

EFFECT OF DENTAL ANXIETY ON BLOOD PRESSURE OF PATIENTS UNDERGOING DENTAL EXTRACTIONS UNDER LOCAL ANESTHESIA

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ABSTRACT

Dental treatment especially surgical treatments like tooth extractions are usually considered by patients as a fearful procedure due to the sight of instruments and blood and the expected pain during and after the procedure. The fear and anxiety may raise the blood pressure which may further complicate the operative and postoperative phases.

The study was aimed at finding a relationship between Dental anxiety and Blood Pressure fluctuations in patients undergoing dental extractions under local anesthesia.

A total of 196 participants were included in the study after getting the written consent signed. Dental anxiety was measured by a Modified Corah's Dental Anxiety Scale. Blood pressure measurements were done at five different points during patients' visit for dental extraction and were standardized according to the JNC (Joint National Committee)-8 guidelines for Hypertension. The local anesthetic solution used was Lidocaine 2% with 1:100,000 adrenaline in a 1.8 mL cartridge.

The results showed that majority of the patients had a variable level of Dental Anxiety. No significant relationship was found between the level of dental anxiety and the blood pressure fluctuations, although some rise in diastolic blood pressures was found just after the administration of local anesthesia, possibly because of fear and pain due to needle penetration.

It is concluded that the dental anxiety can be dealt with by a positive patient-dentist relationship and involving the patient in his/her treatment plan and procedure by explaining the procedure and reducing painful surprises to the patient.

Key Words: Dental anxiety, dental fear, hypertension, Corah's dental anxiety scale, white coat syndrome, hypertension guidelines.

INTRODUCTION

Anxiety has been defined in the Marriam Webster Dictionary, as an abnormal and overwhelming sense of

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apprehension and fear often marked by physiological signs (as sweating, tension, and increased pulse), by doubt concerning the reality and nature of the threat, and by self-doubt about one's capacity to cope with it.¹ Snežana et al discussed two important terms that are interrelated, namely state anxiety and trait anxiety. State anxiety is an unpleasant emotional response while coping with threatening or dangerous situations which includes cognitive appraisal of threat as a precursor for its appearance. On the other hand, Trait anxiety refers to stable individual differences in a tendency to respond with an increase in state anxiety while anticipating a threatening situation.²

Anxiety associated with the thought of visiting the dentist for preventive care and over dental procedures is referred to as dental anxiety.³ Dental anxiety is a major reason for many people to put off dental appoint-

ments and avoidance of dental care and is inversely related to dental clinic attendance.⁴ The reason may be that dental treatment is mostly considered by patients as a stressful or fearful experience regardless of the age. Possible reasons may be one's or a friend's past unpleasant experience. Patients are generally afraid of the dental instruments especially the needle for local anesthesia. The fear of witnessing the whole procedure and the blood in case of minor oral surgical procedures increases the level of anxiety of the patient. Patient's stress and fear when they see a medical practitioner or visit a dentist's clinic may result in elevation of arterial blood pressure termed as White Coat Syndrome. The problem of white coat syndrome has grown with the increasing emphasis on preventive medical care. Patients anxious about dental procedures are often more difficult to treat.⁵

Several authors have studied dental anxiety from different aspects. Eitner et al in their study concluded that dental anxiety has a direct influence on oral health that should be detected and accounted for in a treatment concept integrating dental and cognitive-behavioral therapeutic approaches.⁶ Sohn et al also found dental anxiety as an influencing factor in regular dental visit behavior.⁷

The purpose of this study was to find the relationship between the anxiety level and the fluctuations in arterial blood pressure during dental extractions. A common perception is that anxiety and stress should increase the blood pressure level and considering that we use local anesthetic solution with adrenaline as a vasoconstrictor; it may further worsen the condition. The questions in our mind were;

- 1 Does anxiety affect the local population seeking dental treatment?
- 2 Does fear of dental treatment have any relationship with age and cardiovascular status of the patient?
- 3 Do anxiety and a vasoconstrictor containing local anesthetic solution; have a cumulative adverse effect on blood pressure?

METHODOLOGY

In order to find out the relationship between the dental anxiety and blood pressure, we set our null hypothesis (there is no relationship between the level of dental anxiety and the blood pressure fluctuations in patients undergoing dental extractions) and alternate hypothesis (there is a significant relationship between the level of dental anxiety and blood pressure fluctuations in patients undergoing dental extractions) beforehand. Patients undergoing dental extractions aged 18 and above were randomly selected for the study.

Patients whose blood pressure measurements were found to be more than 180/110 were excluded from the study. Participants were informed about the study and a written consent was taken if they agreed to participate.

A modified Corah's Dental Anxiety Scale (DAS) was translated in Urdu language for a better understanding by the patients (Annexure 1). All patients were asked to fill the DAS form while they were in the waiting room prior to dental extraction procedure. The DAS consisted of four questions with five options each. The Dental anxiety score was calculated according to the patient's responses ranging from 4 (minimum) to 20 (maximum). Consequently a Dental Anxiety Rate (DAR) was calculated as;

Not anxious (dental anxiety score of 4)

Slight anxiety (dental anxiety score 5-8)

Moderate anxiety (dental anxiety score 9-12)

High anxiety dental anxiety score 13-14)

Severe anxiety (dental anxiety score more than 15-20)

Blood Pressure measurements were performed on Citizen R Digital Blood Pressure Monitor Model CH-302B. Two sets of instruments were used for BP monitoring which were validated at the beginning of the study and finally at the conclusion of the study. Five systolic and five diastolic blood pressure measurements were taken by two operators trained on measuring BP on the above mentioned equipment in the following order;

- In the waiting room
- In the dental chair while the operator is preparing the surgical tray.
- In the dental chair immediately after administration of local anesthesia.
- In the dental chair 10 minutes after administration of local anesthesia.
- In the dental chair after completion of the surgical procedure.

Systolic and Diastolic pressure readings were graded separately according to the updated JNC (Joint National Committee)-8 guidelines.⁸ Keeping in view that we were assessing the relationship between rise in blood pressure due to stress and anxiety, a single day reading cannot label a patient as hypertensive; we scored the readings as level 1 to 4. Table 1 shows the details. Variables of our study were Age, Gender, Cardiovascular Status, Dental Anxiety Score, Dental Anxiety Rate, Number of cartridges used, Number of teeth extracted, Type of extraction, Systolic BP (five readings), Diastolic BP (five readings). Data was entered using SPSS version 16 for windows and the relation-

ship between Dental Anxiety and Blood Pressure was analyzed by the Kruskal Wallis Test.

RESULTS

Out of 196 patients between ages 18-85 years with mean age 42.16 (SD 15.7), 127 were females and 69 males with female to male ratio of 1:1.8. 150 patients were American Society of Anesthesiology (ASA)-I with no known cardiovascular disease, 45 were ASA II with controlled hypertension, while only one patient had a history of angina and none had history of myocardial infarction (Table 2).

The anxiety to dental treatment was found to be more in females than males (Table 3). Regarding anxiety rating of the participants regardless of the age and

gender, 30% reported to be not anxious at the start of procedure, 34% reported to be slightly anxious, while only 5% of the participants reported to have high anxiety at the start of procedure (Table 4).

Out of 150 patients without known cardiovascular disease only 6 (4%) participants demonstrated severe anxiety and out of 45 known hypertensive patients with controlled disease, only 2 (4%) demonstrated severe anxiety. Regarding the amount of cartridges dispensed on each participant, 47% received just one cartridge during the procedure while 43% of the participants received 2 cartridges during the procedure. Only 19 out of 196 patients received more than 2 but not more than 4 cartridges of local anesthetic which was 2% lidocaine with 1:100,000 adrenaline (Table 5).

TABLE 1: SYSTOLIC AND DIASTOLIC PRESSURE MEASUREMENT METHODOLOGY

BP Classification	Systolic BP (mmHg)	Diastolic BP (mmHg)	BP levels equivalency for the study
Normal	90-119	60-79	1
Prehypertension	120-139	80-89	2
Stage 1 HTN	140-159	90-99	3
Stage 2 HTN	≥ 160	≥ 100	4

TABLE 2: CARDIOVASCULAR DISEASE STATUS OF PATIENTS

Status	Frequency	Percent	Valid Percent	Cumulative Percent
No CVS disease	150	76.5	76.5	76.5
Hypertension	45	23.0	23.0	99.5
Angina	1	.5	.5	100.0
Total	196	100.0	100.0	

TABLE 3: DENTAL ANXIETY IN MALE AND FEMALE PATIENTS

	Males	Percent	Females	Percent
Not anxious	35	50.7	24	18.8
Slight anxiety	20	28.9	46	36.2
Moderate anxiety	11	15.9	42	33
High anxiety	2	2.8	8	6.2
Severe anxiety	1	1.4	7	5.5
Total	69	100	127	100

TABLE 4: DENTAL ANXIETY RATING

Anxiety Rating	Frequency	Percent	Valid Percent	Cumulative Percent
Not anxious	59	30.1	30.1	30.1
Slight anxiety	66	33.7	33.7	63.8
Moderate anxiety	53	27.0	27.0	90.8
High anxiety	10	5.1	5.1	95.9
Severe anxiety	8	4.1	4.1	100.0
Total	196	100.0	100.0	

TABLE 5: NUMBER OF CARTRIDGES USED

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	93	47.4	47.4	47.4
	2	84	42.9	42.9	90.3
	3	16	8.2	8.2	98.5
	4	3	1.5	1.5	100.0
	Total	196	100.0	100.0	100.0
	Total	196	100.0	100.0	

TABLE 6: NUMBER OF EXTRACTIONS

Extraction	Frequency	Percent	Valid Percent	Cumulative Percent
Single	159	81.1	81.1	81.1
Multiple	37	18.9	18.9	100.0
Total	196	100.0	100.0	

TABLE 7: RELATIONSHIP OF DENTAL ANXIETY RATING AND BLOOD PRESSURE MEASUREMENTS DETERMINED BY KRUSKAL WALLIS TEST

Dental Anxiety Rating		Dental Anxiety Rating	
SP1		DP1	
Chi-Square	5.903	Chi-Square	1.152
df	3	df	3
Asymp.Sig	.116	Asymp.Sig	.764
SP2		DP2	
Chi-Square	2.643	Chi-Square	.473
df	3	df	2
Asymp.Sig	.450	Asymp.Sig	.789
SP3		DP3	
Chi-Square	4.605	Chi-Square	7.245
df	3	df	3
Asymp.Sig	.203	Asymp.Sig	.064
SP4		DP4	
Chi-Square	4.983	Chi-Square	1.1557
df	3	df	3
Asymp.Sig	.173	Asymp.Sig	.669
SP5		DP5	
Chi-Square	2.990	Chi-Square	.603
df	3	df	3
Asymp.Sig	.393	Asymp.Sig	.896

(SP: Systolic Pressure, DP: Diastolic Pressure)

Out of 196 patients, 159 (81%) had single teeth extracted, while 37 (19%) had multiple teeth extractions (Table 6). In the waiting room before the beginning of procedure, only 29% had normal systolic blood pressure, 47% of the participants had slightly high SP whereas

16% participants had moderately high SP and 8% of the participants were measured to have very high systolic blood pressure.

The initial diastolic blood pressure measurements were normal in 63% of the participants, while 29% of

the participants showed slightly high DP. 8% of the participants showed moderately high and only 0.5% participants showed very high DP. These measurements were repeated with the patient in the dental chair before administration of anesthesia, immediately after administration of anesthesia, 10 minutes after the administration of anesthesia & finally at the conclusion of the treatment. Relationship of Dental anxiety Rate with the systolic and diastolic blood pressure readings was analyzed using the Kruskal Wallis Test and no significant relationship was found at 95% Confidence Interval (Table 7).

DISCUSSION

Patients attending dental clinics may also suffer from variable levels of anxiety because of pain as their primary complaint and from fear of a painful dental procedure. The anxiety may in turn worsen pain in such patients as Sohail et al concluded in their study that anxiety and depression are common co-morbidities in patients suffering from pain.⁹

In our study, 137 out of 196 patients or in other words every second patient undergoing dental treatments had some degree of anxiety or fear regarding their treatment. Whereas in a study by Eitner et al⁶, every tenth patient was considered to have high dental anxiety. A significant correlation was found between age of the patient and the DAR. This agrees with Bedi et al, who in their research concluded that one in eight older people in Britain are dentally anxious.¹⁰

In our study dental anxiety among females was found to be more than males and this is in accordance with several other studies in the literature by Saatchi et al¹¹, Arslan et al¹² and Malvania et al¹³. Our study showed no difference in anxiety rating between normotensive and hypertensive patients with controlled disease. Only 4% of both groups showed severe anxiety.

We made sure that the duration of treatment be kept within 45 minutes with the concept that prolonged dental treatment time may increase anxiety of the patient. We failed to find any research relating duration of dental treatment with dental anxiety.

The monitoring of blood pressure during dental treatment especially high stress procedures for example oral surgical procedures has always been emphasized for two important purposes, namely screening of hypertensive patients as well as to avoid possible complications that could result from blood pressure rises during dental treatment.¹⁴

As already mentioned, we used 2% Lidocaine with 1:100,000 epinephrine solution in our study and while we were monitoring BP of our patients, we also considered the cardiovascular effects of the local anesthesia solution containing a vasopressor. The number of cartridges used in our study was restricted to not more than 4. 89% patients received less than 3 cartridges. This was in accordance to the guidelines by Malamed¹⁵ in his handbook of local anesthesia. According to him, resting plasma epinephrine levels (39 pg/

mL) are doubled after administration of one cartridge of lidocaine with 1:100,000 epinephrine. It has been explained that minimal responses of increased systolic blood pressure and increased heart rate develop with the administration of one to two dental cartridges of a 1:100,000 epinephrine dilution. Administration of four cartridges of 1:100,000 epinephrine will bring about a slight decrease in diastolic blood pressure. He recommends maximum dose of epinephrine in concentration of 1:100,000 that can be administered to ASA I patient to be 200µg per appointment equivalent to 11 cartridges of such solution. But in ASA III and IV patients this should be restricted to 2 cartridges per appointment. Chaudhry et al in their study conducted to see the effect of local anesthetic with epinephrine on the blood pressure levels of hypertensive patients, showed a significant fall in the systolic as well as diastolic blood pressure instead of a general perception of rise in blood pressure.¹⁷

Klages et al¹⁶ in their study concluded that during stressful dental procedures, patients indicating dental anxiety and pain sensitivity above median levels are especially at risk of stabilizing exaggerated pain expectations and dental fear. Although fear of dental treatment becomes more challenging for the patient as well as the dental practitioner if the patient has a history of systemic disease like cardiovascular diseases, asthma, or endocrine disorders and with increasing age; it still is experienced in young healthy patients. Lack of patient involvement in their treatment has also been considered as a very important factor in increasing dental anxiety.⁴

The relationship of systolic blood pressure recorded at five different points during patient's visit and his/her DAR was assessed and unexpectedly, no significant correlation found. While monitoring the diastolic blood pressure at five different points during patients' visit, 43% participants were measured to have normal diastolic blood pressure at the beginning of procedure. Whereas at the conclusion of the procedure, 49% participants showed a net increase of just 6%, which was not significant. But a significant correlation was found between DAR and diastolic blood pressure immediately after administration of local anesthesia. This may be because the most painful and fearful part of dental treatment is generally considered to be the needle penetration during local anesthetic administration. Results against a common perception that anxiety would raise the blood pressure have also been documented by Sproat et al¹⁴ and Goulart et al¹⁸ who found no significant relationship between DAS score and blood pressure elevation.

One shortcoming of our study was that our questionnaire did not include previous dental experience of the patient. If it was added it might have an effect on the DAS of the patient but, probably not the blood pressure as even severe anxiety does not seem to cause significant elevation in blood pressure in our study.

Although our study was aimed at finding the effects of dental anxiety on blood pressure, and did not

find any significant relationship between the two, we found that most of the patients did have a variable level of anxiety and fear of dental treatment evident both by the Dental Anxiety Score and the increase in diastolic pressure immediately after administration of local anesthesia, a painful part of dental treatment. This relationship could adversely affect patient cooperation during treatment and therefore the outcome of treatment. Different strategies to manage patients with dental anxiety and phobia have been reviewed in the literature.^{3,19} The minimum role a dentist's behavior could play in decreasing patient's anxiety is by facilitating satisfaction of the basic psychological needs, namely, empathy, effective patient-dentist communication, moral support, and successful prevention of pain.

CONCLUSION

Although the results of our study showed no significant difference in the behavior of the systolic and diastolic blood pressures in relation to anxiety, we recommend that strategies to deal with anxious patients presented in the literature including cognitive behavioral therapy, and the anxiety reduction protocol be used to achieve a better treatment outcome. In addition, routine monitoring of blood pressure in dental clinics should be carried out even in normotensive patients as a screening procedure for hypertension.

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