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Evaluate the Relationship between Dental Anxiety, State Anxiety and Procedure Pain during Maxillary Local Anesthesia in Saudi Arabia 2024

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ABSTRACT: Background: The successful anesthesia is an essential factor for dental treatment. Fear of local anesthesia is a significant barrier to dental care as many patients delay or avoid treatment to prevent pain. It is important to evaluate the relationship between dental anxiety, state anxiety and procedure pain during maxillary local anesthesia.

The study aimed: To evaluate the correlation between dental anxiety, state anxiety and pain after dental injection.

Methods: A cross sectional study was utilized. Before receiving treatment, every one of the 120 children who scored highly on the Frankle behavior measure had a maxillary injection. The Children Fear Scale was used to measure dental fear, while the Children fear Questionnaire was used to measure state anxiety. Pain following dental injection was measured using the FLACC Scale and the Wong Baker Scale.

Results: No statistically significant differences were found in anxiety level scores between genders and age groups with p-value > 0.05. A statistically significant difference in the postoperative pulse rate between males and females, with females having a greater mean pulse rate (p value= 0.024). A positive correlation was found between each dental anxiety

and procedural pain and state anxiety and procedural pain.

Conclusion: Reducing anxiety in young patients improves their quality of life and health care by lowering the expected and procedural pain that they endure.

INTRODUCTION:

Dental anxiety is a patients' response to stress in a dental setting [1]. Medical procedures cause a feeling of fear, inability, as well as anxiety [2]. It can be provoked due to multiple factors, such as previous negative or traumatic experience, sensory triggers such as sights of needles and air-turbine drills, sounds of drilling and screaming, vicarious learning from anxious people, patients' personality characteristics and their coping strategies [3-8]. A patient's reaction to an unknown risk that makes them fearful that something severe is going to happen during dental treatment is known as dental fear and anxiety (DFA), and it's frequently associated with a feeling of helplessness [9]. A number of reasons contribute to the high prevalence of dental anxiety in young patients, which is reported to range from 5.7% to 20.2% [10].

According to Morgan and Porritt, (2017) [11], dental anxiety and fear are normal aspects of a teenager's cognitive development, albeit they typically have less of an impact on an older child. The development of dental anxiety and fear in children is influenced by a number of interrelated personal and environmental factors, which together make up the multifactorial etiology of dental anxiety and dread [12]. Gender and age are contentious variables that influence the onset of dental anxiety. Since there was no correlation between the age at the initial visit and the emergence of dental dread, Shindova and Belcheva, (2021) [13] found that age had no impact in the development of dental fear and anxiety.

According to a comprehensive review by Murad et al., (2020) [14], there is a relationship between age and DFA levels; younger children had greater DFA levels than older patients. In terms of gender, study conducted by Morgan and Porritt, (2017) [11] have generally shown that women report higher levels of DFA than men do, as well as more particular fear and anxiety related to drilling, local anesthesia, and pain. Pain is a major element that is thought to be a high risk factor for developing dental anxiety. According to the IASP, pain is an unpleasant emotional and sensory experience that is connected to or expressed in terms of existing or potential tissue damage [15, 16]. However, the relationship between anxiety and pain is reciprocal due to the multifactorial etiology of DFA and the multiple dimensions of pain [17, 18].

Patients who have had severe dental pain are more likely to report greater DFA levels, which are linked to prior painful oral experiences [19]. Furthermore, a number of studies have found that when receiving invasive treatment, anxious patients typically perceive pain worse than non-anxious patients [20-22]. According to a systematic review by Heaton, (2017) [23] revealed that anxiety levels did not differ between surgical and nonsurgical procedures, but dental anxiety significantly affects expected pain, pain during dental treatment, and pain after treatment. State anxiety significantly affects pain perception and pain during procedures only.

Studies have shown a strong link between procedural pain and anxiety in pediatric patients [24, 25]. Studies on dental treatment have demonstrated that lowering dental anxiety using a variety of techniques, including procedural sedation, virtual reality, and the buzzy system; can successfully lessen patients' perceptions of pain during dental treatments [26]. Hence, the aim of the study was to evaluate the relationship between dental anxiety, state anxiety and procedural pain in school-aged children during dental anesthesia administration.

METHODS:

This observational a cross-sectional study was utilized to evaluate the correlation between dental anxiety and pain during local anesthesia administration. This study conducted from January to July 2024. Children who visited the pediatric dental department of a hospital in Jeddah, Saudi Arabia, were chosen at random to participate in the study. All procedures were followed in compliance with the Declaration of Hospital and all applicable rules and regulations. The University's Ethical Committee also granted ethical approval. Additionally, before the data gathering process began, formal informed consent was acquired from the guardians of each participant.

The sample size was determined with G-power software v3.1.9.7 and based on similar previous studies [23, 24]. A total of 120 children aged 6-10 years who visited the dentist for the first time and needed dental treatment in the maxillary arch including administration of local anesthetic, were included in this study. Patients with communication disabilities, or medical or psychological disorders that may have an effect on the pain threshold were excluded. Moreover, patients with severe dental

pain or acute abscess and children with a negative or absolutely negative ranking according to the Frankle Behavior Rating Scale were also excluded.

Each patient was seated in the dental chair, and then 20% benzocaine gel was applied at the injection site prior to anesthesia for 1 minute via a sterile cotton swab. Afterwards, a 1:80000 lidocaine infiltration injection was administered in the maxillary arch. Pain and anxiety were assessed using several measures: children's state anxiety was assessed by the Child Anxiety Questionnaire (CAQ) developed by Garcia et al., (2020) [27] a tool driven by the State –Trait Anxiety Scale. This accumulative scale was used to measure state anxiety before and after treatment. 4-6 points referred to no anxiety or mild anxiety, while 7-9 points described moderate anxiety, with 10-12 points indicating severe anxiety or phobia. For dental anxiety, the Children Fear Scale (CFS) was used to assess pre- and postoperative fear among patients undergoing a painful medical procedure [28]. This is a self-reported assessment tool consisting of 5 faces representing different levels of fear, with 0 indicating no fear and 4 indicating the worst feeling of fear.

Additionally, changes in the physiological pulse rate were recorded before and after the administration of anesthesia using a finger pulse oximeter the first time was 5 minutes after the patient was seated in the dental chair, second time was 5 minutes after the dental injection. Regarding pain, the child was asked to choose a face from the Wong Baker scale (WB that matches his feelings after receiving the injection). In addition, the child's behavior during the administration of local anesthesia was recorded on video using a mobile phone camera attached to the dental chair, and was subsequently assessed by two external observers according to the Faces-Legs Activity-Cry-Consolability scale (FLACC).

In this study, descriptive data, including means, frequencies and percentages, were calculated for boys and girls. For the quantitative variables, the Kolmogorov-Smirnov test was used to assess normality. Normality was found for the pulse rate scores. The collected data were analyzed using IBM SPSS software v. 28. P value of less than 0.05 was considered significant, and the power of the study was set at 95%. The Mann-Whitney U test was performed to compare CFS, and CAQ scores and WB, and FLACC scores between males and females, while simple t- test was used to compare pulse rate mean between gender and age groups. Moreover, the correlations between CAQ score, CFS scores and FLACC, and WB scores were studied using Spearman's rank correlation with a level of significance of 0.01.

RESULTS:

For this study, 120 patients in all were enrolled. **Table (1)** shows that the average age of the 60 males and 60 females were 7.7 ±1 years. No statistically significant difference was found between males and females with regard to mean age (p value =1.34).

In addition, no statistically significant difference was found between males and females in CFS scores (p value = 0.349), as 46.66% of male patients and 33.33% of female patients had no fear at all (table 1). CFS scores were evaluated for the following age groups: 6- <8 years and 8≤ -10 years. There was no statistically significant difference between these age groups (p value= 0.621), Moreover, there was no correlation between age and anxiety level (p value > 0.05). (**Table1**)

Table (1): Mann-Whitney results for CFS scores for gender and age groups.

CFS	**gender**			**age**		
	Male	**Female**	**Total**	**6- < 8**	**8 ≤ -10**	**Total**
0	46.7 %	33.3 %	40 %	43.4 %	37.31 %	40 %
1	35 %	51.7 %	43.3 %	39.6 %	46.2 %	43.3 %
2	11.7 %	10 %	10.8 %	11.3 %	10.44 %	10.8 %
3	5 %	1.66 %	3.3 %	3.7 %	2.9 %	3.3 %
4	1.7 %	3.3 %	2.5 %	1.8 %	2.9 %	2.5 %
N	60	60	120	53	67	120

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CFS	gender			age		
	Male	Female	Total	6- < 8	8 ≤ -10	Total
p- value	0.349			0.621		

* p- Value is significant at < 0.05

Table (2) shows that CAQ scores did not differ between male and female patients (p value=0.642), with 87.5% of the total patients diagnosed with mild state anxiety and 2.5% of patients suffering from high state anxiety (p value= 0.062).

Table (2): Mann-Whitney results for CAQ scores for gender and age groups.

CAQ	GENDER			AGE		
	Male	Female	Total	6- < 8	8 ≤ -10	Total
Mild (4-6)	86.6 %	88.3 %	87.5 %	92.5 %	8.5 %	87.5 %
Moderate (7-9)	10 %	10 %	10 %	1.88 %	16.41 %	10 %
High (10-12)	3.3 %	1.7 %	2.5%	5.7 %	0 %	2.5 %
N	60	60	120	53	67	120
P- VALUE	0.642			0.062		

* p- Value is significant at < 0.05

Table (3) shows that the mean FLACC scores were 0.88 for males and 0.97 for females, but no statistically significant difference was found between gender groups (p value =0.753), or between age groups (p value= 0.836), as the mean score for those aged 6- <8 years was 0.91 and for those aged 8≤ -10 years was 0.94.

Table (3): Mann-Whitney results for FLACC scores for gender and age groups

	FLACC					
	gender			age		
	male	female	Total	6- <8	8≤ -10	total
Mean	0.88	0.97	0.92	0.91	0.94	0.92
N	60	60	120	53	67	120
Std. Deviation	0.783	0.901	0.842	0.838	0.851	0.842
P VALUE	0.753			0.836		

* p- Value is significant at < 0.05

Table (4) shows that more male patients reported greater pain levels than female patients did but no statistically significant

difference was found (p value= 0.701), additionally, older patients reported greater pain levels than younger patients did, with no statistically significant difference between them (p value= 0.836).

Table (4): Mann-Whitney test for the Wong Baker scores for gender and age groups

	Wong Baker					
	Gender			**Age**		
	Male	**Female**	**Total**	**6- < 8**	**8 ≤ -10**	**Total**
No pain (0)	22	23	45	18	27	45
Hurts little bit (2)	32	33	65	31	34	65
Hurts little more (4)	6	4	10	4	6	10
N	60	60	120	53	67	120
P VALUE	0.701			0.836		

* p- Value is significant at < 0.05

Table (5) shows that there was a statistically significant difference in the pulse rate between males and females, with females having a greater mean pulse rate (p value= 0.024). During anesthesia, the pulse rates did not differ significantly between males and females (p value= 0.981). Moreover, no significant differences in pulse rates were observed between the age groups either preoperatively or during anesthesia.

Table (5): t-test results for pulse rate mean for gender and age groups

	Pulse rate mean					
	Gender			**Age**		
	Male	**Female**	**P value**	**6- <8**	**8≤ -10**	**P value**
Preoperative	95.42	97.02	0.024*	96.62	95.90	0.615
During anesthesia	99.08	99.77	0.981	100.36	98.69	0.192

* p- Value is significant at < 0.05

The relationships between patients' pain responses to dental injection, indicated by the Wong Baker scale and FLACC scale, and their dental anxiety and state anxiety scores were evaluated by Spearman's rank correlation coefficient. There was a statistically significant correlation between the WB, and FLACC scores and both the CFS and CAQ scores (P < 0.01) (Table 6).

Table (6): correlation between dental anxiety, state anxiety and procedural pain measures

Spearman Correlation				
	Male		**Female**	
	Correlation coefficient	**P-value**	**Correlation coefficient**	**P-value**
CAQ/ FLACC	0.382	0.003**	0.589	0.000**
CFS/Wong-baker	0.501	0.000**	0.435	0.001**
CFS/ FLACC	0.386	0.002**	0.636	0.000**
CAQ/ Wong- Baker	0.390	0.002**	0.454	0.000**

** Correlation is significant at 0.01 level

DISCUSSION:

Pain is as much a cognitive and emotional construct as it is a physiological experience [29]. Thus, emotional states, such as anxiety and fear, can affect the severity of pain32. Some studies have demonstrated that patients with a high anxiety level experience difficult anesthesia and more pain during different dental treatments [30, 31]. Dental patients usually expect more pain than their previous experiences, and perception of pain is an essential factor in this regard. According to the literature, people with a high anxiety score tend to exaggerate their level of pain and fear [32].

Dental anxiety and fear originate from unpleasant past experiences, and as anxiety and pain perception were proven to be positively correlated in adult patients, high DFA levels make patients feel more pain [22]. Furthermore, despite the fact that research has demonstrated the effectiveness of DFA in reducing pain during dental procedures, this link has not been thoroughly evaluated in young patients [33]. The aim of this study was to evaluate the relationship between procedural pain, dental anxiety, and state anxiety during the administration of a local anesthetic before dental treatment. Because pain and anxiety have both physical and psychological components, it is challenging to quantify them [34].

As a result, the evaluation of pain and anxiety requires a controlled and regulated setting. In the current study, all patients were treated by a single, skilled pediatric dentist in a calm, distraction-free setting while sharing a single dental chair. Children in school were selected for the study due to their competent cognitive development, which can help them explain their feelings and report them more accurately than younger children [35]. Additionally, Abdelrazk et al., (2024) [36] state that a child's initial attitudes regarding dental care are known to develop around this age range.

In pediatric dentistry, local anesthetic and needle phobia are major issues because they affect children's compliance, treatment results, and anxiety levels [37]. Consequently, this technique was selected because to its ability to influence both pain and anxiety. There is debate in the literature regarding the connection between sex and dental anxiety [38, 39]. However, other research have found that dental anxiety is more common in women than in men [38, 40]. According to Popescu et al., (2024) [41] and Abanto et al., (2017) [42], there was no difference in the CFS and CAQ scores between boys and girls in the current study.

There were not significant differences in the anxiety levels between the two age groups. This might be explained by the fact that every patient scored well on the Frankl behavior rating scale. Age and anxiety levels also did not correlate, although the association between DFA and age cannot be regarded as stable because it can be influenced by exposure to different social and cultural events as well as dental health state [43]. Men and women did not significantly differ in how much pain they reported, which is consistent with research by Ghanei et al., (2018) [44] and Naoumova et al., (2012) [45].

In both genders, there was a positive relationship between dental anxiety and procedural pain as well as between state anxiety and procedural pain, and patients who were nervous expressed higher levels of pain than those who were not. In a relevant finding, Sanikop et al. (2011) [22] found that when patients' dental anxiety levels were greater, they anticipated more pain than they actually felt. This conclusion highlights the significance of DFA management in reducing pain, which ultimately enhances children's opinions of dental care and its results.

CONCLUSION:

Anxiety and dental fear are linked to procedural pain; lowering anxiety helps children feel less pain and have a better dental experience, which improves their oral health and quality of life. Although a high level of anxiety is an indication of sedation in the patients, proper interventions, such as informing patients about anesthesia, dental treatment procedures, regular and periodic visits to the dentist, as well as using psychotherapeutic techniques to reduce dental anxiety before anesthesia, could play an essential role in the success of anesthesia.

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