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Original Research Article

Comparative evaluation of anxiety levels among adult patients undergoing dental treatment in pediatric and conventional operatory: a randomised clinical trial

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ABSTRACT

Background: Individuals of all ages often experience anxiety before undergoing dental procedures. Therefore, it's crucial for dentists to create a calming operatory environment with distraction techniques to help alleviate adult patient anxiety. This clinical trial evaluated adult patient anxiety in both conventional and pediatric operatory rooms.
Methods: This prospective split-mouth randomized controlled clinical trial was 11 conducted between November 2023 and April 2024. Twenty-four adult patients (13 females and 11 12 males) with a mean age of 37±4.53 years participated in this study. Each participant (n=24) received 13 both conventional and pediatric operatory. Pre- and post-operative pulse rates and anxiety scores 14 were measured using a pulse oximeter and modified Corah's dental anxiety scale, respectively, in both 15 operatory rooms.
Results: The study found a statistically significant decrease in both pulse rate and anxiety scores post-operatively in both operatory settings ($p<0.05$). However, the reduction in anxiety was more pronounced in the pediatric operatory compared to the conventional operatory ($p=0.0433$). Participants reported greater comfort and reduced anxiety in the pediatric setting, with 83% favoring its vibrant ambiance and 87% feeling less anxious after treatment in this environment.
Conclusions: The vibrant environment of a pediatric dentistry operatory, featuring colorful walls, television, music, and other engaging elements can serve as a more effective for reducing anxiety compared to the plain and monotonous ambiance of the operatory.

Keywords: Anxiety reduction, Clinical trial, Dental anxiety, Distraction techniques, Operatory environment, Patient comfort

INTRODUCTION

Diagnostic and Statistical Manual of Mental Disorders,1980 defined anxiety as apprehension, tension or uneasiness that stems from the anticipation of danger, which may be internal or external.[1] Anxiety is a feeling of uneasiness and worry usually a generalized and unfocused overreaction to a situation that is only subjectively seen as restlessness, nausea, sweaty palms. Anxiety and fear are two emotions that are intertwined with each other.[2] Dental anxiety is a multidimensional

paradigm that includes social, perceptual, and physiological components.

Many dental procedures can induce fear and trigger anxiety among adults. The sight of an injection or the sound of the suction/drill can set in the feeling of anxiety. This could be due to any traumatic experience in the past, to assume or think negatively about the treatment, and an additional factor could be due to longer waiting periods in the waiting room.[3] Patients who suffer from dental anxiety are more likely to postpone or avoid dental treatment, resulting in deteriorating oral health.

Patients frequently perceive the dentist's office as an unfriendly, irritating, and anxiety-provoking atmosphere, characterized by loud noises, unique odours, bright lighting, invasive touch in the mouth, and the possibility of pain. The fear and anxiety in the waiting room in anticipation of further treatment can adversely affect the patient's response to any particular treatment. Patient's perception towards the treatment is very susceptible to the environment they are present at the time. The ambience of the operatory room can exert the same effect on the patient's perspective. Due to the potential for anxiety, dentists need a repertory of strategies to help with patient management.

Operatory rooms are an important factor in guiding the further course of the treatment. Conventional operatory rooms tend to have monochromatic walls and dim lighting, which can make patients anxious about their treatments and upcoming dental appointments. On the contrary, a well- lit, bright, colorful walls seen in a pediatric clinic operating room can be cheerful and have a positive perception of the patient towards the treatment.

A thorough literature search, reveals that there is a scarcity of such a study that emphasizes on the ambience of the operatory room in a conventional clinic which can act as a factor in reducing anxiety and fear among adult patients.

Hence, the purpose of this study is to evaluate the anxiety of adult patients using the ambiance of the operatory room in a conventional as well as a pediatric clinic. Because of the possibility of anxiety, dentists need a repertory of strategies to help with patient management.

METHODS

This split-mouth randomized controlled trial was designed and conducted in accordance with Consolidated Standards of Reporting Trials (CONSORT) flow checklist. Ours was a two-arm, parallel-group split-mouth randomized control study. Ethical approval was obtained from the research and ethics committee and permission to conduct the study was obtained from the institutional review board and the study was registered under the clinical trial registry-India (CTRI/2022/12/048272).

The study was conducted in two parts: one being in the conventional operatory and another being in the pediatric operatory. All the participants were selected according to the inclusion and exclusion criteria from the outpatient department. After recording the primary information, a clinical examination was carried out under standard operating protocol. The selected participants were explained the procedure and their informed consent was obtained by the principal investigator. Pre-operatively pulse rate and anxiety scores were measured using a pulse oximeter and modified Corah's dental anxiety scale respectively in both the operatories.

Randomization was carried out using a lottery method. For the allocation sequence generation, each number was written on white paper and placed in an envelope by a researcher not involved in the study based on the list of random numbers. Allocation was concealed using opaque envelopes numbered consecutively. The envelopes were opened by an assistant not involved in the research. It was impossible to apply blinding either to the operator or to participants due to differences in operatory environment.

Since it was a split mouth study, the principal investigator carried out restoration in a split mouth manner where restoration in one quadrant was performed in the conventional operatory and restoration in the contralateral side in pediatric operatory under standard operating protocol [Figure 1 and 2]. The procedure was carried out for 30 min for each participant in both the operatories. After the completion of the procedure, pulse rates and anxiety scores were measured again in both the operatories. After a washout period of 1-2 weeks, the other side was restored.

A study proforma was given to the participants post-operatively to fill their responses according to their experience about the treatment for the better understanding of the participants perception and their anxiety levels for analysis.

Inclusion criteria

The participants were selected on the criteria pre-determined before the commencement of the study. Adults between the age group of 21 years and 45 years visiting the dental clinic requiring restoration for Class 1 cavity in permanent molars with caries involving enamel and dentin with an ICDAS score of III and IV only were included in the study.

Exclusion criteria

On the contrary, adults having visual or auditory impairment, adults with special healthcare needs, and participants unwilling to participate in the study were excluded.

Figure 1: Patient treatment in conventional operatory.

Figure 2: Patient treatment in pediatric operatory.

Sample size

The sample size of 24 was calculated based on standard sample size:

$n= 2S^2(Z_1- \alpha+ Z^1-\beta)/d^2$

Where; Z1-α = Z-value for α level (2.58 at 1% alpha error or 99% confidence), Z1- β = Z-value for ß level (1.282 at 10% Beta error or 90% power), d=Margin of error=2.50.

Statistical analysis

The data were obtained from physiological measures and the psychometric scale was analysed statistically with the Statistical Package for the Social Sciences (SPSS) software (Version 28). The continuous data in metrics were showcased as the mean value along with its standard deviation. The analysis between groups was carried out using Mann-Whitney U test and Wilcoxon paired test. For statistical significance, the probability value of <0.05 was considered.

RESULTS

A CONSORT checklist showing the study protocol is mentioned in Figure 3.

The demographic profile of the participants is depicted in Table 1. Twenty-four participants were included in the study of which 13 were female and 11 were male with a mean age of 37±4.53 years. When a comparison of pre-operative and post-operative pulse rate scores among both groups was done using an dependent t-test, the difference was found to be statistically significant among both the groups with p value of 0.0001 (p<0.05) in Table 2.

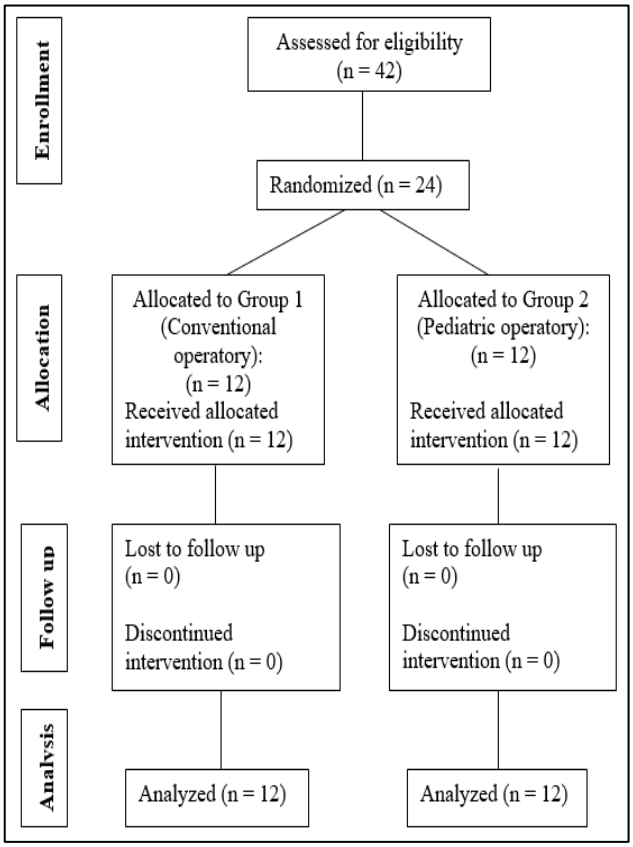

Figure 3: CONSORT flow diagram.

Table 1: Demographic profile of patients in two groups.

Demographic profile	No. of respondents	% of respondents
Age groups (in yrs)		
30-34	8	33.33
35-39	9	37.50
≥40	7	29.17
Mean	37.17	
SD	4.53	
Gender		
Male	11	45.83
Female	13	54.17
Total	24	100.00

On comparing pre and post-operative anxiety scores by Mann-Whitney U test, it showcased that the pre-operatory values did not differ statistically, however the post-operatory values between both the group showed statistically significant difference with the p value of 0.0433 (p<0.05) (Table 3).

When comparison of pre- and post-operatory anxiety scores among both the groups was done using Wilcoxon matched pairs test, both the groups showed statistically significant differences with the p value of 0.0001(p<0.05) (Table 4).

Table 2: Comparison of the conventional group and pediatric group with pre-OP and post Op pulse rate by dependent t-test.

Groups	Time	Mean	SD	Mean Diff.	SD Diff.	% of change	t-value	P value
Conventional group	Pre OP	93.29	10.35	4.71	2.77	5.05	8.3157	0.0001*
	Post OP	88.58	9.60					
Paediatric group	Pre OP	90.58	9.72	4.42	2.10	4.88	10.2830	0.0001*
	Post OP	86.17	9.56					

*Statistically significant

Table 3: Comparison of pre Op and post Op anxiety scores in conventional group and paediatric group by Wilcoxon matched paired test.

Groups	Time	Mean	SD	Mean Diff.	SD Diff.	% of change	t-value	P value
Conventional group	Pre OP	8.83	2.71	1.75	1.22	19.81	3.9199	0.0001*
	Post OP	7.08	1.86					
Paediatric group	Pre OP	9.00	2.34	3.08	1.95	34.26	4.0582	0.0001*
	Post OP	5.92	1.61					

*Statistically significant

Table 4: Comparison of conventional group and paediatric group with pre OP and post Op anxiety scores by Mann-Whitney U test.

Time	Conventional group			Paediatric group			Z-value	P value
	Mean	SD	Mean rank	Mean	SD	Mean rank		
Pre OP	8.83	2.71	23.69	9.00	2.34	25.31	-0.3918	0.6952
Post OP	7.08	1.86	28.60	5.92	1.61	20.40	2.0207	0.0433*
Difference	1.75	1.22	18.71	3.08	1.95	30.29	-2.8558	0.0043*

*Statistically significant

Table 5: Responses of respondents on each question.

Questions	No. of respondents	% of respondents
1. Is this your 1st dental visit?		
1. Yes	10	41.67
2. No	14	58.33
2. Were you feeling anxious before your dental visit?		
1. Strongly agree	4	16.67
2. Agree	13	54.17
3. Neutral	1	4.17
4. Strongly disagree	0	0.00
5. Disagree	6	25.00
3. On a scale of 1-5, how anxious were you before the treatment?		
1. Extremely anxious	3	12.50
2. Anxious	13	54.17
3. Neutral	0	0.00
4. Slightly anxious	2	8.33
5. Not at all anxious	6	25.00
4. Did you like the ambience of the paediatric operatory room?		
1. Strongly agree	7	29.17

Continued.

Questions	No. of respondents	% of respondents
2. Agree	13	54.17
3. Neutral	3	12.50
4. Strongly disagree	0	0.00
5. Disagree	1	4.17
5. Did you like the colourful walls present in the pediatric operatory room?		
1.Strongly agree	7	29.17
2. Agree	13	54.17
3. Neutral	3	12.50
4. Strongly disagree	0	0.00
5. Disagree	1	4.17
6. Did watching television distract you from your ongoing dental treatment?		
1. Strongly agree	2	8.33
2. Agree	13	54.17
3. Neutral	5	20.83
4. Strongly disagree	1	4.17
5. Disagree	3	12.50
7. Which of the following factors helped in diverting your attention from your treatment?		
1. Colourful walls	12	50.00
2. Television	7	29.17
3. Attire of the dentist	1	4.167
4. All of the above	5	20.83
5. None of this helped	7	29.17
8. Which dental operatory room did you like undergoing treatment in ?		
1. Conventional	4	16.67
2. Paediatric	16	66.67
3. Both	3	12.50
4. None	0	0.00
5. Not sure	1	4.17
9. Did you feel anxious after coming out of the paediatric operatory room post dental treatment?		
1. Strongly agree	0	0.00
2. Agree	1	4.17
3. Neutral	2	8.33
4. Strongly disagree	6	25.00
5. Disagree	15	62.50
10. Which of the following factors will help in diverting your attention from your treatment?		
1. Colourful walls	17	70.83
2. Television	13	54.17
3. Newspapers	0	0
4. Magazines	1	4.17
5. None	4	16.67

The conventional and pediatric operatory participant groups were compared pre and post- operatively for responses on each question, such as were they anxious before your dental visit to which 70% responded as anxious. On the scale of 1-5, participants was asked how anxious they were, 66% of respondents replied as anxious or extremely anxious. 83% of the participants liked the ambience of the pediatric operatory room. 83% participants liked the colourful walls of the pediatric operatory. 63% of the participants were distracted by watching television while the ongoing dental treatment. 50% of the respondants were diverted by colourful walls, 29% diverted by television, 4% were diverted by the attire of the dentist and 20% by all the above to divert from the ongoing dental treatment. 66% of the participants preferred to get treated in a pediatric opeatory than a conventional operatory. 87% of the participants did not feel anxious after coming out of the pediatric operatory. 70% of the participants perceived that colourful walls were the factor which helped in diverting attention from treatment followed by television (Table 5).

DISCUSSION

Distraction involves redirecting someone's attention or engaging in an activity to shift focus away from unpleasant stimuli momentarily. These stimuli may include factors like drilling noises, strong chemical odors,

or the apprehension associated with upcoming treatment. Overall, a patient's mindset towards the treatment can significantly influence the course of further procedures. The presence of unpleasant stimuli often heightens anxiety levels, making distraction a valuable tool for redirecting attention away from these stimuli. It activates the autonomic nervous system, which boosts involuntary body activities like blood pressure, heart rate, respiration rate, gastrointestinal tract motility, and cardiac output. The hypothalamus-pituitary-adrenal axis releases adrenaline, which activates the sympathetic nervous system and triggers the fight-or-flight response. It is often accompanied by nervous behaviour such as pacing back and forth.[4]

The calming impact of certain interventions can alleviate patient anxiety by influencing the limbic system of the brain, triggering the release of endorphins which in turn reduces anxiety levels. Non-pharmacological approaches are preferable in managing anxiety during the initial stages. Such methods encompass music therapy, virtual reality, animal-assisted therapy, Snoezelen sensory-adapted dental environments, and guided imagery. However, implementing these anxiety-reducing techniques can pose a significant financial burden for dentists.

Conventional operatory is designed according to the dentist's preference and convenience, which does not bring any freshness to the operating room. The smell of chemicals, which is constantly associated with the operatories can further deteriorate the patient's anxiety towards their treatment. The operating room should be designed in such a way that it should have a calming effect on the patient. Gloomy monotonous rooms can have a reverse effect on the patient's psychology. The conventional waiting rooms do not generally give preference to the patient's choices. Although a customizable ambiance of an operatory room is not always possible, but an ambiance which is soothing to the patient in reducing their anxiety can be helpful.

On the contrary, pediatric operating room is designed in such a way that it is patient-friendly and pleases the patient as soon as they step into the clinic as opposed to the conventional operating area, which is not characterized by patient comfort. Furthermore, it incorporates educational tools like interactive games, colorful posters, and educational videos that teach children about dental hygiene in a fun and engaging way. By focusing on these child-centric elements, pediatric operatories create a more positive and less intimidating dental experience for patients, helping to build trust and encourage good dental habits.

The present study was a split-mouth randomized controlled trial which aimed to assess the impact of operatory environment on patient anxiety during dental restorations. The study compared treatments in conventional and pediatric operatories, the results of which indicated that the pediatric operatory significantly reduced patient anxiety compared to the conventional setting. Participants preferred the pediatric operatory, citing its ambiance and distractions as key factors in alleviating anxiety. The feedback highlighted the feature like colorful decor and television effectively diverted attention from the treatment, contributing to a more comfortable experience. These findings suggest that enhancing the operatory environment can significantly improve patient comfort and reduce anxiety during dental procedures.

As the present study included adult participants, it is suitable for them to grasp the concept of anxiety and fear which makes the reporting scales by the participants more reliable. The psychometric scale was measured through a modified corah dental anxiety scale and the physiological scale was measured through a pulse oximeter which indicates an increase in heart rate due to increase of anxiety levels. Hence, using both psychological and physiological scales assessment plays an important role in the effective assessment of anxiety levels among participants.

The modified Corah's dental anxiety scale asks the patient to score their level of anxiety concerning five dental situations using a 5-point scale. The modified Corah's dental anxiety used in this study to investigate the anxiety levels towards specific dental procedure. Within the group of participants who had previously visited the dentist, individuals who had encountered negative dental experiences reported elevated levels of anxiety, aligning with the studies carried out by Moore et al, Appukuttan et al, Appukuttan et al and Acharya et al.[5-8]

Brukiene et al in their cross-sectional study involving Lithuanian adults, it was discovered that individuals who had not undergone any prior invasive dental procedures exhibited lower levels of anxiety compared to those who had experienced negative dental encounters in the past.[9] Coffey and Di Giusto reported that anxiety levels were higher in adult patients who presented for the first time than in those who came for subsequent visit.[10] According to the meta-analysis of Hoffmann et al distraction therapy with different interventions can take away the attention from the unpleasant stimuli which can increase the anxiety levels.[11] It also suggests listening to music which is neutral, relaxing with a slow tempo can reduce the heart rate, respiratory rate, and cardiac output in anxious patients during dental treatment. These findings highlight the necessity of implementing distraction techniques aimed at alleviating unpleasant stimuli that could potentially trigger anxiety in patients during dental procedures.

The study had several limitations regarding the sampling method, as it only included patients undergoing restorative procedures, excluding those requiring invasive dental procedures. Additionally, the introduction of music

might impede effective communication between the dentist and the patient. The futuristic aspect of our study involves integrating additional distraction methods, such as providing informative pamphlets detailing the procedure to be given to patients prior to treatment. This will be accompanied by visual aids aiming to educate patients about the procedure, thereby mitigating the fear of the unknown and ultimately reducing anxiety. Consequently, there is ample opportunity to expand the study with a larger sample size.

CONCLUSION

The study demonstrated a significant reduction in both pulse rate and anxiety scores post-operatively in both operatory settings, with the pediatric operatory achieving a more pronounced decrease ($p = 0.0433$). Participants reported greater comfort and lower anxiety in the pediatric environment, highlighting its effectiveness in mitigating dental anxiety. These findings underscore the importance of a stimulating operatory ambiance, such as colorful walls and media, in improving patient comfort and can guide future dental operatory designs to reduce anxiety.

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