

RELATIONSHIP BETWEEN DENTAL ANXIETY AND PAIN EXPERIENCE DURING DENTAL EXTRACTIONS

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ABSTRACT

Objective: To assess the effects of anxiety on pain experienced during dental extractions.

Methods: A prospective study was conducted during the academic year July-September 2016, randomly among 60 dental patients who visited the outpatient Department of Oral and Maxillofacial Surgery, Saveetha Dental College, Saveetha University, Chennai, for single tooth extraction. Anxiety was measured using the Hamilton anxiety rating scale. The pain was measured using the pain visual analog scale (VAS) for the level of pain perceived during extraction. Data collected were analyzed with Statistical Package for Social Sciences for Windows, Version 16.0 (SPSS Inc., Chicago, IL, USA) and results obtained.

Results: From regression analysis, $R^2=0.605$ which meant that the independent variable (anxiety) explained 60.50% of the variability of the dependent variable (pain) with significant t-value. There was a statistically significant correlation between VAS and total anxiety score ($p<0.05$). This strongly suggests that an increase in pain level is associated with an increase in anxiety level.

Conclusion: Pre-operative dental anxiety is a major predictor of pain experienced by patients during dental extractions. Hence, it is an important to reduce anxiety before treatment to reduce pain during the treatment. Pharmacologic modalities like sedation can be used for reducing anxiety and pain related to the treatment in indicated patients.

Keywords: Dental anxiety, Sedation, Anesthesia, Pain, Tooth extraction.

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INTRODUCTION

Dental extractions are the commonly performed procedures in dental clinics. An ideal tooth extraction is defined as painless removal of the whole tooth or tooth root with minimal trauma to the investing tissues so that the wound heals uneventfully and no post-operative prosthetic problem is created. Dental anxiety and fear are common among patients, and dental extractions are one of the most feared procedures. Klingberg and Broberg described dental anxiety as a state of apprehension that something dreadful is going to happen in relation to dental treatment or certain aspects of dental treatment [1]. Dental anxiety and fear are said to enhance pain during dental treatment. It may interfere with patients' compliance during treatment resulting in poor dental and oral health [2].

Several factors may influence the perception of pain as it is a complex process. Pain is not only determined by nociceptive stimulus but also by cognitive and emotional factors [3]. According to Rhudy and Meagher emotional states highly modulate human pain reactivity [4]. The positive relationship between anxiety and dental treatment pain as proven by several studies [5-9] state that major generators of anxiety are anesthetic injections and minor oral surgeries such as tooth extraction [10,11]. The rationale of this study was to estimate the anxiety and pain levels of patients during extraction and assess the effects of anxiety on pain experienced during dental extractions done in our college.

METHODS

A prospective study was conducted during the academic year July-September 2016 among the dental patients who visited the outpatient

department of oral and maxillofacial surgery, Saveetha Dental College, Saveetha University, Chennai. This study was conducted randomly on 60 patients who required single tooth extraction for various reasons such as pulpitis, mobility, root stump, periodontal disease, and fractured teeth. Demographic details of the patients - such as age, sex, occupation, and educational qualification - were recorded.

For each patient anxiety and pain levels were measured using questionnaires with the help of patients. Anxiety was measured using the Hamilton anxiety rating scale:

- 0 - no anxiety
- 1 - Mild anxiety
- 2 - Moderate anxiety
- 3 - Severe anxiety
- 4 - Very severe anxiety.

The pain was measured using the pain visual analog scale (VAS) graded 0-10, the level of pain perceived during extraction:

- Score 0/1/2: No pain
- Score 3/4: Moderate pain
- Score 5/6: Depressing pain
- Score 7/8: Horrible pain
- Score 9/10: Excruciating pain.

Extractions were done by a single dentist on all the patients, and data were recorded. Data collected were analyzed with Statistical Package for Social Sciences for Windows, Version 16.0 (SPSS Inc., Chicago, IL, USA) and results obtained. To describe the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean and standard deviation were used for continuous variables. To find the significance in categorical data, Chi-square test

was used. In the above statistical tool the probability value, $p < 0.05$ is considered as significant level.

RESULTS

In our study, 60 patients (29 males and 31 females) in the age range of 21-74 years participated and underwent single tooth extractions. Various data were compiled and calculated as shown below in the following tables. Tables 1-3 give frequency distribution of values for sex, anxiety, and pain, respectively. Tables 4-6 give descriptive statistics age-wise and for males and females, respectively. Table 7 describes correlation between anxiety and pain, and Table 8 gives results for Chi-square tests.

Regression analysis: Anxiety versus pain

Regression analysis was performed to obtain the relationship between pain and anxiety level. It is evident from the below tables that the

Table 1: Sex

Valid	Frequency	Percent	Valid percent	Cumulative percent
Male	29	48.3	48.3	48.3
Female	31	51.7	51.7	100.0
Total	60	100.0	100.0	

Table 2: Anxiety

Valid	Frequency	Percent	Valid percent	Cumulative percent
No anxiety	5	8.3	8.3	8.3
Mild	19	31.7	31.7	40.0
Moderate	23	38.3	38.3	78.3
Severe	13	21.7	21.7	100.0
Total	60	100.0	100.0	

Table 3: Pain

Valid	Frequency	Percent	Valid percent	Cumulative percent
0	5	8.3	8.3	8.3
1	4	6.7	6.7	15.0
2	3	5.0	5.0	20.0
4	1	1.7	1.7	21.7
5	18	30.0	30.0	51.7
6	3	5.0	5.0	56.7
7	7	11.7	11.7	68.3
8	19	31.7	31.7	100.0
Total	60	100.0	100.0	

Table 4: Descriptive statistics

Sex	N	Minimum	Maximum	Mean	Standard deviation
Age	60	21	74	42.6	13.478
Valid N (list wise)	60				

Sex: Male + Female

Table 5: Descriptive statistics^a

Sex	N	Minimum	Maximum	Mean	Standard deviation
Age	29	21	74	45.28	14.217
Valid N (list wise)	29				

^aSex=Male

$R^2=0.605$ which means that the independent variable (anxiety) explains 60.50% of the variability of the dependent variable (pain) with significant t-value (Tables 9-13). This strongly suggests that an increase in pain level is associated with an increase in anxiety level.

The relationship between patients' pain responses to dental extraction indicated by the VAS and dental anxiety scores were evaluated by the Spearman's rank correlation coefficient for total anxiety scores. There was a statistically significant correlation between VAS and total anxiety score ($p < 0.05$).

DISCUSSION

Anxiety can be defined as an unpleasant subjective bodily state that acts as an alerting reaction and coping mechanism to some impending event [12,13]. Gilhotra *et al.* [14] have elaborated various neurochemicals involved in the pathology of anxiety. Anxiety is not always detrimental to a person's capabilities but often is normal and necessary to help prepare for a crisis situation.

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Thakur and Srivastava [15] in their review article elaboratively explains about the mechanisms of

Table 6: Descriptive statistics^a

Sex	N	Minimum	Maximum	Mean	Standard deviation
Age	31	21	60	40.10	12.459
Valid N (list wise)	31				

^aSex=Female

Table 7: Anxiety*pain cross tabulation

Anxiety	Pain								Total
	0	1	2	4	5	6	7	8	
No anxiety	2	2	0	0	1	0	0	0	5
Mild	3	1	2	1	7	1	0	4	19
Moderate	0	1	0	0	10	2	5	5	23
Severe	0	0	1	0	0	0	2	10	13
Total	5	4	3	1	18	3	7	19	60

^aDistribution=60

Table 8: Chi-square tests

Parameters	Value	df	Asymp. significant (2-sided)
Pearson Chi-square	48.257 ^a	21	0.001
Likelihood ratio	51.944	21	0.000
Linear-by-linear association	22.356	1	0.000
Number of valid cases	60		

^a28 cells (87.5%) have expected count < 5. The minimum expected count is 0.08

Table 9: Correlations

Spearman's rho	Anxiety	Pain
Anxiety		
Correlation coefficient	1.000	0.605**
Significant (2-tailed)		0.000
N	60	60
Pain		
Correlation coefficient	0.605**	1.000
Significant (2-tailed)	0.000	
N	60	60

**Correlation is significant at the 0.01 level (2-tailed)

acute and chronic pain and the underlying peripheral as well as central pathogenic mechanisms involved. Pain is usually associated to dental treatment, and several factors may influence its perception because it is a complex process [16].

In terms of the effects of anxiety on the perception of pain, it can be said that anxiety acts concomitantly with pain; as anxiety increases, so does the likelihood of interpreting noxious stimuli as pain [17,18]. It is known that individuals who show general higher anxiety states in their daily lives tend to be more sensitive and reactive to pain than their less anxious counterparts. In addition, during a situation of heightened anxiety, the pain threshold is lowered for all population. Therefore, lowering anxiety levels puts patients at ease and consequently helps them tolerate their own subjective experience of pain.

Our study was conducted to assess the relationship between pain and anxiety during dental extraction. The calculated value of (χ^2) is greater than the table value, so the null hypothesis is rejected. From the data, we can therefore conclude that there is association between pain and anxiety level. The correlation between pain and anxiety is 0.605. It reveals that there is a high degree of positive correlation between these two variables. Hence, the pain level depends on anxiety level. If the anxiety level increases, the pain levels will be increased.

Relationship of anxiety to pain

While some studies have found a significant association between gender and level of dental anxiety, females being more anxious than males [19,20], others have not found this association [9,21]. In our study, we did not find any significant association between gender and dental anxiety. Thomas *et al.* [22], from their study, concluded that high prevalence of depression and anxiety produced a stress response, which triggered a cascade of events resulting in a series of changes in human vital physiological functions such as blood pressure, respiratory rate, and heart rate and they were significantly higher than normal values.

Table 10: Variables entered/removed^a

Model	Variables entered	Variables removed	Method
1	Anxiety ^b		Enter

^aDependent variable: Pain, ^bAll requested variables entered

Table 11: Model summary

Model	R	R ²	Adjusted R ²	Standard error of the estimate
1	0.616 ^a	0.379	0.368	2.096

^aPredictors: (Constant), anxiety

Table 12: ANOVA^a

Model	Sum of squares	df	Mean square	F	Signification
1					
Regression	155.425	1	155.425	35.385	0.000 ^b
Residual	254.758	58	4.392		
Total	410.183	59			

^aDependent variable: Pain, ^bpredictors: (constant), anxiety

Table 13: Coefficients^a

Model	Unstandardized coefficients		Standardized coefficients	t	Signification
	B	Standard error	Beta		
1					
(Constant)	2.256	0.591		3.814	0.000
Anxiety	1.804	0.303	0.616	5.949	0.000

^aDependent variable: Pain, VAS: Visual analog scale

Kain *et al.* [23] conducted a study to determine if post-operative pain could be predicted based on pre-operative anxiety and their results showed positive correlations between the level of anxiety and post-operative pain. Various other studies established the same results [24,25]. Psychiatric and psychosomatic manifestation of increased pain from heightened anxiety is well established [26]. These study results are in accordance to our study. In contrary, a study showed no correlation between pre-operative anxiety and post-operative pain in patients undergoing major surgeries [27].

Anxiety is thought to influence the effective component of pain [28]. Anxious people tend to overestimate the intensity of aversive events such as fear and pain [29]. Canakçi and Canakçi noted that a patient with a high Corah's dental anxiety scale (DAS), score would be more likely to present a high pain response than a patient with a lower DAS score [30]. Other studies have also reported that people with higher scores on scales measuring dental anxiety and pain reported more pain after dental treatment [3,31].

Klages *et al.* showed that subjects expected more pain than they experienced and this effect was stronger in patients with higher dental anxiety scores [5]. It was also suggested that anxiety has an influence on the expected pain but not on the experienced pain [32]. According to Fagade and Ile-Lfe [33], if the anxiety scores are high, then there is a corresponding significant increase in the pain VAS scores. Similarly, Vassend [34] reported that increased level of dental anxiety before dental treatment was associated with increased intra-operative pain perception, thus suggesting a strong relationship between the patient's anxiety state before dental extraction and their perception of pain intraoperatively.

Mehrstedt *et al.* in their study on oral health related quality of life in patients with dental anxiety, found a close association between anxiety and pain before during and after dental procedures. There was prevalence of pain in patients with dental anxiety [35]. In another study, it was shown that pain felt during dental injections was dependent on dental anxiety levels [36]. Post-operative pain is also dependent on dental anxiety as shown by a study on pain after wisdom tooth removal [37]. Pain and dental anxiety is intertwined, influencing each other substantially. According to van Wijk and Hoogstraten people who are predisposed to responding fearfully to pain are at an increased risk of ending up in a vicious circle of anxiety, fear of pain, and avoidance of dental treatment which could, in turn, affect the dental treatment plan [36].

The fear of pain during treatment has been identified as a major factor in preventing patients from seeking dental care. Therefore, delivering dental care with minimal patient discomfort should be an essential part of a clinician's skills to avoid noncompliance. Thus, there exists a need for the dentist to be aware of patient anxiety to effectively deal with it. Hence, assessing the patient's level of anxiety using a questionnaire before dental treatment can lead to modification of the treatment plan as needed [38]. Clinicians should have the ability to reduce patients' fear, discomfort and pain during dental extractions for successful treatment which can be achieved using pharmacologic and/or non-pharmacologic therapies. Conscious sedation is a very useful tool during dental extractions in anxious patients.

CONCLUSION

Pre-operative dental anxiety is a major predictor of pain experienced by patients during dental extractions. Hence, it is important to reduce

anxiety before treatment to reduce pain during treatment. To improve the quality of the care provided to the patients in the dental office, the importance of dental anxiety pain relationship must be understood by dental surgeons. They need to assess their patients preoperatively for dental anxiety and use appropriate patient management techniques based on the outcomes of the assessment. Pharmacologic modalities like sedation can be used for reducing anxiety and pain related to the treatment in indicated patients.

REFERENCES

- Guzeldemir E, Toygar HU, Cilasun U. Pain perception and anxiety during scaling in periodontally healthy subjects. *J Periodontol* 2008;79(12):2247-55.
- Tickle M, Milsom K, Crawford FI, Aggarwal VR. Predictors of pain associated with routine procedures performed in general dental practice. *Community Dent Oral Epidemiol* 2012;40(4):343-50.
- Maggirias J, Locker D. Psychological factors and perceptions of pain associated with dental treatment. *Community Dent Oral Epidemiol* 2002;30(2):151-9.
- Rhudy JL, Meagher MW. Fear and anxiety: Divergent effects on human pain thresholds. *Pain* 2000;84(1):65-75.
- Klages U, Ulusoy O, Kianifard S, Wehrbein H. Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures. *Eur J Oral Sci* 2004;112(6):477-83.
- Okawa K, Ichinohe T, Kaneko Y. Anxiety may enhance pain during dental treatment. *Bull Tokyo Dent Coll* 2005;46(3):51-8.
- van Wijk AJ, Makkes PC. Highly anxious dental patients report more pain during dental injections. *Br Dent J* 2008;205:E7.
- McNeil DW, Helfer AJ, Weaver BD, Graves RW, Kyle BN, Davis AM. Memory of pain and anxiety associated with tooth extraction. *J Dent Res* 2011;90(2):220-4.
- Klages U, Kianifard S, Ulusoy O, Wehrbein H. Anxiety sensitivity as predictor of pain in patients undergoing restorative dental procedures. *Community Dent Oral Epidemiol* 2006;34(2):139-45.
- Loggia ML, Schweinhardt P, Villemure C, Bushnell MC. Effects of psychological state on pain perception in the dental environment. *J Can Dent Assoc* 2008;74(7):651-6.
- Bottan ER, Glio JD, Araújo SM. Ansiedade ao tratamento odontológico em estudantes do ensino fundamental. *Pesq Bras Odontoped Clin Integr*. 2007;7(3):241-6.
- Pizer ME, Dubois DD, Chinnis RJ. Declining dental school enrollments. *Va Dent J* 1982;59(4):34-7.
- Gale EN. Fears of the dental situation. *J Dent Res* 1972;51(4):964-6.
- Gilhotra N, Dhingra D. Neurochemical modulation of anxiety disorders. *Int J Pharm Pharm Sci* 2010;2 Suppl 1:1-6.
- Thakur S, Srivastava N. An update on neuropathic pain models. *Int J Pharm Pharm Sci* 2016;8(6):11-6.
- da Costa RS, Ribeiro SN, Cabral ED. Determinants of painful experience during dental treatment. *Rev Dor São Paulo* 2012;13(4):365-70.
- Sternbach RA. *Pain: A Psychophysiological Analysis*. New York: Academic Press; 1968.
- Sternbach RA. *Pain Patients: Traits and Treatment*. New York: Academic Press; 1974.
- Milgrom P, Weinstein P, Golletz D, Leroux B, Domoto P. Pain management in school-aged children by private and public clinic practice dentists. *Pediatr Dent* 1994;16(4):294-300.
- Kaakko T, Getz T, Martin MD. Dental anxiety among new patients attending a dental school emergency clinic. *J Dent Educ* 1999;63(10):748-52.
- Morse Z, Sano K, Fujii K, Kanri T. Sedation in Japanese dental schools. *Anesth Prog* 2004;51(3):95-101.
- Thomas A, Dubey SK, Samanta M, Alex A, Jose SP. Assessment of psychological stressors of depression and anxiety using depression anxiety stress scale-21 in South Indian healthy volunteers. *Int J Pharm Pharm Sci* 2016;8(5):288-95.
- Kain ZN, Sevarino F, Alexander GM, Pincus S, Mayes LC. Preoperative anxiety and postoperative pain in women undergoing hysterectomy. A repeated-measures design. *J Psychosom Res* 2000;49(6):417-22.
- Kain ZN, Sevarino F, Pincus S, Alexander GM, Wang SM, Ayoub C, Kosarussavadi B. Attenuation of the preoperative stress response with midazolam: Effects on postoperative outcomes. *Anesthesiology* 2000;93(1):141-7.
- Ploghaus A, Narain C, Beckmann CF, Clare S, Bantick S, Wise R, Matthews PM, Rawlins JN, Tracey I. Exacerbation of pain by anxiety is associated with activity in a hippocampal network. *J Neurosci* 2001;21(24):9896-903.
- Cooper IS, Braceland FJ. Psychosomatic aspects of pain. *Med Clin North Am* 1950;34(4):981-93.
- Kain ZN, Sevarino FB, Rinder C, Pincus S, Alexander GM, Ivy M, Heninger G. Preoperative anxiety and postoperative recovery in women undergoing abdominal hysterectomy. *Anesthesiology* 2001;94(3):415-22.
- Woolgrove J. Pain perception and patient management. *Br Dent J* 1983;154(8):243-6.
- van Wijk AJ, Hoogstraten J. Experience with dental pain and fear of dental pain. *J Dent Res* 2005;84(10):947-50.
- Canakçi CF, Canakçi V. Pain experienced by patients undergoing different periodontal therapies. *J Am Dent Assoc* 2007;138(12):1563-73.
- Sullivan MJ, Neish NR. Psychological predictors of pain during dental hygiene treatment. *Probe* 1997;31(4):123-6, 135.
- Rachman S, Arntz A. The overprediction and underprediction of pain. *Clin Psychol Rev* 1991;11(4):339-55.
- Fagade OO, Ile-Lfe FF. Intra-operative pain perception in tooth extraction - Possible causes *Int Dent J* 2005; 55(4):242-6.
- Vassend O. Anxiety, pain and discomfort associated with dental treatment. *Behav Res Ther* 1993;31(7):659-66.
- Mehrstedt M, John MT, Tönnies S, Micheelis W. Oral health-related quality of life in patients with dental anxiety. *Community Dent Oral Epidemiol* 2007;35(5):357-63.
- van Wijk AJ, Hoogstraten J. Anxiety and pain during dental injections. *J Dent* 2009;37(9):700-4.
- Lago-Méndez L, Diniz-Freitas M, Senra-Rivera C, Seoane-Pesqueira G, Gándara-Rey JM, García-García A. Postoperative recovery after removal of a lower third molar: Role of trait and dental anxiety. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;108(6):855-60.
- Sharma S, Majumder K, Dayashankara Rao JK, Arya V, Siwach V, Gulia S. Assessment of relationship between pain and anxiety following dental extraction-A prospective study. *Pain Stud Treatment* 2015;3(3):23-30.