ORIGINAL ARTICLE

BLOOD PRESSURE CHANGES IN HYPERTENSIVE PATIENTS: PRE- AND POST-OPERATIVE ASSESSMENT WITH LOCAL ANAESTHESIA DURING DENTAL PROCEDURES

Kawish Ishtiaq, Hina Nasim, Misbah Razzaq*, Misbah Naseem, Bushra Afridi, Emaan Mansoor***, Ezza Mansoor***, Efrah Mansoor***, Afsheen Mansoor†**

Department of Oral Biology, *Oral and Maxillofacial Surgery, **Operative Dentistry and Endodontics, School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, ***Islamic International Dental College, Riphah International University, †Department of Dental Materials, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan

Background: Patients with hypertension undergoing dental treatments necessitate meticulous monitoring due to the possible cardiovascular implications of local anaesthetics including vasoconstrictors. The objective of this study was to evaluate and quantify changes in systolic and diastolic blood pressure within five minutes before and after administering a vasoconstrictor-containing local anaesthetic in hypertensive patients with stage 1 hypertension using standardized monitoring techniques. **Methods:** This quasi-experimental study examined the effects of local anaesthetic (2% lignocaine with 1:100,000 epinephrine) on blood pressure in hypertensive individuals receiving dental treatment. The study was conducted from Mar to Sep 2024 at School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, involved hypertensive patients (stage 1 hypertension, aged 30–60 years). Severe hypertension, co-morbidities, and being above the age of 60 were exclusion factors. A mercury sphygmomanometer was used to assess blood pressure five minutes before and after the administration of local anaesthetic. Data was analysed on SPSS-25, using paired *t*-tests to compare pre- and post-anaesthetic blood pressure readings. **Results:** The study analysed 62 individuals (mean age 49.83±7.12 years), with 36 (58%) men and 26 (42%) women. The mean pre-anaesthesia systolic blood pressure (SBP) was 135.57±3.98 mmHg, which decreased to 134.50±3.98 mmHg after anaesthesia, (p=0.000). Mean diastolic blood pressure (DBP) decreased from 85.85±4.15 to 84.57±4.03 mmHg (p=0.000). **Conclusion:** Study shows a clinically small but statistically significant drop in blood pressure in hypertensive individuals undergoing local anaesthesia during dental procedures.

Keywords: Hypertension, Local anaesthesia, Root canal therapy, Tooth extraction

Pak J Physiol 2025;21(3):54–7, **DOI:** https://doi.org/10.69656/pjp.v21i3.1855

INTRODUCTION

Hypertension is defined as chronic high blood pressure caused by a complex interaction of hereditary and environmental variables. It is the main cause of cardiovascular disease and early deaths worldwide, highlighting its huge impact on global health.[1] According to the latest guidelines from the American Heart Association (AHA) and the American College of Cardiology (ACC), blood pressure is considered high if it routinely exceeds 130/80 mmHg, emphasizing the importance of close monitoring and management to avoid problems.[2] Hypertension affects almost 1.28 billion individuals worldwide, with a large proportion living in low and middle-income nations. These areas frequently confront obstacles such as restricted access to healthcare, low awareness, and ineffective hypertension management measures, aggravating the problem's prevalence and impact. Hypertension's broad prevalence raises the risk of heart attacks, strokes, renal disease, and other significant health issues, making it an important target of public health activities.[3]

Hypertension has developed as a major public health concern in Pakistan, owing to lifestyle changes, fast urbanization, and other variables such as eating choices, obesity, and stress. The prevalence of hypertension in the country has been alarmingly high. Data from comprehensive national research done between 2016 and 2017 revealed that the overall prevalence of hypertension has risen to 46.2%. This growth presents a substantial challenge for healthcare systems in terms of preventive strategies and treatment alternatives.[4] Regional variations in Pakistan highlight the problem's pervasive nature. For example, a survey done in central Punjab found that the prevalence of hypertension was 35.1%, revealing significant disparities between provinces and groups.[5] These regional disparities highlight the impact of factors such as socioeconomic position, healthcare infrastructure, and lifestyle choices. The rising prevalence of hypertension in Pakistan highlights the critical need for targeted health policies, public awareness initiatives, and increased access to medical care to reduce the burden of this condition and avoid long-term health implications.

Hypertensive patients are frequently seen at dental clinics and hospitals, where they pose special issues owing to the interaction of their condition with various dental procedures. Hypertension can complicate dental operations by raising the risk of excessive bleeding and cardiovascular problems, particularly during invasive treatments or surgical interventions.[6] Dental procedure may become even more complicated when local anaesthesia (LA) is used on hypertensive individuals. To extend the duration of anaesthesia and lessen intra-operative bleeding, anaesthetics that contain vasoconstrictors, like epinephrine, are frequently used. But these vasoconstrictors can also raise blood pressure and heart rate, which can cause negative side-effects in people with poorly managed hypertension. Arrhythmias, hypertensive crises, and even cardiovascular events like myocardial infarction or stroke can be complications.[7] To reduce these risks, dental practitioners should alter the dose and use anaesthetics without vasoconstrictors whenever possible. Dental professionals must take patient's blood pressure before beginning any procedure to identify high-risk instances. If substantial problems arise, the patients should consult their primary care physician or cardiologist to build a complete treatment plan that is tailored to their specific medical needs.[8]

The purpose of this study was to look at the effect of local anaesthesia on blood pressure levels in hypertensive people during dental procedures. The primary objective was to examine blood pressure fluctuations before and after administering a vasoconstrictor-containing local anaesthetic to hypertensive patients. By identifying important changes and potential dangers, the study aims to improve safety measures, optimize management strategies, and prepare dental practitioners to provide care that promotes patient well-being while lowering hypertension risks.

METHODOLOGY

This study was carried out at the Oral and Maxillofacial Surgery (OMFS) and Operative Departments of the School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad. The study period spanned from Mar to Sep 2024. The Raosoft sample size calculator was used to calculate the sample size, with a type I error of 5% and a 95% confidence interval. The study population comprised hypertensive patients visiting the Out-Patient Department of School of Dentistry, who were referred to the OMFS and Operative Dentistry Departments for further treatment.

Informed consent of the participants was taken, in addition to the ethical approval from School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad. A convenience sampling method was used to select participants. Patients with stage-1 hypertension [Systolic BP (SBP) ≤140 and Diastolic BP (DBP) ≤90 mmHg], and aged 30–60 years were eligible. Exclusion criteria included patients with severe hypertension and co-morbidities such as heart illnesses, diabetes, cancer, and age above 60 years.

After written informed consent, a mercury sphygmomanometer was used for measuring blood pressure. A special performa was used for recording BP and demographic information. Blood pressure was measured 5 minutes before and after administering local anaesthesia (2% lidocaine with 1:100,000 epinephrine).

The statistical analysis was performed on SPSS-25. Descriptive statistics such as mean age and gender distribution were analysed. Paired sample *t*-test was used to compare pre- and post-administration blood pressure, with a statistical significance set at $p<0.05$.

RESULTS

The study included a total of 62 participants, with a mean age 49.83±7.12 years. There were 36 (58%) males and 26 (42%) females in the sample.

The mean SBP recorded five minutes before LA was 135.57±3.98 mmHg. Five minutes after administering LA, the SBP dropped marginally to 134.50±3.98 mmHg. Paired *t*-test analysis found a statistically significant difference in pre- and post-treatment SBP levels among stage-1 hypertensive patients (p=0.000).

The mean DBP five minutes before administering LA was 85.85±4.15 mmHg. Five minutes after delivery, the DBP decreased to 84.57±4.03 mmHg. Paired *t*-test analysis revealed that the change was statistically significant (p=0.000). (Table-1).

Table-1: Comparison of pre- and post-anaesthesia BP

Variables	Mean	SD	*p*
Systolic BP 5 min before LA	135.57	3.98	0.000
Systolic BP 5 min after LA	134.50	3.75	
Diastolic BP 5 min before LA	85.85	4.15	0.000
Diastolic BP 5 min after LA	84.57	4.03	

DISCUSSION

The aim of this study was to compare the changes in blood pressure in hypertensive individuals undergoing dental operations before and after local anaesthesia. Systolic and diastolic blood pressures were monitored before and after 5 minutes of administering 2% lignocaine with 1:100,000 epinephrine to hypertensive patients with stage-1 (SBP <140 and DBP ≤90). Several studies have assessed the effect of local anaesthesia or various local anaesthetic drugs, with or without vasoconstrictor, on hypertensive individuals.[9–12] This may be due to the action of adrenaline in the LA medication. Adrenaline in lower dose acts on more sensitive β_2 adrenergic receptors and causes vasodilatation in the skeletal muscles and some vital organs as a part of 'fight and flight' response. In high doses it stimulates α_1 adrenergic receptors causing widespread vasoconstriction combating shock status. This action overrides the action of low dose adrenaline as β_2 adrenergic receptors. In this study, the DBP and SBP did not increase following administration of LA with vasoconstrictor, but rather reduced, proving that

2% lignocaine does not produce a rise in BP in hypertensive patients.

A study conducted in India[13] reported results comparable to the current study on the effects of lignocaine and adrenaline on hypertensive patients undergoing tooth extraction. It discovered temporary elevations in systolic and diastolic blood pressure upon injection which corrected within 60 minutes. The alterations were not clinically significant, demonstrating that this LA formulation is safe for controlled hypertension individuals.[13] A research conducted in Iran[14] reported that providing 2% lignocaine with epinephrine had no significant effect on systolic or diastolic blood pressure in hypertensive patients having dental extractions.

Badar *et al* conducted a comprehensive evaluation of the cardiovascular effects of epinephrine in dental anaesthetics on hypertension individuals. According to them, using epinephrine-containing local anaesthetics resulted in minor changes in systolic and diastolic blood pressure that were not clinically significant.[15] Ilyas *et al* examined the impact of 2% lidocaine and 1:100,000 epinephrine on blood pressure levels in hypertensive individuals having their teeth extracted in Pakistan. They found that in pre-hypertensive, stage I and stage II hypertensive individuals, using three cartridges of this LA had no discernible effect on systolic or diastolic blood pressure.[9]

Several variables contribute to the stability of blood pressure shown in this study and similar investigations. First, the concentration of epinephrine (1:100,000) is low enough to cause regional vasoconstriction while without considerably raising systemic catecholamine levels. This localized impact diminishes systemic absorption and lowers the chance of blood pressure rises. Second, dental guidelines encourage regulated LA dosing and thorough monitoring of hypertensive patients to guarantee patient safety. These guidelines, which include preoperative assessments and stress reduction measures, are crucial in reducing any detrimental consequences.

While the majority of studies report outcomes that are similar to the current study, several studies have found temporary blood pressure rises after administering LA with epinephrine. A study[16] has shown that injecting local anaesthetic can be uncomfortable and may cause cardiovascular alterations such as hypertension or tachycardia. This emphasizes the need of proper local anaesthetic treatment, particularly in patients with cardiovascular disease, in minimizing deleterious consequences.[16] While epinephrine in local anaesthetics helps with haemostasis and prolongs the anaesthetic effect, another research found that it can also raise blood pressure. To avoid potential consequences from elevated blood pressure during dental treatments, individuals with hypertension were advised to use plain lidocaine without epinephrine.[17] These findings emphasize the haemodynamic stability associated with the administration of this LA in a controlled situation.

CONCLUSION

Delivering a vasoconstrictor-containing local anaesthetic to hypertensive dental patients resulted in a statistically significant but subjectively minor drop in blood pressure. Such anaesthetic procedures are safe when carefully controlled. Future interventional research with larger sample sizes and longer observation periods are needed to validate and build on these findings.

LIMITATIONS

This study employed a brief observation time (five minutes before and after anaesthesia), which may not have captured the entire range of BP fluctuations throughout the dental operation. More studies should look into extended monitoring periods and the effects of diverse anaesthetic formulations, particularly those with varied doses of vasoconstrictors. Investigating a bigger and more varied patient sample might improve the generalizability of the results.

REFERENCES

1. Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. Nat Rev Nephrol 2020;16(4):223–37.
2. Whelton PK, Carey RM, Aronow WS, Casey DE Jr, Collins KJ, Dennison Himmelfarb C, *et al.* 2017 ACC/AHA/AAPA/ABC/ ACPM/AGS/APHA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a Report of the American College of Cardiology/American heart Association. Task force on clinical practice guidelines. J Am Coll Cardiol 2018;71(9):e127–248.
3. Organization WH. Hypertension. 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension.
4. Basit A, Tanveer S, Fawwad A, Naeem N, Members N. Prevalence and contributing risk factors for hypertension in urban and rural areas of Pakistan; a study from second National Diabetes Survey of Pakistan (NDSP) 2016–2017. Clin Exp Hypertens 2020;42(3):218–24.
5. Shafi ST, Shafi T. A survey of hypertension prevalence, awareness, treatment, and control in health screening camps of rural central Punjab, Pakistan. J Epidemiol Glob Health 2017;7(2):135–40.
6. Gupta K, Kumar S, Anand Kukkamalla MA, Taneja V, Syed GA, Pullishery F, *et al.* Dental management considerations for patients with cardiovascular disease —a narrative review. Rev Cardiovasc Med 2022;23(8):261.
7. Siddiqui HK, Hussain A, Khan FNA, Shafi AM, Heyat U. Systemic effects of local anaesthesia in hypertensive patients. Pak Oral Dent J 2017;37(4):538–42.
8. Calistro LC, Tinoco EJF, Alcolumbre SB, Paraguassu EC, Voss D. Dental care in hypertense patients: systematic review. Braz J Implantol Health Sci 2019;1(6):152–68.
9. Ilyas M, Khan ZA, Khan I, Zamir A, Ijaz K, Kundi JA. The effect of local anesthesia (lidocaine 2%) with epinephrine (1:100,000) on blood pressure level of hypertensive patients reported to a tertiary care hospital, Peshawar, Pakistan. Biomed J Sci Tech Res 2017;1(6):1687–91.
10. Ezmek B, Arslan A, Delilbasi C, Sencift K. Comparison of hemodynamic effects of lidocaine, prilocaine and mepivacaine

solutions without vasoconstrictor in hypertensive patients. J Appl Oral Sci 2010;18(4):354–9.
11. Abu-Mostafa N, Al-Showaikhat F, Al-Shubbar F, Al-Zawad K, Al-Zawad F. Hemodynamic changes following injection of local anesthetics with different concentrations of epinephrine during simple tooth extraction: A prospective randomized clinical trial. J Clin Exp Dent 2015;7(4):e471–6.
12. Karm MH, Kim M, Park FD, Seo KS, Kim HJ. Comparative evaluation of the efficacy, safety, and hemostatic effect of 2% lidocaine with various concentrations of epinephrine. J Dent Anesth Pain Med 2018;18(3):143–9.
13. Karanam AK, Reddy BS. Effects of lignocaine with adrenaline on blood pressure and pulse rate in normotensive and hypertensive patients undergoing extraction: A clinical study. J Oral Med Oral Surg Oral Pathol Oral Radiol 2017;3(4):202–4.
14. Hashemi SH, Ladez SR, Moghadam SA. Comparative assessment of the effects of three local anesthetics: lidocaine, prilocaine, and mepivacaine on blood pressure changes in patients with controlled hypertension. Glob J Health Sci 2016;8(10):54157.
15. Bader JD, Bonito AJ, Shugars DA. A systematic review of cardiovascular effects of epinephrine on hypertensive dental patients. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2002;93(6):647–53.
16. Soileau KM, DeGenova AE, Yu Q. Blood pressure monitoring following individual carpules of anesthetic utilizing computer-controlled anesthetic delivery. BDJ Open 2020;6(1):21.
17. Patients with blood pressure conditions and how it can affect oral surgery? Phoenix Oral and Facial Surgery 2023;2023 Feb 9. Available from: https://phoenixoralsurgeons.com/help-articles/2704926-patients-with-blood-pressure-conditions-and-how-it-can-affect-oral-surgery/

Address for Correspondence:
Dr Afsheen Mansoor, Department of Dental Materials, School of Dentistry, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan. **Cell: +92-**321-5879166
Email: drafsheenqamar@gmail.com

Received: 4 May 2025 **Reviewed:** 17 Aug 2025 **Accepted:** 27 Sep 2025

Contribution of Authors:
KI: Experimentation and study conduction
MN: Analysis, Interpretation
EM: Data collection
HN: Conception, designing, planning
BA: Experimentation and study conduction
EM: Data collection
MR: Critical review
EM: Manuscript writing
AM: Critical Review

Conflict of Interest: None, **Funding:** None