

ANXIETY, PAIN AND HEMODYNAMIC CHANGES DURING SURGICAL REMOVAL OF LOWER THIRD MOLAR EXTRACTION UNDER LOCAL ANESTHESIA

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Abstract

The aim of this study is to determine the hemodynamic changes in healthy patients during the surgical removal of lower third molar and to evaluate whether these variations are attributable to patient anxiety and pain experienced during surgical procedure. The stress and anxiety that patients experience when they visit a dentist is an everyday occurrence in dentistry. One out of every seven patients treated in Western countries has severe anxiety and/or terror. Patients who believe their visit to the dentist will be uncomfortable or who have previously had painful experiences in the dental clinic. Patients should be treated more gently on their initial appointment to avoid escalating their fear and, as a result, their aversion to dental care.

Keyword: Third molar, Extraction, Impaction, Lower impaction, Local anesthesia, Surgical removal.

INTRODUCTION

The stress and anxiety that patients experience when they visit a dentist is an everyday occurrence in dentistry. One out of every seven patients treated in Western countries has severe anxiety and/or terror. Patients who believe their visit to the dentist will be uncomfortable or who have previously had painful experiences in the dental clinic are more likely to have this reaction(1). When undergoing dental treatment, the patient may experience a variety of negative reactions, including anxiety, which is a response to an imagined future threat that causes sympathetic nervous system activation (for example, sitting in the dental clinic waiting room before a procedure); fear, which is a response to a real action that is perceived as imminent (for example, sitting in the dentist's chair just before undergoing anesthesia)(2) or even dental phobia, which is included within phobias related to "blood-injections-fear" and defined in the classification of "Diagnostic and Statistical Manual of Mental Disorders" as a pronounced, persistence and excessive and irrational fear caused by the presence of a specific object or situation(3). Fear and discomfort can also be determined by a patient's previous experiences, as previously indicated(4). According to a 1980 study, patients with high levels of fear remember the therapy as being more painful than those with low levels of anxiety(5). This would support the earlier hypothesis that this type of patient will put off treatment for a long time, eventually requiring more interventional treatments(6). Fear and anxiety, on the other hand, are not limited to medical procedures. Patients using conservative procedures such as root canal treatment have higher pain expectations than they actually experience during treatment(7).

In medically impaired individuals, administering local anesthetics and performing significant dental treatments such as tooth extraction and minor surgical procedures can create stress and systemic disruptions. Dentists are required to regularly

examine their medically challenged patients in order to avoid possibly dangerous reactions(8). Healthy patients can normally endure these stress-related physiologic responses; however, individuals with hypertension, cardiac disease, cerebrovascular illness, or advanced age may have a reduced stress tolerance. Anxiety during a dentist visit can lead to parasympathetic dominance, which can lead to bradycardia, syncope, and even cardiac arrhythmias(9). The aim of this study is to determine the hemodynamic changes in healthy patients during the surgical removal of lower third molar and to evaluate whether these variations are attributable to patient anxiety and pain experienced during surgical procedure.

MATERIALS AND METHODS

An observational study was made of the hemodynamic constants of normotensive patients subjected to surgical removal of mandibular third molar. The study sample consisted of 20 adults seen in our department from november 2021 to December 2021 for surgical removal of mandibular third molar. All mesioangularly, disto angular, vertically and horizontally impacted mandibular third molars with a difficulty index of 3–4 were included in the study. The difficulty of surgical extraction of the molars was assessed using Pederson's difficulty index. The patient distribution by gender was female- and male-, with a mean age of 37 years (range, 20–53 years). Local anesthesia comprised 2% of lignocaine with vasoconstrictor (adrenaline 1:200,000). Patients below 18 years of age and medically compromised patients were excluded in the study.

Prior clinical history was compiled, a clinical examination was carried out, and a panoramic X-ray study was requested to evaluate buccodental health. In all 20 patients, the surgical procedure was done by the same surgeon. The mean duration of the surgical procedure measured from the time of local anesthesia to the end of suturing was 35 min (range 20–50 min).

During the procedure, the patient position was reclined at an angle of 120°. Amount of local anesthetic solution used during the procedure was not more than 4 ml. Local anesthesia comprised 2% lignocaine with vasoconstrictor (adrenaline 1:200,000). The patients were monitored for diastolic BP (DBP) and systolic BP (SBP) by mercury blood pressure apparatus, and the heart rate (HR), pulse rate (PR) and oxygen saturation (SpO2) were recorded by pulse oximeter. These hemodynamic parameters were recorded on two occasions: before starting the surgical procedure, 1 min after local anesthetic injection. All patients

were informed of the purpose of the study, and signed consent was obtained in all cases. Tests of patient anxiety (Corah's dental anxiety scale) were carried out to evaluate a patient's overall dental anxiety level, both real and imagined. Hemodynamic variables were compared between the gender and at different time points by performing two-way analysis of variance for repeated measures. Global mean values of hemodynamic variables were compared between male and female using unpaired *t*-test. Categorical variables were compared by Chi-square test. All the tests were two-sided. *P* < 0.05 was considered statistically significant.

RESULTS:

Table: 1 Data collection regarding physiological variables in regards to female in the study (n=10)

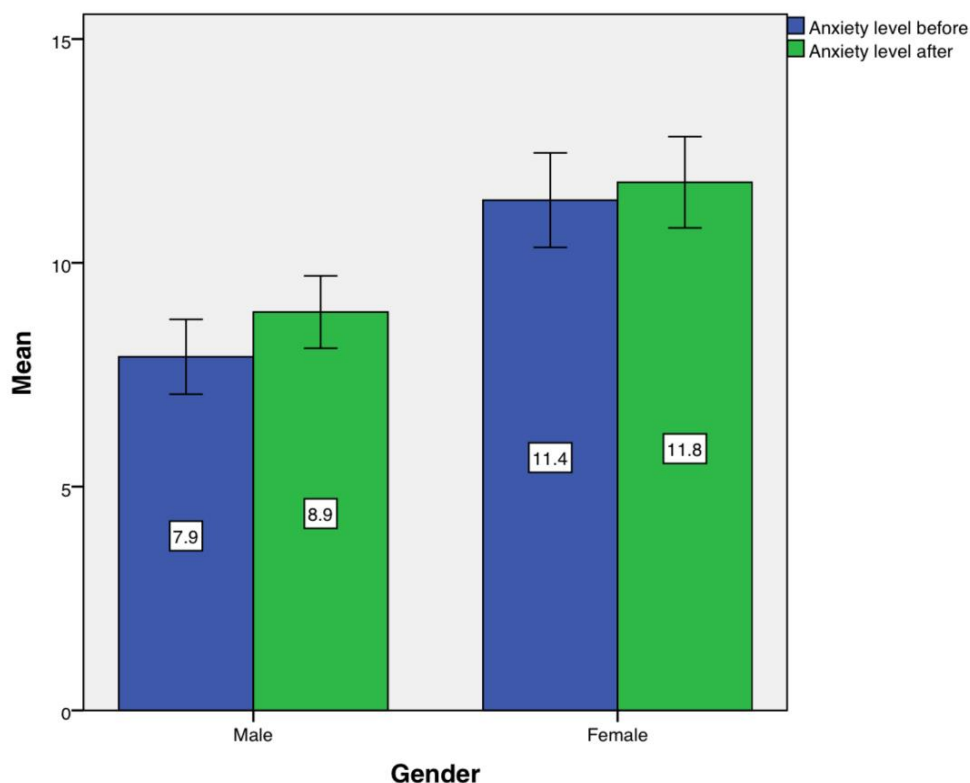
VITALS	TOTAL NUMBER	MINIMUM	MAXIMUM	MEAN	STD. DEVIATION
Anxiety level before	10	6	16	11.40	3.340
Anxiety level after	10	7	17	11.80	3.225
SBP before	10	95	110	101.30	4.244
SBP after	10	95	115	106.50	6.258
DBP before	10	130	150	140.50	7.246
DBP after	10	135	150	143.50	4.743
Heart rate before	10	52	84	64.30	9.627
Heart rate after	10	60	90	70.40	8.897
SPO2 before	10	90	96	92.48	2.011
SPO2 after	10	94	98	96.20	1.398

Table: 2 Data collection regarding physiological variables in regards to male in the study (n=10)

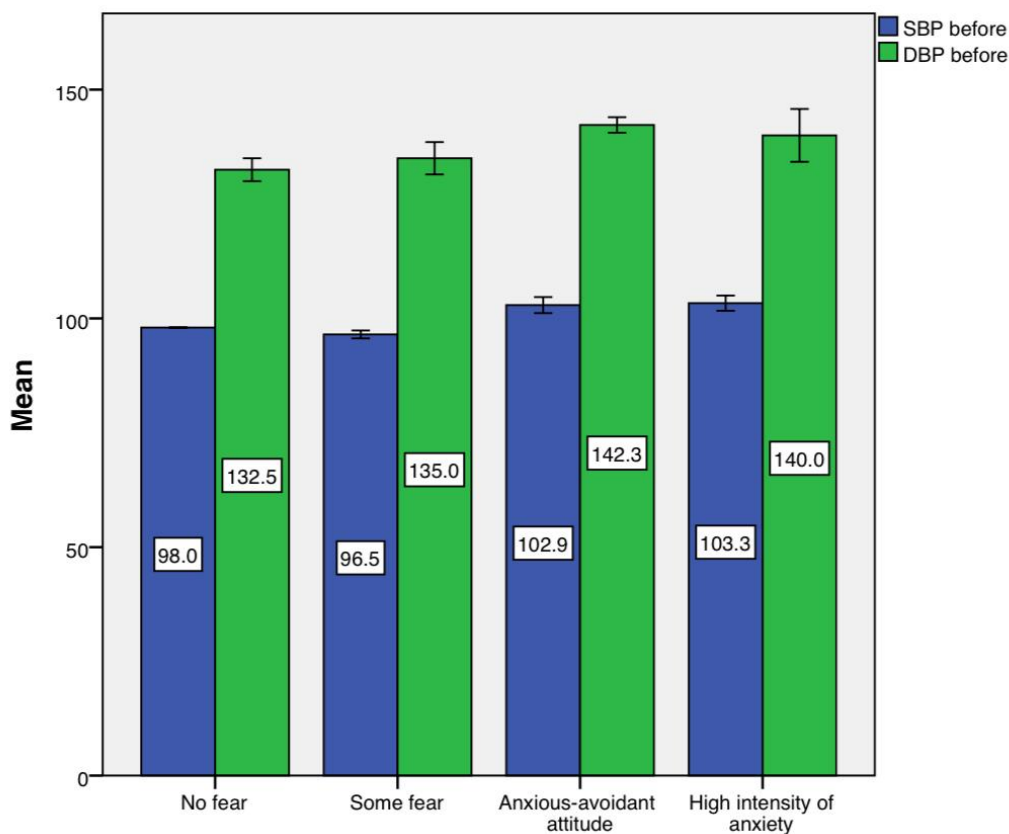
VITALS	TOTAL NUMBER	MINIMUM	MAXIMUM	MEAN	STD DEVIATION
Anxiety before	10	4	10	7.90	2.644
Anxiety after	10	4	12	8.90	2.558
SBP before	10	95	110	101.10	6.296
SBP after	10	98	115	104.80	5.514
DBP before	10	130	150	138.50	7.091
DBP after	10	130	150	139.00	6.992
Heart rate before	10	52	84	64.00	9.404
Heart rate after	10	60	90	71.10	8.950
SPO2 before	10	92	96	94.40	1.265
SPO2 after	10	95	98	97.30	1.059

Table 3: Table represents the paired sample correlation which is significant (p<0.05)

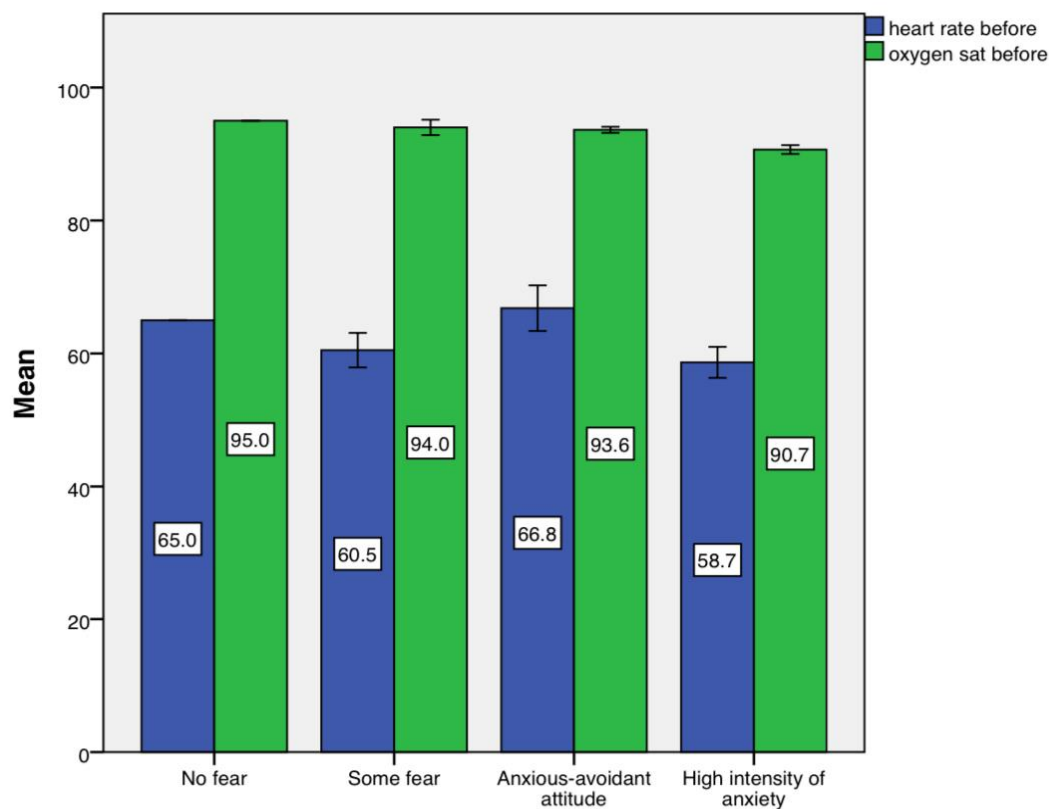
NUMBER	PAIRED SAMPLE	SAMPLE	CORRELATION	SIGNIFICANCE
Pair 1	Anxiety anxiety level before and anxiety level after	20	.792	.000
Pair 2	Systolic blood pressure before and systolic blood pressure after	20	.464	.039
Pair 3	Diastolic blood pressure before and diastolic blood pressure after	20	.709	.000
Pair 4	Heart rate before and heart rate after	20	.937	.000
Pair 5	Oxygen saturation before and oxygen saturation after	20	.491	.028



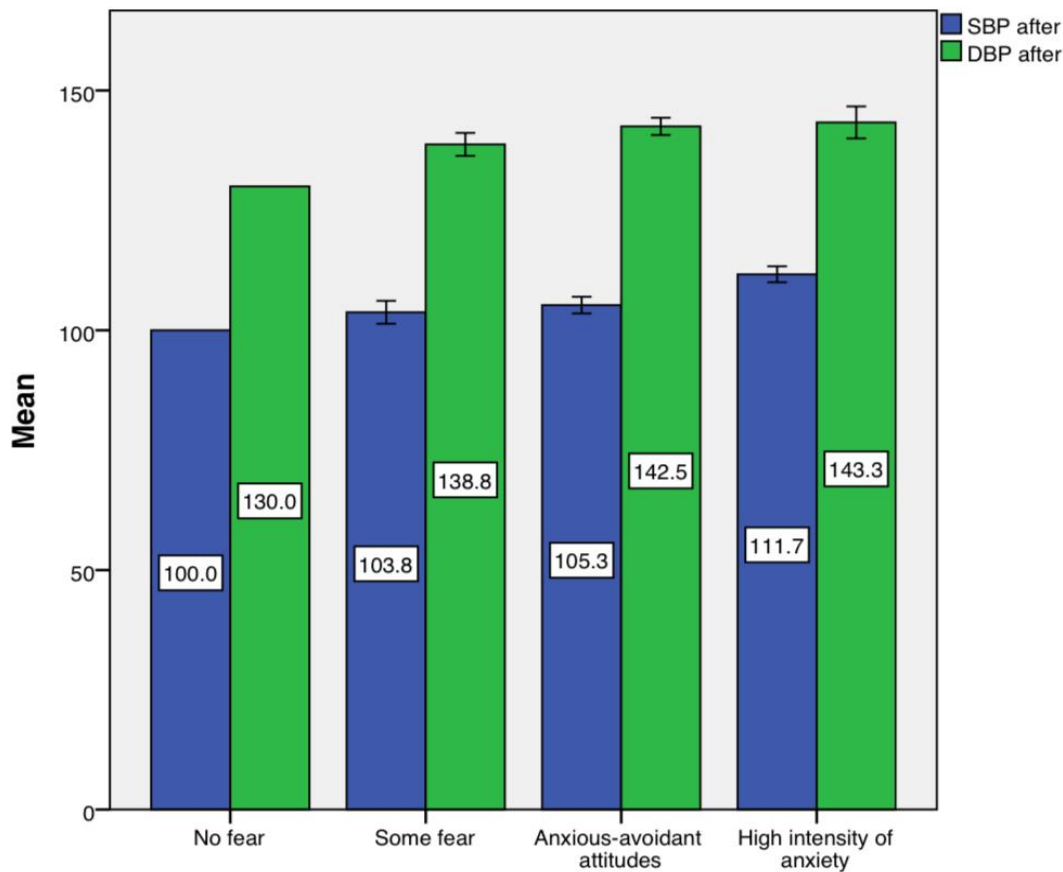
GRAPH: 1 Graph shows relationship between the anxiety level before extraction and anxiety level after surgical extraction by using corah's dental anxiety scale in regards to gender (n=20). The blue colour represents the anxiety level before the surgical extraction and the green colour represents the anxiety level after the extraction.



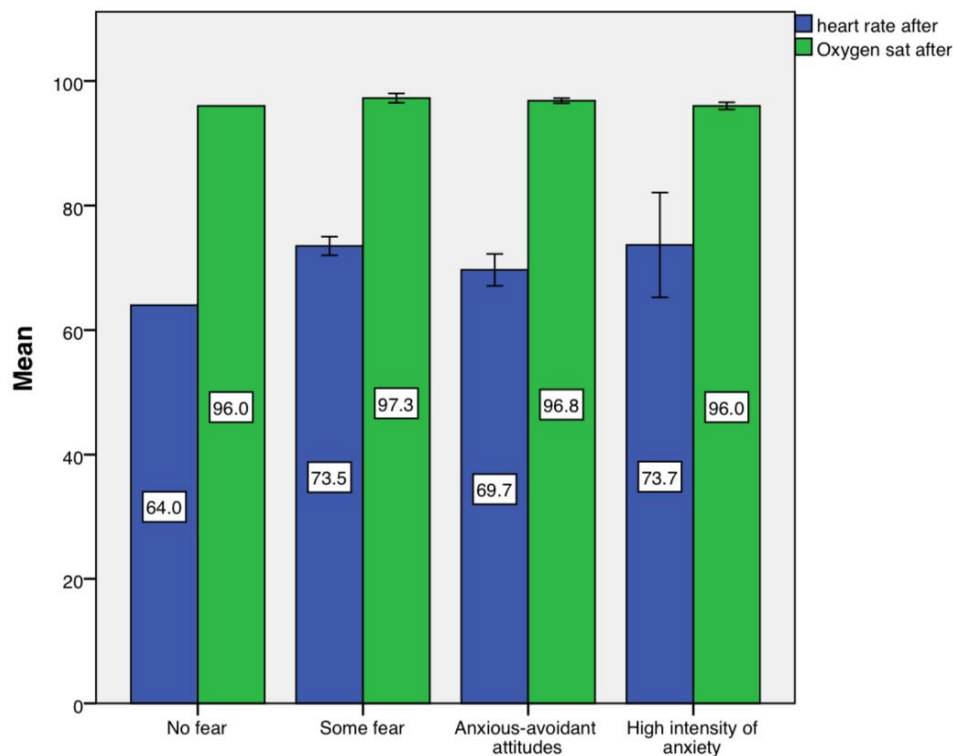
GRAPH: 2 The graph represents the relationship between the preoperative systolic blood pressure and preoperative diastolic blood pressure in regards to corah's dental anxiety scale (n=20). The blue colour represents the preoperative systolic blood pressure and the green colour represents the preoperative diastolic blood pressure to each level of anxiety.



GRAPH 3: The graph represents the relationship between the preoperative heart rate and preoperative oxygen saturation level in regards to corah’s dental anxiety scale (n=20). The blue colour represents the preoperative heart rate and the green colour represents the preoperative oxygen saturation level to each level of anxiety.



GRAPH 4: The graph represents the relationship between the postoperative systolic blood pressure and postoperative diastolic blood pressure in regards to corah’s dental anxiety scale (n=20). The blue colour represents the postoperative systolic blood pressure and the green colour represents the postoperative diastolic blood pressure to each level of anxiety.



GRAPH 5: The graph represents the relationship between the postoperative heart rate and postoperative oxygen saturation in regards to corah's dental anxiety scale (n=20). The blue colour represents the postoperative heart rate and the green colour represents the postoperative oxygen saturation level to each level of anxiety.

DISCUSSION

In the dental clinic, dental extractions are a typical procedure with a quick recovery time if no complications arise. Psychological aspects, on the other hand, suggest that this could be a highly stressful condition for the patient. The aim of the study is to find the anxiety level of patients before the surgical removal of lower molar using corah's dental anxiety scale along with preoperative systolic blood pressure, postoperative systolic blood pressure, preoperative diastolic blood pressure, postoperative diastolic blood pressure, preoperative heart rate, post operative heart rate, preoperative oxygen saturation of patient and postoperative oxygen saturation with significant difference in relation to gender which has higher significance in women in comparison to men in both preoperative and postoperative dental anxiety level. The similar results seen in Gadve *et al.* in which there were higher significant differences in women in comparison to men in both systolic and diastolic BP(10). In our study, females with a mean value of 11.4 have the highest anxiety level before treatment of extraction compared to the mean value of men correlating with the same significance seen in females compared to male with the mean value of 11.8 after the extraction of lower third molar.

The study describes the great significant rise seen in preoperative systolic blood pressure with significance to corah's dental anxiety scale with the level of high intensity of anxiety and preoperative diastolic blood pressure has significant rise in corah's dental scale with the level of anxious- avoidant attitude of patients. These results coincide with those published by Shuruthi *et al.* Patients' physiologic stress response is manifested in corticosteroid release, blood pressure changes, and hemodynamic and cardiovascular reactions in anticipation of upcoming dental treatment(11) Even in normotensive individuals, local anesthetic is used for the majority of dental procedures, and an elevation in blood pressure is typical(12,13). Many variables influence this rise, including psychological and

physical stress, unpleasant stimuli, and the effects of catecholamines found in local anesthetics(14).

In the present study it is hypothesized that the mean value of preoperative heart rate is significantly coincide with the corah's dental anxiety scale with level of no fear with mean value of 95.0 and the significance between the mean value of preoperative oxygen saturation is significantly coincides with the dental anxiety scale with the level of anxious avoidant attitude with value of 66.8. The similar results seen in the yamashita *et al.* heart rate and blood pressure before and during injection and extraction may be a manifestation of endogenous catecholamine release as a result of emotional stress rather than a pharmaceutical impact(15). Emotional stress causes hemodynamic changes that obscure the effects of exogenously active catecholamines(16).

The postoperative systolic blood pressure in our study is significantly associated with the mean value of the corah's dental anxiety scale with the level of high intensity of anxiety (111.7) and the postoperative diastolic blood pressure significantly associated with the mean value of 143.3 with the dental anxiety scale with the level of high intensity of anxiety. Dental anxiety has a considerable impact on the effects of local anesthesia delivery on blood pressure, heart rate, pulse rate, and electrocardiograph, and is linked to an increase in systolic blood pressure, heart rate, pulse rate, and changes in electrocardiogram(16). The similar results seen in khateeb *et al.* have seen differences in preoperative and post-operative diastolic BP with a clear correspondence to the data obtained in the classic DAS(17). They have also seen that patients with higher levels of anxiety have a greater tendency to take anti-inflammatory medication compared to patients with low anxiety, who only require analgesia or no medication(18).

In our study there is a significant relationship between the postoperative heart rate with the DAS of level high intensity of anxiety with mean value of 73.7 along with the postoperative

oxygen saturation rate with DAS level of some fear with mean value of 97.3. The results similarly coincides with Sanz *et al.* study observed statistically significant differences for the different levels of anxiety obtained via Corah's Test and pre and post-operative diastolic BP, as well as pre and post-operative HR(19)(20). The results indicate that the most significant differences are found, above all, for moderate and severe levels of anxiety, similarly to what is described in a study by Sharma *et al.*, where it was observed that, analyzing the patient, BP and HR values rose in Corah's three levels of anxiety (medium, high and severe)(13). The physiological changes evaluated in regards to the levels of anxiety obtained via Corah's Test were also seen in Liao *et al.*'s study, which rose in the three groups, especially in the moderate and severe groups(21).

We have seen the significant difference between the preoperative systolic and diastolic blood pressure with regards to the corah's dental anxiety scale and also with the postoperative systolic and diastolic blood pressure with DAS. In our study we have also seen in patients with regards to gender that females have higher levels of anxiety when compared to male and female before and after the surgical extraction of the third molar. The results show that preoperative heart rate and postoperative heart rate have significant increases seen in relation to corah's dental anxiety scale and also the preoperative and postoperative oxygen saturation state was significant in relation to DAS. The study concludes that there is a significant relationship between the blood pressure and the heart rate.

CONCLUSION

According to the findings, dental anxiety affects the effect of local anesthetic delivery on blood pressure and is associated with increased HR. When dealing with patients who have dental anxiety, a polite, supportive, professional, sympathetic, calm, and more attentive approach should be taken. Patients should be treated more gently on their initial appointment to avoid escalating their fear and, as a result, their aversion to dental care. Even during the minor oral surgical procedures, monitoring vital signs in healthy and medically compromised patients aids the dentist in detecting acute medical problems or taking preventive steps plays a major role.

References

1. Ferguson D. Pain and dental pain: current perspectives [Internet]. Vol. 3, Faculty Dental Journal. 2012. p. 86–91. Available from: <http://dx.doi.org/10.1308/204268512x13312096186406>
2. van Wijk AJ, Hoogstraten J. Experience with Dental Pain and Fear of Dental Pain [Internet]. Vol. 84, Journal of Dental Research. 2005. p. 947–50. Available from: <http://dx.doi.org/10.1177/154405910508401014>
3. Renton T. Pain part 1: introduction to pain [Internet]. Vol. 42, Dental Update. 2015. p. 109–24. Available from: <http://dx.doi.org/10.12968/denu.2015.42.2.109>
4. Kent G. Memory of dental pain [Internet]. Vol. 21, Pain. 1985. p. 187–94. Available from: [http://dx.doi.org/10.1016/0304-3959\(85\)90288-x](http://dx.doi.org/10.1016/0304-3959(85)90288-x)
5. Meechan JG, Robb ND, Seymour RA. Pain and Anxiety Control for the Conscious Dental Patient. Oxford Medical Publications; 1998. 373 p.
6. Dionne R, Phero JC, Becker DE. Management of Pain & Anxiety in the Dental Office. W B Saunders Company; 2002. 418 p.
7. Kojima Y, Sendo R. A Novel Pain Relief Approach for the Treatment of Multiple Dental Caries and Pulpitis. Cureus. 2022 Jan;14(1):e21723.
8. Greenberg BL, Kantor ML, Jiang SS, Glick M. Patients' attitudes toward screening for medical conditions in a dental setting [Internet]. Vol. 72, Journal of Public Health Dentistry. 2012. p. 28–35. Available from: <http://dx.doi.org/10.1111/j.1752-7325.2011.00280.x>
9. Tuğçe T. The evaluation of medical conditions in patients admitted to the oral diagnosis clinic [Internet]. Vol. 25, Balkan Journal of Dental Medicine. 2021. p. 129–33. Available from: <http://dx.doi.org/10.2478/bjdm-2021-0020>
10. Gadve V, Shenoi R, Vats V, Shrivastava A. Evaluation of anxiety, pain, and hemodynamic changes during surgical removal of lower third molar under local anesthesia [Internet]. Vol. 8, Annals of Maxillofacial Surgery. 2018. p. 247. Available from: http://dx.doi.org/10.4103/ams.ams_216_18
11. Shruthi R, Kedarnath N, Mamatha N, Rajaram P, Bhadrashetty D. Articaine for surgical removal of impacted third molar; a comparison with lignocaine. J Int Oral Health. 2013 Feb;5(1):48–53.
12. Evaluation of systolic and diastolic blood pressure, pulse rate and SPO2 levels pre and post dental extraction under local anesthesia [Internet]. Vol. 4, Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology. 2020. p. 74–8. Available from: <http://dx.doi.org/10.18231/2395-6194.2018.0019>
13. Sharma A, Pant R, Priyadarshi S, Agarwal N, Tripathi S, Chaudhary M. Cardiovascular Changes Due to Dental Anxiety During Local Anesthesia Injection for Extraction. J Maxillofac Oral Surg. 2019 Mar;18(1):80–7.
14. Bronzo ALA, Cardoso CG Jr, Ortega KC, Mion D Jr. Felypressin increases blood pressure during dental procedures in hypertensive patients. Arq Bras Cardiol. 2012 Aug;99(2):724–31.
15. Aydin SG, Firat University, Electrical-Electronics Engineering Department, Elazig/Turkey, Kaya T, Guler H. Heart Rate Variability (HRV) Based Feature Extraction for Congestive Heart Failure [Internet]. Vol. 8, International Journal of Computer and Electrical Engineering. 2016. p. 272–9. Available from: <http://dx.doi.org/10.17706/ijcee.2016.8.4.272-279>
16. Yamashita K, Uto A, Uchino M, Shidou R, Kibe T, Sugimura M. Sympathetic Nerve Activity During Tooth Extraction in Women Is Related to Dental Anxiety Immediately After Surgery. J Oral Maxillofac Surg. 2021 Nov;79(11):2268.e1–2268.e5.
17. Al-Khateeb TH, Alnahr A. Pain Experience After Simple Tooth Extraction [Internet]. Vol. 66, Journal of Oral and Maxillofacial Surgery. 2008. p. 911–7. Available from: <http://dx.doi.org/10.1016/j.joms.2007.12.008>
18. Kazancioglu HO, Dahhan AS, Acar AH. How could multimedia information about dental implant surgery effects patients anxiety level? [Internet]. Medicina Oral Patología Oral y Cirugía Bucal. 2016. p. 0–0. Available from: <http://dx.doi.org/10.4317/medoral.21254>
19. Kazi R, Khan W, Kumar A, Badiyani B. ASSESSMENT OF DENTAL ANXIETY USING MDAS (MODIFIED DENTAL ANXIETY SCALE) AMONG DENTAL STUDENTS IN MUMBAI CITY - A CROSS SECTIONAL STUDY [Internet]. Journal of Indian Dental Association. 2019. Available from: <http://dx.doi.org/10.33882/jida.13.25061>

20. Fernandez-Aguilar J, Guillén I, Sanz MT, Jovani-Sancho M. Patient's pre-operative dental anxiety is related to diastolic blood pressure and the need for post-surgical analgesia [Internet]. Vol. 10, Scientific Reports. 2020. Available from: <http://dx.doi.org/10.1038/s41598-020-66068-9>
21. Liao FL, Kok S-H, Lee J-J, Kuo R-C, Hwang C-R, Yang P-J, et al. Cardiovascular influence of dental anxiety during local anesthesia for tooth extraction [Internet]. Vol. 105, Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2008. p. 16–26. Available from: <http://dx.doi.org/10.1016/j.tripleo.2007.03.015>.