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The effect of local anesthesia and tooth extraction on blood pressure and heart rate

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Abstract:

The aim*: show the effect of adrenaline in local dental anesthesia on the heart rate and blood pressure.*

Method: *The number of the patients twenty seven (13male &14 female) and the age ranged from(25-36) years old. Three readings were taken for both systolic and diastolic blood pressure were measured (in mmHg), and heart rate. At three different times: waiting room before giving the anesthesia, after the patient was taken anesthesia, after the extraction of tooth.*

Result: *there is no significant differences between pre-anesthetic , post -anesthetic and post- extraction for systolic pressure, the mean of systolic pressure increased after giving anesthesia about(122.11), but after extraction it will decrease to about (121.11), there is no significant differences between the pre-anesthetic, post – anesthetic, pre-anesthetic post- extraction for systolic pressure. There is increase in the heart rate mean (85.44) after giving anesthesia, but after extraction it will decline (80.56), and there is significant differences between pre-anesthetic and post- extraction heart rate.* ***Conclusion:*** *The study refer for the safety of adrenaline by measurement of blood pressure and heart rate for control patients but the anxiety and stress of the patients made different in measurement of blood pressure and heart rate also the adrenaline may increase the blood pressure and heart rate if increase dose.*

Key word: *local, anesthesia, tooth, extraction, blood, pressure , heart, rate.*

I. INTRODUCTION:

The silent killer was the other name of hypertension [(1-3)]. Blood pressure is understood as that within arteries with communication to the walls. Blood pressure can be measured by multiplying the whole peripheral resistance by the cardiac output and it could vary from a extreme value during systoles and a least value during diastoles [(4)]. Alterations can occur in this measurement because of many factors such as physiological, systemic, behavior variations, , and the stimuli that occur due to oral surgery, possibly [(5)].

There is a close relationship between blood pressure changes and the present oral surgeries, subsequently the patients actually link the dental treatment with pain [(6)], causing fear [(7)] and anxiety that is the negative reaction of the body [(8)] and/or stress [(9-11)] stimuli several times unnoticeable to the dentist. Accordingly, the alteration in physiologic equilibrium blood pressure change is occurred due to the stress of dental procedure [(12)]. The important role was played by the dentists who should pay attention to every symptom for diagnosing the disease [(13)]. Also it was found that there is a relationship between oral surgery and bacterial endocarditis, that could result in heart alterations [(14)]. As well, the condition of blood pressure within normal range during the daily situations while a change was noted in the clinical practice, where the patient is in stress and anxiety during waiting to be seen by either the dentist or the doctor [(13)].

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On the other hand, the use of anesthetic solutions with vasoconstrictor in the clinics of dentistry mostly during oral surgery have an additional important relationship because its mostly used in dental practice [15],these vasoconstrictor drugs such as phenylephrine, epinephrine, felypressin, and noradrenaline, which associated with anesthetic salts and acting directly on the blood vessels system of the anesthetized area, causing constriction of the vessel as chief effect, on the other hand it have adverse effect on the heart rate and/or blood pressure [16], as well as the pain and stress during the application of anesthesia [17]. Alterations can occur inside the circulatory system due to these drugs [18,19]. The heart rate and systolic pressure will raised by the adrenaline, triggering an excitatory movements in the myocardium, tachycardia and palpitations, however, these symptoms are not severe and temporary [19]. Instead of that, noradrenaline & phenylephrine could meaningfully increase diastolic & systolic pressure , and throughout the dental treatment, the response of blood pressure appears to be affected via several factors, such as physical & psychological stress, as well as aching stimuli, and catecholamines action included in local anesthetics, and this increase of blood pressure could be larger in patients with hypertension than in healthy patients [20], and during dental treatment a fatal subarachnoid hemorrhage case was recorded [21]. Then during extraction of tooth, problems are probably to occur, and half of these problems include local anesthetics using [22],

Angina spasms with ischemia of myocardium can be happened to patients with heart circulation deficiency due to felypressin drug in local anesthesia which does not directly affecting the myocardium, nevertheless it is a strong heart vasoconstrictor [23]. Special attention should be paid by the dentist for patients with hypertension, geriatric and heart disease patients [24].

Aim of the study:

Show the effect of adrenaline in local dental anesthesia on the heart rate and blood pressure.

II. METHODS:

This study was conducted at the Faculty of Dentistry at the Babylon University in the department of surgery. The number of the patients participating in the study those came to extract their teeth was twenty seven (13male &14 female) and the age ranged from(25-36) years old.

All patients participating in the study should be healthy without diabetes mellitus ,hypertension ,heart disease or any disease and nonsmokers. Consent Form was taken from all patients who agree to participate in the study.

Three readings were taken for both systolic and diastolic blood pressure were measured (in mmHg), and heart rate, the measurements were carried out with the aid of a digital tensiometer (clinically validated measurement accuracy 2004, German Hypertension Society). At three different times: waiting room before giving the anesthesia, (10-15min.) after the patient was taken anesthesia (1.8 ml of 2% mepivacaine with epinephrine 1:100.000) , after the extraction of tooth (about 15-20 min.) from the second measurement.

After the analysis of the data, the following statistical tests were applied: Analysis of Variance for Repeated Measures Tukey-Kramer Multiple Comparisons, with level of significance of 5%.

III. RESULT:

This study measured by ANOVA , table(1) refer to mean and standard deviation for systolic blood pressure for pre-anesthetic, post- anesthetic and post- extraction , there is no significant differences between pre-anesthetic , post - anesthetic and post- extraction for systolic pressure.

Table (2), figure (4) refer to mean and standard deviation for diastolic for pre-anesthetic, post- anesthetic and post-extraction, there is significant differences between pre-anesthetic and post- anesthetic , and post-anesthetic and post-extraction.

Table (3), figure (5,6,7) we see that the mean of systolic pressure increased after giving anesthesia about(122.11), but after extraction it will decrease to about (121.11).

Table (4) show that there is no significant differences between the pre-anesthetic, post –anesthetic, pre-anesthetic post- extraction for systolic pressure.

Table (5), figure (9,10,11) refer to mean and standard deviation for heart rate for pre-anesthetic, post- anesthetic and post- extraction ,we notice that there is increase in the heart rate mean (85.44)after giving anesthesia ,but after extraction it will decline (80.56), and in table (6), figure (12) there is significant differences between pre-anesthetic and post-extraction heart rate.

Table (1): Test of normality by Shapiro-Wilk for the diastolic pressure:

Variable	Mean	Std.Devation	Level of significant
Pre-anesthetic	77.81	8.517	p>o.o5
Post- anesthetic	72.04	7.041	p>o.o5
Post- extraction	76.7	4.746	p<0.05

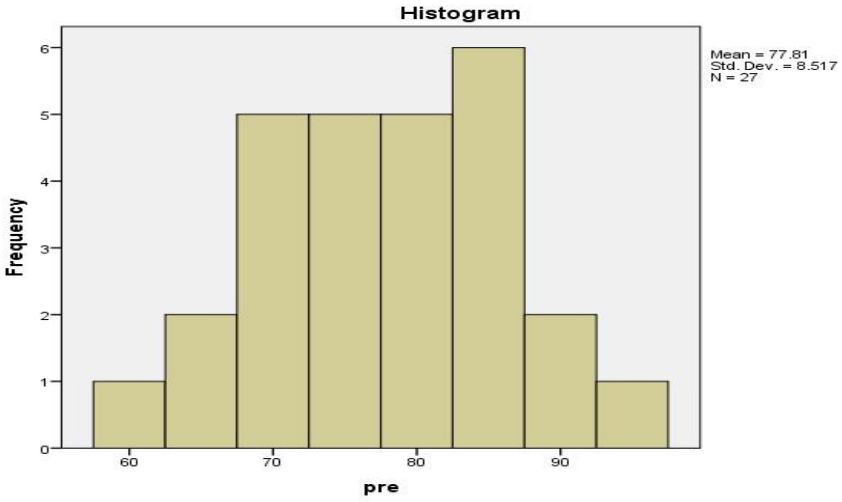


Figure: (1) the diastolic pressure (pre-anesthesia).

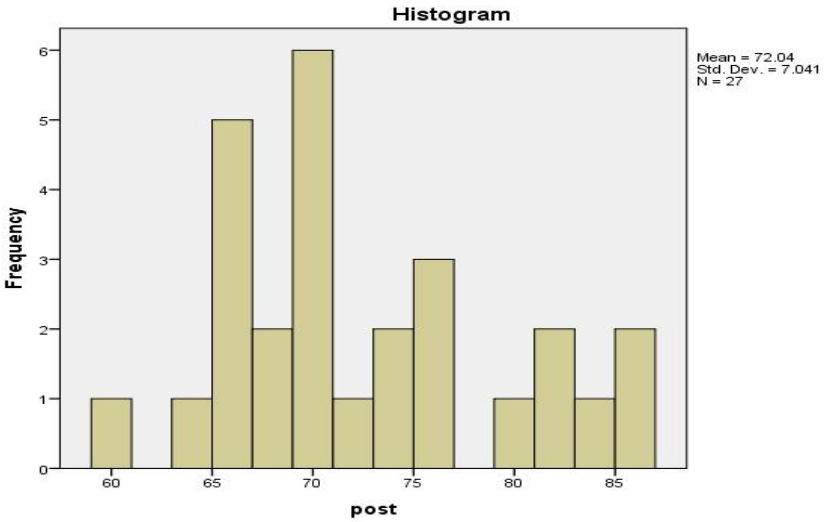


Figure: (2) Histogram for diastolic post-anesthesia

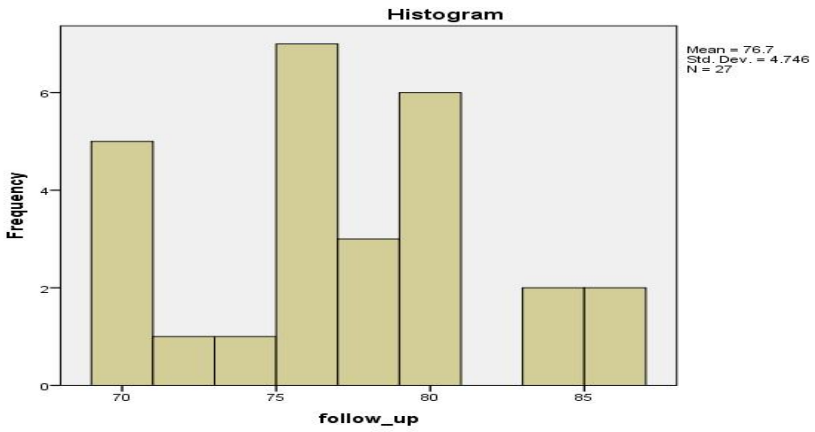


Figure: (3) Histogram for diastolic post-extraction .

Table (2): Correlation between pre-anesthetic , post –anesthetic Pre-anesthetic Post- extraction for diastolic :

Variable	Level of significant
Pre-anesthetic and Post- anesthetic	p<o.o5
Pre-anesthetic and Post- extraction	p>o.o5
Post- anesthetic and Post- extraction	p<o.o5

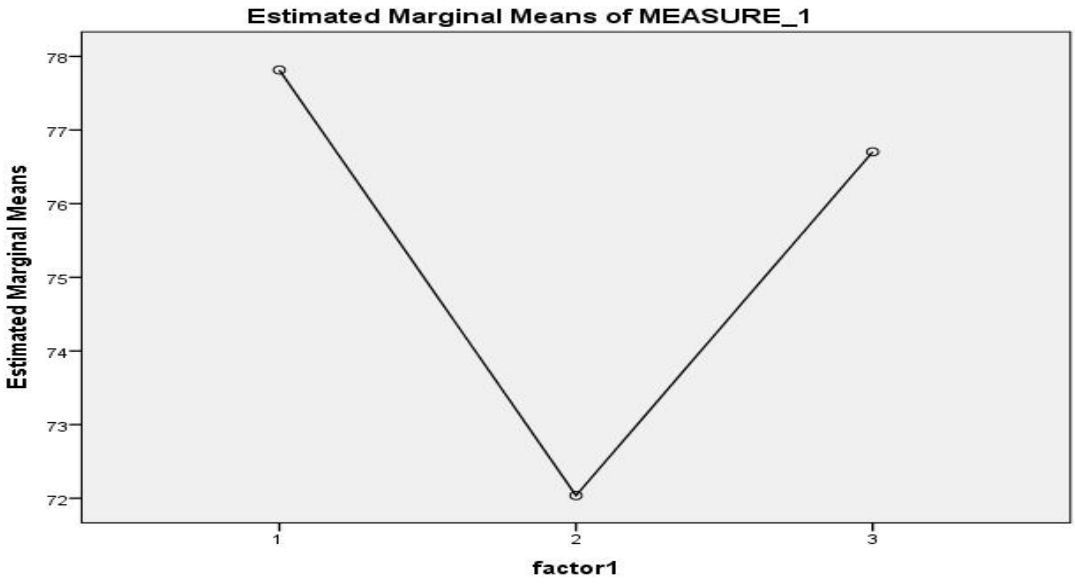
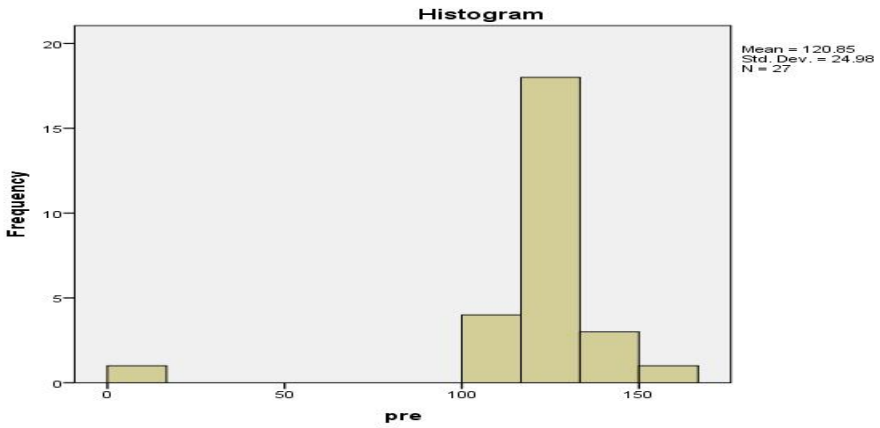


Figure (4):1.Pre-anesthetic , 2.Post- anesthetic, 3.Post- extraction for diastolic

Table (3):Test of normality by Shapiro-Wilk for the systolic pressure:

Variable	Mean	Std.Devation	Level of significant
Pre-anesthetic	120.85	24.98	p<o.o5
Post- anesthetic	122.11	10.956	p>o.o5
Post- extraction	121.11	6.818	p>0.05



Figure(5): Histogram for systolic pressure pre-anesthesia.

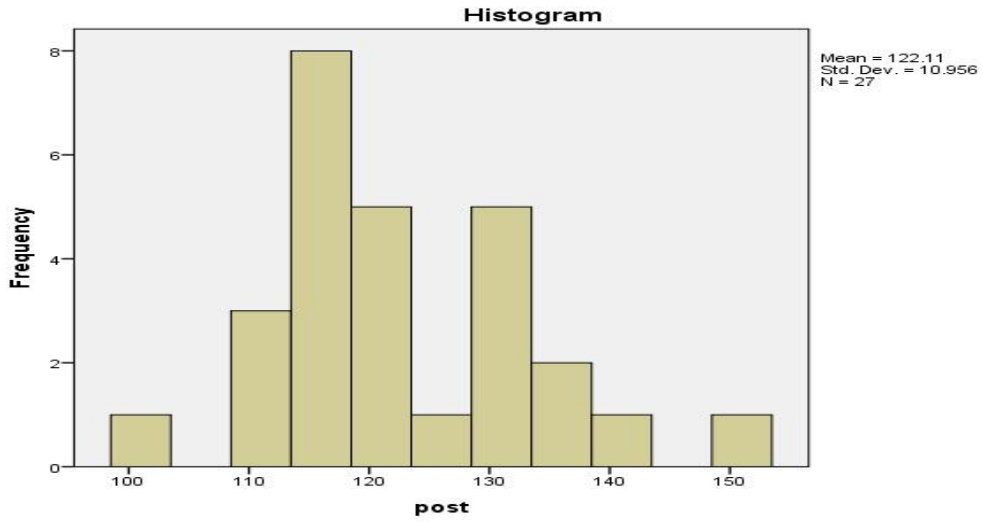


Figure (6): Histogram for systolic pressure post-anesthesia.

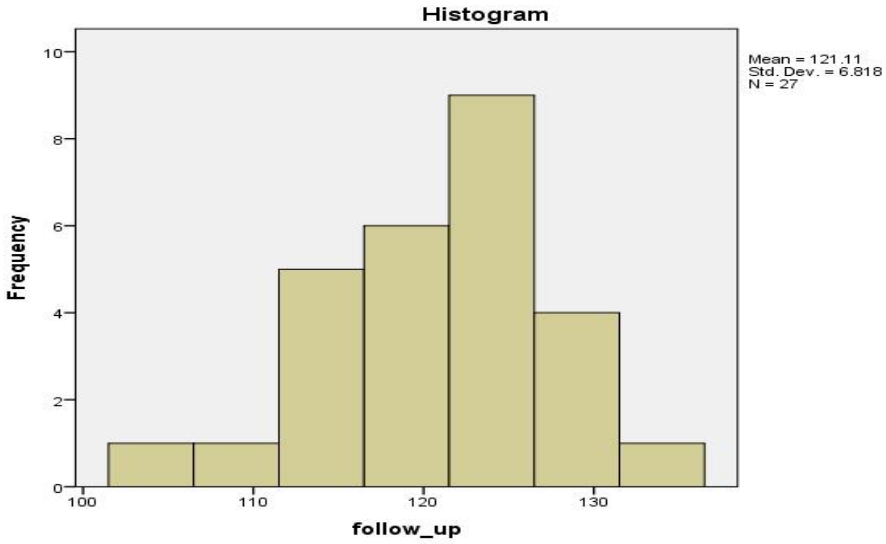


Figure (7): Histogram for systolic pressure post-extraction.

Table (4):Correlation between pre-anesthetic , post –anesthetic, Pre-anesthetic Post- extraction for systolic pressure:

Variable	Level of significant
Pre-anesthetic and Post- anesthetic	p>o.o5
Pre-anesthetic and Post- extraction	p>o.o5
Post- anesthetic and Post- extraction	p>o.o5

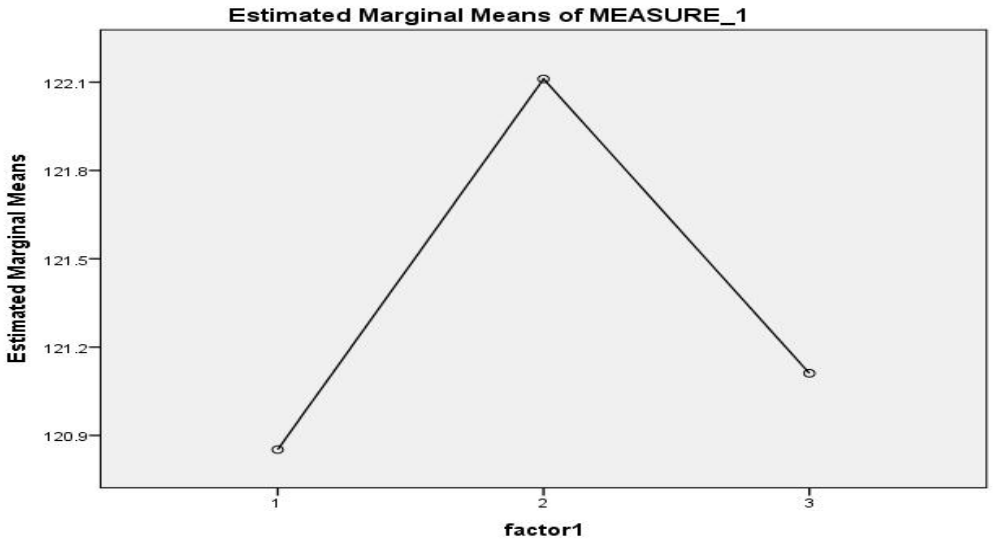


Figure (8):1.Pre-anesthetic , 2.Post- anesthetic, 3.Post- extraction for systolic pressure.

Table(5): Test of normality by Shapiro-Wilk for heart rate:

Variable	Mean	Std.Devation	Level of significant
Pre-anesthetic	84.96	12.424	p>o.o5
Post- anesthetic	85.44	11.325	p>o.o5
Post- extraction	80.56	4.746	p<0.05

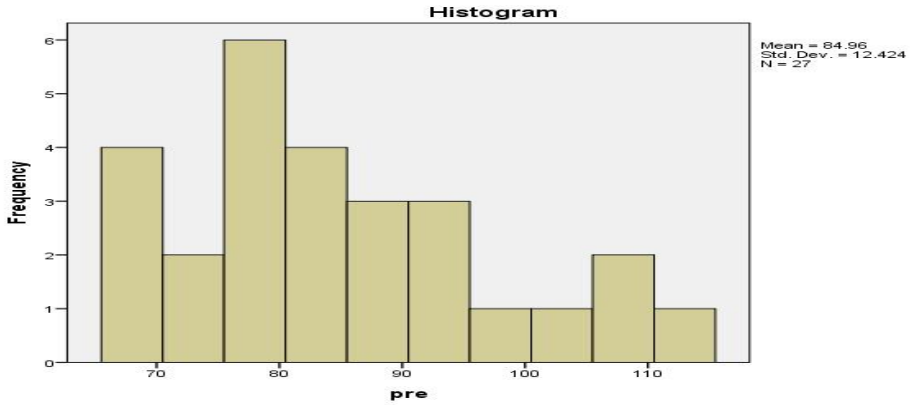


Figure (9): Histogram for heart rate pre-anesthetic.

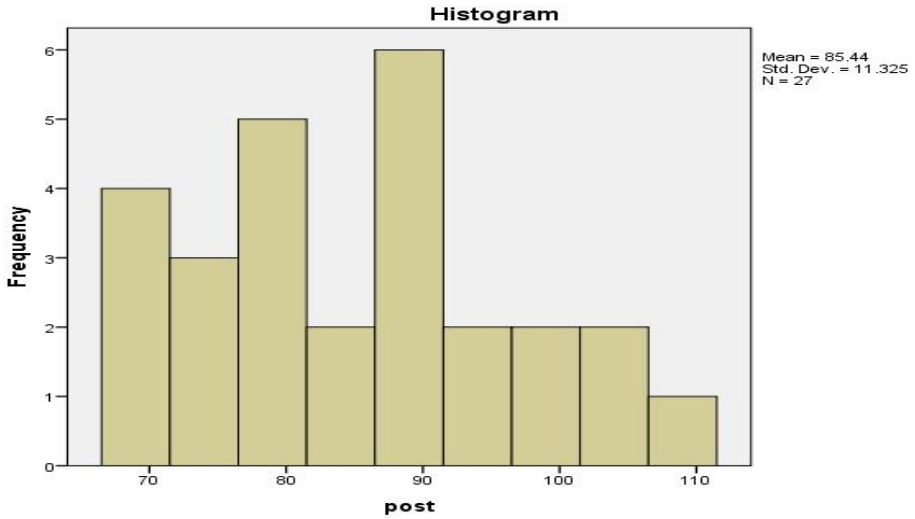
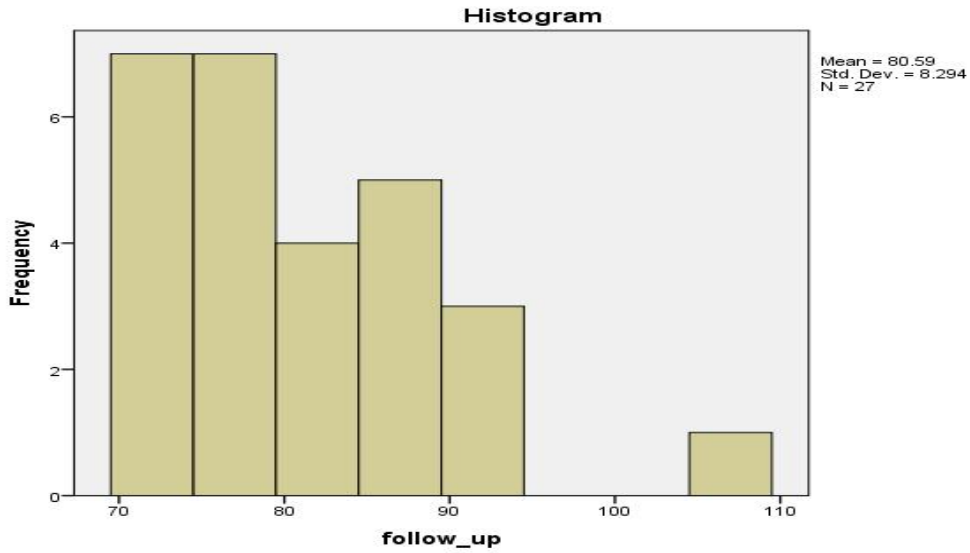


Figure (10): Histogram for heart rate post-extraction



Figure(11): Histogram for heart rate post-extraction.

Table (6):Correlation between pre-anesthetic , post -anesthetic Pre-anesthetic Post- extraction for heart rate:

Variable	Level of significant
Pre-anesthetic and Post- anesthetic	p>o.o5
Pre-anesthetic and Post- extraction	p<o.o5
Post- anesthetic and Post- extraction	p<o.o5

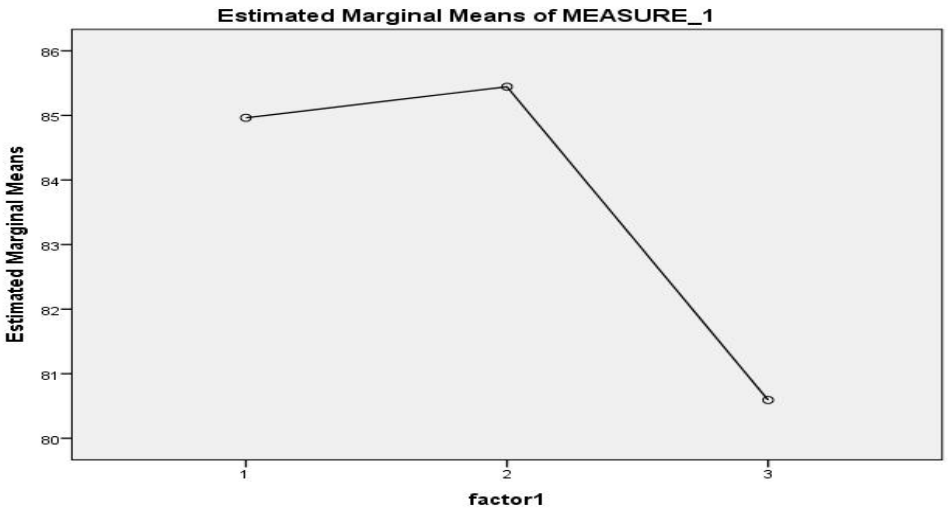


Figure (12):1.Pre-anesthetic , Post- anesthetic, 3.Post- extraction for heart rate.

IV. DISCUSSION:

In dental practice the local anesthetic solution is used for extraction by combination of the lignocaine-adrenaline [25,26], adrenaline act for counteraction which known localized vasodilator effects of lignocaine in subcutaneous and sub mucosal vessels that causing vasoconstriction, by action as chemical tourniquet and also act for decreasing the rate of systemic absorption in the area of injection and diminished the risk of toxicity of anesthetic, adrenaline is achieving the excellent local anesthesia that provide safe and effective control of intra-operative pain in dental clinic [26].

In this study there is no significant differences between pre-anesthetic , post -anesthetic and post- extraction for systolic pressure that mean adrenaline(from anesthesia or adrenaline from the body) have no effect on systolic blood pressure. There is significant differences between pre-anesthetic and post- anesthetic but the onset of action of adrenaline start within (5-10min)[27] that mean adrenaline of anesthesia have no effect on diastolic blood pressure, it may be adrenaline from the body sympathetic stimulation that caused by anxious and stressed which act for release adrenaline that effect on diastolic blood pressure.

There is no significant differences between pre-anesthetic and post- extraction although the adrenaline acted on blood vessel, the stress decrease within finished of extraction and diastolic blood pressure return to normal state and decrease sympathetic stimulation. This study agree with Salles et al. [28], he study the influence of vasoconstrictor drugs on blood pressure, during his study found that the using of 2% of lidocaine with no adrenaline, 3% of prilocaine with felypressin and another 2% of mepivacaine with epinephrine, have not effect on the blood pressure. On the other hand, its disagree with Abraham-Inpijn et al. [20]that show that increased in systolic blood pressure at the time of tooth extraction between 10 to 70 mmHg in normotensive and hypertensive patients, the result of Dantas et al. study [29] which found the effected of mepivacaine with epinephrine on blood pressure the diastolic only increased 1.5mmHg than normal value, and also the result of Paiva LCA[23] that thought that phenylephrine and noradrenaline act for increased systolic and diastolic pressure.

In our study, the mean of heart rate post- anesthetic increased, this may be due to the anxiety and stress of the patient will cause release of adrenaline from the body that lead to increase mean of heart rate, there is significant differences between pre-anesthetic and post- extraction , post –anesthetic and post- extraction, after finished of extraction of tooth , this may be explained that the patients will relax, anxiety and stress diminished that lead to decrease the release of adrenaline adrenaline from the body (sympathetic) which will decrease the heart rate although the present of adrenaline within anesthesia , it still act ,this result agree with [30-32] which thought adrenaline caused slight effect on the heart rate with initial rate elevated, the study of Valenti VE et al[33] , Vanderlei FC et al[34], Abreu LC[35], Vitor ALR [36] and that done for the healthy control patients which found the heart rate through pre- anesthesia, post- anesthesia and post-

extraction increased than normal due to anxiety and stress effect lead to release sympathetic adrenaline which act to elevate heart rate, the study of Ferraz et al. [5] during dental treatment the body may exposed to psychosomatic changes that caused to increase the blood pressure and heart rate, that promote to induce hypertensive crisis, effect of action of vital organs, the study of Matsumura et al. [37] through the study found the changes in blood pressure, and heart rate during dental surgery, and with Jönsson et al.[38], Hirokawa et al.[39], that found that the mental stress can cause abnormal activity to the sympathetic nervous system which cascade hormonal that interfere with blood pressure.

V. CONCLUSION:

The study refer for the safety of adrenaline by measurement of blood pressure and heart rate for control patients but the anxiety and stress of the patients made different in measurement of blood pressure and heart rate also the adrenaline may increase the blood pressure and heart rate if increase dose.

Financial disclosure

There is no financial disclosure.

Conflict of interest

None to declare.

Ethical Clearance

All experimental protocols were approved under the College of Dentistry and all experiments were carried out in accordance with approved guidelines.

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