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The Effect of Hypertension and/or Diabetes on Blood Pressure and Heart Rate Changes in Patients Undergoing Oral Surgeries

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ABSTRACT

The aim of this study was to evaluate the effect of hypertension and/or diabetes on systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) changes of individuals during oral surgeries.

This randomized observational study was conducted on patients undergone oral surgical procedures. The individuals were divided into 3 systemic disease groups. The group 1 consisted of only individuals with hypertension, the group 2 included individuals with hypertension and diabetes, and the group 3 consisted of only individuals with diabetes. Initial and final SBP, DBP and HR measurements according to age, gender and body mass index (BMI) between groups were analyzed statistically. The statistical significance level was set at $p<0.05$.

Of the 414 patients aged 18-82 years included in the study, 38.2% were male and 61.8% were female. Outcomes of 271 patients undergone surgical procedures; the DBP change of the patients in the group 3 were significantly lower than that of those in the group 1 ($p<0.01$). The HR change of the patients in the group 1 was significantly higher than that of the patients in the groups 2 and 3 ($p<0.05$). The increase in the SBP of the patients in the group 2 was higher than that of the patients in the group 3 in patients under the age of 50 years ($p<0.05$).

In the literature, there was no study that evaluated the change in blood pressure and heart rate during surgery in diabetic patients.

Hypertension, diabetes, individual factors like BMI and age were effective in SBP, DBP and HR changes.

Key Words: Blood pressure, body mass index, diabetes, heart rate, hypertension, surgery, oral

Introduction

Blood pressure (BP) and heart rate (HR) are some of the evaluable vital signs under dental clinical conditions (1,2). Monitoring of changes in these parameters is important, especially in terms of prevention of complications. One of the most common systemic diseases seen in patients presenting to dental clinics is hypertension and diabetes (3,4). According to the current hypertension classification, BP values of 130/80 mmHg (systolic/diastolic) and higher have been considered as hypertension (5). There are two types of hypertension which are primary (primary) and secondary hypertension. Some cardiovascular, renal, endocrine and neurological diseases, use of certain drugs like corticosteroids and cyclosporins, and systemic conditions like hypercalcaemia and sleep apnea may lead to secondary hypertension. However, age, family history of cardiovascular disease, smoking and alcohol use, sedentary lifestyle, cholesterol-rich diet and presence of additional systemic diseases (diabetes, obesity, etc.) play an important role in the emergence of essential hypertension, which accounts for the majority of all hypertension cases (6,7).

Changes in HR beyond normal limits (60-100 beats per minute) are defined as arrhythmias. Atrial fibrillation is the most common arrhythmia. Increased age, hypertension and/or heart failure are some of the risk factors for atrial fibrillation. Ventricular tachycardias are the most dangerous arrhythmias. Some diseases known to cause arrhythmias include coronary artery disease, serum electrolyte imbalances, changes in the cardiac muscles, heart attack, damage caused by heart attack, recovery period after cardiac surgery, hyperthyroidism and panic attack (8-10). Arrhythmias may also develop in healthy individuals (usually sinus tachycardia) and usually occurs in cases of physical activity, injury, disease, stress, fear, anxiety and excitement (11).

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In individuals, dental procedures lead to stress, fear and anxiety to varying extents. Oral surgical procedures, especially tooth extraction, are known to increase anxiety. These changes in the emotional state of individuals may affect BP and HR (12). This mechanism can be explained by the activation of sympathetic nervous system following the production of cortisol and other glucocorticoids from the adrenal cortex caused by emotional stimulation (13). Blood pressure and heart rate changes associated with oral surgery has a multifactorial structure. In general, the studies investigating the changes in BP and HR during oral surgery evaluated the effects of anxiety and/or local anesthesia (14-16). In these studies, other factors need to be eliminated or minimized in order to evaluate the effect of the investigated factor. However, it is not always possible to establish this under clinical conditions.

In today's society, sedentary lifestyle, fast food and malnutrition habits, obesity and other diseases caused by these are increasing. These predisposing factors lead to chronic and fatal diseases, especially hypertension and diabetes. While blood pressure and heart rate changes were evaluated in patients with hypertension, these changes have not been evaluated in patients with diabetes and diabetes+hypertension (17,18). It is important to evaluate and determine patients' tolerability of oral surgical procedures when considered that patients presented to clinics have these characteristics. Individual factors such as age, gender, systemic diseases, body mass index (BMI) may affect BP and HR (14,19). In the literature, there are few studies investigating the effects of these individual factors. In the light of this information, the aim of this study was to evaluate the effect of hypertension and/or diabetes according to age, gender and body mass index on systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) changes of individuals during oral surgeries.

Materials and Methods

This randomized observational study was conducted on individuals with undergone oral surgical procedures at the Oral and Maxillofacial Surgery Clinic of Van Yuzuncu Yil University, Faculty of Dentistry between May 2017 and May 2018. The approval for the study was obtained from the Non Invasive Clinical Research Ethics Committee of Van YYU (decision no: 2019/02-01). Randomization was carried out by selecting the first 3 patients aged 18 years and older among the patients who were scheduled for surgery on each working day between the specified dates. The inclusion criteria were as follows: individuals with hypertension and/or diabetes previously diagnosed by a specialist of the relevant branch, individuals who had previously undergone at least one oral surgery. The exclusion criteria were as follows; individuals with anxiety disorders such as panic attack, individuals with neurological and psychological disorders, individuals whose upper arm (brachial artery) BP could not be measured due to any anomaly, individuals who underwent another dental or medical procedure on the same day, individuals who felt pain during and after the procedure, individuals who received more than 4 ml of local anesthetic, individuals with an operative time longer than 30 minutes, individuals whose surgical site was left to heal by secondary intention, individuals who use alcohol and tobacco. The data of 414 patients meeting the inclusion criteria were evaluated. The individuals were divided into 3 groups. The group 1 consisted of only individuals with hypertension, the group 2 included individuals with hypertension and diabetes, and the group 3 consisted of only individuals with diabetes. All groups consisted of stable patients.

The anamnesis forms of individuals included information about clinical and radiological examination findings, age, gender, working status, height, weight, systemic disease, surgical procedure performed and operative time, and postoperative complications. The patients underwent complicated tooth extraction, extraction of impacted tooth, extraction of impacted root, alveoloplasty, epulis fissuratum excision, and flabby ridge reduction.

Blood pressure and heart rate were measured from the brachial artery using a digital BP/HR monitor (Omron M6 Comfort, Omron Corp., Japanese) after the patients were rested on the seat in the vertical and relaxed sitting position for at least 10 minutes. BP was measured from both arms and the values obtained from the arm with higher BP were accepted. The measurements were made twice immediately before the administration of local anesthesia and 5 minutes after the completion of surgical procedures. The second measurements were performed by the same allied healthcare staff from the arm with higher BP. The surgical procedures of the patients with BP values of 180/110 mmHg and higher were not performed.

In the surgeries performed by the same surgeon, topical anesthesia (about 30 mg of lidocaine) was

first administered to each patient, followed by local anesthetic (containing 40 mg/ml of articain and 0.005 mg/ml of epinephrine) and infiltration anesthesia and/or inferior alveolar nerve block. It was waited for 5 minutes after local anesthesia and surgical procedures were initiated following anesthesia control. At the last phase of the surgeries, bleeding control was achieved and the wound sites were primarily closed up using 3-0/4-0 silk sutures and/or 4-0/5-0 pga sutures. The patients were told about postoperative care and what to pay attention to. The postoperative measurements were performed on patients who were rested for 5 minutes following the completion of procedures. The patients were kept under observation for 1 hour in the postoperative period for bleeding control and invited for further postoperative followed-ups on the 2nd and 7th days.

Statistical Analyses: The statistical analyses were performed with The Number Cruncher Statistical System 2007 (NCSS, Kaysville, Utah, USA) software. The study data was evaluated with using descriptive statistical methods (minimum, maximum, mean, median, standard deviation, frequency, percentage). The normality distribution of the quantitative data was tested with the Shapiro-Wilk test and graphical analyses. One-way analysis of variance and Bonferroni correction and Games-Howell pairwise evaluations were used to compare the quantitative variables between more than two groups. The Kruskal-Wallis test and Dunn-Bonferroni test were used to compare the non-normally distributed quantitative variables between more than two groups. The paired sample t-test was used for the intragroup comparisons of normally distributed quantitative variables. The Pearson's chi-squared test was used to compare the qualitative data. The statistical significance level was set at $p<0.05$.

Results

Of the 414 patients aged 18-82 years included in the study, 38.2% (n=158) were male and 61.8% (n=256) were female. The mean age of the patients was 47.58±13.60 years, and of whom 51.9% (n=215) were under the age of 50 years, 48.1% (n=199) were over 50 years of age. There was a statistically significant difference between the age distributions of the patients according to the groups ($p<0.01$). The percentage of the patients aged 50 and over in the group 3 was significantly lower than those in the group 1 and group 2 ($p<0.01$). There was no statistically significant difference between the gender distribution of the patients according to the groups ($p>0.05$). There was a statistically significant difference between the BMI values of the patients according to the groups ($p<0.01$). The incidence of obesity in the patients in the group 3 was significantly lower than in the patients in the group 1 and group 2 ($p <0.05$). There was no statistically significant difference between the distributions of the patients' hypertension severity according to the groups ($p<0.01$). The percentage of normohypertensive patients in the group 3 was significantly higher than in the group 1 and group 2 ($p<0.01$). The percentage of patients with stage 1 hypertension in the group 3 was significantly higher than the patients in the group 1 and group 2 ($p<0.01$). The percentage of patients with stage 2 hypertension in the group 3 was significantly higher than those in the group 1 and group 2 ($p<0.01$) (Table 1).

There were statistically significant differences between the SBP and DBP measurements of the patients according to the groups ($p<0.01$). The SBP and DBP of the patients in the group 3 were significantly lower than that of the patients in the group 1 and group 2 ($p<0.01$). There was also a statistically significant difference between the HR measurements of the patients according to the groups ($p<0.01$). The HR values of the patients in the group 3 were significantly lower than that of the patients in the group 1 ($p<0.05$) (Table 2).

When the outcomes of 271 patient undergone surgical procedure were analyzed;

There was a statistically significant difference between the initial and final SBP and DBP measurements of the patients according to the groups ($p <0.01$). The initial and final SBP and DBP measurements of the patients in the group 3 were significantly lower than that of those in the group 1 and group 2 ($p<0.01$). The changes in the SBP and DBP and HR measurements of the patients in the group 1, group 2 and group 3 were not statistically significant ($p>0.05$). There was no statistically significant difference between the initial and final HR measurements of the patients according to the groups ($p>0.05$) (Table 3).

When the groups were compared in terms of age and gender, there was no statistically significant difference between the changes in the SBP and DBP and HR measurements ($p> 0.05$) (Table 4-5).

The changes in the SBP measurements of the underweight and normal weight individuals according to the groups were not statistically significant ($p>0.05$). The changes in the DBP

Table 1. Distribution of descriptive properties

		Groups				
		Total (%)	Group 1 (n=140)(%)	Group 2 (n=57)(%)	Group 3 (n=217)(%)	p
Age (years)	<50 years	215 (51.9)	47 (33.6)	13 (22.8)	155 (71.4)	a0.001**
	≥50 years	199 (48.1)	93 (66.4)	44 (77.2)	62 (28.6)	
Gender	Male	158 (38.2)	58 (41.4)	19 (33.3)	81 (37.3)	a0.533
	Female	256 (61.8)	82 (58.6)	38 (66.7)	136 (62.7)	
BMI Classification	Underweight/Normal	104 (25.1)	23 (16.4)	12 (21.1)	69 (31.8)	a0.001**
	Overweight	227 (54.8)	77 (55.0)	29 (50.9)	121 (55.8)	
	Obese	83 (20.0)	40 (28.6)	16 (28.1)	27 (12.4)	
Hypertension Classification	Normal	43 (10.4)	3 (2.1)	1 (1.8)	39 (18.0)	a0.001**
	High Normal	21 (5.1)	3 (2.1)	5 (8.8)	13 (6.0)	
	Stage 1 Hypertension	193 (46.6)	52 (37.1)	15 (26.3)	126 (58.1)	
	Stage 2 Hypertension	157 (37.9)	82 (58.6)	36 (63.2)	39 (18.0)	

[a]*Pearson Chi-Square Test **p<0,01*
BMI: Body Mass Index

Table 2. Distribution of systolic blood pressure, diastolic blood pressure and heart rate measurements according to groups

	Total (n=414)	Group 1 (n=140)	Group 2 (n=57)	Group 3 (n=217)	*p*
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Systolic	135.98±20.21	147.14±19.32	146.14±20.33	126.11±15.10	*0.001***
Diastolic	81.18±12.48	87.43±10.82	84.74±12.69	76.22±11.27	*0.001***
Heart Rate	73.16±7.39	74.30±6.89	74.60±6.67	72.05±7.72	*0.005***

[b]*Oneway ANOVA **p<0,01*
SD: standard deviation

measurements of the underweight and normal weight individuals according to the groups were statistically significant (p<0.01). The DBP change of the patients in the group 3 were significantly lower than that of those in the group 1 (p<0.01). The changes in the HR measurements of the underweight and normal weight individuals according to the groups were statistically significant (p<0.05). The HR change of the patients in the group 1 was significantly higher than that of the patients in the group 2 and group 3 (p<0.05). The changes in the SBP, DBP and HR measurements of the overweight and obese individuals according to the groups were not statistically significant (p>0.05) (Table 6).

In the evaluation of the increases in the SBP, DBP and HR measurements according to the groups:

The increases in the final SBP measurements compared to the initial measurements of the patients under the age of 50 years showed statistically significant differences according to the groups; the increase in the SBP of the patients in the group 2 was higher than that of the patients in

Table 3. Evaluation of systolic blood pressure, diastolic blood pressure and heart rate measurements according to groups for patients undergoing oral surgeries

Patients Undergoing Oral Surgeries (n=271)		Group 1 (n=93)	Group 2 (n=41)	Group 3 (n=137)	p	Post Hoc
		Mean±SD	Mean±SD	Mean±SD		
Systolic	Initial measurement	139.35±14.88	140.73±17.66	125.22±14.22	b0.001**	3<1-2
	Final measurement	141.40±15.71	140.49±17.02	124.89±16.54	b0.001**	3<1-2
	dp	0.159	0.921	0.736		
	final-initial difference (Δ)	2.04±13.88	-0.24±15.73	-0.33±11.38	c0,262	
Diastolic	Initial measurement	83.98±8.86	82.44±12.41	75.18±10.77	b0.001**	3<1-2
	Final measurement	83.76±10.62	83.9±12.62	74.53±10.84	b0.001**	3<1-2
	dp	0.813	0.421	0.354		
	final-initial difference (Δ)	-0.22±8.72	1.46±11.52	-0.66±8.27	c0.479	
Heart Rate	Initial measurement	73.48±6.78	73.22±7.07	71.72±6.69	b0.124	
	Final measurement	74.27±6.24	73.90±6.96	72.56±6.89	b0.141	
	dp	0.076	0.233	0.014*		
	final-initial difference (Δ)	0.78±4.22	0.68±3.61	0.84±3.97	c0.983	

[b]*Oneway ANOVA* [c]*Kruskal Wallis Test* [d]*Paired Samples Test* *p<0,05 **p<0,01

Table 4. Evaluation of systolic blood pressure, diastolic blood pressure and heart rate measurements according to age between groups for patients undergoing oral surgeries

Age (years)		Group 1 (n=31)	Group 2 (n=9)	Group 3 (n=98)	cp
		Mean±SD	Mean±SD	Mean±SD	
Age <50 (n=138)	Systolic final-initial difference (Δ)	-0.97±16.6	6.67±20.00	-0.46±10.36	0.344
	Diastolic final-initial difference (Δ)	0.32±10.16	7.78±14.81	-0.46±8.44	0.177
	Heart Rate final-initial difference (Δ)	1.19±4.03	2.56±3.64	0.99±4.00	0.381
		Group 1 (n=62)	Group 2 (n=32)	Group 3 (n=39)	
Age ≥50 (n=133)	Systolic final-initial difference (Δ)	3.55±12.16	-2.19±14.08	0.00±13.76	0.138
	Diastolic final-initial difference (Δ)	-0.48±7.98	-0.31±9.99	-1.15±7.90	0.747
	Heart Rate final-initial difference (Δ)	0.58±4.33	0.16±3.47	0.46±3.92	0.787

[c]*Kruskal Wallis Test*

the group 3 (p<0.05). The increases in the final DBP and HR measurements compared to the initial measurements of the patients showed no statistically significant difference according to the groups (p>0.05). The increases in the SBP, DBP and HR measurements compared to the initial measurements of the patients aged 50 and above showed no statistically significant difference

Table 5. Evaluation of systolic blood pressure, diastolic blood pressure and heart rate measurements according to gender between groups for patients undergoing oral surgeries

Gender		Group 1 (n=40)	Group 2 (n=12)	Group 3 (n=56)	cp
		Mean±SD	Mean±SD	Mean±SD	
Male (n=108)	Systolic final-initial difference (Δ)	5.00±13.96	2.50±12.15	1.25±11.61	0.412
	Diastolic final-initial difference (Δ)	2.25±8.91	2.50±8.66	-0.71±7.59	0.291
	Heart Rate final-initial difference (Δ)	1.83±3.99	0.33±3.77	1.16±4.51	0.417
		Group 1 (n=53)	Group 2 (n=29)	Group 3 (n=81)	
Female (n=163)	Systolic final-initial difference (Δ)	-0.19±13.52	-1.38±17.06	-1.42±11.16	0.585
	Diastolic final-initial difference (Δ)	-2.08±8.17	1.03±12.63	-0.62±8.75	0.358
	Heart Rate final-initial difference (Δ)	0.00±4.26	0.83±3.60	0.62±3.56	0.481

'Kruskal Wallis Test

according to the groups (p>0.05). In the evaluations based on gender, the increases in the final SBP, DBP and HR measurements compared to the initial measurements of the patients showed no statistically significant difference according to the groups (p>0.05) (Table 7).

Discussion

Hypertension is a common disorder and seen in 12.32% of the individuals admitted to the dental clinic (4). The BP values of most hypertensive patients are not under control and high. The primary reason for this is that individuals do not use their medications regularly. It is important to measure BP of individuals, who have hypertension and whose BP values are not under control, or who have a high BP and are not aware of this, prior to oral surgical procedures in terms of revealing their condition (20). Every 20 mm Hg SBP or 10 mm Hg DBP increase in individuals doubles the risk of cardiovascular complications. The risk of BP increase and heart attack proportionally increases in individuals with a BP value above 115/75 mmHg. The aim of the hypertension treatment is to keep the BP values below 140/90 mmHg, and especially those with additional systemic diseases, such as cardiovascular disease, diabetes or kidney disease, should pay particular attention to this (21). If there is a difference of more than 10 mmHg between the BP values measured at home and measured at the dental clinic, it should be kept in mind that this may be white coat hypertension (22). Factors causing changes in BP during oral surgery include age, gender, individual factors such as body mass index; physiological and psychological stress, fear and anxiety, family history of hypertension, dose of catecholamines in local anesthetics (12-14,19,23,24).

In a study evaluated the effect of anxiety on cardiovascular parameters in hypertensive patients, 1.8 ml of local anesthetic containing 2% lidocaine and 1:200000 epinephrine was used. It was found that the SBP and HR values of individuals with severe anxiety were higher (12). In a study on hypertensive patients, 2 ampoules of local anesthetic containing 2% lignocaine and 1:100000 epinephrine were used for tooth extraction. The measurement performed after local anesthesia showed that the SBP did not change, whereas the DBP decreased in hypertensive patients. It was found that the mean HR increased except for patients with stage 2 hypertension (15). In the study by Gungormus and Buyukkurt, it was found that there was no difference between the SBP, DBP and HR measurements prior to local anesthesia, before and after extraction in tooth extractions of in hypertensive and normotensive individuals performed under 1 ampoule of local anesthesia containing 2% articaine and 0.012 mg/ml epinephrine (16). According to the aforementioned studies, there was no

Table 6. Evaluation of systolic blood pressure, diastolic blood pressure and heart rate measurements according to BMI classification between groups for patients undergoing oral surgeries

BMI Classification		Group 1 (n=15)	Group 2 (n=7)	Group 3 (n=48)	cp	Pots Hoc
		Mean +SD	Mean +SD	Mean +SD		
Underweight / normal (n=70)	Systolic final-initial difference (Δ)	7.33±7.99	7.14±18.90	0.00±10.92	0.056	
	Diastolic final-initial difference (Δ)	5.33±6.40	4.29±17.18	-2.29±8,05	0.005 **	3<1
	Heart Rate final-initial difference (Δ)	2.73±2.15	-0.86±5.67	0.77±4.69	0.040 *	2-3<1
		Group 1 (n=57)	Group 2 (n=24)	Group 3 (n=74)		
Overweight (n=155)	Systolic final-initial difference (Δ)	2.46±12.86	-1.67±16.33	-0.07±12.06	0.642	
	Diastolic final-initial difference (Δ)	-0.35±9.25	3.33±10.07	0.41±8.55	0.093	
	Heart Rate final-initial difference (Δ)	0.68±3.87	1.08±3.13	0.89±3.67	0.664	
		Group 1 (n=21)	Group 2 (n=10)	Group 3 (n=15)		
Obese (n=46)	Systolic final-initial difference (Δ)	-2.86±18.21	-2.00±11.35	-2.67±9.61	0.924	
	Diastolic final-initial difference (Δ)	-3.81±6.69	-5.00±8.50	-0.67±7.04	0.326	
	Heart Rate final-initial difference (Δ)	-0.33±5.71	0.80±3.01	0.80±3.00	0.914	

[c]*Kruskal Wallis Test *p<0,05 **p<0,01*

complication due to the use of local anesthetic agents containing 2 ampoules of 1:100000 epinephrine in oral surgery procedures of hypertensive patients. In this study, 2 ampoules of 1:200000 epinephrine were used. In the general evaluations of individuals with BP values below 180/110 mmHg carried out before local anesthesia and after oral surgery procedure, it was found that the changes in SBP, DBP and HR were not significant. However, in individuals under 50 years of age, the increase in SBP was higher in patients with hypertension and diabetes than those with only diabetes. No complication developed during and after the procedures.

Sistolic blood pressure has been shown to increase during oral surgery procedures in the studies by Matsumura et al., Silvestre et al., Abraham-Inpijn et al. and Tsuchihashi et al (19,24-26). Whereas, SBP and DBP along with HR have not been shown to change in the studies by Makani and Nilesh, Gungormus and Buyukkurt, and Meiller et al (16,23,27). BP and HR values have been shown to decrease in the studies by Lambrecht et al. and Gedik et al (22,28). In this study, the initial BP measurements before the administration of local anesthesia and the final BP measurements after surgery were lower in the individuals with only diabetes than those with only hypertension.

Table 7. Evaluation of amount of increase in systolic blood pressure, diastolic blood pressure and heart rate measurements according to age, gender and BMI between groups for patients undergoing oral surgeries

Amount of Increase		Group 1		Group 2		Group 3		p
		n	Mean±SD	n	Mean±SD	n	Mean±SD	
Total	Systolic (n=103)	40	14.25±6.36	16	14.37±8.92	47	12.45±4.28	c0.497
	Diastolic (n=72)	25	11.20±3.32	15	12.67±7.99	32	10.47±2.65	c0.469
	Heart Rate (n=133)	45	4.18±2.47	20	3.65±1.98	68	3.71±2.60	c0.320
Age (years) Evaluations								
Age <50	Systolic (n=49)	11	14.55±6.88	5	20.0±12.25	33	11.36±3.37	c0.034*
	Diastolic (n=42)	10	13.0±4.83	6	15.0±12.25	26	10.19±2.23	c0.083
	Heart Rate (n=75)	17	4.35±2.12	7	4.14±2.04	51	3.63±2.56	c0.167
Age ≥50	Systolic (n=54)	29	14.14±6.28	11	11.82±6.03	14	15.00±5.19	c0.180
	Diastolic (n=30)	15	10.00±0	9	11.11±3.33	6	11.67±4.08	c0.326
	Heart Rate (n=58)	28	4.07±2.69	13	3.38±1.98	17	3.94±2.79	c0.800
Gender Evaluations								
Male	Systolic (n=48)	21	16.19±7.4	7	11.43±3.78	20	14.0±5.03	c0.236
	• Diastolic (n=30)	15	12.00±4.14	4	12.50±5.00	11	10.0±0	d0.122
	Heart Rate (n=60)	25	4.28±2.19	6	3.17±1.33	29	4.17±3.19	c0.476
Female	Systolic (n=55)	19	12.11±4.19	9	16.67±11.18	27	11.30±3.28	c0.342
	Diastolic (n=42)	10	10.00±0	11	12.73±9.05	21	10.71±3.27	c0.774
	Heart Rate (n=73)	20	4.05±2.84	14	3.86±2.21	39	3.36±2.05	c0.547

*[c]Kruskal Wallis Test [d]Mann Whitney U Test *p<0.05*

• As the number of group 2 individuals was insufficient, statistical evaluations were made between Group 1 and Group 3

In the studies evaluated the effect of age and gender, Matsumura et al. and Gedik et al. found that BP values increased as the age increased and there was no difference in terms of gender, Gedik et al. found that HR decreased in women, while Tsuchihashi et al. found that there was no difference in BP according to age and gender (19,26,28). In this study, the incidence of hypertension was higher in individuals aged 50 years and older. Whereas, the changes in SBP, DBP and HR measurements before and after the procedure did not differ according to gender.

There was no study evaluating the effects of body mass index on SBP, DBP and HR in oral surgery procedures. In a study evaluated the body mass index of the individuals admitted to the oral and maxillofacial surgery center, the mean body mass index was found as 28.5. It was reported that 67% of females and 55% of males were overweight or obese. It was found that there was no difference in SBP, DBP, HR and body temperature values of individuals with different body mass index values. It was found that the incidence of overweight or obesity was higher in females aged 21-40 years and in individuals aged 41-60 years (29). In this study, it was found that the mean body mass index was 27.2, and that of the individuals, 25.1% were underweight or normal weight, 54.8% were overweight and 20.0% were obese. The incidence of obesity was higher in hypertensive individuals. From underweight and normal weight individuals, the DBP changes of only hypertensive patients

were higher than that of those with only diabetes. Again, from underweight and normal weight individuals, the HR changes of only hypertensive individuals were significantly higher than that of those in the other groups.

In order to conclude, within the limitations of this study, it was found that medically compromised patients with blood pressure below 180/110 mmHg tolerate oral surgeries performed under 4 ml local anesthesia containing 40 mg/ml articaine and 0,005 mg/ml epinephrine. This was first study that evaluated the change in blood pressure and heart rate during surgery in diabetic patients. The increase in SBP of individuals under 50 years of age with hypertension and diabetes is higher. The incidence of hypertension is higher in individuals aged 50 years and older. The incidence of obesity is higher in hypertensive individuals. In this study, the correlation of individual factors with hypertension and/or diabetes and the effects of these factors on SBP, DBP and HR were demonstrated. These effects should be evaluated in more detail in future studies.

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