British Journal of Healthcare and Medical Research - Vol. 11, No. 06
Publication Date: December 25, 2024
DOI:10.14738/bjhr.1106.18057.
De Romero, B. C., Paba, J. L., Ramirez, C. D., & Tellez, D. A. D. (2024). Assessment of Anxiety and Hemodynamic Changes Pre and Post-Oral Implant Surgery. British Journal of Healthcare and Medical Research, Vol - 11(06). 326-334.

Assessment of Anxiety and Hemodynamic Changes Pre and Post-Oral Implant Surgery

Beatriz Cepeda De Romero
National University of Colombia and
UNICIEO University Foundation

Juliana Lobo Paba
Universidad Santo Tomás de Colombia and
UNICIEO University Foundation in Colombia

Cristian Diaz Ramirez
Colombian Dental College and
UNICIEO University Foundation in Colombia

Diego Alejandro Diaz Tellez
Colombian Dental College, and
UNICIEO University Foundation in Colombia

ABSTRACT

Dental anxiety is the fifth most common cause of anxiety. Patient anxiety is observed in situations involving anesthetic injections, use of rotary instruments. Local anesthetics are used in conjunction with vasoconstrictors, to prolong their action at the applied site and prevent dissemination to the bloodstream and the presence of multisystemic adverse reactions. Method: Clinical, observational, analytical research longitudinal cohort with minimal risk. It shows 40 patients with voluntary participation, over 18 years of age, healthy use of articaine 4% with epinephrine 1:100,000. Pre-anesthesia: assessment of the degree of anxiety using the Modified Corah Dental Anxiety Scale. Blood pressure and heart rate in three stages: pre-anesthesia, 10 minutes post-anesthesia and at the end of the surgical procedure using a digital blood pressure monitor (SCANMED)® and the percentage of oxygen saturation with oximeter (OMRON).® Results: Mean age 56.7 ± 13.1 years, women 26 (65%), men 14 (35%); no pre-existing diseases (60%),. Surgical time (2 hours and 15 minutes). The most commonly used type of surgery is of medium complejidad. In the three times evaluated by the Cochrane Q test, there was a significant difference in the values of systolic pressure (P=0.001), diastolic pressure (P=0.037), Heart rate variations (P=0.660). and moderate anxiety 16 (40%) were present using the Modified Corah Dental Anxiety Scale. Conclusion: Older adults with dental implant surgery presented mild or moderate anxiety, without significant changes in blood pressure and oxygen saturation, 10 minutes after the administration of local anesthesia and at the end of the surgical procedure.

Keywords: Anxiety, Heart rate, Blood pressure.

INTRODUCCIÓN

Oral dental implant surgery is an effective and predictable modality used for patients with the need to rehabilitate their oral health; including in some cases previous surgical techniques such as guided bone regeneration, maxillary sinus elevation and grafting, lateralization of the inferior dental nerve, among other specific surgeries in the case of each individual and their needs. These techniques can produce hemodynamic and perceptual changes in patients before, during, and after the surgical procedure; which may or may not be related to the local anesthetic [1].

To control pain during oral surgical procedures, the use of anesthetics is essential. Due to their mechanism of action, they reversibly inhibit the entry of sodium ions into all cell membranes, blocking the excitation of sensory receptors and nerve conduction of myelinated and unmyelinated nerve fibers, so that sensory information does not reach the cerebral sensory cortex. The most commonly used are lidocaine, mepivacaine, and articaine [2].

Local anesthetics are used in conjunction with vasoconstrictors, to delay the absorption of the drug, thus prolonging its action at the applied site (infiltrative or truncular) and prevent dissemination to the bloodstream to prevent the presence of multisystem adverse reactions (RAM). The most commonly used vasoconstrictors are epinephrine (adrenaline) and norepinephrine (noradrenaline). Vasoconstrictors act on the alpha-adrenergic receptors of vascular smooth muscle, causing vasoconstriction of the arterioles and venules of the local microcirculation and can sometimes cause hemodynamic alterations [3]. On the other hand, it is known that pain during dental treatment can trigger the release of endogenous catecholamines, which in turn can lead to hemodynamic changes, such as increases in blood pressure and heart rate, and can even lead to arrhythmias [4].

Blood pressure is directly controlled by the Sympathetic Nervous System (SNS) and the Parasympathetic Nervous System (PNS). Stress stimulates the predominance of the SNS, causing an increase in blood pressure and heart rate and inducing the contraction of peripheral blood vessels; it can also cause variations in respiratory rate, which is proportional to alterations in oxygen saturation or carbon dioxide levels in the blood, triggering hemodynamic changes and, in some cases, perceptual changes of the senses [2].

Dental anxiety is the fifth most common cause of anxiety. It is an emotional state due to a threatening stimulus that may not be identifiable. A known or perceived reaction to danger or threat is fear. Both dental anxiety and stress elicit physical, cognitive, emotional, and behavioral responses in an individual; however, anxiety or the traumatic dental experience can generate exaggerated production of catecholamines; which can also produce hemodynamic and metabolic changes [2]. In addition to these factors, the dental experience of friends or relatives and congenital aspects determine anxiety or fear of dental treatment among patients [4].

Patient anxiety is observed in situations involving anesthetic injections, use of rotary instruments, and/or tooth extractions [5]. As dental experience determines this anxiety, the gender in which anxiety is most predominant is in women due to the hormonal change that women present at different stages of their lives [6]. Metabolic and hemodynamic changes are also correlated with changes in auditory perception during extensive dental or medical procedures [7].

URL: http://dx.doi.org/10.14738/bjhr.1106.18057.

Fukayama *et al.,* (2006) stated that certain heme modulator drugs and local anesthetics (LA) used in dental surgical procedures could cause vascular variations. Along with surgical procedures, additional factors such as anxiety and stress can also contribute to hemodynamic changes. Several studies have hypothesized that patients' anxiety toward dental procedures plays an important role in hemodynamic disturbances. In addition, the complex appearance of dental instruments and procedures, such as the introduction of injections of local anesthetics, the use of rotary instruments, and surgical forceps, could increase patient anxiety [8].

For all of the above, it is important during surgical or invasive dental procedures to monitor vital signs such as blood pressure (mm Hg), heart rate (c/sec) and pulse oximetry (SpO2), which allows professionals to detect potential risks: pre-surgery, post-surgery and make an early diagnosis of complications [9]. It is also of great importance It should be clarified that the population that shows the greatest need for oral surgery are the elderly, and in this population the variation of normality in blood pressure, heart rate, oxygen saturation and auditory perception is more frequent. Therefore, it is necessary for the health professional to control vital signs and the patient's general condition to avoid adverse effects [10]. It is considered necessary to perform a vital signs protocol in order to prevent complications in the intra- and postoperative dental period, as well as to improve the dental experience of each patient [11]. These physiological responses may more frequently affect patients who are systemically compromised by drug and disease interactions, which implies a meticulous vital signs protocol [12]. It is important to evaluate anxiety in the presence of dental implants or procedures that involve the use of needles, rotary instruments, or extractions, using the Modified Corah Dental Anxiety Scale (MDAS) and its effects on heart rate, artery pressure, and oxygen saturation values to prevent adverse effects in patients [13-14].

Matsumura *et al.,* (1998) The objective of the study was to determine changes in blood pressure and heart rate during tooth extraction. The study included 40 patients between 19 and 74 years of age, who underwent tooth extraction. It was observed that changes in hemodynamic status occur with alterations in blood pressure and heart rate during dental surgical procedures, without significant changes in oxygen saturation, which indicates that there is no significant hypoxic threat to the patient. On the other hand, it was found that middle-aged patients experienced greater increases in blood pressure during dental surgery than younger individuals [15].

Silvestre *et al*. (2001), the aim of the study was to analyze the degree of anxiety in patients who underwent the extraction of a molar, to assess the degree of anxiety using Hamilton's anxiety t-test and the changes in systolic and diastolic blood pressure in three groups of patients according to the type of anesthesia GROUP 1 (2% lidocaine with epinephrine 1:80,000 ppm), GROUP 2 (3% Mepivacaine with 1:80,000 ppm epinephrine) and GROUP 3 (3% Mepivacaine without vasoconstrictor) and assessment of the degree of Anxiety. The results showed that the mean of the initial values of the degree of Anxiety was 5.04 and at the end of it was 3.44. Variations in blood pressure and heart rate did not present statistically significant figures in the three groups of patients. They concluded that whether or not to use a vasoconstrictor with the local anesthetic solution has no effect on blood pressure in normotensive patients, although some increase in systolic blood pressure (SBP) was observed at the time of tooth extraction and at the end of the procedure. This was attributed to increased patient anxiety during tooth extraction [16].

Abdullah *et al.* (2011), the objective of the prospective study was to determine changes in primary hemodynamic parameters and oxygen saturation in systematically healthy patients during surgical crown lengthening procedure. This study included 44 patients who required crown lengthening in a single tooth in the upper jaw; Heart rate (HR), blood pressure (BP), and oxygen saturation (SpO2) were measured in all subjects at three different intervals before injecting the anesthetic (T1), after injection of the anesthetic (T2), and after the procedure (T3). Descriptive and observational statistics were calculated as mean and standard deviation. ANOVA analysis of variance was used to compare the mean observation within the parameters at different time intervals. The results indicated A slight increase in systolic and diastolic blood pressure after the introduction of the anesthetic agent, initially the mean systolic blood pressure observed was 134.82±8.45 mmHg, and the diastolic blood pressure was 79.53±9.32 mm Hg, in the second time PS133mmHg and diastolic pressure 80 mm Hg were slightly reduced, with no significant difference. The heart rate also showed an initial post-anstsia increase and reversed after completing the procedure. Statistically, a significant difference was observed with oxygen saturation records, where there was a decrease after the introduction of anesthetic and decreased even more after the surgical procedure [2].

Tarazona *et al* (2019), In a prospective study in the Oral Surgery Unit of a university clinic, with the inclusion of 125 patients. Its objective was to study the dental anxiety that can be generated by the extraction of lower third molars impacted on blood pressure and heart rate. Anesthesia in the form of 4% articaine with adrenaline 1:200:000 ppm was administered for surgical removal. Before surgery, patients completed the Sliding Scale Ansiedad Dental de Corah (DAS) and systolic blood pressure, diastolic blood pressure and heart rate were recorded in 6 time intervals; A1, before surgery; A2, after anesthesia; A3, during the incision; A4, during osteotomy and dental sectioning; A5, after extraction; A6 during suturing. A univariate descriptive analysis was performed, reporting the data as percentages and frequencies. For the comparative study, analysis of variance (ANOVA) was used for repeated measures. It was found that women experienced greater anxiety than men. Systolic blood pressure showed little change, with the maximum values at the time of incision being 125.6 mm Hg and minimum at the time of suturing 118.7 mm Hg. Diastolic blood pressure, in turn, showed maximum values before the start of surgery 76.5 mm Hg and minimum after extraction 72.1 mm Hg, while heart rate was maximum during incision 87.8% and minimum at suture 78.6%. The differences in systolic and diastolic blood pressure and heart rate between men and women and between patients with and without anxiety did not reach statistical significance [5].

Li J, *et al*., (2022), The objective of which was to assess cardiovascular response during tooth extraction and to analyze risk factors to provide clinical guidance. A retrospective study was conducted in elderly patients with systemic diseases who underwent tooth extraction. Cardiovascular parameters of heart rate and blood pressure were collected preoperatively, post-locally, at the start of tooth extraction, 5 minutes after tooth extraction, and postoperatively. The effects of risk factors, including age, sex, and systemic diseases, on these parameters were analyzed with a multilevel model. The heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) of elderly patients increased significantly with local anesthesia and tooth extraction. Age, sex, diseases systemic extractions and the number of tooth extractions could be risk factors closely associated with cardiovascular response. The findings could provide safety guidance for dentists in tooth extraction in this population [17].

URL: http://dx.doi.org/10.14738/bjhr.1106.18057.

For all of the above, it is important to evaluate anxiety and its effect on the main variations in systolic, diastolic and heart rate, presurgery, postanaethesis and at the end of the dental implantology procedure, which can improve the dental consultation by minimizing or eliminating adverse reactions, in such a way that it improves the consultation experience in each patient and contributes to the success of the implants [2].

OBJETIVO

To evaluate anxiety states using the "Modified Corah Dental Anxiety Scale (MDAS)" and its effect on cardiovascular hemodynamic changes in systolic blood pressure, diastolic blood pressure, heart rate and oxygen saturation" in patients undergoing any dental surgery procedure in the Oral Implant Surgery Unit of a University Clinic during the year 2024.

METHOD

Clinical, observational, analytical longitudinal cohort research. With approval by the Institutional Ethics Committee as a minimum risk research. Reference population: all patients who were selected for any oral implantology surgical procedure in the oral implantology and reconstructive clinics of a University Institution. Convenience sample consisting of patients who voluntarily wished to participate in the study, over 18 years of age, healthy men and women (ASA I) or with the presence of diseases controlled by their treating physician (ASA II) and the certification of the treating physician that indique which is suitable for the procedure to be performed with dental implants between January and December 2024 and use for local anesthesia of Articaine 4% with epinephrine 1:100,000.

Preanesthesia all patients answered the anxiety scale which consists of 5 questions: 1. If you had to go to the dentist tomorrow for a check-up, how would you feel about it? 2**.** When you're waiting for your turn at the dentist's office in the chair, how do you feel? 3. When you are in the dentist's chair waiting while the dentist prepares the drill to start working on the teeth, how do you feel? 4. Imagine you're in the dentist's chair for a dental cleaning, how do you feel? 5. Wait the dentist or hygienist pulls out the instruments that will be used to scrape your teeth around your gums, how does it feel? 5. If you are going to be injected with a local anesthetic needle for your dental treatment, how do you feel? Quantitatively qualified 1 very anxious, 2 moderately anxious, 3 mildly anxious,4 in the anxious. For the statistical analysis of the categorical or qualitative variables, absolute frequency and relative frequency were used to summarize the information from variables. For the quantitative variables and the comparison of blood pressure, heart rate and oxygen saturation in the three evaluation times, the Cochrane Q test and the repeated measures ANOVA test were used, and in case of differences, Bonferroni's Post-Hoc test was used.

For the association between the Corah Modified Dental Anxiety Scale (MDAS) with hemodynamic changes (blood pressure, heart rate and oxygen saturation) in the three evaluation times, the chi2 test and Fisher's exact test were used, and the repeated measures ANOVA test was also used, and in case of differences, Bonferroni's Post-Hoc test was used. The processing was carried out using the SPSS version 24 program.

RESULTS

Total sample, 40 patients who met the inclusion criteria, with mean age (SD) of 56.7 ± 13.1 years, 26 women (65%), 14 men (35%); no pre-existing diseases (ASA I) (60%), with the

presence of diseases controlled by their treating physician (ASA II) (40%). Surgical time (2 hours and 15 minutes). The most commonly used type of surgery is medium complexity (2-8 dental implants or guided bone regeneration) (52.5%) and low complexity (1-2 dental implants-simple extractions-second phases) (40%). Most patients had mild anxiety 15 (37.5%) and moderate anxiety 16 (40%) using the Modified Corah Dental Anxiety Scale (MDAS).

Hemodynamic changes in systolic blood pressure (in the three times evaluated (pre-oral surgery, post-anesthesia and post-oral surgery) showed significant differences (P=0.0001) (Figure 1) and diastolic pressure (P=0.037) (Figura 2) mediante prueba de Q Cochrane. The variations in heart rate in the three times evaluated did not show significant differences (P=0.660) (Figure 3) and oxygen saturation (P=0.816) (Figure 4), an analysis performed using the Cochrane Q test.

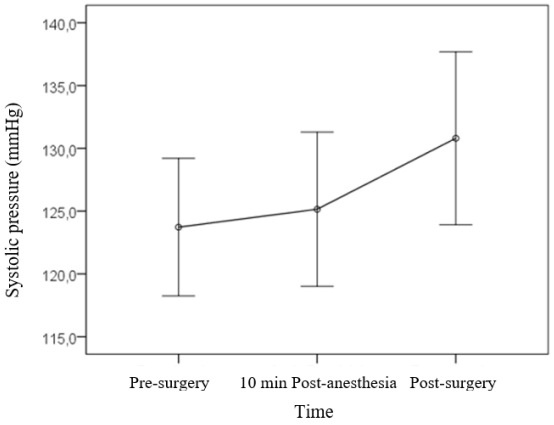

Figure 1: Hemodynamic changes in systolic blood pressure before oral surgery, post-anesthesia and post-oral surgery

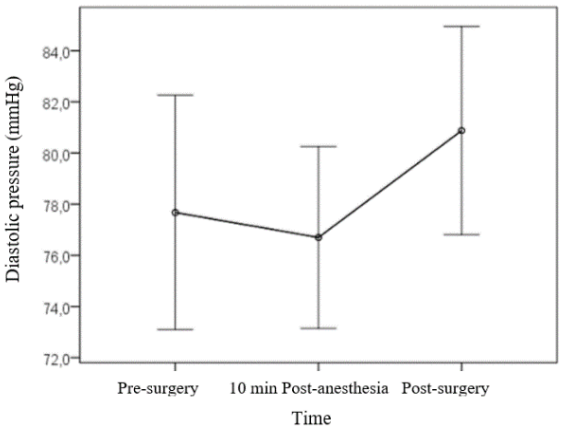

Figure 2: Hemodynamic changes in diastolic blood pressure before oral surgery, after anesthesia and after oral surgery

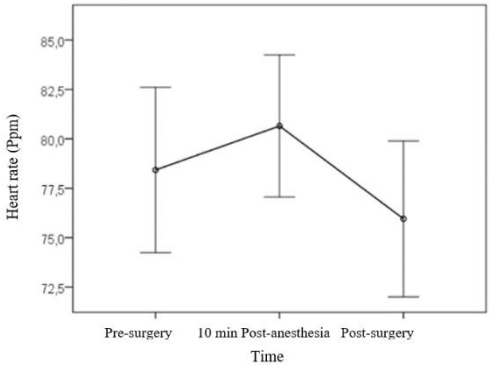

Figure 3: Hemodynamic changes in heart rate before oral surgery, after anesthesia and after oral surgery

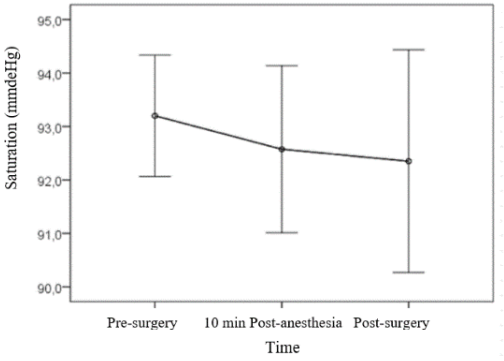

Figure 4: Hemodynamic changes in oxygen saturation before oral surgery, after anesthesia and after oral surgery

The association between the Corah Modified Dental Anxiety Scale (MDAS) showed significant differences with the pre- and post-surgery values of systolic pressure (P=0.030) and with diastolic pressure (P=0.010) performed by chi2 test and Fisher's exact test. It is evident that heart rate and oxygen saturation did (Pre-surgical, pre-anesthesia and post-surgical) performed by chi2 test and Fisher's exact test.

URL: http://dx.doi.org/10.14738/bjhr.1106.18057.

The association between the mild/moderate and severe/elevated Corah Modified Dental Anxiety (MDAS) scale with hemodynamic changes in diastolic pressure in the postoperative period showed a significant difference (P=0.019) performed using one-way ANOVA and Bonferroni's post-hoc surgery.

The association between the levels of mild and moderate anxiety (Modified Dental of Corah (MDAS)) with changes *in heart rate in the three stages (*Pre-surgical, post-anesthesia and post-surgical) showed a significant difference (P=0.001). A significant difference was evidenced between mild/moderate and severe/high levels of anxiety in post-anesty (P=0.048) performed by one-way ANOVA and Bonferroni post-hoc

DISCUSSION

In the present research, it was demonstrated by means of the Modified Corah Dental Anxiety Scale (MDAS), that patients subjected to different surgical techniques of implantology, oral, presented mild anxiety 15 (37.5%) and moderate anxiety 16 (40%). These results are similar to the study by *Tarazona A, et al; 2019*·where it was evidenced that patients undergoing dental surgery of third molars presented mild anxiety (61%) and moderate anxiety (39%). This suggests that surgical dental procedures generate different degrees of dental anxiety with different values depending on the type of surgery and population [5].

In the present study, the hemodynamic changes in blood pressure in the three times evaluated *(pre-oral surgery, post-anesthesia and post-oral surgery)* showed significant differences in systolic pressure (P=0.0001) and diastolic pressure (P=0.037), an analysis performed using the Cochrane Q test. This differs from several studies by *Abdullah S, et al., 2022*, *in* patients who underwent periodontal surgery, where a non-significant increase in systolic (P=0.294) and diastolic (P=0.607) blood pressure was observed, between the 3 times evaluated: presurgery, post-anesthesia and postsurgery [2]. Taking into account that in the study by *Abdullah S, et al., 2022*, surgeries of less complexity and shorter duration of surgical time were performed unlike the surgeries evaluated in the present research.

The results of the evaluation of Anxiety in the present research demonstrated: significant variations in systolic pressure *after oral surgery* (P=0.030) and diastolic pressure *after anesthesia* (P=0.010), performed by chi2 test and Fisher's exact test. These results differ from the results of *Tarazona A, et al., 2019* where they assessed dental anxiety with the Modified Corah Scale in patients undergoing third molar surgery in six evaluated times (Base, anesthesia, incision, osteotomy, extraction and suture) with an average duration time of 30 minutes, they found no significant differences in systolic blood pressure (P=0.502) and diastolic blood pressure (P=0.525) [5]. Likewise, in the study by *Tarazona A, et al., 2019,* where anxiety levels were lower and these patients underwent surgeries of less complexity and less surgical time, which alters the results and that is why the comparison differs with the results of the present research.

In the present study, there was no significant variation in the three times evaluated, heart rate (P=0.660) and oxygen saturation (P=0.816%), an analysis performed using the Cochrane Q test. These results are similar to the study conducted by *Fransisco J et al., 2011*, in which no significant difference was found in hemodynamic changes in heart rate and oxygen saturation,

disassociating the relationship between anxiety or anesthetic application and changes in these variables [3].

In the present study, no significant difference was observed between the presence of dental anxiety and its effect on heart rate at the three times evaluated: *pre-surgical (P=0.296), post-anesthesia (P=0.103) and post-surgical (P=0.171).* This is similar to the study carried out by *Tarazona A, et al., 2019* where they evaluated dental anxiety with the Modified Corah Scale in patients undergoing third molar surgery in six evaluated times (base, anesthesia, incision, osteotomy, extraction and suture) with an average duration time of 30 minutes they found no significant differences in heart rate (P=0.08) [5].

In the literature review, no research was found that evaluated the association between dental anxiety and hemodynamic changes in blood pressure, heart rate, and oxygen saturation in patients with dental implant surgery.

CONCLUSSION

Elderly, healthy patients or patients with pre-existing diseases controlled by their treating physician undergoing dental implant surgery presented mild or moderate anxiety, without significant changes in blood pressure, heart rate and oxygen saturation, preanesthesia, 10 minutes after the administration of local anesthesia and at the end of the surgical procedure.

References

1. Sabbagh A, Nakata H, Abdou A, et al. Fluctuation in salivary alpha-amylase activity and vital signs during dental implant surgery. Int J Implant Dent. 2021;7(1):4–10.

2. Alqahtani AS, Sharanesha RB, Gufran K, et al. Variation in Hemodynamic Characteristics during Periodontal Crown-Lengthening Surgical Procedure: An Uncontrolled Cohort Study. Healthc. 2022;10(5).

3. Silvestre FJ, Salvador M I, Bautista D, et al. Clinical study of hemodynamic changes during extraction in controlled hypertensive patients. Med Oral Patol Oral Cir Bucal. 2011;16(3):354–8.

4. Bortoluzzi MC, Manfro R, Nardi A. Glucose levels and hemodynamic changes in patients submitted to routine dental treatment with and without local anesthesia. Clinics. 2010;65(10):975–8.

5. Tarazona-Álvarez P, ePellicer-Chover H, Tarazona-Álvarez B, et al. Hemodynamic variations and anxiety during the surgical extraction of impacted lower third molars. J Clin Exp Dent. 2019;11(1):e27–32.

6. Viteri Rentería AA, González Bustamante AM. Monitoreo de pulsioximetría en extracciones dentales bajo protocolo de exodoncia simple y quirúrgico. Cambios rev méd. 2020;19(1):56–61.

7. Gong Q, Liu Y, Xu R, et al. Objective Assessment System for Hearing Prediction Based on Stimulus-Frequency Otoacoustic Emissions. Trends Hear. 2021;25.

8. Fukayama H, Yagiela JA. Monitoring of vital signs during dental care. Int Dent J. 2006;56(2):102–8.

9. Huang JIS, Yu HC, Chang YC. Occurrence of trigeminocardiac reflex during dental implant surgery: An observational prospective study. J Formos Med Asso. 2017;116(10):742–7.

10. Seminario-Amez M, González-Navarro B, Ayuso-Montero R, et al. Use of Local Anesthetics With a Vasoconstrictor Agent During Dental Treatment in Hypertensive and Coronary Disease Patients. a Systematic Review. J Evid Based Dent Pract. 2021;21(2):101569.

URL: http://dx.doi.org/10.14738/bjhr.1106.18057.

11. Roco-Bazáez J, Venegas-Gómez R. Cambios Hemodinámicos Asociados a Exodoncias de Terceros Molares Inferiores con el Uso de Articaína 4 % y/o Lidocaína 2 %: Una revisión sistemática. Int J Odontostomatol. 2023;17(2):216–23.

12. Argote AQ, Pomarino SG. Variaciones de la frecuencia cardíaca, temperatura corporal y presión arterial en pacientes sometidos a cirugía de implantes dentales. Odontoestomatologia. 2020;22(36):65–73.

13. 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. Sci Rep. 2020;10(1):1–9.

14. Lara-Machado JR, Lara-Barros BP. Ansiedad dental y pensamientos automáticos en pacientes odontológicos de la Cruz Roja, provincia de Tungurahua. CienciAmérica. 2022;11(1):43–55.

15. Matsumura K, Miura K, Takata Y, Kurokawa H, Kajiyama M, Abe I, et al. Changes in blood pressure and heart rate variability during dental surgery. Am J Hypertens. 1998;11(11 I):1376–80.

16. Silvestre FJ, Verdú MJ, Sanchís JM, Grau D, Peñarrocha M. Effects of vasoconstrictors in dentistry upon systolic and diastolic arterial pressure. Med Oral. 2001;6(1):57–63.

17. Li J, Tian Z, Qi S, et al. Cardiovascular Response of Aged Outpatients with Systemic Diseases During Tooth Extraction: A Single-Center Retrospective Observational Study. Front Public Heal. 2022;10(July):1–9.