had higher odds of experiencing dental anxiety.

The literature shows various methods of assessing dental anxiety; however, each scale has certain limitations. Hence an animated emoji scale given by Shetty *et al.* [24], which describes motions and emoticons, is easy to apply clinically, less time-consuming, and appealing with a scoring system was used in this present study. As the preference and attraction of nowadays generation are inclined towards multimedia [44], this scale can assist, as it emotionally dissects the feelings of anxiety of the children individually. Additionally, this scale offers many advantages such as being very attractive, appealing, child-friendly, also ability to use in children that have with limited cognitive and linguistic skills, easy for children and also can relate to feelings, less time

consuming, and worldwide (no languages or questionnaires are used), common to both sexes, and offers immediate scoring of dental anxiety, hence this scale was used in the present study. Another point is that the previous literature on determining anxiety levels towards rubber dams was done using a visual analog scale, facial image scale, and venhams anxiety scale but this is the first study to assess the anxiety during application of rubber dams using an animoji scale. The application of Pit and fissure sealant was chosen in the study as it prompts just low anxiety in both groups, Other operative treatments in pediatric dentistry, like filling procedures, can be considered more difficult to standardize and would have caused bias in the study. The results proved that through rubber dam isolation the anxiety score was not higher as none of the participants scored very unhappy scores, on another hand overall acknowledgment of the kids to rubber dams may be a result of 'centration' which will be seen during this age group. Further extensive research on anxiety assessment in children is required on a larger scale.

Conclusion

Within the limits of current study, it can be said that using rubber dams does not create a significant rise in anxiety levels in children as per Animoji Scale. Hence, considering the advantages of the rubber dam, it should be used in Pediatric dentistry day-to-day practice in order to provide quality dental treatment for children.

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Conflict of interest: None

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Ethics statement: The study design was approved before the commencement of the study by the Institutional Ethical Review Board (IHEC/SDC/UG-1721/19/PEDO/568).

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