

# Evaluation of Anxiety, Pain, and Hemodynamic Changes during Surgical Removal of Lower Third Molar under Local Anesthesia

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## Abstract

**Aim:** The aim of this study are 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:** Sixty healthy patients were evaluated (i) to determine the hemodynamic changes (systolic blood pressure [SBP], diastolic blood pressure [DBP], heart rate [HR], and oxygen saturation) at nine occasions: before starting the surgical procedure, 1 min and 4 min after local anesthetic injection, during the incision, at the time of ostectomy, at the completion of tooth removal, at the start and completion of suturing, and finally, after completion of surgery and (ii) to evaluate whether these variations are attributable to patient anxiety and pain experienced during the surgical procedure. 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:** SBP and DBP showed significant changes; the highest value was recorded at the time of ostectomy/tooth sectioning. Maximum HR was observed 4 min after local anesthetic injection and the lowest HR was recorded after completion of tooth extraction, i.e., during the suturing. In females, mean HR was significantly increased. **Conclusion:** The present study suggests that dental anxiety impacts the effect of delivery of local anesthesia on blood pressure and is significantly associated with increased HR.

**Keywords:** Anxiety, hemodynamic changes, pain

## INTRODUCTION

The administration of local anesthetics and the performance of extensive dental procedures such as tooth extraction and minor surgical procedures may cause stress and systemic disturbances in medically compromised patients. To avoid potentially serious reactions, dentists are obligated to monitor continuously their medically challenged patients.<sup>[1]</sup> Healthy patients are usually able to tolerate these physiologic responses which are due to stress; however, patients with hypertension, heart disease, cerebrovascular disease, or increased age may have a diminished tolerance to stress.<sup>[2]</sup> Anxiety experienced during a dental visit may cause parasympathetic dominance, with bradycardia and/or syncope<sup>[3,4]</sup> or even cardiac arrhythmias.<sup>[5]</sup> Some studies found an increase in blood pressure (BP) during dental surgery is common even in

normotensive patients. This increase is influenced by many factors, such as psychological and physical stress, painful stimuli, and the action of catecholamines present in local anesthetics.<sup>[6,7]</sup>

## Aim

The aims of this study are to determine the hemodynamic changes in healthy patients during the surgical removal of lower third molar and to evaluate whether these variations are

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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 60 adults seen in our department from January 2013 to December 2014 for surgical removal of mandibular third molar. All mesioangularly impacted mandibular third molars (difficulty index 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 34 and male 26, 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 60 patients, 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, 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 Electronic BP Apparatus (OMRON SEM1), and the heart rate (HR) and oxygen saturation (SpO<sub>2</sub>) were recorded by pulse oximeter (BPL Cleo). These hemodynamic parameters were recorded on nine occasions: before starting the surgical procedure, 1 min and 4 min after local anesthetic injection, during the incision, at the time of ostectomy, at the completion of tooth removal, at the start and completion of suturing, and finally, after completion of surgery. 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 and Kleinknecht dental fear scale [DFS]) were carried

out to evaluate a patient’s overall dental anxiety level, both real and imagined.

**Anxiety rating**

- 9–12 = Moderate anxiety
- 13–14 = High anxiety
- 15–20 = Severe anxiety.

Kleinknecht DFS has score total score ≤20–35 indicates low fear and >35 indicates high fear.

The degree of pain experienced during the surgical procedure was assessed by means of a visual analog scale (VAS).

Ethical approval has been received from the institutional ethical committee.

**Statistical analysis**

Hemodynamic parameters were presented as mean ± standard deviation (SD); categorical variables were expressed in frequencies and percentages. Hemodynamic variables were compared between genders and at different time points by performing two-way analysis of variance (ANOVA) for repeated

**Table 2: Global mean values of systolic blood pressure, diastolic blood pressure, heart rate, and oxygen saturation**

Variable	Mean	SD
SBP	122.76	12.09
DBP	79.68	8.08
Heart Rate	85.28	12.04
SpO <sub>2</sub>	98.61	0.87

SpO<sub>2</sub>=Oxygen saturation, SBP=Systolic blood pressure, DBP=Diastolic blood pressure, SD=Standard deviation

**Table 3: Comparison of Hemodynamic parameters by Gender**

Variable	Male		Female		P	Significance
	Mean	SD	Mean	SD		
SBP	124.72	9.49	121.21	13.63	0.0008	HS
DBP	78.43	7.79	79.87	8.32	0.5299	NS
Heart rate	81.62	9.72	88.19	12.89	<0.0001	HS
SpO <sub>2</sub>	98.66	0.87	98.58	0.87	0.2848	NS

SpO<sub>2</sub>=Oxygen saturation, SBP=Systolic blood pressure, DBP=Diastolic blood pressure, SD=Standard deviation, HS=Highly significant, NS=Not significant

**Table 1: Mean blood pressure, heart rate, and oxygen saturation values at nine different time points during the surgical procedure**

	T1	T2	T3	T4	T5	T6	T7	T8	T9
SBP	119.5±11.3	120.7±16.4	121.3±11.3	122.2±11.6	125.7±14.7	124.1±13.5	122.3±11.5	122.4±13.1	122.5±11
DBP	78.8±7.2	76.6±12.2	76.1±8.4	77.8±9.2	78.4±10.4	80.4±9.3	79.7±8.6	79.8±8.4	79.6±8.0
HR	84.7±11.3	88.2±15.5	91.95±14.2	90.3±15.3	87.5±14.3	84.3±13.9	80.7±12.3	81.2±13.6	81.3±11.7
SpO <sub>2</sub>	98.5±0.75	98.7±0.74	98.7±0.79	98.6±0.92	98.2±1.8	98.4±1.4	98.4±0.9	98.3±1.4	98.6±0.8

T1- Baseline, T2- 1 minute after Local Anesthesia, T3- 4 minute after Local Anesthesia, T4-During incision, T5-During Ostectomy/tooth sectioning, T6- During extraction of tooth, T7- Start of suturing, T8- Completion of Suturing, T9- After completion of surgical procedure

**Table 4a: Mean Systolic Blood Pressure values at different time points during the surgical procedure**

SBP	T1	T2	T3	T4	T5	T6	T7	T8	T9
Global	119.58±11.86	122.44±10.66	121.28±11.44	122.08±11.76	125.57±14.93	124.01±13.70	122.13±11.75	122.44±13.28	122.42±11.87
Male	123.28±9.78	123.2±10.2	120.5±10.7	126.80±12.08	124.96±10.5	121.15±10.60	120.07±10.21	120.4±11.59	120.23±10.17
Female	116.28±12.77	122.09±11.18	122.37±11.96	119.53±9.80	127.71±15.87	126.68±15.58	124.25±12.60	125.05±14.48	124.5±12.99

**Table 4b: Two-way analysis of variance repeated measures for systolic blood pressure**

Factor	F	d.f.	P	Significance
Time	1.99	8	0.0491	Significant
Gender	0.2596	1	0.6241	Not Significant

**Table 5a: Mean Diastolic Blood Pressure values at different time points during the surgical procedure**

DBP	T1	T2	T3	T4	T5	T6	T7	T8	T9
Global	78.88±7.27	77.69±7.23	76.5±7.50	78.12±9.62	78.22±10.81	80.61±9.59	79.98±9.01	80.10±8.80	79.86±8.32
Male	78.69±6.42	74.61±15.75	76.5±7.50	79±8.47	82.5±7.94	79.34±8.03	79.26±8.58	79.69±7.77	79.34±8.03
Female	78.84±8.16	77.62±8.28	76.60±8.99	77.86±9.33	83.5±6.51	83.51±8.71	80.03±9.10	81.81±7.02	79.75±8.23

**Table 5b: Two-way analysis of variance repeated measures for diastolic blood pressure**

Factor	F	d.f.	P	Significance
Time	2.88	8	0.0046	Highly Significant
Gender	1.154	1	0.0260	Significant

**Table 6a: Mean Heart Rate values at different time points during the surgical procedure**

Heart rate	T1	T2	T3	T4	T5	T6	T7	T8	T9
Global	84.71±11.39	88.39±15.68	91.80±14.03	90.56±15.24	87.70±14.13	84.92±14	81.18±12.64	81.75±14.02	82.03±12.02
Male	82.40±6.58	84.25±14.40	88.76±13.41	91.43±11.74	80.45±11.74	81.41±12.65	78.41±9.84	79.09±13.38	80.45±11.74
Female	85.14±12.27	89.67±11.28	92.8±10.25	88.61±10.2	88.92±11.17	88.14±12.74	81.46±9.03	82.34±8.68	82.39±9.49

**Table 6b: Two-way analysis of variance repeated measures for heart rate**

Factor	F	d.f.	P	Significance
Time	10.13	8	<0.0001	Highly Significant
Gender	6.26	1	0.0368	Significant

**Table 7a: Mean SPO<sub>2</sub> values at different time points during the surgical procedure**

SPO <sub>2</sub>	T1	T2	T3	T4	T5	T6	T7	T8	T9
Global	98.55±0.75	98.79±0.74	98.75±0.79	98.67±0.93	98.29±1.29	98.44±1.41	98.53±0.94	98.42±1.43	98.70±0.86
Male	98.46±0.71	98.82±0.84	98.85±0.75	98.64±0.91	98.58±16.88	98.73±0.88	98.42±0.94	98.52±0.93	98.79±0.77
Female	98.60±0.80	98.75±0.67	98.66±0.84	98.37±1.04	98.47±0.98	98.19±1.71	98.60±0.96	98.31±1.76	98.61±0.93

**Table 7b: Two-way analysis of variance repeated measures for oxygen saturation**

Factor	F	d.f.	P	Significance
Time	1.695	8	0.0974	Not Significant
Gender	3.256	1	0.1088	Not Significant

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. STATA version 10.0 was used for statistical analysis.

## RESULTS

The mean SBP, DBP, HR, and SpO<sub>2</sub> values were recorded at each of the nine time points during surgical procedure, for the global sample [Table 1].

**Table 8: Mean Dental Anxiety Scale , Dental Fear Scale and Visual Analog Scale score**

Variable	Total	Male	Female	P	Significance
DAS	10.3±2.95	9.07±2.68	11.3±2.81	0.0029	Highly Significant
DFS	39.61±7.03	35.37±5.69	43.09±6.09	<0.0001	Highly Significant
VAS	1.23±0.83	1.00±0.68	1.42±0.90	0.0482	Significant

DAS=Dental anxiety scale, DFS=Dental fear scale, VAS=Visual analog scale

**Table 9: Mean systolic blood pressure, diastolic blood pressure, heart rate, and oxygen saturation values by dental anxiety scale score**

DAS	SBP	DBP	HR	SPO <sub>2</sub>
≤12 (Low)	119.28±9.88	77.02±6.26	82.89±9.67	98.70±0.79
>12 (High)	120.62±14.51	83.12±8.27	88.18±12.04	98.79±0.79
P	0.6110, NS	0.0037, HS	0.0453, S	0.3612, NS

DAS=Dental anxiety scale, SpO<sub>2</sub>=Oxygen saturation, SBP=Systolic blood pressure, DBP=Diastolic blood pressure, HS=Highly significant, NS=Not significant, HR=Heart rate, S=Significant

**Table 10: Mean systolic blood pressure, diastolic blood pressure, heart rate, and oxygen saturation values by dental fear survey score**

DFS	SBP	DBP	HR	SPO <sub>2</sub>
>35(High)	1119.09±11.52	78.65±6.68	84.42±11.58	98.55±0.73
≤35(low)	121±10.70	78.82±6.64	84.18±7.80	98.54±0.79
P	0.5617, NS	0.9387, NS	0.9396, NS	0.9367, NS

DFS=Dental fear survey, SBP=Systolic blood pressure, DBP=Diastolic blood pressure, HR=Heart rate, SpO<sub>2</sub>=Oxygen saturation, NS=Not significant

### Systolic blood pressure

The global mean SBP is 122.76 mmHg, with a SD of 12.09 mmHg [Table 2]. Distributed by gender, the mean SBP is 124.72 mmHg with SD of 9.49 mmHg in males versus 121.21 mmHg with SD of 13.63 mmHg in females. This difference is significantly high ( $P = 0.0008$ ) [Table 3]. The SBP varied with surgical time ( $F = 1.99$ ; d.f. = 8;  $P = 0.04$ ) shows significant high value at the time of ostectomy. Variation in SBP shows a similar pattern in both genders [Tables 4a and b].

### Diastolic blood pressure

The global mean DBP is 79.68 mmHg, with a SD of 8.08 mmHg [Table 2]. Distributed by gender, the mean DBP is 78.43 mmHg with SD of 7.79 mmHg in male versus 79.87 mmHg with SD of 8.32 mmHg in female. This difference is not significant ( $P = 0.5299$ ) [Table 3]. The DBP varied with surgical time ( $F = 2.88$ ; d.f. = 8;  $P = 0.004$ ) shows significant high value at the time of ostectomy and tooth extraction. Variation in DBP shows significant high values in female ( $F = 1.154$ ; d.f. = 1,  $P = 0.026$ ) [Tables 5a and b].

**Table 11: Mean diastolic blood pressure in male and female by dental anxiety scale scores**

DAS	Male	Female
≤12 (Low)	78.41±6.59	75.16±5.42
>12 (High)	80.5±6.71	83.5±8.82
P	0.6653, NS	0.0025, HS

DAS=Dental anxiety scale, HS=Highly significant, NS=Not significant

**Table 12: Mean heart rate in male and female by dental anxiety scale scores**

DAS	Male	Female
≤12 (Low)	81.77±6.31	84.38±12.95
>12 (High)	91.6±6.84	87.69±12.87
P	0.0410, S	0.4776, NS

DAS=Dental anxiety scale, NS=Not significant, S=Significant

**Table 13: Mean oxygen saturation in male and female by dental anxiety scale scores**

DAS	Male	Female
≤12 (Low)	98.43±0.67	98.58±0.81
>12 (High)	99.45±0.21	98.59±0.79
P	0.0473, S	0.9737, NS

DAS=Dental anxiety scale, NS=Not significant, S=Significant

### Heart rate

The global mean HR is 85.28 bpm with a SD = 12.04 bpm [Table 2]. Mean HR value in male is 81.62 with SD = 9.72 and in female is 88.19 with SD = 12.89 shows statistical significant variation ( $P = 0.0001$ ) [Table 3].

HR varied with surgical time ( $F = 10.13$ , d.f. = 8,  $P = 0.0001$ ) shows significant rise in HR values 4 min after local anesthesia. This variation is seen in female ( $F = 6.26$ ; d.f. = 1;  $P = 0.036$ ) [Tables 6a and b]. The lowest HR was recorded after completion of tooth extraction, i.e., during the suturing [Tables 6a and b].

### Oxygen saturation

The global mean SpO<sub>2</sub> is 98.61 with a SD = 0.87 [Table 2]. Mean SpO<sub>2</sub> value in male is 98.66 with SD = 0.87 and in female is 98.58 with SD = 0.87. This difference is not statistically significant ( $P = 0.28$ ) [Table 3].

SpO<sub>2</sub> variation with surgical time ( $F = 1.695$ ; d.f. = 8;  $P = 0.0974$ ) and in gender ( $F = 3.256$ ; d.f. = 1;  $P = 0.1088$ ) is not statistically significant [Tables 7a and b].

### Anxiety and fear

Mean anxiety level in male is  $9.07 \pm 2.68$  and in female is  $11.3 \pm 2.81$ . The difference in DAS values is significant ( $P = 0.0029$ ). The females show higher level of anxiety than male, but DAS values in females and males are <12 which shows anxiety level low [Tables 8-10].

In anxious patients mean DBP and mean HR is significantly high [Table 9] whereas degree of fear does not show any significant effect on mean SBP, DBP, HR and SpO<sub>2</sub> [Table 10].

In more anxious patients, DBP in female patients [Table 11] and HR in male patients increase [Table 12]. In more anxious males, SpO<sub>2</sub> showed significant changes [Table 13].

Mean DFS in male is  $35.37 \pm 5.69$  and in female is  $43.09 \pm 6.09$ . The difference in DFS values is highly significant ( $P = 0.0001$ ) [Table 8]. The females show higher level of fear [Table 8].

Mean degree of dental anxiety was low and dental fear was significantly high, according to the DAS and DFS assessed before the surgical procedure [Table 8].

However, as compared to males, the degree of anxiety and fear in females was significantly high with significantly higher mean score. [Table 8].

Degree of pain experienced during the surgical procedure was low, equivalent to 1 which indicated hurts little bit with Wong–Baker FACES pain rating scale assessed at the end of the treatment [Table 8].

## DISCUSSION

More than any other of the health sciences, dentistry has been associated with anxiety, fear, and pain.<sup>[8]</sup> The anticipation of forthcoming dental treatment induces a physiologic stress response in patients that manifests in corticosteroid release, BP change, and hemodynamic and cardiovascular reactions.<sup>[9]</sup> Most dental treatments are performed with the use of local anesthesia, and an increase in BP is common even in normotensive patients. This increase is influenced by many factors, such as psychological and physical stress, painful stimuli, and action of catecholamines present in local anesthetics.<sup>[6]</sup> The DAS is designed to evaluate a patient's overall dental anxiety level. On the other hand, the DFS helps the clinician to focus on a patient's autonomic responses, avoidance, and fear of specific stimuli during dental procedures.<sup>[10]</sup> In this study, all patients have completed Corah's DAS questionnaire before receiving anesthetic injection for dental extraction. The overall mean DAS score was  $10.3 \pm 2.95$ . This mean DAS score was slightly higher than earlier studies in adult patients, which reported values in the range from  $9.3 \pm 2.5$  in Taiwan dental patients,<sup>[9]</sup>  $8.6 \pm 3.7$  in German dental patients,<sup>[11]</sup>  $7.87 \pm 3.5$  in Norwegian patients,<sup>[12]</sup> and  $7.26 \pm 2.7$  in patients from Denmark.<sup>[13]</sup> In the present study, women tended to be more anxious than men (females  $11.3 \pm 2.81$  and males  $9.07 \pm 2.68$ ); a finding consistent with ter Horst and de Wit and Settineri *et al.*'s studies on dental anxiety.<sup>[14,15]</sup> This finding might be explained on the basis that women have higher levels of neuroticism than men and that anxiety is positively associated with neuroticism.<sup>[16,17]</sup> In this study, the mean age of the patient was 37 years. Mean anxiety level was low. Several studies have shown that younger people tend to have more severe dental anxiety than elderly people.<sup>[18,19]</sup> However, in contrast to that, the present study shows low anxiety level in young patients which supported the result of Erten *et al.*'s<sup>[10]</sup> study which concluded that age was not a factor affecting the anxiety level. In the present study, mean anxiety score and mean VAS score both were low. The result

indicates that females were more anxious than males (females  $11.3 \pm 2.81$  and males  $9.07 \pm 2.68$ ) and higher VAS score was noted in females than males. This result is in consonance with the study by Averbuch and Katzper,<sup>[20]</sup> who reported that postoperative baseline pain was significantly greater in females than in males after a third molar extraction procedure. However, Slater<sup>[21]</sup> reported that females could tolerate pain more than males, indicating that males tend to bottle up their anxiety but females express their anxiety. Pain threshold in the male patients appears lower than females.

In the present study, all the patients included were operated in the morning. As the explanation by Hansson *et al.*<sup>[22]</sup> in their study, they had explained about diurnal variation in endogenous steroid and opioid concentration may be the reason for the result that showed low mean anxiety and mean VAS score in the present study.

In the present study, patients with high dental anxiety had increase in HR and DBP during the surgical procedure. HR increases after the administration of local anesthetic solution. This result supported the result of Liao *et al.*<sup>[9]</sup> The increase of HR and the alterations in BP during the injection may have been partly due to endogenous epinephrine release as a result of the emotional stress and not from the effect of local anesthetic.<sup>[18]</sup> A study by Taggart *et al.*<sup>[23]</sup> suggests that a stronger anticipatory response to stressful events, which can be measured by DAS, may result in increased HR and DBP. The association of emotional stress with enhanced sympathetic activity, tachycardia with increased plasma concentrations of epinephrine or norepinephrine, or both are possible mechanisms which may explain these effects.<sup>[23]</sup>

Several studies<sup>[24-26]</sup> reported that pain causes an alarm reaction manifested by hypothalamic oriented vasoconstriction and dilatation as well as the release of more epinephrine and norepinephrine. This results in increased in systemic arterial pressure and pulse rate immediately after injection and after extraction. In addition, pain may cause BP to rise due to the release of endogenous catecholamine plus psychosomatic fear of injection and the extraction.

Anderson and Reagan as well as Lilienthal and Reynolds<sup>[27,28]</sup> reported that attempts to assess patient anxiety subjectively during preoperative sessions were not necessarily useful because patients who appeared calm or who claimed to be without anxiety, which may show signs of significant physiologic stress during dental procedures when monitored electronically.

These findings highlight the need for using an objective instrument such as Corah's DAS to assess anxiety. Corah DAS was proven to be popular among dental researchers to assess dental anxiety. It is a simple, easy to score, short, valid, and reliable test for dental visit-associated anxiety.<sup>[29]</sup> The contribution of pain expectations to dental anxiety, and also to dental avoidance, suggests that this might usefully be a specific focus of intervention in programs to reduce dental anxiety.<sup>[30]</sup>

In this study, HR significantly increases 4 min after local anesthesia and then gradually decreases. Lowest value was

recorded after completion of extraction of the tooth. SBP and DBP significantly increase at the time of osteotomy and extraction of the tooth. These findings are consistent with the findings of Meyer<sup>[31]</sup> and Vernale,<sup>[26]</sup> who observed that increase in HR and alteration in BP before injection and during extraction are possibly an expression of an endogenous catecholamine release as a result of emotional stress and not pharmacological effect. These hemodynamic changes caused by emotional stress mask the alterations caused by exogenously active catecholamines. Fear, anxiety, and expectation or experience of pain are special stress factors in this situation. The study by Taggart *et al.*<sup>[23]</sup> supports the present study concluding that emotional stress is conventionally considered to be associated with tachycardia and enhanced sympathetic activity. Salonen *et al.*<sup>[32]</sup> supported the result of the present study showing increased HR after the injection of lidocaine with adrenaline but HR remained unaltered after plain lignocaine. They reported that the adrenaline concentration was higher during surgery than the baseline level. According to Silvestre *et al.*<sup>[33]</sup> and James *et al.*,<sup>[34]</sup> the fact of using or not using a vasoconstrictor with local anesthetic solution exerts no effect upon BP in normotensive patients though a certain increase in SBP was noted at moment of tooth extraction and at the end of the procedure. This was attributed to increased patient anxiety during extraction, taking into account that the difference was comparatively greater between SBP at the start of the procedure and at the actual moment of extraction. In the present study, SBP and DBP significantly increase at the time of osteotomy and tooth extraction; these findings are consistent with the study by Brand<sup>[35]</sup> and Yoshito Nakamura.<sup>[36]</sup> As per Brand *et al.* and *et al.*,<sup>[35]</sup> changes in mean HR and mean SBP and DBP are induced in both the patient's anticipation of scheduled treatment and the actual dental treatment itself. Significant changes have been observed before application of a local anesthetic, during restorative treatment, and during extraction. These cardiovascular responses may vary according to the local anesthetic used and the choice of vasoconstrictor. The individual changes in HR and BP are affected by pain and such individual factors as age, gender, hypertension, dental experience, and psychological responses. The study by Silvestre *et al.*<sup>[37]</sup> on the evaluation of hemodynamic changes in controlled hypertensive during extraction showed no significant hemodynamic changes attributable to anesthetic use with a vasoconstrictor.

For successful dental treatment, a gentle, supportive, professional, sympathetic, quiet, and more considerate approach should be followed when managing patients with dental anxiety. On their first visit, patients should be dealt with more sensitively to avoid increasing their anxiety and thus avoid their repulsion to dental care.<sup>[16]</sup>

## CONCLUSION

The present study suggests that dental anxiety impacts the effect of delivery of local anesthesia on BP and is significantly

associated with increased HR. As the literature shows the cases of fainting, collapse, shock, coma, death during minor dental surgical procedures, monitoring the vitals during minor surgical procedures in the healthy as well as medically compromised patients helps the dentist detect acute medical emergencies or preventive measures that are rendered.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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