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Physiological Parameters of Dental Fear and Anxiety in Adults Related to Surgical Extraction of Impacted Third Molars

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SUMMARY

Background/Aim*: Dental fear and anxiety (DFA) are psychological phenomena normally arising and developed in the dental office during various kinds of dental procedures and interventions. The most usual stressors for the DFA appearance are those related to dental pain, no matter if the pain has already been caused, or potentially will be committed. There are a few main dental pain-provoking factors related to endangering body integrity in the oral cavity, and tooth extraction is the strongest one. The research aimed to observe, notify, and analyze physiological parameters of DFA in adults related to oral surgical therapy procedures of removing impacted third permanent molars.* ***Material and Methods:*** *After inclusive selection 500 patients entered into the study. The study protocol included preoperative assessment of DFA presence with Corah's Dental Anxiety Scale (CDAS) on examination day, preoperative assessment of physiological parameters on examination day and operative day before the treatment, as well as their postoperative assessment followed by evaluation of postoperative pain, on the day after the treatment.* ***Results:*** *The results of our research indicated that an increase in DFA led to increased values of the measured physiological parameters for all preoperative measurement days. The postoperative decrease in the physiological parameters values could be explained by the fact that the oral-surgical procedure was completed, so the psychological burden of the patients was also less.* ***Conclusions****: Patients with higher values of the DFA presence have also declared more postoperative pain.*

Keywords: Dental Fear And Anxiety, Adults, Physiological Parameters, Pain, Extraction

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Introduction

Dental fear and anxiety (DFA) are psychological phenomena normally arising and developed in the dental office during various kinds of dental procedures and interventions. Their offset is mostly related to early childhood when they appear and develop. If the reasons for the DFA origin remain afterward, with the lack of continuous management of children's dental behavior problems, their oral health will subsequently continue to impair in the adolescent and young adult period. The most usual stressors for the DFA appearance are those related to dental pain, no matter if the pain has already been caused, or potentially will be committed[1,3].

The pain itself is a defensive mechanism created to warn if the body's integrity has been disturbed anywhere in any kind. There are several kinds of reactions to pain, and the most frequent ones are fear and anxiety. They are normal psychological reactions with several physiological manifestations created by the inner parts of the central and peripheral autonomous nervous system and adjacent human body organ systems. So, if the body is aroused with pain-provoking factors, the cardiovascular system is

among the first ones to activate to provide the body with confronting or avoiding actions[1,2].

A similar is in oral cavity and dental pain-related provoking factors. Dental pain is among the few pain types capable of developing continuous, strong, and long-term avoiding reactions in the form of DFA. This is specifically present in the adult population of dental patients if their oral health has been seriously and continuously compromised during childhood. Furthermore, there was a lack of dental professional involvement for those young patients to develop coping confronting mechanisms, so that they could only form mostly avoiding mechanisms to the dental profession and related situations. As they grew older, the DFA presence remained a fact, despite that adult patients are aware that this approach could further worsen their oral and general health. There are at least a few important differences related to dental office attendance and treatment cooperation in adult patients with the DFA presence. Avoidance is less frequent and cooperation is usually better because adults usually decide to deal with their oral health problems, but only in most fastest and most pleasant way. The total lack of cooperation and dental avoidance in adulthood mostly exist in those cases where dental phobia develops[4-7].

There are a few main dental pain-provoking factors related to endangering body integrity in the oral cavity, and tooth extraction is the strongest one. If this treatment is performed under the oral surgical procedure, the patient's perception of the DFA reappearance is even stronger. The anxiety component of the DFA makes the adult patient's physiological responses even before the procedure itself happens. Blood pressure, heart rate, and breathing values are among the most effective physiological reactions and are easiest for their precise notification. These body reflexive mechanisms are under the direct control of the autonomous nervous system and are directly stress-related as well. So, if the person is under dental stress-provoking factors and cannot properly cope with them, these cardiovascular and respiratory reactions develop unwillingly and usually fast as objective measures of the DFA presence[8-11].

So this study aimed to observe, notify, and analyze physiological parameters of DFA in adults related to oral surgical therapy procedures of removing impacted third permanent molars.

Material nd Methods

This cross-sectional prospective study was performed according to the Helsinki Declaration[12] and approved by the Ethical Committee of the Medical faculty of the University of Zenica. Study participants were the adult male and female patients indicated surgical therapy of the impacted third permanent molars, without pain and any other related inflammatory symptoms. Patients had to be in proper general health conditions and without the presence of any chronic systemic diseases (such as gastrointestinal, cardiac, or urinary illnesses), hypersensitivity, or allergic reactions to investigational drugs. Pregnant and lactating women were not included in the study.

All study participants signed informed consent before its start. The study procedure implied evaluation of the DFA presence in patients on the examination day before the oral surgical procedure was performed, using Corah's Dental Anxiety Scale (CDAS)[13]. This psychometric instrument was a 4-item scale with the answers ranked by the Likert scale from 1-5 and with a total score from 4-20 [14]. Physiological reactions to dental stress-related due to already planned oral surgical procedures were recorded preoperatively and postoperatively on three occasions. Systolic and diastolic blood pressure was observed and recorded by digital manometer, as an average value derived from 5 repetitive measurements performed. The heart rate was recorded as an average value in the same way, with the pulse-oximeter device attached to the patient's finger. Breathing was observed and recorded as the exact number of the full inhale-exhale cycles performed by the patient within one minute. Preoperative blood pressure, heart rate, and breathing were recorded twice: on the examination day and the operative day before the treatment. The oral surgical procedures of extracting impacted third permanent molars were performed at the Zenica Health Center, with the same operative protocol explained before[15]. Postoperative physiological parameters were recorded the day after the surgical procedure in the same way as the preoperative ones. At the same time, perception of the experienced pain in patients was analyzed and recorded postoperatively with the VAS analog scale. This instrument was a straight line divided into 10 equal parts (values from 0-10), where the participants expressed their pain perception in a way that higher values correspond to stronger pain[16].

The obtained results were presented descriptively in the text and tables. Data distribution was analyzed using the Kolmogorov-Smirnov test. Testing the existence of differences between the samples was performed using Friedman's test (related samples) and Mann-Whitney test (independent samples) and with the subsequent post hoc tests. Testing the existence of the correlation between the variables was performed using the Spearman correlation coefficient. All statistical analyses were performed with the Microsoft Excel software v. 2019 and IBM Statistical Package (IBM, Armonk, NY, USA) for Social Sciences software v. 23 (SPSS Inc., Chicago, IL, USA) for the Windows operative system, with the predetermined significance set to the value of $p \leq 0.05$.

Results

After exclusion criteria were applied, there were 500 study participants in total, aged between 18 and 45 years (average 25.60 years, ± 7.88 years), with mainly female patients (58.2%, 291 patients). Descriptive values of observed study variables were presented in Table 1. Obtained CDAS average values showed that the study participants expressed high levels of DFA presence, with 62.4% of participants with pretty high levels of DFA existence. Female participants expressed higher levels of DFA presence (Mann-Whitney U=41573.5; p≤0.0005). Older participants also showed slightly significantly higher DFA levels (Spearman ρ=0.185; p=0.01). However, all the standard deviation (SD) values were relatively high, pointing to relatively lower significance of differences between single values of physiological parameters.

Table 1. Descriptive values of main study variables

Variable	Mean ± SD	Variable	Mean ± SD
CDAS	14.33 ± 4.07	heart rate-2	88.93 ± 9.83
SBP-1	131.62 ± 7.74	breathing-2	25.06 ± 5.68
DBP-1	81.86 ± 7.72	SBP-3	125.28 ± 9.26
heart rate-1	88.38 ± 10.25	DBP-3	75.92 ± 9.32
breathing-1	24.33 ± 5.79	heart rate-3	81.58 ± 11.31
SBP-2	132.61 ± 7.81	breathing-3	20.47 ± 5.42
DBP-2	83.01 ± 7.71	postop. pain	5.70 ± 2.14

SBP-systolic blood pressure; DBP-diastolic blood pressure; postop. pain-VAS analog scale values for postoperative pain perception; 1-first preoperative measurement on the examination day; 2-second preoperative measurement on the operative day before the procedure; 3-third postoperative measurement on the day after the procedure

All of the physiological parameters (systolic and diastolic blood pressure, heart rate, and breathing) showed the same statistical tendency (highly intercorrelated at p=0.01 level of significance), with a significant increase from the examination day to the preoperative day before the procedure, and a subsequent significant decrease to their lowest postoperative values on the day after the treatment (Friedman's test; p≤0.0005). Preoperative DFA levels expressed by the CDAS average scores corresponded to the perceived postoperative pain VAS average values with their mutual significantly high positive correlation (Spearman ρ=0.708; p=0.01). These results could be explained by the fact that the DFA in the study participants. Physiological parameters of the DFA presence showed the reaction of the participants to the expected dental stressful stimulus (oral surgical procedure). They showed an increasing tendency toward contact with the stimulus. Although psychological reactions postoperatively significantly decreased, the pain perception was still pretty high. These described tendencies were statistically more expressed in older patients (Spearman ρ=0.130-0.422; p=0.01) and female patients (Spearman ρ=0.222-0.506; p=0.01). The fact that the younger patients perceived slightly significantly higher postoperative pain levels could be explained in a way that their coping confronting levels still have space for improvement.

Discussion

Although often neglected, DFA and potential discomfort play an important role in the success of intervention in the oral cavity[17]. They can be caused by a previous unpleasant experience, but also by ideas about the upcoming intervention caused by prejudices about pain[18, 19]. Patients with a pronounced DFA of intervention in the oral cavity represent individuals who tend to have a negative experience during oral surgery, motivated by subjective assessment, i.e. experience, and even due to fear that application of local anesthesia during oral-surgical intervention will not be sufficient for its successful performance[20]. DFA by intervention in the oral cavity is a universal phenomenon, which can be intensified by smell, sound, light, or other already-experienced situations.

The recent systematic review findings suggested that the decrease in the DFA presence was correlated with the increase in age[10]. In our research, we obtained conflicting results and found that DFA increased with age, but unlike other authors, the highest age in our research was 45 years. The results of our research indicated higher DFA scores in female patients compared to males and correlated with recent findings[10]. Furthermore, some recent studies showed that patients with pronounced DFA tended to categorize oral surgical interventions as extremely unpleasant even they have not experienced them earlier, and showed a tendency to overestimate the intensity of postoperative pain[21, 22]. The DFA appearance before application of local anesthesia and tooth extraction was confirmed by a wide range of physical and psychological events and could stimulate the adrenal cortex to increase the level of cortisol in the serum. Some authors pointed to a significant increase in cortisol in saliva before tooth extraction, which indicated the patient's psychological burden[23, 24]. In addition to the influence of DFA on the level of pain, we determined in our research its influence on vital parameters, primarily the cardiovascular response of the body and breathing rhythm.

According to the research protocol, all patients underwent detailed preoperative informations and explanations of the intervention, pharmacological medication, and the postoperative period, as well as possible postoperative complications and ways to

overcome them. Good preoperative information led to a subconscious reduction of feelings of restlessness, anxiety, and fear of the surgical procedure, and this could be accepted as an explanation for the decrease in postoperative general and immediate DFA. Many authors looked for similar ways to alleviate preoperative DFA in patients through various patient preparations for the upcoming treatment, ultimately leading to increased satisfaction of patients and therapists[25-28].

While the results of some studies showed a significant increase in systolic and diastolic blood pressure before extraction, and a slight increase in heart rate, some studies showed a significant increase in the preoperative value of heart rate[29, 30]. The results of our research agreed with the observations that such a correlation did exist. In our research, we primarily considered the influence of the level of DFA on the body's response, following the values of systolic and diastolic blood pressure, as well as heart rate and breathing rhythm. The differences between correlation coefficients were mutually significant, which suggested that people who had high DFA, registered preoperatively on the day of the patient's examination, accordingly also had elevated values of the measured vital parameters. These results implied that an increase in CDAS value levels led to increased values of systolic and diastolic blood pressure, heart rate, and respiration for the first, and second days of measurement. The decrease in the correlation coefficients on the third day of measurement, as well as the values of the measured parameters provided for in the research protocol, could be explained by the fact that oral-surgical procedure has been completed, so the psychological burden of the patients and, accordingly, the organism's "response" to the same, was lower. However, it could be possible that the change in initial values of vital parameters, especially blood pressure, could be influenced by a positive or negative family history of hypertension[31, 32].

Whether local anesthesia with adrenaline caused a change in blood pressure and heart rate during oral surgery, or whether it was the result of psychological stress due to oral surgery, was the subject of discussion by many authors[33, 34]. A usual dose of epinephrine leads to a single increase in serum epinephrine concentration[33-36]. Furthermore, pain caused by the application of the injection was associated with an increase in the cardiovascular response[37].

The pain was an expected post-surgical complication after surgical removal of the third molars[38, 39]. An increase in the value of DFA assessed with the CDAS could have an impact on postoperative pain, in the sense of increasing it. So the patients with higher values of the DFA score had more pain. Some authors did not include dental pain in classic psychosomatic diseases, although the psychological factor was present in all its manifestations. Even more, pain during dental treatment could lead to pain phobia and discomfort associated with the office environment, specifically the dental procedure[40]. In some patients, the fear was so strong that it caused them to refuse dental treatment[41, 42]. Postoperative pain would begin when the effect of the local anesthetic decreased and reached its maximum intensity during the first 12 postoperative hours. Pain description is always subjective[8, 43]. In addition to the sensory, pain is also an emotional experience. Pain and fear control should be an extremely important segment of any surgical therapy[44]. The measurement of the intensity of painful sensations was made possible by one-dimensional and multidimensional scales for determining pain intensity. The most commonly used visual analog scale (VAS). When using it, the patient marked the place corresponding to the intensity of his pain on a 10-fold divided long line, after which the VAS score was read on the other side of the scale. Other one-dimensional scales included: the Numerical Rating Scale (NRS), and the Verbal rating scale (VRS) with four and five points of pain[45]. In our research, we assessed the level of postoperative pain using the VAS with an average value of 5.7. Modern techniques of oral surgery and the current therapeutic approach to pain control made painless oral-surgical interventions a real practice. However, the results of many studies suggested that most people still avoid oral surgery due to fear of pain.

Conclusions

The results of this research could help surgeons to assess the DFA of patients who were scheduled to have the impacted third molar removed, to consider the possibilities of prescribing timely adequate therapy to prevent possible psychological and physiological complications related to this type of intervention.

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